

RECORD, ANALYSIS AND DOCUMENTATION USING GIS APPLICATIONS FOR THE INSTITUTIONAL PROTECTION OF ENORIA SETTLEMENT IN GREECE.

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ABSTRACT:

Enoria settlement belongs to the municipality of Kimi, a small city in Evia, which is an island located at the Aegean Sea in Greece. Enoria's particular building typology and geographic and urban morphology are of great interest and potential. Most buildings belong to the period between 1850 and 1890 and a dense "streets tissue" goes through all the settlement. Enoria is known for its remarkable context, a green all around olive grove that reaches the sea, an area with old deposits and the remaining of an old railway line and its infrastructure, a unique monument of industrial heritage. Facing the need for effective and efficient integration of spatial and descriptive information, this project aims at the production of a dynamic geodatabase with the intention to collect, record and organize all the cartographic, architectural and geographic elements as well as morphological and typological features of Enoria into a GIS. This geodatabase represents a useful tool for the documentation of the settlement.

The first part of the project includes a thorough research on the evolution of the settlement and its context through years, and the creation of the necessary cartographic background for the documentation of the whole area of interest. Additionally, the recording of all the buildings inside the settlement with its characteristics (architectural style, typological features, information about the owners, its current condition etc) took place. For this reason, recording bulletins and reports were designed, updated and placed among the database. The second part of the project focuses on the creation of a geodatabase, so as to converge and join all the above recordings and information of the settlement with the available spatial information of the area of interest. With the produced GIS, all the geographic information can be stored, edited, integrated, analyzed and finally displayed in thematic maps. With the appropriate analysis and procedures a significant number of thematic maps were produced, each one of them portraying and highlighting the unique urban elements of Enoria.

1. INTRODUCTION

1.1 General Information

Enoria settlement is built on a hill, about 220 meters, over the gulf of Kimi in the Aegean Sea, on the east side of Evia Island in Greece.



Figure 1: Panoramic view from Enoria settlement.

Evia is the second biggest island in Greece (6th in the Mediterranean Sea) and has a population of 210.000 people. Kimi (2.500 people) is a small town of Evia and Enoria is a village (300 people) 3 km away from this town.



Figure 2: Enoria on the island of Evia in Greece.

1.2 History of Evvoia Island

Evia's ancient cities Halkida and Kimi founded in 750 B.C. the city of Cuma in Southern Italy. Those people brought and spread there their alphabet, known as Kimi's alphabet, from which came the Latin alphabet. Halkida is also known as the

homeland of Aristotle's (great philosopher) mother and the place he died in. Kimi is known as the birthplace of George PapaNikolaou (famous doctor - Pap test).

Enoria was recommended as a community in 1833, same year Evia was released from the Turkish yoke. The next few years the settlement, which was likely built in a low site on the hill because of the presence of pirates in the Aegean sea, removed to a higher site on the hill. Most of Enoria's buildings were constructed during the period 1850-1890 when the sailing ship expanded and an economic boom took place.

Commercial contacts began with Konstantinoupolis, Izmir and Marseilles due to exportations of red wine and olive oil, produced from the rich vineyards and olive groves in the region of Enoria and Kimi. In 1926 Enoria organized her own olive oil producing cooperative and in 1931 took the first prize in terms of quality for its produced olive oil during the international exposition of Thessaloniki.



Figure 3: First prize for Enoria's olive oil quality in International Exposition in Thessaloniki, 1931.

Nowadays Enoria preserves its particular architectural characteristics. Cars cannot pass through the settlement whose system of ways is mainly consisted of labyrinthine allies. Around these allies stone houses, of two or three floors, with roof tiles, wooden parts inside and balconies viewing the Aegean Sea compose the image of Enoria. Around it, there is an olive grove that reaches the sea and creates a beautiful landscape. Within the olive grove it is worth to mention the existence of: "olive trees – monuments of nature" whose age surpasses some centuries, small old buildings (deposits) of stone and the tracing of an old railroad that carried lignite from a mine to the port of Kimi.



Figure 4: Panoramic view of Enoria settlement.

