Original Study

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Interlocking Networks and the Sacred Landscape of Hellenistic Northern Etruria: Capturing Social and Geographic Entanglement Through Social Network Analysis

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Abstract: The late Hellenistic period is a time of deep entanglement, interconnectedness and complexity. The breakdown of local political systems and the unification of economic spaces had strong repercussions on the perception and expression of several aspects of the cultural identities of local communities. Rapid waves of change can be observed in local religious identities and in the Etruscan sacred landscape: cult buildings were destroyed, sacred places abandoned or replaced by residential areas, and new organisational forms of managing cults appeared; Latin names and new iconographies were given to traditional deities in public religious buildings dedicated to the official religion, while private and popular worshipping polarized around salvation cults. Changes in the sacred landscape regarded both topographic aspects, such as the visibility of cult sites and their connections to settlements, as well as social aspects, such as the patronage of sacred buildings. This paper proposes to employ a relational approach in order to understand changes in the sacred landscape. It analyzes the geographic and social components of the Etruscan sacred landscape by means of Social Network Analysis (SNA), and it does so by looking at the landscape in its entanglement to the archaeological and epigraphic record between 350 and 80 BCE.

Keywords: local response; religious identities; longitudinal network; social change; entanglement

1 Introduction

The concept of a sacred landscape, as intended in this paper, implies an entanglement of religious behaviors with their social, cultural and geographic contexts (van der Graff & Ellis, 2012, p. 283; Papantoniou, 2013, pp. 33–34). The environmental and geographic conditions of religious buildings and cult sites, in particular their visibility and interconnectedness, have been viewed as part of a semantic system created through religious behaviors, liturgy and ritual. A cult's spatial organisation is an important factor in the way it functioned, and therefore sacred landscapes have a physical dimension and also a social one (Warden, 2016, p. 174; for a focus exclusively on the social dimension: Krämer, in press). This social dimension can

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be defined as “religious space” and it involves the social structures of the communities, in particular those responsible for performing and overseeing religious practices (priests and priestesses, kings, magistrates) as well as each individual worshipper. While the former social group actively assumes agency in shaping the sacred landscape, the latter group participates in the construction of the religious social space through a form of secondary agency, namely by their performance and interpretation of cult practices. This secondary agency can be attested since the earliest evidence of the communitarian cult (Laneri, 2015, pp. 7–8). The aim of the present analysis is to identify changes in the sacred landscape of Northern Etruria, understood here as a social, geographic and topographic space, between the middle of the 4th century and the first quarter of the 1st century BCE.

It is a daunting task to attempt to trace the evolution of the sacred landscape of Etruria during the Late Classical and the Hellenistic period (or even more generally the impact on local religious practices of the great political and economic changes of this period: Stek, 2016, pp. 291–295). Approaching this topic from the point of view of its material culture entails confronting the complexities of a multilayered and only partially preserved archaeological record. Further difficulties lie in the less than consistent collection of archaeological data. These are only partly the result of modern excavations and instead derive mostly from recent surveys or from old descriptions of monuments and votive deposits that have since been lost.

For this reason, after the presentation of the geographic and historical framework of the analysis, particular attention is given to the sources and to the methodological choices applied here. Subsequently, we confront the complexity of the data set in combination with the chosen methodology in a case study. Specifically, we adopt an approach that uses the tools of Social Network Analysis (SNA) as a way of integrating geographic and social data. We will subsequently highlight some of the limitations as well as the potential for wider applications.

The geographic area of the case study, Northern Etruria, is located in central Italy, south and west of the Apennine mountains and north of the river Ombrone. This area was a cultural-geographic region rather than a clearly demarcated political unity. It was populated mainly by minor settlements that shared a common cultural history and a highly interconnected space of interaction.

