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Landscapes of power in different ecosystems in 1st-millennium BC Italy: Veneto and Puglia

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ABSTRACT
The analysis of power dynamics and how they interact with landscape organization and environmental factors is a topic of major interest in archaeology. More recently, there has been growing research into non-élite and middling groups, and their interactions with/within landscapes affected by environmental shifts. We outline two case studies from very different ecosystems in 1st-millennium BC Italy: riverine, flood-prone Veneto in a phase of potential climate cooling, ca. 800/750–625/500 BC; and drought-prone northern Puglia (Daunia) in a phase of potential warming, ca. 325–200 BC. In Veneto, a well-off/middling burial group acted upon flooding to potentially ameliorate their social standing in a phase of growing inequality. In Puglia, non-élite communities occupied two arid-prone plateaus with small farms, concomitantly with Rome's rising hegemony. By looking at the way in which these different social groups interacted in such challenging environments, we explore how social dynamics moulded the landscape and how the environment affected inequalities in return. Ultimately, our work contributes to exploring the interplay between environmental and social factors in creating past inequalities, while addressing limitations in evidence and methods.

KEYWORDS
Italy; 1st-millennium BC; climate change; floods; drought; inequality; human-environment interactions; mortuary ritual; Roman Climate Optimum; Hannibalic/Second Punic War

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INTRODUCTION

The analysis of power dynamics and how they interact with environmental factors and landscape organization is a topic of major interest in archaeology. Recent years have seen an increase in research into non-élite and middling groups, and their interactions with/within landscapes affected by socio-environmental shifts at the micro- and macro-scale (Perego – Scopacasa 2018; 2019; Lambrugo – Amicone – Heinze 2019; Farbotko 2019; Samuels 2019; Padilla Peralta 2020; Zamboni 2021; González-Ruibal 2022; Padilla Peralta – Bernard 2022). In this article, we propose two case studies on very different ecosystems in 1st-millennium BC Italy: riverine, flood-prone Veneto in a phase of potential climate cooling, ca. 800/750–625/500 BC; and drought-prone northern Puglia (Daunia) in a phase of potential warming, ca. 325–200 BC. By looking at the ways in which different social groups interacted in these challenging environments, we explore, from a comparative perspective, how social dynamics moulded the landscape, and how the environment affected dynamics of inequalities in return. Overall, our research will contribute to exploring the link between environmental and social factors in creating past inequalities, while addressing limitations in evidence and methods.

DATA AND METHODOLOGY

The present analysis draws on our long-term research on human-environment interactions and inequality in the late prehistoric and early Roman period, ca. 2000 BC–25 AD (Perego – Scopacasa eds. 2016; Perego – Scopacasa 2018; 2019; Perego – Scopacasa – Amicone eds. 2019; Perego – Scopacasa – Tamorri 2020a; 2020b). In our broader research, we employ different analytical methods to examine inequality in various ecological niches in Italy and the central Mediterranean. Our evidence is sampled both from available multi-proxy datasets, and raw data produced within the context of our own projects, such as CoPOWER on coercive power and inequality in late prehistoric Europe (https://linktr.ee/copower_project); the Ancient Italy Climate Project (https://linktr.ee/ancientitalyclimateproject); and MARGA–the MARGinality in Archaeology database (Perego – Scopacasa 2024a; 2024b; https://linktr.ee/MARGAproject).

In this article, we employ micro-scale contextual analysis drawing from existing datasets (Bianchin Citton *et al.* eds. 1998; Goffredo 2011; Perego 2012; Bortolami 2023; Perego – Scopacasa 2024a; 2024b) to generate a fine-grained assessment of the outcomes of climatic oscillations and environmental stress on dynamics of social inequality, with particular attention to their spatial dimension. By drawing on our earlier work (Perego – Scopacasa 2018; 2019; 2024c), we selected two different ecosystems facing environmental challenges of their own, which provided ideal contexts for addressing our research aims: a flood-exposed funerary area in Veneto and two arid-prone microenvironments in northern Puglia (Daunia). These areas were chosen as they provide examples of multifaceted dynamics of inequalities within the framework of different climate phenomena (potential cooling: Perego – Scopacasa 2019 vs. apparent warming Perego – Scopacasa 2018) and offer sufficiently contextualized evidence for the sampled periods in view of this study's scope, logistics, timeline and comparative perspective (Perego – Scopacasa 2024c). Building upon existing archaeological, osteological, climatic, and survey data, we show how landscape acted as a factor in determining the way in which people experienced and reacted to environmental challenges in contexts of growing inequality. We also address how people transformed their landscapes at the micro and regional scale, while attempting to renegotiate the social relations of power in which they participated.

