CONSTRUCTION PROCESS AND TECHNIQUES OF TRADITIONAL HOUSES IN TARAKLI/SAKARYA: AN INTRODUCTORY MODEL FOR WEB-BASED GIS APPLICATIONS

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CONSTRUCTION PROCESS AND TECHNIQUES OF TRADITIONAL HOUSES IN TARAKLI/SAKARYA: AN INTRODUCTORY MODEL FOR WEB-BASED GIS APPLICATIONS

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ABSTRACT

CONSTRUCTION PROCESS AND TECHNIQUES OF TRADITIONAL HOUSES IN TARAKLI/SAKARYA: AN INTRODUCTORY MODEL FOR WEB-BASED GIS APPLICATIONS

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Historic towns and historic buildings are important witnesses of the past cultures and civilizations. Their sustainability and transfer to the next generations require continuous maintenance and repair interventions which should be compatible with their original construction techniques, details and materials. In order to define proper interventions to a historic building, it is necessary to understand how and from what it is built. Therefore, traditional construction materials, detailings and techniques should be well understood prior to any kind of intervention to a historic building. The objective of this study is, first of all, to provide a body of knowledge on traditional construction process and techniques; then, to store, structure, process, represent and share this knowledge in a systematic and controlled way by means of a web based GIS portal.

In this respect, traditional timber framed houses of Taraklı in Sakarya has been chosen as the case study, on account of being one of the significant historical towns in our country where the tissue together with historical building is still conserved.

For this study, among the applications of GIS technology, Web-based GIS has been determined as the most effective and functional tool in order to develop an online information portal for storing, displaying the collected raw data and sharing with other users as utilizable information.

Keywords: Web-based GIS, traditional construction process, traditional construction materials, traditional construction techniques, Taraklı.

ÖZ

GELENEKSEL TARAKLI/SAKARYA EVLERİNİN YAPIM SÜREÇ VE TEKNİKLERİ: WEB TABANLI GIS UYGULAMALARI İÇİN BİR BAŞLANGIÇ MODELİ

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Tarihi kentler ve tarihi evler geçmiş kültürlerin ve geçmiş medeniyetlerin önemli şahitleridir. Bunların sürdürülebilirliği ve gelecek nesillere aktarımı, yapım malzemeleri ve teknikleriyle uyumlu sürekli bakım ve onarım müdahaleleri gerektirir. Tarihi bir binaya doğru müdahalelerin tanımı, o binanın hangi malzemelerden ve nasıl yapıldığını anlamakla mümkündür. Bu nedenle, tarihi bir binaya müdahale öncesinde, geleneksel yapım malzemeleri, detayları ve tekniklerinin iyi anlaşılmış olması gerekmektedir. Bu tezin amacı, öncelikle, geleneksel yapım sürecine ve tekniklerine ilişkin bilgi üretmek; daha sonra, bu bilginin bir web tabanlı coğrafi bilgi sistemi aracılığıyla depolanması, yapılanması, işlenmesi, sunumu ile sistematik ve kontrollü bir şekilde paylaşımını sağlamaktır.

Tez kapsamında, ülkemizde tarihi dokusunun ve yapılarının günümüze kadar özgün haliyle korunmuş olduğu önemli tarihi kentlerden biri olan Sakarya'nın Taraklı ilçesinin ahşap evleri örnekleme çalışması için seçilmiştir. Bu çalışma için Coğrafi Bilgi Sistemi uygulamalarından web tabanlı Coğrafi Bilgi Sisteminin, toplanan

verinin çevrimiçi bir bilgi portalında depolanması, kullanılabilir bir bilgi şeklinde sunumu ve diğer kullanıcılarla paylaşımı için en etkili ve verimli araç olduğu düşünülmüştür.

Anahtar kelimeler: Web tabanlı Coğrafi Bilgi Sistemleri, geleneksel yapım süreci, geleneksel yapım malzemeleri, geleneksel yapım teknikleri, Taraklı.

To my family
for their support and love

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First of all, I would like to express my sincere thanks to A. Güliz Bilgin Altınöz for her guidance, supervision, continued interest and encouragement throughout this study. I am also grateful to all jury members for their valuable ideas.

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TABLE OFCONTENTS

LIST OF TABLES

TABLES

LIST OF FIGURES

FIGURES

LIST OF ABBREVIATIONS

GIS : Geographic Information Systems

HTML : HyperText Markup Language

ICOMOS: International Council on Monuments and Sites

ICCROM: International Centre for the Study of the Preservation and Restoration of Cultural Property

METU : Middle East Technical University

POLIBA : Politecnico di Bari

UNESCO: The United Nations Educational, Scientific and Cultural Organization

YÖK : Yükseköğretim Kurulu (Higher Education Council)

CHAPTER 1

INTRODUCTION

Historic towns are important evidences of the past cultures. Their conservation and revitalization is a way of preservation of history and culture of the society that produce them.

Conservation of historic towns is a complex and long-lasting process consisting of major stages such as recording and documentation, analysis and evaluation, decision making and implementation. Among these stages, recording and documentation phase has a special importance as it provides the basis for the rest of the conservation process.

In the "Principles for the Recording of Monuments, Groups of Buildings and Sites"[1], recording is defined as an essential part of the conservation process aiming at;

- acquiring knowledge in order to advance the understanding of cultural heritage, its values and its evolution;
- promoting interest and involvement of the people in the preservation of the heritage through the dissemination of recorded information;
- permitting informed management and control of construction works and of all change to the cultural heritage;

[1] 11th ICOMOS General Assembly was held in Sofia/Bulgaria, from 5 to 9 October, 1996 and "Principles for the Recording of Monuments, Groups of Buildings and Sites" were ratified in that meeting.

- ensuring that the maintenance and conservation of the heritage is sensitive to its physical form, its materials, construction, and its historical and cultural significance.

Better conservation interventions depend on information rather than assumptions. Conservation and sustainability of historic towns requires, first of all, the existence of reliable and scientific knowledge about their various components and aspects. At this point, conservation interventions to historic buildings, as major components of the historic towns, come out as an important issue. Thereupon, the information about the construction process, materials and techniques of the historic buildings gains special importance for defining proper interventions during the conservation process of historic towns. As a part of the recording and documentation phase within the conservation process, this information can be collected from various sources. Hence, it is complex and needs to be structured so as to be utilizable. Besides, some part of it is directly related to a specific location.

Today, rapid developments in Information Technology influence tools and techniques used in conservation studies. Consequently, for information recording and dissemination purposes, technological tools and softwares have began to be used extensively. In that respect, GIS and web-based GIS are quite recently introduced tools to the conservation process, especially while dealing with complex and spatial data.

1.1. Argument

Cultural and natural properties are at risk of disappearing due to various threats from both environmental (wind, rain, earthquake and so on) and human (pollution, wars, vandalism and so on) sources. In addition to these threats, historic towns and historic buildings are especially influenced from the disappearance of local constructors and knowledge related with the traditional construction materials, detailings and techniques.

Any type of cultural property is not eternal; it is fragile and necessitates interventions in order to be transmitted to next generations. The survival of historical buildings requires permanent maintenance and repair interventions which should be compatible with their construction techniques, details and materials. The performance of a building depends on the materials from which it is made, and the way they are put together. In order to define proper interventions to a historic building, it is necessary to understand how and from what it is built. Therefore, traditional materials, detailings and techniques should be well understood prior to any kind of intervention to a historic building.

However, at the present day, construction of buildings with traditional techniques and skills has almost disappeared. Likewise, local constructors knowing these techniques are also decreasing in number and young builders with traditional construction knowledge are not growing any more. As a result, a construction tradition is at risk of disappearing.

Although, this construction tradition is not continuing any more, knowledge about traditional materials, detailings and techniques can be regained through various historical and contemporary oral, visual and written sources as well as from the existing traditional buildings. For this, data on traditional materials, detailings and techniques of historic buildings should be collected from various sources; the construction processes of traditional buildings should be understood, interpreted and made utilizable by structuring the collected data; and finally they should be shared with different user groups in a controlled way. This requires an information system which can deal with spatial data.

General Directorate of the Cultural Properties and the Museums, as the subsidiary of the Ministry of Culture and Tourism in Turkey, is the main authorized institution for the conservation of historic towns and historic buildings. In order to discharge this responsibility, scientific studies concerning documentation and recording information on traditional construction processes, detailings and techniques of the historic buildings as the basis for the rest of the conservation process become more than an issue. While rapid developments in information technology has begun to

influence the tools used in conservation field all over the world, studies for recording, documenting and also storing collected data have been still made by using conventional techniques in the General Directorate. Mostly, information is stored in paper-based documents and left in the archive sections of the ground floors, or stored in the computers with simple programs, but not in a systematic way. Additionally, dissemination of information and sharing with the public depend on bureaucratic permissions and most of the time, this process takes a long period.

Briefly, it can be asserted that, an information portal, which can function as a spatial databank for storing and for sharing information in a systematic and controlled way, and also for supporting decision making process of conservation, has not been developed yet under the responsibility of General Directorate of Cultural Properties and Museums.

1.2. Objectives

Parallel to the defined problems, this thesis aims at:

- providing a body of knowledge on traditional construction processes, materials, techniques and detailings by collecting data about these aspects from various sources,
- defining the classification of different data groups coming from various data sources such as visual, written or narrative sources,
- proposing a medium for the dissemination and distribution of documentary material and make it available and more easily accessible for users in a controlled way,
- constituting an information system about construction process, materials and techniques of historic buildings to support decisions about conservation interventions.

Internet, one of the latest and widely accepted communication and information technologies, is being used in many working fields all over the world. Nowadays, one of its usage areas is GIS applications by means of querying and displaying

required data more accurately and speedy and sharing available information with more people. In this respect, usage of Internet through web based GIS can provide conservation decision making processes by storing, presenting and sharing data in a systematic and controlled way. Therefore, web-based GIS have been determined as the tool that serves the objectives of this study.

The thesis focuses on Taraklı/Sakarya as the case area, on account of being one of the significant historical towns in Turkey where the tissue together with historical buildings is still conserved.

The objective of this study is, first of all, to generate an original body of knowledge on construction process, materials and techniques of traditional houses in Taraklı; secondly, to propose a web based GIS application for storing, structuring, processing, presenting and sharing information on various aspects of traditional buildings in Taraklı, including also their construction process and techniques.

Web-based GIS for Taraklı has been proposed as a sample model serving as an online databank for storing, processing and presenting the information which is proposed to take place under the auspices of General Directorate of Cultural Properties and Museums. Consequently, conservation specialists have been determined as the target user group of the proposed web-based system, in order to support conservation decision making process of historic towns and buildings, and also in order to carry out better restoration and rehabilitation projects by documenting, storing and sharing available information.

Within the scope of this thesis; influence of social, economical, ethical or political aspects influential on conservation activities are mentioned. The study is limited to the knowledge about the physical structure of the town and the buildings.

1.3. Procedure

After defining the problem and aim of the study the first phase had been literature survey phase. In this phase, an investigation on the fundamentals of GIS, specially

focusing on web-based GIS in order to provide background information for the conceptual part, was carried on (Figure 1.1). Web sites on the web-based GIS applications, not only from conservation field but also studies from other fields in order to understand application methods and system architectures, were visited and studied. In addition to the researches on the web-based GIS, literature review on the traditional architecture and construction systems in general and specificity of Taraklı as the case was accomplished. Literature review of the study was supported by the theses and the publications found in the libraries of the Higher Education Council (YÖK), Middle East Technical University (METU), Politecnico di Bari (POLIBA) were conducted. Online libraries and archives, web sites related to the subject, were also visited.

The second phase was the site survey. Field trips were carried on in order to collect data on construction process of traditional buildings in Taraklı. During site survey, construction materials and techniques of the traditional houses were examined, sketches of the construction details were drawn, and photographs were taken. Necessary graphical and written documents such as maps and technical drawings of the houses were obtained from the Taraklı Municipality. Additionally, interviews were conducted with local constructors in order to understand the construction process.

The third phase is designing the spatial database in order to develop the proposed web based GIS. Raw data collected during the phase of literature survey and site survey, was edited and classified according to the data features and relations; conceptual and graphical data models were created.

The following phases are the data entry, structuring and display of the system. According to the designed data model, data entry has been made into the database in order to store, structure, analyze and display the data as 'utilizable information' on the Internet. During the preparation of data models, softwares such as Auto Cad 2007 for drawing plans, elevations and sections of the houses, Adobe Photoshop CS and Paint Shop Pro 5 for editing images, Final Cut Pro 6 and Adobe Macro Flash Player for editing video formats, and also free softwares of Google Company such as

Google Sketch Up, Google Maps and Google Earth were used. As a result, an online information portal serving for the objectives of the thesis was proposed, which presents the data related with the case area and allows sharing of information with the users.

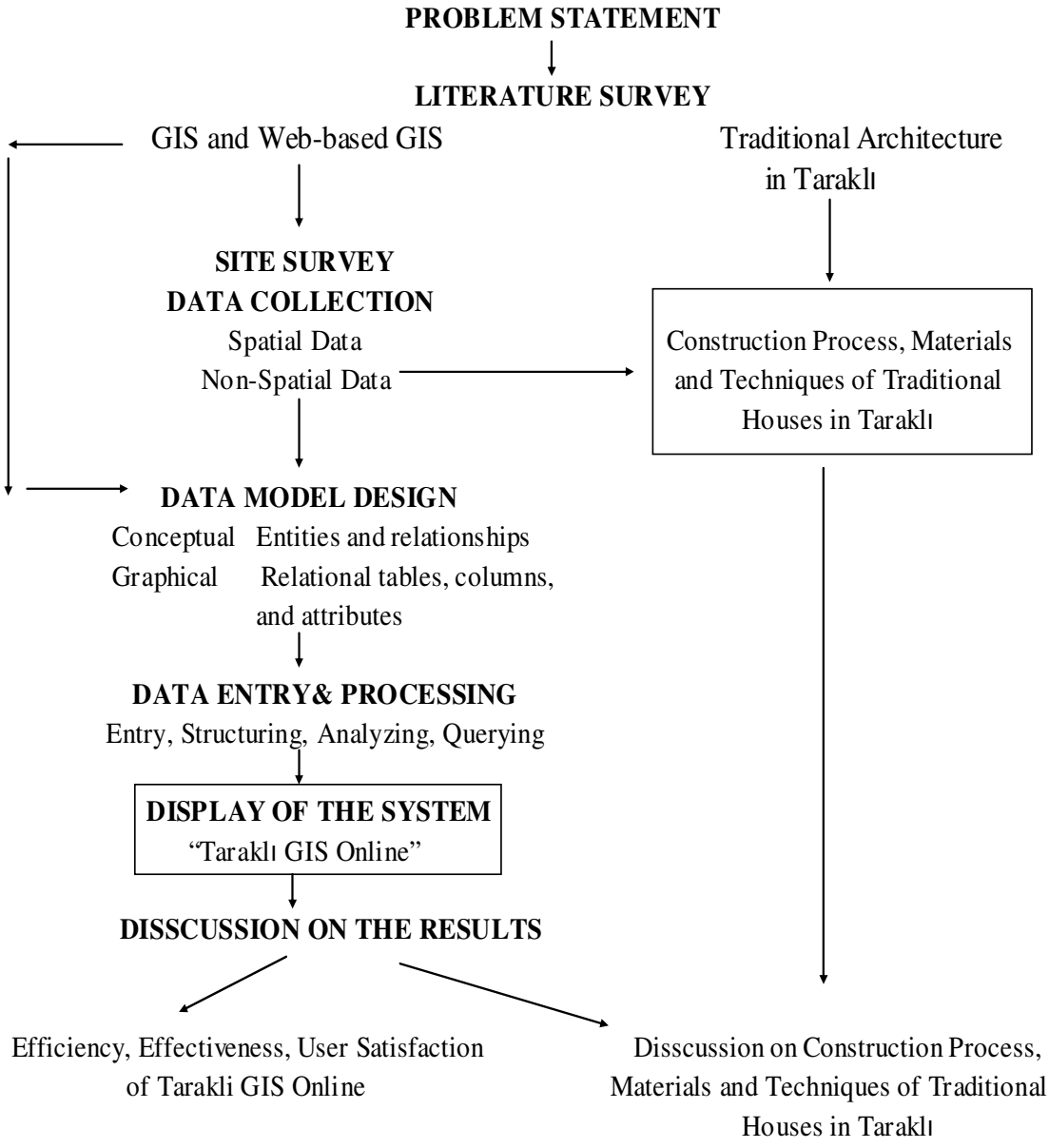


Figure 1.1. Stages of the study.

1.4. Disposition

In the introduction part; the argument, the aim and the objectives of the study, the procedure, and the structure of the thesis are described.

Second chapter focuses on the literature review carried on in two main tracks based on various sources such as unpublished reports, theses, books and web-based sources.. First track is the literature review on Taraklı and general properties of Taraklı Houses. This covered the information on general characteristics and history of the town, conservation and planning studies, and also architectural characteristics of traditional houses. Second one is the literature review on GIS and web-based GIS in which the evolution of GIS and web based GIS, components and architectures of web-based GIS are mentioned. Also in this part, information about GIS and web-based GIS applications in conservation field, specially by referring to the studies in Photogrammetry Laboratory of Politecnico di Bari in Italy, is given. Due to limited web based GIS studies in conservation area, for better understanding of technology of web based applications, online projects from natural and environmental studies are also briefly introduced.

In third chapter, material and method of the study are described. Firstly, as the material, surveyed traditional houses are introduced. Additionally, survey methods of the site studies in Taraklı and proposing web based model *"Taraklı GIS Online"* are explained.

In fourth chapter, body of knowledge produced through this study on the construction process, materials and techniques of traditional Taraklı houses is presented. Following, the proposed web-based information portal *"GIS Online Taraklı"* is introduced. Creation of data types, design of database and display of the system are explained and then, results and discussions are presented in order to evaluate the system effectiveness.

In fifth chapter, results on the construction process and techniques of traditional Taraklı houses and on the proposed web-based system *"Taraklı GIS Online"* are

discussed and also conclusions of the research are presented by referring to the further studies.

CHAPTER 2

LITERATURE SURVEY

The literature review for this thesis is carried on in two main tracks. First one is the literature review on Taraklı and general properties of Taraklı Houses. For this, the main sources of information had been an unpublished survey report on the subject of vernacular architecture of Sakarya region, prepared by DAVULCU (2006)[1], an unpublished master's thesis on residential and monumental architecture of Taraklı, prepared by ÖZKAN (2008)[2], and also a book on the timber framed houses of North Anatolia written by KAFESÇİOĞLU (1955)[3]; web site of Taraklı Municipality[4]; conservation development plan of the town and registration forms and measured drawings of traditional houses obtained from Taraklı Municipality and TARES architectural project office in Sakarya, and restoration projects of two houses prepared by the students of Safranbolu Vocational School in Safranbolu.

The second track is GIS and web-based GIS covering their evolution, components, and architectures. For this part although a number of published sources and web sites had been utilized; two books, describing the fundamentals, components, architectures

[1] DAVULCU M., 2006. Sakarya Yöresi Kırsal Yerleşmelerinde Konut Mimarisi ve Ustalık Geleneği Üzerine Bir İnceleme, Conference of Field Surveys on Sakarya Folk Culture, Unpublished Report, 26.12.2006, Adapazarı.

[2] ÖZKAN S. S., 2008. Taraklı'nın Fiziksel ve Tarihsel Dokusu, Sivil ve Anıtsal Mimarlık Örnekleri Hacı Rıfatlar Konağı Restorasyonu, Yıldız Technical University, Institute of Applied Science, Unpublished Master's Thesis, İstanbul.

[3] KAFESÇİOĞLU R., 1955. Kuzey Batı Anadolu'da Ahsap Ev Yapıları, İTÜ Faculty of Architecture, p.102, Istanbul.

[4] Governorship of TARAKLI, www.tarakli.gov.tr/tarakli/index.html, last accessed: December 2006.

and application areas of web based GIS written by PENG, TSOU (2003)[5] and PLEWE (1997)[6], research papers downloaded from the website of ISPRS[7] and CIPA[8] congresses, and also the web site of *"GIS Online"* project (http:www.stereofot.it) of Architectural Photogrammetry Laboratory at Politecnico di Bari in Italy had been the main sources of information.

Table 2.1. Sources providing basis for Taraklı Site Survey

DATA	SCALE	SOURCE	PROCESSING	RESULTS	DATA FORMAT
Reports and registration forms of the houses		Ministry of Culture and Tourism	Detailed information about traditional houses has been obtained.	Preparation of Survey Inventory Sheets	Raster
20 sheets of cadastral maps of Taraklı	1/1000	Bank of Provinces	20L-I, 20L-II sheets were merged and plan of the town center was drawn in Auto Cad.	Digital drawing of the town center	Vector
11 sheets of Development Plans for Conservation	1/1000, 1/5000	Taraklı Municipality	Examining restoration interventions based on the decisions of Conservation Committee	Analysis and Evaluation of conservation decisions	Raster
Taraklı Maps in Net CAD digital format	1/1000	Taraklı Municipality	Creating different layers for display of traditional houses	Drawings, Maps	Vector
Area Map	1/3500 0	General Command of Mapping	Graphically display of material sources and exact location of houses	Presentation and Evaluation	Raster
Measured Drawings of the houses	1/50	Taraklı Municipality and TARES	Redrawn by the author	Presentation and Evaluation	Raster
Photographs		Taraklı Municipality	Detailed view of construction materials and techniques of traditional houses	Presentation and Evaluation	Raster

[5] PENG Z. R., TSOU M. H., 2003. Internet GIS: Distributed Geographic Information Services for the Internet and Wireless Networks, Wiley Publications, New Jersey, USA.

[6] PLEWE B., 1997. GIS Online: Information Retrieval, Mapping, and the Internet OnWord Press, New Mexico,USA.

[7] International ISPRS Congresses, http://www.isprs.org/society/congress.aspx, last accessed: November 2008

[8] International CIPA Symposiums, http://cipa.icomos.org/index.php?id=20 last accessed: November 2008

2.1. Taraklı

General information gathered through literature review on the town and on the traditional Taraklı houses are described in the following pages.

Figure 2.1. Location of Taraklı (Google Earth, last accessed: September 2008)

Taraklı is at 200 km southeast of Istanbul, 270 km northwest of Ankara and 65 km south of the city of Sakarya (Figure 2.1). It is located at 28 km west of Göynük-Bolu, 34 km east of Geyve, and 30 km north of Gölpazarı-Bilecik. Its estimated 2002 population was 9220, and it was composed of 4 neighborhoods and 22 village settlements. Up to 1987, the town was a part of Geyve, but in that year, following the constitution of local Governorship, Taraklı also became an administrative district of Sakarya province[9].

Total land area is 334 km^2 whose 20% is agricultural area, 60% is forest area, 10% is grassland and 10% is settlement area. Taraklı has an altitude of 450 m above sea level and the town periphery is mountainous and hilly. On these mountains, some important plateaus such as Karagöl Plateau are located. Göynük and Aksu River flow through Taraklı and they meet out of the district and reach Sakarya River[10] .

[9] Governorship of TARAKLI, www.tarakli.gov.tr/tarakli/index.html, accessed: December 2006

[10] Governorship of TARAKLI, www.tarakli.gov.tr/tarakli/index.html, accessed: December 2006

Although, Taraklı is located in Marmara Region, a terrestrial climate is felt throughout the district because of highlands. Winters are snowy and freezing, summers are hot and dry but it is rainy in spring and autumn. The majority of Taraklı's landscape is forest area. Fruit growing is widespread on the plain lands, and it is also a major economic activity for local people.

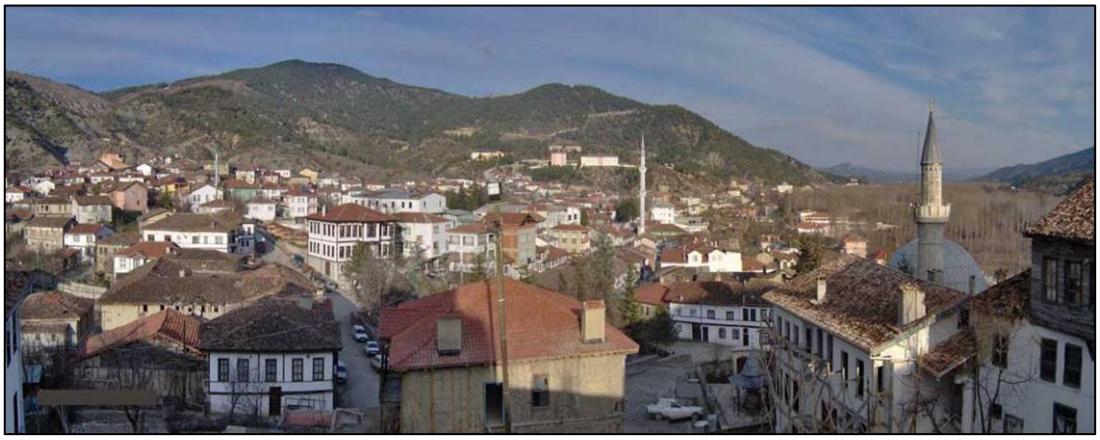


Figure 2.2. General view from Taraklı (author, January 2007)

Due to economic woes, migration from the town has become inevitable and as a result, population density of Taraklı has become lower compared to the other towns of Sakarya. Taraklı has a population of 9220 according to the results of population census in the year of 2002. 4169 people of this population live in the town center and remained 5051 people live in the villages (Özkan, 2008:6).

Taraklı is known to be continuously settled since Hellenistic period onwards (Table 2.2). The town was known with the names of "Dablais, Doris, Deblis and Dablai". It was a part of an ancient region called as Bithynia. In the Roman period, it was a kingdom and Roman province in the northwest of Asia Minor, adjoining the Propontis, the Thracian Bosporus and the Black Sea In Byzantine time, it was a small castle town under the authority of the city of Bursa (Özkan, 2008:11).

In Ottoman period; Osman Bey's fellow soldier Samsa Çavuş raided Sorkun, Yenice Tarakçı (Taraklı) and Göynük. During these raids (1289-1293) Taraklı Castle was damaged too much. In 1333, Famous Arab traveller Ibn Batuta came to this region

and he called Taraklı as Yenice. During Egypt and Syria wartime, Yavuz Sultan Selim's army was deployed in Taraklı due to its strategic position and being a part of Silk Road. In Ottoman time, Silk Road from İstanbul-Üsküdar to Bağdat was passing through Gebze-İzmit and then Sakarya-Geyve-Taraklı and Göynük. In 1517, a mosque was constructed by Yunus Paşa and it was called with his name (İşsever, 1994:35).

The most comprehensive information about Taraklı was given by Evliya Çelebi. In his travel book, he described Sakarya Valley as *"the Ocean of Trees"* and mentioned that Taraklı's castle was damaged but the town had 500 dwellings with full of gardens. He talked about the beauty of the Mosque in the bazaar and also the existence of Turkish bath, 5 hans, 6 schools and 200 stores. He also mentioned that all store owners were labored in making combs and spoons, so that the town was called *"Taraklı"* (Özkan, 2008:15).

In Turkish Republican period; Taraklı was a subdistrict between the years of 1926-1954 and Municipality was instituted in 1954. Similar to the Ottoman silk road, in Republican time, main roadway from İstanbul to Ankara was on the way of Sapanca-Geyve-Taraklı-Göynük-Beypazarı. Accordingly, the trade of the town was so active till 1950. In 1950-1965, Taraklı was an important trade center that all products of villagers were gathered by merchants and marketed to İstanbul. Main income of the local people was sericulture in the town center and poppy cultivation in the villages. Additionally, handicraft products such as timber combs, and spoons were made and sold. At that period, hand workmanship for manufacturing timber spoon and comb was so common. In old Bazaar, most of the shops were used not only as shops for selling these products, but also used as workshops for manufacturing[11].

[11] Governorship of TARAKLI, www.tarakli.gov.tr/tarakli/index.html, accessed: December 2006.

Table 2.2. Chronological Order of Taraklı History

HELLENISTIC PERIOD	ROMAN PERIOD	BYZANTINE PERIOD	OTTOMAN PERIOD	EARLY REPUBLICAN PERIOD
called "Deblis, Dablai, Dablais and Doris".(7. and 6. century BC.)	a part of Bithynia which was an ancient kingdom in North Anatolia (297-74 BC.)	a small castle town under the authority of City of Bursa	Ibn Batuta called Taraklı as Yenice (1333).	an important trade center in 1950-1965 .
			Yunus Paşa Mosque was constructed in Yavuz Sultan Selim period. (1517)	a subdistrict in 1954 with the construction of Municipality..
			Evliya Çelebi mentioned in his travel book that the town had 500 dwellings with full of gardens (1600s).	After the change of Ankara-Istanbul main roadway to Bolu Mountain, the town economy had a big recession.
				an administrative district in 1986

Following 1950s, due to changing the route of Ankara-İstanbul main roadway to Bolu Dağı, the town economy had a recession and merchants traveling between Anatolian cities and İstanbul did not visit Taraklı anymore. Firstly, young people moved to big cities as İstanbul, İzmit or Sakarya in order to find better jobs and afterwards, their families followed them and as a result, many traditional houses were abandoned in the town. Abandoning of these traditional houses by their owners and a remarkable decrease in the number of local constructors working for the construction and restoration of these houses, not only result in destroy and decay problems of construction materials, but also result in the disappearance of knowledge about traditional construction techniques and details[12].

[12] Governorship of TARAKLI, www.tarakli.gov.tr/tarakli/index.html, accessed: December 2006.

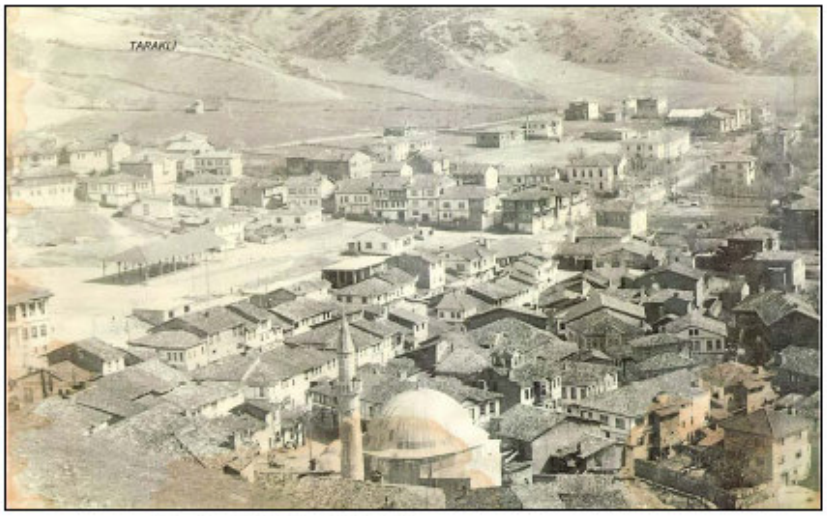


Figure 2.3. Taraklı in 1960 (Taraklı Municipality Archive, 2007)

Figure 2.4. Old Bazaar in Great Mosque District (author, November 2006)

2.1.1. Conservation and Planning Studies in Taraklı

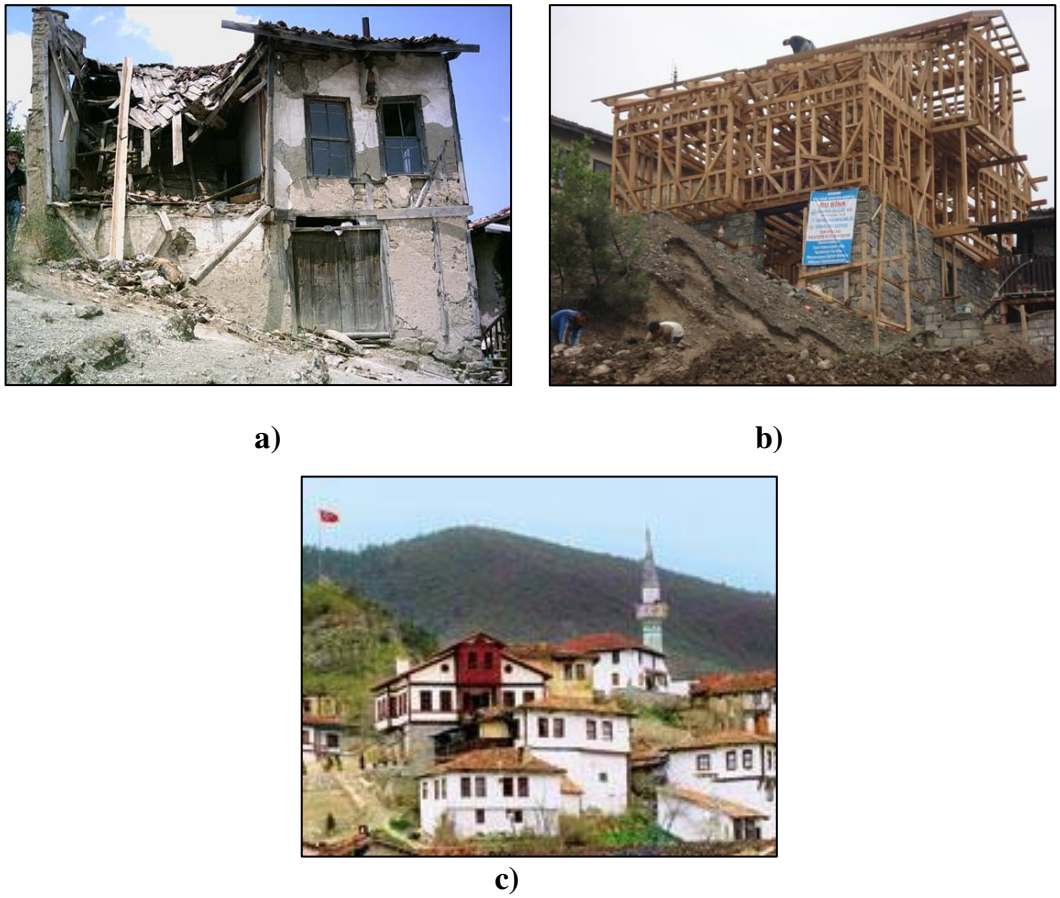
In Taraklı, the traditional houses have been quite well conserved and they have not been so much restored or renewed. However, in recent years, Municipality is trying to make restoration projects in order to develop tourism at the town and wants to use these traditional houses for accommodation purposes. For the financial support, Taraklı Municipality is in relation with Ministry of Culture and Tourism[13] and also Special Provincial Administration of Sakarya[14].

In order to get knowledge about early conservation studies in Taraklı, registration sheets of the town and the traditional houses were obtained from the General Directorate of Cultural Properties and Museums[15]. First conservation study began with the registration of town center as an historical urban site as per decree number 675 dated September 1, 1989 of the Regional Committee for Cultural and Natural Assets of Bursa[16]. With the same decision and with the following decisions in 1991, 1992 and 2005 eighty three traditional houses were registered as "immobile cultural properties". In addition to registration of traditional houses, cultural properties from different categories such as 4 mosques, 1 Turkish bath (stone masonry), 1 han (timber framed), 1 fountain, 2 monumental trees are also registered.

With the conservation decisions, unique examples of traditional timber framed houses showing characteristics of late Ottoman and early Republican Architecture have been registered as immobile cultural properties; however this is not enough to conserve them in their original states. According to Municipality records in 2007, nearly 170 timber framed houses were abandoned or rarely used at the town center due to the limited economic conditions that people are leaving from their houses and moving to big cities in order to find better jobs. Therefore, conservation development plans of Taraklı have been intended to restore and reuse these houses in full capacity for conserving their original values and also using these houses for accommodation, gastronomy or for museum studies in order to develop tourism at the historic town.

[13] T.C. Kültür ve Turizm Bakanlığı
[14] Sakarya İl Özel İdaresi
[15] Kültür Varlıkları ve Müzeler Genel Müdürlüğü-KVMGM
[16] Bursa Kültür ve Tabiat Varlıklarını Koruma Bölge Kurulu-Bursa KTVKBK

In this respect, with the aim of saving historical pattern of traditional building stock in the town center and developing conservation policies in Taraklı, 1/1000 Measured Conservation Development Plans were prepared by Ministry of Culture and Tourism in 1992 and they were legitimized as per decree number 2675 dated September 25, 1992 of Bursa KTVKBK. Up to the present, in order to achieve this aim, government agencies like Ministry of Culture and Tourism, General Directorate of Foundations[17] and Taraklı Municipality are working together.



a) **b)**

c)

Figure 2.5. Restoration Process of Governor Guesthouse in Great Mosque District **a)** Before the restoration intervention (Municipality Archive, 2006), **b)** Construction of timber framework (Municipality Archive, 2006), **c)** After the completion of restoration (Arkiteracom, http://www.arkitera.com, accessed: August 2008)

Due to limited financial situation of the Municipality, for restoration and conservation projects financial support is taken from Special Provincial Administration and Ministry of Culture and Tourism. Moreover, with a new legal

[17] Vakıflar Genel Müdürlüğü

regulation (Regulation for Contribution of Conserving Immobile Cultural and Natural Assets-legitimized as per decree number 2785 dated April 25, 2005), 10 percent of real estate taxes gathering by the provincial municipalities will be left to the conservation of cultural properties. At this point, Taraklı has an advantage that it is the only historical town among the towns of Sakarya Province. Therefore, since a few years, sufficient financial support for restoration projects is also taken from the Provincial Municipality of Sakarya. In that respect, it can be said that, projects of traditional houses are financially supported by the funds of Ministry of Culture and Tourism, Special Provincial Administration and also by Provincial Municipality of Sakarya. Recently, Governor Guesthouse, Municipality Guesthouse, Çakırlar Konağı, and also the traditional house next to Çakırlar Konağı have been restored with their support. Following these projects, in the near future, Hisar Evi for gastronomy and Fenerli Ev for accommodation will also be restored.

On the other hand, restoration projects of Yunuspaşa Mosque and Turkish bath were supported by General Directorate of Foundations a few years ago. Yunuspaşa Mosque and Turkish bath have a special importance that they are the oldest registered cultural properties at the town that they were dated back to 1500s and today, they are still alive with their original characteristics.

Furthermore, rehabilitation projects of historic streets are supported by the Ministry of Culture and Tourism. Especially, traditional houses on Rüştiye Street (Figure 2.7) have the capacity to form an historic pattern. Therefore, conservation of houses on this street (Fenerli Ev, Rüştiye Mektebi, etc.) is considered as the conservation of the historic pattern of the whole street. For rehabilitation process of the street, first of all, registered houses, which need rapid interventions, will be expropriated by the government, and then restoration projects will be completed. Following, street elevations of unregistered timber framed houses will be restored according to their original façade features and meanwhile, stone pavement of the street will be paved with the original stone material. The aim of all these studies is not only the conservation of the buildings, but also the reuse and revaluation of abandoned or destroyed houses for accommodation or gastronomic facilities in order to develop culture and tourism at the town .

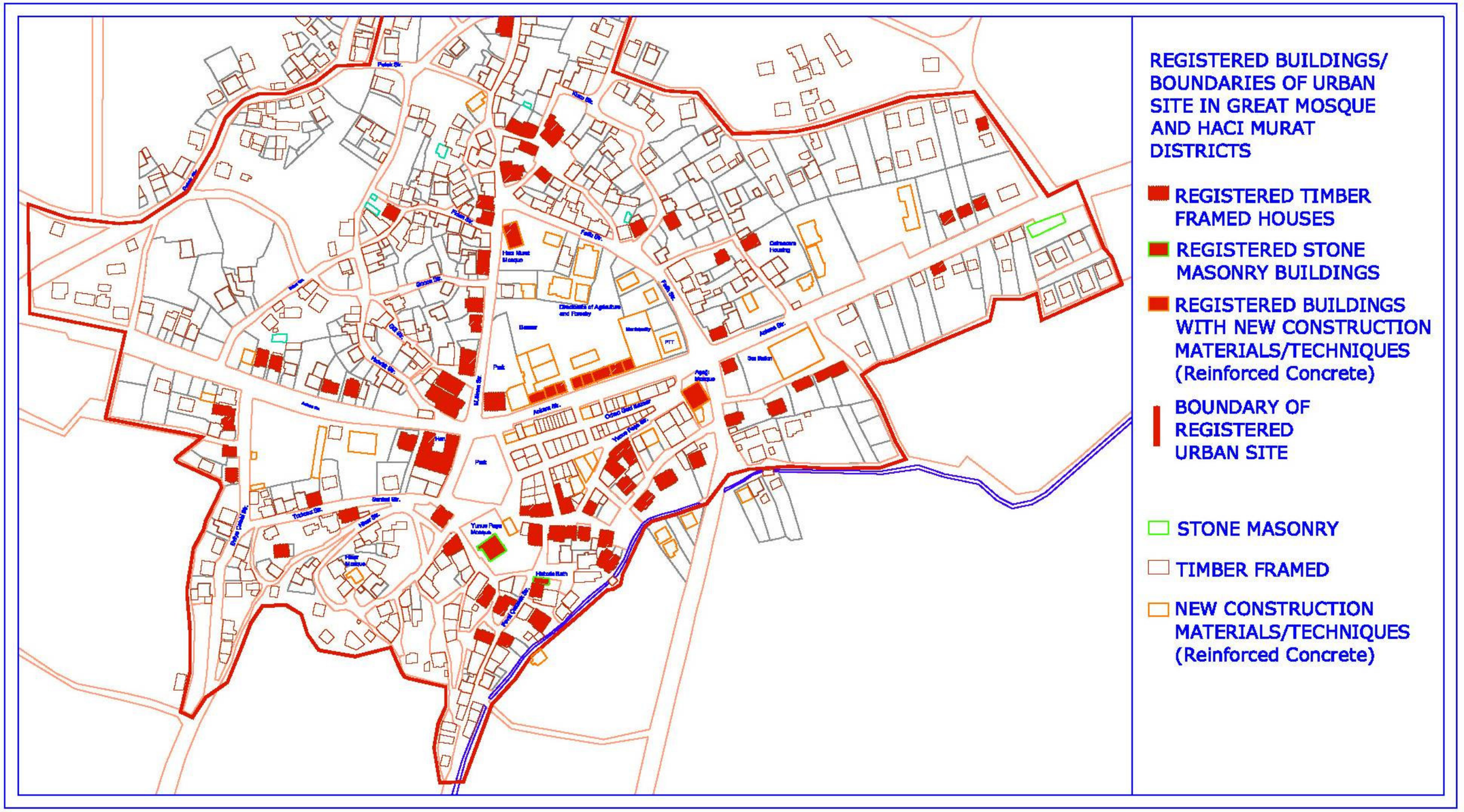


Figure 2.6. Registered Buildings and Boundaries of Urban Site in Great Mosque and Hacı Murat District
(Information Source: Taraklı Conservation Development Plan, 1992-
Digital base map was obtained from Taraklı Municipality, 2007-redrawn by the author, 2008)

2.1.2. Architectural Characteristics of Taraklı Houses

Generally, traditional houses are located adjacent to a street and entrances of the houses are provided directly from these street façades. Courtyards are at the backside of the house and these courtyards are surrounded by mudbrick, stone or timber walls called as **"***daraba*". At the courtyards, there are spaces not only for daily life activities but also for storages, straw house, oven and poultry house (Davulcu, 2006:3).

a)

b)

Figure 2.7. Street Façades of Traditional Houses in Great Mosque District,
a) Traditional houses with two and three storeys on Özkaraman Street (Conservation Development Plan of Taraklı, 1992),
b) Traditional houses with two and three storeys on Rüştiye Street (Conservation Development Plan of Taraklı, 1992)

In the town, one or three storeyed traditional houses are in fewer amounts compared to two storeyed ones. Houses which have more than two storeys are called as "Konak" and they are mostly found in towns not in villages.