The chronological arc of this study, between 350 and 80 BCE, corresponds with a period that is traditionally labelled as that of ‘Romanization’. This term has been strongly debated over the last 30 years (Matz, 2005, p. 65; Woolf, 2014; Roth, 2018, pp. 297–298), and as a reaction to the biased views associated with it during the nineteenth century (van Dommelen & Terrenato, 2007, pp. 8–12) especially in English-language scholarship the trend is now to abandon it. Nevertheless, the term will be maintained in this paper, and not only as simply a convenient label for a chronological period. For the Italian peninsula, the definition of the complex socio-political process of “Romanization” is based on a solid archaeological and epigraphic record, which legitimizes its continued use as part of our historical and archaeological terminology (Cecconi, 2006, p. 82–88). It is evident that the term ‘Romanization’ itself, and what we mean with it ought to be constantly reframed in direct connection to local conditions and contexts, because the administrative, political and economic systems within the Italian peninsula were very different from other regions of Europe and the Mediterranean. This paper uses the term to denote a dynamic process of economic and institutional transformations, as well the non-linear and uneven, but still observable, cultural turn of local societies in central Italy due to the interaction of local structures with the growing political power of the city of Rome (Le Roux, 2004, pp. 198–199; Vallat, 2010, pp. 105–106; Woolf, 2014, pp. 46–48). This cultural turn can be observed in the material world of ancient Italy, as well as witnessed at the political, administrative and economic levels, and more broadly in society at large (such as in changes in the use of symbols, languages and imagery).

In northern Etruria this process articulated itself in a complex sequence of political and family alliances, infrastructural transformations of the territory and sporadic military actions recorded by Roman and Greek historians such as Livy and Diodorus Siculus (e.g. Liv. IX, 37, 11–12; Diod. Sic. XX, 35, 4–5; on the possibility that the partiality of these literary sources has led to biased views: Izzet, 2007, pp. 10–15).

The impact of this process on sacred landscapes shows itself in the interaction between a centralized program of political control and a variety of local reactions. Every local response to the changes can be described as a form of resilience of the local power structures, varying in range from the introduction of

new religious structures modelled on the neighboring Roman colonies to the revitalization of ancient local traditions in order to create or maintain local cultural identities (Maggiani, 2003, pp. 137–154). The dynamics of this uneven interaction are clearly visible in the fast pace of change in Etruscan sacred places. For example, on the one hand we witness the monumentalization of urban cult sites, in particular in the coastal centers of northern Etruria and in the Roman colonies during the middle of the 2nd century BCE (which can be viewed as a reaction to the increasing Roman control of the commercial routes along the Tyrrhenian coast). On the other hand, in a process directly contrary to this, we see the destruction or dismantling of some sites after 80 BCE (e.g. Vetulonia, Costa Murata: Da Vela, 2011, pp. 149–150; or Arezzo, San Lorenzo: Zamarchi Grassi & Settesoldi, 1996, pp. 25–29), when civil wars had disrupted life in the Etruscan *poleis* with sieges, destruction and the assigning of land to Sullan veterans (Gagliardi, 2006, p. 3, note 10). It is possible to trace these changes also in the adaptation of iconographies, cults and devotional practices. An example of this can be seen with the cult of the Selvans (Söderlind, 2002, p. 379), in that of Artumes/Tiu/Diana (sanctuaries of the Chiusine area: Nielsen & Rathje, 2009, pp. 280–283; acropolis of Volterra: Bonamici, 2003, pp. 134–153; temple of Scoglietto: Sebastiani, Chirico, Colombini, & Cygielmann, 2015; on the possible emulation of colonial models in Luni: Forte, 1988, p. 199), as well in the cult of Vei/Demetra (Cerveteri, Vigna Parrocchiale: Bellelli, 2008, pp. 329–332).

The traditional approach of archaeological research on the ‘Romanization’ of the Etruscan sacred landscape has dealt mostly with changes in cult buildings, their architecture and their topographic distribution, and in particular with the disappearance of cult sites as territorial markers of the power of local families or cities (e.g. in the *ager clusinum*: Botarelli, 2004, pp. 182–186; in the neighboring *ager cortonensis*: Bruschetti & Giulierini, 2011, pp. 247–248; and between Populonia and Volterra: Di Paola, 2018, p. 11).

The economic function of cult sites in terms of their role in the production, distribution and consumption of goods has equally been diachronically analyzed (for the Orientalizing and Archaic periods: Krämer, 2017, 2018), as has been the loss of their role in political communication, which emerges from changes in the systems of decoration and in particular from the end of the depiction of political myths on pediments in favor of either ornamental decorations (Stopponi, 1979, p. 270; Cristofani, 1988, p. 55; Forte, 1988, p. 199) or sacred scenes (Forte, 1988, p. 199; Paolucci, 2007, pp. 187–188).

