Towards an Integrated Database for the Study of Long-term Settlement Dynamics, Economic Performance and Demography in the Pontine Region and the Hinterland of Rome

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Introduction

For over 30 years, the Pontine Region Project (PRP) has carried out intensive archaeological artefact surveys in the Pontine region, a coastal landscape south of Rome (fig. 1). These surveys have resulted in a database holding site and ceramic data that derive from all the different landscape zones of this region, which include a coastal ridge, inland plain, volcanic hills, river valleys, foothills and surrounding mountain range. The PRP database structure is aimed at the aggregate and comparative analysis of rural settlement patterns across these different landscape zones in space and time, and to reconstruct economic and demographic trends on the local and regional scales from protohistory into the medieval period.

In the first part of this article we will give an overview of the challenges involved in creating this overarching project database, and present recent work done on the Pontine Region Project and its database as well as longitudinal socio-economic and demographic studies of the Pontine landscape and past populations to illustrate the analytical potential of data integration. So far, we have carried out a restricted number of quantified socio-economic case studies of specific landscapes within the Pontine Region[1] and are working towards truly comparative analyses on the regional scale of the Pontine landscape based on the Pontine data.[2] Moreover, we will outline an objective for the future: to incorporate 'legacy' datasets in our database. In our case these especially comprise topographic studies, among which are several Forma Italiae archaeological inventories to complement our own site data, and to allow us to link rural settlement patterns to urban development and infrastructure.[3]

In the second part of the paper, we discuss the possibility and potential to integrate the Pontine Region database with those of two other major survey projects, the Suburbium Project (Sapienza Rome) and the Tiber Valley Project (British School at Rome), to design an aggregate database that covers representative sections of Rome's *Suburbium.*[4] To this end, we have formed an international consortium of researchers from the Universities of Groningen (NL), Durham (UK), St. Andrews (UK), Cologne (G) and now also Leiden (NL) and Melbourne (AUS). This new project, called the Rome Hinterland Project (RHP), is supported by an internationalization grant from the Netherlands Organization of Scientific Research (NWO) to which all partners contributed financially.[5] This initiative will facilitate longitudinal and quantitative studies on socio-economic and demographic aspects of Rome's hinterland from its formation to well into the medieval period.

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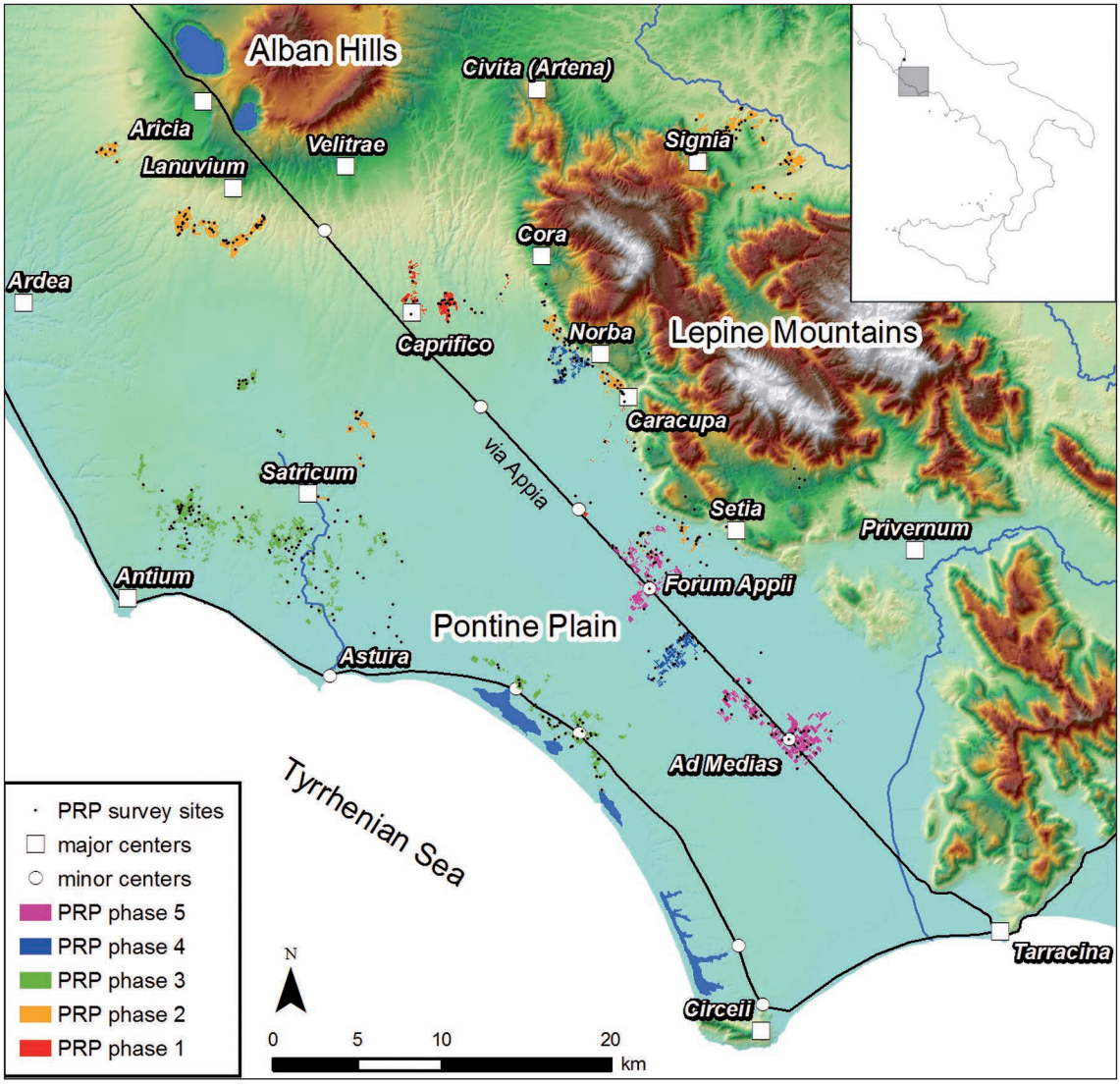


Fig. 1: The Pontine Region with areas and sites surveyed by the PRP.

