4. BRIDGING SEAS: Ancient Road Networks Connecting the Tyrrhenian and Adriatic Coasts, from the Ombrone to the Potenza Rivers

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The objective of this study is to identify a network of routes, better defined as pathways or axes, that would allow travelling from the Tyrrhenian Sea to the Adriatic coast and vice versa. To achieve this goal, we integrated datasets gathered from landscape studies, such as historical and archaeological sources, historical and topographical maps, with cost models currently available and implemented through QGIS.

The original aim was to focus on a specific location: the site of Santa Marta, a central area that has evolved over time. Initially established as a farm in the 2nd

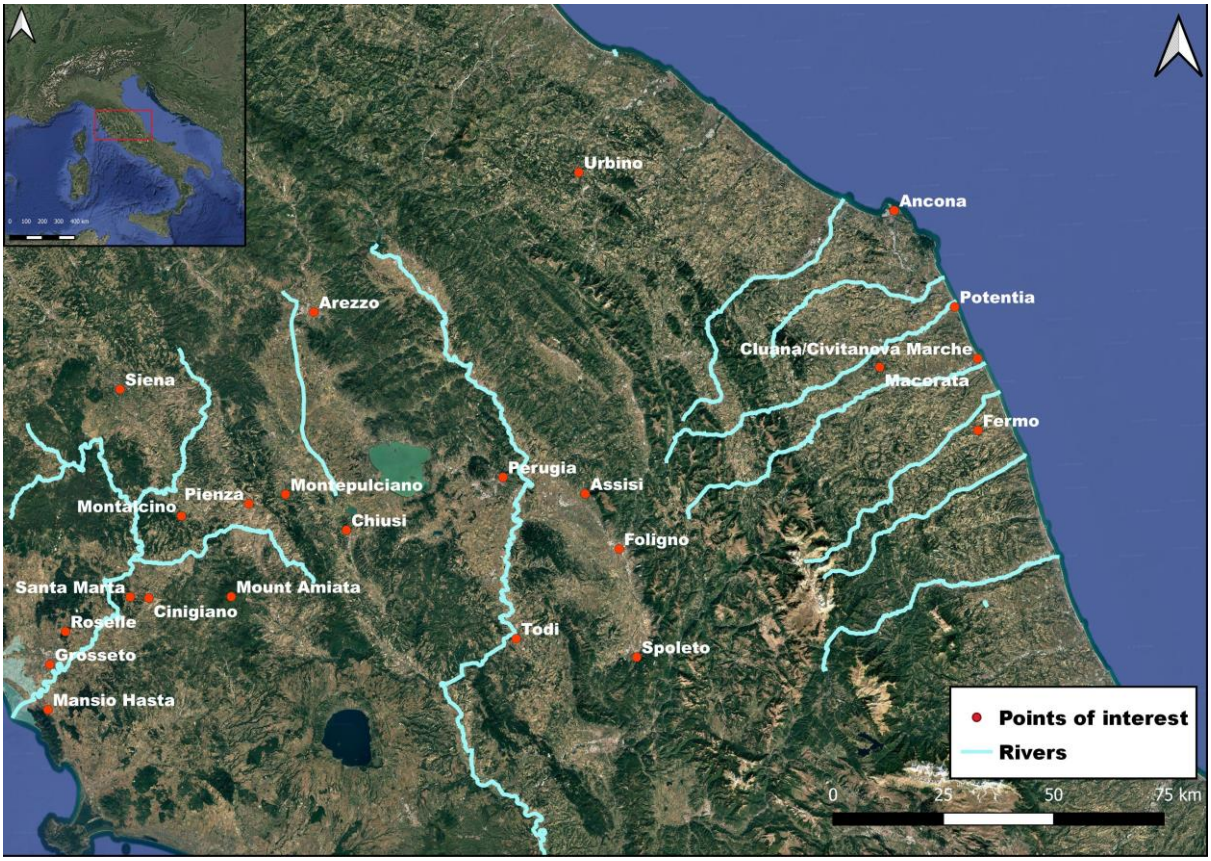

Fig 1. Study area, covering approximately 21,000 km² and encompassing three regions: Tuscany, Umbria, and Marche. We have included specific points of interest to assist the reader in navigation, and the watercourses directly relevant to our study are highlighted. From left to right, these include the Ombrone River, the Orcia River, the Canale Maestro of the Val di Chiana, the Tiber River, and several rivers flowing through the valleys of Marche.

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century BCE, it later transformed into a *mansio*, and eventually a parish church. Situated 30 kilometers northeast of the Tyrrhenian coast, Santa Marta has consistently been an important site, closely linked with road networks from antiquity through the 17th century CE.[1] However, it soon became clear that, despite numerous studies on major Roman communication routes like the Aurelia, Cassia, and Flaminia, as well as transhumance routes, especially in Tuscany, there was a lack of research addressing possible itineraries connecting the Tyrrhenian to the Adriatic coast. Thus, we decided to significantly expand the area under consideration to approximately 21,000 km², which includes portions of three central Italian regions: Tuscany, Umbria, and Marche (Fig. 1). Beginning at the Tyrrhenian coast, we explore the Italian peninsula by tracing the river valleys of the Ombrone, Orcia, and Val di Chiana. From there, we continue into the middle Tiber valley in Umbria, eventually making our way to the Adriatic coast via the river valleys of the Marche region.

1. Cost Path Analysis (CPA)

In spatial analysis and geographic information systems (GIS), CPA is a method used to determine the most efficient pathway to minimize costs associated with transportation. Using QGIS software, a cost model has been developed for the study area, based on a mathematical model and environmental conditions that allow for the implementation of various scenarios.

