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SOUNDSCAPE AND CATCHMENT ANALYSIS FOR A SPATIAL GEOGRAPHY OF MEDIEVAL MONASTIC ESTATES IN SOUTHEASTERN TUSCANY (11TH-12TH CENTURIES)

1. Soundscapes: between phenomenology and spatial geography

The concept of soundscape (or acoustic space) has been described and defined in different ways, especially in the context of landscape ecology (Pijanowski *et al.* 2011; Truax, Barrett 2011; Farina 2014). The soundscape can be understood as the result of a combination of sound sources and sound dynamics of different origin: geo-environmental, or geophonies (e.g., wind, moving water, thunder, volcanic eruption); biological or biophonies (e.g., sounds made by living beings); anthropic/technological or anthropophonies/technophonies (e.g., industrial noises, music, urban or air traffic) (Farina *et al.* 2014). This totality of sounds establishes different relationships with the diverse perception sensitivities of individuals or social groups (Payne *et al.* 2009). Various phenomenological approaches aimed at analyzing human experiences and cognitive processes related to the appropriation of the materiality of the landscape, its 'being-in-the-world' (Tilley 1994), have focused on this correlation between humans and sound perceived in a given spatial context (Meschiari 2010; Johnson 2012). The study of sound and sound environments has been approached in historical contexts, from the perspective of written sources (e.g. Emerit *et al.* 2015 for antiquity, or Fritz 2011 for the Middle Ages), and in recent years there has been increasing attention to sound phenomena by archaeologists (Mills 2014).

Approaches to analyzing 'archaeological' soundscapes have been formulated, for example, for understanding different aspects of the relationships between man-sound-space-religion, such as the experiential/acoustic impact of prehistoric sites like caves (Till 2014; Mattioli *et al.* 2017) or megalithic complexes (Was-Watson 2017) and for investigating the interactions between liturgy, music, acoustics and Christian sacred architecture, particularly in new research on the acoustics of Byzantine churches (Antonopoulos *et al.* 2017; Pentcheva 2017a) including the Hagia Sophia in Istanbul (Pentcheva 2017b), the Hagia Sophia in Thessaloniki (Gerstel *et al.* 2018), and the Basilica of San Vitale in Ravenna (Paliou, Knight 2013). The relationship between humans, sound, and space not only creates a spiritual connection with a transcendental immateriality, but acoustic sources also define concrete geographies that condition human actions related to economic, social, and political choices.

Improvements in GIS methods for the spatialization of sound (Primeau, David 2017) have made it possible to connect and develop new lines of study

regarding landscape-settlement-society interactions from a perspective that differs from prior cognitivist/anthropological approaches to human sensory perceptions. The study we propose here, in fact, starts from assumptions related to the spatial definition of the catchment of particular central places represented by medieval monasteries in the province of Arezzo between the 11th and 12th centuries.

Mileson (2018) has emphasized the role of ringing bells as markers ('soundmarks') both of a community's working and holiday time and therefore of political-economic-administrative influence on a given local district. The mapping of the propagation area of the hypothetical tolling of the bells of the various monastic complexes, crossed with a spatial analysis of visibility and distance per unit of time, creates the possibility of proposing new reflections and hypotheses on the ecclesiastical geography of a territory.

A.C.B.

2. Overview of bells in written sources: data, absences, and interpretative issues

The study of bells and the role they played in the demographic, economic, cultural, and spiritual landscapes of the Middle Ages is characterized by a profound heterogeneity of available data, especially when comparing the early and late medieval periods. It may seem rather obvious to highlight how the sounds of bells were a profoundly defining element of the collective imagination, especially in rural contexts, and their transversality and almost continuous presence also allow for analyses from anthropological, as well as historical-archaeological, points of view (see the fundamental works Corbin 1994 and Gonon 2010; for the eastern context, Rodriguez Suarez 2018). First of all, they marked the time and rhythms of the days, in a 'medieval' legacy that still exists today in the rhythms of some communities, as noted by T. Mannoni. He pointed out how bells could be understood as a cultural evolution of something simpler that already existed, referring to the internal messages of the Roman baths, highlighting how, for material culture, pre-existing phenomena are normal in any sector of production (Mannoni 2007, 15).

Attention to the study of bells has enjoyed significant interest in Italy in recent years, primarily thanks to important works by E. Neri and S. Lusuardi Siena (Lusuardi Siena, Neri 2007; Neri 2012), but also through the publication of a significant collection in 2007 that dedicated ample space to the post-medieval centuries as well (Redi, Petrella 2007). Later, a fundamental work of synthesis, especially in terms of written sources, was co-authored by J.H. Arnold and C. Goodson (2012).

Late antiquity undoubtedly emerges as a moment of progressive conceptual construction of the idea and function of a 'bell' (Neri 2012, 475-478).