The social aspects of the religious landscape, such as the evolution of the role of priests in local communities and the introduction of religious *collegia* or the ‘translation’ of the existent sacerdotal corporations in Roman magistracy (Pfiffig, 1975, pp. 44–49; Haynes, 2005, p. 430), have on the whole been taken less into consideration.

A transformation has also been observed with regard to the religious institutions, in particular between the 3rd and 2nd centuries BCE, which involved a growing participation in the cults that are attested by votive offerings and dedications in sanctuaries (Ceccarelli, 2016, p. 35). These social changes in the urban and suburban religious landscape are particularly evident in funerary cults, in which architectural and topographic changes are strongly entangled with the individual mobility of people and the introduction of new cult practices (on the relationship between individual mobility and changes in worship: Maggiani, 2002, p. 286). In the rural areas of the Etruria the new agricultural organization of the land was one of the main causes of the appearance of collective burial sites, similar to *colombarii* (for the *ager clusinum*: Maggiani, 2014, pp. 51–53; Salvadori, 2014, pp. 61–75), or individual burials with *ustrina* covered by roof tiles. Along with the burial forms themselves, the funerary rituals associated with them also changed. These saw the introduction of libations and offerings of perfumes and wine in front of the closures of the *loculi* or of single urns in collective graves (e.g. in the territory of Chiusi at Balena: Faralli, 2014, p. 44).

Changes related to the perception of supernatural entities like gods and demons are quite difficult to detect, because of how deeply the Roman and Etruscan religions were entangled with each other in the late Republican and early Imperial age (Maggiani, 2002, 285–287; Edlund-Berry, 2006, p. 127; Rasmussen, 2008, pp. 261–263).

These current approaches to changes in the Etruscan religious landscape(s) during the period of Romanization can all be related to actor-based models that search the causes of local changes in global factors. They analyze change as a reaction to the introduction of a new political and economic structure and they contribute to our understanding of local conditions of change in the sacred landscape.

2 Methods

The approach here is the first attempt to understand changes in Etruscan sacred landscapes from a different perspective; namely through an analysis of the connections between places and the embedment of cult sites within the landscape, rather than an actor-based analysis of the changes that these places underwent. The relational approach proposed here aims to integrate the results of previous studies by focusing on the overall changing relationship between sacred sites and the social structures of the period, rather than on analyses of individual local responses. Furthermore, this approach enables us to overcome the core-periphery model that tends to underlie the debate on the concept of Romanization (for the discussion on this model: Schörner, 2005, pp. 95–99). This new network-centered approach leads to the following questions: how did the development of the relationships between cult sites and settlements affect the evolution of religious landscapes? Is the evolution of the social network that connects different settlements with each other during the period of Romanization directly tied to changes in Etruscan sacred landscapes?

Social Network Analysis is a multivariate statistical method commonly applied in the social sciences and archaeology which centers around a relational approach as a way to analyze the complexity of human behavior (the methodology is nowadays applied in many different archaeological studies: Brughmans, 2010; Brughmans, 2012; Fulminante, 2012, pp. 653–670; Knappett, 2013; Blake, 2014; Collar, Brughmans, Coward, & Lemerrier, 2014, pp. 9–13; Collar, Coward, Brughmans, & Mills, 2015, pp. 1–32; Da Vela, 2015).

This methodology presents a number of advantages to help answer our questions. The first is the relational approach that allows us to transcend the focus on two diametrically opposed positions in the discussion about Romanization, because it lies on the relationships between places (the relational ties of the network) as well as on the places themselves (the nodes within the network). The network approach can identify fluid patterns of interaction between local communities and large-scale structural changes within society.

The second is that SNA lends itself well for detecting patterns in how general infrastructural developments in the system of local communities (the network structure) and perceptions of religious identities within them (the properties of specific nodes) depend on each other.