ECOSYSTEM 1 – VENETO

For the first ecosystem, we investigate the impacts of environmental unpredictability on the link between ritual practice and inequality. We examine a case study from the prominent site of Este in 1st-millennium BC Veneto, which was recurrently affected by floods (**Fig. 1**; Perego – Scopacasa 2019 with bibliography). These floods seem to become more frequent between ca. 650–575 BC (non-calibrated). They were not sufficiently violent to jeopardize the survival of the settlement, yet they impinged on Este's development and left traces in the stratigraphy (Balista 1998). The flooding episodes from 650–575 BC were also concomitant with a period of change in settlement organization, ritual practices, technology, trade connections and consumption. This appears to be intertwined with a rise in social inequality and new expressions of hierarchy, which are visible at different Venetic sites beyond Casa di Ricovero (hereafter Ricovero) (Perego 2012; 2014; 2016; Perego – Scopacasa 2019; Perego – Scopacasa – Tamorri 2020a; 2020b).

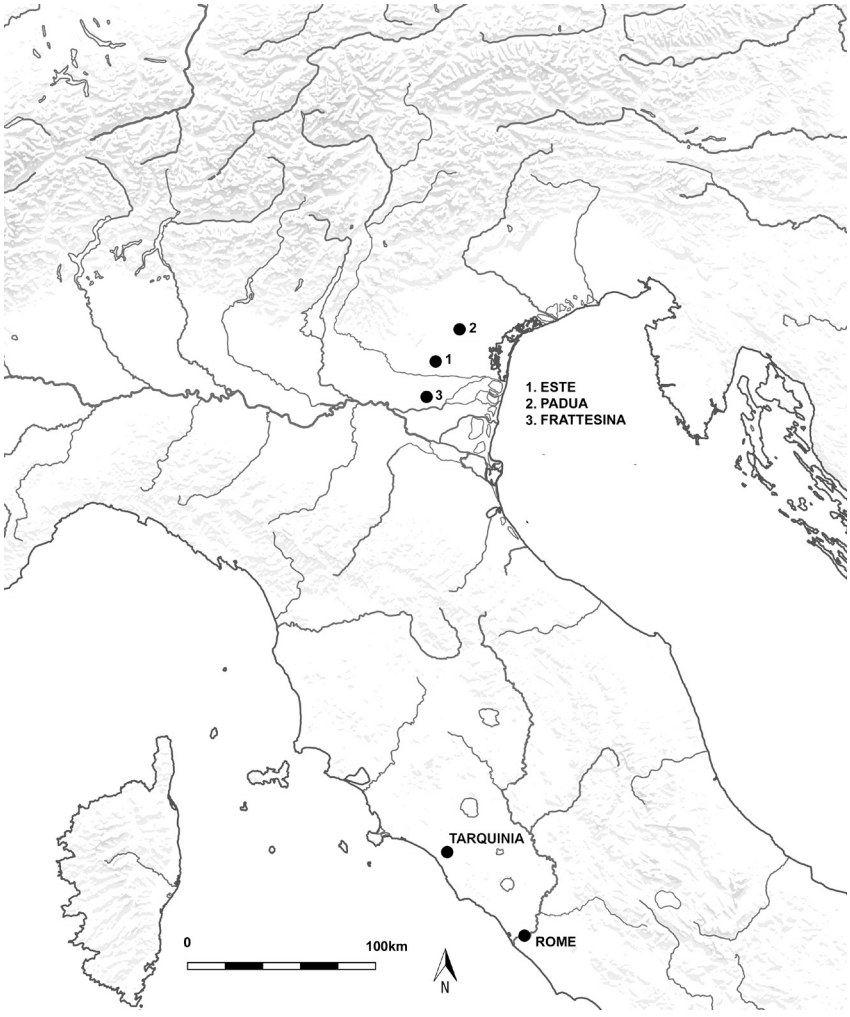

Fig. 1: Map of Italy with the Veneto region and main sites cited, drawn by E. Perego after Perego 2016, base map courtesy of the Ancient Mapping Centre.

Northeast Italy is prone to severe hydrological events, which have been attested from antiquity to the present (Cenni 1973; Balista 2010; Piovan – Mozzi – Stefani 2010; Piovan – Mozzi – Zecchin 2012; Perego – Scopacasa 2019; Final Bronze Age Frattesina in CoPOWER). As noted above, floods are also attested at 1st-millennium BC Este (Balista 1998). A stratigraphic sequence from the Este Ricovero cemetery is among the best documented from the site, and yielded evidence of a significant flooding episode dating to ca. 650–600 BC. This event was recorded stratigraphically as flood 'FL 66b' by the team working at Ricovero in the 1980–1990s (Bianchin Citton *et al.* eds. 1998). This flood appears to be concomitant with major changes in the cemetery, such as the creation of new pear-shaped funerary mounds which diverged from earlier tumuli in size, shape, spatial arrangement and construction techniques (**Fig. 2**).

