

## WEBMAPPING IN THE ETRUSCAN LANDSCAPE

### 1. INTRODUCTION

In 2004 the Etruscan necropolis of Cerveteri was nominated a UNESCO world heritage site (Fig. 1). For a diachronic analysis of ancient settlement models in the southern Etruscan landscape, the Istituto di Studi sulle Civiltà Italiche e del Mediterraneo Antico (ISCIMA) of the Italian National Research Council has proposed this town and its territory as a sample area. In fact, Cerveteri has been investigated since the 1980s by the CNR Institute through systematic surveys and excavations, resulting in a better understanding of the urban and surrounding area. Archaeological field research activities were enriched by computer applications, integrated with archaeoastronomical and spatial analysis techniques and taking into account several variables linked to the evolution of this territory (geomorphology, vegetation, and changes due to human activity).

The results of the “Caere Project”<sup>1</sup>, which was promoted in the Nineties within the CNR Cultural Heritage Special Project, were presented in various national and international events (e.g. MOSCATI 2002, 2005). During the following years, two other inter-institutional projects, partially related to the Etruscan town of Cerveteri, were financed by the Ministry of Education, University and Research (RONCALLI, MOSCATI, SCALA 2007; MOSCATI, in press)<sup>2</sup>. Recently, the Lazio Region has approved and funded a new multimedia interactive project, proposed within the CNR “Cultural Landscape Project”. It is aimed at creating an interactive itinerary, operating with spatial simulation models and exploring diversified and complex realities, to represent the Caeretan territory as a dynamic place, in which a dialogue between the past and the future is created in the present, shaped in digital format.

### 2. THE ACHIEVEMENTS OF THE “CAERE PROJECT”

This new project is to be accomplished by integrating what we have already done and what is still to be done: developing the Caeretan information system into a multimedia interactive product. Previous activities have been devoted to the construction of a digital research model to record, process and

<sup>1</sup> <http://www.progettocaere.rm.cnr.it/>.

<sup>2</sup> FIRB 2001 Project “Il Mediterraneo antico e medievale come luogo di incontro tra Oriente e Occidente, Nord e Sud” ([http://www.ricercaitaliana.it/firb/dettaglio\\_firb-RBNE01YA5C.htm](http://www.ricercaitaliana.it/firb/dettaglio_firb-RBNE01YA5C.htm)); FIRB 2003 Project “Dallo scavo al museo. Metodi e tecniche avanzate di ricerca, elaborazione e fruizione condivisa del patrimonio culturale mediterraneo” ([http://www.ricercaitaliana.it/firb/dettaglio\\_firb-RBNE032MZ4.htm](http://www.ricercaitaliana.it/firb/dettaglio_firb-RBNE032MZ4.htm)).



Fig. 1 – UNESCO World Heritage List.

publish data coming from the excavations in the central area of the urban plateau, where several archaeological phases, from the Villanovan period to the Roman one, have been brought to light. Following modern trends of contextual archaeology, a comprehensive knowledge of ancient city planning development over the centuries was achieved.

The GIS environment provided the opportunity to carefully study and reconstruct the site. The creation of DTMs has highlighted the unique morphology of this territory – characterised by isolated tufa plateaus, originally occupied by ancient towns and necropolises, bounded by streams which have eroded deep ravines (Fig. 2) – offering a more reliable representation of hilltops and crests and better representing the local soil condition as well as the altimetric variations of the ground. Spatial Analysis techniques have been applied to study the distribution of finds at a site level and to widely analyse the surrounding territory. Viewshed Analysis has allowed us to investigate spatial and visual relationships between the archaeological monuments located on the urban plateau and the ancient necropolises on the surrounding hills. An archaeoastronomical approach has also been applied to study the north-west orientation – a unique one in the Etruscan



Fig. 2 – A typical Caeretan landscape.

world – of the Temple of Vigna Parrocchiale, dating back to the beginning of the 5<sup>th</sup> century BC, in respect to the tumuli of the Banditaccia necropolis.

A geological study has preceded each of these analyses so as to reconstruct the paleo-vegetation and the particular nature of the ancient territory. In addition, geophysical prospections have shown a very rich concentration of anomalies: the presence of underlying structures has been thus verified, notwithstanding objective difficulties encountered in identifying geological tufa layers from archaeological structures overlaying or cut out in the same kind of rock.

An innovative procedure has also been proposed to encode the yearly excavation diaries, which give an account on a daily basis of the excavation process. The transformation of the diaries into electronic documents, through the use of markup languages, has provided a process able to encode the texts within a descriptive, flexible model. In the website dedicated to the “Caere Project”, and planned to be a multimedia communication tool, there is also an option of querying excavation data: a client-server architecture provides a dynamic application for data dissemination across the Internet, so archaeologists can visualise data and interact with the excavation map and

the geodatabase, modifying or querying theme layers. The innovative use of markup languages has allowed us to recreate in a digital environment the main phases of the terrain “readings”, and the ability to include the scientific terminology used by archaeologists during excavations has been crucial to the interpretation process (MOSCATI 2006).

