

SETTLEMENT AND VIEWSHED DYNAMICS  
BETWEEN THE ANCIENT SITES OF THE EREI  
AS A KEY OF HISTORICAL LANDSCAPE INTERPRETATION

1. INTRODUCTION: ARCHAEOLOGICAL FRAMEWORK AND RESEARCH TOPICS

The eastern side of the Erei hills and its northern borderline represented by the Dittaino river, a good way of communication leading to the fertile Catania's plain, were the scenario of a millenary process of human occupation deeply connected to the morphology, visibility and natural resources of the place. Here the richness of the natural environment was featured by the great fertility of the soil, due not only to the clay substrate, full of sulphur deposits, but also to the abundance of water, coming from numerous springs, streams and rivers (some partially navigable) and to several woods with various tree species: all these natural features promoted the development of ancient pastoralism and agriculture, together with material productions. The strategic position of this area and its morphology, characterized by sharp peaks alternated with large valleys that allow reciprocal viewshed, has also ensured the defence and control of the full area. The landscape of the study area was subject to continuous and gradual transformations, generated by anthropic and natural agents, which mainly concern all the activities of human allochthonous communities adjusting the natural environment to their familiar, economic and cultural needs: in relation to the altimetry of the region, they selected higher and higher settlement areas but connected with the best available natural resources.

From the beginning of human frequentation there was a shift in place occupation: from sites placed along the Dittaino valley, 250 m above sea level, up to locations placed at 900 m above sea level, where the site of Rossomano, for example, is attested. Very few evidences belong to the Upper Palaeolithic period, when hunter-gatherers occupied hilltops and rock shelters along the main rivers. Since the Neolithic period until the early Bronze Age a long-time continuity in settlement patterns is well documented, centred on the fertile soils of hill slopes and, in some cases, nearby those geological sources, as sulphur and salt deposits.

From the end of the Middle-Bronze Age, a reduction in number of sites could be interpreted as a result of a new broad settlement aggregative model. During the following centuries the interrelation between indigenous peoples and communities of various origin and provenance generated mixtures, interactions and fusions of heterogeneous cultural elements, creating, as a general result, an archaeological record marked by a new and common material culture. The settlements mainly followed a centripetal process, clustering

in proto-urban sites often protected by defensive systems. Later, during the Late-Archaic period, many of these sites became real *poleis*, some with big dimensions and shape and features characteristic of ancient Greek culture. Most of them were bordered by defensive city-walls, *frouria* and isolated sighting towers, transformed in the following centuries in integrated defensive systems, as a consequence of the development of siege techniques in all the Mediterranean world during the Hellenistic period.

In the Roman period the main urban centres were drastically reduced in number and most of them became just markets and pivot points along the ancient routes, even though they remained important religious places for ancient rites celebration. The region's ruralisation, together with the abandonment of many sites and the construction of new ones (mainly for agriculture), soon initiated a process of ancient settlements reuse, continued especially in the centuries following the late-ancient period: this process filled the rural aspect of the region with scattered and punctual places of human presence and activity, making the landscape strongly anthropized.

Many of these abandoned sites, never reoccupied, except in an ephemeral manner, are still visible and preserved by modern and contemporary buildings made in Sicily after the Second World War: these sites stand out today as main landscape view-points of the area and it is clear that the plot of the ancient settlement process was woven around them. These observation points, well distributed in the landscape, became symbolic spots with a strong cultural meaning. Here the main archaeological evidences are flanked by artificial small caves still in use, with stretches of ancient roads transformed in "trazzere" (typical Sicilian pathways) and modern rural houses. All these places belong to a unique cultural identity, which today gives full meaning to the natural framework. It is a rare landscape heritage, a real geographic fossil, well perceivable by experienced eyes. For an historical revaluation of the region, willing to be part of its rich past, it is necessary to increase this potential paying the maximum attention to the current meaning of landscape, in order to make consciousness a promoter of preservation of this heritage.

To proceed to the study and consequent enhancement of this region, considering its various aspects and resources, a holistic approach is required, aware of actual theories, methods and techniques of Landscape Archaeology and its integrated scientific attitude. For the historical knowledge of this area, in addition to this method, we propose a systematic research through the aid of spatial analysis, viewshed and perceptivity using digital and electronic tools for geographic management and virtual reproduction of the ancient landscape, its natural phenomena and ancient vicissitudes, in a dynamic and diachronic framework.