The third is that this methodology is particularly suitable for constructing, analyzing and visualizing multilayered networks consisting of different types of relational ties, for example the geographic proximity between sites, or the relationships between certain families and cult sites, and ultimately for confronting them longitudinally along the full chronological arc of the period. In this way it becomes possible to study the evolution of more entangled and not immediately apparent relational structures (Mizogouchi, 2013; Mol, 2014, pp. 253–254; Da Vela, 2017, p. 148). Consequently, the method is particularly well suited to understanding dynamic structural changes in the sacred landscape, because it is able to take into account the complexity of its geographic and social parameters.

To answer some of the questions on the changes in Etruscan sacred landscapes in the period under consideration, a first test has been conducted in the sub-region of the territory of Clusium, south-west of Lake Trasimeno (fig. 1). The following procedure was adopted (fig. 2): all sites of the geographic region with attestations in the Hellenistic period were collected and inserted in a symmetric matrix showing their degree of connectivity (in this case meaning their topographic vicinity, which facilitates the flow of information). The epigraphic record of these sites was collected and a sample of family names (see Appendix) was inserted in an asymmetric matrix in order to list which names were present in which site; this matrix was in turn converted into a symmetric matrix of kinship. Subsequently, both matrices were processed with the SNA software Visone 2.17 (Brandes & Wagner, 2017), which allowed us to visualize and analyze the social networks that emerge from the two types of relational ties of connectivity and kinship in three different time slots. The degrees of closeness centrality and betweenness were analyzed and their chronological variation calculated for both types of relational ties. Finally, the variation values were cross-connected in order to detect patterns of correlation between geographic connectivity and kinship, and ultimately their impact in the sacred landscape. The single steps of the procedure are discussed below.

Figure 1. The *ager Clusinum*. Shape file retrieved from: <https://www.istat.it/it/archivio/124086>; DTM: Regione Toscana_DG Governo del territorio DTM 10x10 m CC BY 3.0 IT. Realized with QGIS Desktop 2.18.23.

Figure 2. Workflow of the procedure.

The nodes collected for the networks add up to 150 local communities, including 17 cult sites, that were frequented during the Hellenistic period (the sites were collected by including and comparing the entries of the catalogs in: Torelli, 1993; Acconcia, 2003; Botarelli, 2004; Felici, 2004; Paolucci, 2007) (fig. 3).

In line with the goals of the present analysis, a multilayer network was constructed that comprises two types of relational ties: geographic connectivity and kinship.

The first tie, the connectivity, accounts for the possibility of frequent interactions between settlements and cult sites on the basis of their geographic proximity. Links were established between places if the linear distance between them was equal to or less than 5 km, meaning that all nodes within a radius of 5 km of a selected node were indicated in the symmetric matrix with “1”, while those falling outside of this radius were assigned a “0” (fig. 4).

	B	C	D	E	F	G	H	I	J	K	L	M	N	O
		alfni	anaini	ancarni	apre	arntni	ataini	cacnei	cae canti	cainei	causli	ceicnei	cencu	cestnei
1	Bettolle	0	0	0	1	0	0	0	0	1	0	0	0	0
2	Castelnuovo dell'Abate	0	0	0	0	0	0	0	0	0	0	0	0	1
3	Castiglione del Lago	0	0	1	0	0	0	0	0	0	0	0	0	0
4	Castiglione del Lago, Badia S.Cristoforo	0	1	0	0	0	0	0	0	1	0	0	0	1
5	Castiglione del Lago, Cimbanò	0	0	1	0	0	0	0	0	0	0	0	0	0
6	Castiglione del Lago, Gioiella	0	0	0	0	0	0	0	0	0	0	0	0	0
7	Castiglione d'Orcia, San Provenzano, La Ripa, pod. Poderuccio	0	0	0	0	0	0	0	0	0	0	0	0	0
8	Castiglione d'Orcia, Santarelli	0	0	0	0	0	0	0	0	0	0	0	0	0
9	Cervognano loc. Sentinello e Setaiolo	1	0	0	0	0	0	0	0	1	0	0	0	0
10	Cetona	1	0	0	0	0	0	0	0	0	0	0	0	0
11	Chianciano Pod. Gello	0	0	0	0	0	0	0	0	0	0	0	0	0
12	Chianciano Pod. Stiglianese	0	0	0	0	0	0	0	0	0	0	0	0	0