### 3. A NEW METHODOLOGICAL SURVEY

We were encouraged by these achievements to go further into developing efficient communication strategies, linking previous results with modern trends of ICT, in order to represent the Caeretan landscape as a dynamic place in which man and environment can be connected from past and present perspectives. As in 1998 – when before starting the Caere Project an international scientific committee coordinated by François Djindjian published some methodological considerations on the use of GIS in archaeology (DJINDJIAN 1998) – a preliminary survey was carried out to suggest the guidelines to be followed for the best actualisation of the new interactive itinerary. Some theoretical aspects in the application of interactive visualisation techniques, spatial simulation models, webmapping and webGIS were identified in the framework of the current evolution of studies:

- Field research, both at an inter- and intra-site level, is the archaeological sector of application that has surely most intensively benefited from new ICT potentials and tools.
- Using the term “territory” in the 21<sup>st</sup> century is restrictive: in the reconstruction of ancient geography, cultural landscape comes into the scene as a result of the interaction between human activity and environmental evolution (CHAPMAN 2006).
- GIS, which have been welcomed in the Nineties as a revolution, are still one of the strategic ribs of the development of archaeological computing (CONOLLY, LAKE 2006).
- Interest in GIS today converge towards a cohesive, emergent element: the central role of spatial datum as an integrating part of the research, indicator of settlement choices and their relations, source of a visual language and an integrated archaeological knowledge, which can be accessed in its geographical context (WEATLEY, GILLINGS 2002; MEHRER, WESCOTT 2006).

Some open questions have to be faced, when approaching a regional study instead of a local one and using Internet as a vehicle for the diffusion of cultural information. They concern mainly the various modalities of acquisition, representation and transmission of spatial data, keeping into account as well the procedures adopted by other convergent disciplines:

- In the acquisition phase, it is necessary to dwell on methods to be adopted to study the distribution of archaeological features and finds, today influenced

by the contribution of ecology which raises new functional questions about the use of space.

– In the analysis phase, some spatial analysis techniques include new variables. They describe natural, social and anthropic factors which can have influenced the choice of where to locate monuments in a site and sites in a region: visual perception, degree of visibility, natural and artificial barriers, movement in space.

– In the transmission phase, it is worth noting, together with the diffusion of 3D numerical cartography and interactive maps, the recent evolution from GIS to webGIS. It replies to the need of accessing and sharing georeferenced information, with a considerable measure of advantage especially when operating at a distance.

When comparing to our previous survey, the distinction seems to have faded between projects carried out in the CRM framework and those established by research institutions. In fact, the opening of new perspectives promotes the interaction among various approaches in view of an operational synthesis: the analysis of territorial data in function of diachronical variations; the study of population distribution and density; the value of territorial knowledge management in modern landscape and urban planning; the relationship between landscape and city, also from an administrative point of view, as a result of the interaction among man, society and nature. This approach crosses boundaries among traditional disciplines such as geography, archaeology, architecture, ecology and spatial economy and implies that specific subjects, such as cultural, psychological, linguistic, semantic issues, together with economical and administrative ones, need to be included in the reconstruction processes.

#### 4. WEBMAPPING AND WEBGIS IN ITALY

The application of webmapping and webGIS in Italy is endowed at a national level by the General Information System for Cataloguing (SIGEC)<sup>3</sup>. Implemented by the Istituto Centrale per il Catalogo e la Documentazione (ICCD) at the beginning of the year 2000, it is the result of decades of activity in the cataloguing of Italian cultural heritage (MANCINELLI 2004). It now operates in a multimedia environment, in which the integration between cartographic and alphanumeric data allow for the management in a single context of cataloguing fluxes, in which data and metadata are established according to European standards (Fig. 3).

In the cultural sector, webmapping and webGIS find an application mostly where attempts had already been made with presentation of data in

<sup>3</sup> <http://www.iccd.beniculturali.it/Catalogazione/sistemi-informativi/>; <http://www.iccd.beniculturali.it/elearning/web/sito.html>.



Fig. 3 – SIGEC e-learning website.

cartographic form, and in particular in the set up of thematic Atlases. We can quote for example the “Atlas of historical places”<sup>4</sup>, which has been planned as a container of geographic, administrative and safeguarding information together with statistical data coming from the census of historical centres. We can also mention the FastiOnline project<sup>5</sup>, created by the International Association for Classical Archaeology: a web-based GIS database proposing an in-depth coverage of current archaeological excavations, begun in Italy and now expanding to other countries. However, it is particularly worth noting the twenty-year evolution of digital cartography as applied by the Chair of Ancient Topography at the University of Rome “La Sapienza”<sup>6</sup> in national and international projects (Fig. 4), such as the *Tabula Imperii Romani* (SOMMELLA 2006).