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## 2. METHODS AND TECHNIQUES

The research, aimed at the historical and geographical contextualization of the territory of the Erei, followed the Landscape Archaeology procedures, which indissolubly link the archaeological record to its geographical space, morphology and stratigraphy, as well as to the exploitation of natural resources (CAMBI 2011, 2015). Those factors, which have changed over the centuries by effect of man and nature, determined here the development and differentiation of settlement and production dynamics, but also the long life of some places, permanently frequented, that today define the cultural uniqueness of the territory. The intent of our work then it is not only tracing a global human history of the area, but also trying to give a higher value and meaning to particular landscape features which can become solid cornerstones for sustainable and participatory development of the area (VOLPE 2019, 131-160).

All documentation has been collected in an information territorial system planned to record and elaborate the archaeological evidences at a “site” level.

First we have implemented a relational database, in order to summarize all data coming from previous published bibliography, using the MSAccess DBMS and according to ICCD formats for archaeological sites (<http://www.iccd.beniculturali.it/>). We must say that the published archaeological record is uneven and incomplete, especially in the case of older studies: one of the most difficult task was therefore the reworking of this documentation. As a second (but almost contemporary) step we implemented a GIS, using ESRI ArcGis 10.6, primarily creating a new cartographic base, set in the GCS\_WGS\_1984 geographic system and organized in specific themes to represent the characteristics of the area in the most appropriate and complete possible way.

A DEM of Sicily with a resolution of 20 m per pixel, downloaded from the Portale Geografico Nazionale (<http://www.pcn.minambiente.it/mattm/>), was superimposed on the satellite images available by ESRI software (Fig. 1). We added then our area sheets of the Carta Tecnica Regionale (<http://www.sitr.regione.sicilia.it/>), in vector format and 1:10.000 scale, from which specific thematic layers were developed. In order to have historical information on the area, we have georeferenced sheets no. 268 and 269 of the Istituto Geografico Militare topographic maps (scale 1: 25.0000) made in 1940. Here a situation of the island immediately preceding the Second World War is portrayed; thanks to this historical information layer, it was possible to carry out an attempt to redesign the morphology of the places using the C.T.R. contour lines (reported at a distance of 10 m) and integrating them with those reported on the IGM maps; the end result was a new and more accurate DTM, useful for spatial analysis in comparison with the downloaded DEM.

Over this base-map, in parallel with alphanumeric database population, we developed a new general plan of the archaeological sites (Fig. 2) using

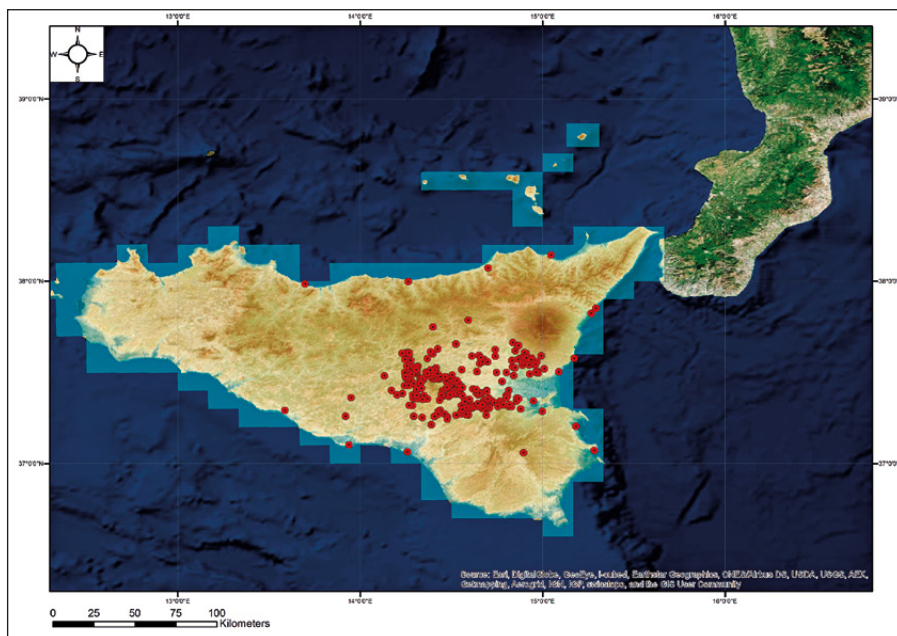


Fig. 1 – General framework of the Sicilian archaeological context analyzed.