The first variable we considered in developing our cost model was slope, as movement across flat terrain is generally preferred over steep inclines. Another key variable addressed was the presence of lakes and rivers; our objective was to minimize or avoid crossings of waterways, since while rivers can serve as transit vectors, our study concentrates solely on terrestrial routes. Lastly, we included a variable pertaining to low-friction areas, such as fords and bridges over rivers, to further enhance our model.

1 S. Campana – E. Vaccaro, Santa Marta: a Roman Nodal Point in the Middle Ombrone Valley (Southern Tuscany, Italy), in: A. Sebastiani – C. Megale – R. Rao (eds.), MediTo, Archaeological and Historical Landscapes of Mediterranean Central Italy (Turnhout 2021) 49–66.

In this cost model, we used a QGIS plugin called "Least Cost Path", which enable us to calculate the most cost-effective route between a starting point and an endpoint.

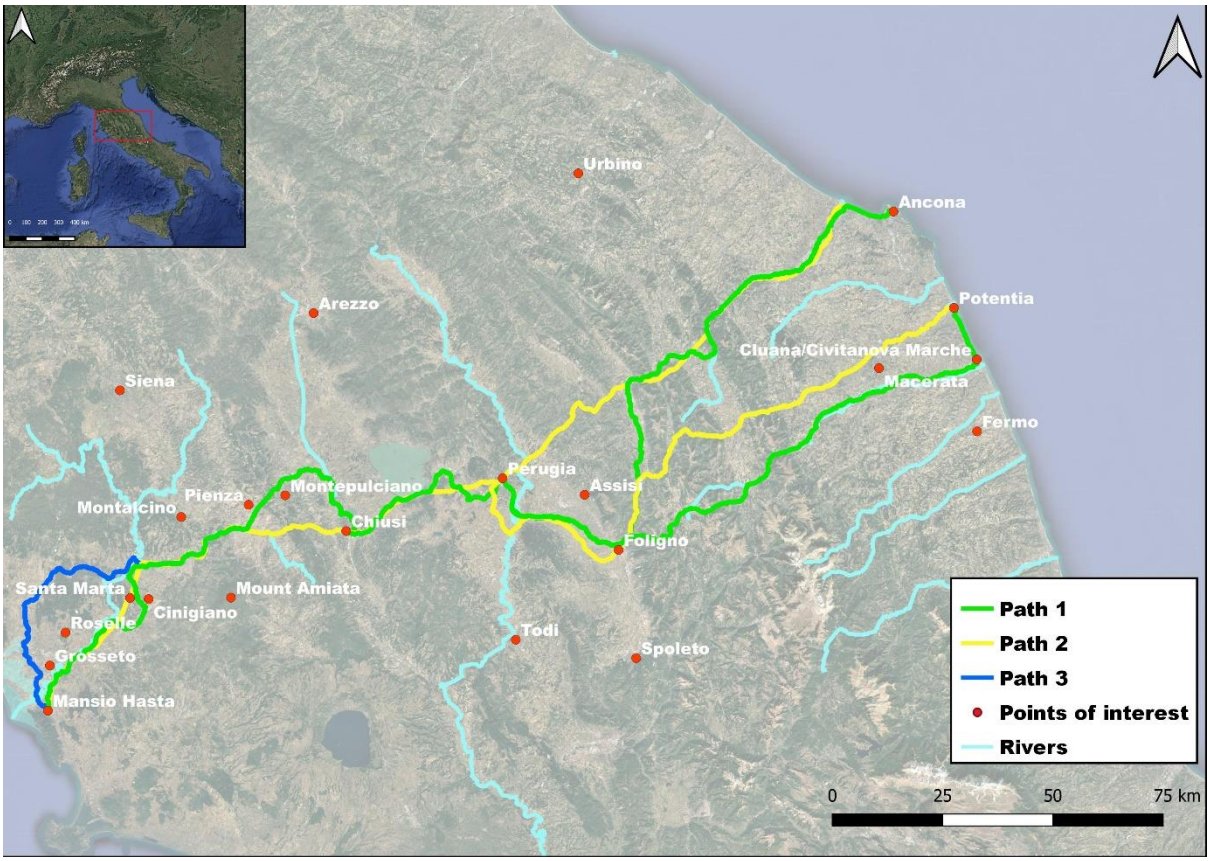

Fig. 2. Path 1, Path 2 and Path 3, in their entirety, from the Tyrrhenian coast to the Adriatic coast.

Three routes were identified: Path 1 considers only the previously mentioned variables - terrain morphology and the presence of rivers and lakes. Path 2 introduces a frictionless area corresponding to the Foce pass while increasing friction in the surrounding areas, encouraging the program to route our path through the pass, thereby facilitating movement from Val d'Orcia to Val di Chiana. Lastly, Path 3 is created by incorporating frictionless areas at locations where Roman bridges are known to have existed along the Ombrone River (Fig. 2).

2. Outcomes

2.1. Hasta – Chiusi

The results will be organized into four distinct areas for improved clarity. We have chosen to begin our routes from the Via Aurelia, specifically from the mansio of Hasta, which serves as the last stop before crossing the Ombrone River.[2] Chiusi has been selected as the first destination due to its significance during both Etruscan and Roman eras, as well as its role as a transit point on the Via Cassia.