Through an in-depth examination of certain written sources, it is possible to document the discussion of *signa ecclesiae* that were specifically devoted to temporal and liturgical organization, already in the first centuries of the post-classical period. Probably the oldest known testimony is found in the works of Gregory of Tours, in which he makes reference to a bell that marked the rhythm of the matins (*De virtutibus Sancti Martini*, I, 28, 33, II, 11, 45, III, 23, 38, in MGH, *Scriptores rerum Merovingicarum*; see also Trevisan 2007, 135). However, making a simple review of the late antique rural churches (from the 4th to the 6th century) known throughout the ancient world, an extremely significant fact clearly emerges: structures even remotely referable to possible bell towers are essentially absent in these chronologies.

It was precisely from the high Middle Ages that the diffusion of bell systems began to occur in a more structured way. Cammarosano (2007, 105) rightly highlighted the problem of the considerable difference in the quantitative availability of sources between the early Middle Ages and the period after the 10th-11th centuries, warning against drawing hasty conclusions based solely on the quantitative data, which could simply reflect different levels of source preservation. However, perhaps the most interesting aspect he emphasized concerns the attribution of distinctive features of considerable prestige and economic value to the bells over the course of the early medieval centuries (Cammarosano 2007, 106). It is mainly from the mid-8th century onward that there are both direct and indirect references to the use of bells.

For example, in a document written a few years before 740, the church of Mont-Saint-Michel in Normandy is mentioned (*Gesta abbatum Fontanellensium*, 10, in MGH, *Scriptores*, II). Undoubtedly, the most important aspect of this document is that it mentions both the actual bell and the *turricula* – a bell tower or, in any case, a small turret intended for housing a bell. The *turricula* is, in fact, one of the most frequently cited elements in early medieval written sources, often in the absence of any explicit mention of the bell itself, though it obviously makes indirect reference to it.

For Italy, however, the first known documentation of a bell tower is found in *The Book of the Popes* (*Liber Pontificalis*, 94, c. 47), in the biography of Stephen II (752-757), who had a *turrem* (tower) built in St. Peter's Basilica. In this specific case, the bell tower was obviously responsible for the main task of calling the faithful to participate in the *officium Dei*, unlike what happened, for example, in monasteries, especially rural ones, where the main purpose of the bells, as we will see, seems to have been related to the need to organize the various parts of the working day, as well as the spiritual and liturgical day. As highlighted by G. Andenna (2007, 73), though it is true that there is no clear mention of bells in *The Rule of Saint Benedict*, it is equally true that, on at least two occasions, the sounds that regulated the rhythms of the monasteries are mentioned.

However, the decisive codification and, above all, affirmation of the primary role of bells in terms of organizing spiritual and economic time would only be definitively established from the late Middle Ages: in this perspective, the papal bull of Innocent III, addressed to the Maronite church of Lebanon in 1216, is of great importance as the pontiff openly states the need to use bells both to summon the faithful to the liturgy and to denote the hours (*Acta Innocentii P.P. III* (1198-1216), n. 216; see also Arnold, Goodson 2012, 99).

From this synthetic panorama, it is possible to see how the material and documentary data seem to coincide in circumscribing the post-classical centuries which, at least until the end of the 7th century, if not the beginning of the 8th century, were almost completely absent of any form of management of church geography or, more generally, landscape-human-economic geography, rooted in the marking of time by bells. Bells were only characterized as a real *vox Domini*, to use a recent definition (Castiñeiras 2014), in later phases. Moreover, it is well known that in numerous studies relating to the definition of rural church geography in the late antique period, a reading has been proposed of the first forms of formation of a church-network as disconnected from the 'territoriality' principles typical of the Roman world, which would be at least partially reintroduced later, albeit with inevitable changes (Violante 1982; Lauwers 2008; Cantino Wataghin 2013).

G.C.

3. Overview of the case studies

While analyzing monasteries as central elements in the economic, and not only spiritual, management of the territory, three monastic complexes were selected. The characteristics of these sites have allowed us to analyze the degree to which the holdings directly in contact with the monasteries were exploited, as well as the reach of the bell sounds with respect to the specific environmental and landscape features. Considering all these elements, three areas located in the province of Arezzo were chosen: S. Maria a Farneta (Cortona), San Salvatore a Camaldoli (Cortona), S. Fedele a Strumi (Poppi) (Fig. 1).

The Abbey of Farneta was founded on a hill overlooking the Chiana River, not far from the center of Cortona. San Fedele a Poppi is located in a flat area near the Arno River, while the Monastery of Camaldoli has its roots in a hermitage, called Camaldoli, surrounded by a dense forest. The Benedictine Abbey of San Fedele was built in 992 for the court of Strumi, at the behest of Count Teudegrimo (Tegrimo) of the comital family of Guidi (Fatucchi 1977, 179), and it was endowed with a substantial patrimony shortly thereafter. In 1007, the widow of Count Teudegrimo 'the Elder', Gisla, with the consent of her son Count Guido I, donated some of her possessions from the villa of Lorgnano to San Fedele. Ten years later, Count Guido himself assigned his