also the fundamental information reported in the Piano Territoriale Paesistico Regionale della Sicilia (province of Enna), which reports the results of the Morgantina Survey and those of the surveys carried out by the Centro Studio di Archeologia Mediterranea (VALBRUZZI 2016). Another great resource were the digital maps of the Barrington Atlas of Greek and Roman World, available at the Ancient World Mapping Center ([https://awmc.unc.edu/awmc/map\\_data/](https://awmc.unc.edu/awmc/map_data/)). The archaeological sites were designed in “point format”, checking their location on the field as well: it was a difficult operation since the toponyms are often ambiguous and easily confused. In addition, some sites are no longer visible today, while others seem to have been positioned incorrectly on previous maps. Subsequently, having linked the features of the archaeological sites to the DBMS tables, diachronic period maps were created through SQL, distinguishing the ancient sites by type and function (Fig. 3).

Once defined the main historical periods of the territory, an attempt was made to understand the relationships and hierarchy between ancient sites, trying to understand also the elements of mutation or survival linked to economic or cultural aspects. A series of spatial analyses have therefore been carried out into three distinct sectors: site location analysis, modelling movement and transport, visibility analysis (VERHAGEN 2018). Site catchment and

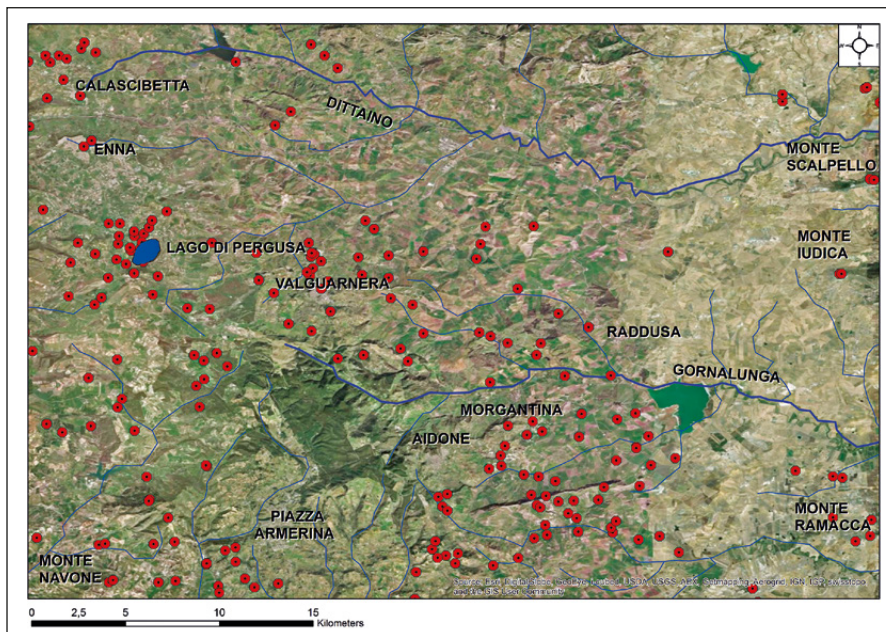


Fig. 2 – General framework of the study area with the evidence of the archeological sites.

buffer analysis have been combined with Thiessen polygons generation, for main sites territorial areas evaluation and comparison (Fig. 4): it has already been highlighted, in fact, how the effectiveness of these methods increases if used together (ALFANO, MURATORE 2014; QUIRINO 2017).

After various experiments we can make preliminary observations on the settlement processes: from our elaborations it transpires how in the Iron Age, in conjunction with a population growth, the main sites increase exponentially (with a continuity of life in the main centres), placing themselves in elevated places, often with limited reciprocal distances; in the Archaic Age some of them, however, were abandoned, while for the Classical-Hellenistic Age it is possible to observe a more rational distribution in the territory of real centripetal towns, such Morgantina, Monte Rossomanno and Montagna di Marzo, positioned at a constant and reciprocal distance of about 9 km (Fig. 3).

