
TRAC Theoretical Roman Archaeology Conference

www.trac.org.uk

Paper Information:

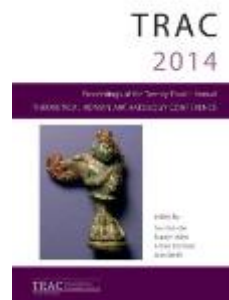
Title: Re-defining the Roman '*Suburbium*' from Republic to Empire: A Theoretical Approach

Author: Matthew J. Mandich

Pages: 81–99

DOI: http://doi.org/10.16995/TRAC2014_81_99

Publication Date: 27/03/2015



Volume Information:

Brindle, T., Allen, M., Durham, E., and Smith, A. (eds) 2015. *TRAC 2014: Proceedings of the Twenty-Fourth Annual Theoretical Roman Archaeology Conference, Reading 2014*. Oxford: Oxbow Books.

Copyright and Hardcopy Editions:

The following paper was originally published in print format by Oxbow Books for TRAC. Hard copy editions of this volume may still be available, and can be purchased direct from Oxbow at <http://www.oxbowbooks.com>.

TRAC has now made this paper available as Open Access through an agreement with the publisher. Copyright remains with TRAC and the individual author(s), and all use or quotation of this paper and/or its contents must be acknowledged. This paper was released in digital Open Access format in March 2018.

Re-defining the Roman ‘*suburbium*’ from Republic to Empire: A Theoretical Approach

Matthew J. Mandich

Introduction

Despite numerous publications, conferences, and excavations focused on the suburbs (or ‘*suburbium*’) of ancient Rome over the last several decades, current definitions of this space, its extent, and its functions remain frustratingly varied and even conflicting. This is partly due to the lack of specific demarcations for such spaces in the surviving ancient literature and epigraphy. In fact, the term *suburbium* only appears twice in known ancient sources (Champlin 1982: 110). However, these assorted and often unsatisfactory modern definitions are also largely the result of a tendency to ignore the numerous and diverse aspects of the suburban realm in order to achieve a simplified, manageable definition. The frequent treatment and study of the Roman ‘*suburbium*’ as an autonomous entity, disconnected from the *Urbs*, further compound the situation, as arbitrarily separating this space diminishes its role in a greater interconnected system largely dependent on the city that it surrounds (see Ravetz *et al.* 2013). Given the current frustrations, one must wonder, whether we are asking the right questions of this space.

This article introduces a set of concepts and approaches that I argue will have validity for redefining and reassessing the Roman ‘*suburbium*’. In it, I will take a holistic approach to the Roman suburbs, embracing their complexity to combat their innate ambiguity. While the topic is indeed substantial, discussion of individual sites and detailed historical sequencing will necessarily be omitted since the focus instead will be on providing new models by which to reexamine and redefine this space (given the myriad issues of the archaeology). This is no easy task however, as even today’s metropolitan planners, (economic) geographers, and land-use analysts struggle to accurately demarcate and assess extra-urban areas around contemporary metropoleis (see www.plurel.net). Yet, by approaching the problem from a theoretical standpoint, and analyzing Rome Ekistically – as a dynamically expanding polis (see Doxiadis 1968: 193–199 and below), innovative ways of mapping and measuring may be assessed, offering a clearer understanding of this space, in turn allowing for its evolution, functions, and mobility to be better tracked from Republic to Empire.

The ‘suburbium’ in Ancient and Modern Thought

As noted, the term *suburbium* only appears twice in known ancient sources, and only once in a classical context:

“*Hisce ego me viis committam, qui Terminalibus nuper in suburbium, ut eodem die reverterer, ire non sum ausus?*” (Cicero, *Philippics* 12.10.24)

(Should I then trust myself to those roads, I who lately, on the day of the feast of Terminus, did not dare even to go into the suburbs and return by the same road on the same day?)

