Mapping Landscapes in Transformation Multidisciplinary Methods for Historical Analysis

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PREFACE

Mapping Landscapes in Transformation: Multidisciplinary Methods for Historical Analysis Thomas Coomans, Bieke Cattoor & Krista De Jonge

PART ONE: PROJECTION

- Cartographic Grounds: The Temporal Cases Jill Desimini
- Data Friction: Mapping Strategies on a (Peri)urban Frontier, Chennai, India Karl Beelen
- Mapping and Design as Interrelated Processes: Constructing Space-Time Narratives Bieke Cattoor
- Mapping the Evolution of Designed Landscapes with GIS: Stourhead Landscape Garden as an Example Steffen Nijhuis
- Unfolding Wasteland: A Thick Mapping Approach to the Transformation of Charleroi's Industrial Landscape Cecilia Furlan
- Photography, Railways and Landscape in Transylvania, Romania: Case Studies in Digital Humanities Cristina Purcar

PART TWO: FOCUS

 Mapping Archaeological Landscapes in Transformation: A Chaîne-Opératoire Approach Piraye Hacıgüzeller, Jeroen Poblome, Devi Taelman, Ralf Vandam, Frank Vermeulen

- A High-Resolution Multi-Scalar Approach for Micro-Mapping Historical Landscapes in Transition: A Case Study in Texas, USA Arlo McKee, May Yuan
- Pixels or Parcels? Parcel-Based Historical GIS and Digital Thematic Deconstruction as Tools for Studying Urban Development Bram Vannieuwenhuyze
- The Secularisation of Urban Space: Mapping the Afterlife of Religious Houses in Brussels, Antwerp and Bruges Reinout Klaarenbeek
- Mapping Through Space and Time: The Itinerary of Charles of Croÿ Sanne Maekelberg
- Landscape Appreciation in the English Lake District: A GIS Approach Ian Gregory, Christopher Donaldson, Joanna E. Taylor
- Digital Humanities and GIS for Chinese Architecture: A Methodological Experiment Chang-Xue Shu

POSTFACE

Mapping Historical Landscapes in Transformation: An Overview John Bintliff

About the authors

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Part two FOCUS



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7.

Mapping Archaeological Landscapes in Transformation

A Chaîne-Opératoire Approach

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Inevitably, archaeology has had something to do with landscapes, ever since the early days of the discipline. In every stage of its development, encompassing or smallish, this relationship has been (de/re-)constructed and (pre/re/post-) conceived. Since the 1990s, the idea of landscape has once again become prominent in archaeology, serving often as an interface between the physical and the conceptual, the spatial and the social, the real and the image, the natural and the cultural (David and Thomas 2016). Archaeological landscapes, however, have served less as an interactive field between these sets of concepts — that typically oppose one another in modernist thinking — functioning more as a common boundary between them. Specifically, remote sensing, photogrammetry, surveying, cartography, and GIS-based methods (mainly cost-distance and visibility analysis) have broadly constituted the empirical and positivist approach to archaeological landscapes, concentrating on the natural and physical aspects (Bevan and Conolly 2004; Hritz 2014; Sevara et al. 2017). Others introduced interpretive and phenomenological approaches as part of which the focus is very much on human agency and cognition, and symbolic meanings ascribed to the landscape (Edmonds 1999; Tilley 1994, Tilley 2004, Tilley 2008). In the 1990s and early 2000s, the limited interaction between these two domains has often been in the form of heated discussions regarding what constitutes the best way to study

archaeological landscapes (Barrett and Ko 2009; Brück 2005; Fleming 2006). Within the last decade, however, many landscape studies in archaeology have aimed at mediating the relationship between these qualitative and quantitative realms (Fitzjohn 2007; Gillings 2015; Llobera 2012; Graves McEwan and Millican 2012).