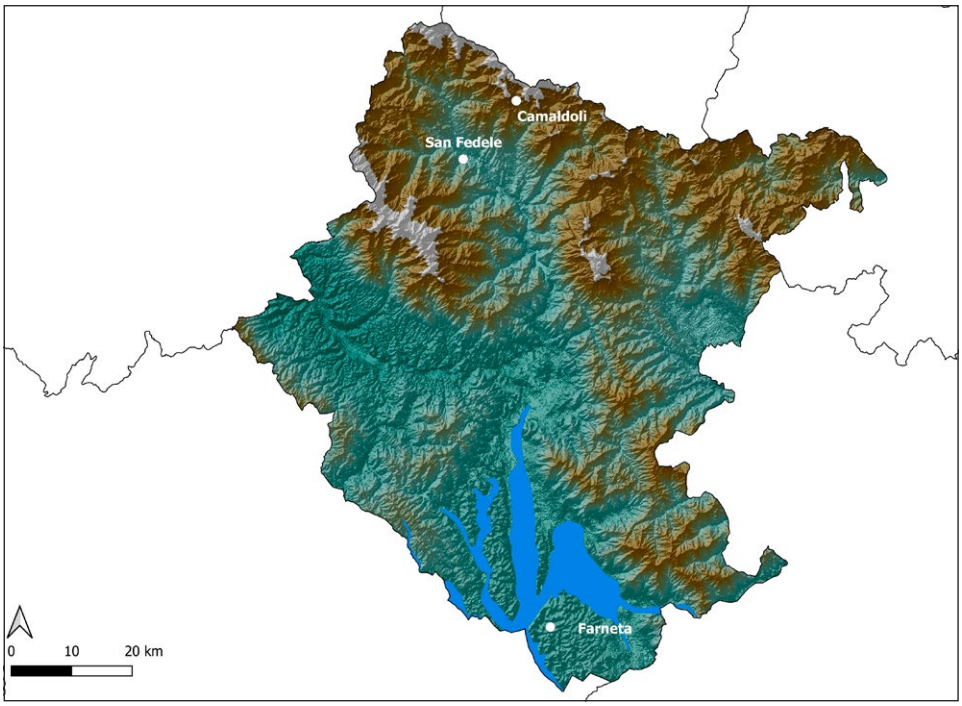

Fig. 1 – Position of the three religious structures analyzed in southeastern Tuscany.

court of Quorle to the abbey, to which he added his possessions from Strumi, Porciano, Vado, Cetica, and Lorgnano in 1029. In 1131, Count Guido III and his wife, Countess Emilia, sold some assets located in Poppiena (Arezzo) and other possessions in Pratovecchio to the Abbey of Strumi.

Towards the end of the 13th century, the church and the abbey, which had become 'cramped and dilapidated', were moved within the walls of the castle of Poppi (Fatucchi 1977, 179). As far as its topographical position is concerned, San Fedele is located in an extremely favorable area characterized by arable soil, a considerable watercourse, the Arno River, and an important road network which it controlled. Sources note the presence of the via Flaminia Minor near Poppi, a road that connected Arezzo with the Adriatic side of the peninsula (Agostini, Santi 2000, 18-19).

The other great resource of the abbey was certainly the Arno, which allowed agricultural activities to be carried out and ensured the availability of water for the operation of the mills owned by the abbey. The only information regarding its architecture is related to the church and describes a Latin cross plan with a transept divided into three large rectangular chapels.

A few meters from the church building, a structure interpreted as a possible bell tower was unearthed (Gabbrielli 1990, 68).

The Abbey of Santa Maria a Farneta is considered to have been one of the richest and most powerful of the Middle Ages, and its abbot enjoyed broad powers. It is located in the municipality of Cortona, about 15 km from the population center, in a geographical area known as Farneta, a toponym that derives from *farnia* (oak) and indicates the presence of an oak forest. The first written document in which the name of the abbey appears is from 1014, in a donation of emperor Henry II (Gabbrielli 1990, 180). According to Kehr, it was founded around the end of the 10th century (Kehr 1908, 190-191; Fatucchi 1977, 129-130).

The Monastery of Camaldoli, famous for having given life to a new religious congregation, the Camaldolese order, which took its name from the toponym of the place where it was founded, *Campus Malduli*, enjoyed great success from its founding, so much so that the congregation gained the approval of the apostolic see relatively quickly. The hermitage was founded on the top of a mountain, in the middle of a dense forest in 1012 by a monk, Romuald, with the aim of preserving the ideal of cenobitic monasticism in obedience to the Benedictine rule. Kurze long questioned the origin of the hermitage, studying and interrogating the main works of Mittarelli, Kehr, and Schneider. Mittarelli considered the document of 1012 and the legend of Romuald to be authentic; Kehr and Schneider, on the contrary, believed that the attribution of 1012 is wrong in light of a document from 1027 in which *Campus Malduli* appears frequently, a word that accurately describes the natural characteristics of the place rather than a person's name (Kurze 1989, 243-250).

Under the influence of the bishop and a count's family, the Monastery of Camaldoli had a sizeable patrimony from the start. Initially Bishop Tedaldo granted the entire area of Camaldoli as well as some *mansi* and tribute obligations from nearby villas, on condition that they would not be denied to these local areas over time.