<sup>4</sup> <http://80.205.162.228/iccdms/index.html>.

<sup>5</sup> <http://www.fastionline.org/>.

<sup>6</sup> <http://www.formitaliae.it/index.html>.

At a regional level, in addition to some projects dedicated specifically to Natural Parks, the Department of Territory of the Lazio Region has an efficient Territorial Information System<sup>7</sup>, which operates within the criteria established by the State-Regions agreement and by the National Cartographic Portal<sup>8</sup>. Its ample cartographic repertory of raster and vector data together with the new Soil Use Map are available online (Fig. 5).

As far as the Etruscan region is concerned, there are specific archaeological projects which involve the use of digital cartography and GIS systems. But closer to our planned project, which starts from fieldwork and is projected to an online virtual communication, are those related to the virtual reconstruction of consular roads such as the *via Appia* and the *Via Flaminia*<sup>9</sup>, through an intensive use of mapping, open source webGIS and modelling activities (FORTE *et al.* 2008).

## 5. THE CAERETAN INTERACTIVE ITINERARY

For the Caeretan interactive itinerary, the conduction of the project follows different operative objectives, that will converge: the phase of perception, connected to the interactive multimedia application, and the phase of knowledge, connected to scientific and educational purposes. Two main purposes have been identified: the first is the gathering and systematisation of data already digitalised and georeferenced on the GIS platform; the second addresses more specifically the optimisation of the multimedia product. The stages of the research process are also articulated along two main directives:

- The creation of a single information repository, which uses the potential of GIS to gather and georeference the evidence of the ancient settlement, allowing for different types of data to coexist and be searchable. This is a valuable tool for scholars, especially where modern urbanisation has erased any trace of the ancient situation.
- The experimentation of dynamic forms of scientific knowledge dissemination, based on the solutions given by ICT. The results obtained can be enjoyed by a wide range of public, even non expert, which will have the opportunity to contextualise and make real the cultural patrimony of this geographical area.

The interactive itinerary has been planned on the basis of an *ad hoc* flight (Fig. 6), which follows a specially designed path, visible both on the traditional cartography and on aerial and satellite orthophotos. The path begins from the Villa Giulia Etruscan National Museum and arrives to Cerveteri.

<sup>7</sup> [http://www.urbanisticaecasa.regione.lazio.it/cartografia\\_on\\_line/](http://www.urbanisticaecasa.regione.lazio.it/cartografia_on_line/).

<sup>8</sup> <http://www.pcn.minambiente.it/PCN/>.

<sup>9</sup> <http://www.appia.itabc.cnr.it/>; <http://www.vhlab.itabc.cnr.it/flaminia/>.

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Fig. 4 – Projects promoted by the Chair of Ancient Topography, University of Rome “La Sapienza”.

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Fig. 5 – The Territorial Information System developed by the Lazio Region.





Fig. 6 – An example of the “flight” methodology during the itinerary.

During the flight, through general and detailed views, some intermediate steps are programmed: the ancient route of the Via Aurelia (Fig. 7), Pyrgi (the port of Caere and place of a famous Etruscan sanctuary), the Archaeological Museum of Cerveteri and finally the plateaus occupied by the necropolises and the ancient town. The narration develops around archaeological records, intended as evidence connected to the territory but enriched with historical and cultural information.

As for the two Museums, the one in Rome – in the Villa built by Pope Julius III (Fig. 8) – and the one in Cerveteri – housed in the Ruspoli Castle – in addition to aerial images integrated with detailed plans, a panoramic tour of some exhibition rooms has been planned together with the direct inspection of Caeretan archaeological objects. These last have a privileged position in the itinerary, being objects that narrate a past to re-live, and that give the chance to observe an event, a place or a specific theme.