Mainly due to this intermediate position, not only in archaeology but also in other fields (Bender 2006; Morin 2009), the attribution of meaning to the 'landscape' concept has often been put aside as complex and ambiguous. In recent, post-representational studies, the dualistic approaches to landscapes (and hence their intermediate position between the above-mentioned realms) are often fruitfully critiqued and the term is taken to encompass both sides. In the case of the separation between representation and referent, Robert Layton and Peter J. Ucko (1999: 1) define landscape as referring 'both to an environment, generally one shaped by human action, and to a representation ... which signifies the meanings attributed to such a setting' (Layton and Ucko 1999: 1; see also: Cosgrove 1984; Daniels and Cosgrove 1988; Dubow 2009). Similarly, the geographer Veronica della Dora states that the referent and representation in landscape studies are to be taken as 'laminated together, just like the windowpane and the landscape in the famous Magritte paintings' (della Dora 2009: 335; see also Olwig 2005). Notably, the approach to landscapes in such post-representational lines of thought comes very close to Jean Baudrillard's influential ideas on reality in which the difference between a referent and its ubiquitous representations disappears in simulation in favour of a hyperreal (Baudrillard 1981).

This complex understanding of landscape, as simultaneously and intricately constituted by what is traditionally referred to as physical and social space or the reality and the image, no doubt renders the study of landscape cartography a crucial part of landscape studies. Yet, even though the 'physical' and 'social' landscapes are major study areas in archaeology, landscape maps and the practices of mapping landscapes have received relatively limited attention (see, however, Gillings et al. 2019). While landscape cartography and GIS have been a substantial topic of concern in phenomenological archaeology, the approach in that context has been predominantly rejectionist where maps and GIS have been considered as inherently modernist media objectifying the landscape (e.g. Thomas 2001: 169; Tilley 2004: 218).



Fig. 1. Aerial view on the flat coastline near Porto Recanati (Marche, Italy) with the limestone massif of the Monte Conero in the distance. The remains of the Roman town site of *Potentia* lie buried under the fields in the forefront, just behind the coastal strip (photo Frank Vermeulen, 2006).

In the rest of this chapter our aim is to approach landscape cartography in archaeology in a new light shaped by the concept of *chaîne opératoire*. The approach is used mainly in practice-based studies of materials within archaeology and anthropology, as we explain in the next section. Through *chaîne opératoire*, technical processes, or performances of making and using 'things' are conceptualised as being shaped by cognitive and pre-cognitive (i.e. pre-conscious), culturally marked choices. As such, the *chaîne opératoire* approach suits the recent ambitions of critical cartography which aims to move its concerns from the 'map object' to the mapping processes (Perkins 2009), and move beyond an unfruitful fragmentation of such processes into modernist oppositions (Del Casino and Hannah 2006).

Subsequent to the introduction of the *chaîne opératoire* concept, choices about cartographic tools and map content and use are presented below in the case of two archaeological projects, namely the Potenza Valley Survey (PVS) and the Sagalassos Archaeological Research Project (SARP). The PVS studies human occupation and changing complexity between the early first millennium before



Fig. 2. View on the area of the Upper Agora at the archaeological site of Sagalassos, South-west Turkey (Photo credits to Bruno Vandermeulen and Danny Veys).

our era and the end of Antiquity in the valley of the river Potenza (Marche region, central Adriatic Italy) (Fig. 1). SARP focuses on the nature and logic of change in the long-term social-ecological development of the study region surrounding and including the archaeological site of Sagalassos (South-west Turkey), between Middle Palaeolithic times and yesteryear (Fig. 2).