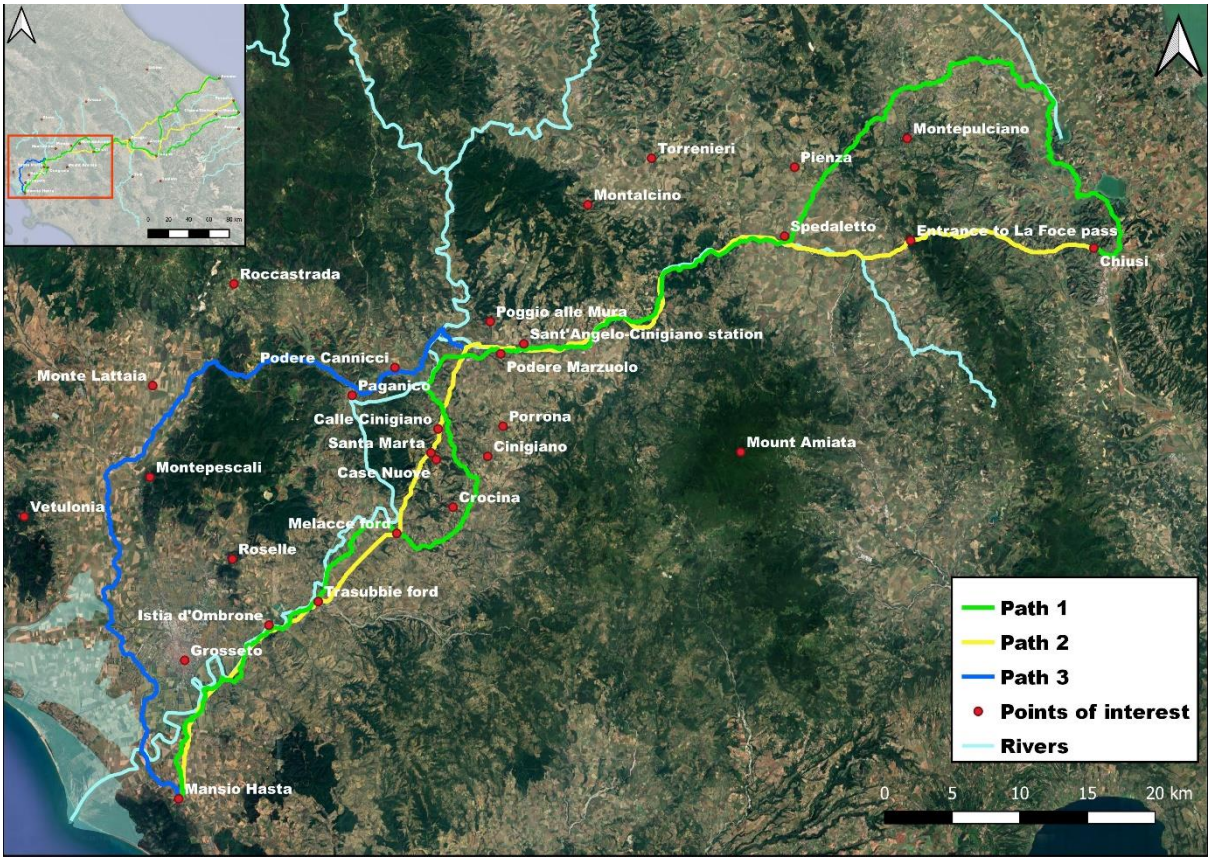

Fig. 3. The three routes identified in the section between the *mansio* of Hasta and the city of Chiusi.

Path 1 essentially traces an ancient transhumance route that crossed the Orcia River at Sant'Angelo Scalo, continuing towards the Calle di Cinigiano. This area served as a payment point for grazing rights until the 18th century.[3] This ancient route continued to Crocina and then reached Grosseto by fording the Ombrone

2 E. Chirico, La mansio di Hasta ad Alberese (GR, Toscana, Italia), The Journal of Fasti Online 458 (Roma 2020) 1–12.

3 P. Marcaccini – L. Calzolai, I percorsi della transumanza in Toscana (Firenze 2003) 134–136.

River at Istia.[4] Continuing east, Path 1 runs alongside the Orcia River and crosses it at Spedaletto, where an ancient Roman road connecting Siena with Bolsena was likely to pass.[5] Finally, the route partially follows a branch of the Cassia that led from the Val di Chiana to Siena,[6] before shifting south toward Chiusi (Fig. 3).

Path 2 essentially retraces path 1 but with two significant differences: immediately after fording the Melacce stream, path 20 continues north past the Roman villa of Santa Marta, before rejoining path 1 at Podere Marzuolo.[7] Another difference is that this second route passes through the La Foce pass, which connects the Val d'Orcia and Val di Chiana, where human presence has been attested since prehistory.[8] After crossing this pass, path 20 reaches the city of Chiusi (Fig. 3).

The Path 3 starts from Hasta and heads north, crossing the Ombrone at the Ponte del Diavolo, an ancient Roman bridge whose remains were still visible in the 18th century.[9] After crossing the river, the route picks up an ancient customs road, the so called "Antica Strada Maremmana della Pia", which allowed pastures from Siena to reach the Grosseto area.[10] After Monte Lattaia, the route heads east through Paganico, a crossing point of the Via di Dogana, which was the main communication route between Siena and the Grosseto province until the 20th century, as well as an important access and control center for customs pastures from the 15th century onward.[11] Moving east, the Bridge Route rejoins the previous routes, tracing their path (Fig. 3).