The PRP Database: Highlighting the Potential for Quantitative Analyses

Thanks to the continuous collection of field data ever since its inception in 1987, the PRP database has grown into a rich but also complex source of archaeological data. Currently, it contains information on approximately 800 sites, 40 km² of off-site data and 300,000 artefacts, of which some 25,000 are diagnostic.[6] The dataset is complex because of the different methodologies that have been applied in our site and off-site surveys over the years. This was done for good reasons: we continuously wished to improve the quality of recording in the systematic survey of arable fields, to adapt our field methodology to survey of different terrain circumstances with low visibility (for in-

stance in overgrown mountainous zones[7]), and to approach different research questions (which sometimes required the collection of off-site data, sometimes not). A challenge in extending the dataset is the incorporation of data collected in other projects carried out in the Pontine region, such as the Forma Italiae on Terracina and Circeii and their countryside;[8] Cora and its countryside;[9] and the Astura valley.[10] These inventories were compiled in a period when the archaeological landscape was far better preserved than today and therefore a crucial source to understand what we are currently able to map on the ground in much more fragmented form. To inventory these landscapes the topographers working in the Forma Italiae tradition used methods of field recording that are very different from the ones used today in Mediterranean survey. The surveys were extensive instead of intensive, more focused on the – then still abundantly present – standing monumental remains. Pottery was – if collected at all – usually taken as 'grab samples' instead of controlled pottery collections, and there was little or no attention given to quantitative ceramic analysis and off-site pottery recording. To make data from such older surveys ('legacy data') compatible with data captured by modern systematic survey, one must consider issues such as uneven coverage and research intensity; representation issues; uneven data quality and dating issues (to which we turn in the next paragraph).

To get a handle on the quality and significance of such topographic studies, resurveying sites they recorded is very useful.[11] This is clearly demonstrated by the resurveys done by the PRP in the early 2000s in the coastal landscape around Nettuno and along the Astura valley.[12] These resurveys allowed us to better understand the chronology and interpretation of sites mapped during earlier extensive non-systematic surveys in the area carried out for the Forma Italiae volume *Astura*[13] and by the then-Director of the Antiquarium of Nettuno. In addition, they focused on establishing scatter size, function, and site chronology. We integrated our own systematic survey with these enhanced data from extensive surveys to carry out settlement trend analysis,[14] as well as economic and demographic reconstructions.[15]

To illustrate this, fig. 2 shows the integration of the three datasets for the area around Nettuno (Piccareta's Forma Italiae volume, the Pontine Region dataset, and that of the Antiquarium at Nettuno) and the trends that can be derived from this aggregate dataset in terms of fluctuating rural occupation from the mid-Republic into the Imperial period. Such trends can be analysed in relation to the functioning of the Roman colony of Antium, and demonstrate that the fates of town and country were strongly tied, with both peaking in the Late Republican and Early Imperial periods. Once we have incorporated legacy datasets for other parts of the region, we will be able to perform such analyses on multiple scales, comparatively between towns and their rural territories or between landscape zones. These can even be done for more overarching aggregate socio-economic and demographic analyses concerning the rural history of the Pontine Region as a whole.

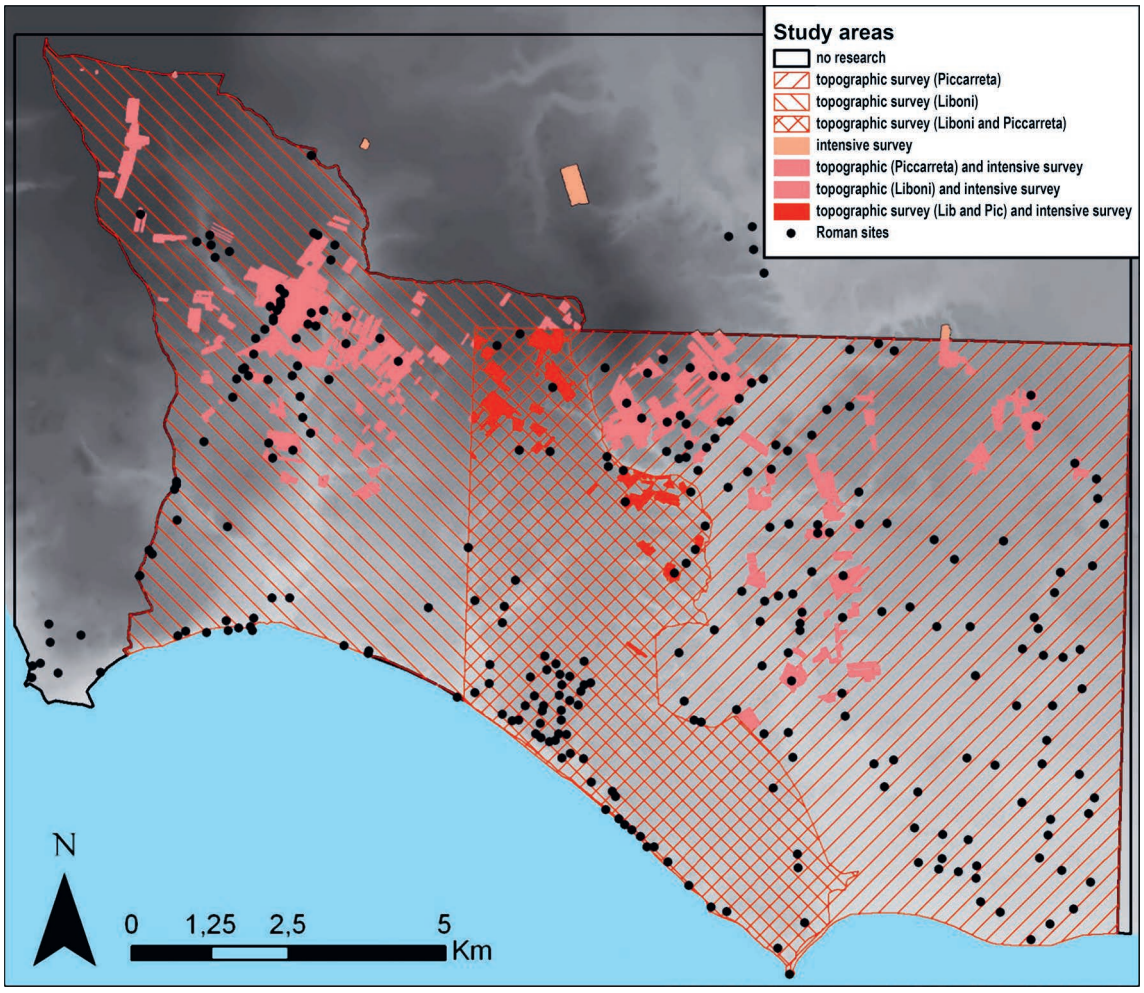
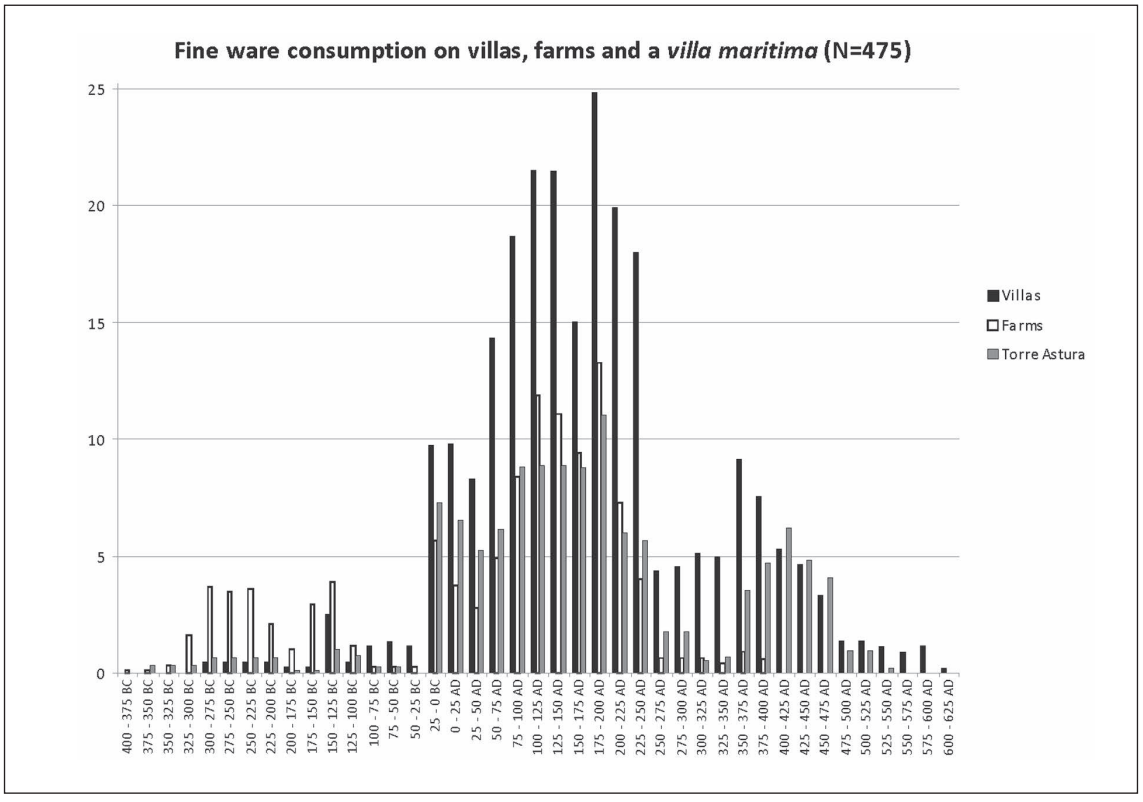