The concept of chaîne opératoire

Chaîne opératoire is a type of anthropological sequence model which is practice-based and presents technical processes as a web of embodied actions (see Schlanger 2005 for an overview). It serves to move 'typological concerns from objects to processes' and, like other sequence models — Marcel Mauss' *enchaînements organiques* — it presents 'a way of relating formally diverse materials to a single process' (Bleed 2001: 117). Studies based on *chaîne opératoire* take as their starting point the insight that 'observing someone digging a hole, or carving a sculpture, is fundamentally different from analysing the digging-stick, the hole, its width and depth' (Coupaye 2009: 438). In simple terms, chaîne opératoire refers to a framework of considering all processes leading to the creation of an 'opus' as well as leading from that 'thing'. The processes as well as the 'things' result from human beings (individuals and/or groups) making choices. These choices are actually the most central element to document in chaîne opératoire, rather than the processes (functions of choices) or 'things' (results from choice), as the choices are mostly meaningful (Caple 2006). The meaningfulness does not always need to represent High Culture, but can also be operational/ mechanistic in nature, especially when making the 'thing'. But all of the choices, no matter at which level, are cognitive, socially and culturally marked - resulting in commodities, no longer 'things' - and therefore represent past human behaviour. As a result, the consideration of *chaîne opératoire* is not limited to the choices made in creating commodities, but also related to their use and discard. Objects forming part of household contexts will be constituted, function, and valued in different ways compared to commodities sustaining public or ritual functions. Even if votives are to be set aside in sanctuaries, for instance, this can never result in discard as the commodities need to stay in possession of the deity within the area of the sacred precinct. In this way, a *chaîne opératoire*-type of insights can also help in understanding the formation processes of the archaeological record and, as a matter of fact, the transformations of archaeological landscapes and their mapping.

Chaîne opératoire and cartographic choices in the PVS and SARP

Crafting maps in archaeological projects are often long *chaînes opératoires* that involve various actions interlinked with one another. These *chaînes opératoires* can also be drastically different from each other, depending on the choices made regarding the cartographic tools and what needs to be mapped. For instance, producing hand-drawn paper maps of a Neolithic house will involve a whole set of knowledges and cartographic skills different from the three-dimensional laser scanning of a Roman theatre. Specifically, while the first will involve taking measurements with tape measures in great precision (up to a centimetre) and sketching on paper, the second requires a command of where best to place 'target points' while dealing with large structures, and how to operate the terrestrial laser scanner and process the collected point cloud. Given this key role of the choices on cartographic tools and content in shaping the *chaîne opératoire* of archaeological mapping, we turn to these sets of choices in the Potenza Valley Survey (PVS) and the Sagalassos Archaeological Research Project (SARP) in the rest of the chapter.

Choices of cartographic tools

Making archaeological maps today is almost exclusively a digital and, in most cases, a geographical information systems (GIS)-based endeavour. This persistent choice for digital tools in archaeological landscape mapping is largely shaped by a 'disciplinary agency' (Pickering 1995: 115), which constitutes a force to consider GIS-based practices to be indispensable in integrating large quantities of geospatial information and generating related knowledge of past human activity. The cases of the PVS and SARP present no exceptions, with GIS technology being used extensively to map archaeological features. What made GIS a favourable choice in both projects has also been the know-how, soft- and hardware available at the time of the respective map-making endeavours, even though not necessarily available in the initial phases of the projects.

Despite its ubiquity, though, GIS is no ordinary tool for archaeological mapping. The technology in the archaeological study of landscapes very often plays the role of connecting abstract theories about past human behaviour with observed archaeological phenomena (often referred to as 'archaeological record': Barrett 2001; Patrik 1985). Here, the archaeological record serves as an empirical proxy for past human behaviour while it is considered to have altered over time through 'site formation processes' (Schiffer 1987). Within this epistemological framework, where the past is represented by archaeological finds, GIS allows 'users to formulate models, or representations, of potential past experiences, attitudes, behaviours, processes, and patterns' which is considered by archaeological practitioners as heuristically useful (Brouwer Burg 2017: 116).

Map 1 is a GIS-map of the archaeological site of Sagalassos that forms an example of such a heuristically useful representation that incorporates the (past) humanscape with the (present) natural landscape. One of the aims in producing the map is to bridge the gap between archaeological hypotheses on ancient Sagalassos and empirical information collected at the site in recent decades. The map comprises architectural drawings overlaid on a digital elevation model. The elevation information used to create the digital model was collected mostly with total and global positioning systems during fieldwork, while gaps in the elevation dataset were filled using the freely available global digital elevation model GTOPO₃₀; information on architectural remains were recorded by architects. **Map 2** is another example that similarly brings the past and present together, this time in the environs of Sagalassos, namely at the archaeological site of Düzen Tepe located at less than two kilometres to the south-west of Sagalassos (Vanhaverbeke et al. 2010). This map is created with GIS using information collected from satellite imagery, intensive archaeological and topographical surveying, existing topographical maps, and geophysical research.