4 Marcaccini – Calzolai, ibidem 138.
5 A. Maroni, Prime comunità cristiane e strade romane nei territori di Siena-Arezzo-Chiusi (Siena 2001) 76–87.
6 S. Bertoldi, Analisi GIS sulla viabilità terrestre e fluviale, in: S. Bertoldi – M. Putti – E. Vanni, Archeologia e storia dei paesaggi senesi. Territorio, risorse, commerci tra età romana e medioevo (Sesto Fiorentino 2019) 31–35.
7 A. Van Oyen – G.W. Tol – R.G. Vennarucci, The Missing Link. A Nucleated Rural Centre at Podere Marzuolo (Cinigiano – Grosseto), in: A. Sebastiani – C. Megale (eds.), Archaeological Landscapes of Roman Etruria. Research and Field Papers (Turnhout 2021) 237–246.
8 C. Felici, Carta archeologica della provincia di Siena. Pienza, vol. 6 (Siena 2004) 37–38.
9 G. Ciampoltrini – M. Cosci – C. Spataro, La via Aurelia dal Chiarone all'Ombrone: immagini aerofotografiche, in: G. Ceraudo – F. Piccarreta (eds.), Archeologia aerea. Studi di aerotopografia archeologica 2 (Roma 2007) 44–45.
10 P. Marcaccini – L. Calzolai, I percorsi della transumanza in Toscana (Firenze 2003) 129–133.
11 P. Marcaccini – L. Calzolai, I percorsi della transumanza in Toscana (Firenze 2003) 121–124.

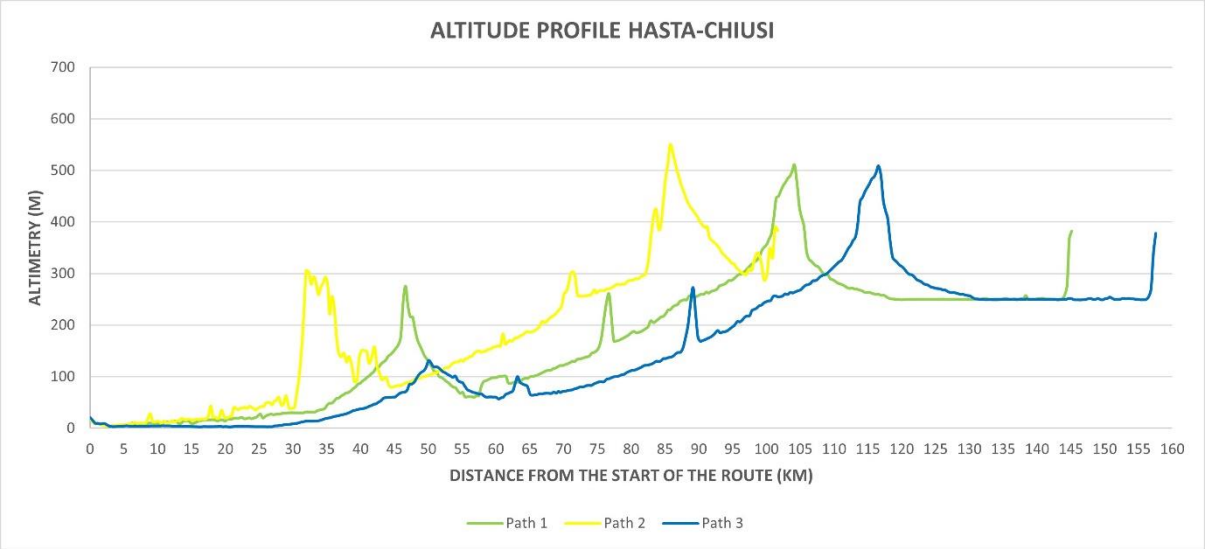

Table 1. Comparison between the three altitude profiles for the Hasta-Chiusi section can be observed. It is immediately noticeable that among the three, Path 1 is the longest; on the other hand, Path 2 is the shortest, but at the same time, it has greater elevation changes. Specifically, Path 1 has three altitude peaks: the first peak, at a distance of approximately 47 km, corresponds to the path passing through a hilly area in the Ombrone valley, near Case Nuove and Santa Marta; the second peak, at approximately kilometer 77, corresponds to a hilly area in the Val d'Orcia, just before Spedaletto, at the foot of Mount Amiata; finally, the last peak, between kilometers 103 and 109, corresponds to the area where the path crosses between the Val d'Orcia and the Val di Chiana (Fig. 3). Path 2 features a significant elevation gain starting at kilometer 30, corresponding to the passage through a hilly area between the ford near the Melacce stream and the Calle di Cinigiano, and another starting at kilometer 85, corresponding to the passage near the La Foce pass (Fig. 3). Finally, the Path 3 is characterized by an initial section of the path with a relatively flat profile. In the final section, it shares the same altitude peak as Path 2, as it follows the exact same track.

Examining the elevation profile table, we notice little difference among all the routes. The elevation peaks are predominantly similar across all three routes, corresponding to crossings through hilly areas of the Ombrone Valley, Val d'Orcia, and Val di Chiana (Tab. 1).

2.2. Chiusi – Perugia

After Chiusi, our routes reach the city of Perugia. We chose to have them pass through or very next to this city due to its importance in both Etruscan and Roman periods.[12] The two routes do not show significant differences (Fig. 4);