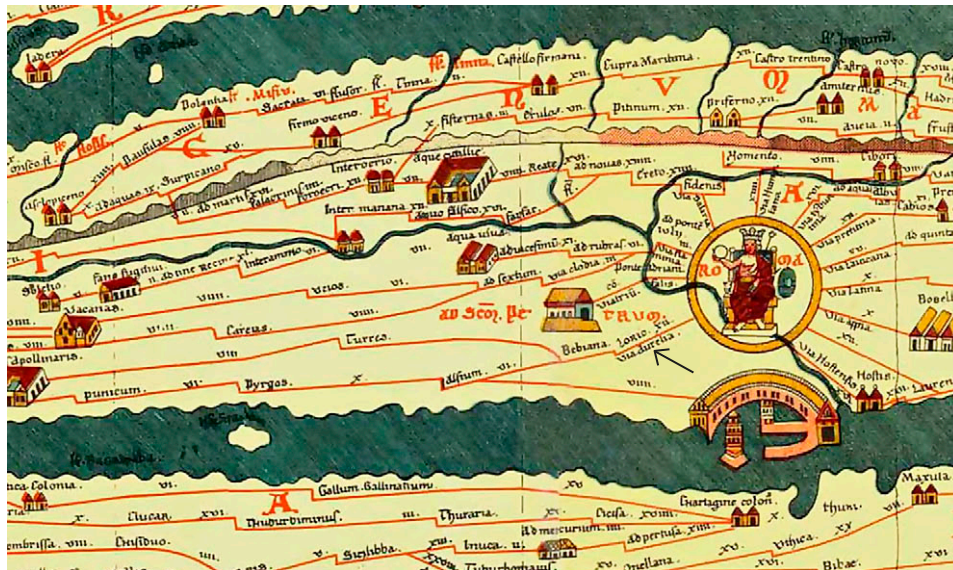


Fig. 7 – The Via Aurelia (see the arrow) as represented in the *Tabula Peutingeriana*.



Fig. 8 – Villa Giulia Etruscan National Museum: the courtyard.

In our project, in fact, virtual musealisation is not intended as a virtual exhibition but as an instrument of re-contextualisation of finds that for different reasons, including the illegal excavation market, are housed in various museums

around the world (MOSCATI 2008). The intention is to create a specific application that replaces objects in the area of discovery, giving a different kind of knowledge from that offered by direct inspection of artefacts, exhibited separately from their historical context. The reality, integrated in its perception by substantial information, can be enhanced, the meaning of objects can be emphasised and every implication of their own cultural context can be exploited.

As for the urban plateau, it will be possible to navigate in an interactive manner inside a 3D georeferenced terrain model. In this way, users will be able to locate the main ancient roads (also those typically cut out of the tufa rock) and gates (Fig. 9), reconstruct the outline of the original fortification system (Fig. 10), have a view of the archaeological excavations and the sacred areas. Some monumental complexes, as in the case of the Vigna Parrocchiale, will be reconstructed, simulating their original aspect and describing their evolution over time. Through ICT solutions, users are therefore guided by specialists along a virtual visit reconstructing the dynamic process of settlement formation (geographical and geomorphological aspects of the territory), its evolution (monuments, road plans, craftwork and commerce) and in the end its decadence (political and economical issues).

In the proposed project, on condition of the assignment of further dedicated funds and the implementation of special safety measures, the possibility to effectively follow some archaeological paths is also planned in addition to the virtual visit. Visitors should be supported by mobile devices as well as by some totems available along the on-site visit and equipped with touch screen to allow them to locate themselves spatially in the urban plateau and to provide access to additional information. If this is the case, a coordination is desirable with a group of engineers of the University of Rome (CINNIRELLA *et al.* 2006) which has developed a prototype of an audioguide using a system of multichannel simultaneous transmission of audio contents and sensible position.

## 6. CONCLUSIONS

In conclusion, fruition by the end users will be available through multimedia workstations located within the two Museums, a website and a DVD to be distributed to cultural and educational institutions. The contents will encourage the visitor to plug-in to the history of an ancient Etruscan metropolis, enhancing interest in learning more according to the personal queries and needs of various audiences, from a general public to specialised scholars.

Beneficiaries of this project will be above all local institutions, that can obtain solutions for a better management and safeguarding of the archaeological and architectural evidence. At the same time, the use of webmapping and webGIS will help to disseminate cultural contents in real-time and in an



Fig. 9 – Caere: the “Porta Coperta” gate.



Fig. 10 – Caere: part of the original tufa walls.

interactive manner, making effective the most stimulating expectations for a dialogue between past and future which includes several information sources, creating a bridge between GIS archives and virtual reality systems.

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#### ABSTRACT

The Etruscan town of Cerveteri and its territory have been investigated since the 1980s by the Istituto di Studi sulle Civiltà Italiche e del Mediterraneo Antico of the Italian CNR, becoming a field of experimentation for computer applications to archaeological surveys and excavations. In recent years, a new multimedia project, aimed at creating an interactive itinerary, has been planned in order to develop the Caeretan information system and experiment with the potentials of new webmapping and webGIS tools. This article gives a general overview of the Italian panorama in this sector of applications and describes the main steps of the itinerary (from the Villa Giulia Etruscan National Museum in Rome to the town of Cerveteri, following the Roman consular road Aurelia) as well as the procedures to be followed for its accomplishment.