A second type of analysis concerned the generation of movement and transport models linked to the reconstruction, for each age, of the communication network: using the methods most frequently applied by archaeologists for least cost path analysis (HERZOG 2014, 2016), we have tried to identify the probable routes, from site to site, according to the slope of the places and their accessibility. Those routes were compared with known archaeological

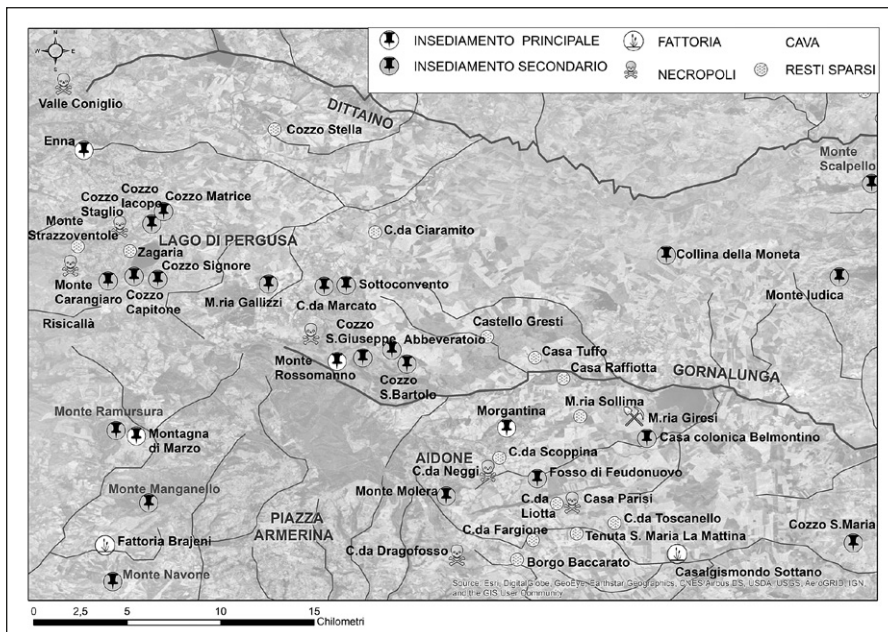


Fig. 3 – Map of the Classical-Hellenistic period.

information on ancient roads, also taking into consideration the paths visible on the 1940 IGM tablets which follow the natural course of the terrain and often suggest the integration of the roads proposed automatically.

The results show that many of the paths already beaten during proto-historic ages were absorbed in a more integrated communication network during the classical age and then reused in the subsequent late ancient and medieval ages: a phenomenon already highlighted in other cases and referable not only to the saving of time and energy but also to a cultural will to connect to the pre-existences (VERHAGEN 2018, 17). These two investigation tools are generally accompanied by visibility analysis (DE MONTIS, CASCHILI 2012; LOCK, KORMANN, POUNCETT 2014) whose initial limits have been highlighted and solved by various scholars over the years with the elaboration of algorithms and software: multiple, cumulative and total viewsheds are implemented (LLOBERA 2003) and it is also possible to use plug-ins for more complex procedures likes fuzzy and probable viewshed.

In our work, the visibility studies essentially concerned a smaller area, near the actual Valguarnera town, where archaeological record collection was more accurate: one of these investigations, carried out in the medium range, concerned the cumulative viewshed of all the sites that for a long period,