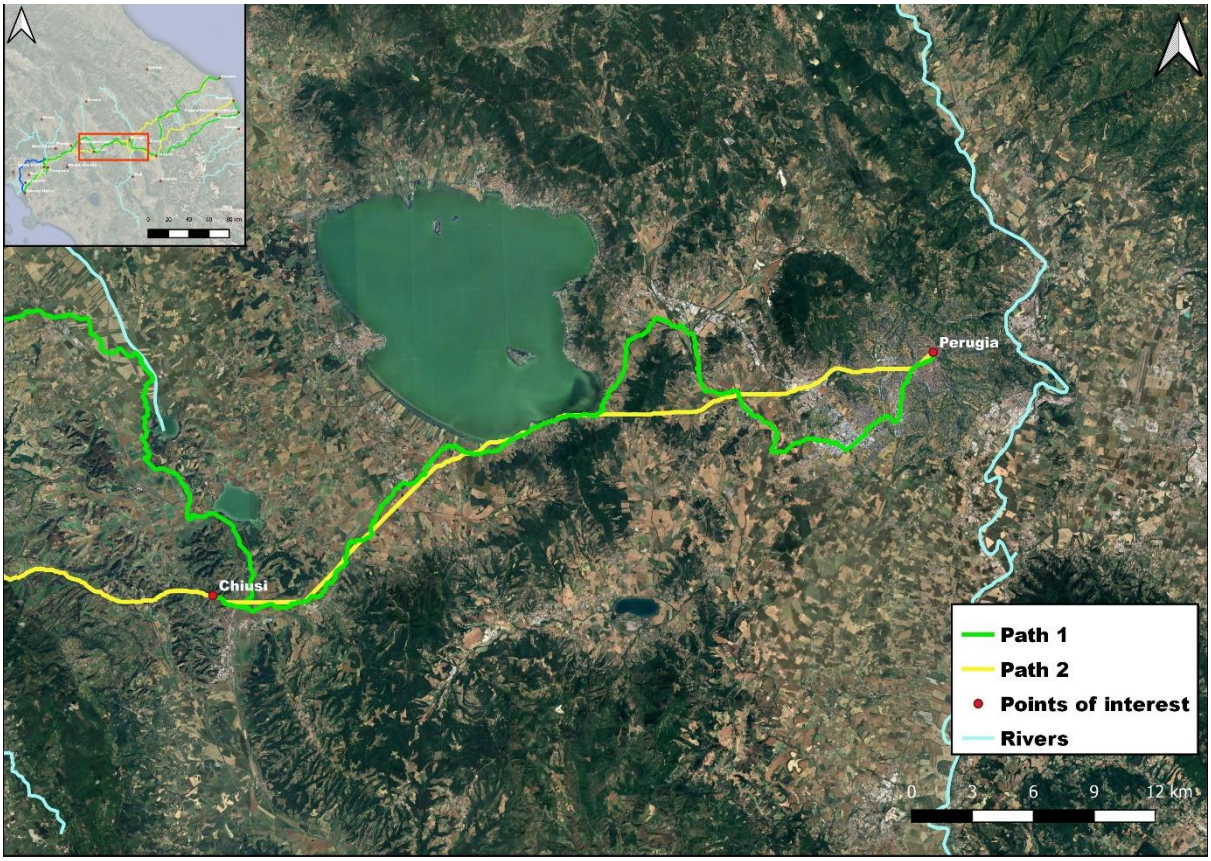

Fig. 4. The two routes identified in the Chiusi-Perugia section.

one follows a straighter path, while the other is more winding in parts. Both follow what appears to have been a deviation of the Cassia, noted on the Tabula Peutingeriana, leading from Chiusi to Perugia.[13]

12 A. Chierici, Per una storia sociale di Perugia etrusca: le tombe con armi, in: Annali della fondazione per il museo «Claudio Faina» 9 (Roma 2002) 95–96.

13 A. Maroni, Prime comunità cristiane e strade romane nei territori di Siena-Arezzo-Chiusi (Siena 2001) 23.

The elevation profile table indicates (Tab. 2) that Path 2, while straighter and shorter than Path 1, has steeper sections. Both paths experience an elevation increase in the final segment as they approach Perugia, which is located at a higher altitude than the middle valley of the Tiber.

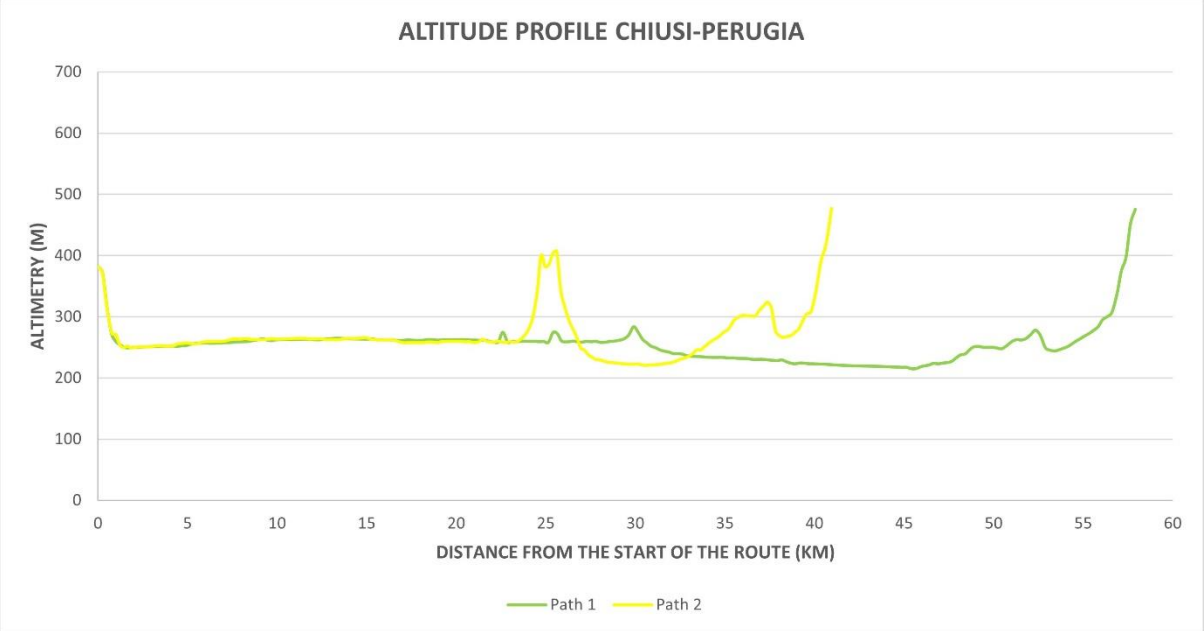

Table 2. Two altitude profiles for the Chiusi-Perugia section. Path 1 has a longer, but relatively uniform, path. Path 2, although shorter, features a peak corresponding to the transition from the Val di Chiana to the Val Tiberina (Fig. 4).