Despite the limited usage of the term, some information may still be gleaned from this brief passage. Cicero, in light of recent events, says that he is afraid to attend the Terminalia festival that took place on the 6th milestone of the Via Laurentina (Ovid, *Fasti* 2.682). This festival, originating in the Archaic period (or earlier), celebrated the god Terminus who watched over all boundaries, but primarily those of farms, personal properties and towns/cities (Ovid, *Fasti* 2.682; Roy 2005: 460). The location of the festival is significant since the 6th milestone marked the symbolic limit of Rome's earliest territory, the *ager Romanus antiquus*, and signified the extent of Rome's suburban realm as early as the 9th century BC (see Fulminante 2014: 112–115, 131–132). However, by Cicero's time Rome's suburban realm was considered to extend far beyond this, stretching to at least *Tusculum* (21 km from Rome) – considering Cicero himself states in a letter to Atticus that he would prefer to meet in *Tusculum*, or at some other suburban location: '*malo enim esse in Tusculano aut uspiam in suburbano*' (Cicero, *Att.* 16.13; see also Cicero, *De Ore.* 1.98 for reference to a '*suburbanum gymnasium*' located at Crassus' Tusculan villa).

Indeed, as Rome continued to develop as a polity her suburban realm inevitably expanded. Propertius, writing in the later first century B.C., alludes to the changing political and physical landscape of the early-mid Republican period when he states: '*Bovillae* was hardly a suburb of the small city [Rome], and *Gabi*, now nothing, was greatly crowded' (*quippe suburbanae parva minus urbe Bovillae et, qui nunc nulli, maxima turba Gabi*) (Propertius, *Elegies* 4.1.3). Several decades later we hear from Ovid that towns such as *Bovillae* (18 km from Rome), *Aricia* (27 km), *Tibur* (32 km), *Lanuvium* (38 km), *Praeneste* (41 km) and *Lavinium* (47 km) were all considered suburban (*suburbani*) to Rome (see Ovid *Fasti* 6.56; 3.66). Contemporaneously, Rome's urban centre was growing rapidly, forcing jurists to scramble to demarcate the City's fluctuating boundaries (see *Digesta* 50.16). This situation is probably best described by Dionysius of Halicarnassus, who in the late first century B.C. stated:

'If anyone wishes to estimate the size of Rome by looking at these suburbs he will necessarily be misled for want of a definite clue by which to determine up to what point it is still the city and where it ceases to be the city; so closely is the city connected with the country, giving the beholder the impression of a city stretching out indefinitely.'
(Dionysius of Halicarnassus, *Roman Antiquities*, 4.13.3–5)

Today, scholars continue to struggle with ways in which to interpret and define Rome's '*suburbium*' in antiquity. Some have taken a geographical approach, using the undulating plain of the *Agro Romano* (extending to the pre-Apennine mountain ranges and the Tyrrhenian coast) as a rough boundary (e.g. Morley 1996: 82; De Franceschini 2005). Others have elected to focus on architecture and material culture as indicators (Witcher 2005: 1045; 2008: 121), or examine the data in administrative texts – such as the range of the corn dole or that of the urban prefects writ (see Rickman 1980; Dyson 2010: 299). Many others have instead chosen to look at distances and travel speeds to gauge the extent of this zone. While useful, as will be shown, this exercise has produced a myriad of results since different modes of transportation and methods for calculating speed have been employed without a consensus being reached (see, for example Champlin 1982: 98; Augusta-Boularot 1998: 49–50; Laurence 1999: 125).

Textual evidence has also proved ambiguous, as the frequently appearing adjectival forms of the term (e.g. *suburbanus*, *suburbana* etc.) may refer to different components of this greater

realm depending on the author and the audience. For example, Roman agronomists tend to use the term *sub urbe* or variations of *suburbanus* when discussing land and villas close to the city of Rome (see Cato, *De Agri.* 7.1; 8.2; Varro *De Re Rus.* 1.16.3; 1.50.2). These writers emphasize the economic and productive aspects of such properties, stressing that they should be travelled to daily (*cotidianus excursus*) to ensure the smooth running of the estate (Columella, *De Re Rus.* 1.1.19; 1.2.1; Cato, *De Agri.* 1.1–2.7). On the other hand, when variations of the term appear in the works of writers such as Cicero or Pliny, it is often in reference to larger estates, more removed from the City and primarily reserved for social practices and personal enjoyment (Cicero, *Rosc. Am.* 133; *Verrem* 2.1.54 and 2.4.121; *Q. Fr.* 3.1; Pliny, *Ep.* 2.17).