Figure 5. Excerpt of the asymmetric matrix: on the columns a sample of family names, on the rows the sites.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46
1	Bettolle	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	Castelnuovo dell'Abate	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	Castiglione del Lago	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	Castiglione del Lago, Badia S.Cristoforo	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	Castiglione del Lago, Cimbanò	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	Castiglione del Lago, Gioiella	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	Castiglione d'Orcia, pod. Poderuccio	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	Castiglione d'Orcia, Santarelli	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	Cervognano loc. Setaiolo	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	Cetona	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	Chianciano Pod. Gello	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

1,6,9,12,24,31,40,60,68,71,75,85,87,90,133,144,147,149
2,4,5,31,39,45,60,61,90
3,5,6,39,43,56,75,80,85,89,133,143,149
4,2,5,6,9,18,24,31,32,33,34,35,38,39,40,45,49,51,58,59,60,61,65,69,74,75,78,79,80,85,89,90,98,99,133,147,149,152
5,2,3,4,6,31,39,43,45,60,61,75,80,85,89,90,149
6,1,2,4,5,9,12,24,31,33,35,38,39,40,43,58,59,60,68,71,74,75,80,85,87,89,90,133,144,149
7,34,0
8,0,0
9,1,4,6,10,12,18,24,31,32,33,34,40,49,51,52,60,65,68,69,71,74,75,77,79,81,85,87,89,90,98,120,133,144,147,149,152
10,9,31,51,52,77,81,120

Figure 6. Excerpt of the sites in the symmetric matrix, on the base of onomastic (above) and transformation in a link list (below).

After collecting the data for both types of relational ties, the networks that emerged were analyzed at three different time slots, defined as attributes of the places (350–250 BCE, 250–150 BCE, 150–50 BCE). The measurements betweenness and closeness centrality of the networks were analyzed at all three time slots in order to detect, respectively, the broker function of places and their centrality (figs. 7–8).

The variations in betweenness and closeness, as well as the variation in the number of connections (indegree) were compared (fig. 9). The specific variations of cult sites were also considered separately (fig. 10). Since most epigraphic attestations of family names derive from funerary contexts, it was not possible to rank the cult sites alone in connection to kinship: in this case the comparison had to be conducted on the whole network set, including the settlements.

The variation of the role of the places in the network can be expressed as differences in the closeness and betweenness values, and when ranked these allow us to analyze changes between the 1st and the 2nd and between the 2nd and the 3rd time slots.

To cross-connect the geographic with the social variations in the role of places within the network, higher and lower rates of variation were considered in tandem in the connectivity and kinship rankings (fig. 11), with particular attention being given to correlations, or the lack thereof, in the increase or decrease of the importance of particular cult sites within the network in both data sets, as well as with to their geographic position (figs. 12–13).

Figure 7. Longitudinal graph of the networks for the tie connectivity. The first Phases is represented in blue nuances, the second phase in red-orange and the third phase in violet. Darker nuances correspond to higher values of betweenness centrality. The significance of the variation visualized in the graph corresponds to a numeric value in a report table (see fig. 9). Graph and Analysis: Visone 2.17 (Brandes & Wagner, 2017).

Figure 8. Longitudinal graph of the networks for the tie kinship. The first Phases is represented in blue nuances, the second phase in red-orange and the third phase in violet. Darker nuances correspond to higher values closeness centrality. The significance of the variation visualized in the graph corresponds to a numeric value in a report table (see fig. 9). Graph and Analysis: Visone 2.17 (Brandes & Wagner, 2017).