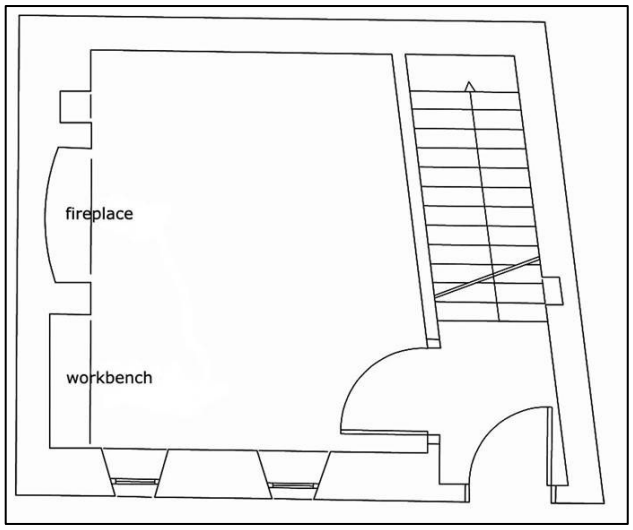


Figure 2.8. Ground floor plan of Hisar Evi, (see Appendix C)
(1/50 Measured Survey Drawing of Hisar Evi-ATEŞ R.,2005)
redrawn by the author, 2008)

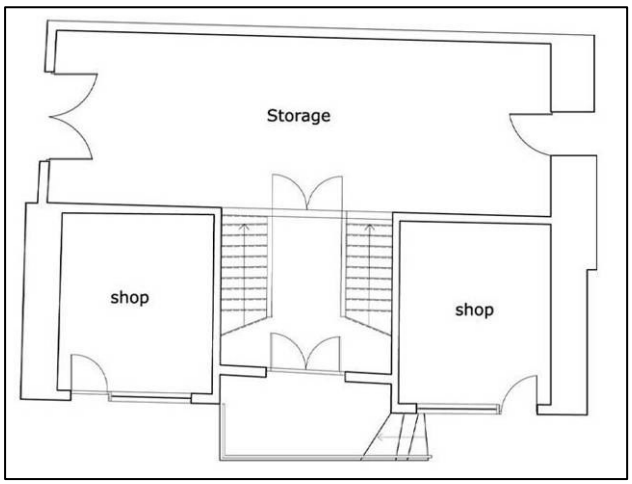


Figure 2.9. Ground floor plan of Çakırlar Konağı, (see Appendix C)
(1/50 Measured Survey Drawing of Çakırlar Konağı-
SELİM İ. , 2005-redrawn by the author, 2008)

Ground floors are used for general services as storage and livestock; therefore, construction workmanship was not as precise as the upper floors. Sometimes height of ground floor could reach 5 meter allowing construction of a mezzanine floor as a winter room or as a servant room. Entrance area which is called as “ayaklık, avlu, hayat or taşlık” provides circulation on the ground floor and also, some farming equipment is kept there. Cattle are sheltered in barns called as “dam or tam” (Davulcu, 2006:3).

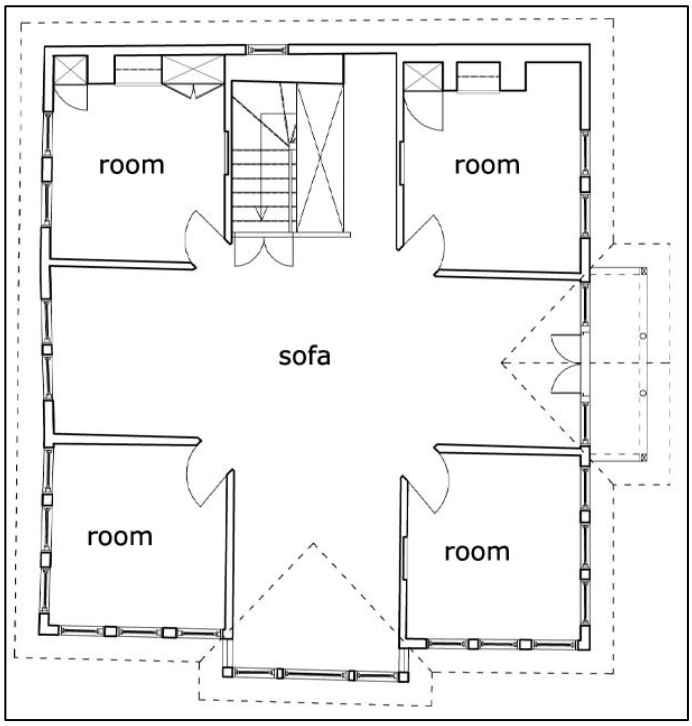


Figure 2.10. Second floor plan of Çakırlar Konağı, (see Appendix C)
(1/50 Measured Survey Drawing of Çakırlar Konağı-
SELİM İ., 2005- redrawn by the author, 2008)

Upper floors are main living units of the houses. If the has three floors, 2nd floor is used for accommodation in cold seasons whereas, 3rd floor is used for warmer seasons. Upper floors consist of a hall (sofa) called *“hayat, yörme and rooms” (*Davulcu, 2006:3). In the house, sofa is a so functional space that provides indoor circulation and also, provides a space for gathering of family members together. On one side of the sofa, there is *“abdestlik”* for washing up and just behind it a toilet called as *“hela” (*Davulcu, 2006:3).

Sometimes, plan of the ground floor was not designed in regular geometry, in order to improve the geometry of the plan on upper floors; one or two rooms were projected towards the street. To support these projections, timber braces were fixed to the main posts on the corners and lighter infill materials (lath covering without infill etc.) were used to decrease the load.

2.2. GIS and Web-Based GIS

By the end of the 20th century, with the rapid growths in the medium of computerized environment, it has become easier to capture, store, update, transform, manipulate, analyze and display all forms of data. Due to the fact that GIS is evolving as a computer based decision and operational support technology, by operating collected data in a digitized computer environment, it is possible to create highly versatile and well designed databases and to represent required information more reliable and effective. GIS can be described as an integrated collection of data and computer software that is used for monitoring and managing information about geographic places, analyzing spatial relationships, and modeling spatial processes. Concerning gathering phase and organization of spatial data and related information, GIS has capability to provide an effective framework in order to display the information and evaluate the results[18].

First attempts in GIS applications were individually managed from personal computers with expensive commercial software programs, but after 1990s, with rapid growth in computer technology, data sharing and data distribution between GIS users apparently become widespread and as an open source computer based communication technology, internet has emerged as a powerful tool all over the world (Longley, 2005:17). Recently, more researches and investments are conducted to develop open source GIS tools rather than commercial ones. This is also a result of availability and easy accessibility of web-based applications not only between individual users but also between governmental and administrative authorities.

[18] ESRI, http://support.esri.com/index.cfm?fa=knowledgebase.gisDictionary.search&searchTerm=GIS, last accessed: June 2008.

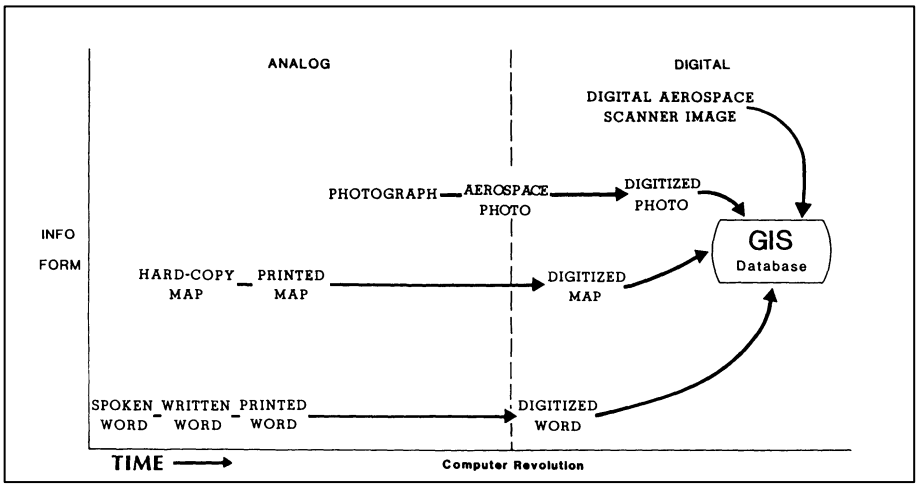


Figure.2.11. Forms of Geographical Information through time and their integration in a GIS database. (Source: King, Guy Q., 1991: 66)

In that respect, to create information system, open source tools (map service, web service, etc.) have been used in order to fulfill the goals of this study. Without buying any expensive GIS software, integrating the technology of the internet and GIS provides general availability and easy accessibility to related information and supports participation of more people and administrative organizations in conservation decision making processes. According to Bill and Korduan (2004:2), the use of internet is also depicted as a cost-effective solution because of the advantages such as saving time, money, effort and the quantity of the data which can be transported.

Peng and Tsou (2003:11) define Internet GIS as a research and application area that utilizes the internet and other internet working systems (including wireless communications, and intranets) to facilitate the access, processing and dissemination of geographic information and spatial analysis knowledge.

There are different usages of terminology when addressing the dissemination of geographically referenced data “online” such as Internet GIS (Peng and Tsou, 2003), GIS Online, Distributed Geographic Information (Plewe, 1997), Web-based GIS, Web GIS (Kearns, 2003). The terms are all similar, but generally they have different meanings. The term internet has a common and effective meaning that it is a

collection of interconnected computer networks, linked by copper wires, fiber-optic cables and wireless connections. On the other hand, the World Wide Web is one of the services, such as electronic mail, online chat and file transfer, accessible via the internet. Briefly, it can be said that the World Wide Web is a networking application that runs on top of the internet (Peng and Tsou, 2003:11). Distributed GIS refers to the use of internet technologies to distribute geographic information in various forms such as maps, images or datasets.

GIS technology may influence many different application fields, on the other hand, it also comprises of various disciplines such as geography, cartography, photogrammetry, remote sensing, GPS technology, statistics and other disciplines concerned with handling and analyzing spatially referenced data. In that respect, it can be mentioned that the use of GIS technology is proposed to fulfill the goal of merging data coming from different sources.

According to Bonham-Carter (1998:1) the term information in GIS, indicates the data in a GIS which are organized to provide useful knowledge, generally displaying as maps and images, graphics, tables and various computerized responses to interactive queries.

Data are raw in nature and they have to be processed before being used as information, whereas information is the collection of data to derive meaning. Data can simply exist in any form such as symbols, numbers or words and it represents the real world. About any fact, amounts of usable or useless data can be collected, and at the stage of data collection it is not easy to say which data will be stored or which one will be eliminated, and between large quantities of data, how the required one will be displayed.

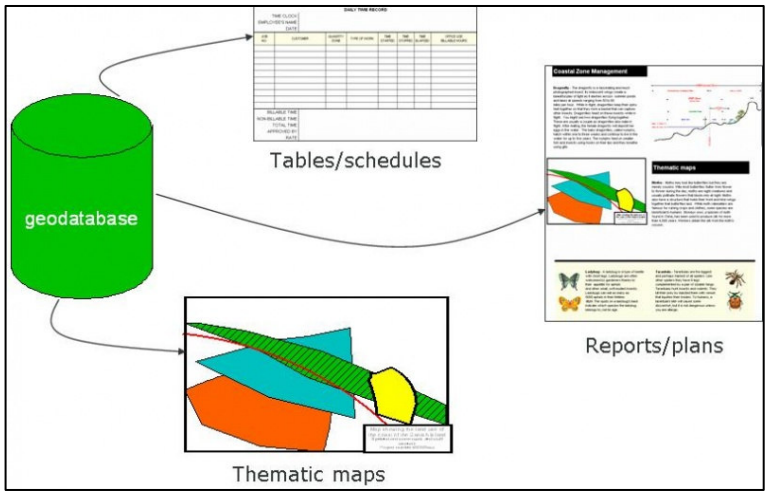


Figure.2.12. Geodatabase
(Encora Project, http://www.encora.eu/coastalwiki/GIS,
last accessed: May 2008)

In GIS environment geographic data is processed in geographic databases. Geographic data describes the location and attributes of things including their shapes and representation. Geodatabase is a database or file structure used primarily to store, query and manipulate geographically referenced data[19].

In general terms, two types of data can be processed in GIS environment: spatial and attribute data, while spatial data is related graphic features such as digitized maps, aerial photographs, satellite images, attribute data concerns with descriptive or statistical features. Graphic data can be represented in two different types of geographic models, the *"vector"* model and the *"raster"* model in order to describe spatial relations. In vector model, information about points (nodes), lines (distances etc.), and polygons (area, boundary etc.) is stored as a collection of x, y coordinates.

The location of a building or a historical monument represents a point feature and it can be described by a single x, y coordinate. On the other hand, in a raster image information is stored as a collection of grid cells that can be represented as a picture.

[19] ESRI, http://support.esri.com/index.cfm=knowledgebase.gisDictionary.search&searchTerm= geodatabase, last accessed: June 2008.

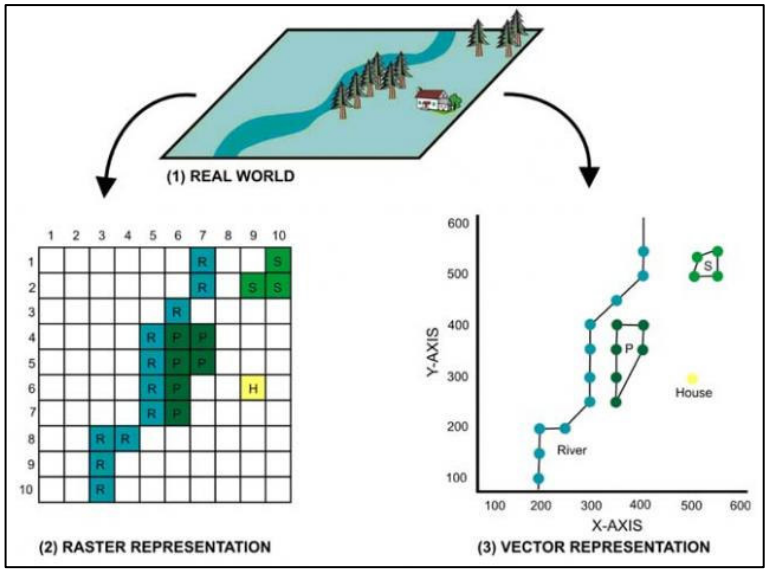


Figure 2.13. Raster and vector data types
(Source: GIS Cookbook, http://www.cookbook.hlurb.gov.ph/book/export/html/, last accessed: June 2008)

GIS technologies are emerging from mainframe GIS to desktop GIS and to distributed GIS, which also includes Internet GIS (Peng and Tsou, 2003:5). Mainframe GIS and desktop GIS are traditionally applied GIS, whereas distributed GIS comprise of last technological advances and it refers to distributed services such as Internet and mobile geographic information services.

Mainframe GIS is adopted as monolithic computing model that all the programs were in the same mainframe computers (Peng and Tsou, 2003:15-19).

Desktop GIS utilizes from GIS programs embedded in desktop computers. Desktop GIS has two different application styles: stand-alone desktop GIS functions and data operations in one stand alone computer, there is no data transfer with the others, whereas in LAN-based desktop GIS application, there is a network communication with the servers inside an official LAN. GIS programs have to be installed on every different computer. Compared to mainframe GIS, more people can utilize the features of GIS on desktop applications, but still limited numbers of people can access the information in terms of depending the numbers of desktop computers in that place.

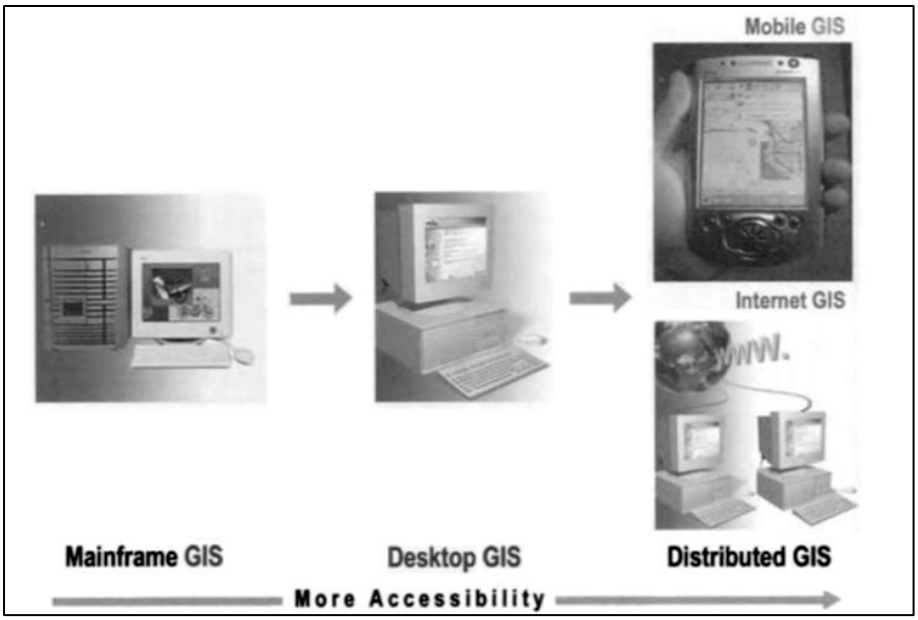


Figure 2.14. Development path of GIS technology
(Source: Peng and Tsou, 2003:6)

Internet GIS, a relatively new approach in GIS environment, provides more flexible, dynamic and simpler applications without constraints of computer hardware and operating systems, whereas traditional GIS services are closed and centralized systems. Transferring one system to other one requires new data models and new system design. Every element is embedded inside and can not be separated from the rest of the system (Peng and Tsou, 2003:5).

On the other hand, compared to Internet GIS, desktop applications has several limitations and, in general terms, Internet GIS technology has emerged to overcome these limitations of desktop GIS software packages (Peng and Tsou, 2003:15-19):

- The first limitation of the desktop GIS is that every user has to buy a desktop GIS software package and has to know how to use that software program even though a small percentage of functions will be used. On the other hand, investment for the GIS software program is not possible for every user, only limited numbers of people organizations can fully benefit from its functions.

Table 2.3. Comparison of Desktop GIS and Distributed GIS

(Source: Peng and Tsou, 2003:8)

Application Characteristics	Mainframe GIS	Desktop GIS	Distributed GIS	
			Internet GIS	Mobile GIS
Architectural Models	Monolithic	Ethernet Era Client/Server (two-tier)	Web Client/server (three tier[20] or n tier)	Wireless Client/server (three tier or n tier)
Client	Dump Terminals[21]	Desktop Computers	Web Client	Wireless devices
Client Interface	--	Fat Graphic User Interface (GUI) Clients[22]	Web browser, Java Beans, Active X Controls	Mini browser, Wireless Application Protocol (WAP)
Networks	Local Area Networks	LANs or Wide Area Networks (WANs)	The Internet	Wireless Networks and the Internet
Server	Mainframe	Application Servers and data servers	Web Servers, Application Server, GIS Server and Data Servers	Gateway Server, Web Server and GIS Servers
Number of Accessible Servers	One	One or a limited few	Thousands or more	Thousands or more

[20] "Three-tier" is a client-server architecture in which the user interface, functional process logic, computer data storage and data access are developed as independent modules, most often on separate platforms. The three-tier model is considered as a software architecture and a software design pattern. (Wikipedia, http://en.wikipedia.org/wiki/Three_tier, last accessed: June 2008)

[21] Dumb terminals were originally used to connect to mainframes, but today it is possible to provide connection between two computers in this way. A dumb terminal connects serially to a host computer allowing the user to login and run text based programs such as text editors, email. The dumb terminal has little processing power and requires no storage medium.
(Techsupport, http://www.techsupportforum.com/hardware-support/, last accessed: August 2008)

[22] The graphical user interface (GUI) is a type of user interface which allows people to interact with electronic devices like computers, hand-held devices (MP3 Players, Gaming devices etc). The traditional client/server GUI is routinely represented by event-driven "fat client" applications with bitmap addressable interfaces, static and sizable installations. These applications directly build on and have a high resemblance with the features and functions of the native operating system.
(Sebring Software, http://sebringsoft.com/images/riacom-factbook.pdf, last accessed: August 2008)

- small percentage of functions will be used. On the other hand, investment for the GIS software program is not possible for every user, only limited numbers of people organizations can fully benefit from its functions.

- The second limitation can refer to the inaccessibility to desktop GIS from every place where the studies are carrying out such as in fields or archeological excavations without desktop computers on which the related GIS program is not utilized.

- Thirdly, desktop GIS software packages require training facility from the user in order to run the program and even to use basic functions of the software.

- The last limitation is that, if the user decides to change the GIS technology and the software package in use, it is very difficult and expensive to buy a new one.

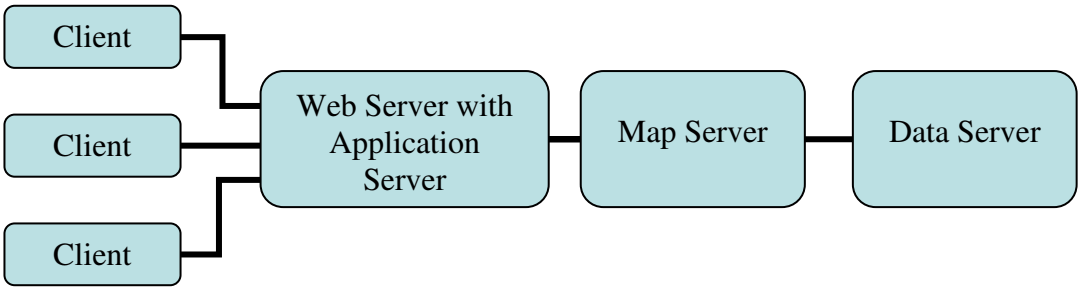
As depicted above, accessibility and availability of information by using desktop GIS programs are limited to a few GIS professions and organizations. On the other hand, there may be people and organizations that they need to use only a small part of whole information. Dessard (2002:16) argues that most of decision-making processes related both public and private sector are based on spatial analysis and it is obvious that use of desktop GIS software products will become insufficient to support increasing needs of such analytical tools.

In this respect, web-based GIS uses the Internet as the basic instrument to access data, carry out spatial analysis and provide location based services (Peng and Tsou, 2003:18). Advantages over desktop GIS are mentioned by Peng and Tsou (2003:29) as accessibility to geospatial data all around the world at any time, simple and user friendly web interface applications and lastly no additional cost.

2.2.1. Components of Web-based GIS

Table 2.4. Components of web-based GIS

(Source: Peng and Tsou, 2003:20-redrawn by the author, 2008)



In several web-based GIS applications the sequence of processes is continued as below:

When a request is sent to the web server that has a link to a web-based GIS application, first of all, query parameters are transferred to a GIS engine, afterwards, the query is executed by the GIS software and the result is summarized into a single image which is then transformed to be visualized in a standard graphic image file as a result page on the WWW interface. Also many advanced web-based GIS applications use more sophisticated forms of data transfer, that they will be discussed under the title of "Web-based GIS Architectures".

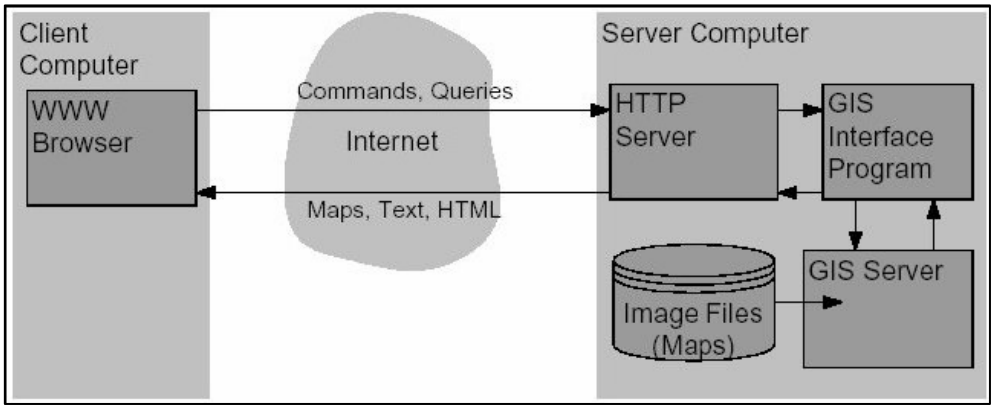


Figure 2.15. Architecture of Dynamic Configuration

(Source: Plewe, 1997:85)

One unique characteristics of web-based GIS is the highly influence from the rapid

changes in Information Technology. Developments in computerized technology also affect the technological tools (computers, digital cameras and notebooks, scanners, software programs, etc.) used in GIS environment. In that respect, usage of Internet as being a major part of information technology, it is also being widely used in GIS applications.

2.2.1.1. Web Server with Application Server

HTTP (Hypertext Transfer Protocol) is a web server which receives client requests from web browsers. The web server accepts every request as a new request, so it is not possible to define two points on the web browser before sending out the request to the web server. Sending HTML document is one of the most common ways to respond user requests from web browsers.

HTML is a mark-up language in order to demonstrate the structure of text-based information of document on a web browser. The text elements can be displayed in the forms of links, headings, paragraphs, lists, and also they can be supported with the embedded images or tables, and with other objects[23].

On the other hand, spatial features such as point, line or a polygon can not be coded by only the features of HTML, because it provides static representation, once it is presented on the web, the user can not change it. In other words, if someone wants to draw a circle or a rectangle directly on the web browser, it is impossible to manage it for web-based GIS depending on HTML and HTTP alone (Plewe, 1997:73).

To overcome these limitations of the HTML and HTTP, some client side applications such as plug-ins, Active-x controls, and Java applets have been developed. With these applications, spatial data can be processed by enabling functions such as drawing lines or polylines in order to display a geographic location, to define the boundaries of an area, or to measure the distance between two different location

[23] W3schools, http://www.w3schools.com/html/html_intro.asp, last accessed: August 2008.

points. When required, the result of process as an output data can be visualized on static or interactive maps such as Google maps or Live Earth on the internet.

An application server is the connector between the web server and server side applications such as a map server. It provides the transfer of client requests from web server to the data server by supporting security and by balancing the loads among the servers (Peng and Tsou, 2003:22). With the success of java platform, the term application server is often mentioned with Java Enterprise Edition application servers such as Oracle OC4J (Oracle Corporation), Sun Java System Application Server (Sun Microsystems), SAP Web Application Server.

2.2.1.2. Map server

The map server is one of the major components of web-based GIS that it generates static or interactive maps on the web browsers, also provides spatial queries by displaying requested information on the maps. Recently developed map servers have not only the capabilities of basic GIS functions such as zooming, panning, drawing point, line or polygon they also have some advanced GIS features such as inserting attribute tables, graphics and also video scripts and 3D animation records in order to give more visual information and prepare a more attractive representation of a specific area or building. Today, Google maps allow people to prepare such attractive presentations of areas or buildings on the Internet by using the free tools of Google Company such as Google Earth, Google Sketch Up and Google 3D Warehouse[24].

2.2.1.3. Data Server

Data server provides process of spatial and non-spatial data in a relational database. A web user or a map server reaches the database generally by using SQL statements,

[24] 3D Warehouse, http://sketchup.google.com/3dwarehouse/search?q=TARAKLI&btnG=Search&styp=m, last accessed: June 2008.

therefore, a data server is usually called as SQL engine or SQL server (Peng and Tsou, 2003:231). SQL is a standard interactive and programming language for querying and modifying data and managing databases. The structure of an SQL server is composed by a command language that allows performing many functions such as the retrieval, insertion, updating, and deletion of data in a database[25].

2.2.1.4. Client

The Client is a place for users to support interaction with mapping and processing geospatial data and with GIS functionality on the web. Peng and Tsou (2003:21) define it as a place for web-based GIS programs to display outputs to the users. A typical web interface with HTML forms can be thought as a simple client application for web-based GIS. For the visualization of outputs of web-based GIS applications, a desktop computer, a laptop computer, a PDA or a mobile phone can be used as hardware solutions.

2.2.2. Web-based GIS Architectures

The internet is client/server based where the client sends a request and then the server processes the request and as an output information is received by the client. Some technical terms are frequently used in order to describe open-source features of web technology (Babu, 2003:2):

- the communication protocols: transfer control protocol/Internet protocol (TCP/IP),
- state distribution protocols: file transfer protocol (FTP), and hypertext transfer protocol (HTTP),

[25] IBM, http://publib.boulder.ibm.com/infocenter/db2luw/v9/index.jsp?topic=/com.ibm.db2.udb.admin.doc/doc/c0004100.htm, last accessed: August 2008.

- document content formats: hypertext mark up language (HTML), extensible mark up language (XML)[26],
- image formats: GIF and JPEG

There are two ways of implementing GIS functions on the internet:

- Server-side applications; basic load of the GIS operations are carried out at the server.
- Client-side applications; Rather than performing all tasks on the server, some GIS tasks, such as performing mapping operations, are operated on the client side.

2.2.2.1. Server-side Applications

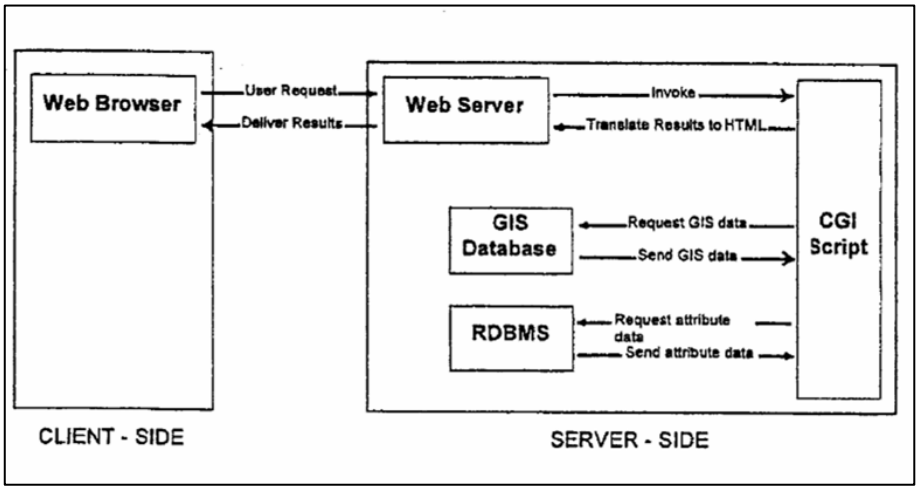


Figure. 2.16. Server based architecture.
(Source: Prastacos, 2001:597)

On the server, in order to support GIS functionality, a programming language such as Visual Basic, C Plus or commercially available GIS software programs are used. In this manner, companies like ESRI, Map Info, and Intergraph presented their own products with online features. While each of these commercial web-based GIS

[26] XML was designed to transport and store data, with focus on what data is. HTML was designed to display data, with focus on how data looks.
(W3 Schools, http://www.w3schools.com/xml/xml_whatis.asp, last accessed: May 2008)

programs has its own software design architecture and depends on specific database structures and formats; this may prevent interoperability and sharing of mapping and processing of geographical sources through different systems. However, server based implementations support all versions and types of browsers of these companies on computer platforms, they are the most appropriate for mass market online GIS applications (Prastacos, 2001:5).

In the early days of internet, web-based GIS applications were carried out with limited operation capabilities such as the display of the map in the form of raster image file formats such as JPEG and GIF. Raster map images provide poor quality in visualization compare to vector file format in the client side model. This is because most of the user requests are handled by a map server; the output image file format is embedded in HTML pages and sent back to the client. While sending map images through static HTML format, low resolution is provided in order to decrease file size, however, lowering map resolution results in the low quality of the image display on the web.

Due to the fact that, every user request is performed directly on the GIS server (map servers on the web, etc.), there is no need to install any additional resources on the desktop machine. On the other hand, this solution may become impractical, performing every request on the server side creates high volumes of network traffic and after a time the server can not handle such a large volume of operation tasks coming from online users (Peng and Tsou, 2003:172). A definite advantage of server side model is that there is no need to have a powerful client machine, because the client is only retrieve maps and display some results based on map image queries revealed in HTML formats.

2.2.2.2. Client-side Applications

Some of data processing operations are performed on client computer rather than carrying out all tasks on the server side. Therefore, there is less load on the server, and less network traffic on the web (Prastacos, 2001:598).

Recently, GIS is more practical due to various enabling internet technologies like Java applets, ActiveX Controls, browser plug-ins or help programs (Vatsavai, 2000:2). Browser plug-ins are software additions that run on the browser to enlarge the capabilities of web browsers (Peng and Tsou, 2003:21). To illustrate, when the mouse moves over a spatial feature like a point or a line on a map, the color or the thickness of that spatial feature can change, a text box or an image could be popped up to display the attributes of that spatial feature.

To increase user interactivity, users download these separate components or programs that work as an extension to the web browser (Prastacos, 2001:598). This component works as a program within the browser and supports more advanced GIS analysis. Installing and performing these components or programs provide HTML more dynamic that the data is sent to the user in vector format which has more advantages in comparison to raster image formats. Running these additional components on the browser, visualization quality of spatial queries on a digital map becomes faster.

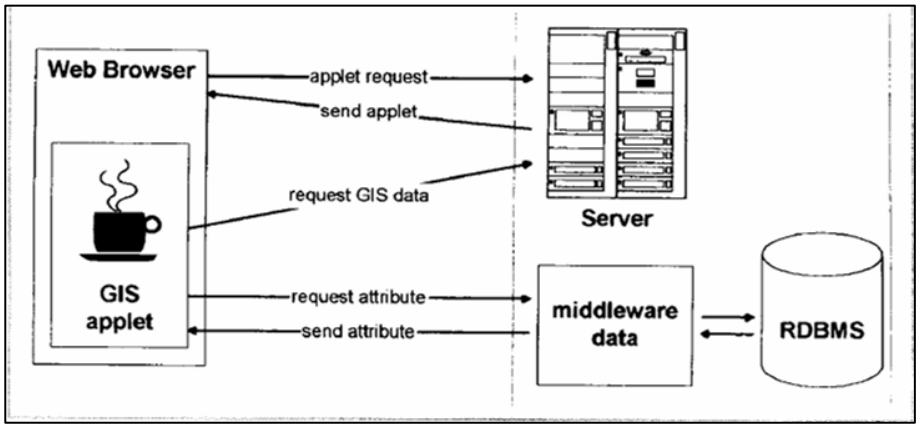


Figure 2.17. Sequence of operations in a client-side application
(Source: Prastacos, 2000:14)

Java applets are designed to provide interactive features to web applications that cannot be provided by HTML. Applets written in Java can be downloaded to the user's computer, they do not need any installation, when the user machine connected to the Internet with a Java-enabled web browser, they run into the browser's memory space, and in the same manner, when the connection is cut off, they are unloaded.

Active X Control is developed by Microsoft for Windows applications whereas**,** Java programming language is developed by Sun Company for the internet in every platform. It will not work on a UNIX or Mac computer even it connects through Internet Explorer. Instead, Netscape Navigator with various plug-ins can be used in Mac or UNIX environment (Prastacos, 2000:14). In that respect, main disadvantage of active x is that for different platform users, different versions of active x programs should be developed as it was explained just before. For active internet users, from different platforms, interaction with the system database becomes more difficult and reinstallation of the component for each platform is time consuming.

As mentioned above, several researches have been explored to extend capabilities of Internet applications such as Java applets and active x controls. All these small components are client-side implementations and also allow increasing GIS functionality on the web as well.

2.2.2.3. Web-based GIS Models

In more recent times, advances in computer technology will enable utilization of GIS in full capacity on the web in order to analyze, manage, and display of spatially-referenced information. In order to display and disseminate spatially-referenced data, various web based GIS applications with static or dynamic mapping functions are being developed.

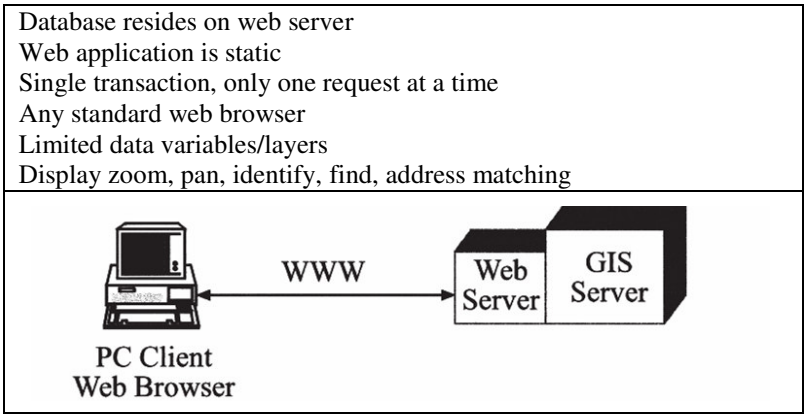


Figure 2.18. Model 1: Basic web-based GIS mapping (Source: Foresman, 1999:60)

Recently, applied web-based GIS systems can be categorized into three groups ranging from the simplest architecture to the most advanced system (Foresman, 1999:57). According to this categorization, the first model, the most commonly used today, disseminates information by displaying static HTML files and images. The client sends a mapping request to a web server. Through an identified URL address, the web server contacts with the GIS server. Requested information and map images are prepared by the GIS server and sent back to the web server and then to the web browser. Finally, the images are displayed on the client's computer through GIS software or mapping software.

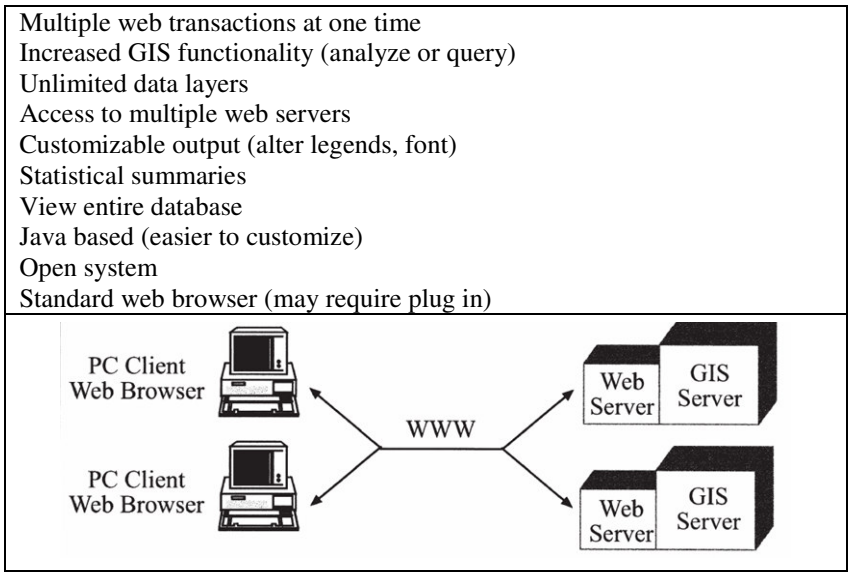


Figure 2.19. Model 2: Advanced web-based GIS
(Source: Foresman, 1999:61)

According to Foresman (1999:60) second model resembles to first model, however, the client has a more chance to utilize mapping functions using both browser based and server based programming. This model requires more advanced computer programming technology in order to enable more complex features such as query and analyze. Compared to the first model, greater volume of processing requests can be operated by multiple users at the same time, data files located on different web sites can be interoperated and more analytical queries can be made.

The third model is described as the most advanced web based GIS system by Foresman (1999:61).This model can use multiple servers and data transfer is faster. The client can work with Java based or active x browser programs in order to increase the functionality of web mapping and GIS. When the client submits a request to the web server through a web browser, the web server sends the requests to the GIS server. The GIS server contacts with the database servers in order to prepare requested images in selected data layers. Database servers provide all data layers which are essential for dynamic map functioning. In this system architecture, multiple GIS servers can interact with multiple database servers in order to prepare data layers which are requested by the clients in any time. In that respect, application of web-based GIS in full functioning can be provided by developing the third system architecture in the near future.

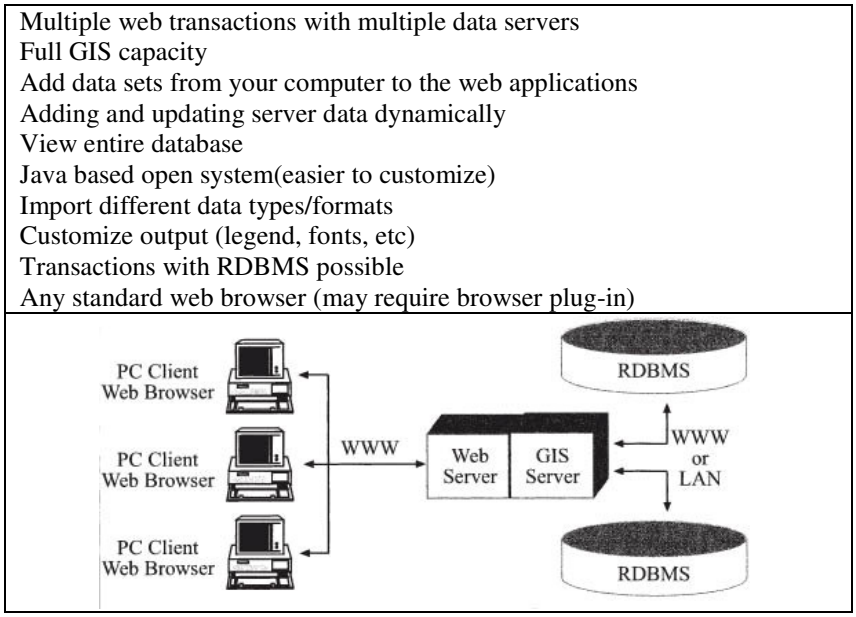


Figure 2.20. Model 3: Future full capacity web-based GIS

(Source: Foresman, 1999:62)

Following brief descriptions of three different types of web-based GIS models developed by Foresman (1999), some online GIS projects having features of the first model, the most commonly used today and disseminates information by displaying static HTML files and images, will be introduced in the following subtitle.

2.2.3. GIS and Web-based GIS Studies in Conservation Field

Application fields of GIS technology vary from environment and natural resource management to planning and engineering facilities. In all cases, GIS use the most recent developed technological tools such as remote sensing devices, aerial and satellite images and also computerized environment in order to allow construction of maps and the manipulation of integrated data on the maps for various queries of users.

Utilization of GIS as supporting tools through the conservation decision making process is respectively realized in conservation of archaeological and historic urban sites. Access to all useful information related to a historic site is an essential factor in order to support decision making processes and also provide control mechanism on the conservation interventions. In order to organize and process such a huge amount of data, it is inevitable to implement an information system for the management of historic sites.

In the area of conservation, main goal of the usage of GIS tools are not only integration of data in a well-organized database system, also enabling documentation of all useful information related with conserved areas/buildings before restoration, conservation, and management plans. Furthermore, other ultimate purposes are to prevent knowledge from disappearing, to share it with public in order to make them aware of the importance of these historic areas/buildings, and also to transfer useful information to the future.

Attempts to develop GIS projects in conservation field only date back to 20 years ago. Especially in the last a few years, GIS technology became a usual tool for architects, conservators, restorers, archaeologists, and all other categories of experts involved in cultural heritage activities. Parallel to conservation studies which are carried out personally, with each passing day, more central and local authorities are aware of the importance of using GIS technologies in order to allow creating complex and integrated information systems for the projects of cultural heritage conservation.

In Turkey, according to Petrescu (2007:4), based on his literature survey, there are many projects that use GIS technology for cultural heritage conservation, whereas most of them are at regional and local level. Main fields of GIS are conducted in archaeology and historic monuments and these applications are not yet available to the public.

Although web-based GIS technologies are relatively new, they are already being used in a variety of different ways. There are web sites providing maps as images, such as MapQuest (www.mapquest.com), which allows users to create maps using street addresses, and also web sites such as the World Atlas of Biodiversity (http://stort.unepwcmc.org/imaps/gb2002/book/viewer.htm) which provides geographic information about a specific topic in a more interactive format (Kearns, 2003:543).