While these textual discrepancies have been acknowledged, little has been done to deal with such issues in definitions of the Roman 'suburbium'. Instead, elite aspects of suburban space have been the dominant focus, as variations of the adjectival form of *suburbanus* appear most frequently in these writings (Champlin 1982: 97; Goodman 2007: 20 n.75, 77, 87). This has led to the *suburbium* being defined as 'the rustic retreat of the urban elite' (Champlin 1982: 110), or a 'geistiger Lebensraum' (intellectual space) (see Mayer 2005: 263), and geographically indefinable. In a similar vein, it has been argued that perception rather than position dictated whether or not a villa was considered suburban in ancient thought (Goodman 2007: 20–22). However, as position surely influenced perceptions, further studies on villa location and amenities as qualifiers of suburban status have been undertaken, producing useful, yet inconclusive results (for example, Mayer 2005; Viitanen 2010).

In sum, various methods and approaches have been employed to delineate and define Rome's suburbs, yet none have produced a wholly satisfactory result. This is likely because many definitions attempt to crowd too many aspects of this complex zone under one roof (e.g. social, economic, physical), rather than focusing on each individually to achieve a more complete understanding of this ever-changing region. In a recent article, Rob Witcher (2013: 215) states that 'the (Roman) suburbs are characterized by a distinctive mobility and diversity' and cannot be defined 'unambiguously'. Yet the mobility and diversity of these suburbs were certainly motivated by real factors, and for every action there was a reaction. Therefore, by focusing on the causes of this mobility and diversity in the landscape, we should be able to move in new directions, and closer to less ambiguous definitions of this suburban realm.

Below I set out some of the previously applied approaches to interpreting this space, but highlight in particular new ways of modeling its form and functions. In doing so, I intend to show how we should draw on models and debates in modern and ancient urbanism to help understand the complex dynamics of ancient Rome's 'suburbium', and hopefully change the ways in which we perceive and engage with it.

Other Approaches: Modeling Suburban Space and the Use of Ekistics

While the search for a coherent spatial extent has dominated studies on the Roman 'suburbium', predictive modeling has also been employed to examine Rome's hinterland, albeit much more sparingly. Andrea Carandini (1985) was one of the first to apply aspects of economic geography to the Rome's extra-urban space when arguing (convincingly) for the existence of a complex and nuanced agricultural system surrounding the City based on marginal productivity and economic rents. In particular, he uses the work of Johann von Thünen (1826; translated as Von Thünen 1966) and its subsequent reworking by Michael Chisholm (1979) to model land use tendencies around Rome given the distinct lack of archaeological evidence for many agricultural activities