	connectivity Ph 1			connectivity Ph 2			Variation Ph 1-2			connectivity Ph 3			Variation Ph 2-3			Kinship Ph 1			Kinship Ph 2			Variation Kin Ph 1-2			Kinship Ph 3			Variation Kin Ph 2-3		
	B	C	I	B	C	I	DB	DC	DI	B	C	I	DB	DC	DI	B	C	I	B	C	I	DB	DC	DI	B	C	I	DB	DC	DI
1 Bettelle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2 Castelnuovo dell'Abate	0	0	0	0	0	0	1	0	0	1	0	2	3	0	2	2	0	0	0	0	0	0	0	0	0	4	2	0	4	2
3 Castiglione del Lago	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4 Castiglione del Lago, Badia S.Cristoforo	0	0	0	0	0	0	0	0	0	0	0	2	3	0	2	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 Castiglione del Lago, Cimbanaro	0	0	0	0	0	0	0	0	0	0	0	25	3	25	1	3	0	0	0	0	0	0	0	0	0	15	2	1	15	2
6 Castiglione del Lago, Gioiella	0	0	0	98	2	5	98	0	5	0	1	3	98	1	2	0	0	0	30	3	1	30	3	1	9	2	1	21	1	3
7 Castiglione d'Orcia, San Provenzano, La Ripa	0	3	10	0	2	5	0	1	3	0	1	3	0	1	2	23	7	4	16	3	1	7	4	3	3	2	1	13	1	4
8 Castiglione d'Orcia, Santarelli	0	3	11	0	2	5	0	1	3	0	1	3	0	1	2	23	6	5	10	3	1	13	3	4	0	0	0	0	0	0
9 Cervignano loc. Sentinello e Setaiolo	0	0	0	0	0	0	0	0	0	0	0	7	1	3	7	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0
10 Cetona	0	0	0	0	2	5	0	2	5	0	1	3	0	1	2	0	0	6	2	1	6	2	1	1	1	1	5	1	1	0
11 Chianciano Pod. Gellu	0	0	0	0	2	6	0	2	6	37	1	3	37	1	2	0	0	6	2	1	6	2	1	1	1	0	5	1	1	0
12 Chianciano Pod. Stiglianese	0	0	0	0	0	0	0	0	0	4	1	3	4	1	3	0	0	0	0	0	0	0	0	0	1	2	1	2	1	0
13 Chianciano Pod. Stigliano	0	0	0	0	2	5	0	2	5	7	1	3	7	1	2	0	0	4	2	1	4	2	1	1	1	1	3	1	1	0
14 Chianciano S. Elena	0	0	0	0	0	0	0	0	0	3	1	2	3	1	2	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0
15 Chianciano Campo Grande	0	0	0	0	0	0	0	0	0	1	1	2	1	1	2	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0
16 Chianciano Campobibio	0	0	0	0	0	0	0	0	0	1	2	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17 Chianciano Colle Tolle	0	3	12	0	2	5	0	1	2	0	0	0	12	1	2	4	4	5	1	2	1	3	2	4	0	0	0	1	2	1
18 Chianciano Collegiata	0	0	0	0	0	0	0	0	0	1	2	0	0	1	2	0	0	1	2	1	1	2	1	0	2	1	1	1	0	0
19 Chianciano Le Camerelle	0	0	0	0	2	4	0	0	4	10	1	2	10	1	2	0	0	1	2	40	1	2	40	0	1	33	1	1	1	0
20 Chianciano Le Morelle	0	2	5	0	2	4	0	1	1	1	2	1	2	1	4	4	6	1	2	1	3	2	5	0	1	1	1	1	1	0
21 Chianciano Le Piane	0	2	5	0	2	3	0	0	2	0	1	2	0	1	1	4	3	6	0	2	1	4	1	5	0	1	0	0	1	0
22 Chianciano Magliarella	0	0	0	0	2	0	0	2	0	11	2	0	0	9	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
23 Chianciano Monte di Prati	0	0	0	0	2	3	0	2	3	0	1	2	0	1	1	0	0	1	1	2	4	1	2	0	1	0	1	0	0	0

Figure 9. Example of calculation of the longitudinal variation in the measurements of the network. In the blue sector the first phase, in the orange sector the second phase, in the yellow sector the difference, pointing out the variation as increasing (green) or decreasing (red) value. In the first column of each Phase is the percentual measurement of betweenness centrality, in the second column of the closeness and in the third of the indegree.