Fig. 2: Map showing three integrated, partially overlapping datasets.

Also, studies into economic performance and standard of living proved possible by combining our own field data with settlement- and artefactual information collected by the then-director of the Antiquarium of Nettuno. The graphs in figs. 3a, b show an example of how fine wares and amphorae can be used as indicators of access to and consumption of commodities in the countryside.[16] They show peaks in the late Republican and early Imperial periods. The building of the overarching PRP-database allows us to confront these local trends with those recorded for other parts of the Pontine region, teasing out differences in settlement and economic histories on the regional scale.[17] Analysing quantities of fine wares and amphorae at modest farmsteads and richer villas may show how far commodities reached the lower ends of the settlement spectrum, and hence if (and when) these were both economically integrated. Regarding the demographic inferences, we used the aggregated Nettuno data. Assigning numbers of persons to site classes and correcting numbers of sites for differential site recovery



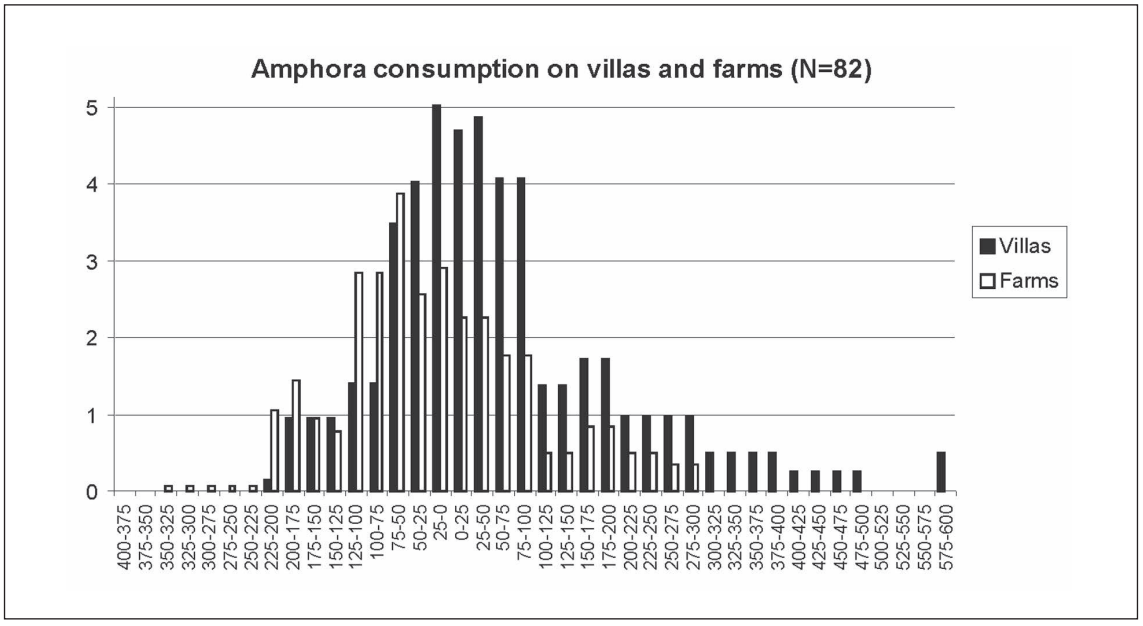


Fig. 3: 3a: Aggregated fine wares and amphorae for sites from a sample area in the Pontine region. 3b: Fine ware and amphora consumption between the 4th c. BC and 6th c. AD.

rates, we arrived at rural population estimates for the coastal landscape between *Satricum* and *Antium* for the Archaic to Roman periods.[18] We are convinced that, once we have added the vast amount of legacy data to the Pontine Region database, these studies will become more robust and will allow for comparisons over larger areas.