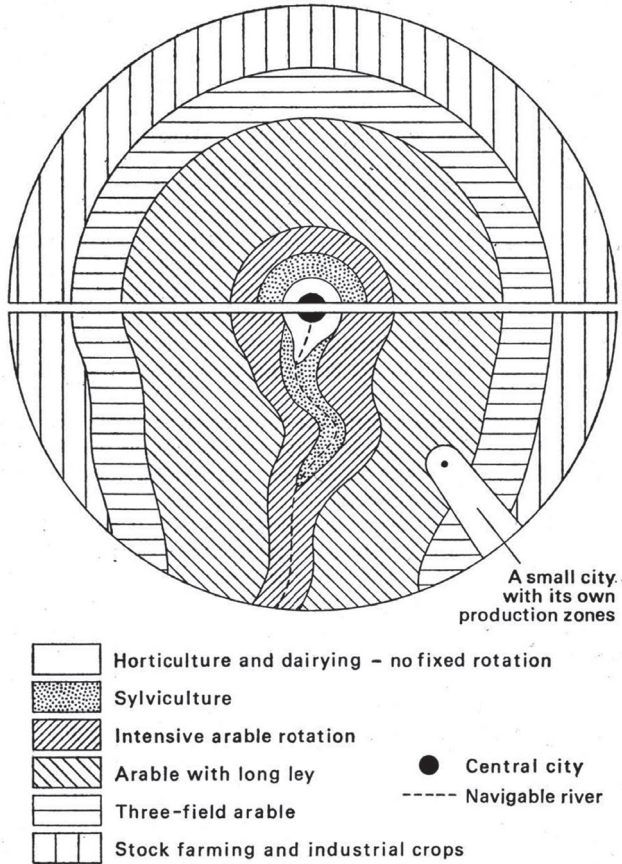


Figure 1: The 'Isolated State' model, based off model by Johann Von Thünen. Upper half of diagram represents conditions in hypothetical isolation; lower half introduces real-world factors such as waterways and additional settlements. (Chisholm 1979: Fig. 2)

(followed by Morley 1996: 59–68). The model employed, known as the 'Isolated State' theory, takes a hypothetical, isolated, pre-industrial city and examines how the locations of various agricultural undertakings should be dictated by production costs, transport costs, resource location, and profit maximization (also known as 'Von Thünen rent') (Fig. 1). Yet Carandini's discussion focuses solely on Rome's urban fringe, and while this model has been examined to some extent in relation to the wider suburban realm (Morley 1996; Goodman 2007; Wilson 2009), there is still potential for further extrapolation – especially when combined with other theories on Roman settlement and economy, and more particularly, with advances in spatial analysis.

Yet the principles of the Von Thünen and Chisholm models have already impacted on archaeological theory in a variety of ways. For example, Site Catchment Analysis (SCA) follows an almost identical framework, as it assumes 'the farther one moves away from an inhabited locus, the greater the amount of energy that must be expended for the procurement of resources' (Roper 1979: 120). This translates to more intensive land use and cultivation closer to a settlement, with a gradual decrease until a point is reached where exploitation of resources is no longer profitable due to costs (i.e. Von Thünen rent). This 'point', or boundary, is then where the site or settlement is considered to end (see examples of Thiessen polygons for most recent applications). While the Chisholm model, SCA, and Central Place Theory (see Christaller

1933) tend to work reasonably well for assessing and demarcating smaller agrarian settlements and their hinterlands (see Stone 1996: 12–27), they have proved much too simplistic for dealing with large metropolitan areas such as first century A.D. Rome. For cities of this scale, a more all-encompassing, realistic model is needed, one that can account for expanding infrastructure, and, in particular, a dynamic transportation network.

Because of Rome's unique size, population, and political and socio-economic situation it is extremely difficult to model in a conventional way. Therefore, we must look for alternatives that can account for large, complex, man-made systems and their evolution. In my opinion, one of the few disciplines with scope for such an endeavour is Ekistics, the science of human settlement. Developed by Constantinos A. Doxiadis (1968), this science was proposed as a solution to problems facing contemporary human settlements, which had begun to grow unsustainable, and unsatisfactory for their inhabitants (Doxiadis 1968: 5). 'Ekistics starts with the premise that human settlements are susceptible of systematic investigation', and 'take(s) into consideration the principles man takes into account when building his settlements, as well as the evolution of human settlements through history in terms of size and quality' (Doxiadis 1970: 393). The science itself revolves around an interconnected system featuring five elements that can be influenced diversely by five forces. These are:

- *Elements*: Man, nature, society, shells (i.e. structures), and networks
- *Forces*: Economic, social, political, technical, and cultural

Interestingly, one can recognize that these concepts are often studied individually in Roman archaeology. Yet, as will be shown, the combined study of these constituent elements can generate more holistic approaches to the Roman world.