1.3 Aim of the project

This project aims at the production of a useful tool for the documentation of Enoria settlement, such as a dynamic geodatabase in order to collect, record and organizes cartographic, architectural and geographic elements, as well as morphological and typological features of Enoria into a GIS.

For this reason, a thorough research on the evolution of the settlement and its context through years, the production of the necessary cartographic background for the documentation of the whole area of interest and the recording of all buildings inside the settlement with its features (architectural style, typological features, information about the owners, its current condition etc) takes place.

After that a Geodatabase is created, so as to integrate all the above recordings and information of the settlement into the cartographic background. As a result, using a GIS application, a considerable number of thematic maps are produced, each one of them portraying and highlighting the unique urban features of Enoria.

2. CARTOGRAPHIC BACKGROUND

2.1 Cartographic maps

In order to make a research on the evolution of the settlement and its context through years, a correct and an accurate cartographic background is essential. For that reason, the first part of the project included the creation of the necessary cartographic background for the documentation of the whole area of interest.

2.2 Data

The data used for the creation of the cartographic background were:

1. Cadastre maps 1:2000 and 1:5000, produced by the Greek Office of Cadastre and Land Mapping.

After their geographical reference using appropriate programme/software (ERDAS Imagine), these maps were the cartographic basis for the process of recording, analysis and documentation of the settlement.

2. Two aerial photos 1:7000 and 1:1000, produced in 1979 and 1946 respectively.

These photos were selected in order to give a complete picture of the way how the settlement evolved through space and time. Main intention was to integrate them into a GIS application and extract information from them for the production of thematic maps.

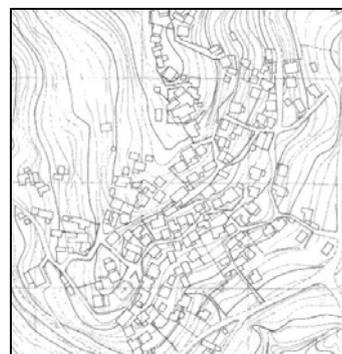


Figure 5: Detail of a cadastre map 1:2000 showing Enoria settlement.

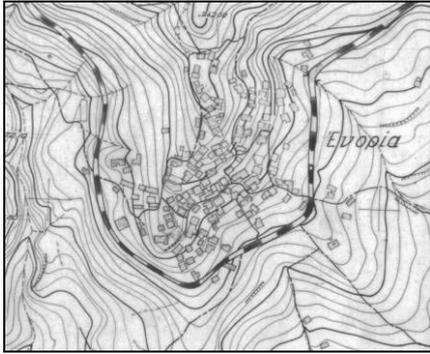


Figure 6: Detail of a cadastral map 1:5000 showing Enoria settlement.



Figure 7: Aerial photo 1:1000 of Enoria settlement (1946).



Figure 8: Aerial photo 1:7000 of Enoria settlement (1979).

2.3 Image processing

In order to eliminate distortions arising from the topographic relief a Digital Terrain Model (DTM) of the study area is needed. Since there was no available DTM, the desirable DTM of the study area was produced digitalizing the contour lines of the cadastral maps mentioned above.

The orthophoto maps that were produced, with the use of DTM, the cadastral maps and the aerial photos, have the advantage that they could be represented on a planar surface, conform to other images, having the integrity of a map.

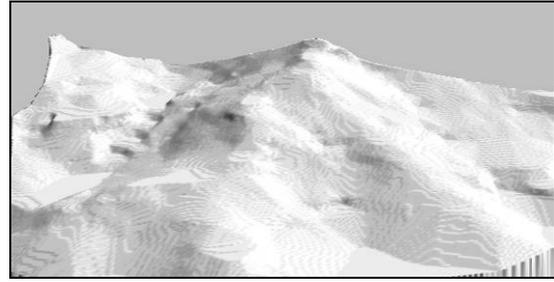


Figure 9: Terrain model of the whole area around Enoria settlement.



Figure 10: Orthophoto map draped on a DTM.