A third example of recent work on the PRP database is illustrated in fig. 4. It shows pottery production sites identified in the Pontine Region surveys from protohistory to the Roman period. In recent surveys we have been able to add to this sample, as geophysical surveys are now increasing the possibility of detecting actual kilns.[19] To reconstruct production and consumption patterns, as we are now endeavouring for the Pontine plain

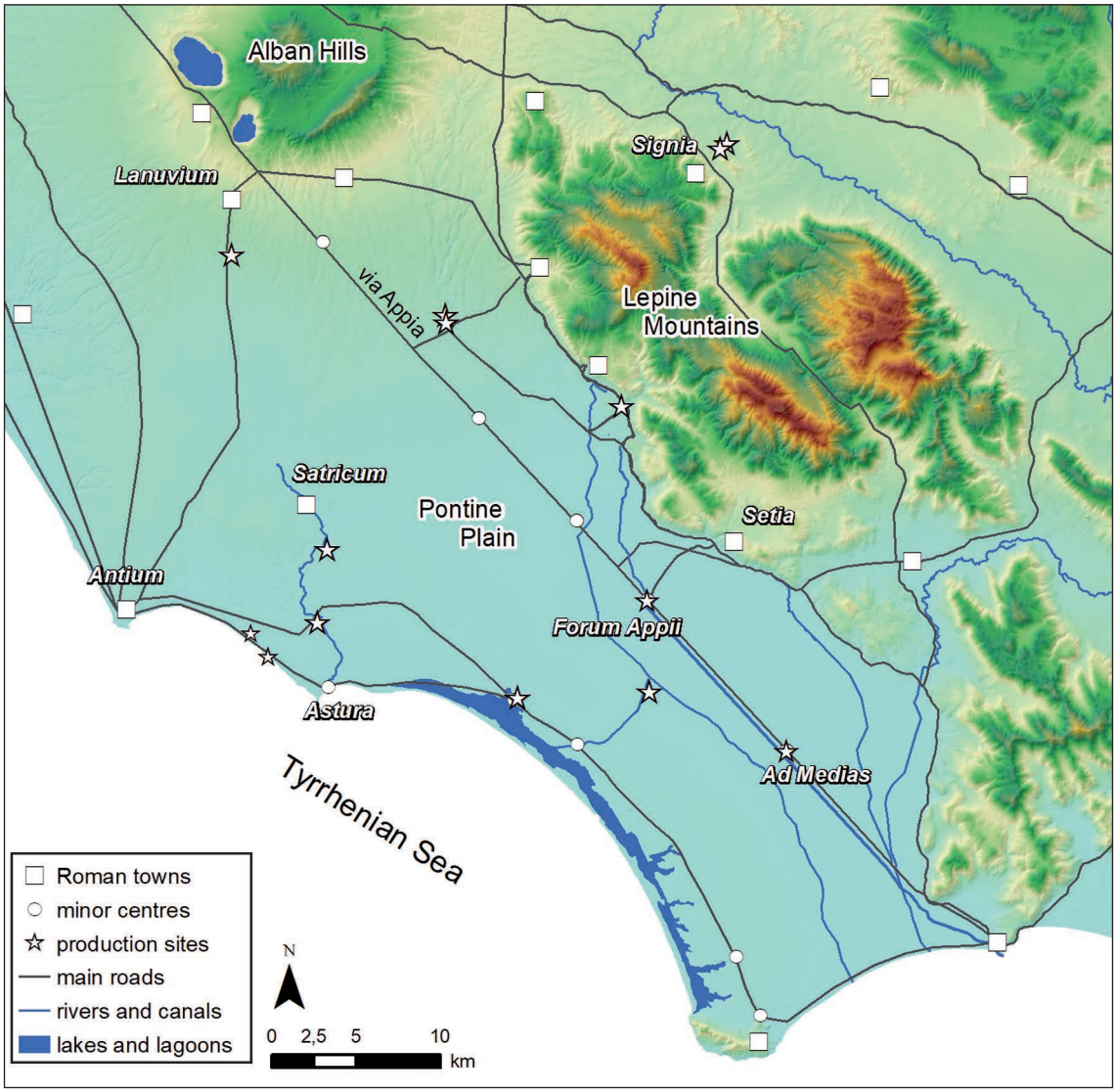


Fig. 4: Pottery production sites identified in the Pontine Region surveys from protohistory to the Roman period.

during the Roman period, we need to be able to link the ceramics related to the kilns with their actual distribution over the landscape.[20] This needs further classification of especially the common wares through archaeometric analysis, which is currently being undertaken as part of the PhD research of Filmo Verhagen, carried out at the University of Uppsala (Sweden) and Barbara Borgers at the University of Vienna (Austria).

Why an Integrated Database for the Suburbium of Rome?

While we plan further work on the Pontine Region database and to extend it with legacy data over the next years, at the same time we have started to work on the integration of the Pontine Region database with those created by the Suburbium project of Sapienza University and the Tiber Valley Project of the British School. This so-called Rome Hinterland Project (RHP) will facilitate the type of socio-economic and demographic analyses presented above on a wide scale for Rome's hinterland. Below, we first describe the relevance of the RHP initiative, followed by the challenges the RHP consortium encounters in realizing the objective of an integrated database for the Suburbium that is moreover expandable with other projects.

In debates on ancient demography and the nature of the ancient economy, ceramic data from archaeological surveys is increasingly used as an important source, as ceramics can attribute chronology, function and status to archaeological sites recorded in surveys.[21] As such, we can use survey data as proxies to reconstruct patterns of production, trade and consumption[22] and, to some extent, to approximate population levels and trends.[23] Ceramic analysis is a tool that, independently from historical sources, is instrumental in classifying archaeological sites within a chronological and functional spectrum of settlement forms. By combining classified site data, one can proceed to map settlement patterns on a regional scale.

