

The Augustan aqueduct in the context of road system and urbanization of the served territory in Southern Italy

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Abstract The study of ancient hydraulic infrastructures (e.g., aqueducts) is usually tackled in terms of their technical features and of classical texts and archaeological evidences while insufficient attention is devoted to the framing of the structure in the social, economic and political context of the crossed territory or of the cities and activities served. This method was applied in this study to one of the biggest ancient Roman aqueduct complex: the Augustan aqueduct in the Campania region of Southern Italy. The paper highlights which *civitates* or settlements were served and why some *civitates*, although in the same regional area, were instead excluded. The main roads and the *centuriationes* of the zones crossed are mentioned. This allows to clearly realize as great works, such as the Augustan aqueduct, were not isolated monuments but integrated in a context of very detailed, widespread and planned governance and organization of that territory.

Keywords: Aqua Augusta; aqueduct; centuriations; Roman; Pompeii; water supply.

INTRODUCTION

The end of the period of the civil wars with the achievement of Augustan rule and the availability of considerable financial resources arising from the acquisition of new and important provinces, allowed the realization of a massive program of public works both in the city of Rome and in the imperial territories in the period between the second half of the first century B.C. and the first half of the first century A.D.

Among these, the hydraulic works had a significant impact. In a recent survey (De Rosa, 2008), which only takes into account the urban aqueducts of public use made in Roman times in Italy (excluding Rome), 149 aqueducts have been identified, of which 32 realized in the Augustan age.

The aqueduct so-called *Aqua Augusta* - formerly erroneously attributed to the emperor Claudius -, even in this context of intense activity, appears to be exceptional in size (the main trunk was about 103 km and the branches about 60 km (Libertini, 2013) and technical complexity. It carried plenty of water of great quality from springs in the area of Serino, south of *Abellinum*, to a number of cities attested in an inscription regarding repairs which took place in the time of Constantine the Great (324/326 A.D.): *Puteoli, Neapolis, Nola, Atella, Cumae, Acerrae, Baia* and *Misenum* (Miccio and Potenza, 1994). Archaeological evidence

shows that it also served the coastal cities of *Vesuvius* (*Pompeii*, *Herculaneum*) destroyed in the eruption of 79 A.D. (Catalano, 2003).

The main goal of the aqueduct was to provide water to two main harbours of the Empire, the civilian one of *Puteoli* and the military one of *Misenum*. Other important additional aims included the provision of water to colonies and settlements linked to the Augustan power, as the above said *civitates*, and to several very illustrious residences in the served area. This explains the considerable investment, estimated between 140 and 450 million sesterces (1-2 years of non-military expenditures of the State (Duncan-Jones, 1994).

The choice of the springs of Serino area as *caput aquae* of the aqueduct appears bold and extreme for the reduced technical possibilities of the time. But the springs on the right side of *Clanius* river (present-day Regi Lagni) (e.g., those of Taburno-Camposauo, which already served *Capua*), had to be excluded because the overcoming of the valley of *Clanius* would have entailed very long and high arches. It was also necessary to rule out the use of the springs of the *Sarnus* (Sarno) river as a possibility, because they were at a low altitude (30 m above sea level, shortened in this work to “asl”). Thus, only the rich springs of Serino area remained, offering abundant high quality water.

The valley of the *Sarnus* river was overcome by routing the aqueduct path towards north until it reached the watershed between the basins of the *Sarnus* and *Clanius* rivers (with an altitude of 50-55 m asl in its lower part). After circling the northern slopes of Mount *Vesuvius*, the aqueduct went past the valley of the Sebeto river precisely where it was relatively narrow and with a higher altitude, around the watershed between the basins of Sebeto and *Clanius*, by a grand canal bridge over 3.5 km long, but of reasonable height.

In the last analysis, the choice of Serino springs was optimal to feed the Neapolitan area and remained so even after two millennia (Vernau, 1907).

The aqueduct, arguably built between 33 and 12 B.C. when *Marcus Vipsanius Agrippa* was *curator aquarum* in Rome (De Feo and Napoli, 2007), suffered serious damage, at least for the branch which covered *Pompeii* and the nearby centers, by the Vesuvian eruption of 79 A.D. Afterwards, it suffered damages due to periods of insufficient maintenance as justified by the major interventions testified by the inscription in the time of Constantine the Great.

There is no direct evidence about the period in which the aqueduct ceased to operate. However, it is known that Alaric, in 410 A.D., devastated the Campania region after having sacked Rome, attacking in particular *Neapolis* and *Nola* and severely damaging the surrounding areas (Savino, 2005). Questionably, the aqueduct was seriously damaged in some key points during such events, and the gravity of the general crisis, both from the organizational point of view that economic, avoided its reactivation.

From 456 A.D. Campania suffered numerous incursions by the Vandals coming from the sea and this shows that at this point the Roman fleet no longer had the ability to fight invasions by sea (Savino, 2005). Thus, the main reason for the existence of the Augustan aqueduct was gone, namely the need for water supply of the military port of *Misenum*.

The Vesuvian eruption of 472 A.D. (Mastrolorenzo *et al.*, 2002), so-called Pollena eruption, heavily damaged the Nolan area and the middle portion of the aqueduct, and it would have blocked its functioning, if it had been running.

Finally, *Procopius Caesarensis*'s historical testimony about the cut of an aqueduct, which allowed *Belisarius* to penetrate in *Neapolis* in 536 A.D. (Comparetti, 1895), interpretable as evidence for the persistence of the functioning of the Augustan aqueduct (Pavesio, 1985), may be explained better as the cut of an aqueduct that was inactive along many decades and

that therefore aroused no alarm among the Neapolitans, served by a more ancient aqueduct (i.e. the so called “Bolla/Volla”).

METHODOLOGY

In the study of the aqueduct, the attention has been focused on the description of the areas crossed, trying to define the towns (sites and, where possible, town walls), the roads and the grids of the centuriations.

Information already in part known have been used (Chouquer *et al.*, 1987; Talbert, 2000), drawing them on Google Earth© cartography and integrating them with a multiplicity of data that resulted from the observation of the territory. To draw centuriation grids, it has been used a special software developed for a larger work, in preparation by one of the Authors (Libertini, 2013), covering all the areas studied in due time by Chouquer *et al.* (1987).