One important case study is Tumulus Tr. D with its subsequent development into Tumulus L, which was built after flood 'FL 66b' (Bianchin Citton *et al.* eds. 1998; Perego – Scopacasa 2019). Both tumuli have been re-examined by Bortolami (2023).

Tumulus Tr. D was an earthen, collective mound with a boundary made of trachyte stones, rather than limestone as in the more recent Tumulus L. It contained at least three graves, all cremations:

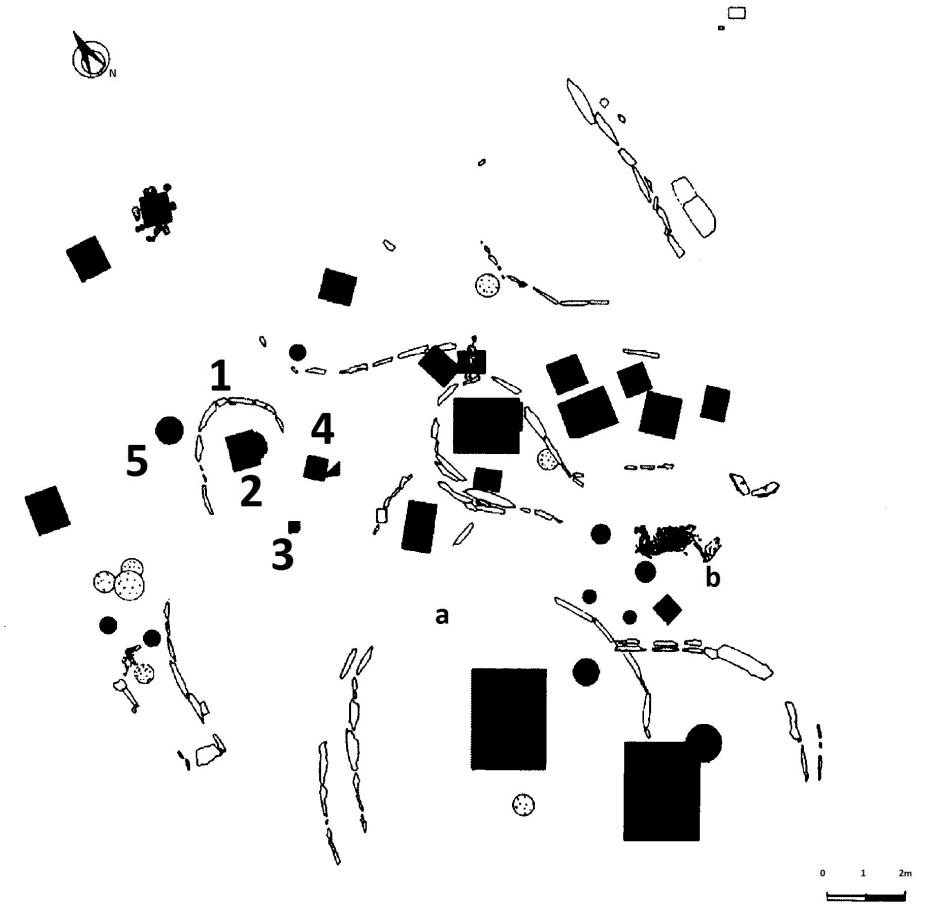

Fig. 2: Plan of Este-Ricovero. 1 – Tumulus L; 2 – Tomb 19/1987; 3 – Tomb 80; 4 – Tomb 99; 5 – Tomb 102. Drawn by E. Perego after Perego 2012; 2016 and Balista *et al.* eds. 1998, courtesy of Soprintendenza del Veneto.

- Tomb 81 is provisionally dated to 800–750 BC. It was the deposition of an infant estimated to be 3–9 months at the age of death. The tomb container appears to have been a so-called *cassetta* ('box') originally made of wood and stone slabs. The bones were in a small pot, of a type usually associated with infant depositions in the study area during the period in question. No visible grave goods were found.
- Tomb 83 is provisionally dated to 750–675 BC. It contained a minimum of three individuals in two different urns. An individual estimated as an adult male was in a single urn with grave goods such as a fibula. A second urn contained the remains of both an adult female and an infant estimated to be 3–9 months. This practice of 'bone mingling' is more commonly recorded in wealthy graves in 1st-millennium BC Veneto, and might have been used to underline family relations in the funerary sphere among élite or well-off social groups (Perego 2012; 2016). The urn also contained grave goods like ornaments, some of which, such as the bracelets (*armille*), are associated in this phase with women. The tomb appears to have been in a more central position in the mound in respect to infant Tomb 81 and the slightly later Tomb 143, below. Notably, the two infants buried in Tumulus Tr. D, who were around the same age, received partially different funerary treatments: deposition in the same urn with a woman, potentially the mother, in the more conspicuous Tomb 83, as compared to deposition in a tomb alone with no visible grave goods, in Tomb 81 (Bortolami 2023). Both infants, however, were cremated as adults and deposited *within* the burial mound.