The classification and dating of sites within a single survey is useful to reconstruct the settlement patterns on the scale of that survey and to relate these patterns to local urban centres, landscape and infrastructure. Yet, we need to aggregate datasets for macro-regional and interregional socio-economic and demographic analyses, as is the case with the Suburbium of Rome, for which multiple datasets exist. However, as we will explain below, aggregating datasets faces us with challenges and is time-consuming. Why take all this painstaking effort to integrate survey data and databases? One of the principal reasons is that aggregating survey databases from around Rome – where large tracts of land were, and still are, available for archaeological study – provides us with one of the few (if not only) opportunities to study the impact of the foundation, growth and decline of an ancient metropolis on its immediate hinterland. Substantively, the RHP team is convinced that bringing together site and pottery data for the hinterland of Rome will be a fundamental tool in the study of longer-term socio-economic trends quantitatively, qualitatively and comparatively. We are, for example, interested in:

- the diversity of land use and the rural settled landscape
- production and consumption patterns
- economic performance and standard of living
- rural demography
- intra-regional synchronic and diachronic comparison

Fig. 5 shows a comparison of settlement trends in sample areas in four landscapes in the Pontine plain from the Archaic period into the late Imperial period; it shows the potential of aggregate datasets to make comparisons between landscape zones. The Roman hinterland database would allow such analyses on a much wider scale, comprising the various landscape zones around Rome. Similarly, we may use the classification of rural sites to come to demographic inferences, as we discussed above using the example of *Antium* in the Pontine region.

To contextualize the integrated database of systematically collected rural survey data in the landscapes that make up the hinterland of Rome, we can make use of a large body of archaeological knowledge on cities, ports, towns, road and production infrastructure as well as on a range of rural site types (farmsteads, villas, hamlets, villages, production facilities) mapped in other projects than our own. Such information is gathered from the already mentioned Forma Italiae inventories, and from local site inventories and excavations. The incorporation of these data will be indispensable to use the aggregate quantitative data to carry out sophisticated spatial analyses of the economy and demography of Rome's hinterland. Cartographical data on the physical aspects of the landscape and past topography is incorporated in the consortium's separate GIS databases.

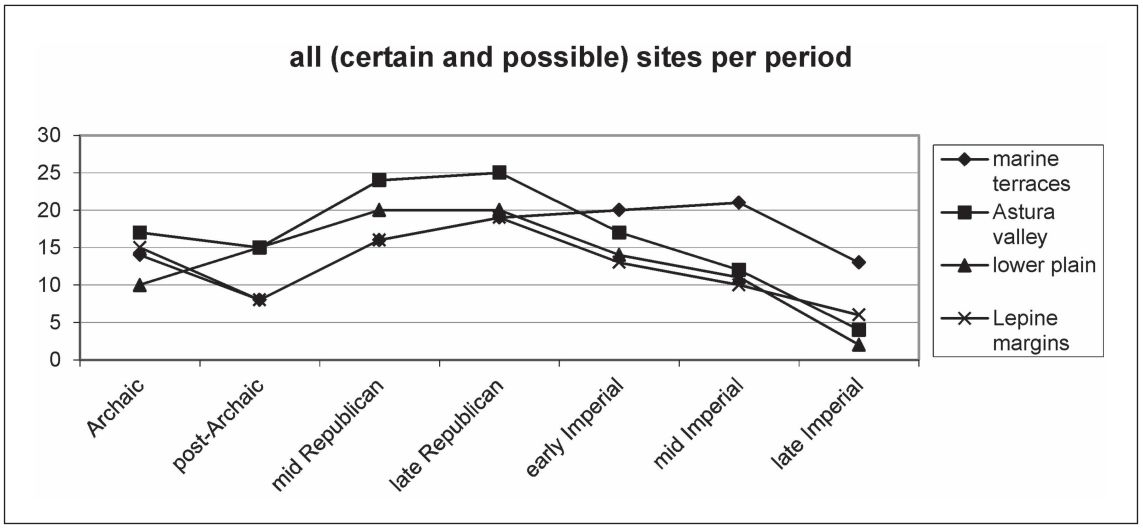


Fig. 5: Comparative approach of settlement dynamics between the Archaic and Imperial period in sample areas in four landscapes in the Pontine plain.

Challenges in Creating a Survey Database for the Pontine Region Project

Data integration is however not straightforward and requires several preparatory steps. A first step is updating and homogenizing the databases for each project individually. Below we illustrate this exercise for the Pontine Region Project database, by discussing how we have recently dealt with challenges in site- and pottery chronology and site classification.

Issues of Site-Chronology: Examples from Crustumerium and the Pontine Region

Concurrent with the excavations of the cemeteries and settlement of Crustumerium, the Groningen Institute of Archaeology has carried out resurveys of parts of the urban and rural areas of the ancient town.[24] Its aim was to increase our understanding of legacy survey datasets created in the 1970s within the framework of the Latium Vetus surveys[25] and in the 1990s, as part of the Suburbium project.[26] The pottery data collected in the 1970s were interpreted as proof that many sites were settled as early as the protohistorical period. However, the principal researcher, Jorn Seubers, found that the ceramic types on which the early chronology of find assemblages were foremost based (i.e. red fired coarse ware tile and pottery), of find assemblages in Crustumerium's urban context, were consistently consistently associated with *bucchero* and *impasto rosso* (i.e. late 7th/6th century BC). These findings lined up with insights made by colleagues from Sapienza University.[27] The same 7th/6th century BC wares were largely absent in rural sites containing similar coarse ware fabrics. Instead, black gloss (from the mid-4thcentury BC onwards), which was sporadic in the urban area, was the primary pottery class associated with (red firing) coarse wares in rural assemblages.[28] Comparing associations of coarse wares with the distribution of fine wares for the urban area of Crustumerium and the surrounding countryside thus demonstrated that there are significant differences between the two. This is visualized in figure 6: the upper histogram tabulates find contexts from the urban area showing a consistent Orientalising to Archaic dating pattern with substantial numbers of diagnostic *impasto rosso* and *bucchero* sherds thought to match the dates of the bulk of the finds. This would be congruent with the historically and archaeologically attested abandonment of the settlement of Crustumerium and its cemeteries around 500 BC. The lower histograms in fig. 6, however, which tabulate find contexts from the rural territory, show an abundance of black glazed ware, dating to the Republican period and only a few diagnostics for the Orientalising and Archaic periods. This suggests that there is a bias in the chronology provided for the bulk of the material reported from the countryside in the surveys of the 1970s. Considering the scarcity of diagnostic pottery evidence on sites attributed to the protohistoric periods (750–500 BC) many of these rural sites probably should be dated after the abandon-