A similar GIS-based mapping practice bridging the past and present is presented in Map 3 of the Roman colonial town of Potentia, located ca. 1 kilometre south of the present-day mouth of the river Potenza. Specifically, while historical sources and small-scale excavations since the second half of the twentieth century provided first insights into the general development of this ancient settlement, very little was known of the site's internal structure and its relation to the wider landscape context. Oblique aerial, vertical aerial, and satellite imagery revealed crop and soil marks of the town's street network, walls, and buildings. In combination with legacy data and field walking results, the remote sensing data provided diachronic density maps of archaeological materials, which allowed a more detailed appreciation of the site's general chronological development, functional zoning, and spatial evolution between the early second century BCE and the later sixth-seventh centuries CE (Vermeulen et al. 2006). While this approach revealed archaeological traces for most of the urban and suburban areas, the western and southern parts of the town and its immediate hinterland were lacking archaeological indications. Map 3 presents the efforts to fill these gaps in the archaeological narrative of Potentia and connects the town with its wider environment through geoarchaeological (mapping of the microtopography, geomorphological augering, electrical resistivity profiling) and remote sensing (active, oblique aerial photography, geophysical surveying) applications.

Choices of content and use

Mapping is both an epistemological and ontological process in the sense that 'it is both a way of thinking about the world, offering a framework for knowledge, and a set of assertions about the world itself' (Kitchin et al. 2009: 1). Perhaps this is more the case for Western scientific cartography — in comparison to indigenous and other non-Western mapping traditions — which is the predominant cartographic tradition in today's landscape archaeology. This is because in Western scientific cartography, maps typically serve as authoritative tools preoccupied with objective and accurate mimesis of the mapped places (Turnbull 1996). If archaeological landscape maps are in fact taken as mirroring the landscapes unproblematically, the choices about their content become all the more important. As unproblematic copies of the landscapes, they constitute strong arguments, or at least powerful statements, about mapped archaeological landscapes rather than being mere descriptions of them (Corner 1999; Wood 2010). This is exactly the case for the maps in Map 4 presenting mainly the settlement history of the Potenza river valley. The maps, showing results of a complex methodological workflow, are not merely a mirror of the Potenza river valley but essentially an epistemological and ontological statement that defines the changing settlement patterns through time as a crucial aspect of the valley. Specifically, Map 4a shows the three sample zones of the PVS Project together with annotated main modern town locations. These sample zones are a product of multi-scalar landscape research in the project where the field methodologies (landscape-based, artefact-based, and remote sensing-based) are applied on scales ranging from the wider regional scale to the level of these three sample zones along the ca. 80 kilometre-long course of the river Potenza (roughly coinciding with the upper, middle, and lower sections of the valley) and to the scale of the individual site. The maps in Map 4b-f represent transforming settlement patterns from the Iron Age into Late Antiquity. The complex methodology that led to these five maps involves archaeological line walking and associated surface artefact analysis. Limitations of this surface record are dealt with by geoarchaeological and remote sensing case studies focusing on the preservation and detection potential of the archaeological record (e.g., erosion and sedimentation), landscape exploitation, landscape dynamics, and human-landscape relation of the detected human occupation sites (Taelman et al. 2017; Vermeulen et al. 2017). Recurrent site visits with higher resolution artefact collections, intensive active aerial and geophysical prospections, and targeted excavations are among the most important strategies employed to deal with traditional biases and the restricted view imposed by selection and sampling in the Potenza Valley. The results of the intensive fieldwork allow us better to understand the surface records and to re-evaluate the general landscape and settlement history of the region (Taelman et al. 2017; Van Limbergen et al. 2017), and visualising these results on maps which prescribe the Potenza river valley as an arena for transforming human settlement patterns.