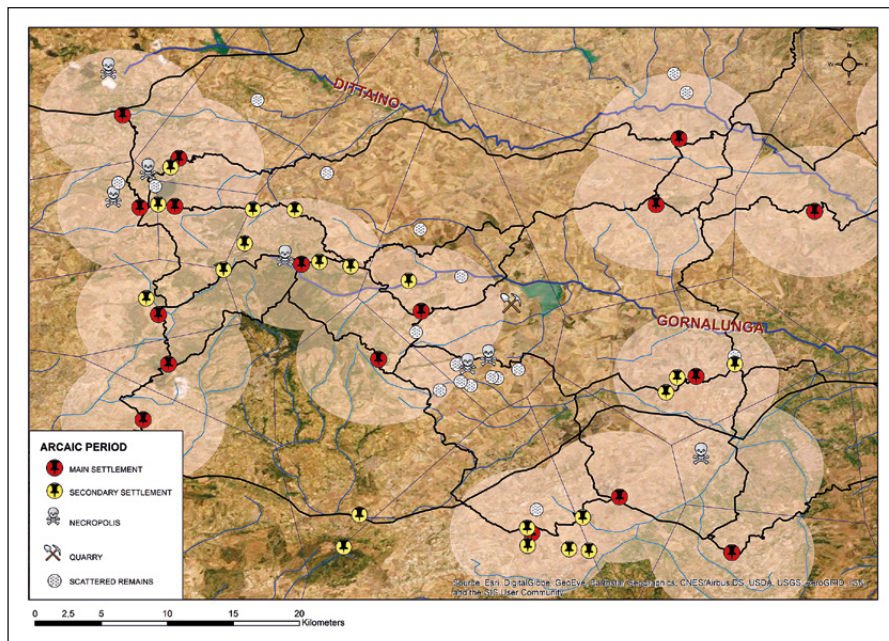


Fig. 4 – Buffer analysis and Thiessen polygons for the study of the settlement dynamics.

between the protohistoric and classical age, have been used as observation points (Fig. 5); it is possible to mark the cultural significance of the memory of the landscape that these places have played and still do, like cornerstones of the territory that they have observed.

E.B.

### 3. DEVELOPMENT AND VIEWSHED ANALYSIS OF THE VALGUARNERA TERRITORY

The investigated territory is included in a radius of 8 km, starting from the archaeological site of Contrada Marcato, near the actual town of Valguarnera Caropepe (Fig. 3). The morphology of the place is characterized by the alternation of moderate hills, low plains and high peaks: in order to better understand the dynamics of the area we must keep in mind this distinction, considering that the orography has strongly determined the distribution of the sites. Here a first moment of occupation can be dated to the Final Neolithic and is documented by a prehistoric village found at Contrada Marcato. The existence of other villages scattered throughout the territory, relating to the phases of the final Copper-Ancient Bronze Age, is given by the presence of numerous nuclei of cave tombs (DRAIÀ 2018). Among these should be

mentioned the site of Contrada Gallizzi, where several tombs, dating back to the Bronze Age, were made on the chalky-sulphurous bedrock (Fig. 3).

The development of these small centers in a later age led, probably due to the emerging external threats of new people on the island, to a perch towards safer and more controllable areas, as well as the abandonment of previous settlements. The arrival of Greek populations in the hinterland, through a relationship of synecism with the local communities – similarly to what happened in the near contexts of Morgantina, Montagna di Marzo and Enna (VALBRUZZI 2016, 15) – led to the urbanization of the area with the birth of the fortified city of Rossomanno (Fig. 3). During the subsequent Classical-Hellenistic period the presence of farms, scattered throughout the territory, and the reoccupation of previously abandoned area suggest the desire of total control of the available resources and, probably, the need of larger areas cultivation for the growing number of inhabitants in the territory. During the Roman period, when Sicily became a Roman Province and the granary of the capital, we witness the abandonment and the downsizing of some settlements like Rossomanno, or the remodeling of others like Contrada Marcato. At the same time new and numerous rural settlements arise in the area, scattered throughout the district with the function of control and sorting of the granary resources (BRIENZA 2018, 209-213). Finally, the political transformations that occurred between the Byzantine and Islamic Ages also affected this part of Sicily in an incisive way, once again leading to new settlement systems.

The mild phenomenon of modern urbanization in the area, whose population density today is among the lowest in the entire nation, has made it possible to perform a series of investigations aimed at understanding the anthropization processes of the territory. In particular, an intervisibility analysis was produced from various observation points taking into consideration the sites studied in their chronological development. What emerged during our analysis, taking into consideration any reasonable doubt, is a very interesting picture of long-term continuity in the main first occupation settlements, due to various factors: morphology of places, proximity to available resources, control of the surrounding area, ease in reaching supply places. The continuous surveys have allowed a clearer reading regarding the positioning of the sites which appears to be not casual but dictated by strategic means. The ratio between the sites has increased over the millennia and it is mainly related to the rise of external threats (Fig. 5).