– Tomb 143 is provisionally dated to 650–600 BC. It contained the remains of an individual estimated to be 13–19 years. This was potentially a female, in view of the associated grave goods. This individual is suggested to have been re-buried in Tomb 19/1987 in the later Tumulus L (Bianchin Citton *et al.* eds. 1998).

When flood 'FL 66b' took place, ca. 650–600 BC, Tumulus Tr. D was covered by sand and silt drawn in by water. After the flood, there was a major re-arrangement of this funerary segment: i) Tumulus Tr. D was replaced with the pear-shaped and limestone-bound Tumulus L; ii) Tomb 143, whose existence has been recorded stratigraphically, was replaced by Tomb 19/1987; iii) the deceased from Tomb 143 appears to have been re-buried in the new Tomb 19/1987; 'feminine' grave goods, initially associated with Tomb 143, were found inside and around Tomb 19/1987, showing that the individual moved was likely a female; iv) Tomb 19/1987 became the central and only tomb *inside* Tumulus L. Some stone slabs from Tomb 143 were recovered near and under Tomb 19/1987, testifying to the existence and partial re-use of the earlier tomb container.

Tumulus L is one of the first pear-shaped mounds to appear at Este Ricovero. While not among the wealthiest graves from Ricovero, Tomb 19/1987 was a *cassetta* of good standing, made of limestone slabs. It was accessible through a central corridor and yielded two pottery urns with at least three individuals (Bagolan – Michelini 1998). According to the available osteological analyses, which were carried out by local specialists, these are: i) a 13-to-19-year-old pair whose remains were placed together in the same urn (bone mingling); the female individual was likely the only deceased in the earlier Tomb 143, re-deposited in the new tomb *after* the flood; the relatively rich jewellery and tools found in this urn are commonly associated in this phase with adult male and female individuals, suggesting that the young deceased were presented as adults in the funerary sphere; ii) a 7–13 year-old sub-adult in a second, more recent urn; this was after another flood, identified stratigraphically as 'US 305', which, however, did not cause the tomb's abandonment. The young deceased was found with ornaments associated with children in this phase, as well as with objects usually associated with female adults; some fragments pertaining to these grave goods were both in the 'adult' urn in the tomb and in stratigraphic layers associated with the earlier Tomb 143, suggesting these objects initially pertained to the older female. Ceramic vases were also near or inside Tomb 19/1987, possibly as offerings to the dead or remains of funerary banqueting rites. One possibility is that the three deceased were close relatives, which would suggest the burial rituals in Tombs 143 and 19/1987 were close in time. The chronology of these events, however, remains to be fully elucidated (Perego – Scopacasa 2019, 23, note 6, with further bibliography). The complex stratigraphy at Ricovero, and some uncertainties in pottery-based chronologies, would benefit from methods such as radiocarbon calibration.

Three other cremation graves, generally with less conspicuous furnishings than Tomb 19/1987, were on the edge or in proximity of Tumulus L. All were, however, outside the mound's limestone boundary.

- Tomb 99 is provisionally dated to 550–500 BC. It consisted of a smaller *cassetta* containing three urns, with the remains of an adult estimated as a woman, a child estimated to be 4–7 years, and a neonate estimated to be 3–9 months. All deceased were in separate urns. While external to the mound edge, Tomb 99 is spatially closer to Tumulus L than the other graves and appears to be the most conspicuous tomb in the cluster after Tomb 19/1987. The adult in Tomb 99 was associated with bronze ornaments. The neonate was found in a pot with no apparent lid and no surviving grave goods. The older child was found with several ornaments, which are very similar to the ones found with the child in Tomb 19/1987 (Bortolami 2023, 131, fig. 5). These included a fragment of a large *navicella*-shaped fibula,

which, for its dimensions, might have belonged to an adult, and could have been deposited with the child as an offering; a similar practice is attested with the child in Tomb 19/1987 (Bortolami 2023). These practices of ritual fragmentation and/or redistribution of grave goods are noted in other élite or well-off graves in Este and other Venetic sites (Perego 2012; 2016), thereby suggesting a relatively privileged status for both Tomb 19/1987 and 99. The grave goods and urn associated with the child in central Tomb 19/1987 appear to be overall slightly more conspicuous than those for the child in peripheral Tomb 99, either because of their age – with the child in Tomb 19/1987 being likely older – and/or because of status. A somewhat different chronology could also have played a role (we note, for example, the taller 'situla-shaped' (*situliforme*) urn, a shape generally used for adults, in Tomb 19/1987, as compared to the smaller and rounder urn in Tomb 99, apparently with no lid, which is more similar to pots used for small children).