The monastery's lands formed a complex of considerable expanse that permitted good profitability both to provide for their own livelihood as well as a more wide-ranging economy destined for external trade. One of the main economic activities revolved around the exploitation of the *Campus Malduli* forest, described by Bishop Elemperto as *sepem altissimam* (the 'highest hedge'). The monastery's economy, strongly linked to the forest but also connected to the breeding of livestock and cultivation of vineyards (in the areas of Partina and Soci) and cereal crops (in the lands of Chiana), was run directly, with the help of lay brothers, until at least the mid-1300s. As for the presence of a bell tower, we know that excavations in 1979 (whose results are unfortunately unpublished) uncovered a quadrangular structure that was in use before the fire of 1203 and which has been interpreted as a bell tower.

This presentation of the chosen sample areas clearly demonstrates the geographical and patrimonial characteristics which were preferred over others. Monastic complexes of this type, with great economic capacity and territorial influence, needed a precise management program that could facilitate the organization of both the daily spiritual routine and working routine.

C.M.

4. Dataset and analyses

The goal we set for ourselves was to experiment with the ArcGIS plugin called Sound Mapping Tools (Keyel *et al.* 2017) in order to understand whether the propagation of bell sounds in space could have played a role in the work rhythms in the medieval countryside, as well as whether this role can be understood by analyzing geography. In a substantially silent world like the medieval one must have been, the issue of noise pollution would not have been present and the propagation of bell sounds, in addition to their high symbolic and spiritual value, would have been a way to communicate a message, especially in rural areas.

To carry out the analyses, we used a digital model of the terrain of Tuscany, with a resolution of 30 m; the rasters of the Grand Duke Leopold II (hereafter Leopoldine) land registry (*catasto*), furnished by the Region of Tuscany as WMSs; settlements between the 10th and 12th centuries, exported from the Archaeological Map database of the Laboratory of Informatics Applied to Medieval Archaeology (LIAAM) (Fronza 2005); the marshy area of the Val di Chiana, as proposed by F. Salzotti (Boisseuil *et al.* 2011).

The three types of GIS analysis that we carried out are linked to three different types of approaches, all of which have in common the desire to define the possible catchment area of a settlement. Specifically, these are catchment analysis (Cambi, Terrenato 1994), viewshed analysis (Wheatley 1995) and sound mapping analysis. The result of the first type of analysis is a raster in which each cell has a value (expressed in seconds) that represents the time it takes to travel between the point defined as the center and the cell itself.

Catchment analysis is based on the concept of travel raster, to be understood as a survey of the resources accessible in a region from a given site (Conolly, Lake 2006, 214). Generally, those who use this type of approach to studying landscapes start from the Tobler function (Tobler 1993). Over time, variants of the Tobler function have been developed. However, the theoretical problem with this type of analysis is linked to a marked determinism in this approach and its resulting unreal supply basin. Thus, the significance of this method must be understood not so much in terms of the reconstruction of the area under investigation as the identification of an area whose resources were potentially exploitable.

Our intention was to determine the maximum area beyond which it would have been difficult to go after having already walked 30 minutes, worked about 8 hours, and still return home. We know that many choices are completely subjective and debatable, such as the fact that:

– the 30-minute polygon is relatively small;
– the presence of bridges over the Arno could increase the polygon and also occupy the part of the valley North of the river;
– roads/paths could facilitate accessibility, whereas areas with high vegetation could hinder it;
– movement starts from the monasteries, which assumes that there were no scattered houses nearby.

The second type of analysis concerns the definition of visible areas. The ability to see a certain area affects the perception of the landscape and could contribute to a further delimitation of the catchment area. The ability to see was one of the nodal points of settlement choices in all historical phases, especially when it came to fortified sites (Di Zio, Bernabei 2009), but also for places of worship and monuments of importance for the society to which they belong (Wheatley, Gillings 2002, 201-202).

The last kind of analysis relates to sound. Through a plugin developed for ArcGIS based on the calculation of the diffusion, reflection, refraction, diffraction and absorption of sound in space, we wanted to define the real catchment area of a given settlement; but, more than anything else, we wanted to understand whether sound could have had a role in defining rural work spaces. In the absence of data relating to the frequency of the bells from these localities, we have chosen to use an 'average' of 400 Hz, obtained from analyses carried out on various European bells between the late Middle Ages and the modern age.

The ArcGIS plugin Sound Mapping Tools required the following information:

– digital terrain model;
– land use, classified into: uncultivated, forest with tall trees, forest with short trees, cultivated and/or grassy land, shrubs and bushes, areas occupied by human settlements, water;
– sound frequency;
– atmospheric humidity and temperature;
– wind direction and speed.

In our case, we were not aware of most of this data. However, our intention was to create a theoretical model to be compared with the catchment and visibility analyses and not to precisely define a physical limit of sound propagation. For land use, we used only three classes, with the marshes of the

Val di Chiana, forest areas on the high hills and the Apennine ridge, cultivated and/or grassy land in the plains and on the low hills. For atmospheric data, we used default data.