Table 2.5. Web-based GIS Resources

(Source: Kearns, 2003:543)

Software	
Autodesk MapGuide	http://www.mapguide.com
Caliper Maptitude for the Web	http://www.caliper.com
ESRl Inc's ArclMS	http://www.esri.com/software/arcims
Intergraph GeoMedia WebMap	http://imgs.intergraph.com/gmwm
Maplnfo MapXtreme	http://www.mapxtreme.com
Websites for Natural Resources	
Bay Area EcoAtlas Information System	http://ecoatlas.org
ESRl Inc's ArclMS site links	http://www.esri.com/software/internetmaps/visit_sites.html
National Atlas of the United States	http://nationalatlas.gov
National Oceanic and Atmospheric Administration C-CAP Data Distribution	http://www.csc.noaa.gov/crs/lca/locate.html
Newyork Department of Environmental Conservation, Environmental Navigator	http://www.dec.state.ny.us/website/imsmaps
Sudden Oak Death Monitoring	http://www.oakmapper.org
Tompkins County, NY Interactive Mapping	http://owasco.co.tompkins.ny.us/gis
US Dep. of Ho. and Ur. Dev. Environmental Maps	http://hud.esri.com/emaps
US EPA EnviroMapper	http://www.epa.gov/enviro/html/em/index.html
US Geological Survey Wildfire Maps	http://wildfire.usgs.gov
United Nations Environment Programme World Conservation Monitoring Centre	http://stort.unep-wcmc.org/imaps/
MN Department of Natural Resources	http://www.dnr.state.mn.us/maps/index.html
Popular Map Services for General Use	
MapQuest	http://www.mapquest.com
Yahoo Maps	http://maps.yahoo.com
Google Maps	http://maps.google.com
Rand McNally	http://www.randmcnally.com
Live Local Search	http://maps.live.com

In order to give more information about web-based GIS applications, some online projects from both natural resources and conservation field, are introduced with basic information below:

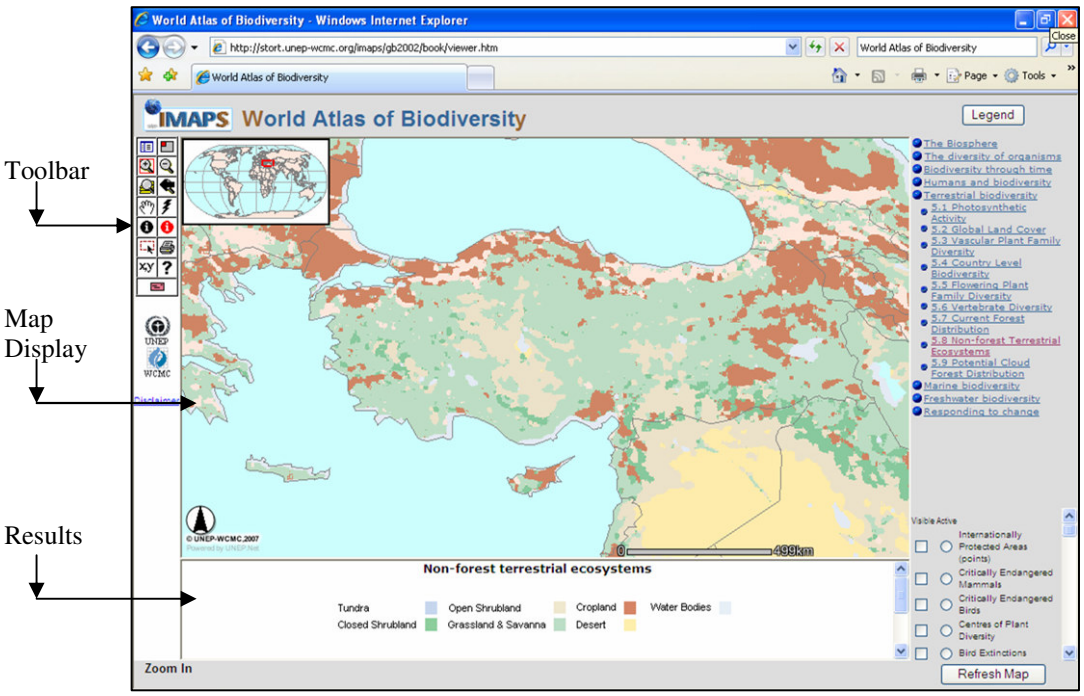


Figure 2.21. Web site of World Atlas of Biodiversity

(World Atlas of Biodiversity, http://stort.unep-wcmc.org, last accessed: June 2008)

IMAPS has been created by "United Nations Environment Programme World Conservation Monitoring Centre". For many years, the company has provided sharing of information on conservation issues by using interactive maps on the Internet. Interactive maps can be created for specific regions such as tropical rainforests, breeding areas of ocean turtles, species etc.

World Atlas of Biodiversity aims to disseminate information about diversity of organisms all over the world. On the web page, interactive map is displayed at the center, with a standard toolbar on the left side including features such as zoom in, zoom out or panning and with a layer legend on the right side. Visual information of the project is presented on different layers and categorized as the biosphere, the diversity of organisms, humans and biodiversity, terrestrial, marine and freshwater biodiversity. While any user wants to make a query on the map, required data is presented in a colored image, and query results are shown below the map.

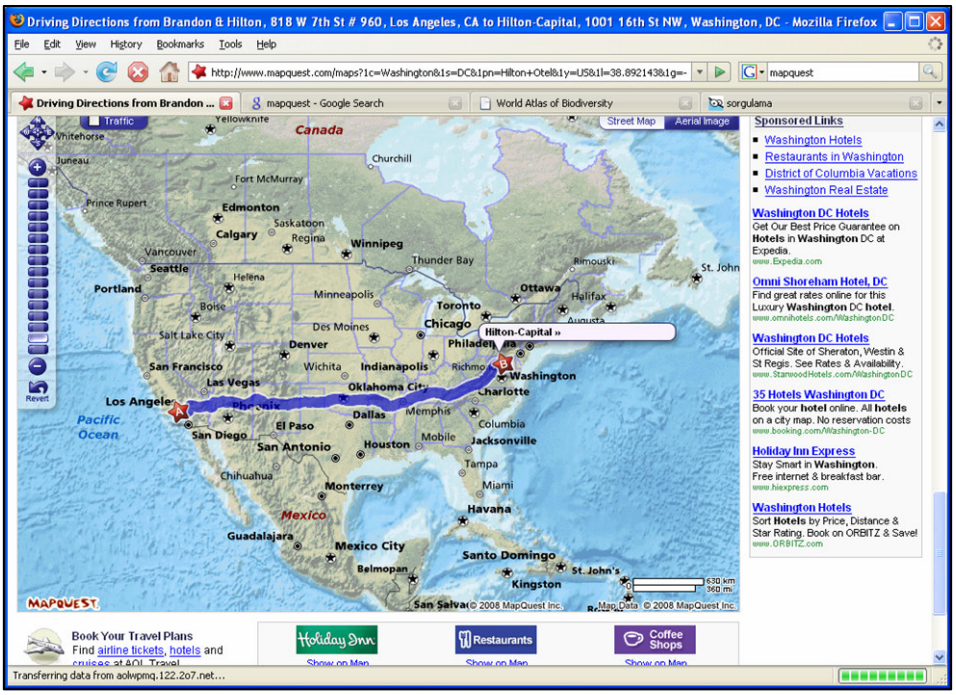


Figure.2.22. Web site of MapQuest

(MapQuest, http://www.mapquest.com, last accessed: June 2008)

MapQuest is developed by Geosystems Global Corparation[27]. The site provides a dynamic online mapping service for visualization of locations based on address, city, or zip code and also for generating a route between two points. If enough address information is provided between two points, detailed driving directions with relevant interactive map of those two points will be displayed. Driving directions will be presented with estimated time intervals and with estimated distances.

Briefly, three main functions are generated by using MapQuest:

- Find It: in order to find exact location of a point an area such as a restaurant, a hotel or an airport.
- Maps: in order to visualize an area with nearby area by centralizing the addressed area on the map
- Directions: in order to get directions by entering a starting and ending address.

[27] Geosystems Global Corparation, http://www.geosys.com, last accessed: August 2008.

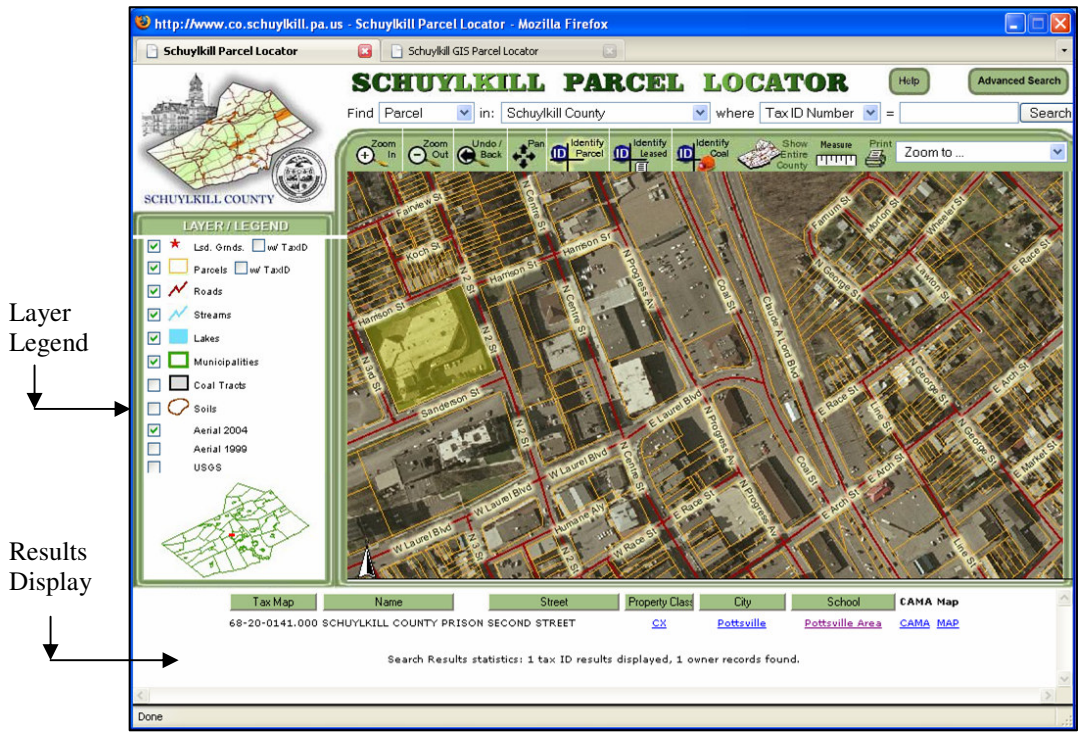


Figure 2.23. Web site of Schuykill Parcel Locator
(Schuykill GIS Parcel Locator, http://www.co.schuylkill.pa.us/parcelviewer/, last accessed: June 2008)

This page is provided by Schuylkill County in Pennsylvania, USA. The project aims to provide land information of every parcel freely available to everyone on the internet.

On the web site, active map of the county is displayed at the right side and layer legend is on the left. At layer legend, current layers are roads, parcels, streams, lakes, municipalities, and also aerial photograph of the county in 1999 and 2004. While parcel number or name of the owner is written on the search bar, required parcel area is presented on the map in yellow color as shown on the Figure 2.23 and also result of the query is displayed at the bottom part.

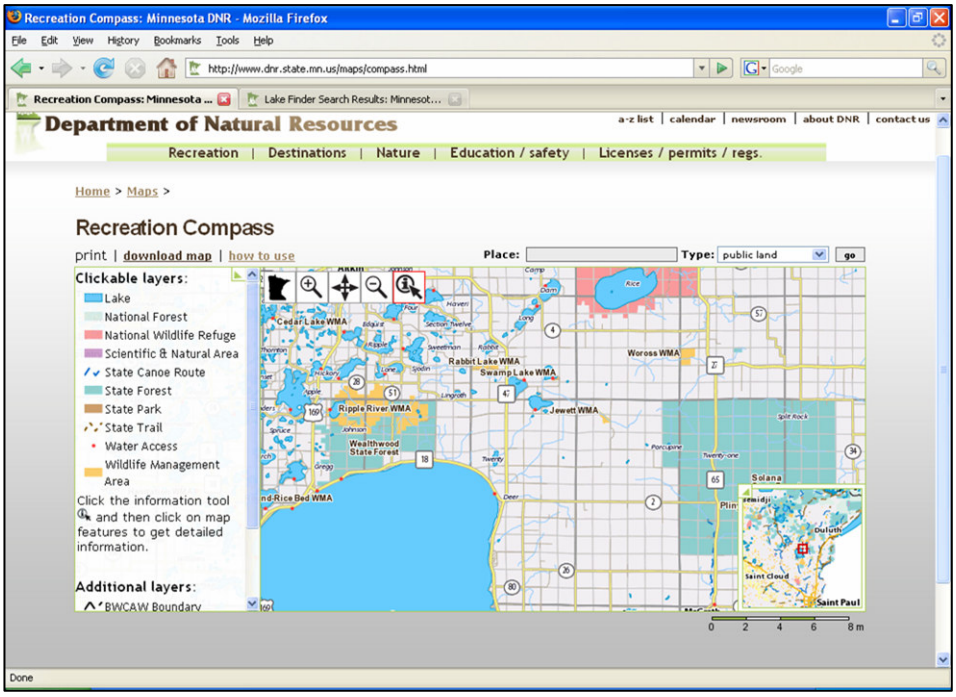


Figure 2.24. Web site of Recreation Compass

(Maps Minnesota DNR, http://www.dnr.state.mn.us/maps, accessed: August 2008)

"Recreation Compass" has been developed by Department of Natural Resources, Minnesota University using MapServer[28], OpenLayers[29] and TileCache[30]. By the department, interactive maps of Minnesota State in the field of recreation (airphotos online, animal mapping tool, recreation compass-interactive place locator etc.), natural resource management (forestview, timber harvest plans, wildfire location maps etc.) and hunting (bear hunting, deer hunting, moose hunting etc.) have been created and made available to public access. Active map of the web site is generated on the right with standard toolbar including basic features such as panning and zooming. On the other hand, "clickable data layers" list is presented on the left by displaying each type of recreation area in different data layers such as lakes, national forests, state parks, etc.

[28] MapServer is an open source development technology for processing spatially referenced data such as images, maps and vector on the internet. (UMN Map Server, http://mapserver.gis.umn.edu/, last accessed: August 2008)

[29] OpenLayers enables putting a dynamic map in any web page. It is an open source JavaScript and freely available. (OpenLayers, http://openlayers.org/, last accessed: August 2008)

[30] TileCache provides easy set up of a web mapping server or tile map server by using a pluggable caching and rendering mechanism. (TileCache, http://tilecache.org/, accessed: August 2008)

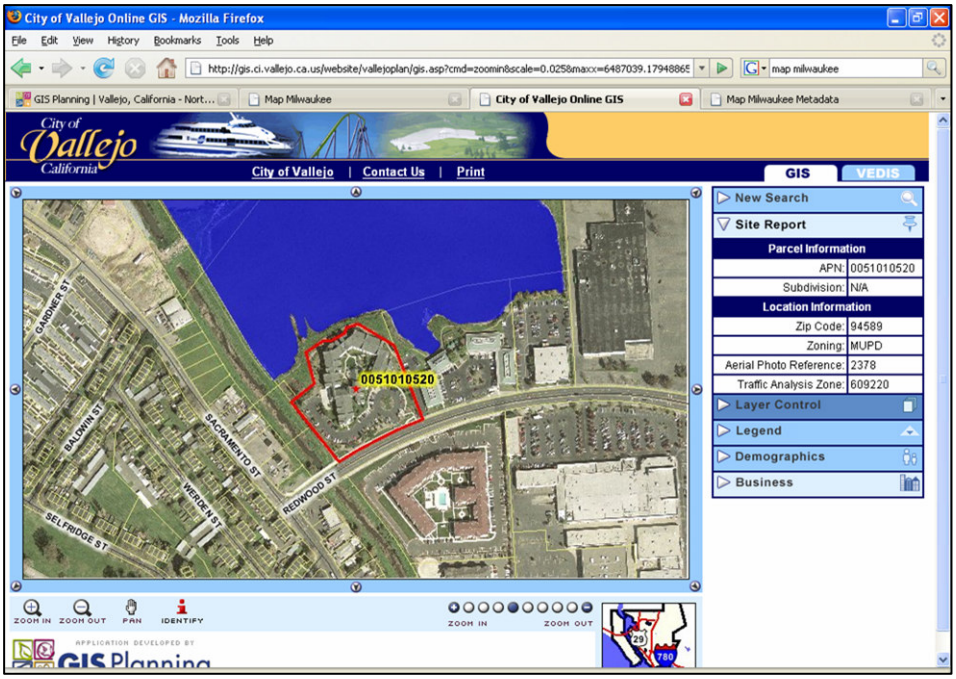


Figure 2.25. Web site of Vallejo city, California, USA
(City of Vallejo Online GIS, http://gis.ci.vallejo.ca.us/website/vallejoplan, last accessed: August 2008)

The web site was developed by GIS Planning Inc.[31], in USA. Purpose of the web-based GIS was to provide real estate agents, developers, businesses and residents internet access to information about properties and market conditions of the city. At the web site, data related with building attributes, traffic counts, and business lists are available to the users. The user can analyze around of a property with the price, area of the building and closeness to the highways.

At the web site, city map is displayed with a high resolution aerial image. While layer legend and search options are listed on the left side, standard toolbar options are located at the bottom of the map. When a particular property is selected on the map, boundary of the property is displayed in red color and search results are reported with parcel and location information.

[31] Since 1997, GIS Planning Inc. is working on the technology of Internet GIS and trying to develop web-based GIS site selection analysis program in USA.
(GIS Planning, http://www.gisplanning.com/, last accessed: August 2008)

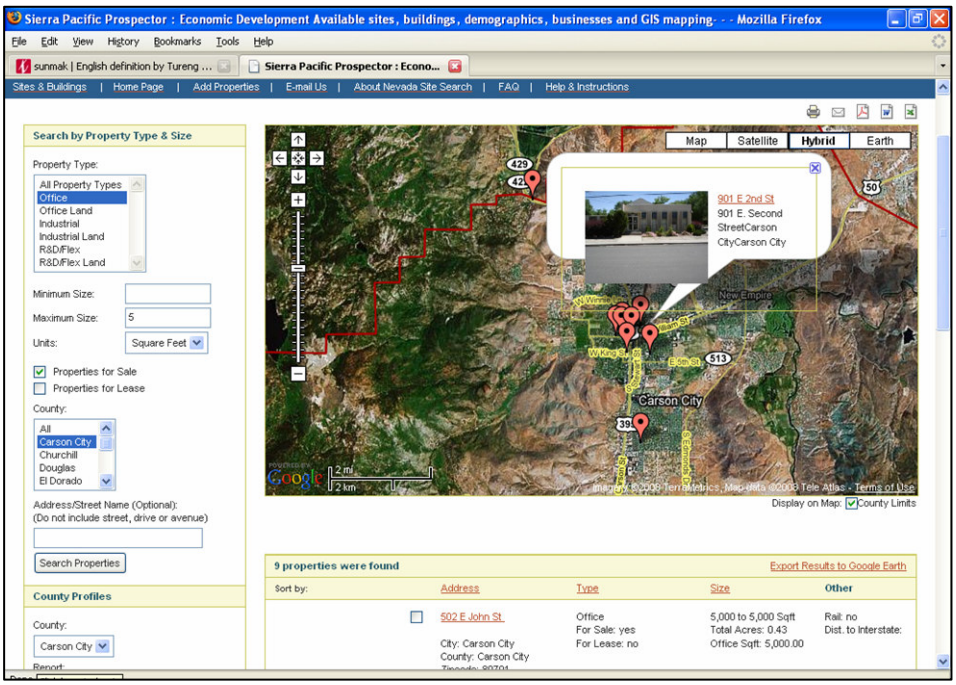


Figure 2.26. Web site of Nevada Site Search

(Nevada Site Search, http://www.nevadasitesearch.com,

last accessed: August 2008)

The web site has been developed by GIS Planning Inc. in USA and for the mapping functions, Google maps technology is provided. Compare to commercial GIS software programs such as ESRI mapping technology, Google maps is not very compatible with showing polygonal map layers such as parcels, land use, etc. On Google maps, every operation is processed on a single map layer as seen on the Figure 2.26. However, this web site tries to enrich capabilities of Google maps that the user can reach different alternatives of property selection depending on property types and sizes also with address information and county name. To illustrate, when a query is made as “in Carson City, maximum in 5 square feet office type buildings which are in sale” as the research results, 9 properties are marked on the Google maps and listed with related information below the map. When the user clicks one of the red icons displayed on the map, address information with a photograph of that property in a small box is shown on the page. If the user clicks on the active row in that box, detailed information about building name, address, utility and transportation is presented in a new web page.

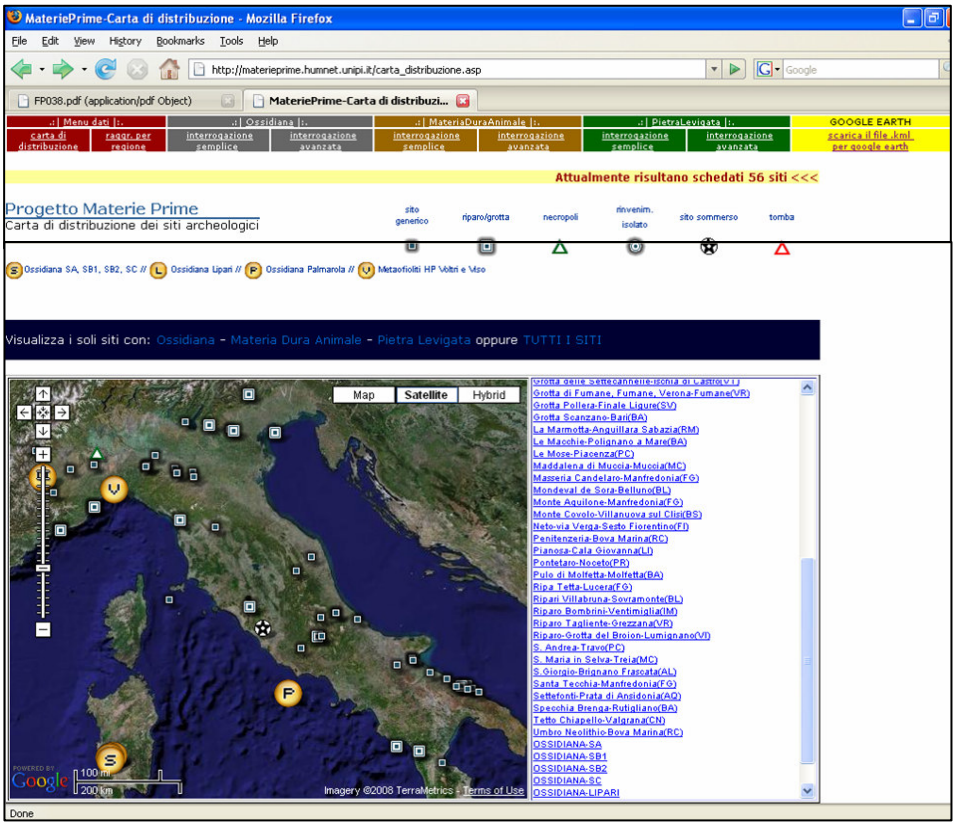


Figure 2.27. Web site of Raw Materials Project
(Raw Materials Project, http://materieprime.humnet.unipi.it,
last accessed: June 2008)

The project has been developed by Italian Institute of Prehistory and Protohistory, University of Pisa in 2003. The aim of the project is to map sources of the materials in Italy, and reveal processing methods of three main types of neolithic artifacts - obsidian tools, bone tools and polished stone. Microscope observations, chemical analyses are utilized for identifying characteristics of the artifacts.

Final aim of the project is the display of the results on the web, referenced with geographical information. As the map tool, freely available Google Maps API features have been used. Results of the surveys are displayed on the online map of Google in order to share information with the scientific community. Exact locations of the materials are marked on the map with available information.

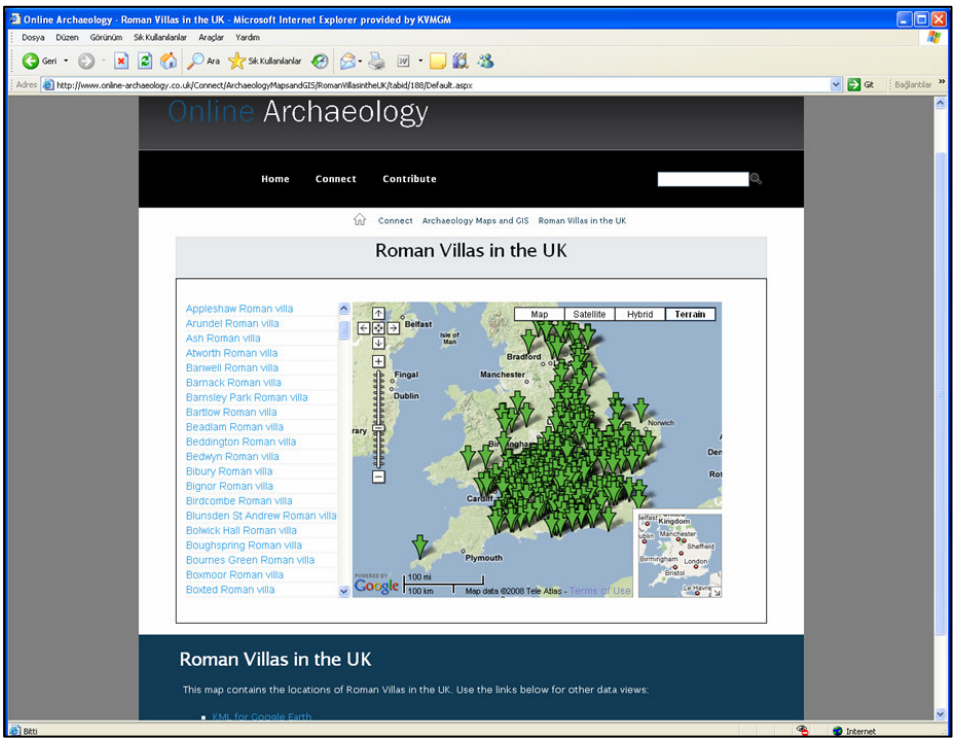


Figure 2.28. *"Online Archeology"* web site

(Online Archeology, http://www.onlinearchaeology.co.uk, last accessed: June 2008)

Online Archaeology website is created in order to give information about archaeological places not only in the UK but around the world. The project has been generated by the use of freely available Google Maps API. The aim was not display of an existing archaeology map, but sharing of archaeological data with public through online applications. The website is configured not only for display of data on Google maps, but also users have chance to join online forums about archaeological subjects, share photographs, reach related articles or papers by signing up a personal account.

2.2.4. *"GIS Online"* Project in Architectural Photogrammetry Laboratory, Politecnico di Bari, Italy

The laboratory was established in 1976 for developing researches in the area of photogrammetry[32]. In 1980, after a destructive earthquake occurred in Basilicata, for surveying the damages of the buildings of the town, a research team was created by Prof. Daddabbo. The first idea came from the restoration decision-making process of Church of St. Mary, which was destroyed in the earthquake, in order to relief the building reliably by using photogrametry technology.

Main research instrument was "Stereo Camera WILD 120" and in that period, there were only four in Italy. Two of them were in Bari while one belonged to urban police of Bari and the other one was in the Laboratory in order to demonstrate an evolution in the field of photogrammetry. In 1981, results of the studies were presented in a conference held in Bari with the patronage of Politecnico di Bari and Provincial Administration of Puglia.

In January 1985, an agreement was made between the Provincial Administration of Puglia and the Politecnico di Bari on the subject of documenting Cultural Heritage of Puglia. The main aim of the agreement was "the use of electronic–photogrammetric equipment for the documentation of cultural heritage in terms of protection of the monuments of the region". Also participation of schools in all levels of documentation process was another key point of the research. After signing the agreement, in order to carry out researches, a Documentation Center was established in the Complex of Sn. Scholastica which was a property of Politecnico di Bari.

[32] General information about the Laboratory was taken from the web site of *"www.sudvirtuale.it"* and *"www.stereofot.it",* and also from the interviews with Prof. Antonio Daddabbo and Prof. Pietro Grimaldi.

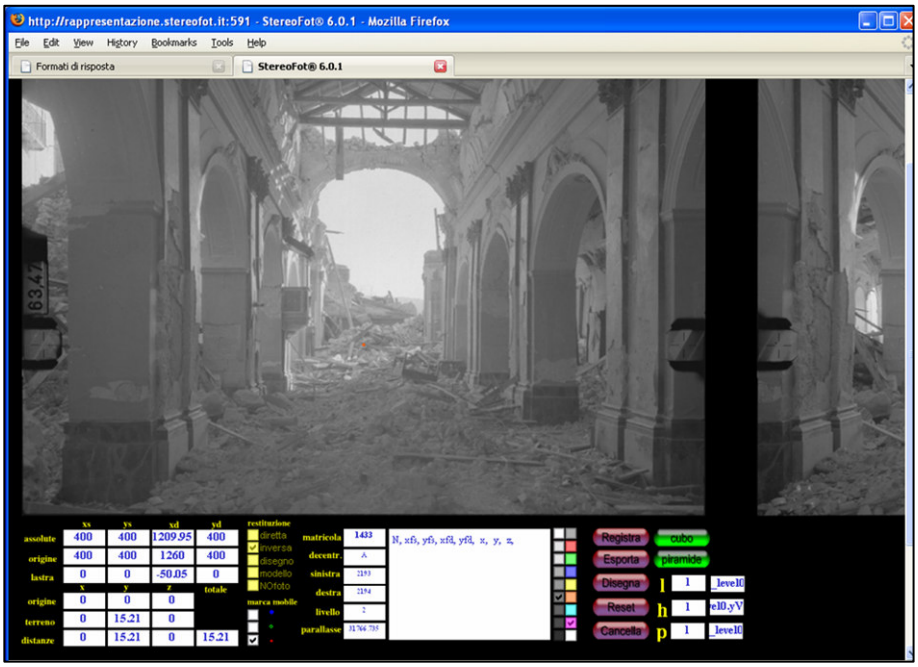


Figure 2.29. Using "Stereofot 6.0.1." for Church of St. Mary, Basilicata/Italy (Politecnico di Bari/Italy, http://rappresentazione.stereofot.it, last accessed: September 2008)

In 1986, at the 3rd National Conference of Architectural Photogrammetry, some students of the laboratory gave life to the association called as "Architectural Foundation of Italian Photogrammetry". The national conference was held on every two years by the new association and took an international character by inviting experts to Bari. The slogan of the meetings was "a good architectural survey is already half of the project".

In 1991, an international conference was held with the patronage of Ministry of Cultural Heritage. In conference, in order to document cultural heritage, photogrametric techniques and methods and also the problems faced with were discussed. Based on the results of the meeting, the multi media program of "Stereofot" was developed for the interactive catalog of cultural heritage and presented at "XIV International Symposium of CIPA" in 1991 and at the 2nd International Conference of Architectural Photogrammetry in Bari, in 1993.

In 1996, the laboratory was moved to the main campus of Politecnico di Bari and in the new building, the laboratory could obtain advanced computerized equipment such as Macintosh desktop computers, digital video cameras and, photogrametric tools integrated with computers. By using these effective tools, digital documentation studies were began to be carried out and methods for online documentation of Cultural Heritage have been developed in the laboratory.

The first study was on-line documentation of Serracapriola town with the involvement of local authorities. The basic principle of the research was depend on the idea of "know what and how to protect" and to achieve this goal, a virtual site of the town with all related collected information was created on the Internet.

Besides to the project of *"GIS Online: Serracapriola",* web-based studies of Politecnico di Bari, Basilicata, Molfetta, Modugno, Sammichele of Bari, Selva di Cadore, Zoldo Alto in Italy, Taubate in Brazil and Taraklı in Turkey have been worked out by the directorship of Prof. Antonio Daddabbo.

Firstly, a virtual web site of Serracapriola has been demonstrated in order to share collected information with the public, to support involvement of local authorities in the conservation decision making process of the region and in order to make available corrections and additions to existing documentation which is visualized on the Internet. Information about historical, architectural, political and economical aspects of the territory was revealed on the web site. And by using the functionality of the Internet, it is possible to visualize required information at any time all over the world.

Google free tools on the Internet and basic knowledge for preparing an HTML web page by using Javascript programming language were the key issues for developing online project of Serracapriola. After 20 years of collection of data related with Serracapriola, in order to create information system, map server Google Maps was used for the analysis of written and visual data on an interactive map. Furthermore, Google Sketch Up was used for the creation of three dimensional models of the town and significant buildings. These models were shared with the public through "Google

3DWarehouse" that anyone can survey them on the Internet. On the other hand, video records and animations presenting conferences, interviews and news related with the site were prepared by using Macintosh versions of free video editing programs such as Final Cut Pro and Adobe Macro Flash Player.

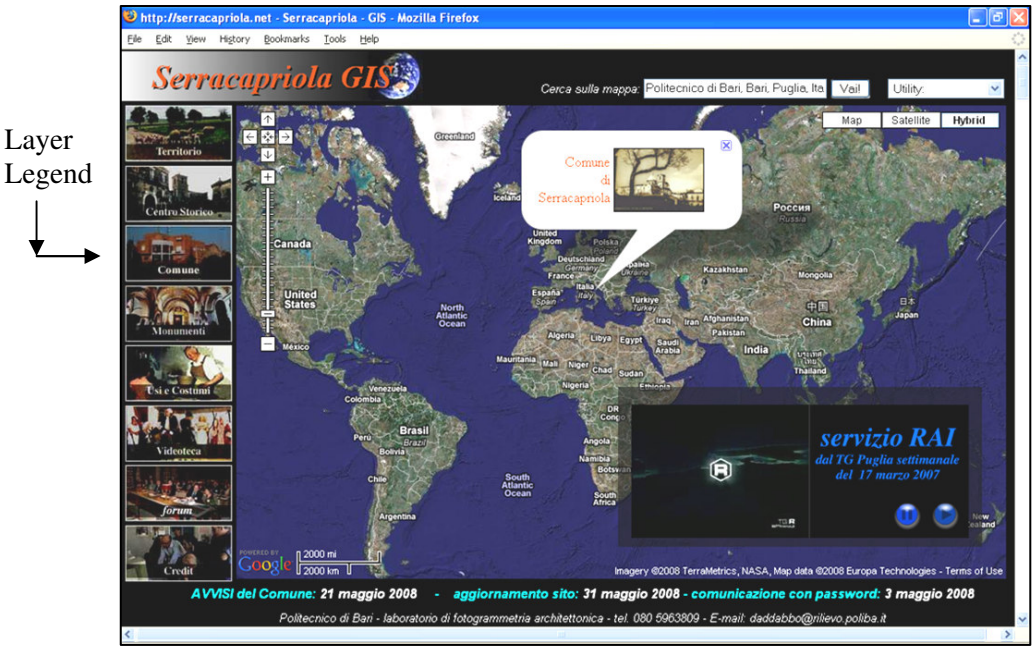
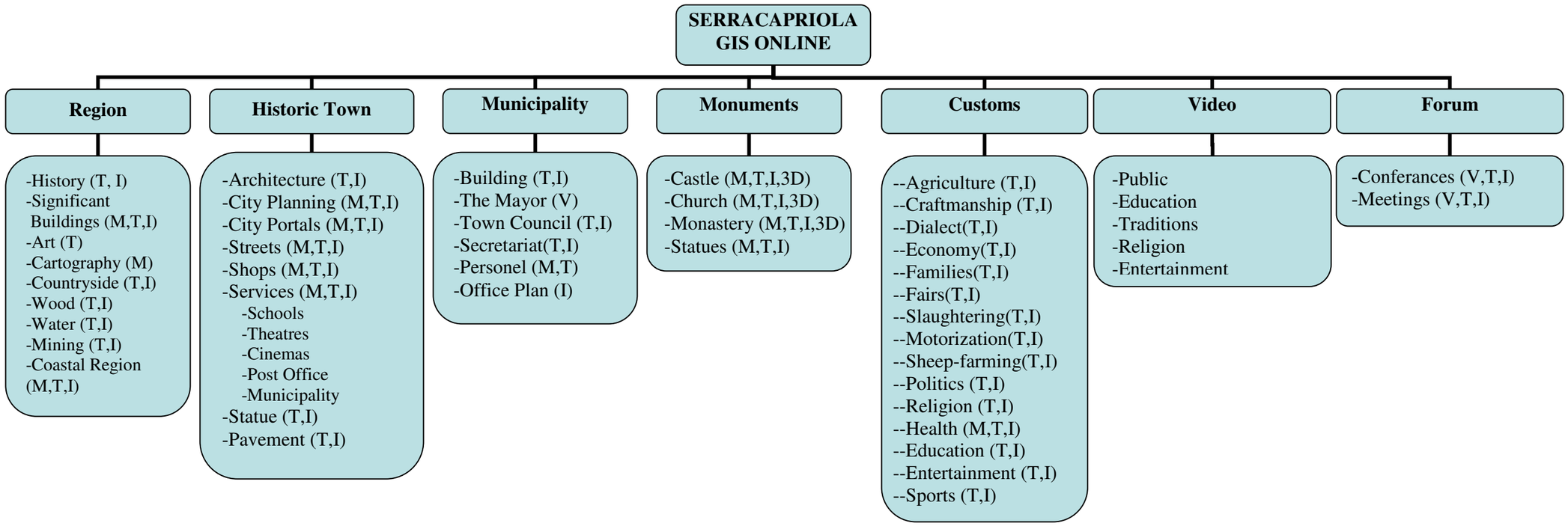


Figure 2.30. *"Serracapriola GIS Online"* web site
(Serracapriola GIS, http://serracapriola.net, last accessed: November 2008))

At the web site, location of Serracapriola is pointed on the interactive world map of Google and displayed with small image icon as seen in Figure 2.30. All available information is categorized at layer legend, on the left side. Potential users of the system have been thought as people with basic Internet knowledge and who want learn detailed information about the territory. Serracapriola Municipality is an active user of the web site that according to an agreement with the Laboratory, current information related with the town is provided to the system by the Municipality.

For structuring the database of the system, collected information has been categorized and the data types have been created as seen below:

Table 2.6 Data types in Serracapriola GIS Online



Format of Data Types

Text: T

Image: I

Map: M

Video: V

3D Models: 3D

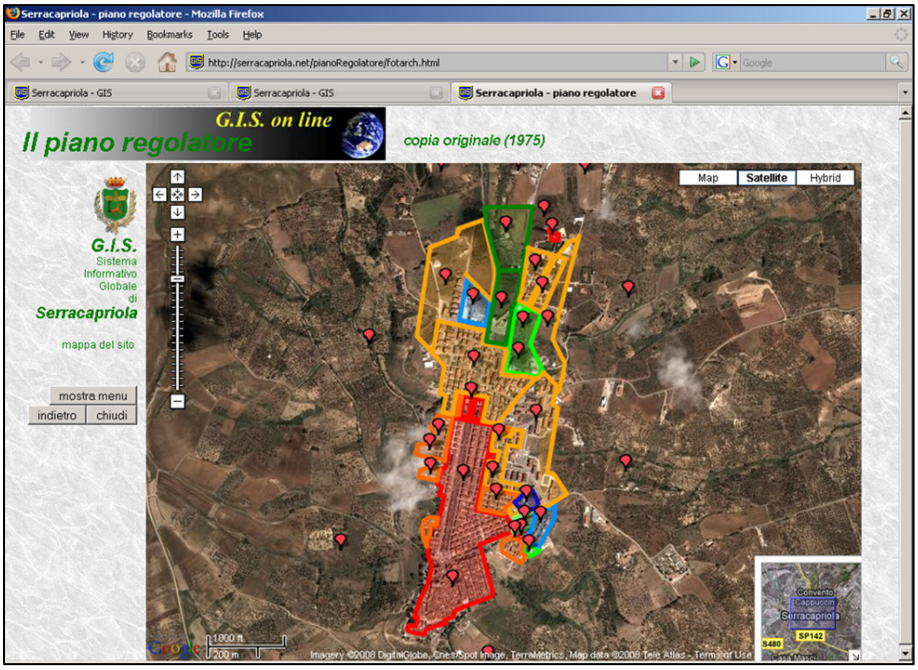


Figure 2.31. Location display of buildings on interactive Map of Google (Serracapriola GIS, http://serracapriola.net/, last accessed: October 2008)

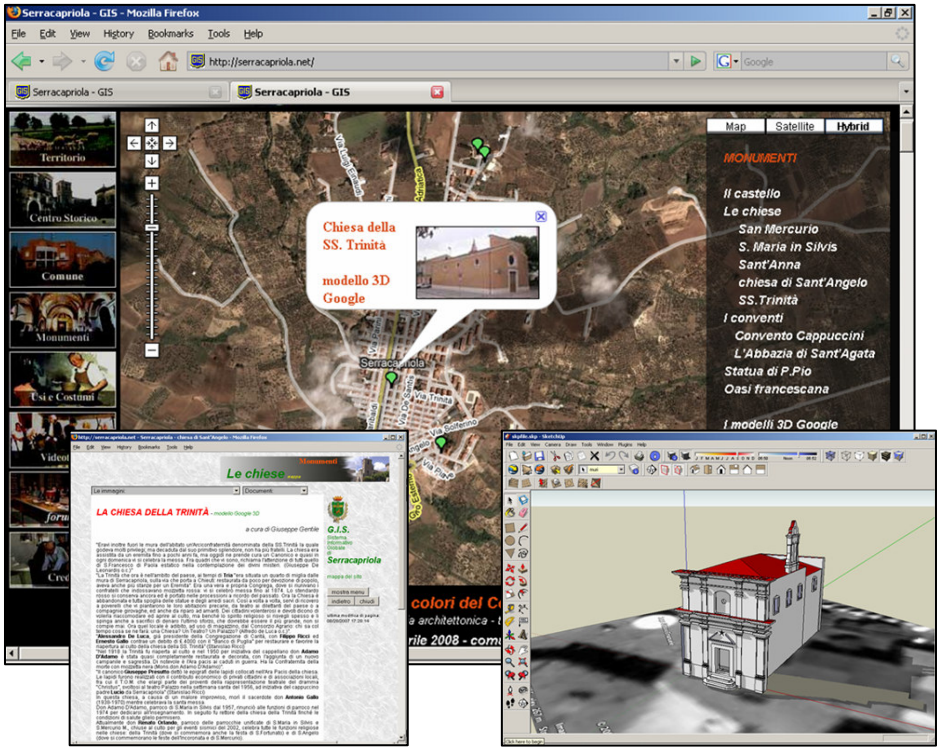


Figure 2.32. Display of information in map, image, text and 3d image format (Serracapriola GIS, http://serracapriola.net/, last accessed: October 2008)

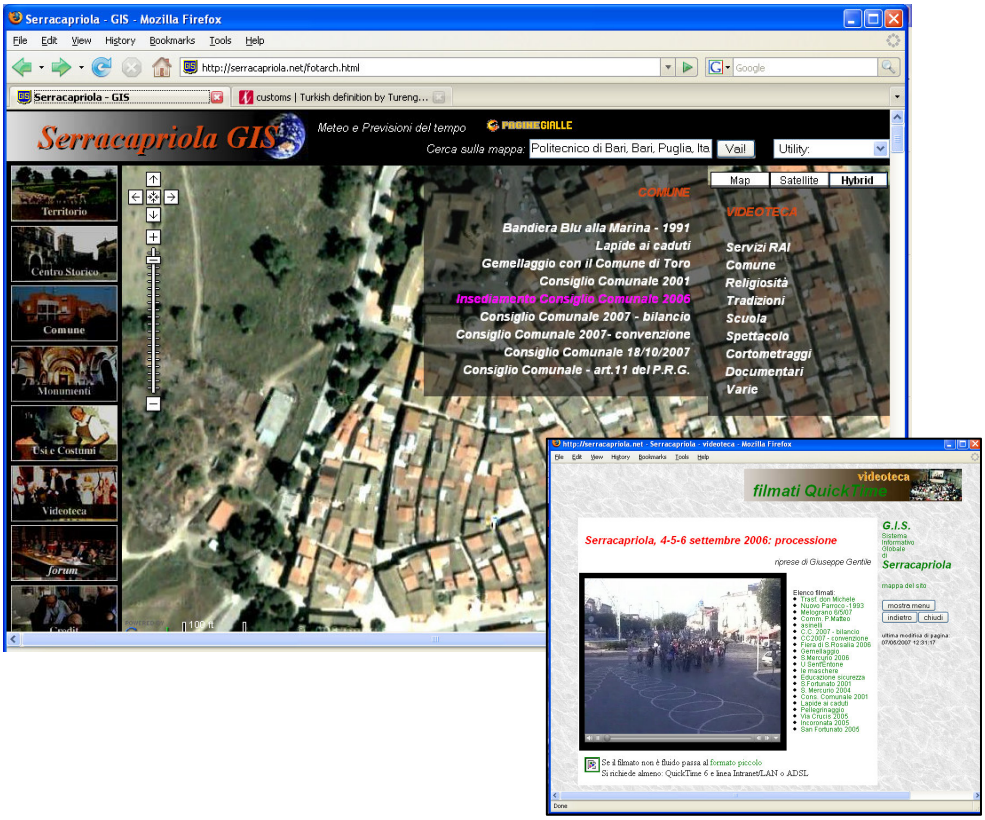


Figure 2.33. Display of information in video format

(Serracapriola GIS, http://serracapriola.net/, last accessed: October 2008)

As seen from the Figures 2.31, 2.32 and 2.33, various data types can be displayed in various formats such as in written, graphical (map and images) or video format. If required data is related with a location, building or an area, its location is displayed on the interactive map and supported with images and text (Figure 2.32). Moreover, if required data is related with an interview, conference or meeting, information is displayed in video format (Figure 2.33).

CHAPTER 3

MATERIAL AND METHOD

Taraklı is chosen as the case for this thesis as a significant historical Ottoman settlement with conserved historic pattern. Most of traditional houses in the town center have been dated to 19th century and even today, they are presenting architectural and constructional features of that period. In this chapter the material and method of the study is presented.

3.1. The Material

The main material of thesis is the traditional timber framed houses of Taraklı in Sakarya. In this respect, for collecting data, a survey was performed on the construction materials, techniques and the construction process of these houses.