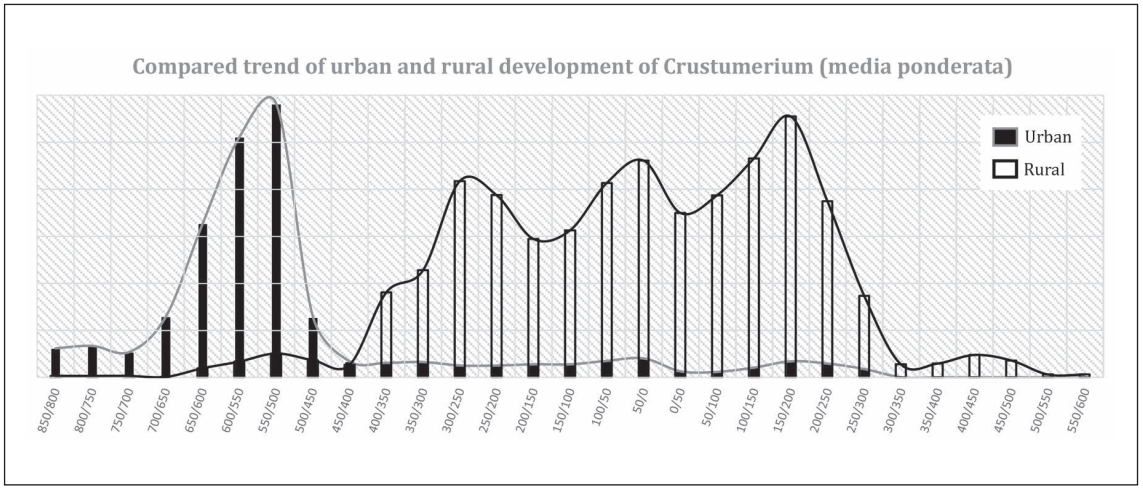


Fig. 6: The frequency of the occurrence of specific chronological intervals in the pottery collected in the urban survey and in the rural survey of the GIA. The compared pottery consumption trends clearly illustrate how different the urban and rural ceramic records are, and show how pottery consumption in the countryside starts to increase especially after the abandonment of Crustumerium.

ment of the settlement. The two maps in figures 7a, b illustrate the consequences. The upper map plots the 'legacy' scenario (i.e. providing consistently early dates for impasto and coarse wares); in the lower map, the sites have been filtered on the presence of diagnostic materials with 7th/6th century dates. When these are compared, the impact becomes clear regarding our understanding of the nature and intensity of ruralisation of Crustumerium. In this particular case there is a potential drop in sites from approximately 150 to 30. Although individual sites might hide earlier phases, the ruralisation around Crustumerium during the Archaic period was certainly less intense than previously postulated. The key to such critical reviews is the greater insight that pottery specialists have obtained since the 1980s in the actual date ranges of impasto and coarse wares. These ranges appeared to be much longer than protohistoric landscape archaeologists, including the authors, thought them to be. The above case shows the importance of acknowledging pottery dating issues, and the realization that this may lead to very different scenarios of urban and rural development. It also shows the need for transparency regarding analytical choices. Below we highlight another challenge when integrating survey data, attributing function to sites.

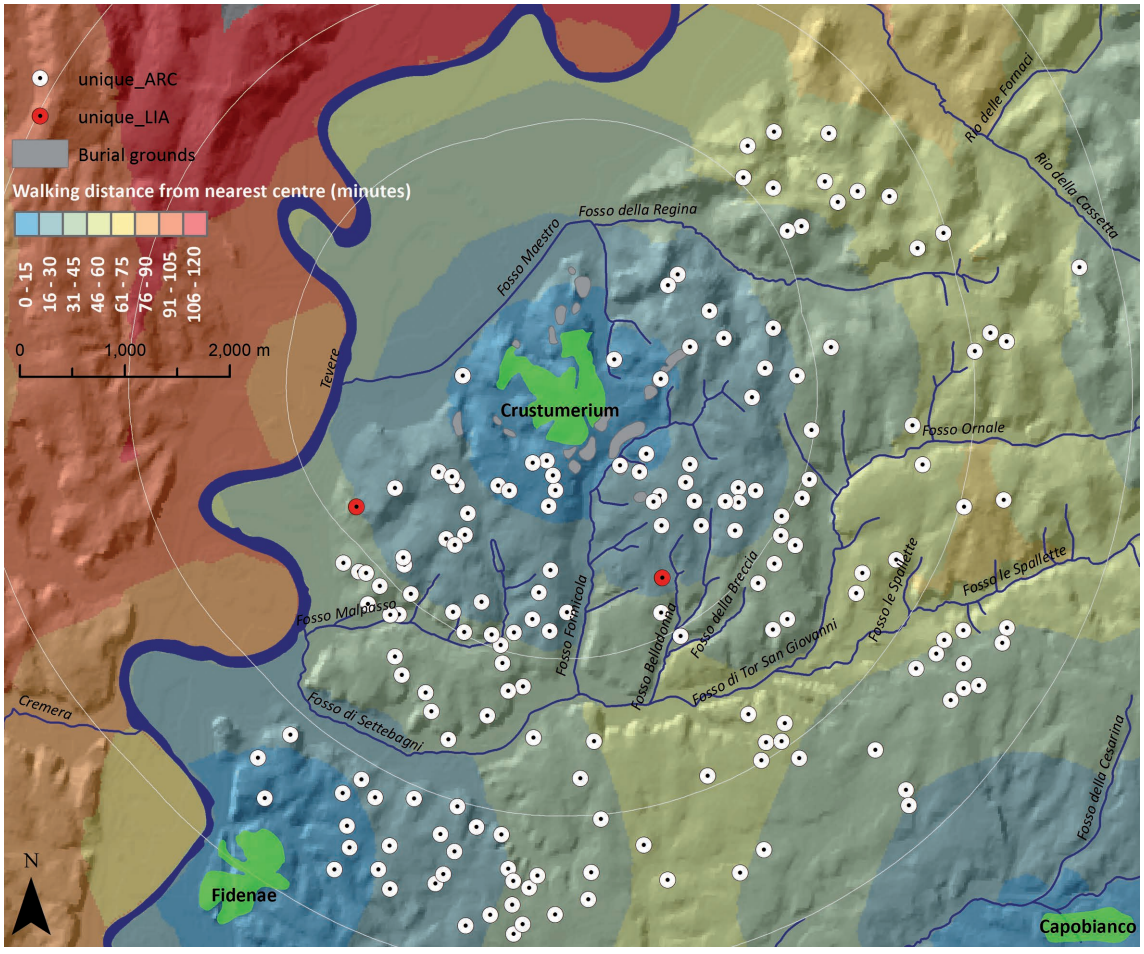


Fig. 7a: Recorded observations of surface ceramics of Orientalising/Archaic date, in a 5 km radius around Crustumerium based on Latium Vetus and Suburbium data.