The Augustan aqueduct, and its ramifications, passed through the areas subdivided by the centuriations (*centuriones* or *limitationes*) reported in Table 1. All the centuriations in the table have square modules with dimensions equal to an integer multiple of an *actus* (1 *actus* = 35.48 m). The source for the data is Chouquer *et al.* (1987). Some different interpretations (see notes to Table 1) and the drawings, on Google Earth© cartography, are unpublished data elaborated by one of the Authors (Libertini, 2013).

Table 1 Centuriations present in the territory crossed and served by the Augustan aqueduct (Chouquer *et al.*, 1987).

Centur. number	Fig. number	Name	Period	Module (<i>actus</i>)	Module (m)	Angle (degree)	Number of rows	N. of columns	Drawings colour
51	48	<i>Abellinum</i>	Gracchian or Sullan	14	496,72	-27,30°	10	12	green
69	65-66	<i>Ager Campanus I</i>	Gracchian	20	705	-00° 10'	34	40	amaranth
70 ^a	63-64	<i>Ager Campanus II</i>	Sullan and Caesarean	20	706	00° 26'	33	40	green
72	70	<i>Acerrae-Atella I</i>	Augustan	16	567,68	26° 00'	14	26	violet
73 ^b	70	<i>Neapolis</i>	Augustan	16	567,68	26° 00'	19	7	green
74	71	<i>Atella II</i>	after Sulla?	20	710	-33° 00'	9	2	yellow
75 ^c	72	<i>Nola I-Abella</i>	Sullan	20	706	00° 00'	26	27	green
76	73	<i>Nola II</i>	?	20	707	41° 30'	21	16	violet
77	74	<i>Nola III</i>	Vespasianan	20	707	-15° 00'	29	35	yellow
78 ^d	75	<i>Nola IV-Sarnum</i>	Augustan	16	567,68	43° 30'	14	6	amaranth
79	76	<i>Nuceria I</i>	Augustan?	20	710	-02° 00'	8	21	violet
80	77	<i>Nuceria II</i>	Triumviral? Neronian?	20	708	14° 30'	12	27	green

^a: For Chouquer *et al.* (1987), it has an angle of 0° 40' and a module of 706 m. A better approximation is obtained by an angle of 0° 26' and a module of 705 m.

^b: With the same module and angle of *Acerrae-Atella* centuriation. The *decumani* (defined as the *limites* inclined 26° compared with the direction north-south) appear to be on an extension of the corresponding *decumani* of the other centuriation, while for Chouquer *et al.* (1987) they are slightly misaligned. In any case, the nearest *cardines* of the two centuriations are at a distance that is different from a module, or a multiple of a module, and so they are two different centuriations.

^c: For Chouquer *et al.* (1987), it has an angle of 0° 40', but with an angle of 0° we have a much better approximation.

^d. Rectius: *Nola IV-Urbula*.

The table also shows the arbitrary number assigned to each centuriation by Chouquer *et al.* (1987) and the number of the figures that illustrate them in the cited work.

The centuriations subdivided areas with numerous large estates (*praedium*, pl. *praedia*), having the owner's house (*domus*), the modest houses of the slaves (*casae*) and service facilities. These estates were often named from the same owners, especially in the Campania region: *praedium artianum*, *iulianum*, *crispianum*, ... (Flechia, 1874), from which the names of many modern centers (Arzano, Giugliano, Crispano, ...) and of many medieval villages (Libertini, 2011), later disappeared or embedded in larger centers (e.g.: *Nevanum* in Grumo Nevano). The large amount of available data on *praedia* in the areas crossed by the aqueduct are not reported for brevity, but it is useful to consider that the towns were not surrounded by uninhabited fields but filled with many *praedia*.

RESULTS AND DISCUSSION

The route of the Augustan aqueduct is presented and discussed with reference to ten segments that have been chosen in order to facilitate the description of the aqueduct and its branches, served towns, crossed centuriations and roads.

First segment - From the source to the “caduta della Laura” (included) (371 -> 205 m asl; 18 km)

As shown in Figure 1, the Augustan aqueduct commenced between the present-day settlements of San Michele di Serino (in the district of Avellino, shortly “Av”) and Santa Lucia di Serino (Av), where it collected the Acquaro spring water (371 m asl). After, it headed towards Aiello del Sabato (Av) and Cesinali (Av), then turning around to the place where now sets the center of this town. Next, it turned towards Bellizzi Irpino (in Avellino, Av) and Contrada (Av), here passing by a long tunnel (about 6 km) under the mountain of Forino near the homonymous town (Av) and after, by the tunnel so-called the “caduta della Laura” (fall of the Laura, 1.45 km, carved out of solid rock), came to Preturo (in Montoro Inferiore, Av) and Montoro Inferiore (Av). The fall happened from 359 to 205 m asl.

In this first segment, except for *Abellinum*, there is no evidence of noteworthy population centers on ancient times. Definitely it was, in the area said Serino, a forested area with great wealth of rich sources of high quality water. In this area, the famous marmoreal inscription, dating from the time of Constantine the Great, in which there were the *civitates* served by the aqueduct, was found (De Biase, 2006).

From the same area, another aqueduct, intended to supply *Beneventum*, started. It began from Urciuoli spring water (about two and a half kilometers from Acquaro spring), then headed north passing around *Abellinum*, in the immediate vicinity of present-day Atripalda (Av), and then went on to *Beneventum* (De Feo *et al.*, 2009).

In terms of towns and centuriations, near the present-day Cesinali, there was the town of *Abellinum*, not served by the Augustan aqueduct, and the homonymous centuriation, crossed by the aqueduct in its southern part.

In terms of roads, after a big curve around the site of the present-day Cesinali, the aqueduct ran near the road that connected *Abellinum* with *Nuceria Alfaterna* and *Salernum*.