Structural organization of timber framed Taraklı houses can be classified into 3 main sections according to the characteristics of construction materials and techniques:

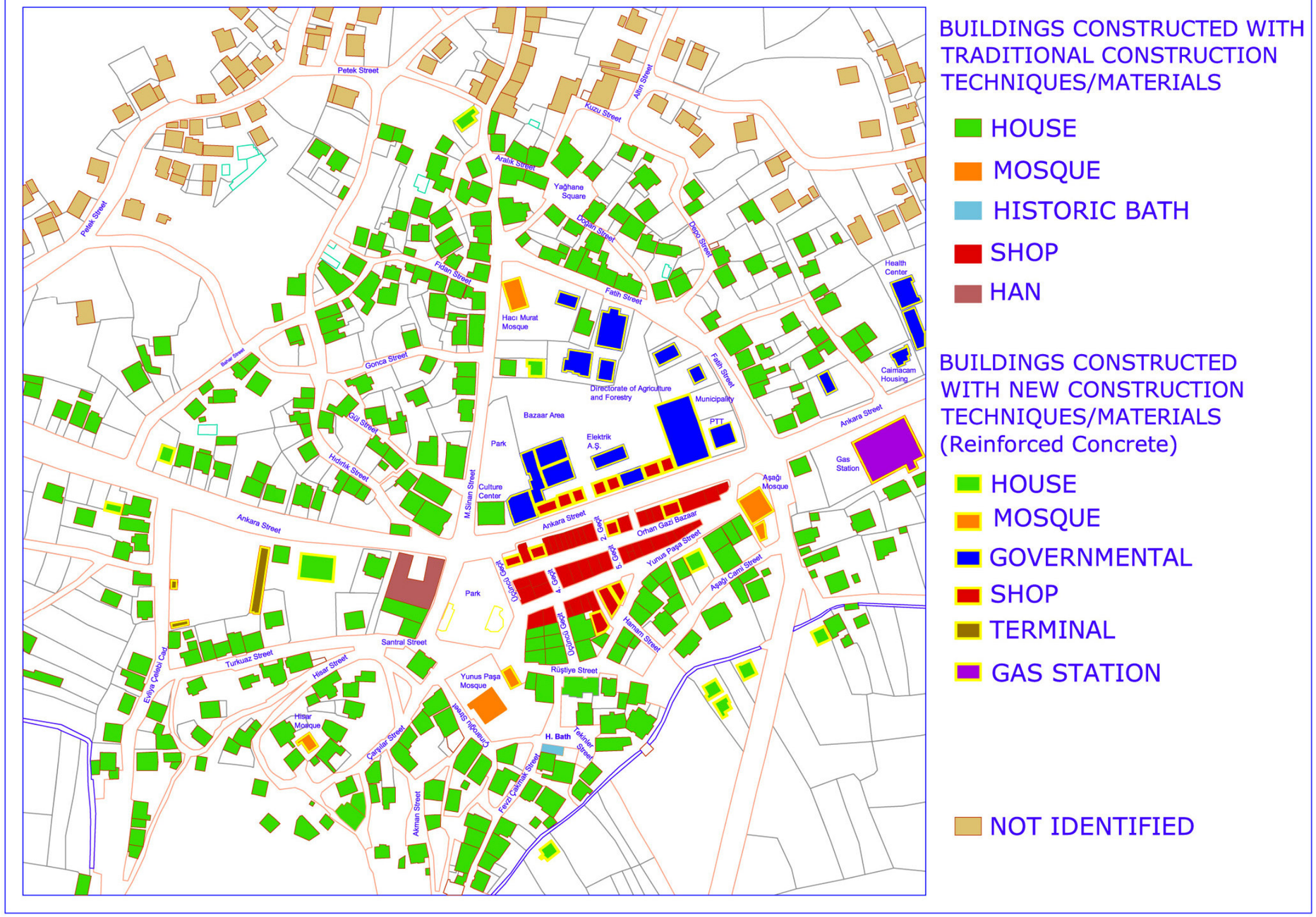
1. Masonry section: consists of the foundations and the main walls of the ground floor
2. Timber-framed section: consists of the horizontal and vertical structural elements of the upper floors
3. Timber roof

In this study, masonry and timbered framed sections are taken into consideration by focusing on the process of wall construction, building materials and techniques.

In the town center, when examining construction techniques/materials of the traditional houses, it is obviously ascertained that main building type is timber frame structured residential house with mudbrick infill material (see Figure 3.2 and 3.3). On the other hand, residential houses constructed with new construction materials are a few in numbers and most of them are located on hillsides rather than in town center. In the town center, there are a few houses constructed with new materials, owing to the fact that they may be constructed instead of destroyed traditional houses.,

In Taraklı, governmental, commercial and educational buildings with new building materials and construction techniques (such as reinforced concrete) are just in the middle of the town center, alongside of the Ankara Street, and residential houses surround them (see Figure 3.2). The oldest traditional houses are located in Great Mosque District, in where also two historical monuments, Yunuspaşa Mosque and Turkish Bath, dating back to 16th century. Furthermore, traditional bazaar is located just near the Mosque and all these traditional edifices form a homogenous historical pattern.

Figure 3.1. Traditional timber framed houses in Great Mosque District (author, November 2006)



BUILDINGS CONSTRUCTED WITH TRADITIONAL CONSTRUCTION TECHNIQUES/MATERIALS

- HOUSE
- MOSQUE
- HISTORIC BATH
- SHOP
- HAN

BUILDINGS CONSTRUCTED WITH NEW CONSTRUCTION TECHNIQUES/MATERIALS (Reinforced Concrete)

- HOUSE
- MOSQUE
- GOVERNMENTAL
- SHOP
- TERMINAL
- GAS STATION

- NOT IDENTIFIED

Figure 3.2. Current Building Category of Taraklı Town Center (Great Mosque District and Hacı Murat District)
(Digital base map is obtained from the Municipality, 2007-redrawn by the author, 2008)

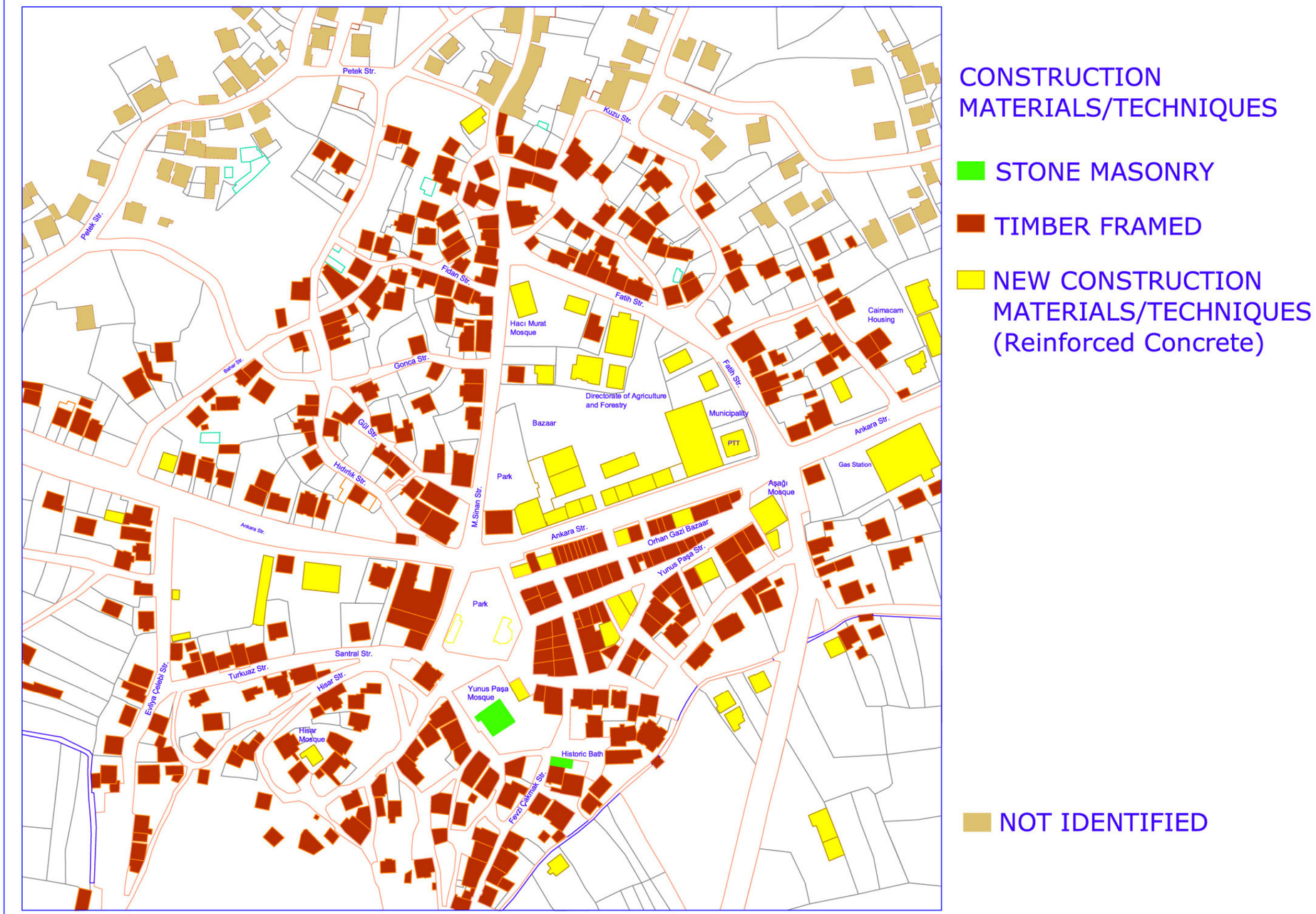


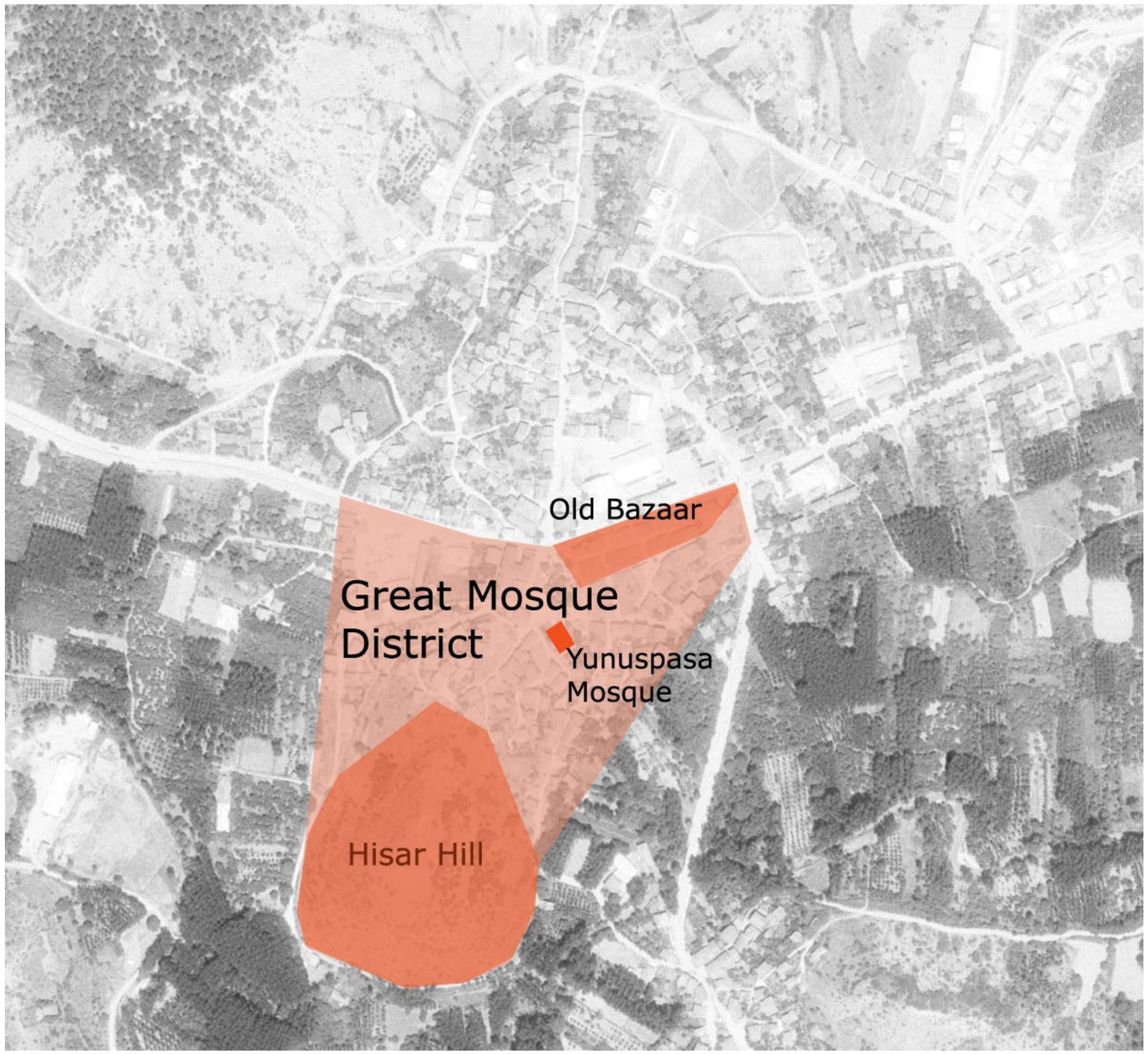
Figure 3.3. Construction Materials/Systems of Buildings in Taraklı Town Center (Great Mosque District and Hacı Murat District)

(Digital base map is obtained from Taraklı Municipality, 2007-redrawn by the author, 2008)

The oldest timber framed houses, forming a major part of the historic pattern of the town, are located in the south part of the town center and surround Yunus Paşa Mosque. In order to obtain information about the construction materials, techniques and construction process of traditional buildings, researches have been carried out on 9 timber framed houses chosen from Great Mosque District (see Figures 3.4 and 3.5). The major selection criteria were; their not being restored, hence conserving most of their original architectural, material and constructional properties, as well as some of them being abandoned, so easy to survey (see Appendix B). The selected traditional houses are:

5 sheet 425 parcel (Rüştiye Mektebi): abandoned and a rare sample of its type,
5 sheet 542 parcel (Fenerli Ev): a rare sample of its type,
6 sheet 626 parcel (Çakırlar Konağı): a rare sample of its type,
6 sheet 639 parcel (Hisar Evi): abandoned and damaged so easy to survey,
5 sheet 533 parcel (Ali Pektaş Evi): abandoned and damaged so easy to survey,
6 sheet 658 parcel: a rare sample of its type,
6 sheet 664 parcel: a rare sample of its type,
6 sheet 691 parcel: abandoned and damaged so easy to survey.
6 sheet 702 parcel: abandoned and damaged so easy to survey,

During site surveys, and studies on buildings, a great support has been taken from the technical personnel of the Municipality. Not only technological equipment such as computer or digital camera, but necessary documents such as maps, photographs, some technical and architectural documents of the houses have been taken from the Municipality. The site has been surveyed and permissions have been taken in order to enter some of these houses for taking detail photographs and drawing sketches, and interviews have been done with local people and local builders with the help of the technical personnel from the municipality. Consequently, information about construction materials, techniques and process of these houses has been investigated from the houses themselves and from the local people who are living in them.



STUDY AREA
(Great Mosque District)

Limits of the Study Area

Node Areas of the district except from the housing units

Great Mosque District is the oldest settlement area of the town with timber framed houses located around Yunuspaşa Mosque.

Figure 3.4. Study Area within Taraklı (1/35000 measured area map of Taraklı
(Area map was obtained from the General Command of Mapping, Ankara, 2007)

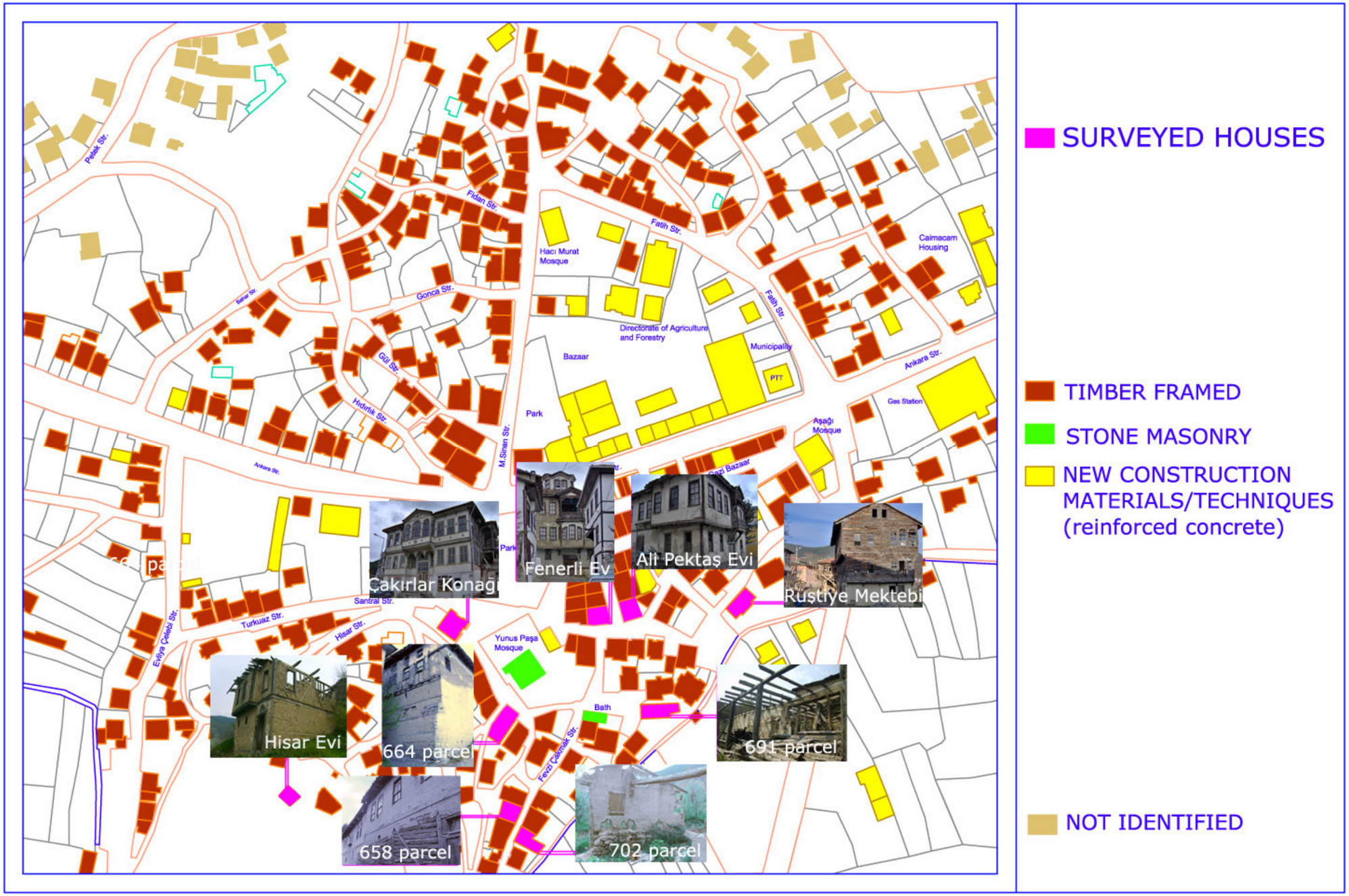


Figure 3.5. Surveyed Houses in Great Mosque District

(Digital base map was obtained from Taraklı Municipality, 2007-redrawn by the author, 2008)

3.2. The Methods

Within the context of the thesis, this study consists of two procedures; first one is in situ survey on traditional timber framed houses of Taraklı in Sakarya, and second one is the creation and design of *"Taraklı GIS Online"*.

3.2.1. In situ Survey of Taraklı

Following the literature survey on the traditional Taraklı houses, data collection phase was continued through the execution of site visits to Taraklı. Traditional timber framed houses of Taraklı were determined as the case study since;

- timber framed houses in Taraklı do not have very much restoration interventions therefore, original construction technique can easily be understood.
- construction techniques show homogeneity that most of the houses were constructed with timber framed structural systems with an infill material.
- quantity of historical buildings is enough to form an historic pattern to study
- visual and written documents can be obtained from local resources that local builders can give major information about traditional methods.

Four site visits to Taraklı town center was made in November 2006, January 2007, April 2007 and May 2007. A considerable support was provided by Taraklı Municipality. Necessary documents such as digital map of the town, some historic photographs, some plans and elevation drawings of historic houses were taken from the Municipality. Permissions from local people for photographing their houses, for entering their gardens to draw some sketches were also taken by the help of the Municipality personnel.

During these site surveys, traditional construction detailing and material techniques of nine houses were surveyed. These houses were chosen, because they do not have so much restoration interventions and some of them were abandoned that it was easier to enter and investigate the structure of the house from inside.

As the one efficient way of gathering and documenting body of knowledge about construction process of timber framed houses, interviews were done with the local builders and they were recorded. Mustafa AKDOĞAN, local builder in 83 years old and built about 60 traditional timbered framed houses in Taraklı, gave significant information by showing details on the houses that he had built.

During these site visits, Taraklı Municipality support and friendly welcoming of local people can be thought as the advantages, whereas in addition to long, tiring journeys, rainy weather conditions are disadvantages of working in open areas.

For the support of site surveys, cadastral maps were obtained from Bank of Provinces, conservation development plans and digital drawings of the town were obtained from Taraklı Municipality, area map was from General Command of Mapping.

3.2.2. Taraklı GIS Online

Following the literature survey on GIS and web-based GIS, studies on creation and design of proposed information portal was continued in Architectural Photogrammetry Laboratory at Politecnico di Bari in Italy during the fall semester of 2007-2008. The main project of the Laboratory, *"GIS Online",* was studied in order to understand the concept, to analyze the structure and to be able to create a similar system by using parallel techniques for Taraklı. Among the projects of this laboratory, "GIS Online: Serracapriola" study was specially investigated due to the fact that Serracapriola was also a small historic town with a homogenous building pattern similar to Taraklı. It was decided to follow the model created for Serracapriola which is a part of "Online GIS" study in the laboratory. So the collected data is structured following the main structure of that project.

Following the survey phases, a sample model was proposed, which presents the data related with the case area and allows sharing of information with the researchers. In order to develop the system, data gathered from various sources, was edited; conceptual and graphical data models were created and inserted into the database in

order to process, structure, analyze and visualize on the Internet. Concerning the process of the data, some computer programs such as Auto Cad 2007 software for drawing plans, elevations and sections of the houses; Adobe Photoshop CS for image editing; free softwares of Google Company such as Google Sketch Up, Google Maps and Google Earth were used (see Table 3.1).

Table 3.1. Softwares providing basis for *"Taraklı GIS Online"*

SOFTWARE	USAGE AREA	SOURCE
Google Maps Api	running Google maps into the proposed web site with JavaScript	*http://code.google.com/apis /maps*
Google Earth	displaying study area with geographical coordinates on earth by the latest satellite images	*http://earth.google.com/ index.html*
Google SketchUp	creating three dimensional models of the houses	*http://sketchup.google.com/*
Google 3d Warehouse	an online archive of 3D models for sharing on the Internet	*http://www.google.com/intl/ en/sketchup/3dwh*
Auto Cad 2007	drawing maps, plans, and sections of the surveyed houses	running on the author's notebook
Adobe Photoshop CS	editing images, photographs and posters	running on the author's notebook
Macromedia Flash Player and Final Cut Pro	preparing audio-visual files including interview records with local builders	running on the computers of Photogrammetry Laboratory of Politecnico di Bari, Italy
HTML and Javascript	creating web pages of proposed web site	Internet
W3school	learning how to organize a web site by using HTML and JavaScript	*http://www.w3schools.com*

In a GIS project, queries and analysis are graphically presented with geometry such as points, lines, polylines and polygons. Developing a web-based GIS by embedding Google maps, queries can be visualized with this geometry. For location analysis markers, icons or positioners can be created; for distance, road or direction analysis,

lines can be created in different formats (color and thickness may change); also for area/surface analysis polylines and polygons can be created in various formats (color and transparency level may change). In this respect, many different and efficient tools freely available from Google are used:

Google Maps Api allows users to embed Google Maps into the web pages with JavaScript. The API provides many utilities for manipulating maps and allows users to create correct map applications on the prepared websites. For obtaining an API key from Google Maps, web site of "*http://code.google.com/apis/maps"* can be visited.

Google Earth and *Google SketchUp* programs are downloadable free from Google and easy to use compared to other programs. For downloading Google Earth, web site of "*http://earth.google.com/index.html"* and for Google Sketch Up, web site of "*http://sketchup.google.com/*" can be visited.

Google Earth is a map tool that has a virtual globe program created in 2004. The program allows users to visualize every place on earth by the latest satellite images with one click on the computer. It also allows users to make quick geographical analysis before developing projects on the subject of land use, urban planning, archaeology etc. Google Earth offers the most effective ways of distributing information to people involved in decision-making processes. The program can provide various possibilities for the visuality of the ground, that anyone can obtain a natural perspective of the area of interest with exact geographic coordinates.

Within the context of conservation field, it is possible to follow every kind of changes like construction studies, archaeological excavations on historical or conserved areas by means of the updated satellite images, and also it is possible to create 3d display of area of interest. Google Earth program allows users to show 3d models of buildings and structures to the users, which presents in the form of Sketch Up, a three-dimensional modeling program.

Sketch Up is a powerful tool for 3D modeling and is used to create three dimensional images directly on the region. It is also a free downloadable program from Google. It has an extensive library of components ready for use as trees, cars and people. Set specialized tools allow users to model organic shapes and simulate movements of the camera.

A map of the area of interest can be imported from Google Earth to SketchUp. A virtual construction of the monuments can be created on this base map and then the 3D model can be transferred and visualized in Google Earth.

Sketch Up allows designers, to explore complex ideas, to import and export a wide range of formats, to create interactive presentations and print to high-resolution devices. It is also possible to cover the models with real images and making movies from the models.

Google 3d Warehouse: After modeling 3D buildings in Sketch Up, the models could be published in the Google 3D Warehouse for sharing them with the public. The Google 3D Warehouse is an online archive of 3D models. Anyone can search for and download models by using personal Google account on the web site of "*http://www.google.com/intl/en/sketchup/3dwh"*.

Auto Cad 2007 is used in order to draw maps, plans, and sections of the surveyed houses, details of construction techniques and materials in digital format.

Adobe Photoshop CS is a graphics editor program developed and published by Adobe Systems. Within the process of the thesis study, it has been used for the edition of images, photographs and posters.

Macromedia Flash Player and Final Cut Pro is used in order to prepare audio-visual files including interview records with local builders.

HTML and Javascript: HTML forms and GIF image maps can be accepted as traditional web tools whereas Java is a newer technique in order to perform various queries and analyses.

The Java language is much more flexible than HTML, any necessary interactive map features can be integrated into the applet. The limitation of World Wide Web is the context of displaying text, numbers, and graphics by using basic HTML language. The main purpose of HTML language is to provide hypertext links to other sources and markup capabilities. Therefore, Java's open, object-oriented design is an ideal platform for mapping and GIS solutions for the users.

W3schools is used in order to learn how to organize a web site by using HTML and JavaScript scripting language, web site "*http://www.w3schools.com"* was visited and studied.

CHAPTER 4

RESULTS

This study focuses on producing body of knowledge about the construction process and the techniques of timber framed houses of Taraklı in Sakarya and storing, structuring, processing, displaying and sharing information through a web based GIS portal.

In the first part of this chapter, the original body of knowledge produced through this thesis on the construction process, materials and techniques of traditional Taraklı houses is presented. In the second part, the proposed web-based information portal *"GIS Online Taraklı"* is explained.

4.1. Construction Process, Materials, and Techniques of Traditional Houses in Taraklı

Collected and documented data during the phase of in-situ survey is explained in three parts under the titles of construction materials, construction process, and the techniques.

4.1.1. Construction Process and Materials

In traditional settlements, climate, topography, local materials, and social living styles affect the original architectural and constructional characteristics of the houses. Due to these factors, main building materials are wood, mudbrick and stone in Taraklı. All these materials are natural materials, easily obtainable from nearby area and also, so compatible with the geography and the climate of the region.

In the region, these three construction materials were used in different construction techniques with different combinations. To illustrate, according to information obtained from the interviews with local builders, structural usage of timber as the log house was limited to higher plateaus where the forestry areas are so abundant. On the other hand, generally on plain lands where the supply of timber is more restricted, different combinations for structural usage are seen such as stone or mudbrick masonry construction on the ground floor and timber framed construction with an infill material on upper floors.

In the region, due to climatic and geographic effects, the most commonly used and available construction material is *wood*.

The interviews with local builders reveal that, wood of black pine trees cut from nearby forests was not as durable as a building material. Therefore, wood was also brought from higher plateaus of Alballar, Kemaller and Dedeler villages (see Figure 4.1). Firstly, it was cut, prepared in small sizes and made ready to use in those plateaus; afterwards, smaller wooden pieces were transported to the town center by oxcarts. In those days, there were no modern vehicles for carrying the loads, whereas by the developments in transportation sector, today it is possible to carry them with modern vehicles in larger sizes as timber logs directly to the construction site and make them ready to use in construction site with modern carpentry equipment.

In timber framed houses, timber was used for the construction of post and lintel, woodwork of window, door, covering of ceiling and floor, also cupboards and roof. Structural timber was generally in 10-12 cm cross section. The thickness of timber also determined the thickness of mudbrick due to the fact that both mudbrick and timber surfaces should be on the same level for better plastering.

In the region, oak, pine and fir trees were used most commonly. The common characteristics of these wood types were that they were hard, resistant to moisture and heat changes, and long lasting. According to their usage areas; oak was used for main load bearing columns, fir for main load bearing beams and pine for braces and secondary posts.

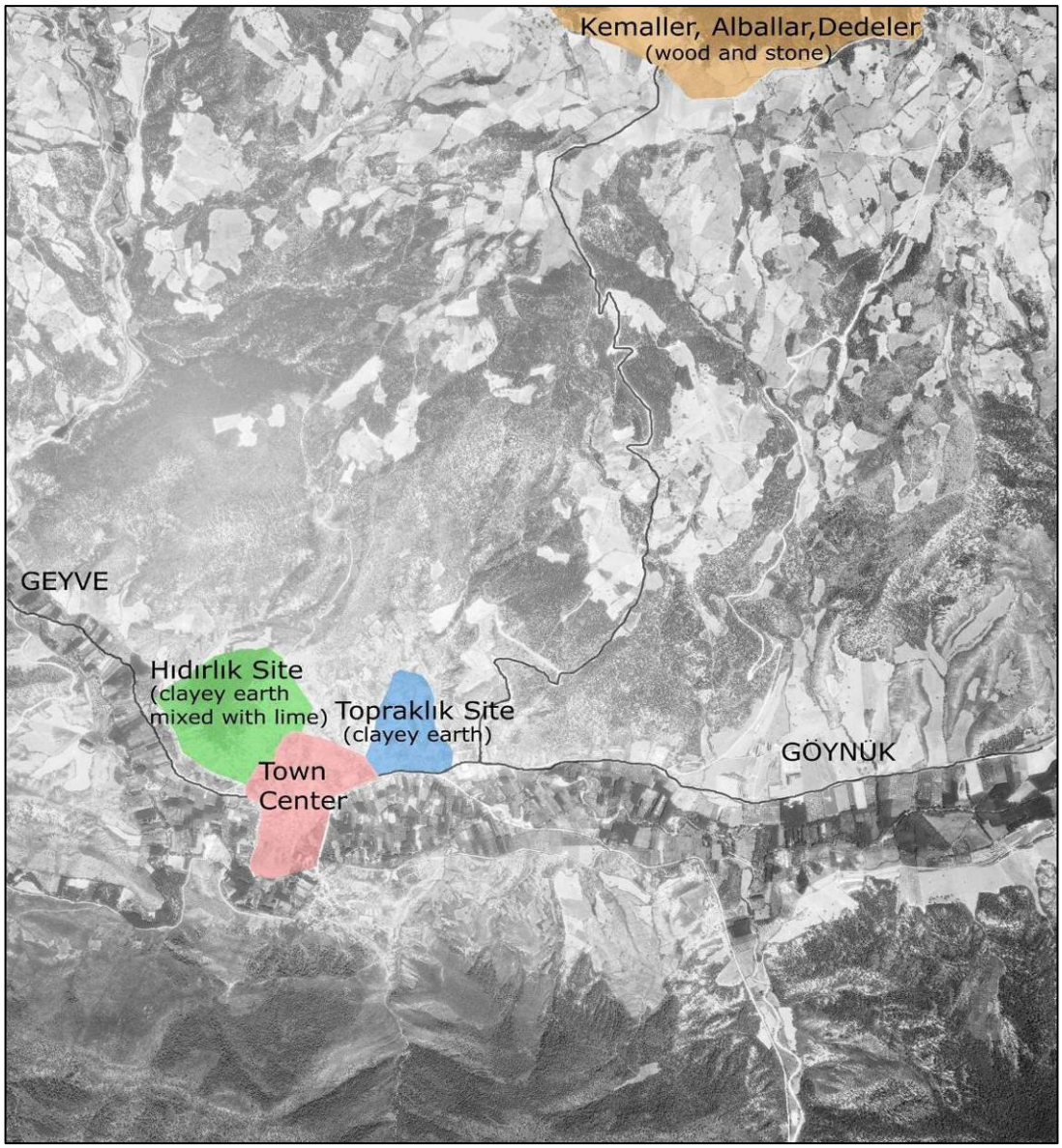


Figure 4.1. Location of the material resources shown on the area map (1/35000 measured area map of Taraklı, obtained from the General Command of Mapping, Ankara, 2007)

Stone is the second main construction material following the wood. Traditional houses in this region rise on stone foundations or on a ground floor of rough stones. Stone is a good transition material for connecting the building made from organic materials such as timber and mudbrick to the natural ground due to the fact that stone is more resistant to damp when compared to timber and mudbrick. Therefore it helps avoiding the damage of dampness coming from the ground to the building. However, stone types were not so available in this region and also, quarrying stone from the ground and transporting it to the construction site were so expensive. Therefore, stone was rarely used in the rest of the construction, and this has resulted in less development of stone workmanship.

a)

b)

c)

d)

Figure 4.2. Construction of stone foundations, **a)** Sheet 6, Parcel 691 (author, May 2007), **b)** Rüştiye Mektebi (author, May 2007), **c)** Hisar Evi (author, May 2007), **d)** Fenerli Ev (author, May 2007)

In Taraklı, stone was provided from nearby area and was also brought from higher plateaus such as Alballar, Kemaller and Dedeler villages (nearly 15-20 km away from the town center).

In Sakarya region, two types of stone were used for in the constructions. *Rubble stone* was used in the construction of foundations whereas, *Kayran,* which is not so durable, was generally used for garden walls or pavements. Ground floor walls of the traditional houses were constructed in rubble stone up to 80-120 cm height from ground level, whereas sometimes, if the houses were constructed on a sloppy area (such as Hisar Evi, Çakırlar Konağı), stone wall construction could reach up to 1 floor level height to prevent dampness and other problems coming from the ground.

Clayey earth was used for mudbrick and rough plaster. It was taken from Topraklık Site on the east direction of town center. In mudbrick production, only three ingredients were mixed which were water, clayey earth and straw. Local builder, Mustafa AKDOĞAN also mentioned that quality and type of straw had designated the quality and durability of mudbrick, too. In Taraklı, more than 100-150 years old mudbrick masonry houses still exist today and also people are still living in them. According to Mustafa AKDOĞAN, during harvest time, farmers collected the grain and gave the straw to whom needed it. Straw was used for feeding animals or it was used for the construction purposes mostly as a binding material in the mud mortar and mudbrick.

Earth mixed with lime was used for finishing plaster. It was taken from Hıdırlık Site on the west direction of town center. The interview with local builder Mustafa AKDOĞAN revealed that to 20 kg earth mixed with lime, 2 kg hemp plant was added. Hemp plant worked as a strong binding element and prevented cracks on the plaster. When the mixture was used to plaster the wall, it had a light pink color therefore; there was no need to paint on it. After the first application, the same earth was diluted with some water and coated to the wall by the help of a felt or sponge to cover the cracks.

Mudbrick as an earth-based material has also an important part on the traditional architecture of the region. Especially on plain areas this type of building materials are used, whereas on forestry and mountainous places timber workmanship has more significance.In Taraklı, most of the traditional houses were constructed in the technique of timber framed structure with mudbrick infill. To produce mud brick, water, clayey earth and straw were used.

Local builder Mustafa AKDOĞAN described that 1 truck (1.5 tones) clayey earth and 10 kilos straw were mixed while they were dry. The mix was trampled on and left to decay for about 2 days. Afterwards, it was trampled on again and molded into timber moulds. The next day, the molds were turned over and they were left to dry. In order to make them more durable, they were dried on June, July and August on sunny days. Approximately, in every ten days they were turned over.

a) **b)**

Figure 4.3. Original mudbricks during the restoration of traditional houses,
a) Çakırlar Konağı (author, May 2007), **b)** Hacı Rıfatlar Konağı (author, May 2007)

Mudbrick sizes can vary, but most widely used infill ones were 10x12x20 cm, 10x15x20 cm whereas for masonry wall construction the dimensions could raise to 10x15x30 cm or 10x20x30 cm as local builder Mustafa AKDOĞAN mentioned. In general, main timber posts used on ground floors were in 15x20 cm cross-section, and on upper floors, in 10x12 cm cross-section. In this respect, mudbricks used on ground floors were in larger dimensions compared to the ones used on upper floors.

a)

b)

Figure 4.4. Construction of mudbrick masonry, **a)** Traditional house constructed with mudbrick masonry on ground floor and timber skeleton with mudbrick infill on upper floor (author, May 2007), **b)** View of exterior wall at close range (author, May 2007)

a)

b)

Figure 4.5. Mud plaster on exterior wall, **a)** Flaking off rough mud plaster and fine mud plaster on the exterior façade of traditional house (author, May 2007),
b) Dredging of rough mud plaster for holding finishing plaster (author, May 2007)

Figure 4.6. Masonry mudbrick construction in Great Mosque District (author, May 2007)

In areas where timber supply was limited, instead of constructing whole structure of the house with the timber, mudbrick was used as a filling material. Due to the fact that mudbrick is economic, efficient, easily workable, easily available and resistant to heat, it is so convenient to be used as filling material. It is also less conductive than timber and holds plaster better.

In addition to information on the construction materials, the interview with local builder Mustafa AKDOĞAN, who had worked in the construction of nearly 60 houses in Taraklı, also reveal reliable information on the construction process of traditional houses.

First of all, in order to construct a house, owner of the land agrees with a local builder about one year ago. Secondly, the owner revises his demands, decides on the plan of the house and calculates the total cost. Then the owner and the builder reach an agreement and the house plan as a draft is formed.

Afterwards, the site is excavated to construct the foundations. The trees needed for the construction of the house are selected from the forestry area, and then they are signed. Due to the fact that, the trees do not take any water after December, these trees are cut down on late December and on early January, barks of trees are taken

away and they are left to dry in their places. The reason for taking of shells is to destroy insect larvas, and the reason to leave them there is to make them completely dry to lengthen their lifetime. This wood is taken in the spring time, cut and then transported to the construction site. Sometimes cutting process is done on construction site and timber for the flooring, ceiling, door, windows, and ornamentation are prepared. Sawing timber should be done without detaching fibers. If the surface of timber component is covered with another element, there is no need to beware of the fibers, whereas if the surface is left open, to prevent cracks, fibers should not cut. As a result, timber is left to dry for about six months, then cracked or detached parts are separated and the rest is used for the construction.

For the construction of the foundation, stone was brought from the water courses around. Rubble stone was used without any workmanship and as a binding material mud mortar was used. Following the construction of stone wall up to 80-90 cm height from the ground level, timber skeleton was built. Timber foot plate was placed on top of the stone wall. It was in 10/15x15/20 cm cross-section to carry the load of upper floors. Then timber main posts were placed on foot plate and structural framework of the house was built. To construct structural framework of a house, after placing main posts on the foot plate, secondary elements as studs, braces were situated between them, then wall plate was located on top of posts and floor joists were placed in one direction and perpendicular to the wall plate. After placing floor joists on footplate of upper floor, structural framework of upper floor was constructed in the same manner. After completing structural work of the house timber roof system was constructed and covered with brick tiles in order to protect the building from weather conditions.

Previously, the timber was cut, prepared in small sizes and made ready to use in forestry area, then transported to the town by horse or ox-cart. At that time, during construction period, carpenters were using handsaw to give shapes to the timber doors, windows or shutters etc. Hand saw was one of the main tools that were used for timber works. Structural timber was generally in 10-12 cm cross section. The thickness of timber also determined the thickness of mudbrick due to the fact that both mudbrick and timber surfaces should be on the same level for better plastering.

a) **b)**

Figure 4.7. Use of nail for jointing, **a)** An original nail for jointing timber parts (author, May 2007), **b)** Jointing timber capital with timber post by nailing on sheet 6, parcel 691 (author, May 2007)

On the construction of traditional timber framed houses dated to 19th century, timber components were connected to each other by nailing (Çakırlar Konağı, Rüştiye Mektebi and so on). Half part of the post top was cut and then capital component was nailed to the post. In some applications, to place the post capital, connection part of main structural beam was cut for better fixing.

Following the construction of the roof system, spaces between the posts and studs were divided by tie beams and the intervals were filled with mudbrick. After the insertion of mudbrick into the wall intervals, rough plastering and fine plastering were applied on the wall surfaces. For fine plastering, in addition to mud and straw, lime and hemp plant was cut in small sizes and added to the mixture in order to avoid cracks on the surface. The earth was taken from Hıdırlık Site. Fine plastering without painting was applied only on exterior walls, whereas interior walls were also whitewashed. Application of mud plaster on the walls provides filling of the gaps between the bricks and the mortar and also provides filling of the cracks on the surface.

a) **b)**

c) **d)**

Figure 4.8. Processing step of mudbrick in original methods for Restoration of Hacı Rıfatlar Konağı; **a)** Trampling on mixture of mudbrick (Özkan, 2008:208),

b) Molding into timber moulds (Özkan, 2008:208),

c) Leaving mudbricks for drying (Özkan, 2008:208),

d) Drying of mudbricks (Özkan, 2008:208)

In construction of one house, generally four people were working, while 3 of whom were builders and the one was apprentice. According to the Mustafa AKDOĞAN, structural construction of a house could be completed in one month if the builders could work in full time.

4.1.2. Construction Techniques

According to survey results, information on traditional construction materials and process was tried to be revealed on previous section. Gathered information during the surveys by observing construction materials and detailings on the houses and by conducting interviews with local builders, also enables making a categorization of construction techniques. Therefore, depending on the obtained body of knowledge from various sources as mentioned, construction techniques can be classified into two main groups such as timber skeleton system (subcategorized into 4 according to infill material) and masonry construction system (subcategorized into 2 according to the usage of vertical support elements) (see Table 4.1 and Figure 4.9).