Object_ID	Cult_Place_Name	betw 1	betw 2	betw 3	clos 1	clos 2	clos 3	ind 1	ind 2	ind 3
2	Castelnuovo d. Abate	0,000	0,000	0,000	0,000	0,000	1,728	0,000	0,000	3,511
3	Castiglione del Lago	0,000	0,000	0,000	0,000	0,000	1,958	0,000	0,000	3,321
10	Cetona	0,000	1,000	0,000	0,000	1,981	1,443	0,000	5,357	2,824
15	Campo Grande	0,000	0,000	1,000	0,000	0,000	1,286	0,000	0,000	2,634
31	Chiusi	0,005	0,012	0,000	2,350	1,245	0,000	2,500	1,136	0,000
36	Martinella	0,000	0,014	0,000	0,000	1,245	0,000	0,000	1,136	0,000
42	Campo Libero	0,000	0,000	0,000	2,000	0,000	0,000	0,357	0,000	0,000
45	Montevenere	0,000	0,010	0,000	0,000	1,228	0,000	0,000	0,974	0,000
73	San Bartolomeo	0,000	0,000	1,000	0,000	0,000	1,286	0,000	0,000	2,634
85	Montepulciano	0,000	0,008	0,000	0,000	1,178	0,943	0,000	0,487	0,458
97	Casa al Savio	0,005	0,000	0,000	2,000	0,000	0,000	2,000	0,000	0,000
98	Casa al Vento	0,005	0,008	0,000	2,319	1,219	0,987	2,000	0,893	0,763
133	Balena	0,000	0,000	0,000	0,000	0,000	0,887	0,000	0,000	0,076
142	Torrita	0,000	0,000	0,000	0,000	0,000	0,878	0,000	0,000	0,038
149	Acqua Santa	0,000	0,008	0,000	0,000	1,202	0,970	0,000	0,731	0,469
150	Fucoli	0,000	0,008	0,000	0,000	1,219	0,982	0,000	0,893	0,725
153	Radiconfani	0,000	0,000	0,000	0,000	1,125	0,906	0,000	0,810	0,191

Figure 10. Excerpt of the variations of the measurements of betweenness centrality, closeness centrality and indegree for the tie connectivity in urban and extra-urban sanctuaries and in healing cult places. In blue nuances the first phase, in orange nuances the second phase and in violet nuances the third phase.

ID	I-II connectivity	ID	II-III connectivity	ID	I-II Family Names	ID	II-III Family Names
7	3,379	11	26,186	31	1,894	31	8,263
20	0,526	19	8,026	87	0,013-	60	6,99
8	0,465	13	0,543	134	0,027-	40	3,85
		84	0	38	0,095-	149	3,62
21	0,268	87	0	29	0,665-	61	0,001-
28	0,014						
29	0,003	23	0,385-	34	2,358-	10	4,747-
61	0,003	21	0,557-	17	3,093-	11	4,868-
149	0,003	8	14,789-	20	3,647-	8	7,026-
34	0,077-	7	17,703-	60	6,095-	6	12,152-
17	-2,061	6	27,248-	7	8,202-	7	19,596-

Figure 11. Ranking of the variation of measurements for the tie 'connectivity' and the tie 'kinship'. In blue the first 5 positions in the ranking, in red the last 3. The ID-Number is unique for each site. Following the position of the sites (ID) in the ranking it is possible to compare the chronological variation of their role in the networks of both ties.

network of local elites broke down. Probably, the patronage of elites at urban and extra-urban cult places was not the key factor for these sites' survival during this period, but rather it was the entire community that took responsibility for the management of the sacred landscape, in particular in the cities. The impact of the breakdown of social networks was higher in urban centers, which were particularly important in the political organization of the territory, and it was lower in minor centers and small settlements or in dispersed residential units in the countryside. Seen within this context, the persistence of sanctuaries and cult sites linked to healing and nature cults within the longitudinal network is remarkable (see the cave cult at Cetona: Paolucci & Minetti, 2003, pp. 143–147; or, the water cult at Chianciano, I Fucoli, Sillene and Acqua Santa: Paolucci, 2007, pp. 187–188). This probably shows the different impact that the large-scale political and economic changes had on popular and agro-pastoral cults (Botarelli, 2004, p. 183; Nielsen & Rathje, 2009, p. 283) and in rural areas more generally (for religious agency in rural areas during the period of Romanization in Italy: Stek, 2016, pp. 299–300).

4 Discussion

The attempt in this paper to apply social network analysis to the issues surrounding changes in the Etruscan sacred landscape has allowed us to identify some limitations, as well as the potential of this method in relation to a series of specific questions.