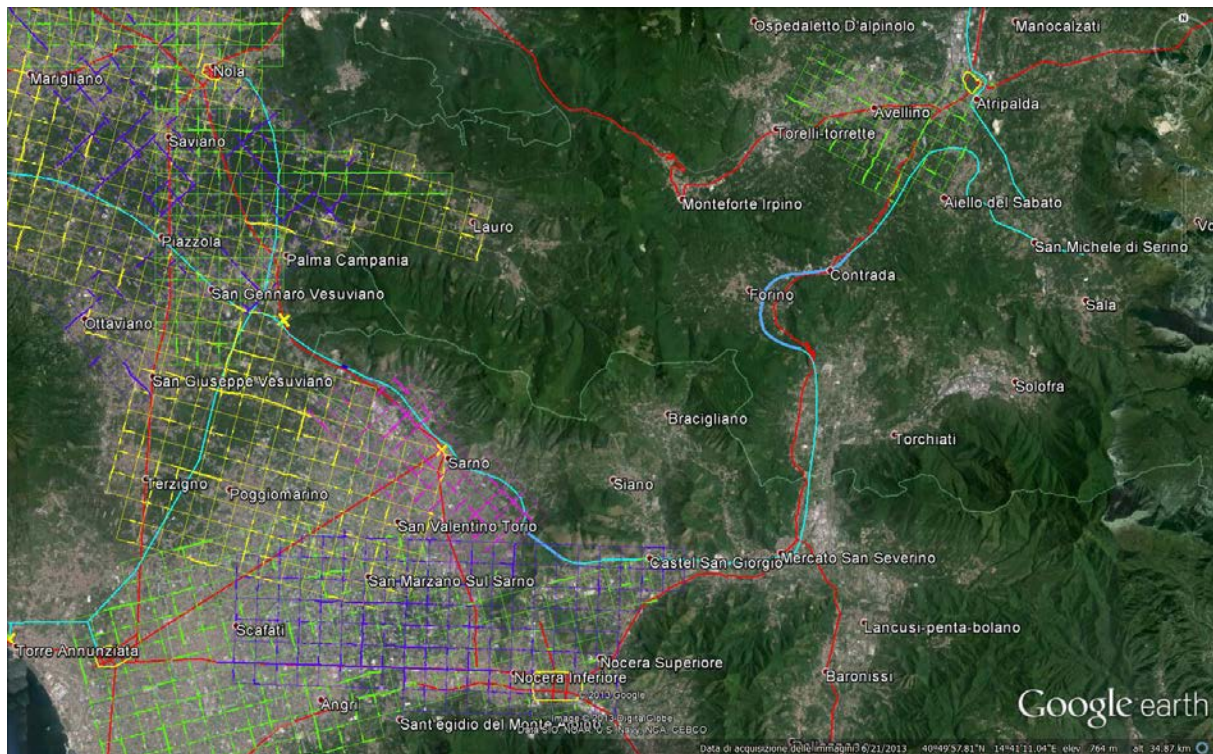


Figure 1 Aqua Augusta segments 1 and 2 (introduced in this work).

Second segment – From the end of the previous segment to Monte Paterno tunnel (included) (205 -> 70 m asl; 16.4 km)

As shown in Figure 1, after the “caduta della Laura”, the aqueduct descended to a lower altitude, continuing south towards Mercato San Severino (in the district of Salerno, shortly “Sa”), 142 m asl, and then turning west towards Castel San Giorgio (Sa), 95 m asl, going along the side of the hills in the area. Immediately after, it reached mount Paterno, passing by a tunnel of about 1.9 km, descending from an elevation of about 83 m to about 70 m asl.

In terms of towns and centuriations, in the second part of this segment, the aqueduct ran north of *Nuceria Alfaterna*, which contended with *Teanum* as the third largest town of Campania, after *Capua* and *Puteoli*. The area was subdivided by two centuriations: *Nuceria I* and *Nuceria II*. The town of *Nuceria Alfaterna*, although destroyed during the Germanic invasions, had the trail of the walls which, for the most part, is somehow identifiable and guessable. This ancient town was not served by the Augustan aqueduct but was likely served by other local springs.

In terms of roads, the aqueduct ran near the street that went from *Abellinum* to *Nuceria Alfaterna*, up to the area of the present-day Castel San Giorgio (Sa). The road to *Salernum* originated in the area where the aqueduct changed direction pointing towards the west.

From the town of *Nuceria Alfaterna* four main roads branched out: 1) to *Abellinum*; 2) to *Salernum* (via *Popilia*); 3) to *Nola* (via *Popilia*), with a branch for *Pompeii*; 4) to *Stabiae* and *Surrentum*.

Third segment - From the end of the previous segment to the branch points for *Nola* and *Pompeii* (70 -> 50 m asl; 13.7 km)

As shown in Figure 2, the aqueduct ran along the side of the hills above *Urbula*, present-day Sarno (Sa), with a soft downward slope, going inward the Campanian plain. Where the height of the plain had raised enough, on the watershed between the basins of *Sarnus* and *Clanlus* rivers, it bend to north-west towards the site of present-day San Gennaro Vesuviano (in the district of Naples, shortly “Na”), and to a point from which the first two important branches originated. After Sarno, we can still see the ruins of a section of the aqueduct, at a point where it ran on a canal bridge, the so-called “Mura d’Arce” (walls of Arce) (Catalano, 2003). Other remains are visible in Ponte Tirone, a place in the territory of Palma Campania (Na) (Catalano, 2003).

In terms of towns and centuriations, in the first part of this segment (area of *Urbula*), the aqueduct ran along an area subdivided by the centuriation *Nola IV-Sarnum* and marginally by *Nola III*. In the second part, the land was subdivided by the centuriations *Nola I-Abella*, *Nola II*, and *Nola III*. Along the route, there was the small town of *Urbula*, for which, however, the news of the Roman times are only epigraphic (from *Pompeii*) (Conticello de’ Spagnolis 1989), while for Sarno the first evidence dates back to Longobard times (Ruocco, 1999).

In terms of roads, for a good part of the way, the aqueduct ran along the *via Popilia*, departing from it in the initial and final portions. On the *via Popilia*, it could be found *Urbula*, probably a *mansio* (an official stopping place on a Roman road used by officials and people on official business whilst travelling), at a third of the way between *Nola* and *Nuceria Alfaterna*. Midway between *Urbula* and *Nola*, where the aqueduct went away from the *via Popilia*, there was *ad Teglalum*, likely another *mansio*.