Table 4.1. Construction Techniques on traditional Taraklı houses

Technique	Wall type	Plaster	Wall dimension	Surveyed house
TIMBER SKELETON SYSTEM				
Timber Skeleton with mudbrick infill	Timber Skeleton on stone masonry continues up to 80-120 cm height	finishing plaster on rough mud plaster	50-60 cm stone masonry, 15 cm ground floor wall and 12 cm upper floor walls	Rüştiye Mektebi
Timber Skeleton with mudbrick and stone infill	Timber Skeleton on stone masonry to 1 floor level	finishing plaster on rough mud plaster	50-60 cm stone masonry, 15 cm ground and 12 cm upper floor walls	Çakırlar Konağı
Timber Skeleton with timber infill	Timber Skeleton on stone masonry continues up to 80-120 cm height	finishing plaster on rough mud plaster	50-60 cm stone masonry, 15 cm ground and 12 cm upper floor walls	Sheet 6, parcel 658
Bağdadi System	Timber Skeleton on stone masonry continues up to 80-120 cm height	finishing plaster on rough mud plaster	50-60 cm stone masonry, 15 cm ground and 12 cm upper floor walls	Fenerli Ev
MASONRY CONSTRUCTION SYSTEM + TIMBER SKELETON SYSTEM				
Mudbrick Masonry with corner posts on the ground floor	On ground floor, mudbrick masonry on stone masonry continues up to 80-120 cm height and timber skeleton on first floor	finishing plaster on rough mud plaster	50-60 cm stone masonry, 15 cm ground floor wall and 12 cm upper floor wall	Hisar Evi
Mudbrick Masonry without corner posts on the ground floor	On ground floor, mudbrick masonry on stone masonry continues up to 80-120 cm height and timber skeleton on first floor	finishing plaster on rough mud plaster	50-60 cm stone and mudbrick masonry on ground floor wall and 12 cm upper floor wall	Sheet 6, parcel 664

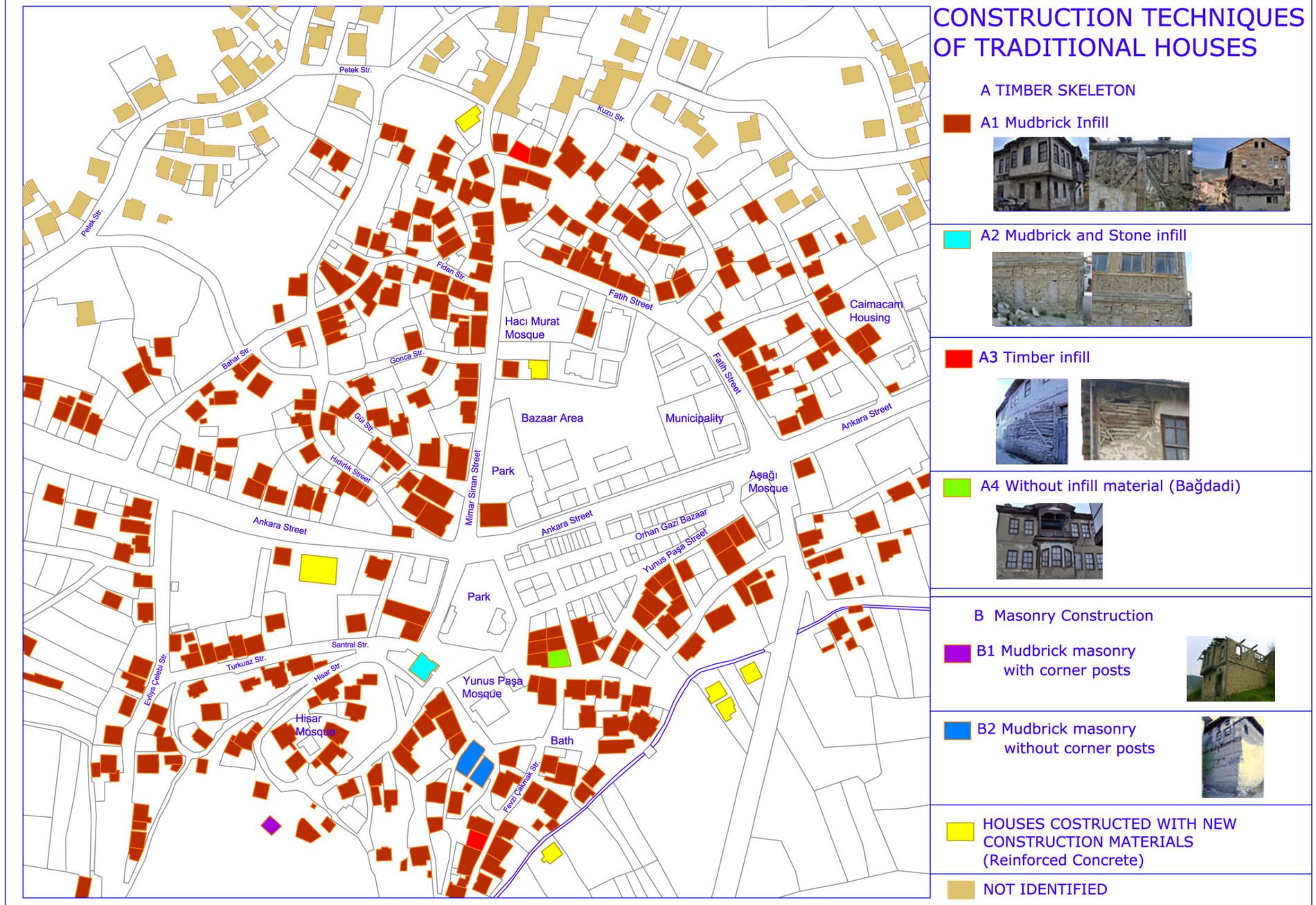


Figure 4.9. Construction Materials/Systems of Buildings in Taraklı Town Center (Great Mosque District and Hacı Murat District)
(Digital base map is obtained from Taraklı Municipality, 2007-redrawn by the author, 2008)

Timber skeleton system with mudbrick infill was the most common wall construction technique in Taraklı. Mudbrick, stone and timber could be used as infill material, whereas the most widespread used one was mudbrick due to the fact that others were obtained limitedly.

a) **b)**

Figure 4.10. Timber skeleton construction with mudbrick infill, **a)** Front façade of Çakırlar Konağı (author, May 2007), **b)** Standing wall of sheet 6, parcel 702 (author, May 2007)

Following the construction of stone wall up to 80-90 cm height from the ground level, timber skeleton was built. Timber foot plate was placed on top of the stone wall and on foot plate timber main posts were placed. After placing main posts on the foot plate, secondary elements as studs, braces were placed between them, then wall plate was located on top of the posts and floor joists were placed in one direction and perpendicular to the wall plate. After placing floor joists on footplate of upper floor, structural framework of upper floor was constructed in the same manner. Completing the construction of structural framework of the house and roof, spaces between the posts and studs were divided by tie beams and the intervals were filled with mud brick.

Figure 4.11. Timber framed construction of Hisar Evi (author, May 2007)

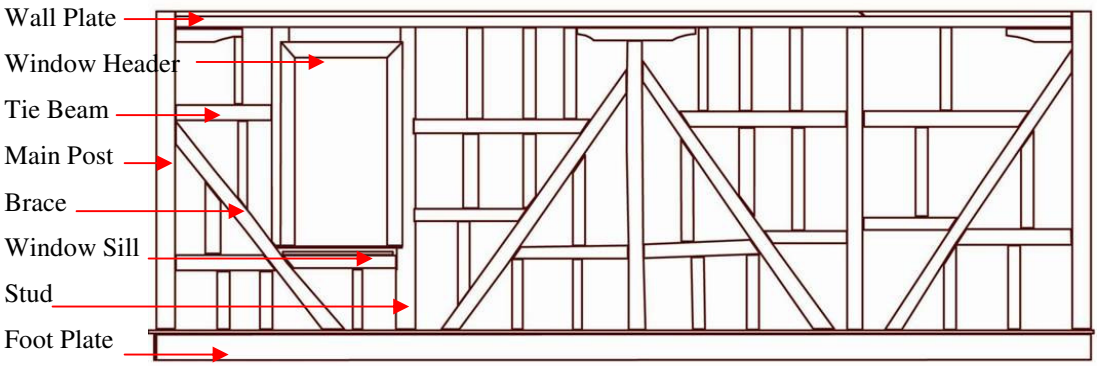


Figure 4.12. Detail of timber framed construction on Hisar Evi – division of wall into small parts by tie beams, as seen in the figure, was called *"çatı"*.

If exterior wall was fine plastered, capitals of floor joists were covered with a timber board in order to make floor level apparent from street façade. On the other hand, on some houses, exterior wall was rough plastered and no application was done for covering the façade and floor joists and timber framework of upper storeys could be seen from outside.

a) **b)**

Figure 4.13. Covering floor joists with a timber board on exterior façades of the traditional houses **a**) Çakırlar Konağı (author, November 2007), **b)** Fenerli Ev (author, November 2007)

Figure 4.14. Floor joists visible on exterior façade of parcel 664 (author, May 2007)

Secondary structural elements were arranged according to the type of filling material. In Taraklı, main infill material is mudbrick and secondary elements such as studs, braces and tie beams were arranged according to mudbrick dimensions.

Components to form this system are;

Main Posts are placed on the corners of the walls, set on the foot plate and carry the main load of the structure. In Taraklı, generally they are in 10-12x 12-15 cm cross section. With support of studs, main posts were placed at intervals of 120-150 cm.

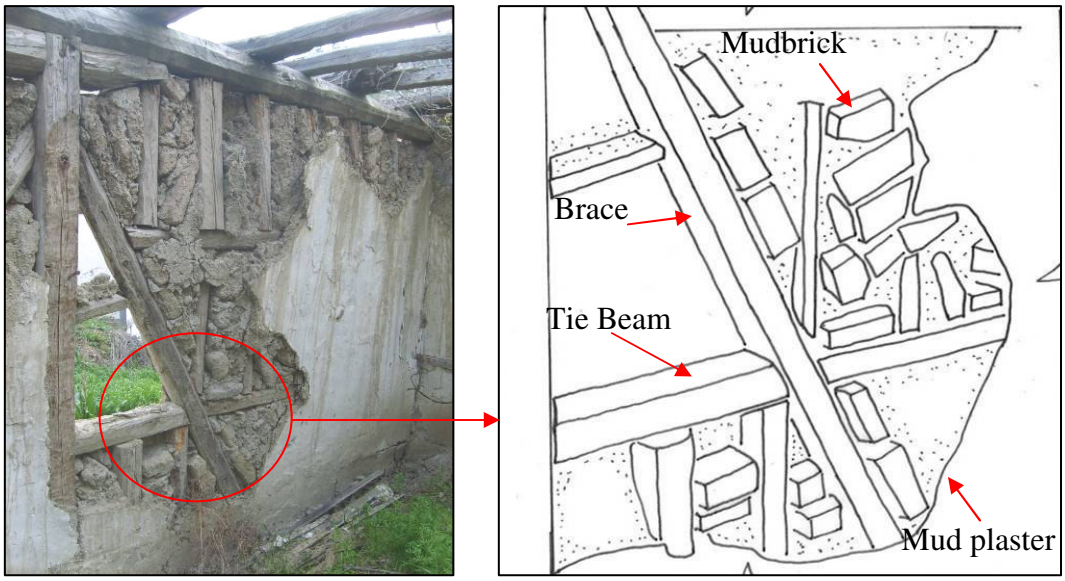
Studs are secondary posts to frame the openings and divide distance between main posts. Similar to the main posts, studs also carry the load. In Taraklı, filling material was mudbrick and the intervals between studs were arranged according to the dimensions of mudbrick. While the length of a mudbrick was 30-33 cm, interval could change 28-30 cm to hold mudbrick a bit slanted. By this application, stability of structure is increased and infill material is held stable.

Figure 4.15. Mudbrick inserted a bit slanted in order to increase the stability of the structure-Hisar Evi (author, May 2007)

Window Header and Sill are kinds of tie beams in order to form the framework of a window with cross-section of 5x10 cm or 5x15 cm.

Wall and Foot Plate; while main posts are placed on the footplate, floor joists are set on the wall plates and integration of these two structural components with main posts behave as a box system and constitute the main framework of a traditional house.

Tie Beams divide the spaces between posts and studs and create small box-like intervals. The height of these intervals is determined according to the height of infill material. Generally 5-6 mudbrick could be placed overlapping in these intervals.



a) **b)**

Figure 4.16. Construction of brace element, **a)** Detail from the wall of sheet 6, parcel 691 (author, May 2007), **b)** Support of brace by tie beams at sheet 6, parcel 691 (drawn by author, May 2007)

a) **b)**

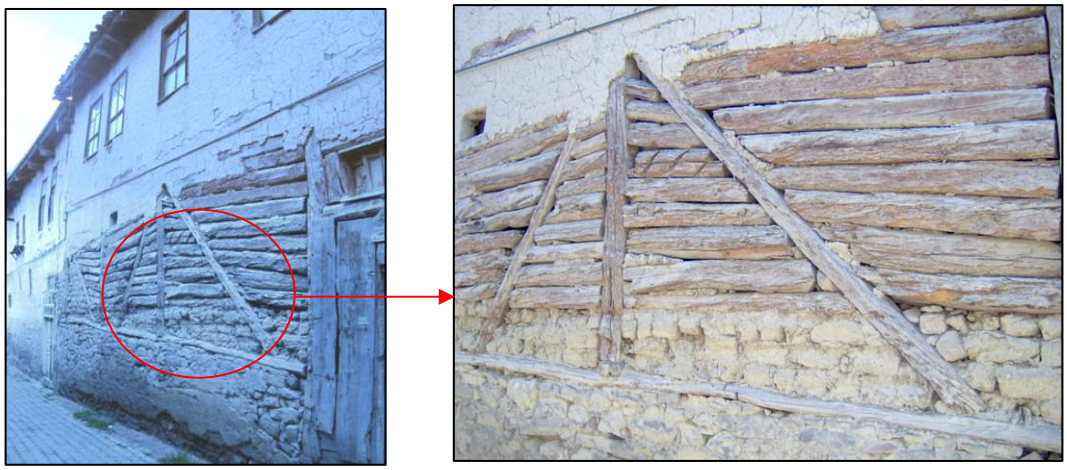
Figure 4.17. Construction of braces on the walls of the traditional houses, **a)** Hisar Evi (author, May 2007), **b)** Çakırlar Konağı (author, May 2007)

Braces provide resistance against horizontal forces and they are placed with an angle of 30˚-45˚. In Taraklı, generally they do not continue from foot to the top so that they are nailed somewhere near the top of the posts as seen in the Figure 4.16. Braces support the main vertical post, whereas the small components share the load of the brace and prevent it from bending or curving.

Timber skeleton with mudbrick and stone infill technique can be seen on the construction of a few houses. At the construction of timber framed houses, rough cut stone could be used as infill material on the walls of ground floors. Stone was used in its simplest form and no workmanship was applied on it, whereas workmanship on the upper floors was more precise. In this system, due to being infill material, stone blocks could not carry any load, but as compared to mudbrick infill, stone material was more durable and resistant to damp. Mudbrick bonding was applied on the walls of upper storey where living units were arranged, whereas stone infill was only applied on the walls of ground floor where general services as storage and livestock were supported.

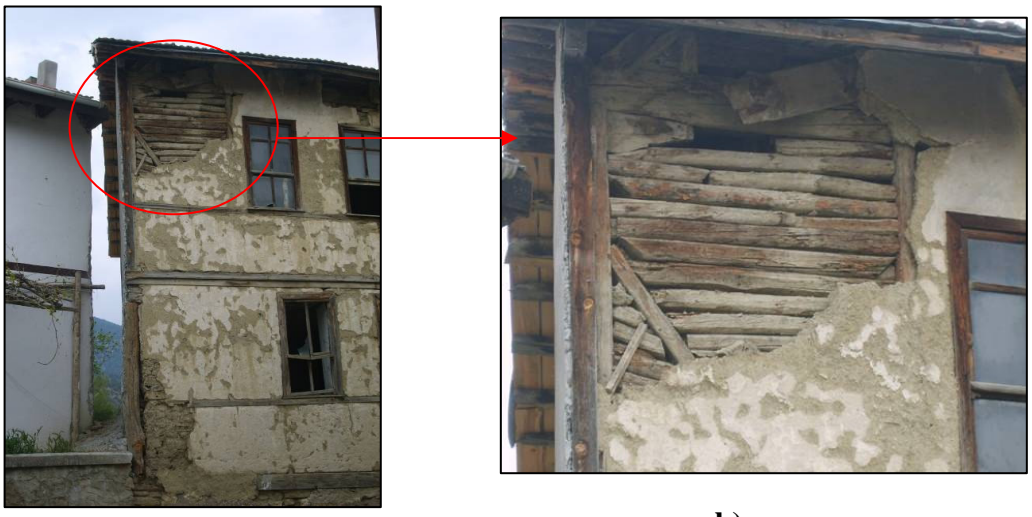
Figure 4.18. Timber skeleton with stone infill on Çakırlar Konağı (author, May 2007)

In ***timber skeleton with timber infill technique,*** timber elements for filling the spaces between posts and braces. They do not carry the load as the filling mudbrick material. These timber elements were not used only for exterior walls of the houses; they were used also on the walls around the entrance door and even on the window or on the door openings to lighten the structure. After placing timber components between the posts and braces, mud plaster including straw was applied on.



a) **b)**

Figure 4.19. Timber skeleton with timber infill on sheet 6, parcel 658, **a)** Front façade (author, May 2007), **b)** Detail of front façade (author, May 2007)



b)

a)

Figure 4.20. Timber skeleton with timber infill on Parcel 204, **a)** Front façade (author, May 2007), **b)** Detail on the front façade (author, May 2007)

In ***bağdadi system (timber skeleton without infill material),*** lath coverings in 2-3 cm width were nailed on both inner and outer wall surfaces horizontally. The spaces between surfaces were filled with small stone or brick pieces or left empty. Then the outer surfaces were plastered with the mixture of mud and straw. Generally, it was filled with remaining material such as small stone or brick pieces on exterior walls, whereas to lighten the structure, interior space of the bağdadi wall was left empty. Construction of this system requires not only vast amount of wooden lathes but also a large contribution of workmanship. In Taraklı, in construction of Fenerli Ev, this technique was applied without infill material between lath coverings as seen in the Figure 4.21.

a)

b)

Figure 4.21. Bağdadi system on Fenerli Ev, **a)** Front facade (author, May 2007)
b) Interior façade of the wall of pinnacle (author, May 2007)

Masonry construction system with mudbrick was used on the walls of ground floors and it was based on stone walls which were up to 80-90 cm height from the ground level. Use of masonry mudbrick was an older technique compared to timber skeleton and the dimensions of masonry mudbricks were larger compared to the infill ones.

In ***masonry mudbrick system with corner posts*** technique, timber footplate was placed on the stone foundation, and then main timber posts were set on the corners and the space between the posts were filled with masonry mudbrick. To increase the stability of the wall and to hold the mudbrick in situ, horizontal tie beams were placed.

Figure 4.22. Masonry mudbrick with corner posts at Hisar Evi (author, May 2007)

In ***masonry mudbrick system without corner posts*** technique, masonry mudbrick wall was constructed without timber posts, but the wall was supported by stone and horizontal tie beams on the corners as seen in the Figure 4.23. Masonry mudbrick could carry the load and it is called as *"ana"* by local people. It was in larger sizes compared to infill one and the sizes could change as 10x15x30/33 or 10x20x30/33 cm whereas infill ones could vary 10x12/13x20 cm, 10x12/13x30 cm.

Figure 4.23. Masonry mudbrick without corner posts on parcel 664 (author, May 2007)

Dimensions of materials used in the construction:

Masonry Mudbrick: 10x15x30/33 or 10x20x30/33 cm

Infill Mudbrick: 10x12/15x20 or 10x12/15x30 cm

Stone Masonry height: 80-120 cm hieight from the ground

Horizontal timber beam cross-section on exterior wall: 10-15 cm.

Height of ground floor: could not be measured but approximately 450-500 cm

Height of first floor: could not be measured but approximately 250-300 cm

It was not allowed to enter into the house during the survey; however due to the altitude of ground floor, there may be a mezzanine floor between the ground floor and the first floor. While ground floor was used as barn, mezzanine floor was functioned as storage area. The walls were constructed in masonry mudbrick, whereas living units were arranged on the first floor whose walls were constructed in timber skeleton with mudbrick infill.

Flooring (floor joists and boards) and cladding construction was also done with timber material on traditional Taraklı houses. After constructing the wall of ground floor, a timber footplate was set on, and then floor joists were placed in the short direction of the room and perpendicular to the footplate. On floor joists main posts were placed and timber framework of upper floor was constructed.

Generally, the ceilings of the corridors or service areas were not covered with panels and floor joists could be seen, whereas the ceilings of the living units were covered with panels and most of the time they were painted or ornamented for visual impact.

Figure 4.24. Ornamentation on the ceiling of first floor of Çakırlar Konağı (Taraklı Municipality Archive, 2005)

a) **b)**

c)

Dimensions of materials used in the construction of timber flooring:

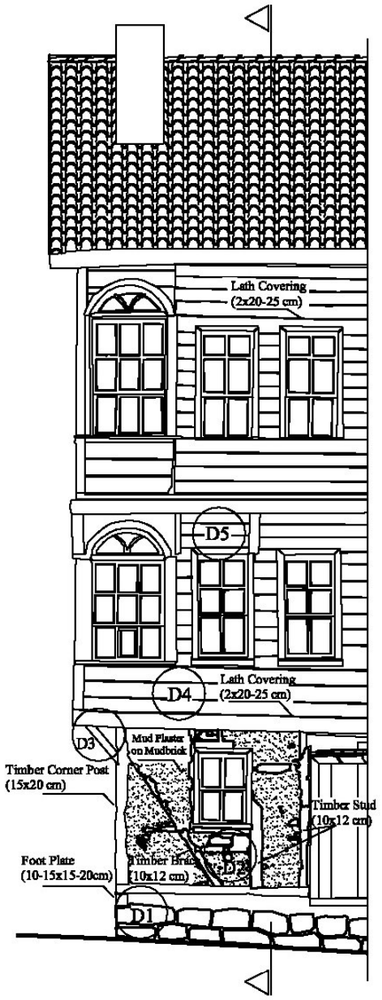
- Floor board: 2x20 cm
- Floor joist: 7-10x14-20 cm
- Distance between the timber joists: 40-50 cm

Figure 4.25. Timber Flooring Construction **a)** Flooring of first floor in Fenerli Ev (author, May 2007), **b)** Flooring of first floor in Rüştiye Mektebi (author, May 2007), **c)** Flooring of first floor in Hisar Evi (author, May 2007)

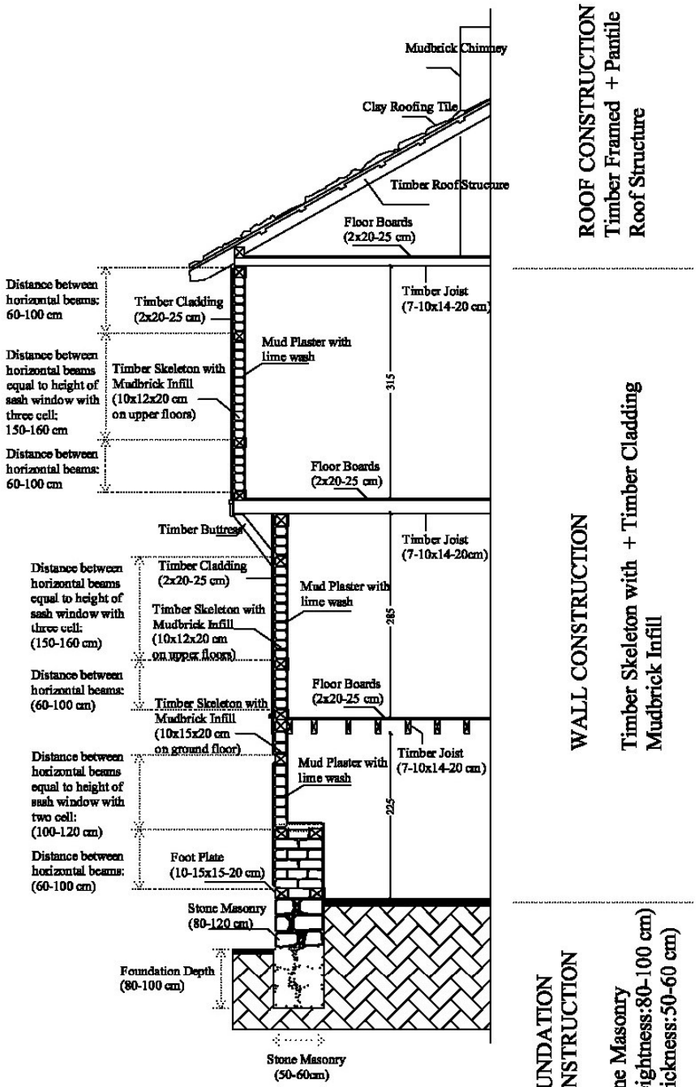
On the other hand, after construction of timber framed wall with mudbrick infill, timber cladding was applied on upper floors of some traditional houses. Cladding elements were approximately in 2x20-25 cm cross-section and they protect the walls from climatic effects such as rain, sunshine, wind etc. Sometimes timber cladding was preferred because of visual concerns.

Figure 4.26. Timber cladding on Rüştiye Mektebi (author, May 2007)

Figure 4.27. Timber cladding on parcel 298 on Ankara Street (author, May 2007)



PARTIAL BACKSIDE ELEVATION



PARTIAL SECTION

ROOF CONSTRUCTION
Timber Framed + Pantile Roof Structure

WALL CONSTRUCTION
Timber Skeleton with + Timber Cladding
Mudbrick Infill

FOUNDATION CONSTRUCTION
Stone Masonry
(Heightness:80-100 cm)
(Thickness:50-60 cm)

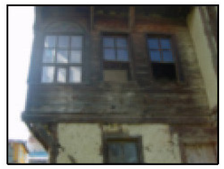
POINT DETAILS

D1

D2

D3

D4

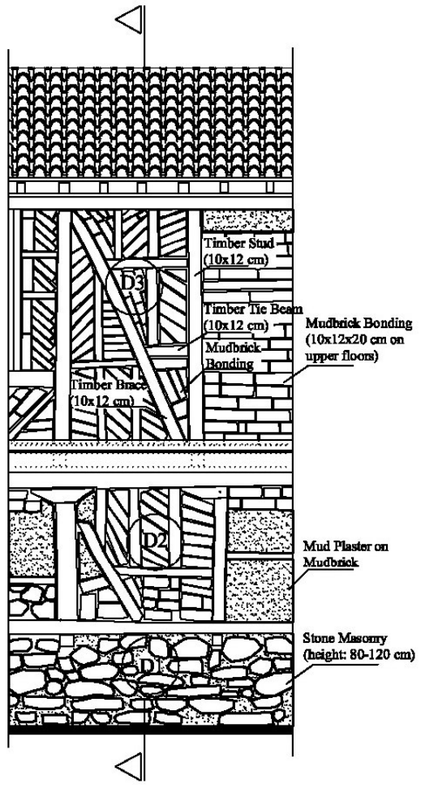


D5

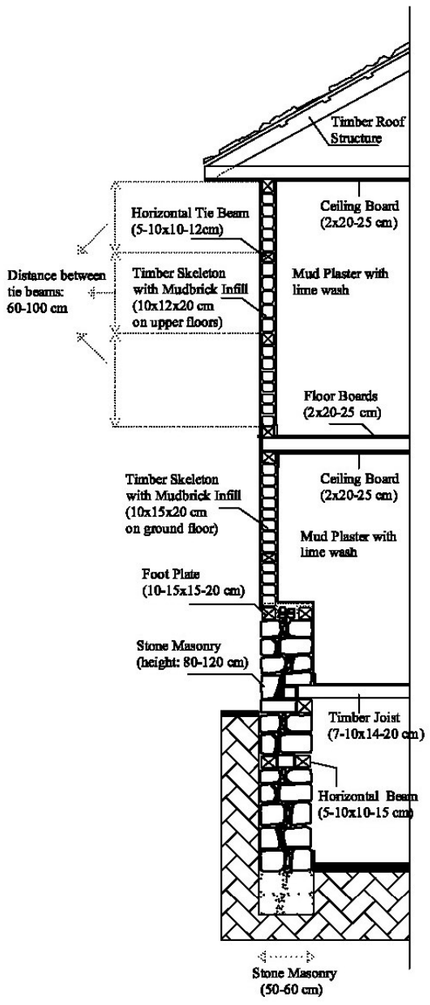
Base elevation drawing was obtained from TARES Architectural Project Office in Sakarya, 2008-redrawn by the author. Information about the dimensions and distances of the construction elements have been obtained from the interviews with local constructors, Mustafa AKDOĞAN, Sıtkı BULUNTEKİN, and also from the measurements made by the author at the site.

RÜŞTİYE MEKTEBİ

Figure 4.28. Construction Detail Drawings and Images of Rüştiye Mektebi



PARTIAL BACKSIDE ELEVATION



PARTIAL SECTION

ROOF CONSTRUCTION
Timber Framed + Pantile
Roof Structure

WALL CONSTRUCTION
Timber Skeleton with
Mudbrick Infill

STONE MASONRY
CONSTRUCTION
(Thickness:50-60 cm)

POINT DETAILS

D1

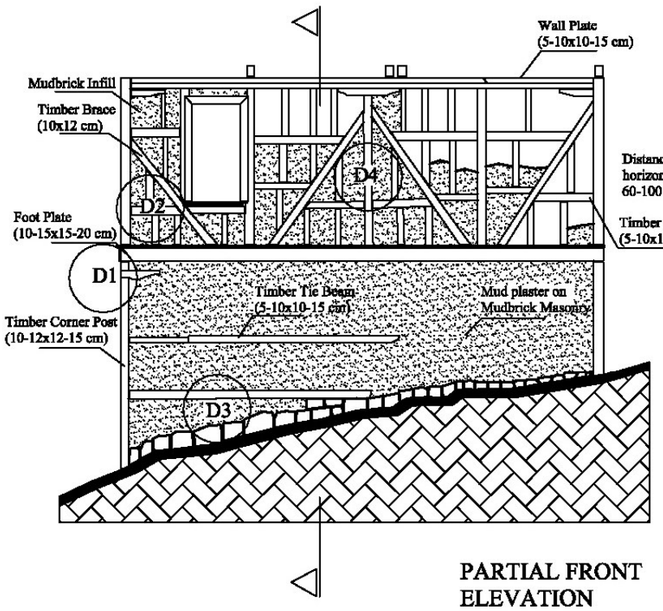
D2

D3

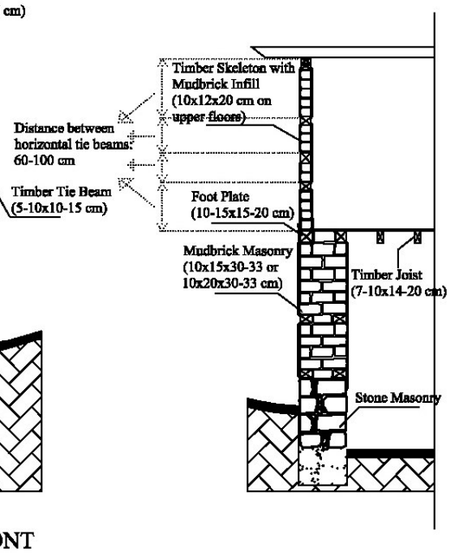
Information about the dimensions and distances of the construction elements have been obtained from the interviews with local constructors, Mustafa AKDOĞAN, Sıtkı BULUNTEKİN, and also from the measurements made by the author at the site.

ÇAKIRLAR KONAĞI

Figure 4.29. Construction Detail Drawings and Images of Çakırlar Konağı



PARTIAL FRONT ELEVATION



PARTIAL SECTION

WALL CONSTRUCTION

Timber Skeleton with Mudbrick Infill

MUDBRICK MASONRY CONSTRUCTION (Thickness:50-60 cm)

STONE MASONRY CONSTRUCTION (Thickness:50-60 cm)

POINT DETAILS

D1

D2

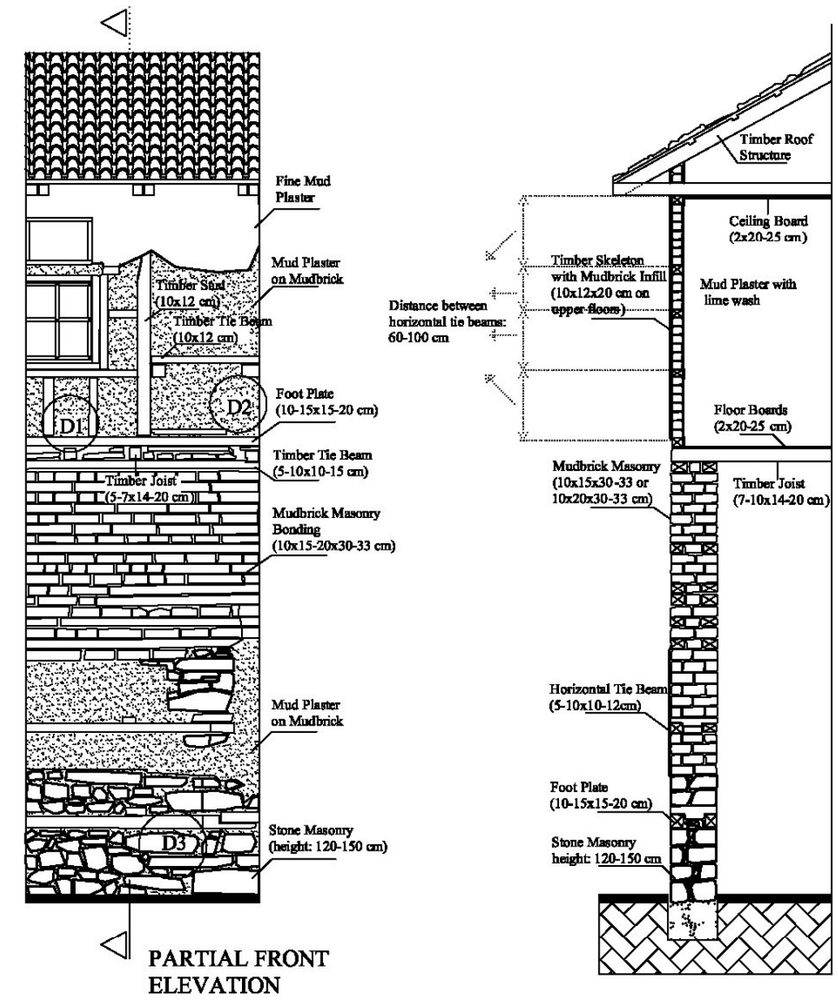
D3

D4

Base elevation drawing was obtained from "ATEŞ R., A Technical Report on Restoration of Hisar Evi, Safranbolu Vocational High School, 2005"-redrawn by the author.
Information about the dimensions and distances of the construction elements have been obtained from the interviews with local constructors, Mustafa AKDOĞAN, Sıtkı Usta, and also from the measurements made by the author at the site.

HİSAR EVİ

Figure 4.30. Construction Detail Drawings and Images of Hisar Evi



PARTIAL FRONT ELEVATION

PARTIAL SECTION

ROOF CONSTRUCTION
Timber Framed + Pantile Roof Structure

TIMBER SKELETON WITH MUDBRICK INFILL

MUDBRICK MASONRY CONSTRUCTION (Thickness:50-60 cm)

STONE MASONRY CONSTRUCTION (Thickness:50-60 cm)

POINT DETAILS

D1

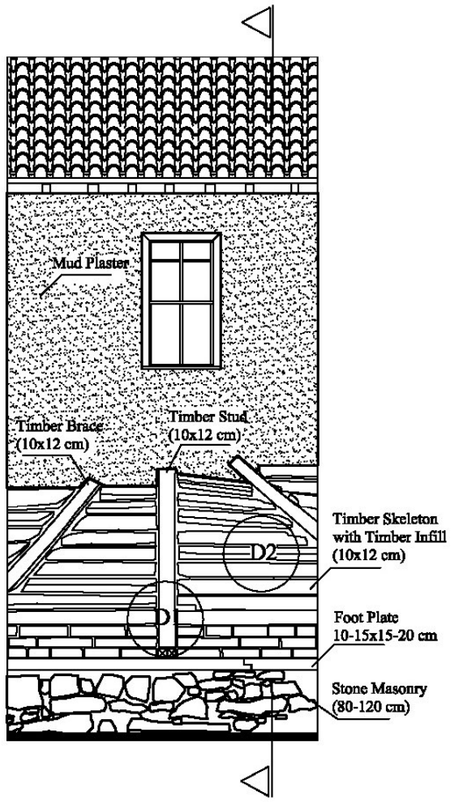
D2

D3

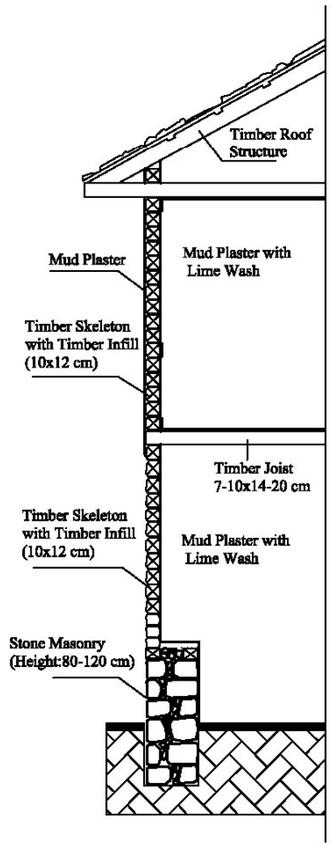
Information about the dimensions and distances of the construction elements have been obtained from the interviews with local constructors, Mustafa AKDOĞAN, Sıtkı BULUNTEKİN, and also from the measurements made by the author at the site.

SHEET 6, PARCEL 664

Figure 4.31. Construction Detail Drawings and Images of Sheet 6, Parcel 664



PARTIAL FRONT ELEVATION



PARTIAL SECTION

ROOF CONSTRUCTION
Timber Framed + Pantile Roof Structure

TIMBER SKELETON WITH TIMBER INFILL

STONE MASONRY CONSTRUCTION (Thickness:60-100 cm)

POINT DETAILS

D1

D2

Information about the dimensions and distances of the construction elements have been obtained from the interviews with local constructors, Mustafa AKDOĞAN, Sıtkı BULUNTEKİN, and also from the measurements made by the author at the site.

SHEET 6, PARCEL 658

Figure 4.32. Construction Detail Drawings and Images of Sheet 6, Parcel 658

4.2. System Proposal: "*Taraklı GIS Online*"

"*Taraklı GIS Online*" project has been created and displayed as an integrated part of the main project of "*GIS Online*" which has been carried out by Architectural Photogrammetry Laboratory at Politecnico di Bari, Italy. The research was carried out during the thesis studies at Politecnico di Bari, Italy in fall term of 2007-2008. Throughout 5 months, (from October 2007 to February 2008) participation to the lectures (about web-based GIS applications) in the laboratory was ensured and system architecture of the *"GIS Online"* project was tried to be understood by learning basic HTML and Javascript knowledge.

Architectural Photogrammetry Laboratory has carried out the "*GIS Online*" project with the aim of developing methods for online documentation of Cultural Heritage. In that respect, digital documentation of various historical sites has been utilized and displayed on the web site in order to disseminate the information and share with the public. The laboratory uses free tools of Google such as Google maps for mapping utilization, Sketch Up for 3 dimensional modeling, Google Earth for insertion of prepared models on the exact geographic coordinates on the Earth.

In that respect, in order to develop Taraklı online web site, system architecture of the *"GIS Online"* project has been surveyed. As guidance to the categorization and classification of collected data of Taraklı, existing data models of Serracapriola in text, table, chart, image or video format are revised. For creating and designing online database, basic knowledge of HTML and Javascript are tried to be learned in order to understand how to insert a text, a table, a chart or an image to the proposed web site.

Hence, following these studies at the laboratory, architecture of the system created for *"GIS Online"* project can be summarized as:

- Client : A conservator working for the Ministry of Culture and Tourism and developing conservation projects for historic towns and buildings with the basic knowledge of using a PC, Notebook, or a PDA with an internet connection
- Web browser: Internet Explorer or Mozilla Firefox (Mozilla Firefox gives better display results for online active map applications)

- Web server : HTTP

- Map server : Google maps API or Live Earth

- Data Server : Macintosh Computer in Architectural Photogrammetry Laboratory at Politecnico di Bari, Italy.

- URL address: "*http://www.stereofot.it/*"

When the tasks of these components and the structure of the project have been considered, model proposed for *"Taraklı GIS Online"* resembles to the features of the first model, which is the most commonly used today and disseminates information by displaying static HTML files and images, mentioned in the second chapter, mapping layer is limited, web pages for data display are in static HTML forms; however, due to having more dynamic GIS features with utilization of Google maps rather than static mapping, the model also have more dynamic system just as in the second model.

Users of the system can submit any request from the web site of *"http://www.stereofot.it/"* through a web browser. When the request is submitted by the web server, it contacts with the data server which is located in the laboratory and

the mapping server Google maps. Data server and map server is worked in integration for preparing requested data with mapping features. Prepared information is sent back the web server" and then to the web browser-Internet Explorer or Mozilla Firefox and displayed on the clients' computer on the web site of *"http://www.stereofot.it/"*. In the display of the mapping servers such as Googlemaps and Live Earth, the web browser-Mozilla Firefox serves better and faster than Internet Explorer. Therefore, in order to run the web site of *"http://www.stereofot.it/"*and *"Taraklı GIS Online"* properly, Mozilla Firefox should be preferred.

Web site *"http://www.stereofot.it/"* has a restricted access for the data insertion and only authorized users can log in and operate; but also the clients have a chance to report any changes and correctness of the data on the server by informing the author sending an email. Each authorized user has its own account on the server and his/her operations are recorded. Correctness and the reliability of any change that have been reported by any user are surveyed by the author and confirmed to the expert of the subject, then inserted to the server.

4.2.1. System Design

As the first phase of the creation of Taraklı GIS Online, raw data collected during the phase of literature survey and field trips, is classified and categorized due to the data features and relations between data types.

- Geographical coordinates of the town location and surveyed houses have been determined on the interactive map of Google, on the internet. Geo-referenced data that will display on Google maps, spatial and non-spatial data that will display in written, graphical or audio-visual format are ascertained and their relations are determined.

- General headlines of the data groups, which will display on the layer legend of the system, have been decided.

- Enabled functions of these data groups have been written in the Javascript format in order to enable the web based system of Taraklı GIS Online.

- On the other hand, presentation criterias (design of web page such as text color, image format, map size, etc.) of *"GIS Online"* project carried out by Architectural Photogrammetry Laboratory at Politecnico di Bari, Italy have been surveyed, and tried to be adapt to the *"Taraklı GIS Online"*.

In the *"Taraklı GIS Online"* project, data types have been determined according to data collected during literature survey and site surveys as below:

1. General Information

Written Data: **-**Location, neighborhood
-Geographic and climatic conditions
-History

Supported by;

Graphical Data: **-**Interactive Map of Googlemaps
-Building Categorization Map
-Photographs and drawings of the town and the houses

2. Conservation Studies and Site Decisions

Written Data: -Registration Forms
-Regional Committee Decisions
-Information about Conservation Development Plans

Supported by;

Graphical Data: **-**Map of Registered Buildings and Urban Site
-Photographs and measured drawings of the houses

3. Architectural Characteristics

Written Data: -Plan characteristics
-Elevation features

Supported by;

Graphical Data: Photographs and measured drawings of the houses

4. Constructional Characteristics

Written Data: -Construction Materials

--Wood

--Stone

--Mudbrick

-Construction Techniques

--Timber Skeleton

--Masonry Construction

- Construction Process

Supported by;

Graphical Data: -Interactive Map of Googlemaps for Location Display of Surveyed Houses

-Construction Material Resource Map

-Construction Materials Map

-Construction Techniques Map

-Plan, Section and Elevation Drawings

-Construction Detailing Drawings

-Audio-visual documents of interviews with local builders

-Images

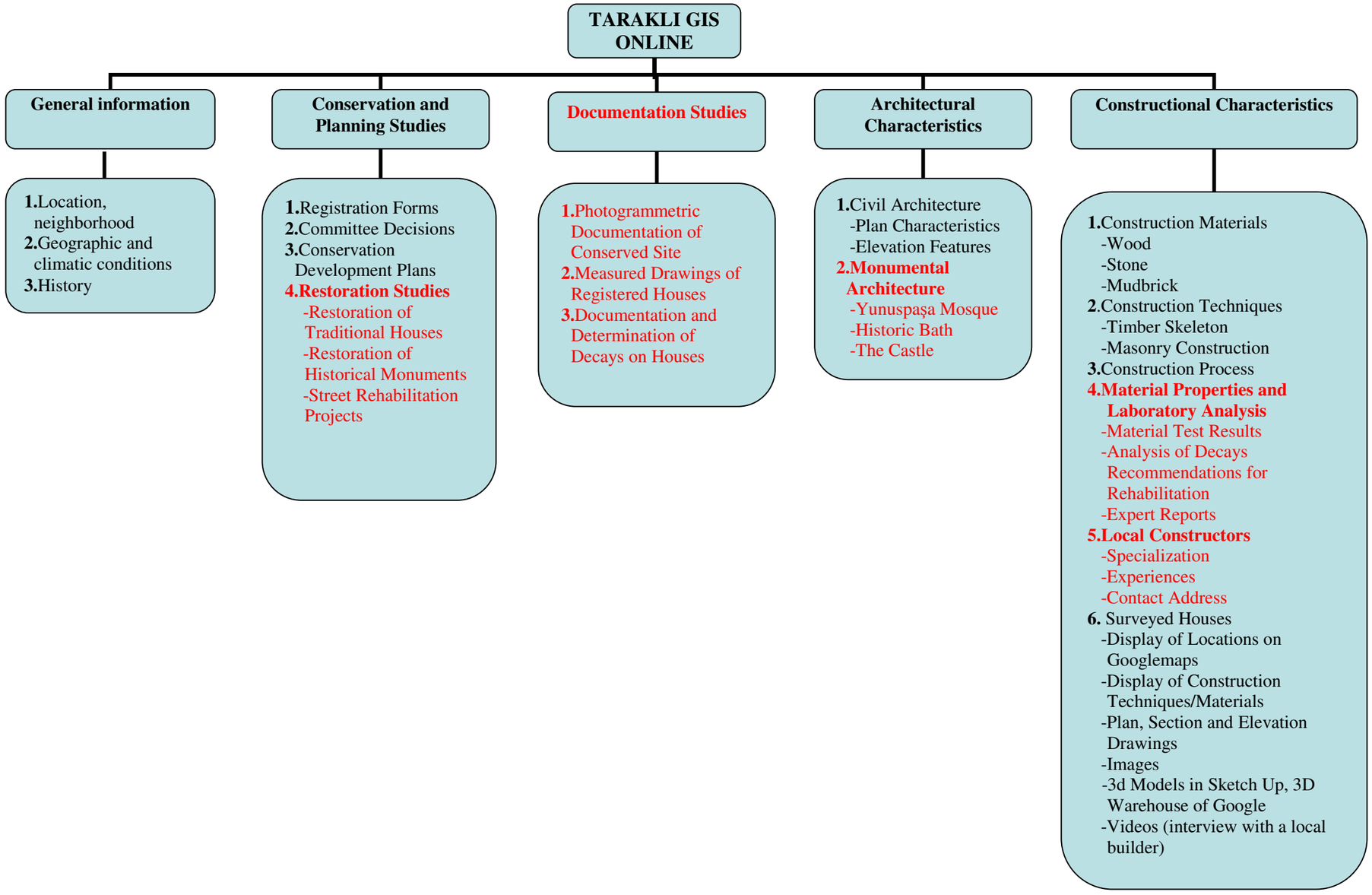
Categorization of these data types was limited to the collected data both from the literature survey and from the site surveys to Taraklı. However, in order to increase the efficiency of the project, documentation studies, laboratory analysis, restoration studies, local constructors and monuments can be new data groups (Table 4.2).