As regards the study of the Leopoldine land registry, we chose to use it while introducing a further variable that was used only for a comparison of the results. We applied the regressive method, based on the concept that, from the Middle Ages to at least the early 19th century, the countryside would have undergone limited transformations in terms of land use, properties, and the size of the land parcels. This method, which Bloch (1931) experimented with in the historical field and Barker (1986) used for archaeology, has been the subject of much controversy. In the mid-1980s, Coste reaffirmed the concept of the importance of the regressive method applied to medieval topography, starting from what we know best, then proceeding backwards in time to complete the information that is missing in medieval documentation (Coste 1996, 1-15).

As far as Tuscany is concerned, there are areas, generally those in more rural areas and far from the cities, in which the best results are obtained (Putti 2008), as well as areas which are more prone to change. There are also some elements of the landscape, such as roads, in which substantial transformations have not been observed from ancient times to the introduction of the railroad and the automobile. Paths of transhumance can be included in this category as they seem to have a continuity of use even from prehistoric times (Pizziolo *et al.* 2017). Performing a regression from the late to the early Middle Ages for the ecclesiastical network is certainly an adventurous methodology, if not outright flawed.

In our case, the application of the regressive method was not used in a systematic way nor as the main methodology, but rather as a check on the results, bearing in mind that the monasteries in question are located in different geographical areas with different fortunes.

S.B.

5. Discussion of the results

For the Abbey of Farneta, the catchment area defined by a thirty-minute journey was an extremely large polygon covering an area of about 3,000 hectares, while the visibility area was very limited and jagged in shape. The only well-defined area was in the valley immediately to the South, with a total extension of about 234 hectares. The sound diffusion analysis, on the other hand, generated a well-defined polygon around the abbey, extending southward in coincidence with the area of visibility and westward over the entire plain between the hills of Farneta and the marshes of the Val di Chiana (Fig. 2).

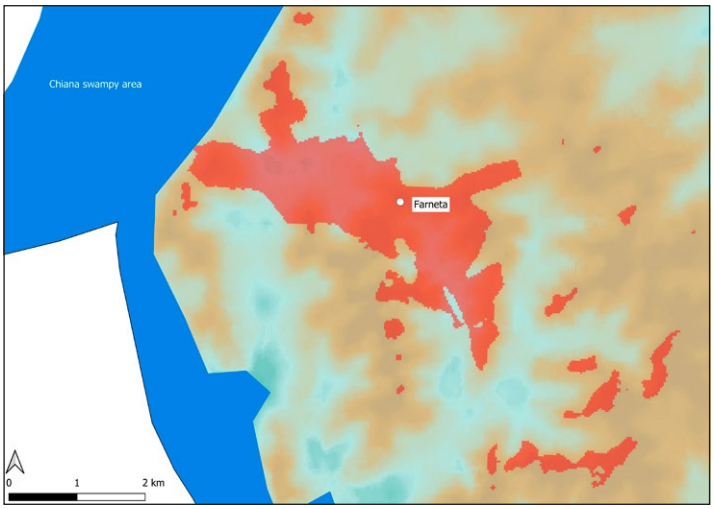

Fig. 2 – Sound diffusion area of the Abbey of Farneta.

In our opinion, simply multiplying the three rasters to define the area simultaneously visible, walkable in 30 minutes and exposed to bell sounds would be a schematization that fails to take into account certain historical dynamics of the abbey itself: the real catchment area must be located West of Farneta, which is an area reachable in less than half an hour and where you can hear the sound of the bell, but which is not visible. Unlike the valley to the South, at the beginning of the 19th century it was still an agricultural area with many fields still owned by the cathedral of Cortona or the abbey, as confirmed by the land use and owner data in the Leopoldine land registry. Furthermore, the southern area, again based on the land registry from the early 1800s, was partially occupied by woods which limited its visibility from Farneta, thus correcting data not considered in the spatial analysis phase.

In addition to this, we must also reconsider the assumption of an absence of other settlements given that, near the banks of the Val di Chiana marshes, there is a toponym of medieval origin, 'Porto', according to the Leopoldine land registry, which must have been a landing place for Farneta, and where the sound of the bell was audible; there was also a small settlement called Pino, with an adjoining church. It is curious to observe that these two areas, immediately beyond the half-hour journey, were still within hearing range of the sound of the bells (it should be noted that the sound spread only in these areas and not around them) (Fig. 3).

For Camaldoli, however, the scenario was completely different: it was a mountainous area with a much more limited half-hour travel range (783

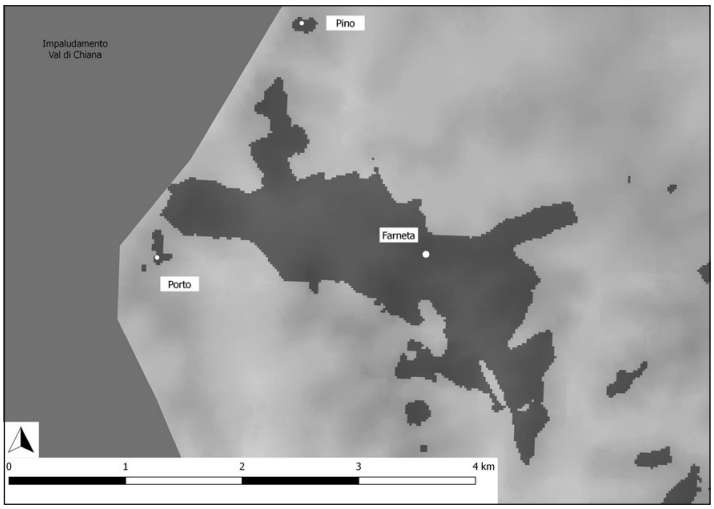

Fig. 3 – The settlements of Porto and Pino, outside of the main sound diffusion polygon but where the bells of Farneta could still be heard.