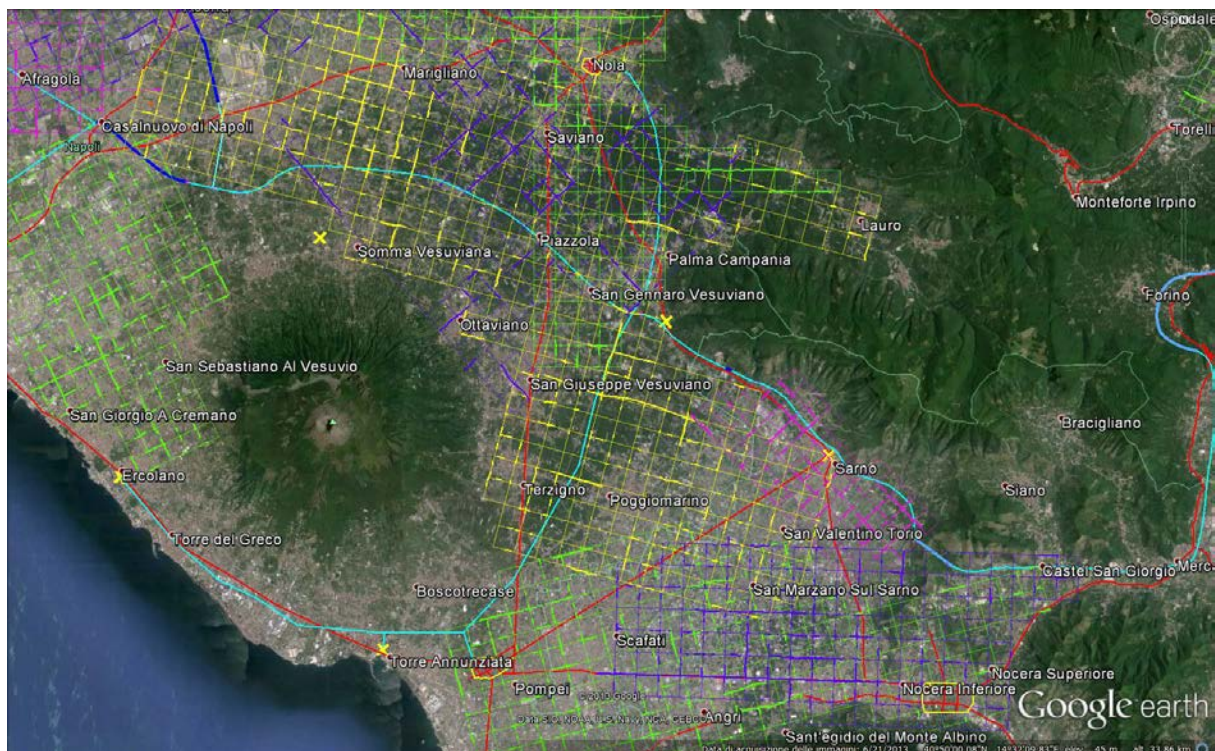


Figure 2 *Aqua Augusta* segments 3 and 4 (introduced in this work).

Branch for Nola (6.9 km)

The first branch was for *Nola* that, being located about 12 meters asl below the branching point, could easily be served by the Augustan aqueduct. In fact, the city was also served by another aqueduct coming from the hills above *Abella*, but certainly the new supply enriched water availability with likely better and steady water. *Vergilius* complained that his home in *Nola* had not had the grant of a private connection and, in some way, he found a way to retaliate in his verses (Catalano, 2003).

In terms of towns and centuriations, the branch passed through lands subdivided by the centuriations *Nola I-Abella*, *Nola II* and *Nola III*. Its end reached *Nola*, an important center, which, however, for its urban dimension and population was not among the first towns of Campania.

In terms of roads, *Nola* was immediately at the side of *via Popilia*, halfway between *Suessula* and *Urbula*. *Nola* was also crossed by the road that went from *Neapolis* to *Abella* and then to *Abellinum*.

Branch for Pompeii, Oplontis, Herculaneum (12.4 km up to the sub-branch for Pompeii + 12.9 km from Pompeii to Herculaneum = 25.3 km)

The second branch headed south, turning gently around the Vesuvio (*Vesuvius mons*), in the direction of *Pompeii*, where the supply by an aqueduct sufficient for the needs of the town is well documented (Catalano, 2003). It is probable that the aqueduct did not point directly towards *Pompeii*, but that it remained on a higher altitude and continued towards *Oplontis*, where the present-day Torre Annunziata (Na), and *Herculaneum*, now Ercolano (Na), are located, and that served the sumptuous villas set along the aforesaid path. The remains of an aqueduct near *Herculaneum* and of a *castellum aquae* in the town were found (Catalano, 2003): in that area, where the ground is composed of black basalt, alternative sources capable of powering an aqueduct using springs from the slopes of the volcano, are not known. Furthermore, it is not likely that a relatively important center as *Herculaneum* and villas owned by very important people were neglected in the supplying of public waters. An alternative route, departing from the southern area of the present-day Pomigliano d'Arco (Na), would be possible but it would be even more costly and would have crossed an area for which there was no strong demand.

In terms of towns and centuriations, the branch crossed, in a first section, lands subdivided by the centuriations *Nola I- Abella*, *Nola II* and *Nola III*, in a second portion, lands subdivided only by *Nola III* and, in the third portion, lands subdivided by the centuriation *Nuceria II*. It is interesting to note that the traces of *Nuceria II* centuriation go beyond the town of *Pompeii*, buried by the eruption, in the direction of Vesuvio. This indicates that in later stages, after the famous eruption, the lands of the area were again subdivided respecting the module and the orientation of *Nuceria II* centuriation. *Pompeii* was the main town of its surrounding territory, but, obviously, was not mentioned in the inscription of Constantine the Great since its destruction. The smaller towns of *Oplontis* and *Herculaneum* for the same reason could not be mentioned either. Only for *Pompeii*, the circle of the walls is known and maybe it was the only center among the three which had walls.

In terms of roads, *Pompeii* was connected by roads with *Nola*, towards north, *Surrentum* and *Stabiae*, towards south, *Herculaneum* and *Neapolis* towards north-west, *Urbula*, towards north-east, *Nuceria Alfaterna* and *Salernum* towards east.

Fourth segment - From the end of the previous segment to the branching point for *Acerrae* (50 -> 47 m asl; 13.8 km)

As shown in Figure 2, the aqueduct turned gently around the northern slope of the Vesuvio, gradually declining from 50 to 47 m asl, until it reached the branch for *Acerrae*.

In terms of towns, centuriations and roads, the aqueduct crossed lands subdivided, in a first section, by the centuriations *Nola I- Abella*, *Nola II*, and *Nola III*, and then only by *Nola III*. No town is known in this area. In the region overlying the final part of this segment, it was found, under several meters of volcanic deposit, a very sumptuous villa, still object of careful archaeological excavations and interpreted as the famous villa that *Octavianus Augustus* had in the area (by inheritance from his natural father) and where he died (D'Arms, 1970).