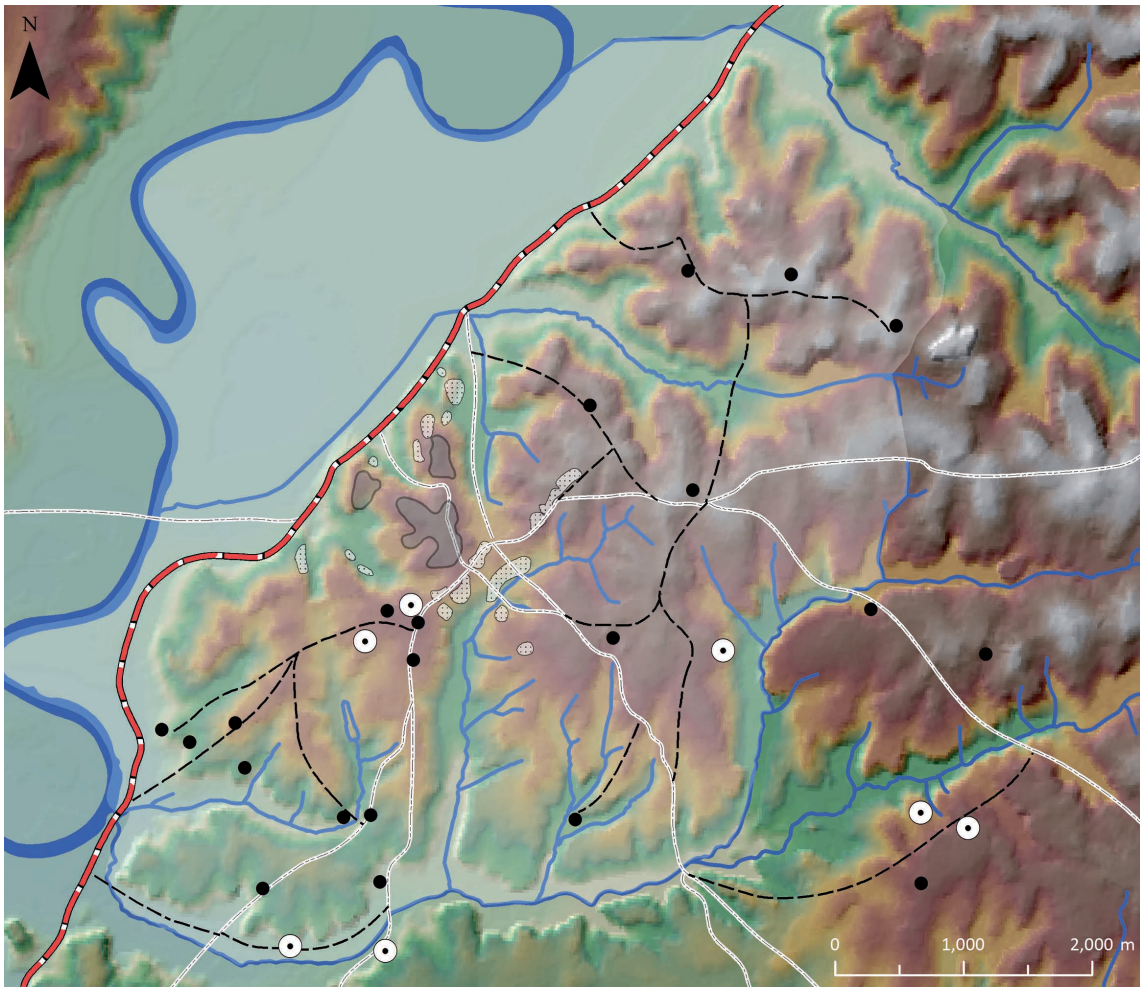


Fig. 7b: An overview of the urban and rural layout of Crustumerium according to the "low count" of Archaic evidence (transparent white = territory, grey = urban area, white dotted = funerary areas), marked with larger and smaller rural sites (white and black) and primary (white) and secondary roads (dashed).

Issues with Determining Site Function

Another challenge concerns the functional analysis of survey pottery from archaeological sites. What functions can we assign to the dots (sites) on our survey maps on the basis of surface finds? Are we dealing with a farmstead, a villa, a rural sanctuary, a tomb, or a kiln? In 2011, Carter and Prieto published part of the Metapontino survey in detail and showed how a functional analysis of assemblages of potsherds from regional survey can result in a classification of sites as tombs, farmhouses, and rural sanctuaries.[29] For the Pontine Region, we have used similar approaches.[30] Tol (2012), for instance, showed how intra-site analysis on the basis of hyper-intensive surveys may go further and

reveal functional areas within sites, such as the pottery production part of a modest farmstead's economy, even if the relevant material is only a fraction (0.01%) of the total amount of material diagnosed.