Map 5 is yet another representation of transformation of the Potenza river valley: a representation of the changing environmental conditions of the southern suburban area of the lost town of *Potentia* and the ancient bed of the river Potenza. The composite image with many cartographic elements is created using aerial photography and LiDAR imagery. Inset 1 shows crop marks of the ancient river Potenza demonstrating an abandoned deltaic river channel with bifurcating channels. Topographic correlation of the ancient riverbeds indicates a gradual southward migration of the active delta channels. Inset 2 shows the location of the Roman bridge of *Casa dell'Arco*, the preserved arches of the Roman bridge in the walls of the eighteenth-century farm, the soil profile with a typical fluvial upward fining and the corresponding radiocarbon dates. Similar to the case of settlement patterns, the contents of this map are part of an ontological project that involves defining Potenza Valley's past, this time in terms of changing environmental conditions.

Importantly, choices about map content will not only put forward arguments about the mapped places but also will have consequences for the use context. That is, users place maps in a new set of relations and make it part of a novel set of practices which bring in new cartographic tensions and opportunities. This has been the case for the old site plan of Sagalassos crafted in the 1990s [Map 6] by cartographers who paid most attention to the *hic et nunc* of how the site presented itself, for orientation and reference purposes (Van Rompaey and Depuydt 1997). Of extant archaeological remains, such as the Theatre, only the contours were included in the map, but not the details of the still visible architectural parts of the buildings. Here, the cartographers aimed at considering the ruin as part of the topography and landscape, rather than of a once-upon-a-time town. In the same way, the excavated remains were not mapped in detail, with the natural topography dominating the visual aspect of the resulting map. Deemed an adequate cartographic representation of Sagalassos by the cartographers themselves, this map faced tensions when archaeologists who wanted to use it for publications needed more architectural detail. In other words, when the map was placed in a new set of relations by archaeologists and their user choices, the need for a more detailed version became obvious. As a result, of the unpublished, original 1:500 map with contour intervals of 1 metre, a detailed version at 1:2000 was derived for publication purposes, including a higher degree of interpretation of the 'archaeological' urban fabric. This new map constitutes yet another powerful statement about the mapped place, rendering the architectural remains at Sagalassos more of a fundamental characteristic of the site in comparison to the original 1:500 map.

Conclusion

The *chaîne opératoire* approach can serve as a way to study landscape mappings in terms of the choices that shape them. Concentrating on pre-cognitive, culturally marked cartographic choices that form archaeological landscape mapping is one way of coming to terms with the fact that maps are performative. Performativity in this context refers to the idea that there is no pre-given territory that serves as a reference for the map. Instead maps and mapped places are repetitively created through cartographic choices and associated practices (Hacıgüzeller 2017).

The *chaîne opératoire* approach then is a way of addressing archaeological landscapes as social constructs. It is a way to emphasise that we both make our worlds and live in them. From this point of view, archaeological landscape studies do not need to focus on physical landscape or social landscape conceptualised as separate. In fact, archaeological landscape cartography from a *chaîne opératoire* approach makes it bluntly clear that there is no sense in using such modernist distinctions since the cartographic choices we come to discuss through the *chaîne opératoire* approach clearly rely on a complex set of relations that defy these distinctions.

