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Archaeological GIS for Land Use in South Etruria Urban Revolution in IX–VIII Centuries B.C.

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INTRODUCTION

Urban Revolution in Ancient Etruria Between IX-VIII Centuries B.C. Origin of the Etruria Protocities

Archaeological discussion about protourban centers growth in middle Tyrrhenian and in Ancient Etruria regions outlined the original and revolutionary features of such process, called Villanovan Revolution for resuming the deep transformations occurring in a few decades.

New largest protourban settlements grew through the concentration, fusion and absorption of the earlier scattered sites on the plateaux of South Etruria, extended for many hectares and well defended (Bartoloni, 2002; Bietti Sestieri, 1996; Carandini, 2003; Mandolesi, 1999; Pacciarelli, 2000; Peroni, 1994, 1996).

Geographic position of plateaux and agrarian quality of adjacent soils were the key factors for settlement position selection. Tens of scattered older villages were abandoned with simultaneous people transfer, called synoecism, to the plateaux from the late final Bronze age to the first Iron age. The process features, the plateaux selected and their area extension would prove existence of some urban planning. New settlements extension, until to about 200 hectares, would testify the great dimension of the new communities born from synoecism (Peroni, 1969, 1994) and a gradual reduction of settlements number with significant increase of their population size and surface extension (Carandini, 2003; Pacciarelli, 2000).

Analysis Objectives

Although many aspects of protourban centers growth, like the foundation of Rome and its organization in *curiae* are investigated, relevant criticism remains about the same processes in South Etruria. In fact, some issues about the strong changes in settlement patterns observed in this period have to be yet clarified and deepened (see Background section - Bartoloni, 2002; Pacciarelli, 2000; Peroni, 1994).

The present research has the goal to explain the main factors that favored such historical process as well the features of the settlement strategies.

Use of GIS is the most powerful technology introduced to archaeology since the introduction of carbon 14 dating and seems the most suitable for specific information.

Most widespread use of this technology is for Cultural Resource Management, data visualization, excavations but also for prediction of archaeological site locations.

This paper focuses on the use of GIS for archaeological predictive modeling of ancient land use, by critically applying this new technology and exploring its theoretical and analytical implications. Archaeological data are point like geographical and temporal data with more or less large uncertainty. Work of the archaeologists is to connect all the point like data related to a geographic region and to an historical period using a qualitative and quantitative based narration that fit in the best way with available data and with the theory and model.

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An archaeological GIS is designed with the aim to record the existing and reconstructed data on a database, to visualize data by thematic maps and to use such data for advanced statistical and spatial analysis. Archaeological GIS is realized installing GRASS GIS on OS Linux with interface to PostgreSQL database, with its extension PostGIS for geographic information and to R package for statistical and geostatistical analysis.

BACKGROUND

Archaeological Theories on Protourban Centers Genesis

Archaeologists suggested two approaches to protourban centers origin: the first approach underlined a continuity between protourban centers and earlier settlements through gradual development of settled areas, between the late final Bronze age and the beginning phases of first Iron age (Pacciarelli, 2000); the second approach suggested an ungradual transition from the scattered villages on the territory to the protourban centers with an extension 30 times larger than the villages of preurban phase (Peroni, 1994, 1996). Surface surveys of last fifty years showed an uniform distribution of the villanovan pottery remains, attesting a protourban phase after 1,000 B.C., with occupation of large areas, because of transformations in social and economical structures (Pacciarelli, 2000).

Villanovan Urban Revolution During X-IX Centuries B.C.

Studies of Peroni and Rittatore Vonwiller in the 1960s (as cited in Pacciarelli, 2000, pp. 11-12) outlined the close relationship of Urban Revolution in South Etruria with social, political and economic transformations starting from 1,000 B.C. Changes concerned the techniques of agrarian production, the work organization and the social relationships.

A new economic organization of the agrarian property is based on the private ownership of land by division into lots for households (Mandolesi, 1999; Pacciarelli, 2000; Peroni, 1994).

In this context the nuclear family emerged as the basic social cell of the protourban centers, replacing the older multi familiar clans.

Social hierarchies reflected kinship and rank relationships, as shown from the funerary data since the X century B.C. (Bartoloni, 2002, 2003; Iaia, 1999; Pacciarelli, 2000; Peroni, 1996).

Urban Revolution developed between XII-VIII centuries B.C. in the Mediterranean area (Moscati, 2001) and along Mediterranean sea coasts, favored by the emergence of a global Mediterranean market area. New situation produced huge changes: villages in a few tenths of years disappeared and protourban centers grew.

Collapses of the great eastern territorial empires and of the earlier palatial states, also due to the invasions by the People of the Sea, promoted the propulsive role of Phoenicians in the new Mediterranean global market between XII-VIII centuries B.C.

Such role of Phoenicians has been recognized in the last decades (Braudel, 2002; Giardino, 1998; Guidi, 1998; Liverani, 1988; Moscati, 2001; Pacciarelli, 2000; Trigger, Kemp, O'Connor, & Lloyd, 2000). Because of Phoenicians maritime activities, autonomous urban centers developed in the Etruria, middle Tyrrhenian and in central Aegean areas.

Case Study: Tarquinia

The Tarquinia settlement is an important case study on the genesis of protourban centers (see Figure 1.)

The surface surveys testified the uniform distribution of the villanovan pottery in all area, showing a full plateaux extension of the protourban center. Data show that the main center covered about 120 hectares on main plateaux of La Civita, including the oldest final Bronze age