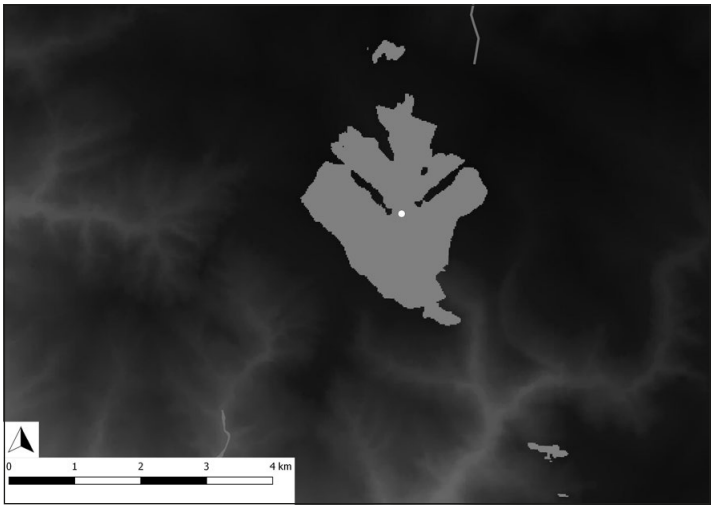

Fig. 4 – Sound diffusion area of the Monastery of Camaldoli.

hectares, therefore just over a quarter of Farneta's range) and with steep slopes, in which the visibility was very poor and even more jagged (thus resulting in a variable of little impact), but in which the sound spread evenly over a fairly rational polygon around the valleys near the monastery (Fig. 4).

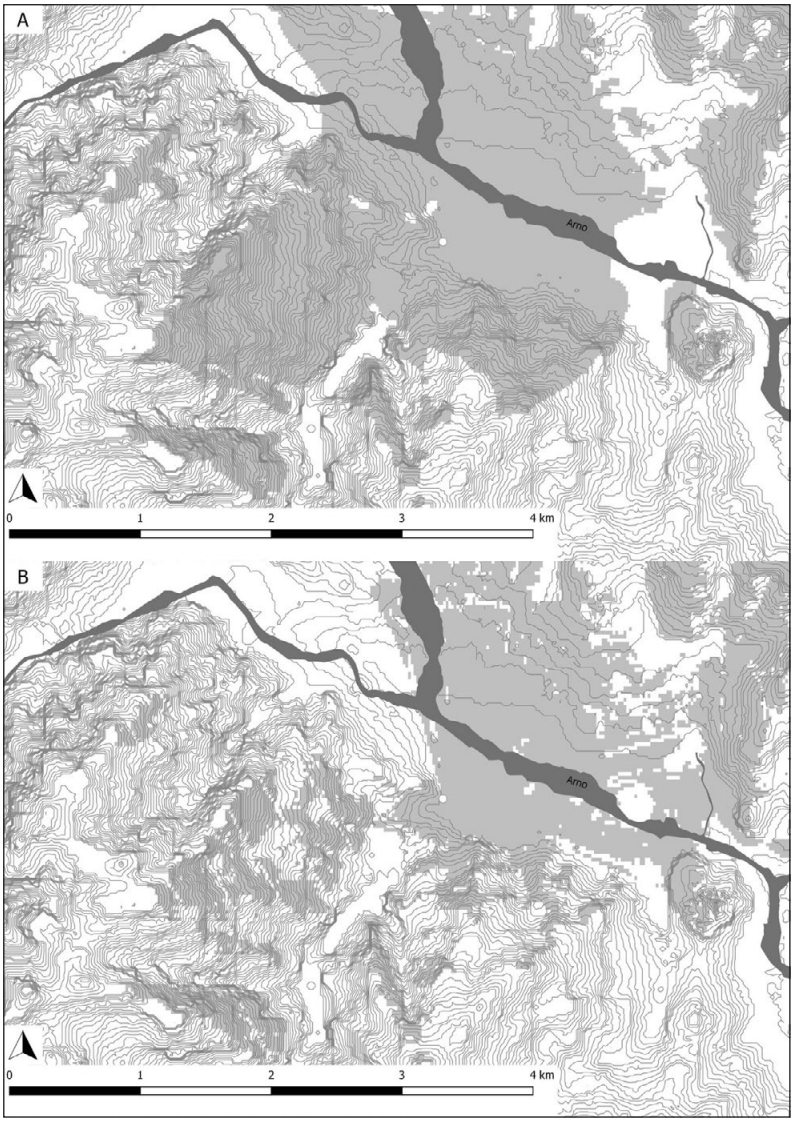

Fig. 5 – Sound diffusion area (A) and visibility raster of the Abbey of San Fedele (B).