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Introduction

Long-running projects such as the Potenza Valley Survey (PVS) and the Sagalassos Archaeological Research Project (SARP) typically evolve in research questions, but also in the technologies applied in the various steps of the research, including the management, analysis, and representation of spatio-temporal data. In the initial years of the PVS, map-making was based on a GIS approach that combined ESRI's ArcView 3.x (later replaced by various versions of the ArcGIS suite) and Microsoft Access. The maps presented here are a product of this particular set of tools. Currently, the PVS spatial data are being migrated to an open-source and cross-platform data infrastructure based mainly on PostgreSQL, R (The R Project for Statistical Computing) and QGIS, and at the web publishing front, Arches web application and CIDOC CRM semantic ontology (see www.potenzavalleyproject. ugent.be). This migration, in combination with the documentation of source codes and scripts, for the purpose of data management, analysis, and visualisation of spatial information enhances the reproducibility and verifiability of the map-making process, and promotes the reuse and extension of the methodology. In SARP geospatial data management and display in cartographic format evolved from the use of simple data tables and computer aided drawing (CAD) software [Map 6], to that of a combined approach where AutoCAD, ArcGIS 9.x and 10.x, QGIS and PostgreSQL are employed together [Map 1] and [Map 2]. Typically CAD software is vector-based and does not allow the use of raster data structure. A combination of vector and raster data using GIS software, as in [Map 1] and [Map 2] here, on the other hand, powerfully brings together detailed vector drawings of architectural remains with raster datasets such as hillshades and digital elevation models.



Map 1: Sagalassos Archaeological Research Project, map coordinated by Piraye Hacıgüzeller (2018), *Map of the Archaeological Site of Sagalassos*.

A map of the archaeological site of Sagalassos (SW Turkey) recently created using geographical information systems technology. The map has shortcomings similar to the one produced by Prof. Frans Depuydt and his team. It presents Sagalassos as an immutable landscape through a snapshot of the ancient settlement which never existed. The snapshot combines actual topography with a selection of excavated (and at times backfilled) architectural remains during different fieldwork seasons. As such, these remains were never exposed in the combination presented on the map. However, the map remains a visually powerful rendition of Sagalassos produced through the application of tried-and-tested techniques common to geospatial research as well as a desire to push the boundaries within digital humanities. Specifically, the map was produced by incorporating freely available digital elevation models with the existing contour map of Sagalassos through meticulous manual editing. Subsequently highly detailed architectural drawings in computer aided design (CAD) format were integrated into the topography created. The map was created to serve as a detailed architectural interface for the newly built integrated geospatial database system of Sagalassos. The system aspires to employ innovative spatial ontologies for digital geohumanities research.



Map 2: Sagalassos Archaeological Research Project, map coordinated by Hannelore Vanhaverbeke (2010), *Map of the Archaeological Site of Düzen Tepe*.

The map of the archaeological site of Düzen Tepe (SW Turkey), produced by Dr. Hannelore Vanhaverbeke and her team. The site of Düzen Tepe is difficult to read. Not only is agriculture and pastoralism still performed on large parts of the site, making it into an active, utilised landscape, but the nature of the archaeology is also difficult to read. The settlement itself dated to late Achaemenid and early Hellenistic times. In this way, the site is earlier than the introduction and development of the concept of polis in the region in middle Hellenistic times. With the polis of Sagalassos, monumental urban architecture was to be introduced. This quite visible urban armature was missing at Düzen Tepe, however, as this site was situated within another period and associated with another type of social complexity and organising daily life on the ground. Additionally, the site was abandoned by middle Hellenistic times, allowing cultural and natural processes of depletion and degradation to take over. As a result, the archaeology of Düzen Tepe is best characterised as ephemeral on the ground. Considering its acknowledged historical importance, however, a truly concerted effort at mapping revealed an interesting reading of the archaeological site, based on the application of satellite image study, intensive archaeological surveying, topographical mapping, and geophysical surveying.



0 50 100 200 400 I I I I I I I I I Metres

Map 3: Devi Taelman (2018), Urban and Suburban Setting of the Roman Colonial Town of Potentia.

Urban and suburban setting of the Roman colonial town of *Potentia* (184 BCE and abandoned in the early Middle Ages). A multi-method approach (artefact survey, vertical aerial and satellite imagery, and geophysical survey), in combination with legacy data, has allowed a more detailed appreciation of the site's chronology, functional zoning and spatial evolution between the early second century BCE and the late sixth–seventh centuries CE. The N-S oriented *cardo maximus* coinciding with the Roman coastal road and the E-W oriented *decumanus maximus* coinciding with the final stretch of the road linking *Potentia* to the *Via Flaminia* form the town's main axes. The intra-mural urban area consisted of a regularly subdivided network of streets and housing blocks of different sizes. Extra-mural activity was mostly attested as funerary zones and sectors of economic activity (pottery production, market gardening...). A. Orthorectified oblique aerial imagery and satellite imagery showing clear crop marks of the town's urban and suburban street network. B. Results of the magnetometer survey showing the internal urban structure, including street grid, public monuments, and housing structures. C. Interpretation of the main components of the Early Imperial town plan set against the microtopography derived from LiDAR data. The microtopography reveals the elongated beach ridge on top of which ancient *Potentia* was built that was eroded in its southern part during Late Medieval times due to river activity.