Branch for Acerrae (6 km)

At a point where one of the authors of this work (Leone) is a direct witness to the presence of traces of an aqueduct and of one of its branches, midway between two other points where remains of the aqueduct also were found (all points marked with amaranth crosses), it is plausible that the branch for *Acerrae* originated. There is certainty of this branch because it is attested in the inscription of Constantine, but there is no other news about it. The branch originated at an altitude of about 48 meters and reached *Acerrae*, situated on a slight rise at an altitude of 31 meters, after crossing an area with a lower altitude (23-26 m). Necessarily, then, after the first part, it had to run on a canal bridge, of which, however, there is no historical testimony. The branch did not go on to serve *Suessula*, which enjoyed probably of other water sources. *Acerrae*, for the shallowness of the aquifer in the area, was able to make use of wells of little depth but with water of lesser quality.

In terms of towns and centuriations, *Acerrae* was a secondary center, but its urban structure; in particular the orientation according to the same angle of *Acerrae-Atella II* centuriation, dating from the time of *Augustus*, has been preserved to the present day. The branch ran through lands subdivided by centuriation *Nola III*, in a first part, and also by the centuriation *Acerrae-Atella II* in the second part.

In terms of roads, *Acerrae* was on the route *Neapolis-Suessula*, which then continued to *Caudium* and *Beneventum*. In addition, two secondary ways connected it, the first, towards west, with the road *Suessula-Atella*, and the other, towards north-east, with the *via Popilia*, on the stretch between *Suessula* and *Nola*.

Fifth segment - From the end of the previous segment to the branching point for *Atella* (47 -> 44 m asl; 4.5 km)

As shown in Figure 3, after a short distance from the ramification for *Acerrae*, there was the beginning of an imposing canal bridge having a length of over 3.5 km, and that in some places reached a height of about 15 m. In a small final stretch, the canal bridge, oriented towards the north-west, had necessarily to change direction, then pointing towards south-west. This canal bridge long survived the deactivation of the aqueduct. In the early Middle Ages, there is the testimony of the various centers that, being placed beyond the arches of the aqueduct (in the perspective from *Neapolis*), were called *foris arcora* or also *a foris Arcora*. As derivations from these names, we have: Pomigliano d'Arco, Arcora, the church of Madonna dell'Arcora in Casalnuovo di Napoli (Na), and likely Afragola, as a contraction of *a foris arcora* -> *afracora* -> Afragola. In the late medieval and modern times, the remains of the aqueduct were used as stone quarries, until its total destruction above ground level.

In terms of towns, centuriations and roads, no towns existed in this area, which was subdivided by *Nola III* centuriation, and for a small final portion by *Ager Campanus I*. The area was crossed by the road, which coming from *Neapolis*, from south-west, branched off in an arm towards east, with a slight inclination to the north, to *Nola*, and in another arm heading towards north-east to *Acerrae* and *Suessula*.

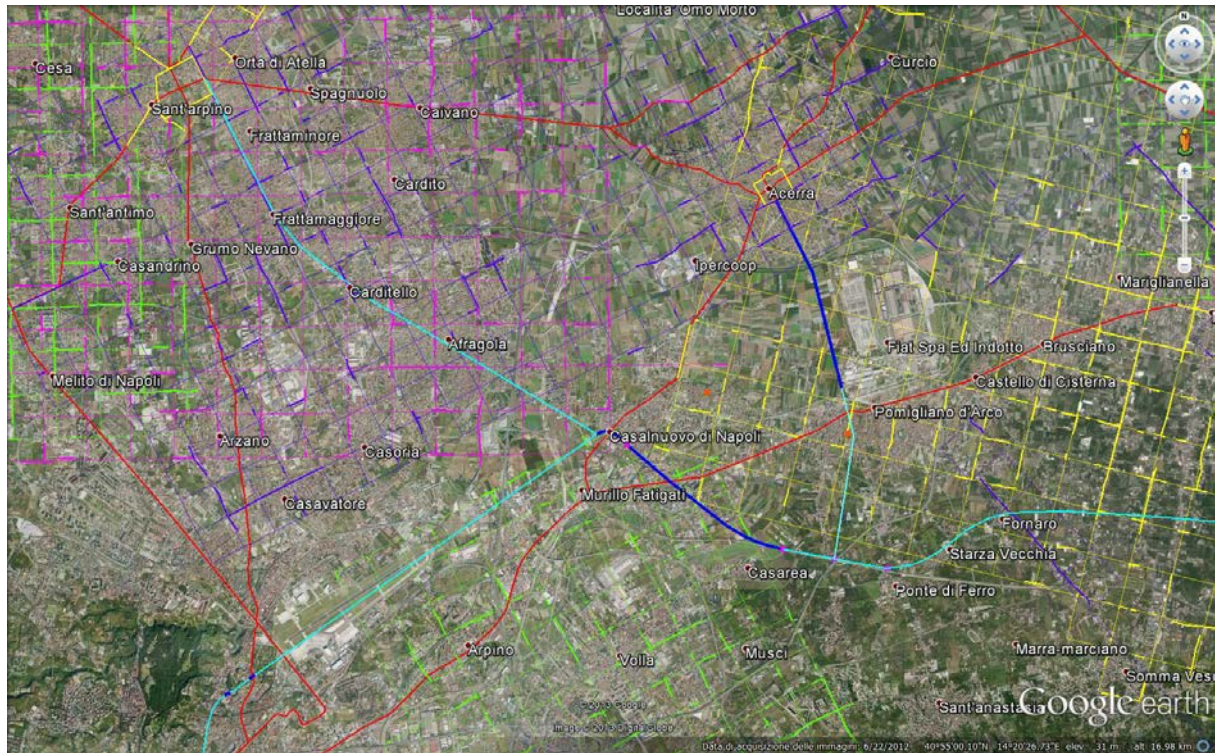


Figure 3 *Aqua Augusta* segments 5 and 6 (introduced in this work).

Branch for Atella (8.8 km)

Just after the end of the great canal bridge, the branch for *Atella* had to be, as it was the closest point to that town.

In terms of towns and centuriations, the town of *Atella* is well known for its *fabulae atellanae*, and in particular for *Maccus*, from which Pulcinella in all probability derived. *Atella* was equipped with walls of which it is possible to define the trail. The area crossed by the branch was subdivided by the centuriations *Acerrae–Atella II* and *Ager Campanus I*, and grazed areas subdivided by the centuriations *Atella I* and *Ager Campanus II*. *Atella*, similarly to *Acerrae*, for the shallowness of the aquifer in the area, was able to make use of wells with little depth but having water of lesser quality.