- Tomb 80 is provisionally dated to 550–500 BC. It was a small, poorly built *cassetta* with a neonate estimated to be a few months. The tomb did not contain any visible grave goods and the urn was a small pot with a lid. The *cassetta* was in a more peripheral position in relation to Tumulus L than the more conspicuous Tomb 99.
- Tomb 102, provisionally dated to 550–500 BC, was a simple pit grave with the remains of an adult estimated as an older woman. The deceased was in an urn with a lid, but no visible grave goods.

Many elements indicate a lower social status, or lower degree of social inclusion, for these deceased individuals in comparison to those *inside* Tumulus L: i) the more detached location of the tombs in respect to the mound; ii) the simpler grave structures and funerary provisions; iii) the deposition of two infants without any visible grave goods; iv) potentially, the lack of bone-mingling cases. Moreover, the deceased in Tombs 102 and 80 were buried alone: higher status people were often buried in the same tomb with others, presumably family members, in this phase in Este (Perego 2012; 2014; 2016). It cannot be ruled out, however, that receiving a single, 'personal' grave might have been a sign of *post-mortem* recognition, at least on some occasions, as suggested for other Iron Age sites in Italy (e.g. Di Lorenzo *et al.* 2016). This could also have been the case with the infant in Tomb 81 from Tumulus Tr. D. Differences in the expression of funerary identities, at any rate, can be detected even among the deceased *outside* Tumulus L, thereby further suggesting not all individuals received the same degree of recognition in death and possibly in life. This was even among those who do not appear to have belonged to the highest social echelons, indicating nuances and intricacies in dynamics of social differentiation in the funerary sphere.

The organization of the mortuary landscape in Este, therefore, was interwoven with the negotiation of identity in death (Perego 2012; 2014; 2016 with additional bibliography). Individuals who appear to have received lower degrees of social recognition were more spatially detached from the most conspicuous tombs in the burial groups in question. A shared funerary code in the two mounds (Tr. D and L) seems to be discernible to an extent: i) infants could receive different burial treatments in terms of their location in the funerary landscape, but tended to be deprived of visible grave goods while still being cremated; ii) older children, presumably female in this burial area, were granted more sophisticated funerary treatments. The potential offering of fragments of larger ornaments, possibly originally belonging to adults, could have been indicative of the status/role these older children were not able to achieve in life, but was still underlined in death; these practices could have also reinforced relations of proximity (e.g. mother–daughter) among high-status groups (Perego 2012; 2014; 2016); iii) adults could receive more or less sophisticated grave assemblages and funerary treatments,

potentially in view of their age, gender, role, status, family affiliation, and descent line; iv) individuals deposited in collective tombs inside or near a tumulus were generally given the most elaborate *post-mortem* funerary presentations; v) inhumation appears not to have been used in either of the two mounds. A minority rite in late prehistoric Veneto, inhumation has been associated with heterogeneous *post-mortem* identities, which included extreme forms of social exclusion (Perego 2014; 2016; Gamba – Voltolini 2018; Pasini *et al.* 2019; Perego – Scopacasa – Tamorri 2020a; 2020b; Capasso *et al.* 2023). Often inhumations were found outside or on the margins of burial mounds. This raises questions about the status of these individuals, which could be spatially detached from a mound's centre, not dissimilarly from the external burials in Tumulus L, which, however, were cremations (Perego 2012).

What is notable for our case study is how environmental events like the floods were chronologically interlinked with some changes in funerary practices, for example as regards the shape and structure of the mounds. Yet, some burial customs seem to have persisted even in the face of environmental downturns: for example, continuity in the use of the same flood-prone area, which was not abandoned; or the funerary presentation of infants under one year before and after the main flood ('FL 66b') recorded in our study period (no visible grave goods).