Some of the method's limitations are implicit in the nature and quality of the underlying sources of the analysis: epigraphic sources present some complications, because they are unequally distributed between urban and sub-urban contexts and the countryside. Basing the analysis exclusively on the relationships between cult places and kinship patterns may unduly penalize the rural component of the sacred landscape, as these sites are far away from the urban centers. A further issue with the use of epigraphic records is the stratification of the attestations, in particular the possibility that family names spread before their first attestation in the *necropoleis*. This chronological stratification of family names somewhat diminishes their usefulness in establishing connections between places on the basis of kinship.

However, these limits can be overcome by improving the size of the epigraphic records used and by integrating still further sources into the network analysis. For these reasons, a future development of the present study will include additional layers of social network analysis that will introduce further relational ties, such as consumption patterns of ceramic and metal objects (Da Vela, 2018), which will allow us to link places also on the basis of similarities in consumption choices and the accessibility of consumption goods.

The application of SNA clearly has great potential for the analysis of sacred landscapes as an entanglement of geographic and social factors. This method permits a structural longitudinal analysis that will make it possible to identify changes in local religious and social structures in direct connection with the general developments of the infrastructural system. This approach is especially promising for deeply entangled areas like Etruria, in which local communities are an expression of segmented societies characterized by a high degree of social differentiation and stratification.

The pilot project suggests some general observations on the advantages of adopting a structural approach alongside a traditional actor-based one as a way to understand changes in the Etruscan sacred landscape. The point is not so much to choose one over the other as the best way to achieve results. Rather, it is to discuss if an alternative approach could integrate the methods that are currently more widely used by being able to identify aspects of this process of change that have so far remained invisible.

In the more commonly used approach, the geographic position of cult sites is analyzed as a marker of local power within the landscape. These places play a role in the economic, political and symbolic system of Etruscan society. The specificities connected to the ritual practices, the accessibility, the visibility and the architectural and decorative systems of these cult sites are usually evaluated as expressions of cultural choices that are dependent on the codes of communication and the values of Etruscan society. However, such an exclusive focus on local actors does not acknowledge the full picture of social change at work at the time; that is to say that they view local choices as deriving from the individual interactions of local communities with external push and pull factors. Instead, the interactions that determine local changes

could well be consequences of a chain of short-term and long-term events. Thus, local responses are indirectly conditioned by larger-scale structural changes, even if not all of these changes are perceived directly in their full complexity by local actors.

In the relational approach adopted in this paper, the geographic position of cult sites is not the *a priori* focal point of the analysis but something more like a data point that is used in order to analyze relationships between these sites and settlements. Their structural role is considered through their dynamic interaction within the geographic and social infrastructure of this system, while ritual practices, visibility and accessibility are considered as markers of religious identities, whose changes are directly connected to the larger-scale evolution of the relational structure.

In conclusion, it could be said that while the more commonly used agent-based approach favors the view of an internal evolution of Etruscan society caused by external factors, the relational approach used in this paper analyzes the dynamics of the larger-scale structural changes in Etruscan society by considering their impact on local realities.

These observations suggest the complementarity of the two approaches, with each being able to see one of two sides of the same medal, and they suggest what may be gained from integrating an agent-based view of sacred sites with a structural relational approach that analyzes them as part and parcel of the broader context of the Etruscan sacred landscape. By striking a balance between an actor-focused methodology and the relational approach we will be better able to integrate both local decisions and larger-scale structural factors in our understanding of changes in the Etruscan sacred landscape.

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Appendix: List of the Family Names Sampled for the Network of Kinship

alfni, anaini, ancarni, apre, arntni, ataini, cacnei, cae canti, cainei, cencu, cestnei, clanti, clani, cupsna, fastntru, fraucni, hapuri, herini, latini, marcna, matausni, pantna, papasa, pensnei, pethna, pethna scire, petrui, pulfna peris, pumpu, purni, rathumsna, remzna, sepi, sathna, seianti/sentinate, seianti hanuna, seianti sinunia, sentinate caesa, sentinate cumere, sethre, tetina, tlesnei, trepu/trebuni, tutna, umrana, urinate, velsi, vetu, vipine.

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