In terms of roads, in the final part of the branch, the route ran at half the distance between the *via Atellana* (west of the branch), which went in the direction of south from *Capua* to *Neapolis* passing through *Atella*, and the road (north of the branch) that went from *Atella* to *Suessula* in direction of the west.

Sixth segment - From the end of the previous segment to the Ponti Rossi (included) (44 - > 41 m asl; 7.4 km)

As shown in Figure 3, from the point of ramification for *Atella*, the aqueduct ran, mildly declining, with a long straight stretch under the present place of the Neapolitan airport, then emerging with a small canal bridge, which no longer exists, in a tract of the present-day “calata Capodichino” (descent), near the destroyed church of San Giuliano (Lettiero, 1560), and, afterwards, with another canal bridge, the remains of which are known as “i Ponti Rossi” (the red bridges).

In terms of towns and centuriations, no town is known in this area that was subdivided by the north-west part of *Neapolis* centuriation.

In terms of roads, in the final part, before the Ponti Rossi, the aqueduct intersected the two routes, corresponding to the present-day calata Capodichino (shortest but steepest; in the Middle Ages: *clivum maiorem*) and Doganella (longer but also gentler; in the Middle Ages: *clivum beneventanum* or *de galloro*; for the distinction between the two routes, s. RNAM (Libertini, 2011), which led from *Neapolis* to *Atella* and other centers that were in the north.

Seventh segment - From the end of the previous segment to the tunnel for “Fuorigrotta” (included) (41 - > 40 m asl; 8 km)

As shown in Figure 4, after the Ponti Rossi, the route approached *Neapolis*, passed under a corner of the present-day Orto Botanico (Botanical Garden), emerged with a short canal bridge up via Vergini (road), and bordered on the northwest corner of the city walls. Then it went, keeping the necessary altitude, to a point opposite the ancient *Palepolis* (Partenope), and running along the side of the hill above the present-day Mergellina headed for the hill that separates *Neapolis* from the next small plain, present-day Fuorigrotta, which reached by a tunnel different from the famous *crypta neapolitana*.

In terms of towns and centuriations, in the area, there was the town of *Neapolis*, of which in the map the walls in the Greek and Republican period (in yellow) and in the late-imperial times (in pink) are shown. The town, at least in the parts that were altimetrically lower, was served by the aqueduct of the Bolla/Volla, perhaps even from the time of its foundation. There was also the minor center of *Palepolis*, who had no administrative autonomy from *Neapolis*.

In terms of roads, *Neapolis* was connected to the surrounding centers by various roads: 1) towards west, with *Puteoli* through a path that in its first section had two alternatives, the first that used the *crypta neapolitana*, while the second went through the present-day Vomero, the so-called (by modern Scholars) *via Antiniana*; 2) towards south-east, with the areas where, in their times, there were *Herculaneum*, *Pompeii* and *Oplontis*, and then to *Nuceria Alfaterna* and *Salernum*; 3) towards north, with *Atella* and *Capua*, in a section through the two alternatives mentioned above; 4) towards north-east, with a fork where one of the branches went to *Nola-Abella-Abellinum* and another to *Acerrae-Suessula-Caudium-Beneventum*.

First branch for *Neapolis* (0.05 km up to the walls)

In the north-west corner of the walls of *Neapolis*, the aqueduct bordered on them and here a branch of the aqueduct that served the upper part of *Neapolis* started, reaching the crossroads of Santa Patrizia (Lettiero, 1560), where currently via Luciano Armani continues with via Capozzi. Through this branch of the aqueduct, which was already in disuse, it is likely that the soldiers of *Belisarius* infiltrated into the town in the famous conquest of *Neapolis* during the Gothic War, by penetrating in it from the canal bridge near via Vergini.

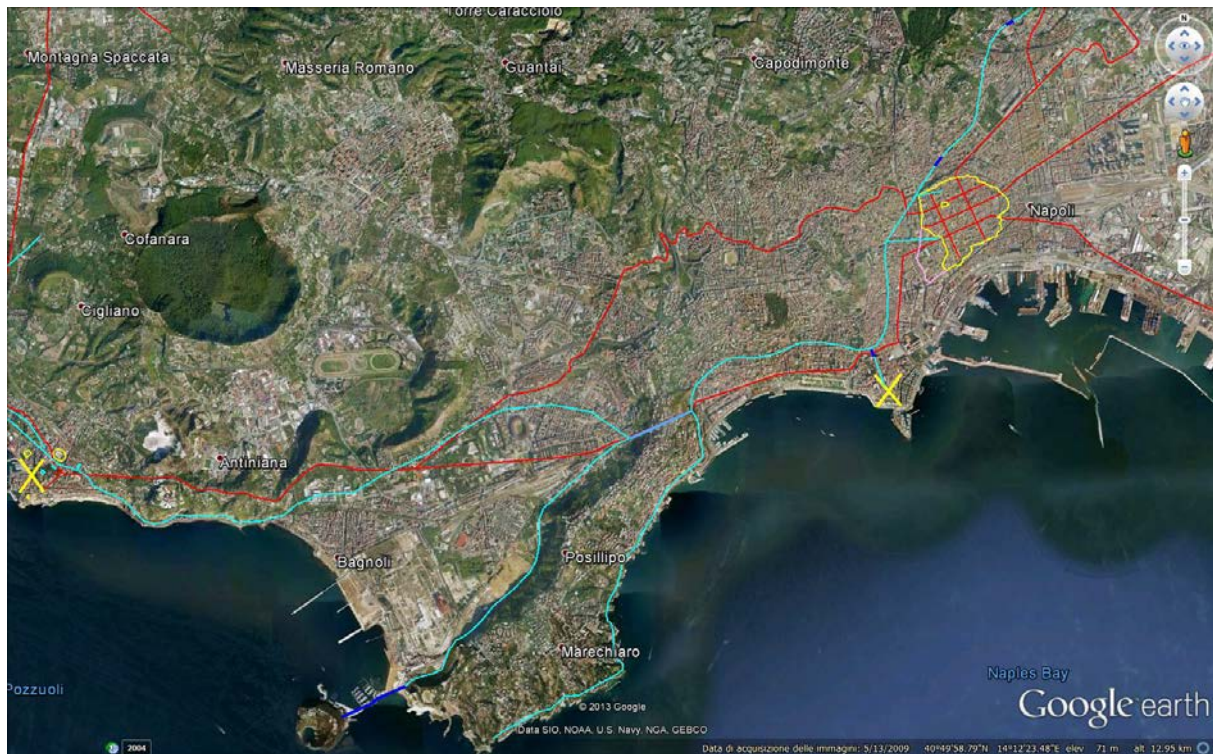


Figure 4 Aqua Augusta segments 7 and 8 (introduced in this work).