When compared to Tumulus Tr. D, Tumulus L shows a more hierarchical organization of the burial space, which also had a temporal dimension: the central tomb, namely Tomb 19/1987, was also the most ancient, while the less conspicuous graves, also *external* to the mound edge, were generally more recent according to archaeological and stratigraphic data. This new spatial arrangement appears to indicate a possible shift in the community's social organization in respect to the previous Tumulus Tr. D. This shift is equally suggested by various archaeological indicators at Ricovero, at other Este cemeteries, and at additional Venetic sites like Padua, which we discussed elsewhere (Perego 2012; 2014; 2016; Perego – Scopacasa 2019; 2024c; Perego – Scopacasa – Tamorri 2020a; 2020b). We note that – at the micro-scale – major changes in our case study followed the flood documented at Ricovero in 650–600 BC ('FL 66b'). Other innovations are present in the novel pear-shaped mounds in this Ricovero sector: for example, the use of limestone from the nearby Euganian hills in Tumulus L, instead of trachyte like in Tumulus Tr. D; and the appearance of a new ceramic class known as 'red-and-black ware'. We note that the second urn in Tomb 19/1987, containing the child, was a red-and-black vase deposited after the second flood US 305, although not immediately (according to microstratigraphic analysis in Bianchin Citton *et al.* eds. 1998). Interestingly, in the neighbouring centre of Padua red-and-black ware appears in Via Tiepolo Tumulus A also after a flood (Perego – Scopacasa 2019). Altogether, these data indicate that flooding episodes were interlinked with changes in stone procurement, ceramic production, ritual praxis, and social hierarchies in the local communities. The people that used Tumulus Tr. D, and possibly created Tumulus L, were intimately involved with these changes: they might have exploited environmental instability to ameliorate their social position, as shown by the early, more peripheral Tomb 143 from Tumulus Tr. D becoming the central and only tomb *inside* Tumulus L after flood 'FL 66b'. Otherwise, the burying group might have embraced a funerary ideology overstating the appearance of higher status in a phase of socioenvironmental instability: such ideology seemed to emphasize diversity and inequalities among individuals – for example by putting less conspicuous burials *outside* the mound edge, as in Tumulus L.

While we know that the floods contributed to these changes, the extent to which this was the case is a complex issue deserving further study. We draw attention again to the multiple factors at play; these might have included a climate shift towards wetter and cooler conditions, including the climate event known as the 'the 8th century cooling period' (Manning 2013; further discussion and bibliography in Balista 2010; Perego – Scopacasa 2019; 2024c).

ECOSYSTEM 2 – DAUNIA

For the second ecosystem, we focus on inequalities in the context of the rising Roman hegemony in Italy (Terrenato 2019), which saw the reshuffling of power relations within an overall context of climatic shifts. The present case study concerns the city of Canusium in the ancient region of Daunia in southern Italy, roughly corresponding to present-day northern Puglia (**Fig. 3**). There, the onset of the so-called 'Roman Warm Period' (RWP) or 'Roman Climate Optimum' (RCO) could have altered the profile of two natural microenvironments, the Tavoliere and Murge plateaus, concomitantly with the consolidation of Roman supremacy (Perego – Scopacasa 2018).

Fig. 3: Map of southern Italy, drawn by R. Scopacasa after Perego – Scopacasa 2018.

During the Hellenistic period (ca. 330–30 BC), Daunia featured a number of large, nucleated centres, including Canusium in the Ofanto river valley. Canusium became a Roman ally around 318 BC and there are indications that some local people benefited from the alliance. This is suggested by material evidence of prosperity in and around the city, such as lavish chamber tombs with south Italian amphorae, like the so-called 'Barbarossa hypogeum' (Volpe 1990).

The start of Roman hegemonic expansion was also contemporaneous with changes in the surrounding countryside. The number of known, small rural sites around Canusium seems to increase fourfold after ca. 325 BC (Goffredo 2010; 2011). A total of 119 sites dated by the Ofanto Survey team to ca. 325–200 BC were reported, as opposed to 33 sites dated to the preceding period of ca. 600–325 BC. Most of the 325–200 BC sites are characterized in the literature as 'houses' (*case*) or 'small farms' (*fattorie*), in view of their size, location, and surface finds. The finds generally consisted of i) building materials such as brick, plaster, limestone blocks, tile, and occasional marble slabs; ii) tools, such as objects classed as millstones and loom weights; iii) ceramic fragments spread over areas of 300–1000 sq m: the presence of tableware suggests stable inhabitation. Many of these ca. 325–200 BC rural sites seem to have remained in use during the 2nd century BC, with some continuing into the 1st century BC and later (Goffredo 2011). Overall, the infilling of the Canusium countryside recalls simultaneous developments elsewhere in Italy, including in the Sangro valley in Abruzzo and the Biferno valley in Molise (Scopacasa 2015), as well as in other parts of the central Mediterranean. These developments can be seen as an overall trend towards rural infill, potentially stimulated by demographic growth and agricultural expansion (Samuels 2019; Terrenato 2019).

Regarding the socioeconomic profile of the people who moved into the Canusium countryside from the late 4th century BC, the survey evidence suggests a range of status groups

that do not adhere to a uniform scenario (Goffredo 2011; Perego – Scopacasa 2018). Most likely, there was variation in wealth and status; yet, it seems probable that many small rural sites were associated with lower-status groups, in comparison with the highest social strata whose presence becomes more conspicuous in Canusium's urban space. Few of the small rural sites have thus far been excavated, but traces of inhabitation tend to be simpler than the élite structures recovered in Canusium, although not as simple as the wattle-and-daub dwellings from previous periods. One example is the house at Madonna di Costantinopoli: a stone-built, single-room *casa* with paved floors, tile roof and beaten-earth courtyard. Among the surface finds in rural sites, the presence of potential millstones, loom weights, and spindle whorls suggests manual labour by people engaged in textile production and farming. This might have involved sheep rearing, which is documented in Puglia in the Roman period and later (Trentacoste *et al.* 2023). Regarding the cultural makeup of these small rural communities, we note the funerary and epigraphic material is scanty as regards the Ofanto Survey data and therefore falls short of providing a clear picture. However, as regards the broader Daunia region, funerary data seems to suggest cosmopolitan élites with Mediterranean-wide connections, while the epigraphic record indicates a multicultural context with the use of Greek, Oscan, and Latin languages and alphabets (e.g. Volpe 1990).