At the beginning of the 19th century, the sound polygon was occupied in almost all cases by wooded areas, and there was an almost total absence of agricultural fields; according to Leopoldine land registry, these areas were owned by the monastery itself. This circumstance confirms what Camaldoli's

'main business' must have been during the Middle Ages: activities linked to exporting wood. In consideration of the regression method, the Apennine area, where the Monastery of Camaldoli stands, lends itself perfectly to this type of analysis as the economic, settlement, and infrastructural transformations since the Middle Ages do not seem to have affected the landscape.

Moving towards the main medieval settlements in the area, Serravalle and Moggione, in the extreme periphery of the sound polygon and outside it, the size of the land parcels of the early 19th century becomes smaller, with non-ecclesiastical property owners and the land used more for agriculture than the exploitation of forest resources.

A fact that emerges from these analyses, in addition to the delimitation of the catchment area, is the probable unsustainability of the monastery's food resources; it was, in fact, necessary to obtain flour from other religious institutions. The only areas that could produce flour were the chestnut groves concentrated in some 19th-century parcels to the West of the monastery (it was a very limited area, though, of about 42 hectares). Thus, a complex settlement framework emerges in which the monastery's activities were first devoted primarily to the exportation of timber, but later shifted to more of a subsistence economy based on livestock and with the importation of flour and other agricultural products from other areas.

Moving on to our third case, San Fedele, the results of the analyses are difficult to interpret, in part due to certain 'disturbances', such as the fact that, during the 13th century, the church was moved inside the castle of Poppi. San Fedele is located in the center of a small alluvial plain formed by the Arno River and some of its tributaries; it is an area favorable to agriculture, as shown by both the regional map of Tuscan soil quality and the use of the soil identified in the Leopoldine land registry. This area is easily accessible in less than thirty minutes, and is reached by the sound of the bells (Fig. 5, A), though only its southern and eastern parts are visible from the abbey (Fig. 5, B).

Towards the West, near Filetto, we know that there have been discoveries of medieval pottery. In this area, and only in correspondence with this settlement, the sound of the bell of San Fedele would have been audible. It may have been a small village related to agricultural work in the fields between the abbey and Filetto. On the hills immediately South of San Fedele, we know that a settlement called Loscove existed from the 11th century, which was owned by the abbey. In this area, there were alternating wooded, grazing, and agricultural areas, perhaps representing a mixed economy. This site is outside the thirty-minute travel threshold from the abbey as well as the visibility area (though just barely), but it is within the sound range. The hill on which Poppi is located, which must have been the site of a settlement already at the beginning of the 11th century, was reached by the sound of the bells of San Fedele, thus delimiting the catchment area of the abbey also towards the East (Fig. 6).

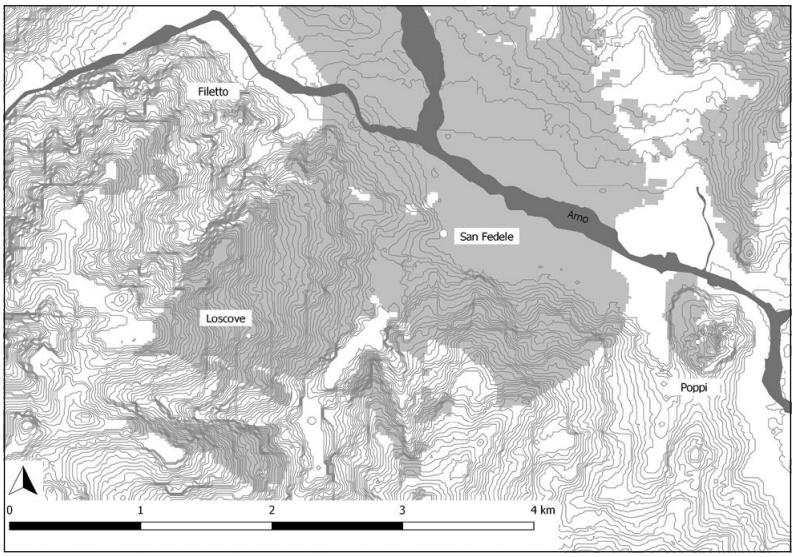

Fig. 6 – The settlements of Poppi, Filetto and Loscove near the Abey of San Fedele: the sound of the bells could be heard in all three places.

The area is therefore defined by the Arno River (to the North) and the settlements of Loscove (to the South), Poppi (to the East), and Filetto (to the West). The abbey's economy would have been somewhere in-between those of Farneta and Camaldoli, with a predominance of agriculture but also with secondary activities related to forest resources and livestock.

S.B., C.M.

6. Conclusions

The first consideration that is important to highlight is related to the role and function of the bell in medieval monastic contexts: the perception of a loud sound, capable of drowning out other noises and heard across great distances, was probably a way of giving rhythm and order to religious life. But it was also a way to communicate in a relatively silent and slow-moving universe. Despite these considerations, in the absence of other types of data, it would be difficult to strongly support claims regarding the role of bells in defining the geo-political and economic relevance of medieval monasteries. However, what should be considered is how the sound of the bells must have given workers the perception of the presence of a central 'control', not only from a phenomenological and emotional point of view but as a soundmark of a concrete power.