Map 4: General Landscape Setting of the Potenza Valley Survey.

Map 4: Devi Taelman (2018), General Landscape Setting of the Potenza Valley Survey.

General landscape setting of the Potenza Valley Survey (PVS). The project focuses on the human occupation between the early first millennium before our era (c. 900 BCE) and the end of Antiquity (c. 600 CE) in the valley of the river Potenza (Marche region, central Adriatic Italy). Field work is applied on scales ranging from the wider regional scale to the level of three sample zones along the c. 80-kilometre-long course of the river Potenza, roughly coinciding with the upper, middle. and lower sections of the valley, and to the scale of the individual site. A: Overview of the three sample zones along the river Potenza selected for intensive artefact survey in the PVS project and indications of the main modern towns. B-D: Changing settlement patterns in the lower valley section of the river Potenza between Iron Age and Late Antiquity (red = certain sites, yellow = possible sites). B: Iron Age; C: Republican period in relation to the Roman colonial town of *Potentia*; E: Middle Imperial period in relation to the Roman colonial town of *Potentia*; D: Early Imperial period in relation to the Roman colonial town of *Potentia*.

Map 5: Devi Taelman (2018), Landscape Setting of the Southern Suburban Area of the Lost Town of Potentia and the Ancient Bed of the River Potenza.

Landscape setting of the southern suburban area of the lost town of *Potentia* and the ancient bed of the river Potenza, mapped with the combined use of aerial photography and LiDAR imagery. Inset 1 shows crop marks of the ancient river Potenza, demonstrating an abandoned deltaic river channel with bifurcating channels. Topographic correlation of the ancient riverbeds indicates a gradual southward migration of the active delta channels. At the latest in 1453–1635 cal CE the river abruptly migrated to the north, partly eroding the Potentia beach ridge and the southern part of the Roman town. Inset 2 shows the location the Roman bridge of *Casa dell'Arco*, the preserved arches of the Roman bridge in the walls of the eighteenth-century farm, the soil profile with a typical fluvial upward fining, and the corresponding radiocarbon dates. The fluvial upward fining points towards a migrating meandering river. Radiocarbon dates indicate that the Roman channel remained in use until the late medieval period. The final date illustrates that the alluvial plain was still subject to regular floods until the late nineteenth century or early twentieth century.



Map 5: Landscape Setting of the Southern Suburban Area of the Lost Town of Potentia and the Ancient Bed of Rhe river Potenza.





The 1:20 ooo map of the archaeological site of Sagalassos (South-west Turkey), produced by Prof. Frans Depuydt and his team. The scaled version of the map accentuates the urban framework of the ancient city, but freezes it in the rendering of the actual landscape contours of the site as well as in time. In this way, no chronological depth or interpretation is considered, displaying graphically a snapshot understanding of the importance of mainly the urban monumental core zone. Although providing a strong visual synopsis of the urbanscape, it remains difficult to unpack this map. It not only stacks stages of its diachronic development, but also presents a topography that never existed from integrating actual landscapes and contours with a reconstructed archaeology. Terraces must have been a very common feature at ancient Sagalassos, for instance, sustaining the development of the built framework for a community on an undulating and at times even steep terrain. Such elements would have had an impact on circulation and communication, and in this way formed an essential element of the urban landscape. This interface is lacking from the map, as the available information on the archaeology of terraces is insufficient. As a result, the map is the result of a set of rational decisions, and these need to be considered in order to fully comprehend the map.