Written sources afford additional indication that the rural infill of the late 4th and 3rd centuries BC happened in an overall context of social inequality. Canusium was apparently home to wealthy families, such as that of the noblewoman Busa who allegedly supported thousands of Roman survivors after Hannibal's victory at the battle of Cannae in 216 BC (Livy xxii, 52.7). Such élites appear to have focused on investment and display in the urban space. The basis of their wealth might have been the use/exploitation of labour and resources in the countryside, where the small rural sites were multiplying. We might therefore hypothesize that some of these sites could have been occupied by tenant farmers and sharecroppers, though the presence of free smallholders should not be ruled out.

As noted above, the infilling of the Canusium countryside is consistent with contemporaneous trends throughout Italy, known as the 'Hellenistic rural site boom' (Terrenato 2019). However, once the available environmental data are considered, it appears that the rural infill around Canusium concerned arid-prone microenvironments vulnerable to climate oscillations, where agriculture could have depended on a fine margin of climatic stability (Perego – Scopacasa 2018). The microenvironments in question are the southern terrace of the Tavoliere plateau, and the northern slopes of the Murge plateau. The Tavoliere is one of the most arid-prone areas in Italy, with an average yearly rainfall below 500 mm (**Fig. 4** shows the Puglia summer landscape in the 2010s). It remains at risk of desertification, while palaeoenvironmental data suggest that in the last ten thousand years it periodically became barren (Broodbank 2013). The Murge is a karst plateau with a thin soil layer; rainfall in recent decades has been described as moderate, but surface water remains relatively scarce in view of contemporary measurements for Italy. Research on 20th-century droughts in Puglia concluded that the underground water table in the Tavoliere and Murge was among the most sensitive to rainfall oscillations (Polemio – Dragone 2004). While it remains unclear to what degree these conclusions pertain to our study period, the Murge's karstic formation may have rendered it a more difficult environment for farming than the nearby Ofanto river valley. People settling in the Murge would therefore have had to reach the underground water table, which was probably affected by seawater infiltration.

Moreover, palaeoclimate research suggests that the rural infill took place during the onset of a warming trend. This might have augmented the challenges presented by the arid-prone microenvironments of interest, although the chronology of this apparent climatic oscillation

Fig. 4: Photograph of the Puglia landscape in summer. © E. Perego.

remains to be fully contextualized (Perego – Scopacasa 2018; 2024c). The 3rd and 2nd centuries BC can be seen to coincide with the start of the so-called 'Roman Warm Period' (RWP) or 'Roman Climate Optimum' (RCO). This is generally acknowledged as a climate regime characterized by warmer temperatures in Italy and many parts of the Mediterranean (Manning 2013). While it remains debated to what extent these changes triggered drier conditions in certain microenvironments, the start of the RWP/RCO has nonetheless been noted in several climate proxies (Zonneveld *et al.* 2024). We note that the climate data available for 1st-millennium BC Italy range significantly in chronological resolution: more sophisticated methods emerge at a fast pace, so that available datasets can become obsolete (Perego – Scopacasa 2024c). This also applies to pottery data. Thus, the collection of updated climate and archaeological proxies is key to the study of the broader chronological interplay between climatic oscillations and socioenvironmental inequality. Nonetheless, research on ancient Mediterranean climate suggests that temperatures in the Italian peninsula during the RWP/RCO might have been broadly compatible with those of the late 20th century (Giraudi 2014). If correct, the Tavoliere could have been facing a desertification risk at the time of the Hellenistic rural infill. Likewise, the karstic Murge formation may have intensified the impact of warmer climate conditions. While we cannot exclude that arable farming would have remained possible, people settling these areas may have needed to rely on a fine margin of climatic stability.