There is no doubt that, if we want to use our site data quantitatively, we have to aggregate our data in functional classes. While self-evident, the compatibility between local site classifications based on the functional interpretation of assemblages is not a straightforward exercise even within one region, and will depend on a careful selection of attributes. Most scholars will agree that functional interpretations of artefact assemblages in combination with scatter size is the basis of site classification. However, when aiming to compare classified sites between individual surveys, we must be sure that we compare like with like. The difficulty here is that we need to group sites under a single site classification label that may have very different material manifestations in the landscape, depending on a range of cultural and landscape factors. Also, classifications are often rigid and do not easily accommodate multiple functions. To illustrate the problem: the material manifestation of a mid-Republican farmstead on the marine terraces in the Pontine Region is different from that of a mid-Republican farmstead on the slopes of the Monti Lepini; while the first consists of a scatter of pottery and building materials, the second may have a platform of drystone masonry of polygonal blocks on which the farmhouse was built. Do the different material manifestations mean that both site types nonetheless belong to the same class of medium sized isolated farmsteads, or do the platform sites perhaps represent a separate class of farms, more geared at the market-oriented production of olive-oil?[31] Another example: for the Roman period it is very difficult to distinguish between funerary contexts, farmsteads, and (some) votive deposits. These largely contain the same wares, especially when deposits contain largely pottery shapes and no figurines, such as at Casarinaccio in Ardea and votive deposit II in Satricum.[32]

Challenges in Creating a Survey Database for the Roman Suburbium

With individual databases updated and standardized, the next challenge in integrating different project databases was solving issues of compatibility between the different projects involved within the RHP. Individual survey projects use different ceramic and site classification schemes based on different criteria that are often not made explicit. Between projects, pottery classifications will have different breakdowns of chronological periods and different chronological ranges attributed to ceramic wares, while different terminologies will be used. Site classifications will be based on varying criteria.[33] When aiming at aggregate, macro-regional and comparative analyses, the issue then becomes how to make ceramic and site data from multiple projects and case studies compatible for quantitative diachronic analyses. This is fundamental if we want to do the various types of analyses that we have referred to above for the Pontine Region on an even larger scale.

Hence, the challenges faced by the consortium of the Pontine Region Project, the Suburbium Project, and the Tiber Valley Project prior to the migration of their pottery and site classification data into the shared RHP database can be summed up under three headings:

1. reaching consensus on the semantic level. This means agreeing on similar ways of classifying pottery as to wares and shapes, and similar ways of classifying sites
2. reaching consensus on pottery chronologies to facilitate dating of sites
3. finding solutions to the technical challenge of bringing together separate databases within one overarching database structure.

These aims were addressed by the RHP consortium in various workshops in Groningen, in Rome (at the British School and at Sapienza University), in Durham, and in Cologne between 2015 and 2018. In the 2015 Rome workshop, for instance, pottery specialists of the three projects brought 'problematic' pottery categories to the workshop and discussed them, such as the supposedly Archaic coarse wares (to which we referred above in a case study concerning the site of Crustumerium). The outcome was positive: the group encountered no major obstacles to devise a classification into which pottery from all three projects could fit. It appeared that standard procedures for site classification and dating were shared by all three groups. Moreover, it was found that no major differences appeared in terms of the presence/absence of pottery wares and that the three projects broadly used the same ceramic typologies and chronologies. The group noted, however, differences on the level of database structure, and had to work on a common vocabulary for pottery classes and chronologies for non-local pottery wares and shapes.

Conclusions

In this paper we have given an update of the status quo of the Pontine Region database and given examples of analyses that we have carried out so far, showing its potential for studying the Pontine economy and demography on the level of the whole region, as well as comparatively between its constituent local rural landscapes and towns. We have also highlighted the potential of incorporating legacy data in the Pontine Region database, which would significantly broaden the quantitative basis with which to perform analyses. At the same time, we have commented on the challenges this poses to integrating data recorded in older topographic surveys with those obtained in modern systematic surveys. Next, we discussed the initiative of merging the Tiber Valley Project database, the Suburbium database, and the Pontine Region Project database in one overarching Rome Hinterland database. This initiative will result in one of the largest databases of its kind, holding many thousands of site and pottery records for the hinterland of Rome. For the first time, the RHP database will allow for detailed diachronic socio-economic and demographic analyses of the hinterland of an ancient metropolis over a timespan of more than ten centuries. Having taken the steps of data preparation and consen-

sus building regarding typologies, chronologies and terminologies, the international RHP consortium is in the crucial phase of preparing for data-migration and finalizing the overarching database structure. Once the basic design of the database has been established, the group will plan the first analyses of the pottery and site records, write a technical publication and a position paper. At the same time, however, we are looking forward to extending the project to include other datasets, projects and scholars. The aim is to expand the project in the form of an 'open' structure that will benefit the larger archaeological community. We believe that concerted efforts to bring together regional pottery and site datasets in overarching databases is the way for survey archaeology to move forward if we want to answer detailed questions of demographic, socio-economic and cultural developments on a larger scale.

Notes

[1] De Haas et al. 2011.

[2] See Tol 2017.

[3] Attema 2018.

[4] Morley 1996; Witcher 2005.

[5] The project 'Integrating Archaeological Field Surveys – Rome and Beyond' (project number 236-61-002) is funded by NWO for a period of four years between 2016–2020. The consortium also received financial support from the British Academy, for which it is likewise very grateful.

[6] cf. De Haas – Tol forthcoming.

[7] Van Leusen et al. 2010.

[8] Lugli 1926, 1928.

[9] Brandizzi Vittucci 1977.

[10] Piccarreta 1977.

[11] cf. Witcher 2008.

[12] Attema et al. 2008; 2010 and 2011; Tol 2012.

[13] Piccarreta 1977.

[14] Attema et al. 2011.

[15] Tol 2017; Attema – De Haas 2011.

[16] cf. De Haas et al. 2011.

[17] Tol 2017.

[18] Attema – De Haas 2011.

[19] Tol et al. 2014; Tol – Borgers 2016.

[20] Borgers et al. 2018a and b.

[21] e.g. Launaro 2011.

[22] Millett 2000.

[23] Sbonias 1999; Drennan et al. 2012.

[24] Attema et al. 2014.

[25] Quilici – Quilici Gigli 1980.
[26] Carafa – Capanna 2007.
[27] Carafa – Capanna 2009.
[28] Seubers – Tol 2016, figs. 10. 11.
[29] Keith Swift in Carter – Prieto 2011, 129–142.
[30] De Haas 2011; Attema et al. 2013/2014.
[31] De Haas et al. 2012.
[32] di Mario, 2005; Bouma 1996.
[33] Fulminante 2014, 131–141.

Image Credits

Fig. 1: map T. de Haas, after de Haas – Tol forthcoming fig. 1. – Fig. 2: map T. de Haas, after Attema – de Haas 2011, fig. 5.10. – Fig. 3a: after de Haas 2011, fig. 7. – Fig. 3b: after de Haas 2011, fig. 8. – Fig. 4: map T. de Haas. – Fig. 5: de Haas 2011, fig. 6.9. – Fig. 6: Seubers – Tol 2016, fig. 14. – Fig. 7a: Seubers 2018, fig. 5.36A. – Fig. 7b: Seubers 2018, fig. 5.46.

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