However, the initial anthropization seems linked to available resources whose form and types of exploitation should be better identified, like it has been already done for other Sicilian contexts (CULTRARO 2016), while the visibility ratios between sites do not seem to be the main basis for the choice of places, mostly related to the cultivation of land and the breeding of cattle. The Marcato site is the only one to enjoy a dominant position, allowing the



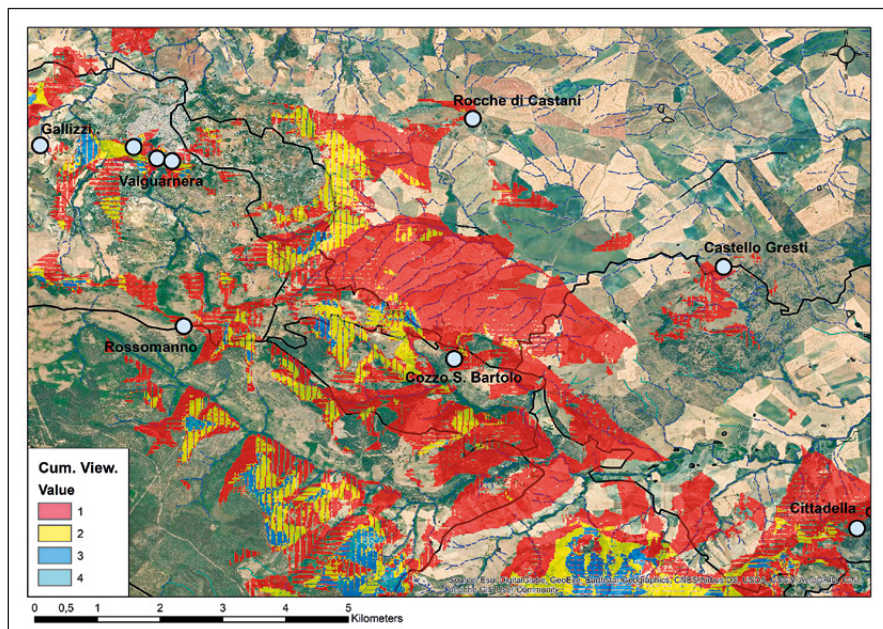


Fig. 5 – Cumulative viewshed of historical observation sites and the territory memory.

visibility of large portions of the Sicilian hinterland. From the beginning of the Iron Age new communities fully exploit the Erei mountain system, where between mountainous areas, steep slopes and small waterways, the area offers naturally defended and easily controllable spaces. Unlike what happened previously, there is a new reorganization of the settlements in the area, as well as an increase in the population, readable by the numerous necropolises of the period. The inhabited areas are located in higher and more impervious places, through a checkerboard arrangement, in order to increase the degree of mutual visibility, for better control (Fig. 4).

This phenomenon reached its peak in the Archaic Age when the visibility relationship between the indigenous towns, also in relation to bordering areas, became the key element for their survival. Later, during the Classical-Hellenistic period some of the first occupation sites, such as Marcato, partially regain their vitality, while other new small settlements that arise fall inside the *chora* of the main Rossomanno site, becoming places of surveillance and agricultural exchange. After the Roman conquest it is possible to see, in general, a new reorganization of the cities in Sicily, as well as a more speculative management of the land: this leads to a partial abandonment of urban hinterland towns. The site of Rossomanno, for example, loses part of its vitality,