Still, it would have been in such climatic circumstances that these two drought-sensitive microenvironments were occupied by larger numbers of small rural sites. If our analysis is correct, the available data suggest a situation in which non-élite groups could have borne the brunt of socio-political, climatic, and environmental challenges. One possible scenario is that those people who moved into the Murge and Tavoliere were driven out of more fertile areas. They may have included non-élite and/or middling families compelled to occupy microenvironments regarded as sub-prime. These people might have been pushed or motivated to exploit a broader range of environmental resources, to satisfy surplus demands by the élites, or to set up independent livelihoods for themselves. They might have included local people, as well as incomers from other areas (including possibly enslaved and/or freed-people) in connection with mobility in the context of Roman expansion – a topic deserving further attention. The resilience of the small rural sites is suggested by the fact that many survived into the

1st century BC or later. Indeed, resilience was possibly strongest among the more remote rural sites: it is notable that, after the Hannibalic/Second Punic war of 218–201 BC, we do not seem to have evidence for the re-emergence of rural sites close to the subsidiary centre of Cannae, probably in connection with the devastating battle fought there in 216 BC (Goffredo 2011). It would be important to explore to what extent people from these small rural sites were among those who fought and perished in the battle, or were otherwise affected by the presence of such huge armies in the vicinity. This would carry implications for our understanding of the war's impact on the local population in terms of e.g. gender imbalance, survivorship, health status, partial depopulation and migration (for the historiographical debate on the impacts of the Hannibalic War on the Italian countryside, see Crawford 1985; Hoyos 2011).

Additional analysis of the location of the rural sites and their surface finds can shed further light on social dynamics, while not overlooking the fragmentary nature of the available survey data (Goffredo 2011). For example, the known ca. 325–200 BC sites closer to Canusium and Cannae tend to be located in proximity to each other (500–1000 m apart), in comparison with those located further away from both centres, which are on average 2–3 km apart. The larger distances between the more remote sites could suggest the existence of larger land plots: this would have made sense as a way to increase agricultural yields and/or develop animal husbandry in relatively poor land. Many of the Tavoliere sites, however, occupy the plateau's fringe overlooking the river valley: this does not exclude the possibility that people built their dwellings on the Tavoliere, while working the more fertile land in the river valley below. Yet, the existence of sites further away from the Tavoliere edge could suggest that some settlers were exploiting the poorer plateau land.

In conclusion, the trends affecting the Canusium countryside can be regarded as part of a broader tendency towards rural infill in the Hellenistic Mediterranean. This trend has been interpreted as evidence for demographic growth; in central Italy specifically, it has been seen as evidence for the possible democratization of land ownership and a rising class of free smallholders (Terrenato 2019). Our analysis of the spatial and environmental dimensions can put into sharper focus whether the rural infill involved the aggravation and/or renegotiation of social inequalities. This also affords an opportunity to explore the resilience strategies of non-élite/middling agents in ecologically challenging environments.

Further research should involve a better understanding of the social and environmental vulnerability of the communities in the study area. In theory, the scenario outlined in the Canusium countryside may have included non-élite individuals that were pushed into conditions of deprivation, but also resourceful social agents who took advantage of changing environmental conditions to re-arrange social hierarchies and possibly ameliorate their socio-economic position: for example, through innovative farming techniques, or by achieving a more independent lifestyle in a less densely populated landscape, which was geographically detached from the potentially 'insalubrious' city. Although located a few km from our area of interest, and later in chronology, zooarchaological and isotope analysis from the site of Vagnari in the Besentello valley, testifies to the sophisticated farming strategies that might have been achieved in this complex landscape by exploiting different ecological niches (Trentacoste *et al.* 2023).

CONCLUSION

In the two ecosystems under study, we first identified a well-off to middling burial group in riverine Veneto, acting on flooding to rearrange social hierarchies at the micro-scale of two burial mounds in the prominent site of Este, 800/750–650/500 BC. This was a period

which apparently coincided with a phase of climatic cooling and growing inequality. In our second case study, two arid-prone microenvironments in Puglia, the Tavoliere and Murge plateaus, appeared to have attracted a noticeably high number of small rural sites in a phase of potential warming, ca. 325–200 BC. This phase was also marked by social inequality and Roman expansion in the region, with the crushing defeat at Cannae against Hannibal being a potential inflection point (216 BC). As in Veneto, a shifting and potentially hostile natural environment became the setting for strategies of social negotiation that might have led to increasing inequality, but also to social agents bearing the brunt of environmental downturns to ameliorate or maintain their status in unstable socioecological systems.

Therefore, we showed how power dynamics can be played out and leave proxies in the landscape. In particular, we shed light on the complex interplay between human communities in the past and their environment. Our case studies explored socially situated dynamics of power and potential marginalization, which were deeply rooted within local ecosystems; we also addressed how social groups reacted to such dynamics in phases of environmental shifts and hazards. Landscapes are shaped by people and, in turn, contribute to shaping social relations. Social agents use the landscape to delineate, reinforce, and/or overcome inequalities, while, at the same time, the landscape itself provides opportunities and constraints for people to construct, highlight, and tackle such inequalities in a two-way relationship. Space and the environmental context are, therefore, not merely inert backdrops against which social tensions and dynamics play out, but rather active forces that contribute to structuring and altering such tensions and dynamics.

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