3. RECORDING BULLETINS AND DATABASE

Recording of Enoria settlement started using as cartographic background the maps of scale 1:2000 with geographical reference. A thorough and systematic process was followed by recording bulletins special designed for the settlement of Enoria. As a result, plenty of the buildings' features (total number: 77) were recorded. These features have to do the chronology, property, morphology, typology, construction, photography, history and other information about the buildings. For instance:

1. Building code.
2. Region code of the building within the settlement.
3. Construction date.
4. Photo of construction date plate.
5. Owner (original or new).
6. Type of use (original or current).
7. Type of residence (permanent or seasonal).
8. Number of residents.
9. Photos of residences.
10. Extract map showing the building.
11. Floors, height, cellar, plan type, valuation, interior parts, exterior parts, housing etc.
12. Basin for rain water.
13. Building state of conservation, evaluation, protection grade, plaster, additions.
14. Dimensions, wall height, area land, area floor, total area etc
15. Sketches concerning typology.
16. Video documentation etc.

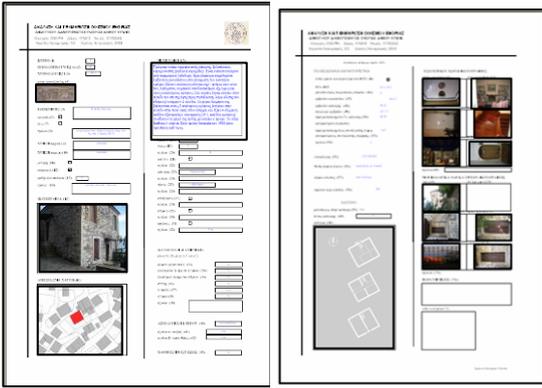


Figure 11: Recording bulletins.



Figure 12: Buildings of the settlement.

4. GIS APPLICATIONS

This part of the project comes from the conjunction of the two previous ones. It focuses on the creation of a geodatabase in which cartographic background and recording bulletins are related using a GIS application. So all the above recordings and information of the settlement converge and join with the available spatial information of the area of interest.

A GIS integrates, stores, analyzes and displays geographic information. In general, GIS applications are tools that allow users to create interactive queries, analyze spatial information, edit data, maps, and present the results of all these operations. In this case study, the result is a GIS application, where all the geographic information could be stored, edited, integrated, analyzed and finally displayed in thematic maps.

Appropriate analysis and procedures produced a significant number of thematic maps, each one portraying and highlighting the unique architectural, morphological and typological features of Enoria.

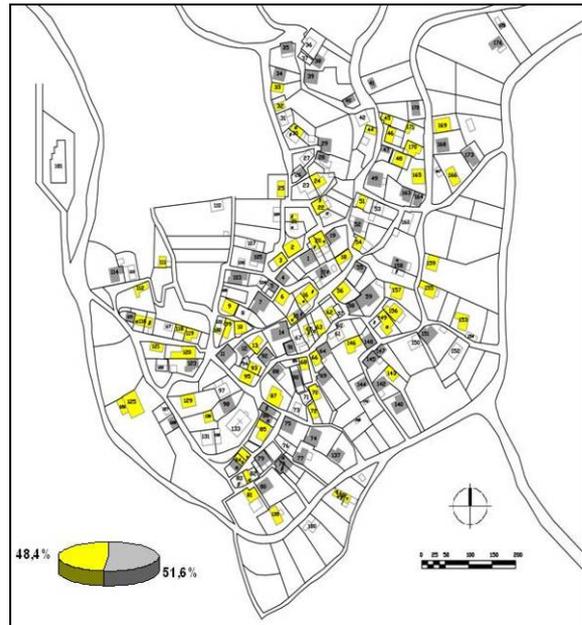


Figure 13: Thematic map showing the residence of Enoria settlement: permanent (yellow) and seasonal (grey)