In *"documentation studies"* data group, photogrammetric documentation works of the conserved site, measured drawings of the registered houses, documentation of material decays on traditional houses can be worked and added to the system. In *"material properties and laboratory analysis"* data group, material test results and

expert reports in order to support determination of material decays and also in order to support usage of a suitable construction material for immediate repairs can be worked and added to the system. Furthermore, in *"restoration studies"* data group, restoration projects of traditional houses and street rehabilitation projects such as Rüştiye Street, in where Fenerli Ev and Rüştiye Mektebi are stated, can be worked and added to the system. Finally, information about local constructors and monumental buildings such as Yunuspaşa Mosque and Historic Bath can be collected and added as new data groups to the *"Taraklı GIS Online"*.

In the future, with the entry of these new data groups to the system, more data will be stored, processed in the system and shared with the users in a controlled way. More efficient analysis and evaluations will be enabled with various queries on different data topics. As a result, suitability and efficiency of the project as a support tool for the decision making process of the town conservation will be increased.

Table 4.2. *"Taraklı GIS Online"* database created and designed by the author



Data types that can be further studied and added to the *"Taraklı GIS Online"* database are written in red color.

4.2.2. Display of the System

In Taraklı GIS, in order to allow researchers to make deeper queries, the surveyed buildings and locations have been marked on the interactive map, and additionally, descriptive information of the construction materials and techniques of buildings has been given in a new window.

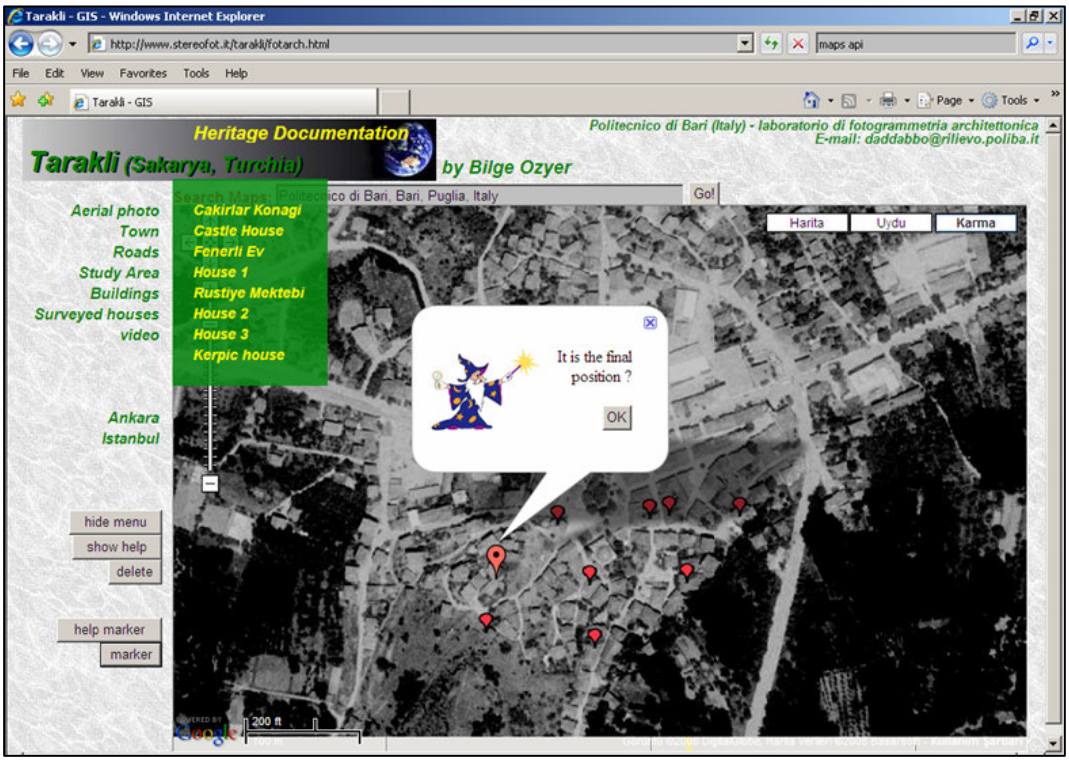


Figure 4.33. Verification of a location coordinates

The possibility of the verification of what has already been written by any client is another significant feature of the system. To illustrate, if any user finds the report indicating ‘Çakırlar Konağı’ in wrong position, the information can be corrected by clicking on the "marker", positioning the pawn (indicated by the comic) in the exact location, then clicking on click "OK" (in the comics) and filling out the card that appears, indicating the exact name of the building, any historical information, the user name and personal e-mail address for any clarifications.

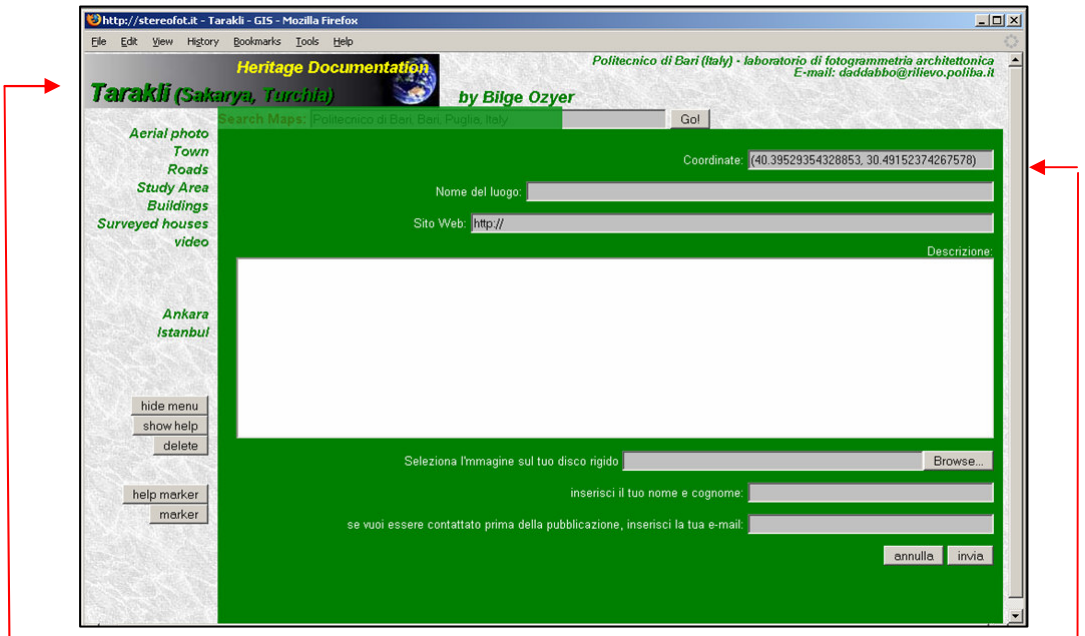


Figure 4.34. Mailing method of any verification

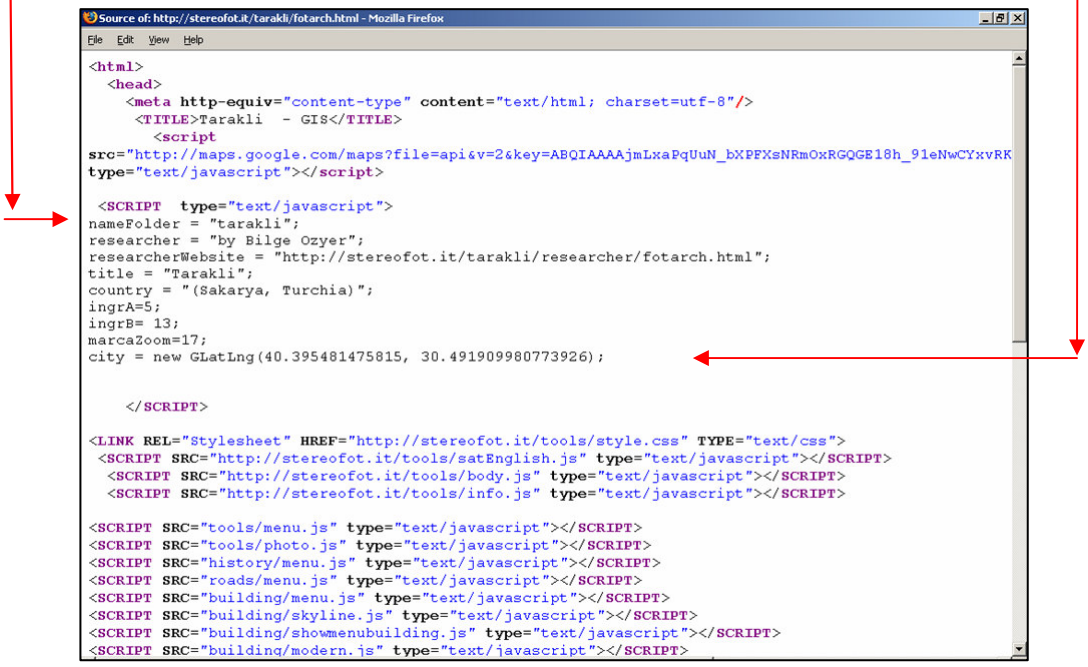


Figure 4.35. Database page source in JavaScript format.

In order to visualize Google Maps on the web site, the authorized user should sign up for an API key at the web site *http://code.google.com/apis/maps/signup.html*. Following signing up, the name of the server (stereofot.it) is written and then a Google Maps API key is created for embedding Google maps into the web site. By

copying that key to JavaScript of the web page, many utilities for manipulating maps and adding content to the map through a variety of services could be possible.

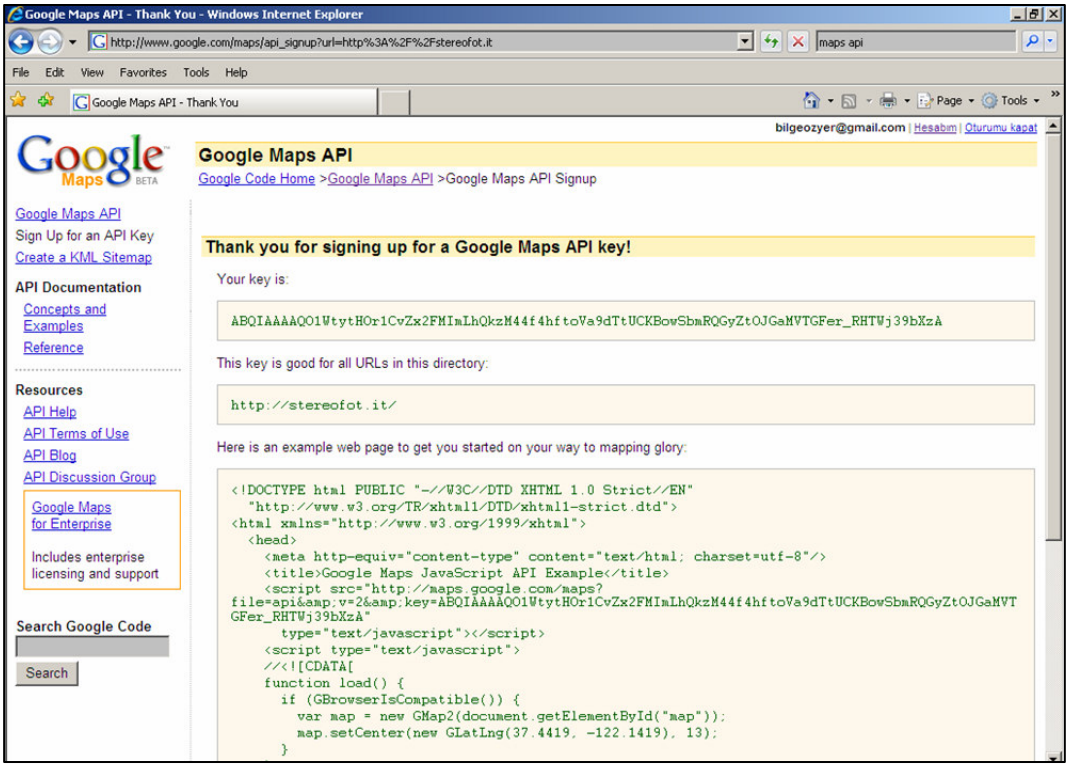


Figure 4.36. Display of Google Maps Api key.

In order to display location of Taraklı on Google Maps, geographic coordinates of exact location of the town center should be written to the JavaScript of the website and inserted as the map set center. Then, Googlemaps is centered on location of Taraklı and displayed in the form “Map, Satellite or Hybrid” which can change according to the user request. After these applications, various data requests on the interactive map can be submitted to the web site.

In order to reach the information, web page *"http://www.stereofot.it/"* should be visited that a world map appears with the places marked on. By clicking on "GIS Online", a list of places appears and by the dragging the mouse on Taraklı the world map is focused on that place.

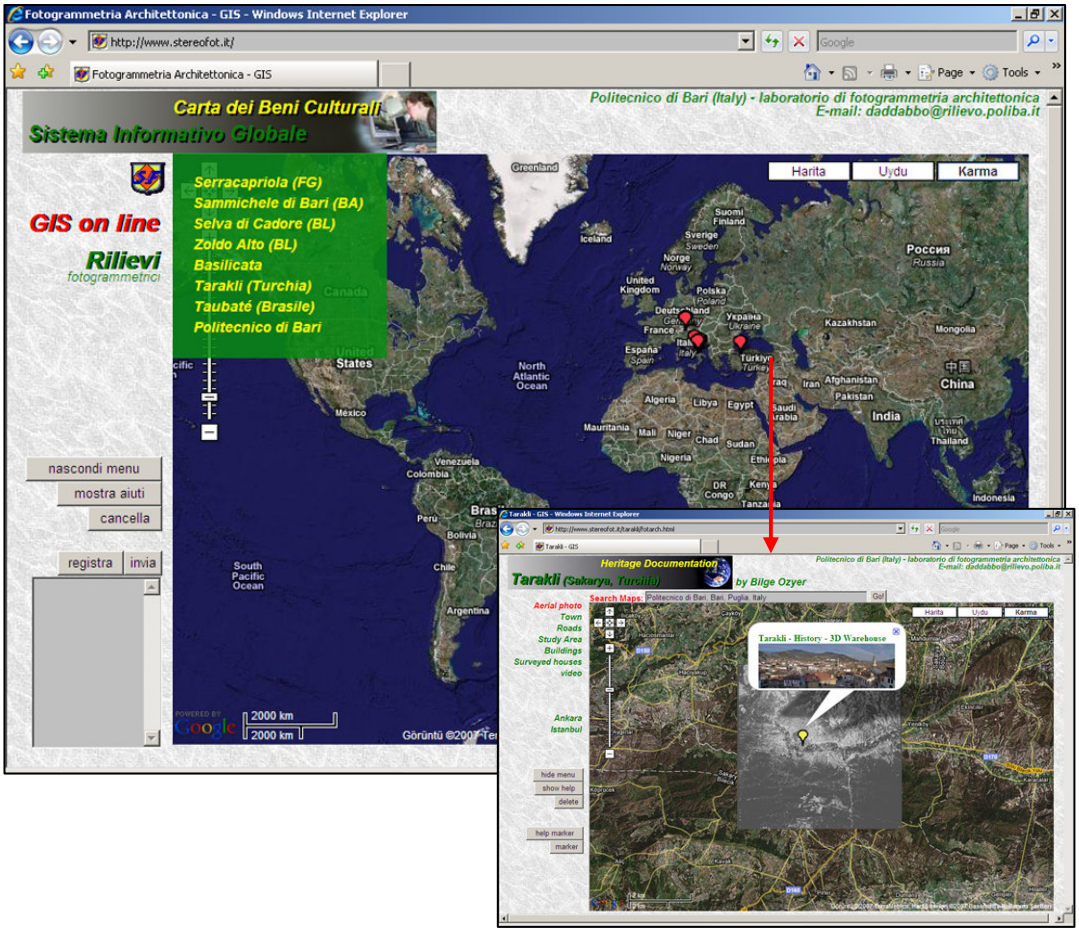


Figure 4.37. Displaying location of Taraklı

Clicking on Taraklı, home page is opened with thematic map and general view of the town is seen on a bubble. Clicking on the bubble, an enlargement of general view appears in a new window. Also, on the home page, the list of main categorization of collected information appears on the left side.

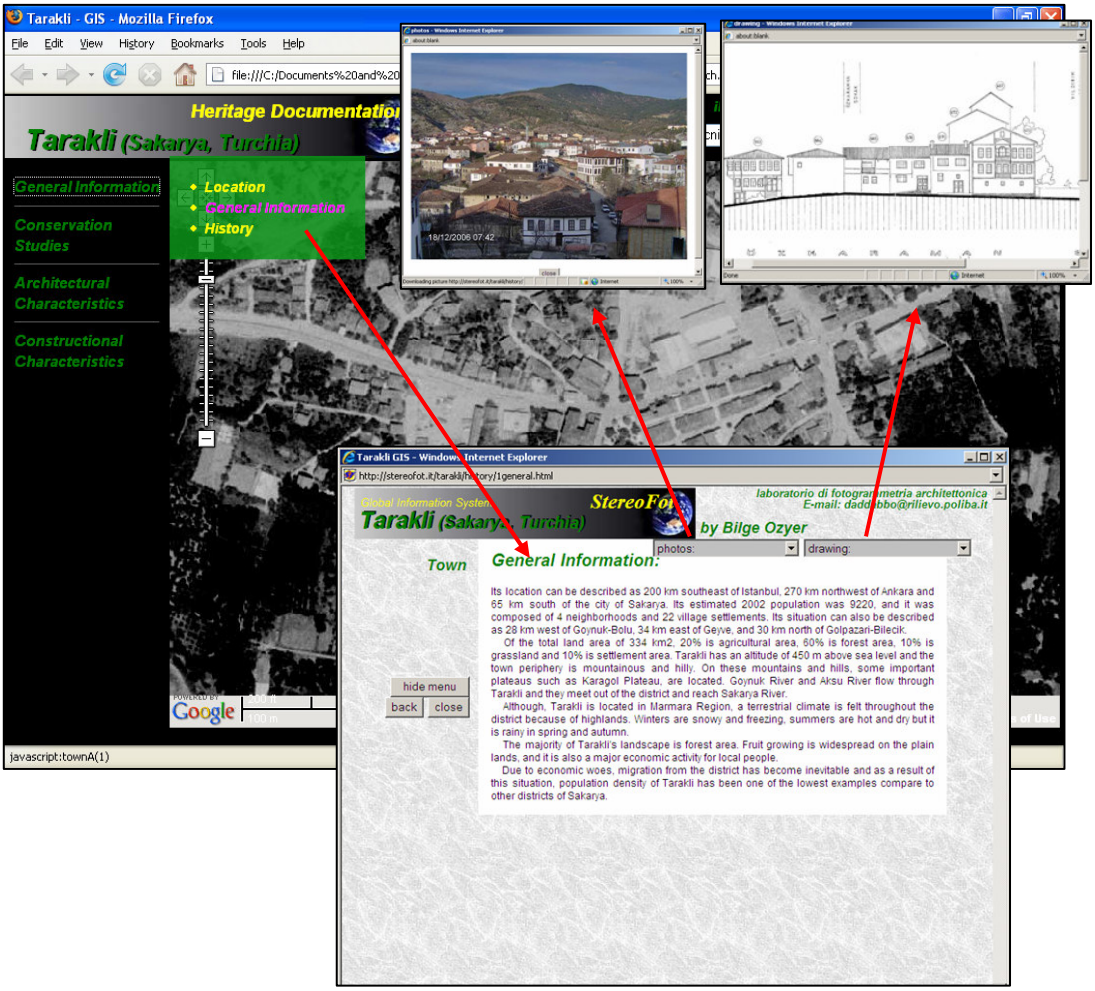


Figure 4.38. Display of information in different windows.

To illustrate, by clicking on *"General Information",* written document appears in a new window. At the right top of the page, two active rows appears that by clicking the first one, the list of the photos is seen, whereas by clicking the second one, the list of the drawings is seen. By clicking any image or drawing name, it opens in a new window.

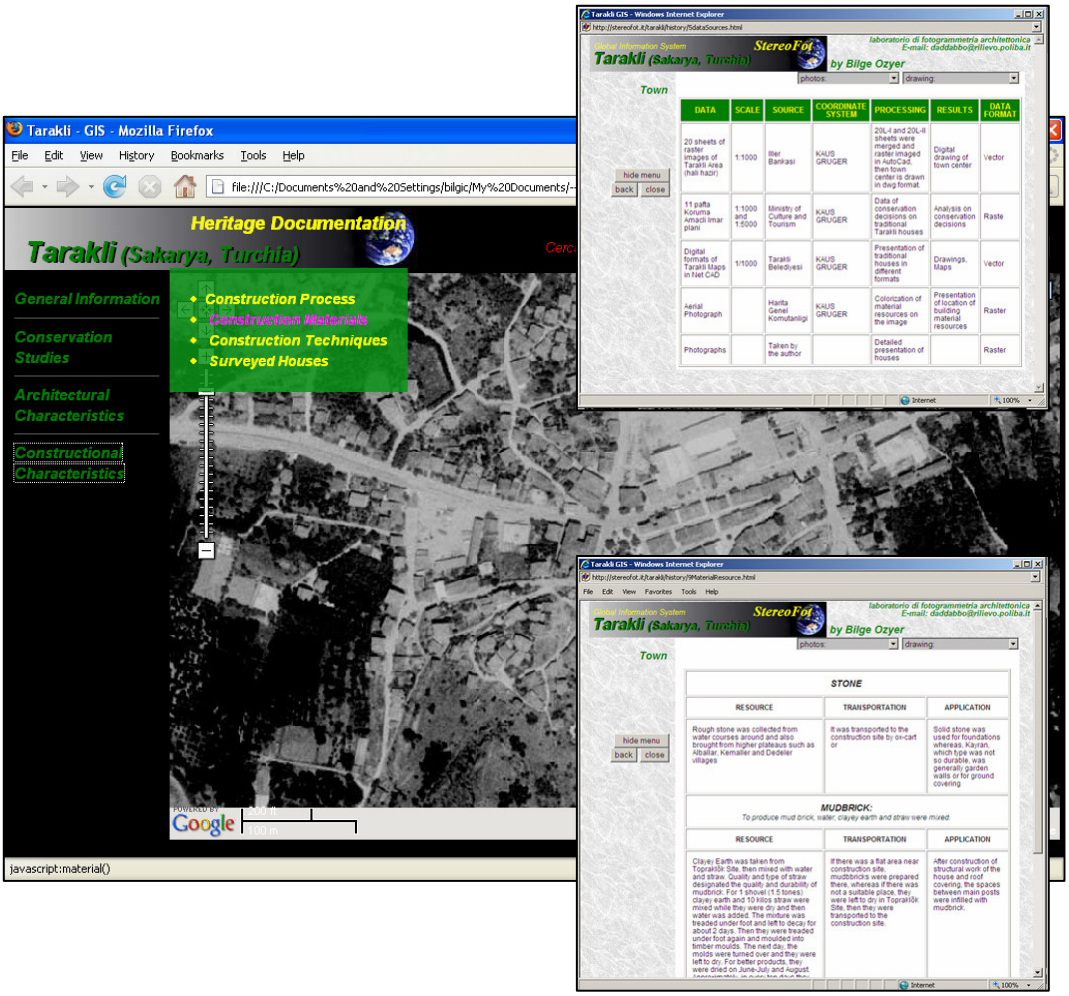


Figure 4.39. Display of the charts and the tables

Various types of charts and tables can also be displayed at as seen in the Figure 4.39. In order to achieve this, chart or table format with requested data is embedded to JavaScript of the web site. When clicking on the related title, it opens in a new window.

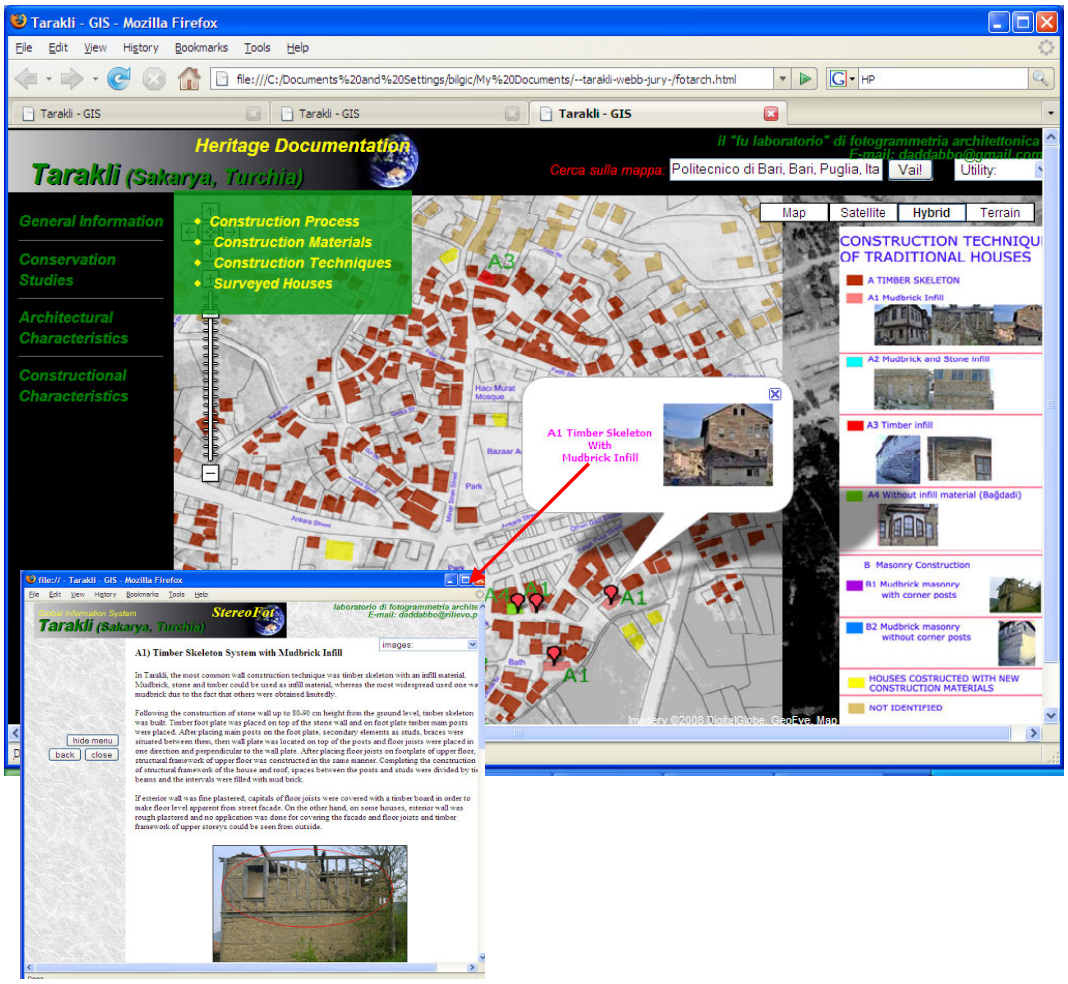


Figure 4.40. Display of construction materials and techniques

The drawings prepared in AutoCAD 2007 program have been overlapped with the area map of the town to allow clients to make deeper analysis about categories of building according to their functions, construction material and construction techniques. The opacity of the drawing is reduced in Adobe Photoshop CS in order to obtain better integration of two maps. By clicking on a marked house, a new window is opened by giving information of the construction material and technique of that house with a descriptive image.

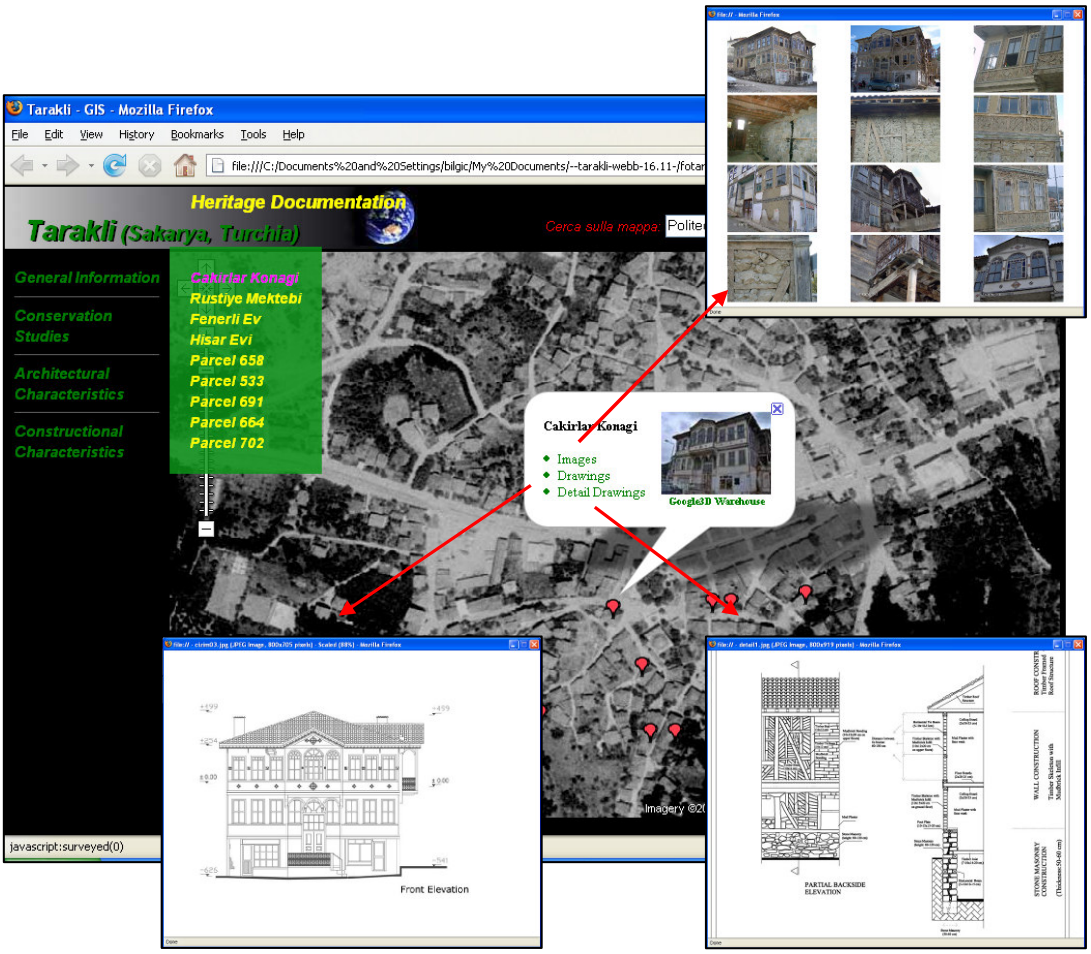


Figure 4.41. Display of the data on surveyed houses

Moreover, during site survey, nine traditional houses have been studied in detail. The main reason for survey of these houses is that information about construction materials and techniques are easily understood due to the fact that some of these houses were abandoned or some of them were destroyed so easy to study on. By clicking on *"Surveyed Houses"* under the title of *"Constructional Characteristics"*, the list of houses is opened. By clicking on one of the houses, the location with a red marker and small icon of that house in a new bubble appears on the screen. In order to survey the images, drawings or detail drawings of the house, one of the titles should be clicked on.

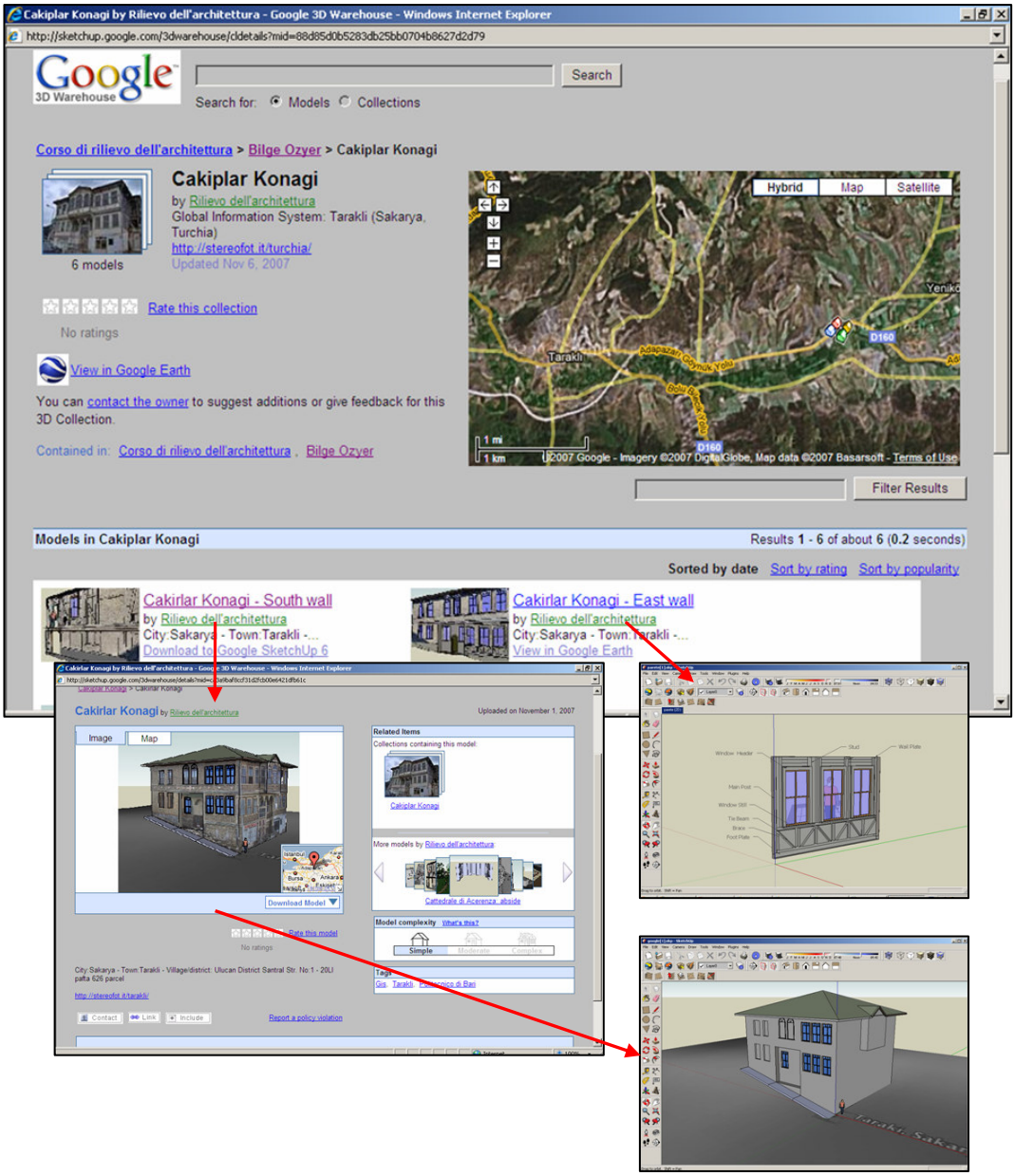


Figure 4.42. Display of the models in Sketch Up

By enhancing the system with additional scripts written for GIS, it is also possible to visualize the project in 3D model. In order to create 3D model of the buildings, Google SketchUp is a free tool to achieve this goal. Google Earth and SketchUp programs are downloadable free from Google and are used to draw three dimensional images directly on the region. A map of the area of interest can be imported from Google Earth to SketchUp. A virtual construction of the buildings can be created in SketchUp, and the model can be supported with covering of rectified images, and then the proposal could be displayed in Google Earth.

If required, the Sketch Up models can be published in the *"Google 3D Warehouse"* for sharing on the Internet. The Google 3D Warehouse is an online archive of 3D models. Anyone can search and download the models related with the project by using personal Google account.

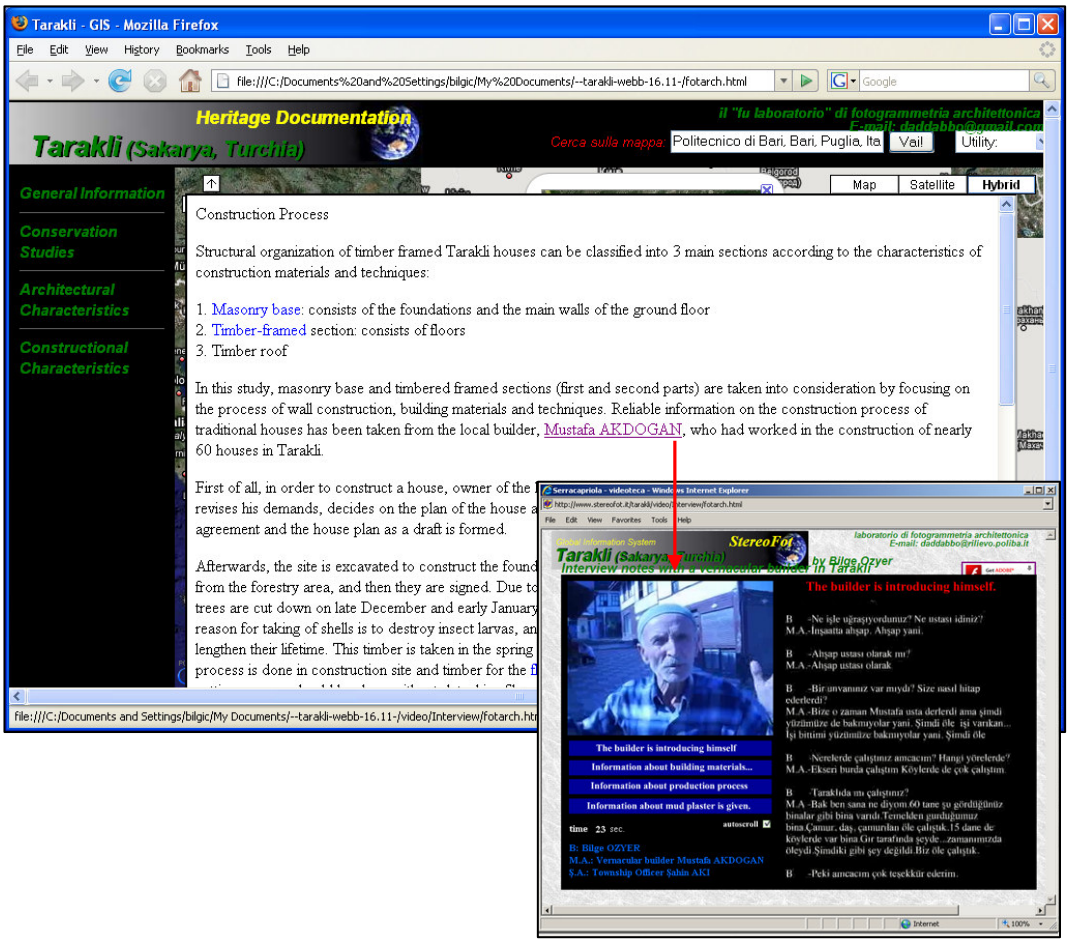


Figure 4.43. Display of the audio-visual data

In addition to the insertion and display of maps, images, drawings and written information, audio-visual data can also be inserted into the system. Firstly, recordings of interviews with vernacular builders have been published into written format then, by using Macromedia Flash Player and Final Cut Pro video editing softwares, video recordings have been edited. In order to finalize the presentation, written and audio visual format has been designed together as it is seen above. These software programs have the ability to increase the image quality and also cut the recording into pieces according to the categorization of the subject.

CHAPTER 5

DISCUSSION AND CONCLUSION

In this chapter, discussions on the construction process and techniques of traditional Taraklı houses and on the proposed web-based system *"Taraklı GIS Online"* are revealed. Following, conclusions of the research are presented.

5.1. Discussion

Results are discussed and evaluated on the subjects of construction process and techniques of traditional Taraklı houses, and also on the proposed web based GIS.

5.1.1. Discussion on Construction Process and Techniques of Traditional Taraklı Houses

This study aimed at producing body of knowledge about construction process, materials and techniques of traditional Taraklı houses through various sources. Hence, the information produced depends on these sources and site survey, and this brings about some restrictions. First of all, structural changes on the buildings throughout the time were not mentioned in this study. Actually, construction process and techniques of the traditional houses may have changes by the time and information on these changes can be understood with a more detailed survey carried with conservation specialists.

Secondly, narrative information is a significant data source, whereas, reliability of that source can not be evaluated. Local builders may not remember some events very well and their explanations can be misleading. Therefore, this information should be

verified with the support of other data sources. At this point, the information based on narrative sources should be verified with the support of scientific studies including laboratory analysis. To illustrate, information about the preparation of mud mortar obtained from the local builders can be utilized after being verified with the material laboratory analysis.

On the other hand, if the information gathered on the construction process and techniques of traditional Taraklı houses will be shared with different user groups, this study should be supported with several scientific works. Moreover, under the General Directorate of Cultural Properties and Museums in Ankara - as the proposed body for directing the proposed system - a scientific advisory council should be established in order to manage processing and sharing information in a more systematic and controlled way.

5.1.2. Discussion on *"Taraklı GIS Online"*

In this study, all the collected information was stored and organized in a single database and transferred to a web-based GIS with the aim of displaying and sharing the knowledge. While designing the database of the proposed system *"Taraklı GIS Online"*, four data groups could be created as *"General Information", "Conservation and Planning Studies", "Architectural Characteristics"* and *"Construction Characteristics"* due to limited sources of literature survey and site survey about traditional Taraklı houses. However, in order to increase the efficiency of the project, further surveys can be done on the subjects of documentation studies, material properties and laboratory analysis, restoration studies, databank on local constructors and monumental structures. In the near future, with the entry of these new data groups to the proposed system, more information will be stored, processed and shared with the users in a systematic and controlled way. More efficient analysis and evaluations will be enabled with various queries on different data topics.

Furthermore, application of web-based GIS in *"Taraklı GIS Online"* project can provide;

- Systematic overview of all related information about conserved area and traditional buildings,
- Analysis and interpretation of knowledge in an environmental context (spatial relationships, relationships to natural conditions such as topography, climate),
- Decision support to the conservation interventions and immediate repairs at the historical site,
- Easy access, availability, free of charge and updatable data through the web,
- Dynamic and flexible database structure in order to answer various evaluation criteria and queries of end users,
- Faster, precise and widespread distribution of related data to different user groups all around the world by using open source communication technologies such as Internet.

As mentioned in the second chapter, the model proposed for *"Taraklı GIS Online"* project resembles the first model presented by Foresman (1999:60), however, usage of Google maps as the map tool for the proposed system provides display of the data on a single map layer. Therefore, query and analysis of a required data on multi layers are not possible. The system allows users to display georeferenced data on one layered interactive map, and allows users to display written or graphical data in different HTML pages. By using Google maps, it is not possible to create a multi layered system. This is because, application of free map tools such as Google maps or Live Earth for web based GIS projects is a new technologic development; instead of complex multilayered interactive map tools, one layered and user-friendly map tools are designed and made freely available.

In this respect, display of data on a single map tool may be a critical point of the proposed system, whereas during creation and design phase of the system, usage of Internet for sharing information with more people faster and cheaper, usage of free map tools and downloadable drawing tools of Google Company are the advantages of the system for the users.

On the other hand, process for the preparation of a web based information portal *"Taraklı GIS Online"* was not an easy period and all throughout the process, many stages and difficulties have been overcome such as working on a project using web based GIS for the first time, working and making surveys for the thesis in a different country in a limited period, etc.

5.2. Conclusion

The existence of reliable and scientific information is an important issue for conservation of historic towns and historic buildings. In last years, information about the construction process, materials and techniques of the historic buildings are at risk of disappearance and instead of them, new construction materials and techniques have began to be introduced. At this point, producing the body of knowledge about traditional construction detailing and material techniques of historic buildings support the conservation decision making process by defining proper materials and techniques for interventions and immediate repairs. As previously, the main authorized governmental organization for the conservation of historic towns and historic buildings in our country is the General Directorate of the Cultural Properties and the Museums in Ankara, as the subsidiary of the Ministry of Culture and Tourism. Restoration, rehabilitation and conservation projects of registered buildings, conserved sites and conserved streets are developed within the control of this General Directorate. Most of the projects are tendered to the private restoration project offices, and also, some projects (such as Taraklı Conservation Development Plan, etc.) are directly developed by the conservators of the General Directorate. In this point, recording and documentation of raw data in the case area is the first phase of developing better conservation projects. Therefore, in either case, there is not a controlled and efficient information system, in the General Directorate of the Cultural Properties and the Museums, which provides reliable information as the basis for the development of conservation or restoration projects of the areas and buildings at issue.