2.3. Perugia – Ancona

From Perugia, the last two itineraries branch out, one leading to Ancona and the other to Potentia. Path 1 diverges from Perugia southeastward, following a branch of the Via Flaminia that connected Forum Flamini to Perugia.[14] From this point onward, it essentially follows the Via Flaminia northward, then enters the valley of the Esino River at Fossato di Vico. From there, the itinerary shifts eastward, following a significant branch of the Via Flaminia that led from Elvillum to Aesis.[15]

14 P. Camerieri, L'antica via Flaminia in Umbria (Roma 1997) 48.

15 M. Destro, La rete stradale delle Marche settentrionali in età tardoantica, in: G. Uggeri (ed.), Atti del Terzo Congresso di Topografia Antica. La viabilità romana in Italia, Roma, 10–11 Novembre 1998, RTopAnt 9, 2001, 209–210.

From here, the Via Ottavia commenced, evidenced by the discovery of the lapis Aesinensis, which facilitated the connection to the city of Ancona[16] (Fig. 5).

Path 2 definitively presents a more direct trajectory compared to Path 1. Departing from Perugia, it heads eastward, crossing the Umbrian-Marche Apennines before rejoining Path 1 at Elvillum (Fig. 5).

Looking at the elevation profiles, we can see in Path 1 a gradual decrease in elevation typical of the Marche valleys. Path 2, although shorter, presents numerous elevation peaks due to crossing the Umbrian-Marche Apennines (Tab. 3).

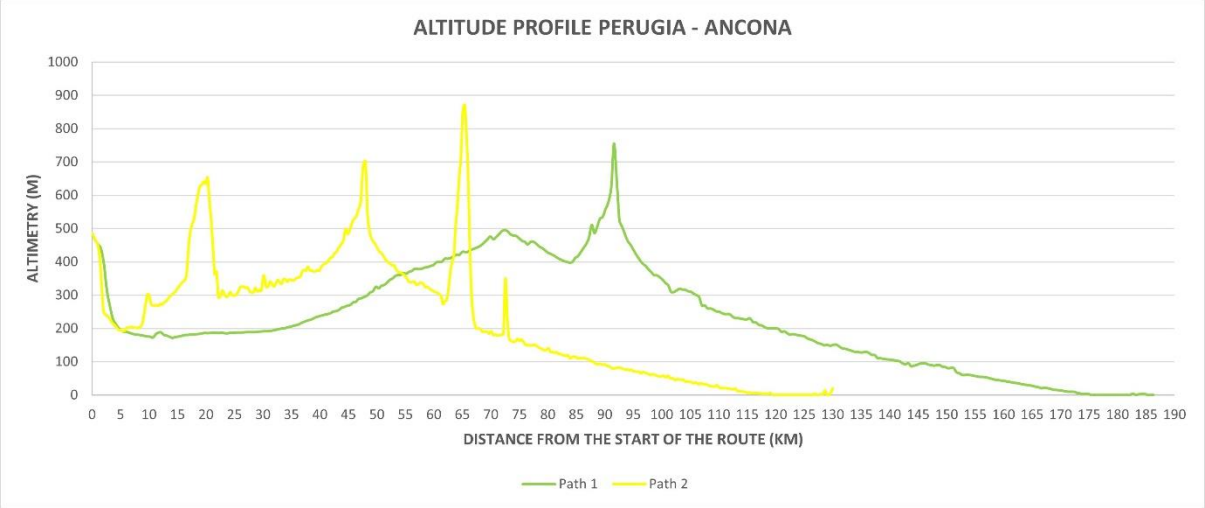

Table 3. The graph compares the two altitude profiles for the Perugia-Ancona section. Regarding Path 1, a peak around kilometer 97 can be observed, which corresponds to the entrance of the path into the Esino valley. Path 2, having a shorter and straighter path, is characterized by an altitude profile with several peaks due to the crossing of the Umbrian-Marche Apennines.

16 E. Giorgi, Diramazioni della Salaria sul versante adriatico, in Atlante tematico di topografia antica. Strade secondarie dell'Italia antica, in: Roma monumenti territorio 31 (Roma 2021) 161–165.