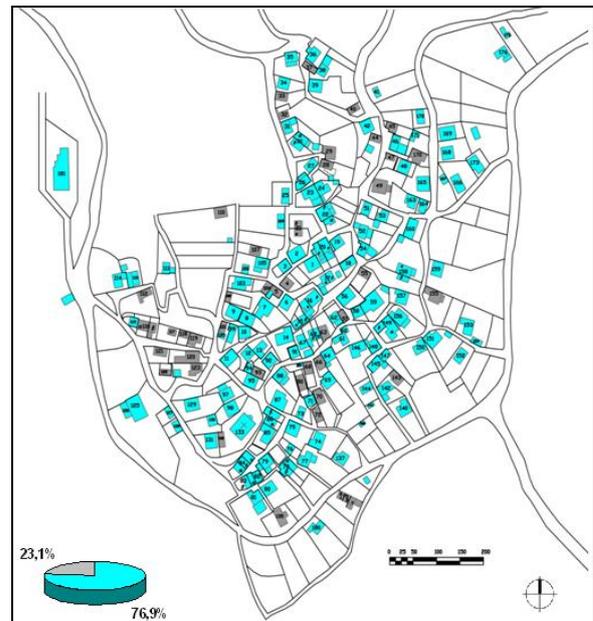


Figure 14: Thematic map showing the main axis of the buildings: parallel (cyan) and vertical (grey) to the slope.

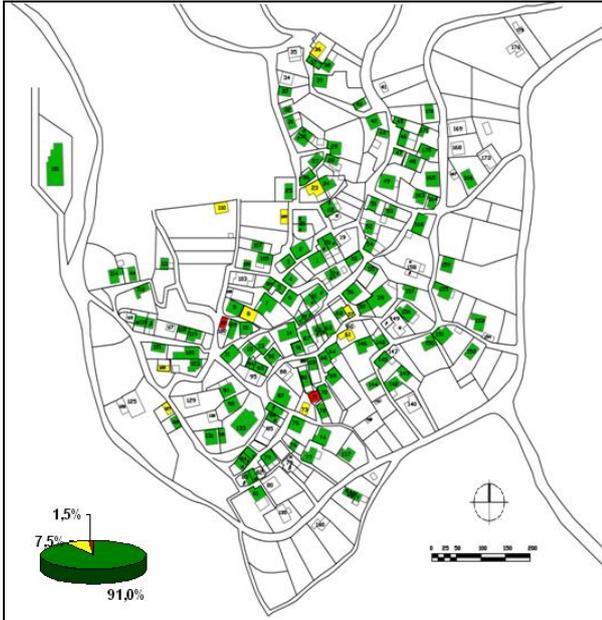


Figure 15: Thematic map showing the state of conservation of the buildings: good condition (green), moderate condition (yellow), bad condition (red).

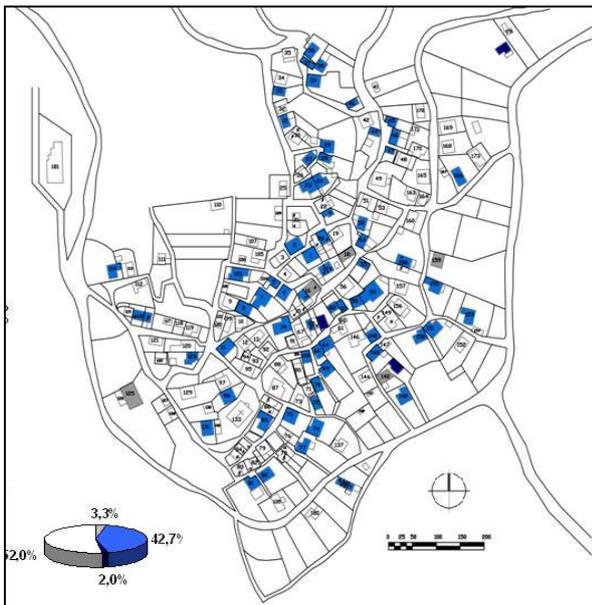


Figure 16: Thematic map showing water storages: basins for rain water (blue), ex-basins for rain water -no more existing- (grey), water wells (dark blue)

5. EXTRA STUDY

In this project photogrammetric and surveying methods were also used for the documentation of some residences in Enoria settlement. Ground and façade plans and photos of these residences could be integrated into the GIS application (figure 17).