Second branch for Neapolis (0.7 km)

Further on, there was a second branch (Lettiero, 1560), which debatably served the lower part of *Neapolis*. At a point where the aqueduct crossed the course of Emperor Charles V's walls, below the present-day Military Hospital, former Monastery of the Trinity, there were found the remains of a cistern junction (Summonte, 1748; Carletti, 1776), from where this branch likely commenced. The baths found near the Maschio Angioino (Giampaola, 2011) were served by this or by another branch of the aqueduct.

Branch for Paleopolis (Partenope) (0.5 km)

In front of the hillock of *Paleopolis*, there was the beginning of a third branch which reached the ancient center, necessarily by means of a canal bridge. Remains of pipes have been found in present-day Piazza Santa Maria degli Angeli (Giampaola, 2011).

Branch for Pausylipon (5.5 km)

Just before the tunnel that led to Fuorigrotta, there was a secondary branch that ran along the hill of *Pausylipon* (Posillipo) serving the rich villas in the area until the famous residence of *Publius Veditius Pollio* near Gaiola islet (D'Arms, 1970).

Branch for Nisida (5.2 km)

Immediately after the tunnel, another secondary branch ran along the side of the hill until it reached, by a canal bridge on the sea, the small island of Nisida (Lettiero, 1560), where there was the sumptuous residence of *Lucullus* (D'Arms, 1970).

Eighth segment - From the end of the previous segment to Puteoli (40 -> 38 m asl; 7.8 km)

As shown in Figure 4, after the tunnel, the aqueduct ran on the hillsides north of the plain of Fuorigrotta, passing near the *thermae* of Terracina and the *thermae* of Agnano (Catalano, 2003), and then along the cliffs above the sea up to *Puteoli*.

In terms of towns and centuriations, *Puteoli*, which was not defended by walls, had the third largest amphitheater after those of *Rome* and *Capua*, and was, together with *Alexandrea ad Aegyptum* (Alexandria, Egypt), between the major ports of the empire. *Puteoli* was also served by a local aqueduct coming from the near mount Gauro (*Gaurus mons*) and the surrounding hills. However, the Augustan aqueduct enriched its availability of water and allowed the existence of several pools, of some of which the remains still exist. The area was not subdivided by centuriations.

In terms of roads, the main route was the one that connected, *Puteoli* with *Capua* (the so-called, by modern Scholars, *Consularis Campaniae*), towards the north. *Puteoli* was also an end of the *via Domitiana* that, going first towards west and then north-west, connected it with *Cumae*, *Liternum*, *Volturnum*, *Sinuessa* and then, by *via Appia*, the next centers in direction of *Rome*. Moreover, branches of this road went to *Baia*, *Bavli* (-> **Bavuli* -> present-day Bacoli) and *Misenum*. A third road went towards *Neapolis*, as before mentioned.

Ninth segment - From the end of the previous segment to the branching point for *Cumae* (38 -> 36 m asl; 5.5 km)

As shown in Figure 5, got past *Puteoli*, the aqueduct ran towards *Cumae*, turning around to the north side of Lake *Avernus*. A branch of the aqueduct (1.1 km) reached *Cumae* by gallery. In terms of towns and centuriations, the ancient *Cumae* is well definable even today within its walls. For its minimum altitude, it might have been provided with wells that were sufficient for local needs but had water of moderate quality. The area does not show evidence of the centuriation testified by classical sources (Chouquer et al. 1987).

In terms of roads, *Cumae* was on the *via Domitiana* between *Liternum* and *Puteoli*. A road that went towards north-east, connected it with the important route *Capua-Puteoli* in a point near the present-day Qualiano (Na). Two roads towards south connected *Cumae* with *Baia* and hence with *Bavli* and *Misenum*.

Tenth segment - From the end of the previous segment to the *cisterna* Dragonara (36 -> 0 m asl; 8.4 km]

As shown in Figure 5, after turning around the south side of lake *Avernus* (lago d'Averno), the aqueduct headed towards *Baia* and *Bavli*, and finally reached *Misenum* and its military port, the main and fundamental goal for the construction of the aqueduct, ending *inter alia*, in the imposing so-called *piscina mirabilis* (De Feo et al., 2010) and in other cisterns in the area, such as that so-called Dragonara near Miseno cape. The area was not self-sufficient for its water availability. In particular, the military port needed large quantities of water and for this critical necessity the aqueduct was essential. With the fall of the Roman military power and the decay of the fleet, the military port lost its function and consequently the Augustan aqueduct lost the fundamental reason for its existence.

In terms of towns and centuriations, *Baia*, *Bavli*, *Misenum*, the patrician villas in the area, the military port and all associated installations and housings, were a mixed whole, with no defensive walls and not classifiable as a distinct urban entity according to the canons of the ancient world, but were closer to the typology of modern metropolitan aggregations. The area was not subdivided by centuriations.

In terms of roads, *Misenum* was connected with *Puteoli* by a road which passed through *Bavli* and *Baia*. As mentioned above, two routes connected *Baia* with *Cumae*.