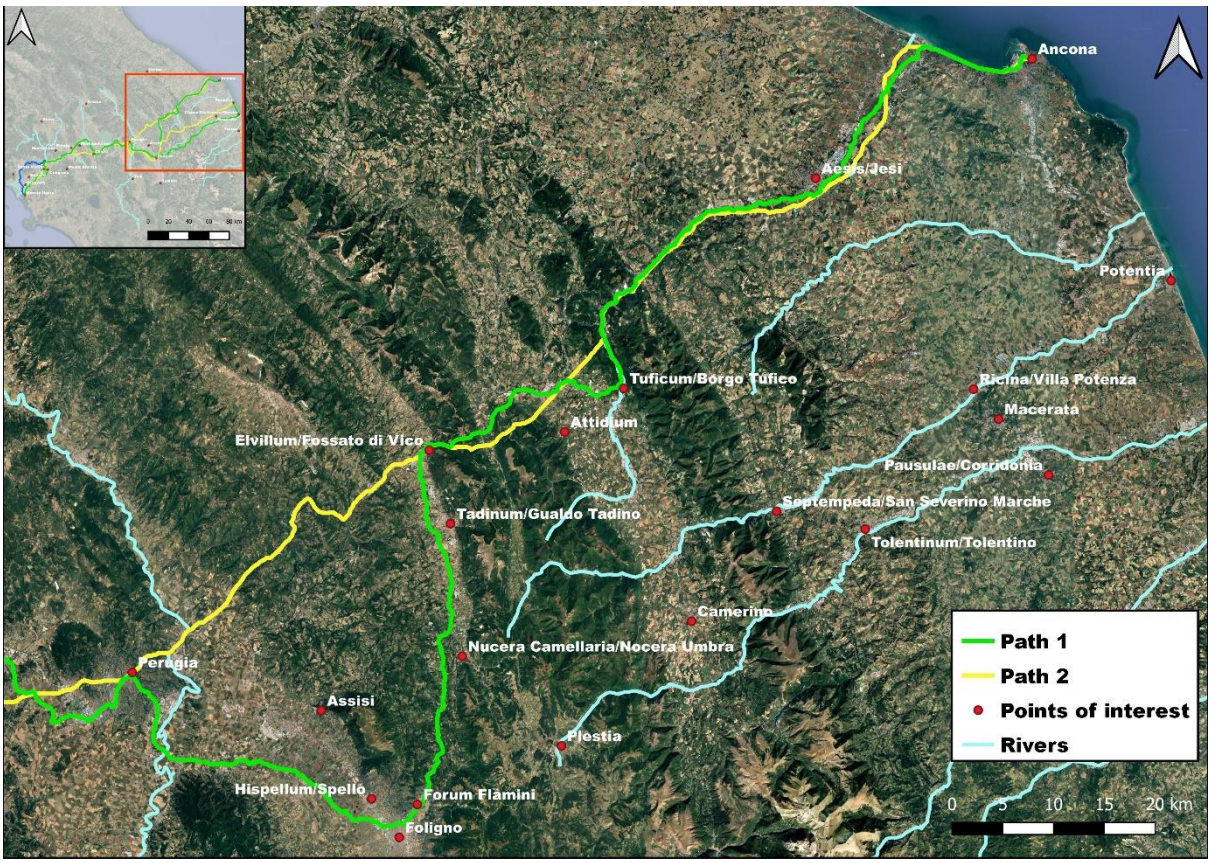

Figure 5. The two routes identified in the Perugia-Ancona section.

2.4. Perugia – Potentia

The final segment concerns the stretch from Perugia to Potentia. Path 1, starting from Perugia, moves south to the Via Flaminia at Forum Flamini. Here, it follows a branch of the Flaminia, which, tracing the Chienti Valley, reaches Cluana.[17] From there, it heads north toward Potentia, following the route of the Via Salaria Picena (Fig. 6).

17 Giorgi ibidem 148.

Path 2, upon reaching Forum Flamini, moves north, following the path of the Flaminia to Nucera Camellaria. Here, it follows another branch of the Flaminia, known as the Via Prolaquense,[18] along the Potenza Valley, arriving at Potentia (Fig. 6).