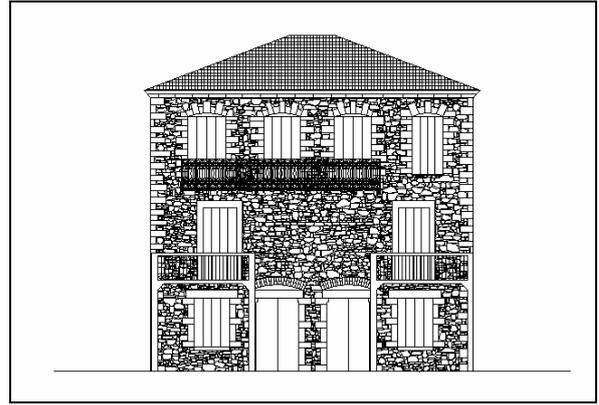


Figure 17: Façade of an old residence in Enoria settlement.

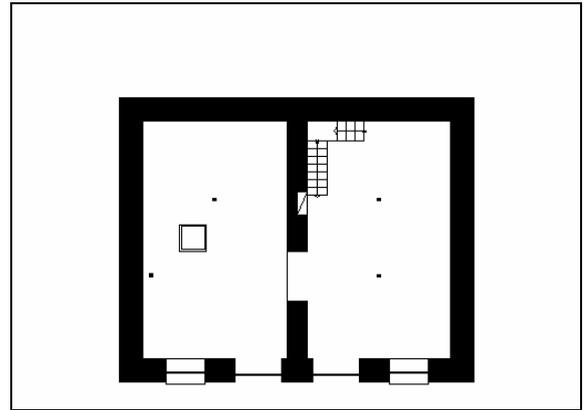


Figure 18: Plan of a residence in Enoria settlement

Recording bulletins and a new Database were used for old buildings (figure 19) in the olive grove near Enoria settlement. The railway line of the old lignite transport within the olive grove (from the mine to the port of Kimi) was documented digitalizing cadastre maps 1: 5000 (figure 20). Photographic documentation of the old railway line and its infrastructures (walls, bridges, installations of machinery, old building offices) took also place.



Figure 19: View of old buildings in the olive grove.



Figure 20: Cadastre map 1:5000 showing part of the old railway line (green color).

6. CONCLUSION

The detailed record of the architectural, morphological, typological, etc. characteristics of the settlement is valuable for the stage of analysis. Then its automated form (database) and even more its visualization (geodatabase) –in other words, GIS application- played a key role in the whole project.

Significant conclusions came out about Enoria's history and architecture. First of all, although there had been doubts, it was proved that the initial site of the settlement was lower on the hill, within the olive grove.

The buildings were divided into three main categories according to their dates (from date construction plate) and their morphological and typological characteristics. The result was a very important opportunity to reverse the process: to be able to find approximate date for buildings without date construction plate from observing their morphological and typological characteristics.

Wide use of basins for rain water, stone ovens and cellars for domestic animals and storing agricultural products showed the ability of the buildings to be integrated residential units, having autarky. This and other significant conclusions came out about the past of the settlement demonstrating folk architecture's "wisdom" (in general), documenting its uniqueness as a historical settlement - cultural heritage monument- and therefore the necessity for its protection.

As a result using GIS applications for the record, analysis and documentation of Enoria settlement can be a really useful and hopeful tool for its institutional protection to become true. Thus recording of the current situation through the geodatabase can be particularly useful in the future as a substratum for procedures of restoration. Alongside the detailed record may help in further analysis and the export of many important findings. Here it is worth to mention how much a video documentation could contribute to a more detailed record and simultaneously to saving precious time when recording at the study area.

Furthermore the geodatabase / GIS application has the great potential for continuous updating and adding of information. It could be enriched with a project including the extra processes and the processes on the supplementary cartographic background mentioned above (architectural plans, DTM, recording bulletins and database for the older buildings in the olive grove, documentation of the old railway line and its infrastructure - unique monument of industrial heritage-).

At the end, this project or some parts of it may have a wide application on the record, analysis and documentation of other settlements' cultural heritage as well.

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