In the General Directorate of the Cultural Properties and the Museums, when a study on recording or documentation of cultural properties of a historic site is planned to be

performed, the primary sources of information are the registration forms of the registered cultural properties in that area in order to provide background information. In addition to them, related maps and graphical sources (cadastral maps, conservation development plans) are obtained from the Bank of Provinces or from the local authorities. Furthermore, if there are ongoing restoration or rehabilitation projects on some historic buildings, or if there are ongoing archaeological excavations on the historic site, necessary information and documents are acquired from the Department of Constructional Works and Restoration and also from the Department of Archaeological Excavations, which are working under responsibility of the General Directorate. In this respect, before working on the site, related information is gathered from various sources; this situation is time consuming because of official correspondences.

Due to these reasons, developing an information system, which will work as a spatial databank in order to store, structure, process and display utilizable information in a controlled way, will simplify preparatory works of conservation projects. Furthermore, development of such a web-based GIS information portal, provides storing, structuring and management of complex data groups in multi layered systems. With the adaptation of the proposed system to the computerized tools, data editing, data entry and data updating will be available in every time in every where, just an internet connection to a PC, a PDA, or a laptop is available.

GIS and web-based GIS are quite recently introduced tools to the conservation process, especially while dealing with complex and spatial data. In GIS architectures, more data can be stored and processed in order to obtain utilizable information. Furthermore, web-based GIS use the technological advances in information and internet technologies and this provides a variety in the presentation techniques of the required data. Advances and variety in the display medium of information also increase quality of analysis and evaluations about the system. Additionally, use of internet technologies for information sharing and dissemination, provides availability, accessibility of information all over the world. In this respect, while establishing Taraklı GIS Online project, web-based GIS architecture has been considered as the main tool of this study, since this technology can also provide;

- integration of different data groups and different databases into one environment
- analysis, display and management of spatial data in a complex environment
- rapid production of specialized maps and graphic products
- distribution of useful information and sharing information with other users

Therefore, while considering suitability of the proposed medium *"Taraklı GIS Online"* by using web-based GIS for supporting decision making process of conservation, the aspects of web-based GIS mentioned above can be considered as the advantages of the targeted approach.

Developing this kind of an information system also provides documentation of all related visual, audio-visual and written information about that object or monument. The user has the chance to search, query the data obtained from different research activities, or to specify the origin of the data. At first glance, the model may appear more complicated, but the relations between the spatial and non-spatial data are explained clearly, the users could easily understand and adapt to the system. In the model, if different information is matched by well defined relationships and the basic structure can be organized in a simple and understandable manner, then by preserving the original structure, every kind of correctness or change can be done in the database. This feature shows the flexibility and adaptability of the system.

Achieving design and application of GIS database for an historic and cultural site as Taraklı, could be a well guiding example and an introductory model for developing a more advanced and detailed model in the future. On the other hand, if these studies are supported by the institutions working in the area of conservation and restoration as the universities or Ministry of Culture and Tourism, they will serve not only for the objectives of cultural and conservational aspects but also for economical aspects, urban planning and tourism.

On the internet, application of web-based GIS projects not only for the conservation of natural resources, but also for the conservation of historical areas are increasing everyday. Interactive and free online maps such as Googlemaps, Live Earth are more

commonly used for the development of information portals of historic areas and buildings with georeferenced and spatial data.

In this respect, for the further studies of historic towns, web-based GIS can be used in full capacity as explained by Foresman (1999:62) as the third model in chapter 2. Advanced technology of web-based GIS also enables effective visual representation of historic towns on the internet by using building and site 3 dimensional animations, high resolution area and satellite images and audio-visual records. Good advertisements of these historic sites may also increase the interest of people for visiting and conserving them. Location based queries on the interactive online maps can easily be made and when necessary, gathered data can easily be updated on the web. Additionally, with the use of web-based GIS in full capacity, more gathered data can be entered, stored, processed and presented in multilayered information systems. Multiple web transactions with multiple data servers can be created.

"Taraklı GIS Online" was presented as an introductory model with the creation and display of 4 data groups on one layered database. However, in the near future, making better use of the technological advances and working in multi-disciplinary teams may also allow verifying and processing more complex data groups on the web.

Instead of one layered maps with simple query features as Googlemaps and Live Earth, advanced web GIS and map tools with more analysis and query features may develop in order to enter, process and display complex data groups on multi map layers on the web. Each passing day, technological advances also increase the speed, accessibility and availability of Internet in everywhere in any time. Therefore, only internet connection on a PC, PDA or laptop can be sufficient for entering, updating and sharing information on the web at any time.

Furthermore, verification of data groups on the internet may also be possible with the usage of web based GIS for the further projects. Data on the material properties and material decays can be tested and verified by laboratory analysis and results can be inserted to the system through the internet that is used in the laboratory. To illustrate,

displayed data of interview with local builder Mustafa AKDOĞAN on the preparation of mud plaster can be supported with the material analysis of mud, straw, hemp plant as the components of the mix of mud plaster in the laboratory. Laboratory studies will give the certain results; therefore existing data on the system can be verified and edited with laboratory results. Briefly, following this kind of a procedure will not only increase the reliability of the system, it will also enable controlling, verifying, editing and updating of information with the participation of various institutions such as universities and laboratories into projects which are being developed.

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APPENDIX A

INTERVIEW WITH A LOCAL BUILDER

B : H. Bilge ÖZYER

M.A.: Vernacular builder Mustafa AKDOĞAN

Ş.A. : Township Officer Şahin AKI

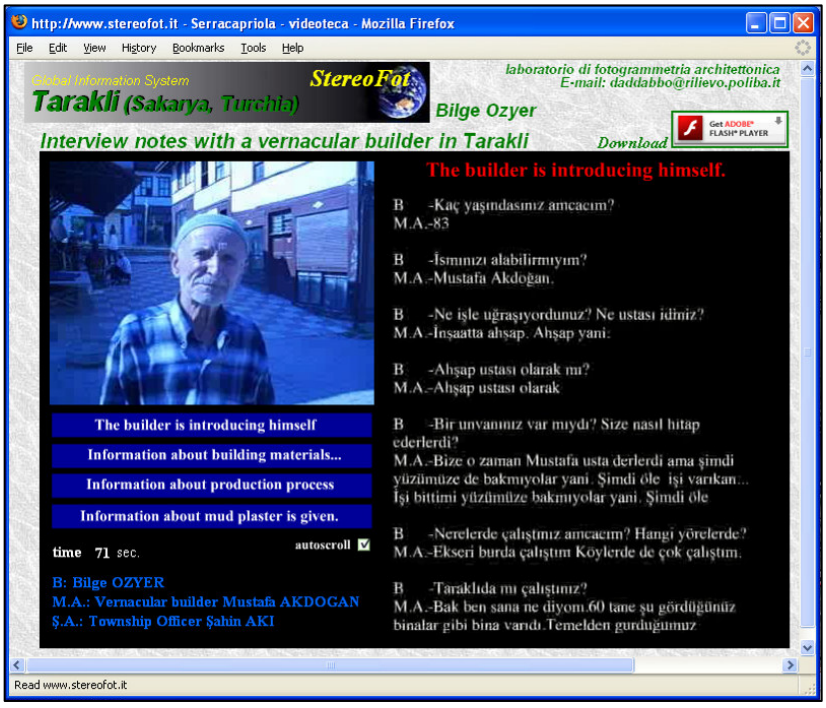


Figure A.1. Display of interview with local builder Mustafa AKDOĞAN

The builder is introducing himself.

B -Kaç yaşındasınız amcacım?

M.A.-83.

B -İsminizi alabilir miyim?

M.A.-Mustafa AKDOĞAN.

B -Ne işle uğraşıyordunuz? Ne ustası idiniz?

M.A.-İnşaatta ahşap. Ahşap yani.

B -Ahşap ustası olarak mı?

M.A.-Ahşap ustası olarak

B -Bir unvanınız var mıydı? Size nasıl hitap ederlerdi?

M.A.-Bize o zaman Mustafa usta derlerdi ama şimdi yüzümüze de bakmıyolar yani. Şimdi öle işi varıkan... İşi bittimi yüzümüze bakmıyolar yani. Şimdi öle.

B -Nerelerde çalıştınız amcacım? Hangi yörelerde?

M.A.-Ekseri burda çalıştım Köylerde de çok çalıştım.

B -Taraklıda mı çalıştınız?

M.A.-Bak ben sana ne diyom.60 tane şu gördüğünüz binalar gibi bina varıdı. Temelden gurduğumuz bina. Çamur, daş, çamurılan öle çalıştık.15 dane de köylerde var bina. Gır tarafında şeyde...zamanımızda öleydi. Şimdiki gibi şey değildi. Biz öle çalıştık.

B -Peki amcacım çok teşekkür ederim.

M.A.-Ben de teşekkür ederim.

Information about building materials, construction techniques and construction process of timber skeleton houses is given.

M.A.-Ben ahşap ustasıyım.

B -Buyrun amcacım.

M.A.-Biz bunları taş, döşemeye kadar taş, yukarısı ahşap, ağaç, çamur yani kerpiç çamur.

B -Evet amcacım. Temelden itibaren nasıl yapıyordunuz? İlk nasıl kazardınız temel yerini?

M.A.-Temeli açardık işte kıyıya kadar temeli kazardık işte. Taşını atarız.

B -Taşı nereden getiriyordunuz amcacım?

M.A.-Derelerden getiriyorduk, taş vardı oralarda.

B -Civardan?

M.A.-Evet, civardan getirirdik. Buraya atar, yıkar burdan, biz burdan temeli atarız.

B -Ne kadar zaman alırdı? Taş işiniz ne kadar nekadar sürerdi?

M.A.-İşimiz en aşağı 1 ay sürerdi tabii. Tam tekmil yapacak olursak daha fazla sürer. Çatı bırakacak olursak 20 günde de çatardık. Binayı 20 günde kiremidi çekerdik.

B -Taşı nasıl bağlıyordunuz temelde?

M.A.-Taşa bağlarız, atarız aynı böyle.

B -Bağlayıcı bir maddesi var mı taşı biraraya getiren?

M.A.-Var tabii.

B -Ne kullanıyodunuz?

M.A.-Efendim?

B -Ne kullanırdınız?

M.A.-Çamur.

B -Çamur.

M.A.-Başka bişey yok o zaman. Çamur. Başka bişey yok. Çimento diye harç diye bişey yok. Çamur hep çamur. Dolgusu da çamur kerpiç sıvası da çamur. Yalnız şu sıvası varya ince sıva bunu kireç ilen kıtık derdik biz kıtık deriz kendir olur yani kendir onu kıyar ondan sonra onu karıştırır onu yaparız... fakat o çatlamaz işte, çatlamaz duvarda onu yapardık. Öyle harç diye bişey yoktu. Hep çamur. Ellerin falan bi çamur olur taş da tutmaz taşı da tutmaz.

Ş.A. -Onu bir yerinde gösterebilirmiyiz usta.

M.A.-Aynı işte bak. Atmış buraya kadar çıkmış. Hatıl deriz biz buna. Yeni şimdi lente deniyo ya, biz de hatıl derdik.

Ş.A -Burda da direkler.

M.A.-Hee.

B -Temelin üstüne bir ahşap hatıl.

M.A.-Tabii, bir ahşap hatıl.

B -Ondan sonra.

M.A.-Direk.

B -Ahşap direkler.

M.A.-Ahşap direk var işte.

B -O ahşabı nereden temin ediyordunuz? Nerden geliyordu?

M.A.-Bizim bu mıntıkadan.

B -Kim getiriyodu size ahşabı?

M.A.-Getiriyorlardı işte sonra, hep o zaman yollanan biçme de değildi. Şimdiki gibi böyle biçme ağaç olsa. Nacağlan yolunacak, biz çakacaz...Şimdi kolaylık var işlerde.Her işte bir kolaylık var yani.Bizim zamanımızda para verseler biz böyle bina yapamazdık.Şimdi ben bu şekilde temelden dıllandığım yani yaptığım 60 tane bina vardı Taraklıda.Temelden kırdığım içinde çalıştığımı hiç saymıyom.

B -Peki hangi tür ahşap, tekrar binaya döncek olursak, hangi ahşabı kullanırdınız? Hangi ağaç?

M.A.-O zaman hep çam ağacı kullanılırdı. Kavak yoktu zaten. Kavak ağacı çürür derlerdi bizim zamanımızda. Kavak ağacı çürür. Taban deriz biz araya lente atılıyo ya. Biz onlara taban deriz.

B -Şu temelin üzerine atılan mı taban?

M.A.-Yok yok. Binayı böldüğü içerden binayı böldüğü şey var. Şimdi kiriş atılıyo ya. Ortalara da kiriş atılıyo ya.

B -Tavana mı?

M.A.-Şurda döşeme var bak.

B -Tamam.

M.A.-Döşeme atılıyordu, bu arada taban var orda. Taban dediğimiz...

B -Döşemenin altında.

M.A.-Tabii. Şimdi bu duvarların üstünü direk tutuyor. Arayı tabanlar tutuyor. Tabanların üzerinde şimdi yük...

B -Döşemeler...

M.A.-Tabi döşemeler.

B -Bir altta tabanımız var, temelin üstünde, sonra direklerimiz var.

M.A.-Direklerimiz var. Gene bu tabanların altında direklerimiz var. Ortada, direk var tabii. Aynı kiriş gibi yav. Şimdi kirişler atılıyoya. Kiriş altında direk var aynı tabanların altına ağaç taban aynı direk korduk. Direklerin üstünde yürürdük.

B -Alta tabanı attık. Direklerimizi çıktık.

M.A.-Döşemeyi atarız.

B -Döşeme, ahşap döşememizi atıyoruz.

M.A.-Ondan sonra direkleri çıkıyoruz.

B -İkinci kata direklerimizi çıkıyoruz.

M.A.-Direkleri çıkıyoruz.

B -Peki kerpiç ne zaman döşemeye başlıyorsunuz? Örmeye başlıyorsunuz?

M.A.-Kerpici binayı çatcan, üzerini kapatcan, 'çatı' deriz, kerpiç hesabı böyle 'çatı' yapardık, çatıların aralarını kerpiçlerlen doldururuz.

B -Burda gösterebilirmisiniz? Mesela şurda ahşaplar var.

M.A.-Bak işte böyle.

B -Bütün hepsi bittikten sonra mı oluyor?

M.A.-He bu çatı bittikten geri, bu çatı bittikten geri bu kerpiç konur.

B -En son kerpici örülüyor.

M.A.-He tabi, ondan sonra sıvası işte bak çamur sıvamış.

B -Peki kerpici nasıl hazırlıyorsunuz? Hatırlıyor musunuz?

M.A.-Çamur yaparlar samanlan… saman karıştırırlar… bunlara bak karıştırmış. Saman deriz biz buna. Bu olmazsa tutmaz. Bu saman olmazsa bu kerpiç de tutmaz, sıva da tutmaz. Bu saman atılır güzel harman çamur olur, kalıpları bunların şöyle 20 ye 10 luk, 15 lik… 20 boyu yani.15 cm enleri var kimisinin…bunlar 10 luktur yahut 12 lik.

B -Dolgu kerpicimi oluyo bunlar?

M.A.-Evet dolgu kerpici.

B -Bide yığma kerpiç var heralde?

M.A.-Yığma olursa 15 lik olur işte.

B -Daha mı büyük?

M.A.-Tabii.

B -Bu 20 ye 10 luk.

M.A.-Hee.

B -Onlar?

M.A.-Onlar 15 lik.

B -20 ye 15 mi?

M.A.-20 ye 15 ya da 20 ye 30 olur.

B -Ya da 20 ye 30?

M.A.-20 ye 30 ha. Bölemesine koduğun zaman iki tane de böle korsun. Bi de böle bağladığın zaman böyle bağlanır bu. Bi tanesini böyle gittiğin zaman bi sırayı da böle gidersin, böyle bağlar bunu.

B -Yani bir uzunlamasına atıyorsunuz, bir de kısalamasına.

M.A.-Temel deriz biz buna. Ana duvar da denirdi eskiden. Şimdi bu 'çatı'. Çatı yapmışlar.

B -Kaç türlü teknik vardı amcacım hatırlıyor musunuz?

M.A.-Başka türlüsü yoğdu. Bizim bildiğimiz buydu yani.

B -Ahşap çatkı?

M.A.-Ahşap çatkı, hee ahşap çatkı.

B -Bide kerpiç yığmanız var?

M.A.-Efendim?

B -Kerpiç yığma yapıyordunuz herhalde.

M.A.-Tabi, tabi kerpiç yığma var.

B -O daha mı eski bir teknik?

M.A.-Ya bir şey oluyor yani. Duvarda bir teknik oluyor. Soğuk bakımından, şey bakımından... Şimdi kerpiç ilen çıktığın zaman böle tek tük olmuyor. O zaman daha şey oluyor yani.

B -O duvarlar daha kalın mı yapılıyor? Yığma olunca?

M.A.-Tabi, tabii.

B -Ne kadar oluyor.

M.A.-30 cm olur işte.

B -30? 40?

M.A.-40 da olur, 30 da olur yani.

B -Bunlar ne kadar peki hatırlıyor musunuz?

M.A.-Hatırlamıyom ama bunlar 10 luk…

B -Daha mı ince?

M.A.-İnce bu, kalın yok. Ağaçlar ince çünkü.

B -Ağacın kalınlığında mı? Kerpiç ağacın kalınlığında mı?

M.A.- Tabi, tabii. Şimdi bu şeyler, ağaçlar ince olduğu gibi kerpici de kalın gorsa, bu ağaçların arasını doldurmak çamurlan… çok çamur gider yani. Ama yüz olursa bir şekilde sıvanır gider yani.

B -Samanı nerden getiriyorlardı?

M.A.-Efendim?

B -Hatırlıyormusunuz? Bu kerpicin içine konulan saman malzemesi?

M.A.-Hep köy civarlarında olur. Şimdi bak. Harman geldi diyolar, harman diyolar, saman yapıyolar bizim orda, danesini alıyor. Samanını hayvanına veriyor.

Böyle şuraya lazım olanı böyle lazım olana verir.Köylere verir.Saman başka bir yerden gelmez yani.

Ş.A.-Şeyle harman makinesi de değildi eskiden dövenle.

M.A.-Tabi, tabi düvenlen düvenlen. Hayvanlan dolana dolana sürerler.

F.M.-Bide o var o dönemde yani eskiden harman makinesi olmadığı için atların veya öküzlerin çektiği o…

M.A.-Yahut çakılan yahut ekseri öküz olurdu..öküz dolan bu sıcakta harmanını dövcen işte...başka olay yok şimdi. Ama şimdi adam makineyi de bıraktı da makineyi de bıraktı şimdi döver biçer var. Geri dönüyor, daneyi doldurup gidiyor. Şimdi kolaylık var. Her şeyde kolaylık var. İnşaatında da şeysinde de her şeysinde kolaylık var. Eskiden doğrama, takardık. Kapıların yanlarına takoz goycaz diye…Şimdi adam sıkıveriyor ora köpüğü bitti.

B -Peki amcacım bu ahşabı nasıl getirirlerdi inşaat sahasına hatırlıyor musunuz? Neyle getirirlerdi? Nasıl taşınırdı?

M.A.-Yav şeylen, o zaman da vardı vesayetler bizim zamanımızda vesayet tek tük vesayet vardı yani. Kamyon yani ama eskiden daha eskiden arabaylan, hayvanlan daşınır işte, başka bişiylen daşınmazdı, vesayet yok o zaman. Ama başka büyük yerlerde varmışdır vesayet…Bizim burlarda…

B -Ağaç ormandan kesiliyor…

M.A.-Kesiliyor tabi hayvanlan geliyor.

B -Hayvanlan direkt inşaat sahasına mı indiriyorlar?

M.A.-Tabi, inşaat sahasına.

B -O kesim işleri, kereste işleri hep inşaat sahasında mı?

M.A.-Kesiyolar işte o zaman, adam kesip geliyor, dağdan kesip geliyor işte. Şimdi orman kalmadı zaten.

Ş.A. -Peki o zamanlar marangoz var mıydı?

M.A -Marangoz var tabii.

Ş.A. -Çünkü bu kepenkler, çerçeveler, kapılar falan onlar da o zaman. Mesela süsleme var burda.

B -Süslemeleri kim hazırlıyor bu ahşapta?

M.A.-Bunu yapan adam hazırlıyo işte kendisi. O zaman plan yok, proje yok kafandan çıkaracan şu binayı işte.

B -Mal sahibinin isteğine göre mi?

M.A.- Mal sahibinin tabii.

B -Kaç oda olacağını falan o mu söylüyo size?

M.A.-Kaç oda olacak, nerden girecen, nerden çıkacan... planını hazırlamak bizim zamanımızda... şimdi plan var elinde adamın. Plana göre gidiyor, ama bizim zamanımızda plan milan yok.

B -Mal sahibi size tarif mi ediyodu şöyle istiyorum diye?

M.A.- Hee, ben diyo şöle ev istiyom diyo. Ona göre yapacan işte. Bu adam öle istemiş, bu öle istemiş, öte yandaki öle istemiş.Daha mesela o zaman galenderlik vaar...öle yardım ederdik ki biz ona. Galenderlik var yani yok yav.

Ş.A. -Ev yapana ustalar da yardım ederdi.

M.A.-Ev yapana tabii, biz de yardım ederdik.

B -Kaç kişi çalışıyordu bi evin inşasında? Ortalama kaç kişi çalışıyor?

M.A.-Bu evleri yaparken 4 kişi çalışıyoduk. 4 usta olarak.

B - 4 usta?

M.A.- 4 usta, yok 3, bir tane de çırak vardı yanımızda.

B -Ne kadar zaman alıyordu amcacım toplam inşaat süresi hatırlıyor musunuz?

M.A.-1 ay falan sürerdi yani bizle 4 kişi...O zaman çalışma vardı …

B -Her şeyi temelden çatıya kadar.

M.A.-Tabii, tabii. O zaman çalışma vardı şimdi çalışma yok. Şurda şey yapıyolar burda gelirken giderken görüyom şurda. Hamit çavuşların şeysine...Oraya bi kesme şeysi gomuşlar makine.Burdan gelio şu kadarcık ha şu ende tahta, onu oraya getiriyo buraya goyuyo zzz kesiyo...El desderesi varya bu el desderesi şimdi bu binayı salla tepede burda çekerken ama böle salla sallayamazsın...El desderesi bu binayı böle tam da terazi şahında olursa bina böle gider gelir bina desdereden. Demekki o gadar yük var o desderede öle olmasa neylen kesti bu desdere...aha şu kadarcık el desderesi

B -Hıhı.

M.A.-Ama şimdiki gibi ben bakıyom da. Adam orda aha şu kadarcık tahta. Ordan getiriyo ordan makinede kesiyor. İnşaatın şeysine el desderesinlen asıl bakalım asıl...

B -Siz mi şekil veriyordunuz ahşap burda?

M.A.-Efendim

B -Yapıda kullanılan ahşapa siz mi şekil veriyordunuz, siz mi kesiyordunuz?

M.A.-Tabii, tabii. Gelen ağacı daa burdan kesilmiş ağaç gelmiyo ki...kesecen mecbur yerine göre kesecen. Onun için zordu yani bizim zamanımızda inşaat yapmak çok zordu. Şimdi bi düşünüyom da nasıl dayandık acaba. Ama Gençlik gibi hiçbişey yok. Gençlik varya. Şimdi bana Allah bi gençlik daha verse...gider gelir böle bina... El desderesinin gücü yani...Her şeyde kolaylık var yav herşeyde şimdi...

Information about production process of roof tile and mudbrick is given.

Ş.A. -Nerde hangi köyde? Saraçlar köyünde mi?

M.A.-Hee…Bu Ali Başların da vardı. Ali Başlar var ya onların da vardı. Keserler işte. Çamurunu yapar, fırını yapmış. Keser, serer böle güneşe. Güneşte duruyor bu öle tepsiye çamur hale geliyor. Kurur hale de geliyor.

B -Kırmızı toprak mı amcacım?

M.A.-Kırmızı? Pek de kırmızı değil ama işte kondunuydu sararıydı. Ondan sonra döşeyo fırına.Böle döşeyo, döşerdi, döşerdi.

B -Fırının içine mi?

M.A.-Fırının içine. Kaç binlikse o 5 binlik mi.3 binlik mi. Zamanında kaç binlikse. Dolduruyor, sonra alttan ateşliyon.

B -Nerde oluyo bu işlem?

M.A.-Burda şu yakında.

B -Başka bir köy mü?

M.A.-Buraya bağlı gene de işte buraya bağlı.

B -O toprağın içinde başka malzeme var mı amcacım?

M.A.-Yok, yok. Başka malzeme yok. Hep çamur işte başka o zaman ne malzemesi var ki. Bir bilgi yoktu o zaman.

B -Bu kerpiçte başka bir malzeme var mı amcacım.

M.A.-Hiç bir şey yok hiç çamur, saman.

B -Saman? Çamur nerenin çamuru? İnşaat sahasının mı?

M.A.-İnşaat sahasının. İnşaat yerininki olmazsa getirirlerdi. Topraklık var şurda. Topraklık deriz. Ordan getirirler, oranın toprandan, dökerler buraya, orda yaparlardı.

Çamurunu yani şu toynalardan mesela, toyna deriz biz. Şu tepelerde toprak var mı? Çamur? Yok. Oraya çıkarlar. Toprağı ordan getirir, oraya daşırlar. Orda garar, haleder ondan sonra…

B -Kerpici nerde hazırlıyorlardı? Gene inşaat sahasında mı?

M.A.-İnşaat yerinde hali yeri varsa hali yere döşer.

B -Düz bir zemine mi?

M.A.-Tabii boş yer varsa, oraya döşer. Yoksa orda döktürür.

B -Orası neresi?

M.A.-Topraklık deriz biz.

B -Topraklıkta.

M.A.-Orda döktürür ordan daşıttırırdık.

Ş.A. -Peki Hıdırlık Tepesinden sıva toprağı hiç getirdiniz mi? Hatırlıyor musunuz?

M.A.-Çook.

Ş.A. -Hıdırlık Tepesindeki o beyaz toprak direkt hiçbişey katılmadan veya ince saman mı katılıyordu?

M.A.-İnce saman katıyoduk.

Ş.A. -İnce saman katılarak direkt sıva yapılıyordu.

M.A.-Badanayı da ondan yapıyorduk. O zaman kireç bilenmi var? Badanayı da o topraktan. Aynı şey sürüyorduk, şey de sıvasını da ince saman katıyorduk öle sıvıyoduk.

B -Hıdırlık toprağımı oluyor?

M.A.-Tabii, tabii Hıdırlık toprağı.

B -O zaman sıva için Hıdırlık toprağı?

M.A.-Haa, yani bu dışına.

B -Evet.

M.A.-Yahut içine. O zaman içini sıvadan yoktu zaten. Bi badana yapıoduk. İşte onu da üzerine müzerine sürülür gider.

Ş.A. -İnşaatlarda genelde ince sıvadan sonra ince çamur sıvadan sonra kuruyo ya kuruduktan sonra direkt badana. Sıva olarak değil ama dışarıda genelde kaba sıva yapıldıktan sonra Hıdırlık toprağından ince saman karışımı topraklı direkt sıva.

M.A.-Karşıda var ya şu işte o üzerine sıvanmış. Üstlerine sıvanır. Ama bu kireç heralde. Kireç olmasaydı bu kadar durmazdı. Herhalde kireç bu. O zamandan beri durmuş mesela.

B -Bu ahşap nasıl tutuyor amcacım bu sıvayı? Bir şey var mı tutturmak için bir önlem var mı? Teldir başka bir şey?

M.A.-Yok, yok. hiç bişeysi yok. Çamur yoldurtcan geri attığın zaman altı da toprak ya, kerpiç emişiyolar. Orada da zaten kerpiçlerin aralıkları kalır böle. O aralıklara da girer, yüme yapar ona. Bırakmaz işte, bırakmıyo bak. Bıraksa şimdiye kadar şunlan dökülmesi lazım. Dökülmez.

Ş.A. -Yağmurda bir problem oluyor mu?

M.A.-Yağmurda?

B -Kerpiç yağmur yiyince zarar görüyor mu?

M.A.-Görür tabii. Gurulukta olmazsa erir ama gurulukta olursa bişi olmaz. Ama burada şimdi yağmurun altında durursa erir.

Ş.A. -Şimdi kerpiç duvara yaptık, şu kerpiç bile kalkacak gibi ama düşmüyor. Mesela bu yağmur yemiştir almıştır ama hala çamur sıva olarak duruyor.

M.A.-Hala etkisi var bak hala etkisi var.

Ş.A. -Yağmur çok etkili değil o zaman. Burası yıllardır beklide bu bina 200 yıllık…200 yıllık bi binanın bu kendi öz çamur sıvası ve hala duruyor. Büyük ihtimal yağmur yemiştir.

B -Nasıl bu kadar uzun süre dayanmış amcacım?

Ş.A. -Samanın özelliğinden mi?

B -Samandan mı?

M.A.-Saman bırakmıyor işte. Saman bırakmıyo. Saman olmazsa zaten çatlak olur dökülür. Saman tutuyo yani.

B -Miktarını hatırlıyor musunuz? Ne kadar karıştırılıyor? Ne kadar samana ne kadar çamur konuyordu?

M.A.-Yani işte göz kararı atıyoz. Kazmayı vurduğun zaman belli olurdu zaten samanın çamurda azsa biraz daha atardık.

Ş.A. -Şurda ilerde sıva çamuru vardı.

B -Gelin amcacım.

Information about mud plaster is given.

M.A.-Daş olmuş.

Ş.A. -Bakın ayağınızı bi tutun taş gibi oluyor.

M.A.-Daş olmuş. İşte bu saman tutuyor bunu bak şu saman var ya bak. Şu saman gaynamış yani saman gaynamış, daş olmuş.

B -Niçin böyle olmuş amcacım bu?

M.A.-Gurumuş gurudumu böle olur bu…

Ş.A. -Şimdi bunun üzerine bir kova su dökün. Bu tekrar hemen sıvı çamur haline dönüşür. Öyle değil mi amcacım?

M.A.-Öyle.

Ş.A. -Yani ne kadar sertleşirse sertleşsin.

M.A.-Bak gurumuş. Biraz sonra suyu dök gene aynı şey haline gelir.

Ş.A. -Burada sadece masraf olarak bir saman başka birşey yok. Yani bir çimento masrafı yok bir tuğla masrafı yok, bir kerpiç masrafı yok. Bir de saman boşluklu bir madde. Saman boşluklu madde değil mi? Yani içi boş. Bir nevi izolasyon.

M.A .-Hava da alıyor.

Ş.A. -Hava da alıyor. Binaların uzun ömürlü olması biraz da ondan kaynaklanıyor.

B -Yaptığınız bütün evler kerpiç dolgu evler miydi? Başka hangi malzemeyi kullanıyordunuz?

M.A.-Hep aynısı aynısı bizim zamanımızda…

B -Taş dolgu ev yaptınız mı? Taş dolgu?

M.A.-Taş dolgu yapmadık.

B -Ya da sırf ahşap yığma?

M.A.-Ahşap yığma yaptık tabii. Ahşap yığma yaptık. Daha demin dediğim gibi kerpiç ilen ahşap yığma…

B -Hiç kerpiç kullanmadan sırf ahşap yığma, tomruklarla?

M.A.-Yok ondan kullanmadık. Eski şatolarda varımış eskiden yığma böle ağacılan mesela sen onları diyon. Onlardan yapmadık biz.

B -Bu yörede yok mu o tür evler?

M.A.-Bu yöre de yok, bi şeylerde vardır belki köylerde kalmıştır belki.

APPENDIX B

TRADITIONAL BUILDINGS SURVEY INVENTORIES

5 SHEET 425 PARCEL (RÜŞTİYE MEKTEBİ)

5 SHEET 542 PARCEL (FENERLI EV)

6 SHEET 626 PARCEL (ÇAKIRLAR KONAĞI)

6 SHEET 639 PARCEL (HISAR EVİ)

5 SHEET 533 PARCEL (ALİ PEKTAŞ EVİ)

6 SHEET 658 PARCEL

6 SHEET 664 PARCEL

6 SHEET 691 PARCEL

6 SHEET 702 PARCEL

TRADITIONAL BUILDINGS SURVEY INVENTORY

Name :Rüştiye Mektebi			
Sheet:5 Parcel:425	**Original Function**	**Current Function**	**Date**
Address: Great Mosque District, Rüştiye Street	House	Abandoned	1919

CONSTRUCTION SYSTEM

Load Bearing System		**Flooring**
Timber Skeleton with mudbrick infill		Timber Flooring

MASS PROPERTIES

3 storeyed house and a gable roof; ground floor wall is coated with mud plaster, whereas upper floors have timber cladding. Second floor is projected over the front and back facade, whereas first floor is projected over the opposite directions and supported with timber buttresses.

CURRENT SITUATION

LOAD-BEARING SYSTEM			**INTERIOR**			**EXTERIOR**		
Good	Average	Not Good	Good	Average	Not Good	Good	Average	Not Good
	X			X			X	

GENERAL INFORMATION

Ground floor wall was constructed in stone material up to 80-90 cm height from ground level. Following the construction of timber framed wall with mudbrick infill on top of stone wall, timber cladding was applied on upper floors. Cladding elements were approximately in 2x25 cross-section and they protect the walls from climatic effects such as rain, sunshine, wind etc. Sometimes timber cladding was preferred for visual concerns.

Figure B.1. Survey Inventory of Rüştiye Mektebi

TRADITIONAL BUILDINGS SURVEY INVENTORY

Name : Fenerli Ev			
Sheet: 5, Parcel: 542	**Original Function**	**Current Function**	**Date**
Address :Ulucan District Rüştiye Street	House	House	Early 20th century

CONSTRUCTION SYSTEM

Load Bearing System		**Flooring**
Bağdadi System (without infill material)		Timber Flooring

MASS PROPERTIES

3 storeyed house with a pinnacle; all exterior walls coated with mud plaster; cantilever overhangs over the street in two directions. On the some parts of the exterior walls, mud plaster is decayed.

CURRENT SITUATION

LOAD-BEARING SYSTEM			**INTERIOR**			**EXTERIOR**		
Good	Average	Not Good	Good	Average	Not Good	Good	Average	Not Good
	X			X			X	

GENERAL INFORMATION

Lath coverings in 2-3 cm width were nailed on both inner and outer wall surfaces horizontally. The spaces between surfaces were filled with small stone or brick pieces or left empty. Then the outer surfaces were plastered with the mixture of mud and straw. In Fenerli Ev, the spaces between lath coverings were left empty, no remaining material was added.

Figure B.2. Survey Inventory of Fenerli Ev

TRADITIONAL BUILDINGS SURVEY INVENTORY

Name :Çakırlar Konağı			
Sheet:5 Parcel:626	**Original Function**	**Current Function**	**Date**
Address: Ulucan District Santral Street No:1	House	House	1905

CONSTRUCTION SYSTEM

Load Bearing System	**Flooring**
Timber Skeleton with mudbrick and stone infill	Timber Flooring

MASS PROPERTIES

3 storeyed house; ground floor is used as a storage at the back side and used as shops at the street facade. First and second floors are for living units. There is a projected part with a triangle pediment over the entrance of the house on the second floor. Additionally, exterior surface of the second floor is ornamented with colorful mozaics in lozenged shapes.

CURRENT SITUATION

LOAD-BEARING SYSTEM			**INTERIOR**			**EXTERIOR**		
Good	Average	Not Good	Good	Average	Not Good	Good	Average	Not Good
X			X				X	

GENERAL INFORMATION

On the stone foundation, timber post and lintel system was constructed. On the construction of ground floor walls, in addition to mudbrick, rough stone pieces were used as the infill material.

Figure B.3. Survey Inventory of Çakırlar Konağı

TRADITIONAL BUILDINGS SURVEY INVENTORY

Name : Hisar Evi			
Sheet:6 Parcel:639	**Original Function**	**Current Function**	**Date**
Address: Great Mosque District, Hisar Street	House	Abandoned	

CONSTRUCTION SYSTEM

Load Bearing System		**Flooring**
Timber skeleton with mudbrick infill		Timber Flooring

MASS PROPERTIES

2 storeyed house; timber roof structure is destroyed. Mud plaster and infill mudbrick material is decayed in most parts of the exterior walls. First floor has a projected part over the front facade.

CURRENT SITUATION

LOAD-BEARING SYSTEM			**INTERIOR**			**EXTERIOR**		
Good	Average	Not Good	Good	Average	Not Good	Good	Average	Not Good
		X			X			X

GENERAL INFORMATION

Following the construction of stone wall up to 80-120 cm height from the ground level, timber skeleton was built. Timber foot plate was placed on top of the stone wall. Foot plate is in 10x15 cm or 15x20 cm cross-section to carry the load of upper floor. Then timber main posts were placed on the foot plate. Following the construction of structural framework of the house and the roof, infill material mudbrick was inserted. It was constructed on the slope of Hisar Hill and has a great view of the town center.
Hisar Evi has a simple plan layout with one each room both on the ground and first floor.

Figure B.4. Survey Inventory of Hisar Evi

TRADITIONAL BUILDINGS SURVEY INVENTORY

Name : Ali Pektaş Evi			
Sheet:5 Parcel:533	**Original Function**	**Current Function**	**Date**
Address: Ulucan District Rüştiye Street	House	Abandoned	Early 20th century

CONSTRUCTION SYSTEM

Load Bearing System		**Flooring**
Timber Skeleton with mudbrick infill		Timber Flooring

MASS PROPERTIES

2 storeyed house with mud plastered exterior walls; a projected part on the corner of the house towards the street, a timber framed balcony supported with timber buttresses over the entrance of the house.

CURRENT SITUATION

LOAD-BEARING SYSTEM			**INTERIOR**			**EXTERIOR**		
Good	Average	Not Good	Good	Average	Not Good	Good	Average	Not Good
X			X				X	

GENERAL INFORMATION

On stone foundation, timber post and lintel system was constructed. On ground floor, as an infill material, stone pieces were used, whereas on upper floor it was mudbrick. Stone workmanship was not so developed due to the limited usage, whereas mudbrick was the main infill material of timber framed wall constructions.

Figure B.5. Survey Inventory of Ali Pektaş Evi

TRADITIONAL BUILDINGS SURVEY INVENTORY

Name :						
Sheet:6 Parcel: 658	**Original Function**		**Current Function**		**Date**	
Address: Ulucan District Fevzi Çakmak Street	House		House			

CONSTRUCTION SYSTEM

Load Bearing System		**Flooring**
Timber Skeleton with timber infill		Timber Flooring

MASS PROPERTIES

2 storeyed house; ground floor is used as a barn and first floor is for the living units. On the exterior wall of the ground floor, mud plaster is decayed that construction technique can easily be understood, whereas on the upper floor, mud plaster is in good condition.

CURRENT SITUATION

LOAD-BEARING SYSTEM			**INTERIOR**			**EXTERIOR**		
Good	Average	Not Good	Good	Average	Not Good	Good	Average	Not Good
	X			X				X

GENERAL INFORMATION

On some traditional houses, timber elements were used for filling the spaces between posts and braces. On this house, timber components were placed as infill material, and they do not carry the load as filling mudbrick material. After placing timber components between the posts and braces mud plaster including straw was applied as seen in the figures below..

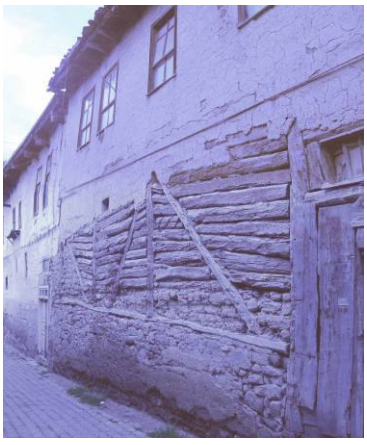


Figure B.6. Survey Inventory of Sheet 6, Parcel 658

TRADITIONAL BUILDINGS SURVEY INVENTORY						
Name :						
Sheet:6 Parcel:664	**Original Function**		**Current Function**		**Date**	
Address: Great Mosque District	House		House			

CONSTRUCTION SYSTEM		
Load Bearing System		**Flooring**
Masonry Mudbrick + Timber Skeleton Construction		Timber Flooring

MASS PROPERTIES

2 storeyed house; ground floor is used as a barn, and first floor is for the living units. On the exterior wall of the first floor, mud plaster is decayed, so that construction technique can be observed. Street corner of the masonry wall was rounded in order to support the structure of the house by using more stone material and timber beams on that corner.

CURRENT SITUATION

LOAD-BEARING SYSTEM			INTERIOR			EXTERIOR		
Good	Average	Not Good	Good	Average	Not Good	Good	Average	Not Good
	X		Not applicable (No entry into the house)					X

GENERAL INFORMATION

Following the construction of stone wall up to 80-90 cm height from the ground level, masonry mudbrick was constructed on the ground floor and masonry wall was supported with horizontal timber beams. Upper floor, where living units were placed was constructed in timber skeleton with mudbrick infill.

Figure B.7. Survey Inventory of Sheet 6, Parcel 664

TRADITIONAL BUILDINGS SURVEY INVENTORY

Name :			
Sheet:6 Parcel:691	**Original Function**	**Current Function**	**Date**
Address: Ulucan District Fevzi Çakmak Street	House	Destroyed	

CONSTRUCTION SYSTEM

Load Bearing System		**Flooring**
Timber Skeleton with mudbrick infill		Timber Flooring

MASS PROPERTIES

2 storeyed house; first floor structure is completely destroyed. Only exterior walls of ground floor and timber floor joists of first floor are standing. Mud plaster and infill mudbrick material on the ground floor walls are decayed.

CONSERVATION

LOAD-BEARING SYSTEM			**INTERIOR**			**EXTERIOR**		
Good	Average	Not Good	Good	Average	Not Good	Good	Average	Not Good
		X			X			X

GENERAL INFORMATION

It was constructed with timber skeleton infilled with mudbrick. Both exterior and interior surfaces of the walls are mud plastered. Upper structure is completely destroyed, and mudbrick infill material of ground floor wall is decayed on most parts.
There is an irrigation trench near the house.

Figure B.8. Survey Inventory of Sheet 6, Parcel 691

TRADITIONAL BUILDINGS SURVEY INVENTORY

Name :			
Sheet:6 Parcel:702	**Original Function**	**Current Function**	**Date**
Address: Great Mosque District, Fevzi Çakmak Street	House	Destroyed	

CONSTRUCTION SYSTEM

Load Bearing System		**Flooring**
Timber Skeleton with mudbrick infill		Timber Flooring

MASS PROPERTIES

1 storeyed house with gable roof; the walls on two sides and the roof structure are completely destroyed On the standing wall, Mud plaster and infill mudbrick material are decayed.

CURRENT SITUATION

LOAD-BEARING SYSTEM			**INTERIOR**			**EXTERIOR**		
Good	Average	Not Good	Good	Average	Not Good	Good	Average	Not Good
		X			X			X

GENERAL INFORMATION

Following the construction of stone wall up to 80-90 cm height from the ground level, timber skeleton was constructed on top of it and the structure was infilled with mudbrick material, and then coated with mud plaster.