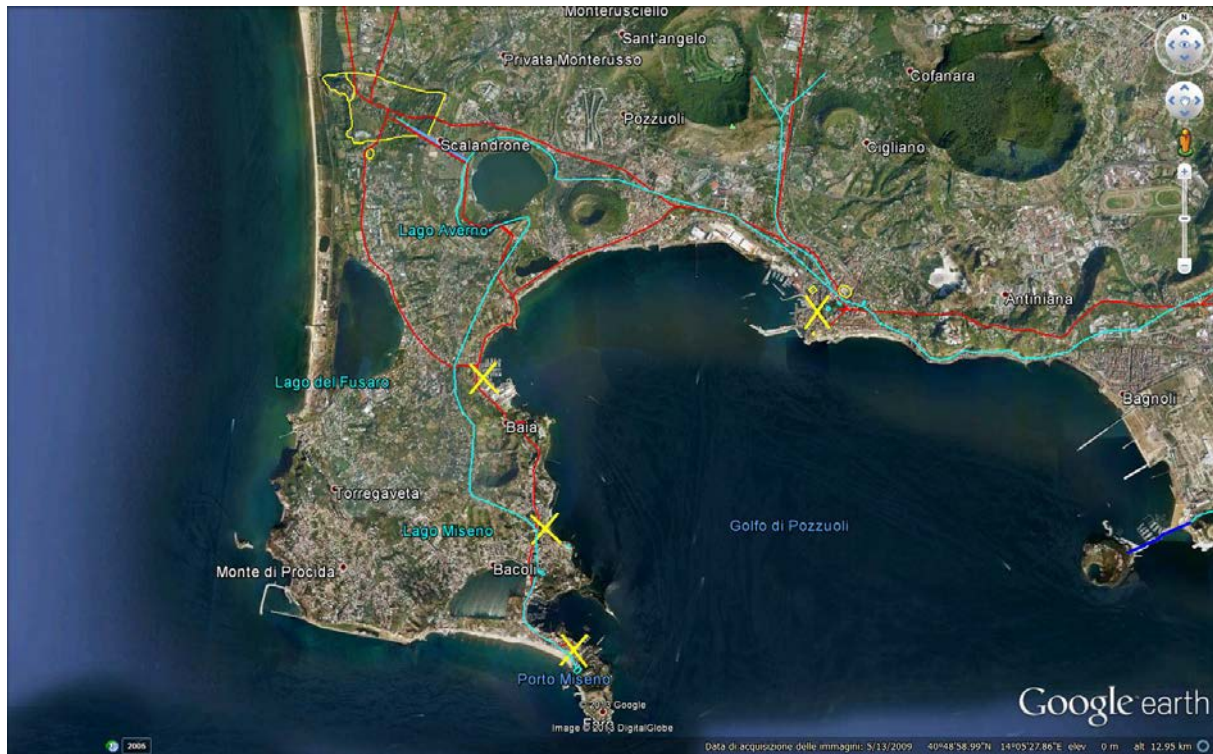


Figure 5 *Aqua Augusta* segments 9 and 10 (introduced in this work).

CONCLUSIONS

Often, studying great structures of the ancient world, as the Augustan aqueduct considered in this study, due attention is devoted to the technical characteristics of the work and how the documentation of classical texts and archaeological evidence can testify regarding their use (Abbate, 1842, 1862; VV.AA., 1883; Miccio and Potenza, 1994). However, little attention is devoted to the framing of the structure in the general context of the *civitates* and the area served.

For the territory of the Campanian plain, crossed by the Augustan aqueduct, the persisting tracks of the routes of many centuriation *limites* and of ancient streets are quantitatively very noteworthy and impressive. The density of city structures, which are often still - in various ways - definable in their ancient enclosing walls, together with the network of connecting roads and the grid, often stratified, of centuriation *limites* (extended in all for thousands of kilometers), allow a significantly detailed definition of the territory. In this context, a service structure as the Augustan aqueduct is evident in its full meaning as a very important element in a more general and complex organization (Figure 6).

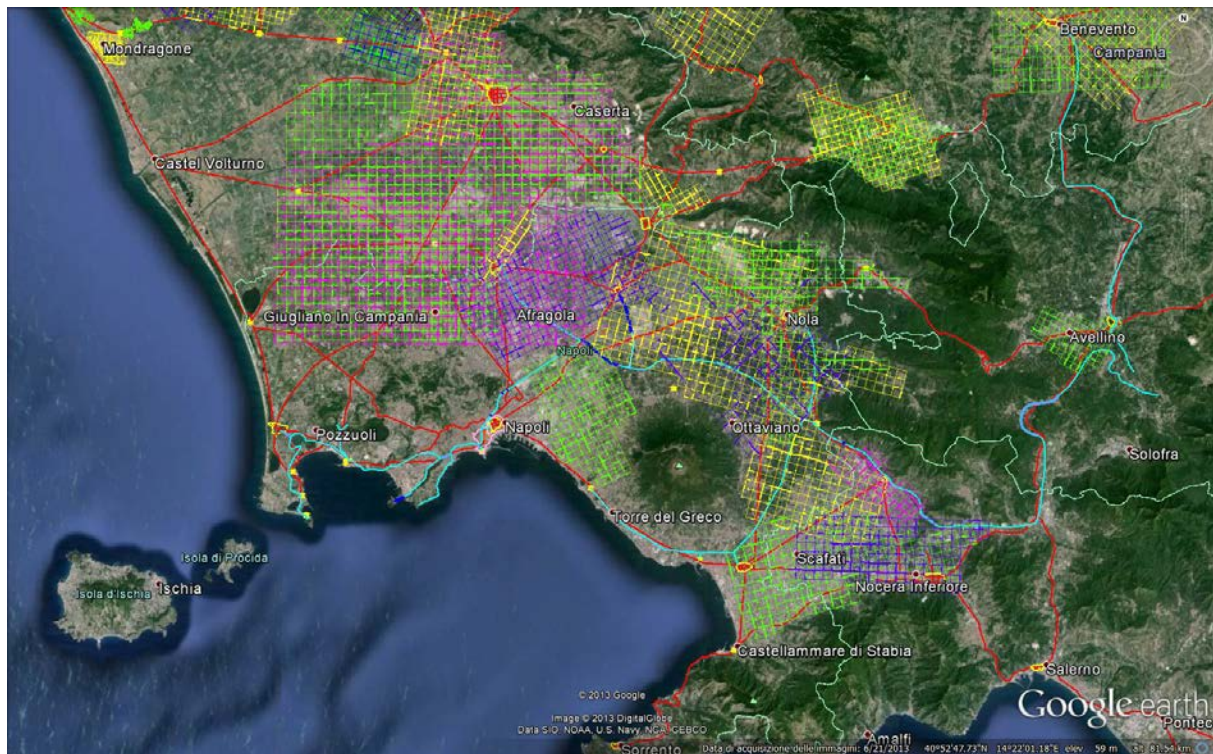


Figure 6 Aqua Augusta in its territorial context.

The brief schematization of this paper is perceptibly very limited in relation to the richness of the subject and it clearly indicates the need for a more detailed exposition. This is the potential prelude for further enrichment based on the rational integration of data of different types, not limited to the archaeological data and the classical literary sources.

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