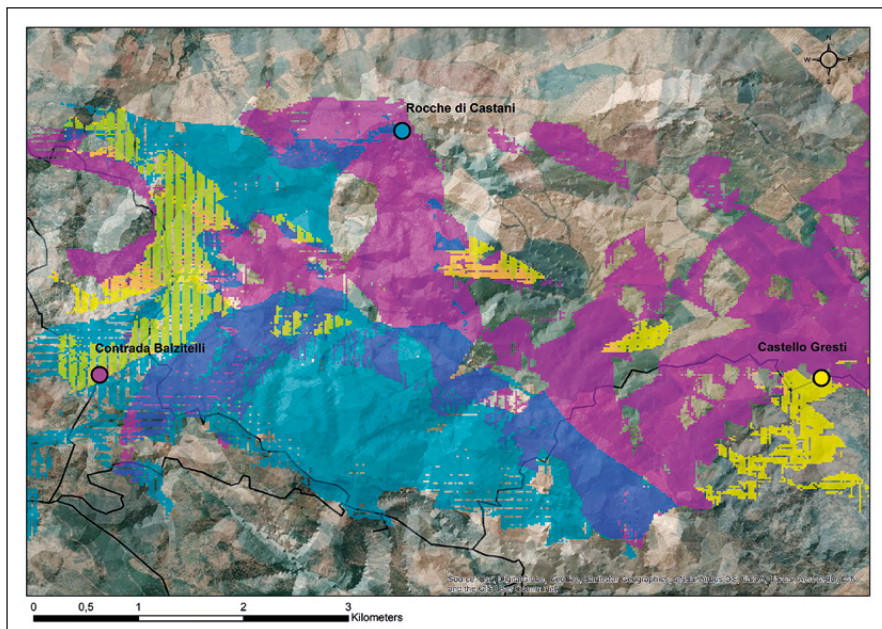


Fig. 6 – Multiple viewshed of medieval control towers.

due to a population decrease and a consequent reduction of urban space. At the same time numerous *mansiones* and *villae* arise, scattered in the territory and mainly located along the main roads or in hilly areas for direct control of the land. Visibility relationships remain among the few existing settlements but are no longer a direct control element. Finally, concerning the Medieval Age, there is a re-occupation of the highland sites (which has never ceased to exist) such as Rossomanno and Contrada Marcato, generated by the Arab incursions since the 8<sup>th</sup> century AD.

The defensive wall of Rossomanno is now strengthened and new control towers are built along its perimeter. The sense of fear and the consequent need for control clearly emerges with the discovery of some structures suitable to signal imminent dangers. These are little control towers, located in the territory on a regular basis and precise recurrent distances between them, in order to transmit information through fire signals. These little towers were set in order to control the most important roads and areas easily reachable by the enemy. Through their capillary dislocation, with a regular distance of 4 km from each other, it was possible to anticipate the enemy's moves by counting on a visual correspondence (Fig. 6). The observation radius of each sighting tower was calculated by placing it in relation to those placed in line

of sight. This control system seems based on a mutual triangulation of each observation point, in a logic of reciprocity such as to allow the control of a large portion of the territory. However, what has just been proposed is still being studied and must be integrated by future developments of our research.

E.D.

#### 4. CONCLUSIONS

The first results of our research give us a new starting point to perform other analyses in order to understand the endogenous development dynamics that have taken place in this territory. It is possible to say today that the relationship of visibility of the sites played a fundamental role for the development of the area, relatively also to the continuity of some settlements from the time of first occupation until the medieval age. Probably the sites with the best visual position had a lasting continuity of life over time as well as a leading role in relations with the other settlements of the area. Although we are aware of the limits presented by the applied method, the relationships deduced from our analysis contributed significantly to the understanding of the territory. This allowed to show how the human habitat evolved in function of the available resources, pushing up the creation of routes suitable for development that later became the most important roads network of ancient times.

Today, the reading of this territory is promoted by the lack of contemporary visual barriers; in consideration of this, it is necessary to act for a preservation of this ancient landscape defining, protecting and enhancing several landscape observation points of the territory, permeated by historical memory and holders of a view that has never changed over the centuries.

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## ABSTRACT

The inner Sicilian area of the Erei hills, crossed by rivers and important streams directed to the Catania's lowland, witnessed very ancient human occupation and activities, starting from the Upper Palaeolithic. Here the dynamics of human activities and the organization of the supply basin during early times were distinctive in certain historical periods: some featured a substantial continuity with the earlier phases, while others showed a complete discontinuity with the older human settlement framework and a new organization of the area and activities connected with the environment. These agricultural, proto-urban and urban communities organized their existence on the exploitation of natural resources, distributing themselves according to the local morphology. They built, mostly on top of the hills, constructions used as control viewpoints of the area, and created a complete communication network to connect settlements of the same or different level. Those features in several cases had a long-term continuity that survived to dramatic historical changes and represent today the optimal way for a right perception of current landscape and its millenary history.