Figure B.9. Survey Inventory of Sheet 6, Parcel 702

APPENDIX C

ARCHITECTURAL DRAWINGS OF SURVEYED HOUSES

5 SHEET 425 PARCEL (RÜŞTİYE MEKTEBİ)

5 SHEET 542 PARCEL (FENERLİ EV)

6 SHEET 626 PARCEL (ÇAKIRLAR KONAĞI)

6 SHEET 639 PARCEL (HİSAR EVİ)

5 SHEET 533 PARCEL (ALİ PEKTAŞ EVİ)

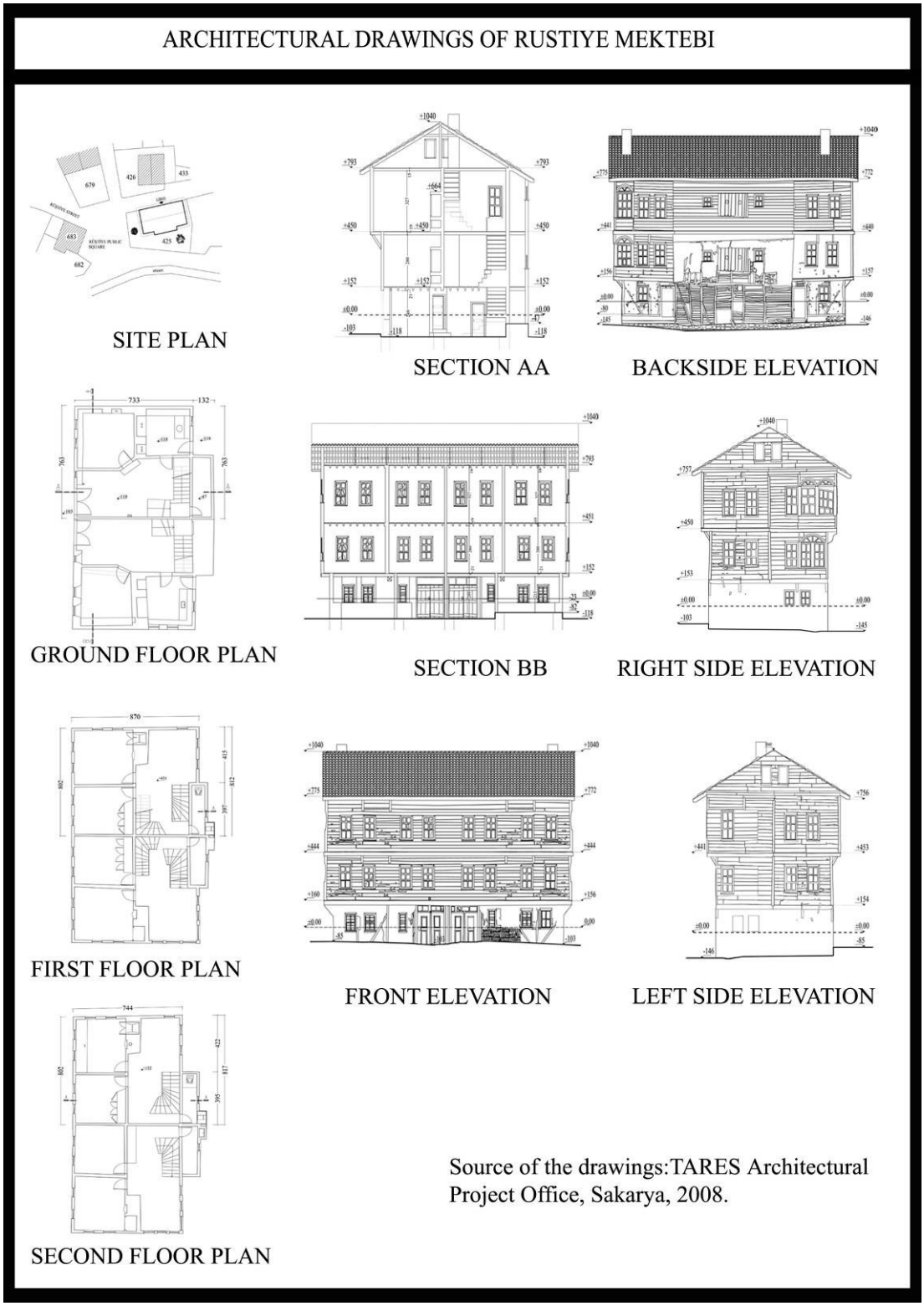


Figure C.1 Architectural Drawings of Rüştiye Mektebi

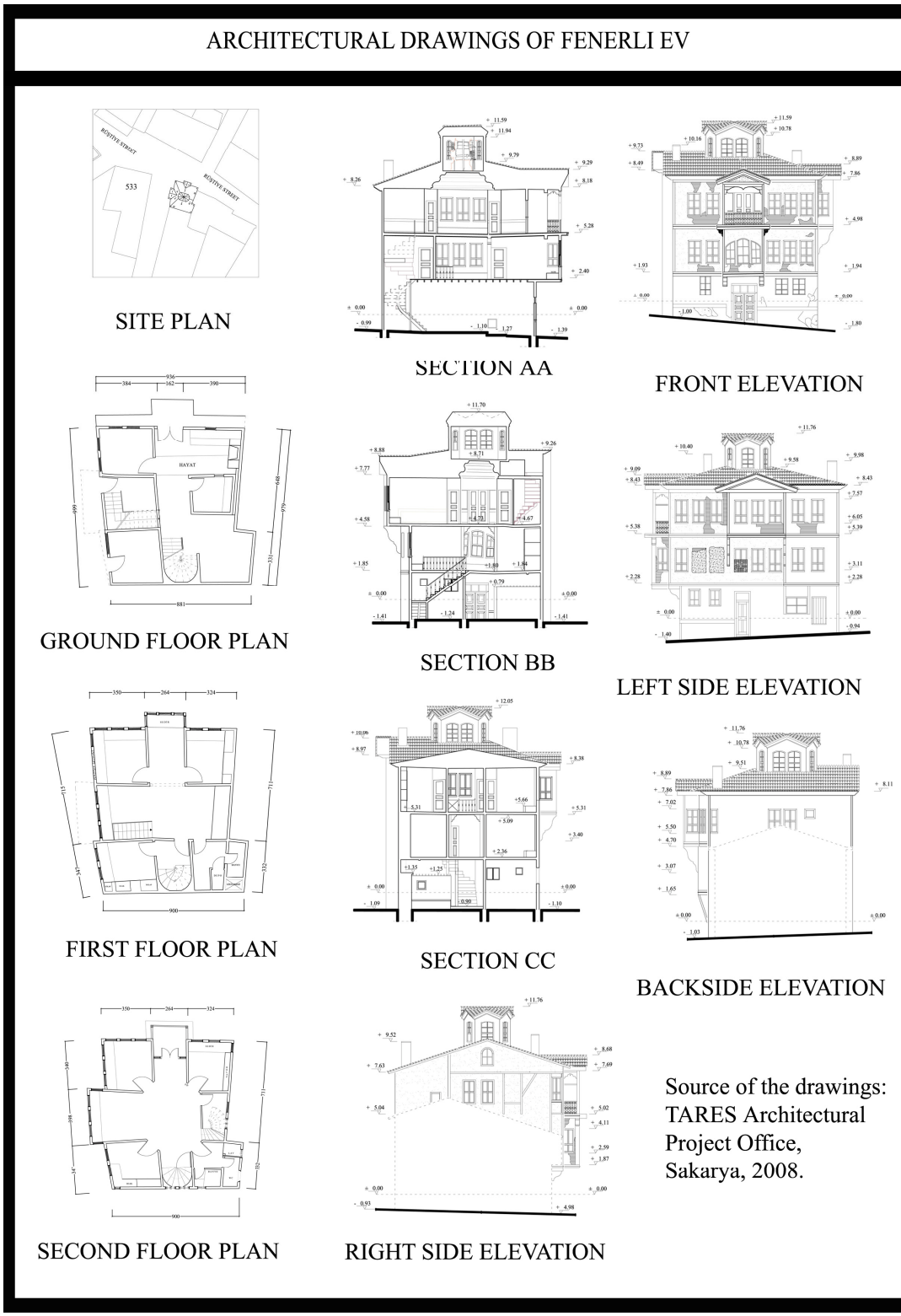


Figure C.2. Architectural Drawings of Fenerli Ev

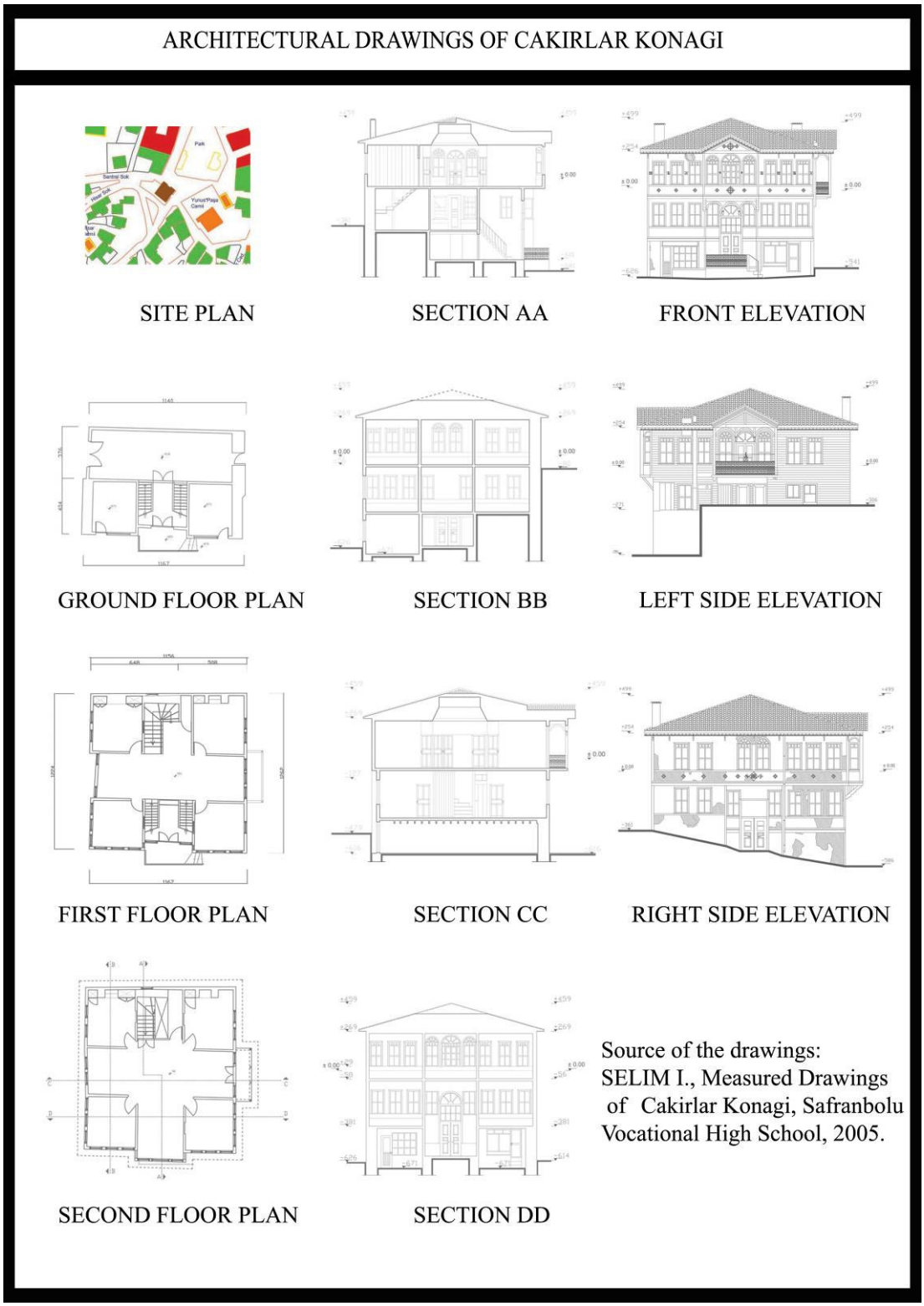
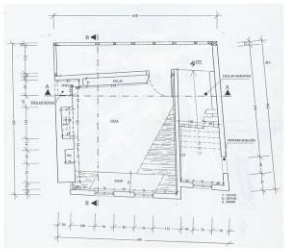


Figure C.3. Architectural Drawings of Çakırlar Konağı

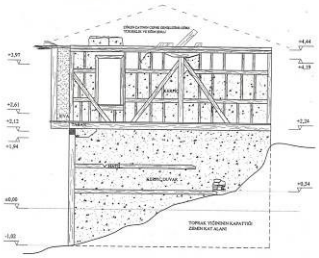
ARCHITECTURAL DRAWINGS OF HISAR EVI

SITE PLAN

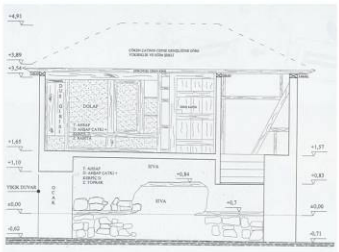
FRONT ELEVATION



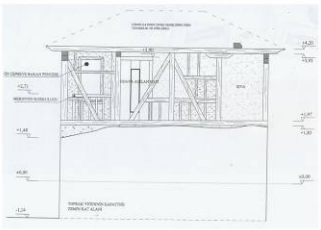
GROUND FLOOR PLAN



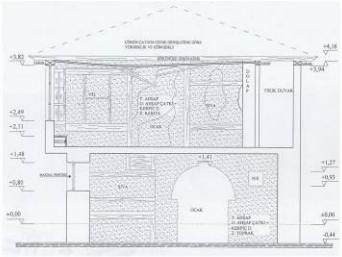
LEFT SIDE ELEVATION



SECTION AA



BACKSIDE ELEVATION

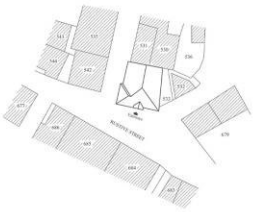


SECTION BB

Source of the drawings:
ATES R., A Technical Report on Restoration of Hisar Evi, Safranbolu Vocational High School, 2005.

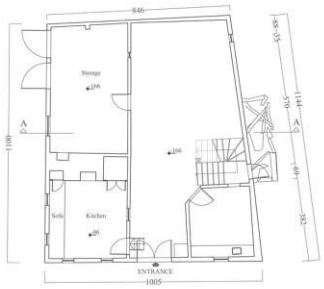
Figure C.4 Architectural Drawings of Hisar Evi

ARCHITECTURAL DRAWINGS OF ALI PEKTAS EVI(5 SHEET, 533 PARCEL)



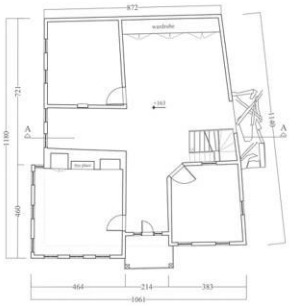
SITE PLAN

SECTION AA

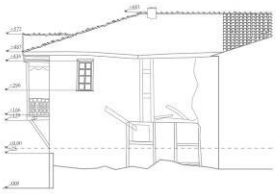


GROUND FLOOR PLAN

LEFT SIDE ELEVATION



FIRST FLOOR PLAN



RIGHT SIDE ELEVATION

FRONT ELEVATION

Source of the drawings: TARES Architectural Project Office, Sakarya, 2008.

Figure C.5. Architectural Drawings of Ali Pektaş Evi

APPENDIX D

"TARAKLI GIS ONLINE"

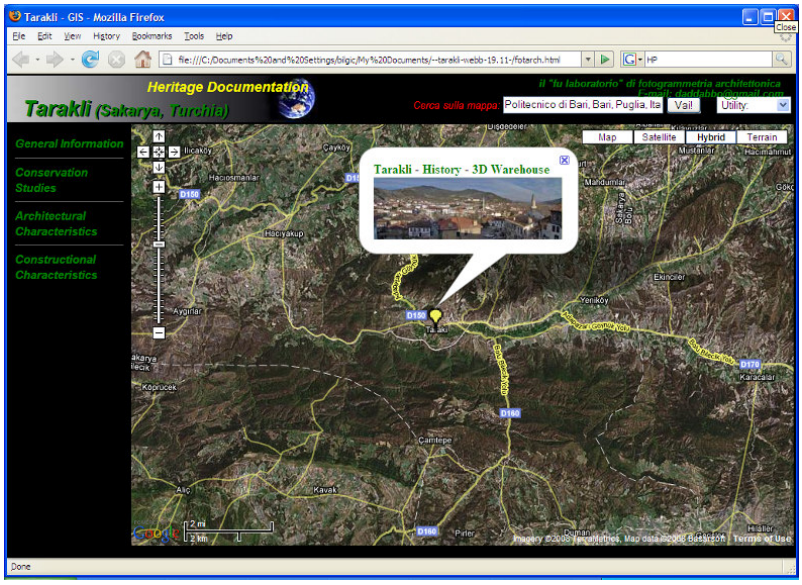


Figure D.1. Home page of *"Taraklı GIS Online"*

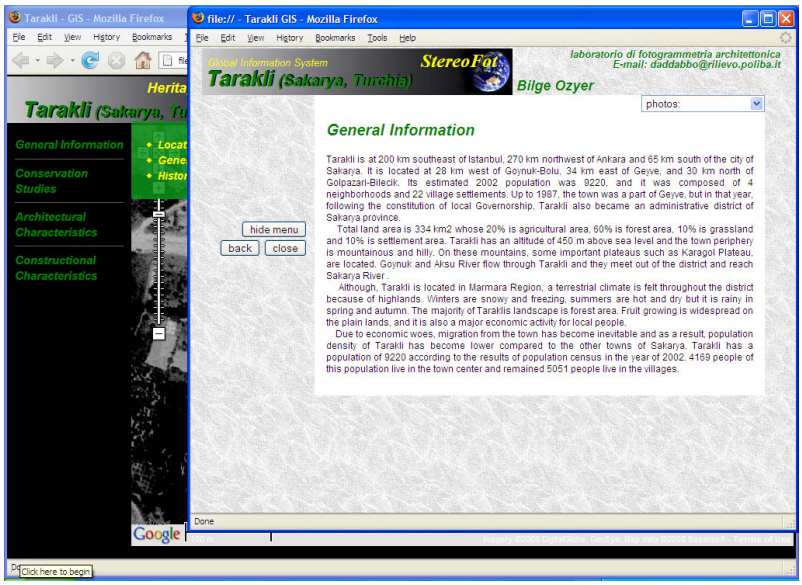


Figure D.2. Display of general information

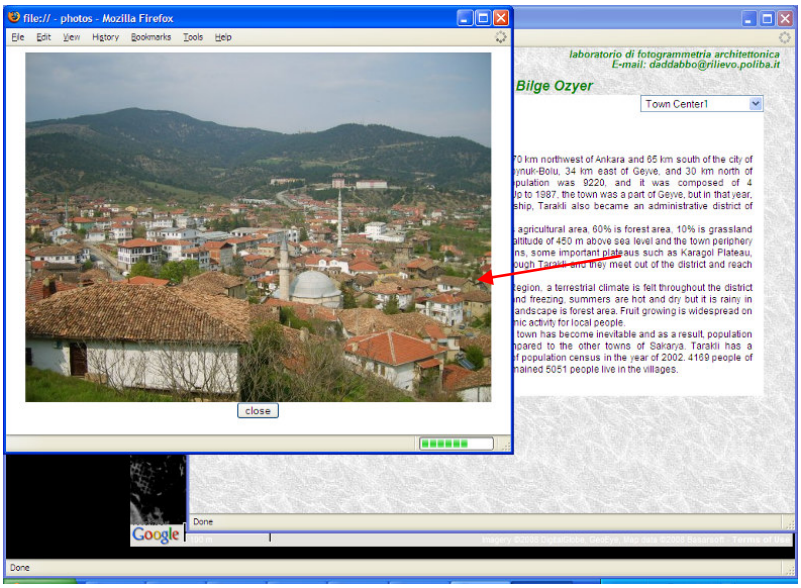


Figure D.3. Image display of town center

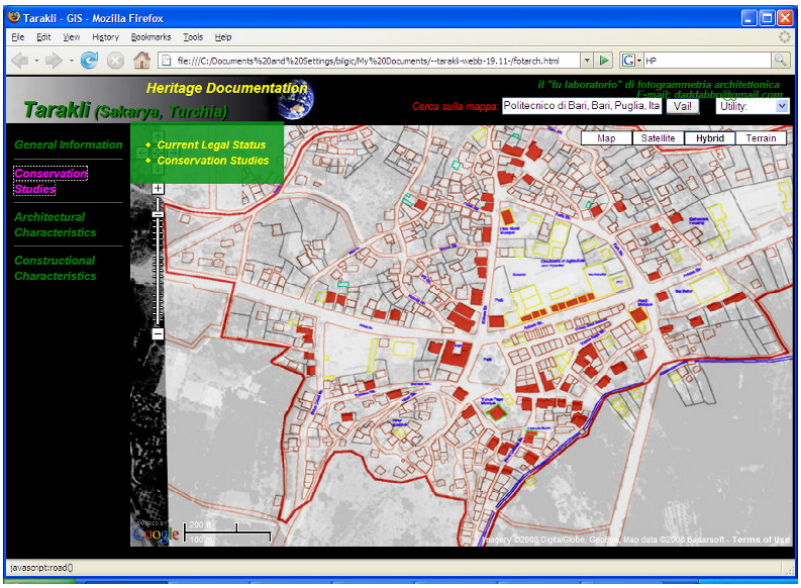


Figure D.4. Map display of registered buildings

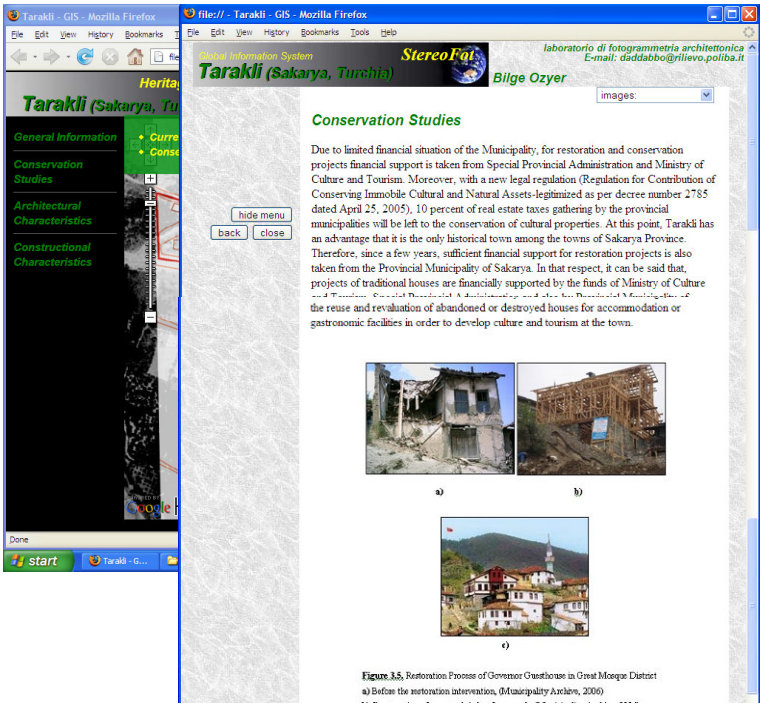


Figure D.5. Display of conservation studies

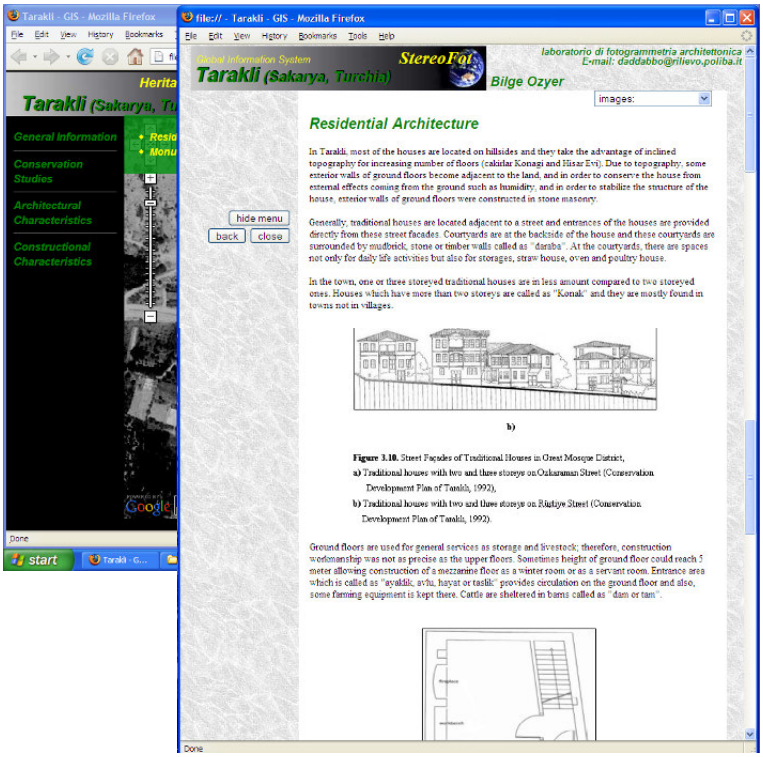


Figure D.6. Display of residential architecture

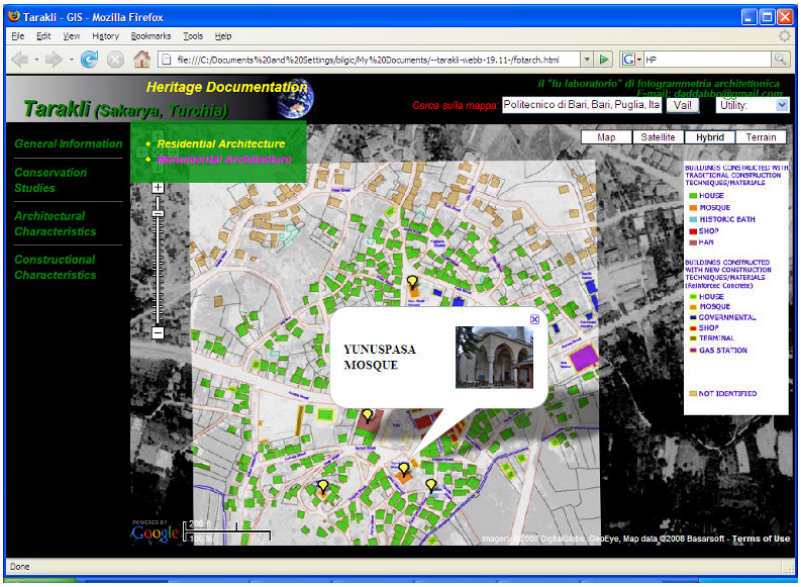


Figure D.7. Display of Yunuspaşa Mosque

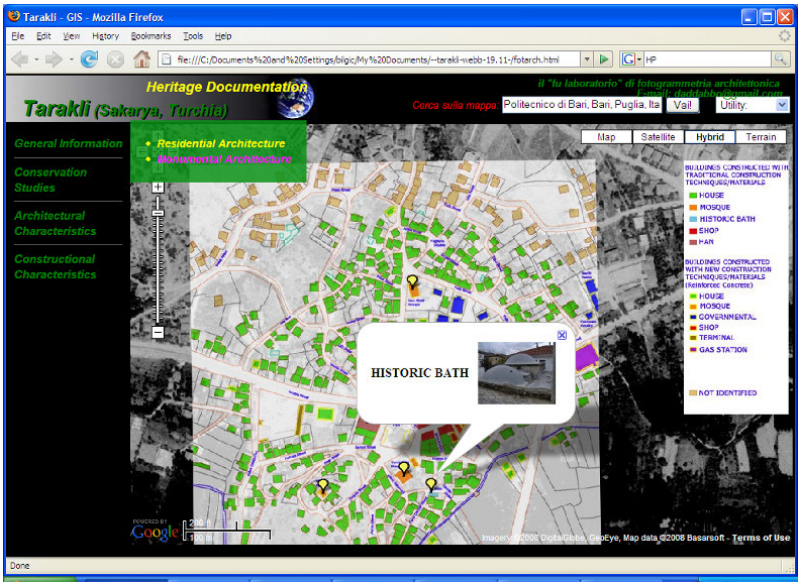


Figure D.8. Display of Historic Bath

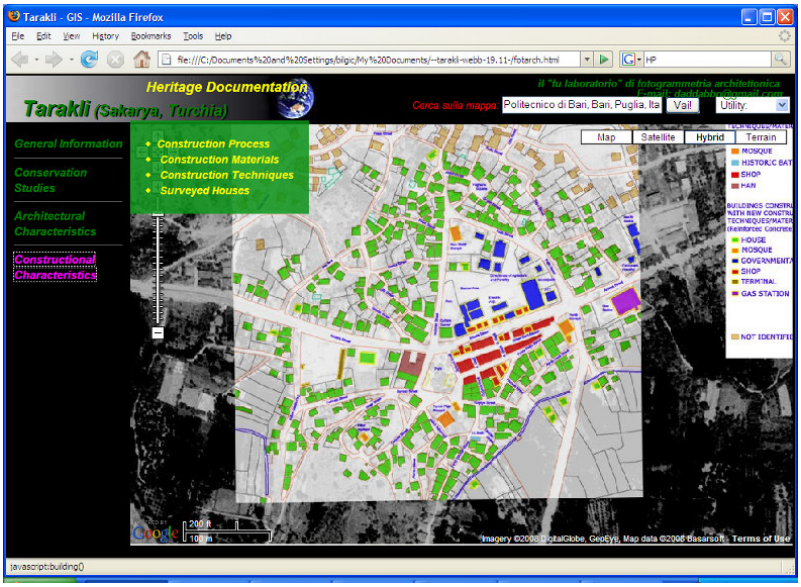


Figure D.9. Map display of current building category

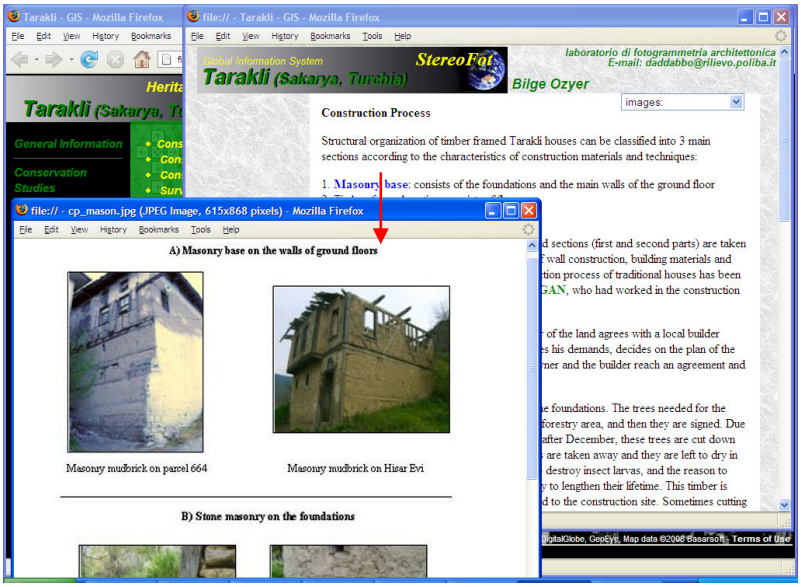


Figure D.10. Image display of houses according to masonry construction

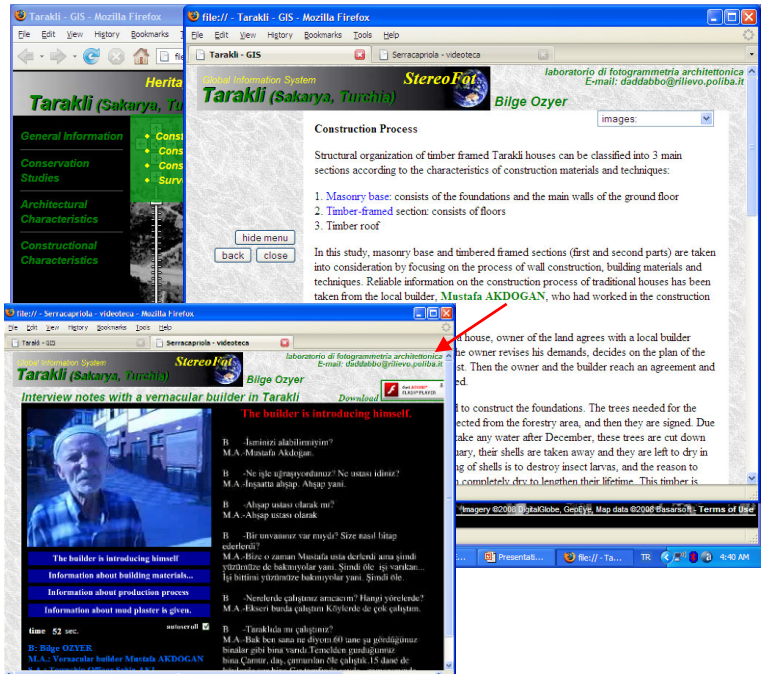


Figure D.11. Display of audio-visual document on construction process

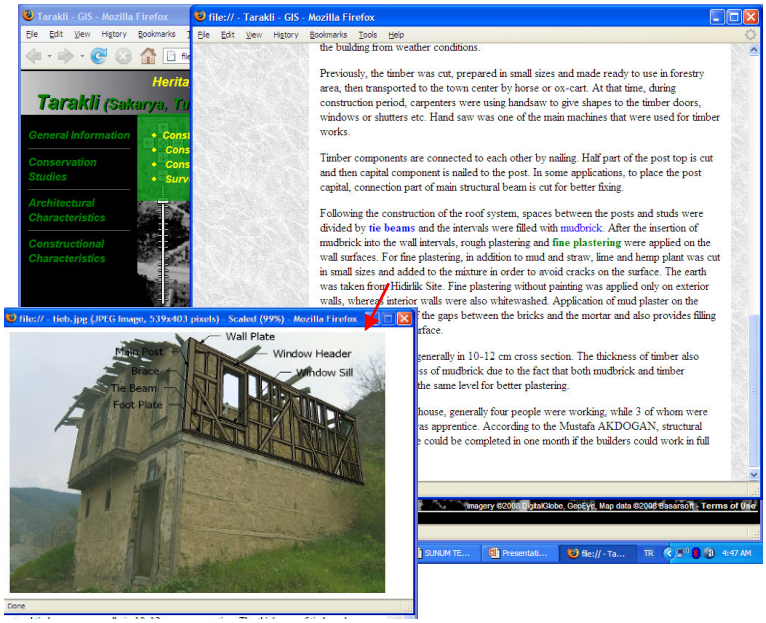


Figure D.12. Image display of timber skeleton components

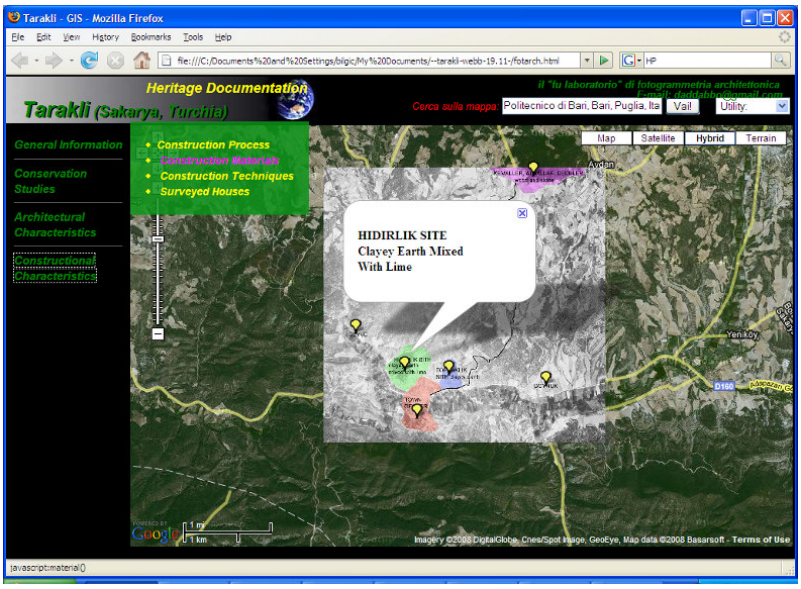


Figure D.13. Display of construction materials' resources

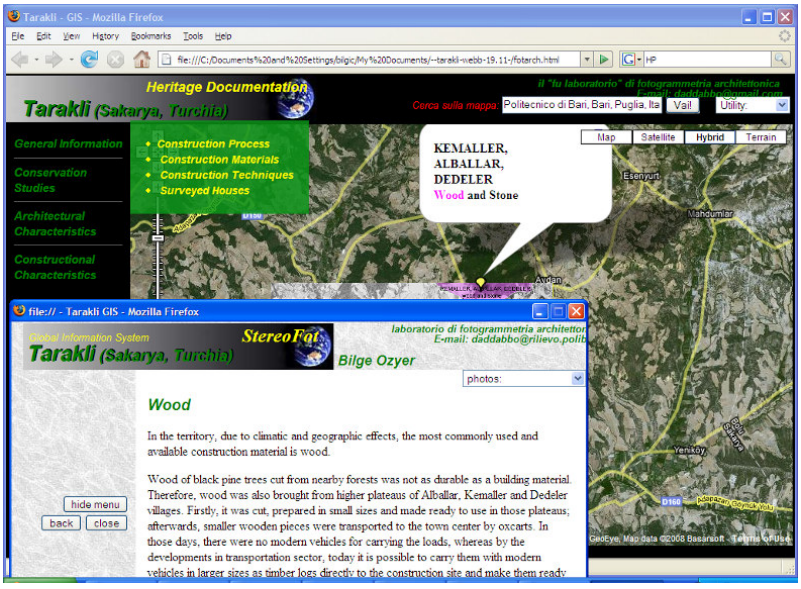


Figure D.14. Display of information about the wood resource

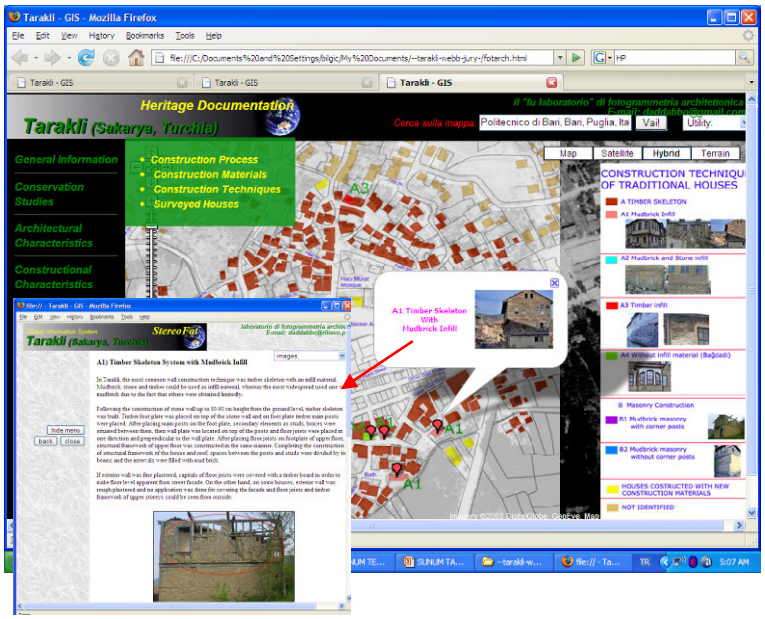


Figure D.15. Display of construction technique of Rüştiye Mektebi

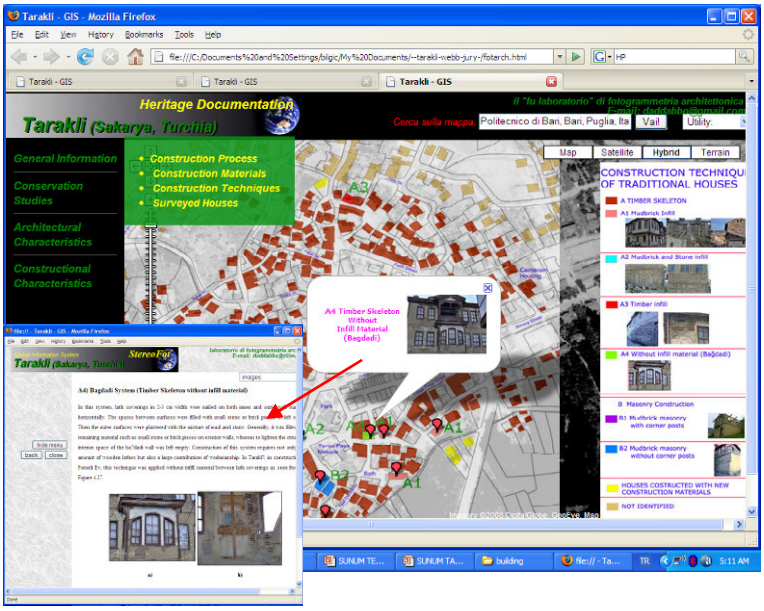


Figure D.16. Display of construction technique of Fenerli Ev

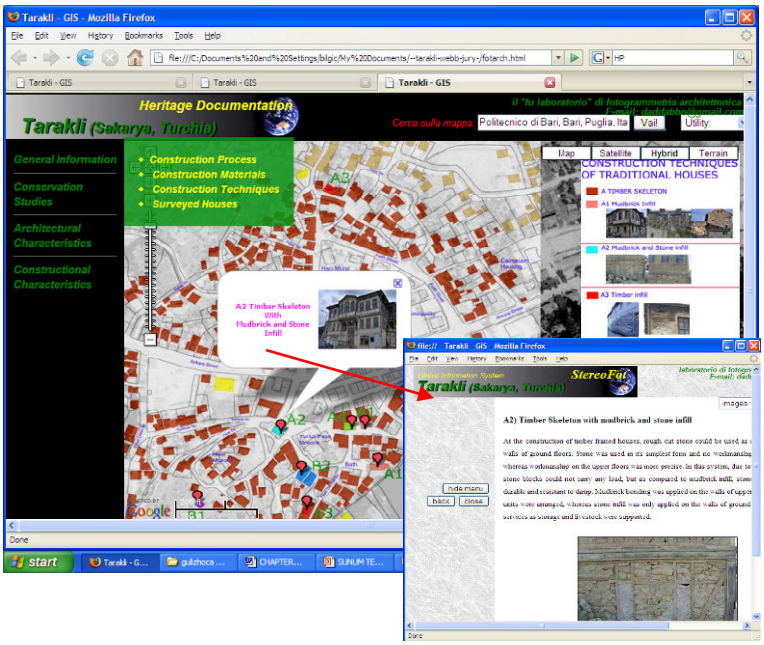


Figure D.17. Display of construction technique of Çakırlar Konağı

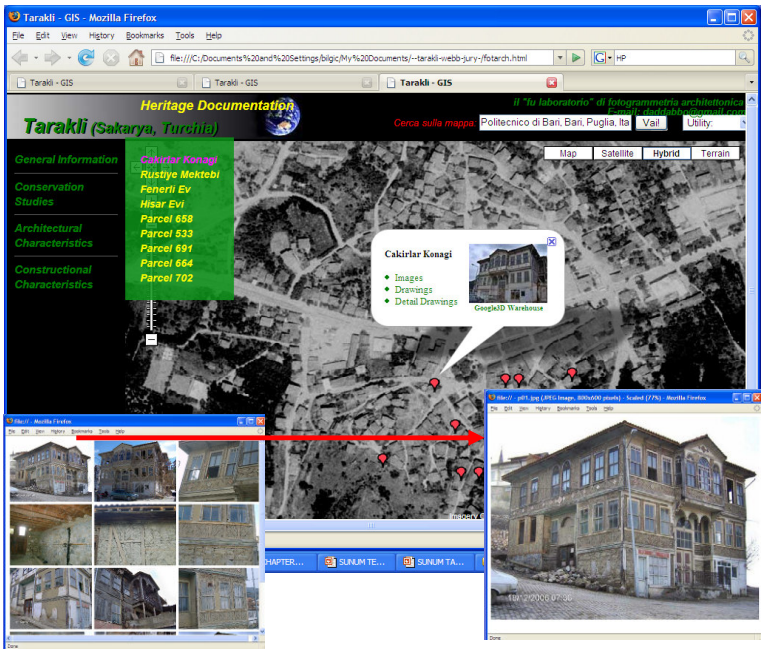


Figure D.18. Display of images of Çakırlar Konağı

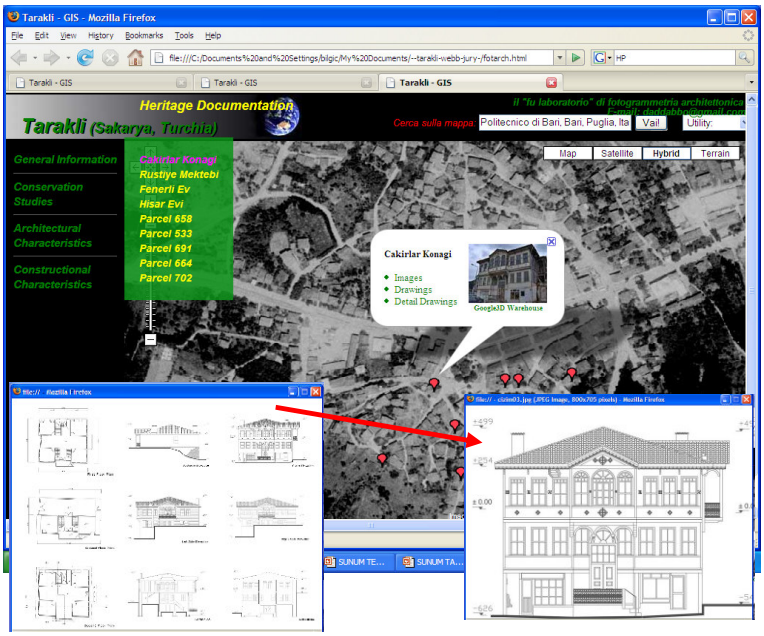


Figure D.19. Display of architectural drawings of Çakırlar Konağı

Figure D.20. Display of construction detail drawing of Çakırlar Konağı