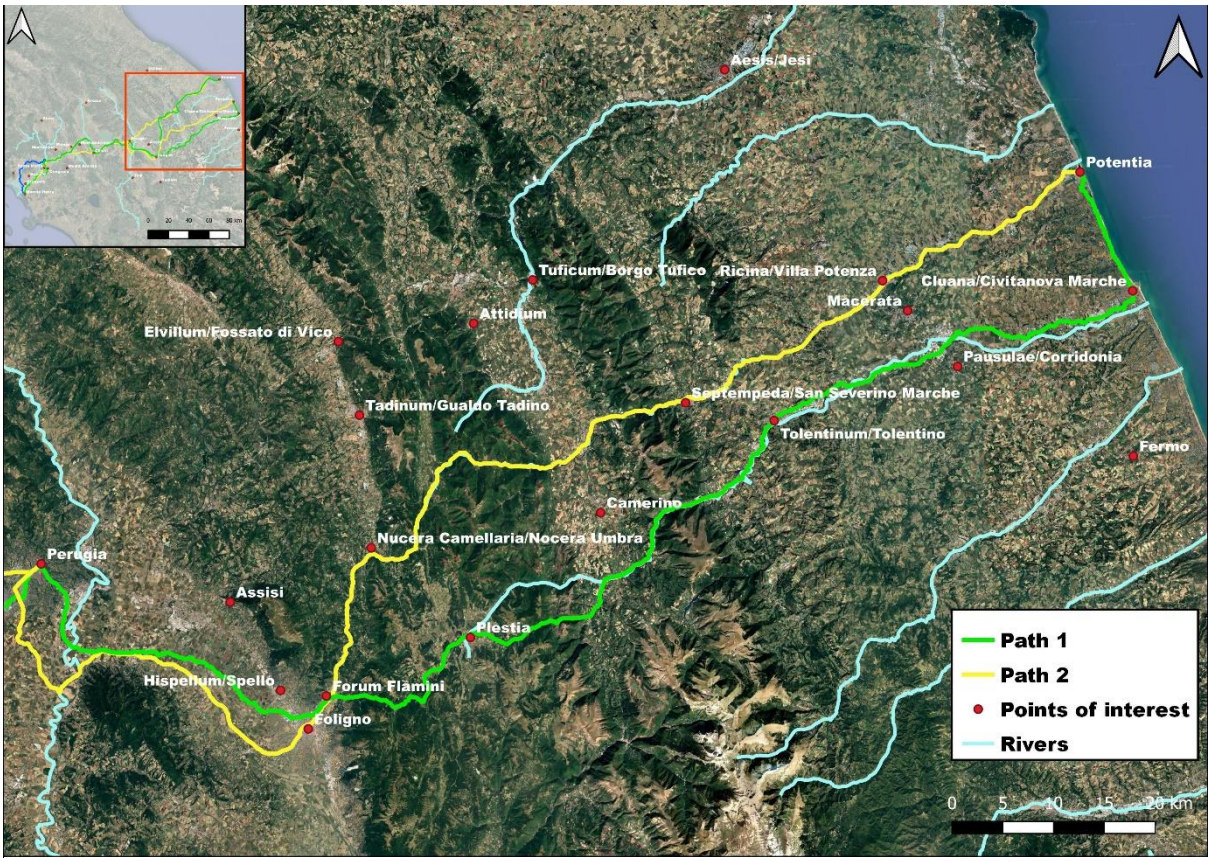

Figure 6. Map highlighting the two routes identified in the Perugia-Potentia section.

Again, elevation peaks are attributed to our routes entering the river valleys, in this case, the Chienti and Potenza valleys. A gradual decrease in elevation typical of the Marche valleys is also noted here (Tab. 4).

18 Ibidem.

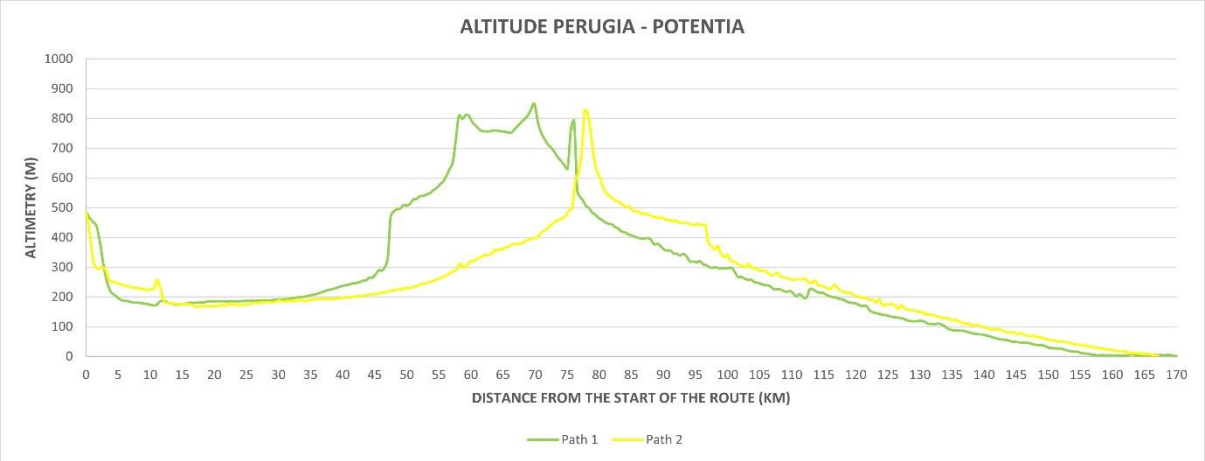

Table 4. Two altitude profiles for the Perugia-Potentia section. Path 1 shows a rather sudden increase in the altitude profile between kilometers 46 and 78, due to the crossing of the Umbrian-Marche Apennines. The altitude begins to gradually decrease from approximately kilometer 80, following the entry of Route 1 into the Chienti river valley (Fig. 6). Path 2 is characterized by a single altitude peak between kilometers 80 and 85, which corresponds to the path crossing the Umbrian-Marche Apennines, about ten kilometers after Nucera Camellaria. Again, the altitude begins to decrease around kilometer 100, following the entry of Route 20 into the Potenza river valley (Fig. 6).

3. Conclusion

In summary, we conclude that all identified routes are likely pathways. The various road axes align both historically and archaeologically, frequently passing near important sites from the Etruscan and Roman periods, as well as areas associated with transhumance practices. These routes closely emulate the transhumance paths detailed by Marcaccini and Calzolai in their extensive studies of the Tuscan region. Furthermore, in the mid-Adriatic context, they resemble the Via Flaminia and its branches traversing the Marche valleys, which have been thoroughly reconstructed by Giorgi.

However, in the regions of Umbria and Marche, there is a notable lack of specific studies on transhumance routes, which has limited our ability to draw meaningful comparisons. Additionally, research on the West-East axis, linking the Tyrrhenian Sea to the Adriatic, is insufficient. A comprehensive investigation of this axis could be highly valuable, as it may reveal potential commercial and cultural exchanges that have historically taken place, as well as explore divisions that arose over time. Understanding the historical utilization of this route could shed light on who benefited from it, enhancing our knowledge of the socio-economic dynamics of the past.

It is crucial to note that the routes developed in our study are based on cost models that utilize a Digital Elevation Model (DEM) and river maps, reflecting the current geomorphology of the area under study. By employing a longue durée approach, which examines historical developments over extended periods, and by identifying various historical timeframes, we could develop more refined cost models. These models would capture the critical aspects of environmental transformations, potentially revealing new routes and facilitating meaningful comparisons across different historical periods. This multifaceted approach has the potential to deepen our understanding of how landscapes have shaped, and been shaped by, human activity throughout history.

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