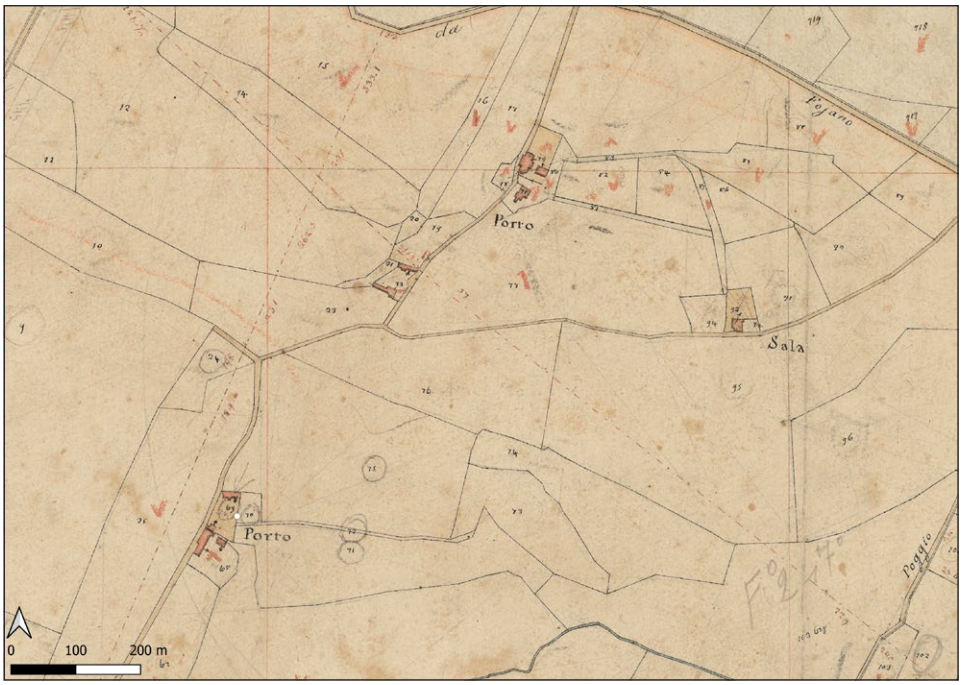

Fig. 7 – Porto and Pino in the Leopoldine land registry (source: WMS Service, Region of Tuscany).

The analyses carried out have certainly made it possible to add a further variable in defining the complexity of the areas of influence that these religious structures had in the Middle Ages, showing that, even at a distance of many kilometers, the sound of the bells could be heard in specific correspondence with human settlements. In particular, we found that, in Pino and Porto (Fig. 7), as well as Loscove, Filetto, and Poppi (Fig. 8), settlements outside the polygon of the half-hour walk, the bells of Farneta or San Fedele were still audible.

Among the three types of analysis that we conducted, it is evident that the viewshed analysis offered inferior results which would perhaps only be useful for understanding the monitoring of military and non-productive territory. In addition to the fog and rain, the darkness of the nighttime environment would have clearly represented a limit for the strategic control of the territory. In this direction, the role of the soundscape strongly emerges with respect to the visual one: though it was perhaps less immediate (in fact requiring a coding of information), the soundscape would have had much more communicative capacity.

Fig. 8 – Poppi, Loscove, and Filetto in the Leopoldine land registry (source: WMS Service, Region of Tuscany).

The application of the regressive method, used in this context as a comparison test of the results, certainly offers some additional food for thought. In particular, in the case of Farneta, the toponyms Porto and Pino were recognized within the Leopoldine land registry. The use of the land, the extension of the parcels, and the names of the owners then helped to understand the areas of influence of Camaldoli, San Fedele and Farneta. The use of the sound of bells (intended as 'technophony') among the possible spatial variables for the analysis of medieval historical landscapes therefore offers innovative potential and new insights into the complex correlation between geo-morphological/environmental factors and socio-economic and cultural dynamics.

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ABSTRACT

This contribution is the result of experimenting with methodologies linked to the understanding of soundscapes in the context of medieval monasteries. In our specific area, the approach was not focused on the cognitive concept itself so much as the perception of the spirituality of the ringing of bells. The premise was to understand whether, and how, the bells functioned as a soundmark for controlling the territory. The case studies examined are the Abbey of Farneta, the Monastery of Camaldoli and the Abbey of San Fedele, today located in the Province of Arezzo: the three religious structures differ in their historical development, geographical position, and economy. However, what links them (and what links the great majority of medieval monastic complexes) is a tight control of their territory for production purposes, in order to guarantee the profitability of their material heritage. Analyses of the diffusion of the sound of the bells was compared (and integrated) with visibility and catchment analyses. The aim was to understand whether this type of analytical approach could contribute to the definition of a monastery's 'catchment area'. The data that emerged describe a complex economic landscape in which identified anomalies at settlement level can be worth analyzing and trying to understand.