In order to classify settlements, Doxiadis invented the Ekistic Logarithmic Scale (ELS) consisting of 15 Ekistic units ranging from the smallest unit (Man) to the largest (Ecumenopolis). Given that Rome's population is estimated to have reached 1 million by the early Imperial period (see below) it is best represented by the tenth Ekistic unit on the ELS – the Metropolis, which has a population range from 50,000 to 10 million (Doxiadis 1968: 91). Aside from population, a metropolis can also be characterized as a major urban area that has grown beyond its initial borders and incorporated other small settlements (rural and urban) that existed around it (Doxiadis 1968: 91). Metropoleis tend to grow dynamically, and dynamic settlements (or Dynapoleis) are defined by their continuous growth – typically at a rate of at least 0.6–1.2 percent per annum in population and economy (Doxiadis 1968: 193, 208). A dynamically expanding metropolis is therefore known as a Dynametropolis; however, Doxiadis did not believe Dynametropoleis existed prior to the 18th century (1968: 101). He argued that ancient settlements, while able to grow at high speeds, did so only for short periods until they reached 'a few score thousands of people' (1968: 101). Yet Doxiadis was also aware that the populations of ancient Rome and Byzantine Constantinople grew far beyond this number, and that these settlements could in fact be qualified as metropoleis due to their size (Doxiadis 1968: 213). However, he goes on to state that while these cities each experienced a period of dynamic growth, they should instead be noted for the long static phases that preceded their eventual declines (Doxiadis 1968: 213). While this sequence of 'dynamic growth – static phase – decline' is crucial for understanding the evolution of Rome as both a city and a polity (see Bettencourt *et al.* 2007 for a recent application of this concept in a modern context), a more thorough examination of Rome's growth and expansion phase is certainly warranted.

Rome: An Ancient Dynametropolis?

Regardless of Doxiadis' thoughts on the subject, if we can qualify ancient Rome as a dynamically expanding Metropolis on the ELS, then we should be able to examine its evolution and expansion as such. So, was Rome an ancient Dynametropolis? Studies dealing with the demography of peninsular Italy are notoriously debatable (see Scheidel 2001; 2007) and the situation regarding the population of Rome and the '*suburbium*' is no less ambiguous (see Witcher 2005; 2008). However, it is important to note that due to Rome's unique size and situation, inferences on demographic trends on the Italian peninsula do not necessarily (need to) coincide with those of Rome. That said, plausible estimations of population numbers for Rome and growth rates for the city are elusive, as they are often tied to larger debates on Italian population (i.e. 'low count' vs. 'high count' hypotheses). Yet based on census data, and the work of Brunt (1971) and Hopkins (1978), it is generally agreed that Rome's free population rose from 150,000 to 650,000 between 225–28 BC, equaling a 0.74 percent rise in population per annum (Lo Cascio 2001: 115–118). Taking slaves, migrants, women and children, and some extra-urban inhabitants into account, Rome's total population in this same time frame swelled from 250,000 to roughly 1 million (Hopkins 1978: 68–69; Morley 1996: 33–39; Jongman 2003: 103–104), exhibiting an almost identical growth rate of 0.70 percent per annum. These numbers are right on par with Doxiadis' dynamic growth parameters, indicating that, from the mid-late Republic and into the early Empire, Rome exhibited demographic growth characteristic of a Dynametropolis.

While population numbers for the mid to later Imperial period are far less secure, a figure of 1.2 million inhabitants for the city of Rome in the Constantinian period (proposed by Guido Calza) has gained the most acceptance (Coarelli 1997; Lo Cascio 1997). However, it is important to note that this figure is based upon the *insulae* recorded in the Regionaries, numbering 44,000 – each with 27 inhabitants, combined with 1,800 *domus* each featuring 30 prescribed inhabitants – all within the Aurelian Wall (Hermansen 1978: 146–148). Yet *insulae* and *domus* were not the only housing options, as many less permanent structures are attested to in the ancient sources – housing peasants, slaves, and ex-slaves (see Bradley 1994: 90–92). Taking these into account, plus the urban space beyond the Aurelian Wall (i.e. the pre-existing *continentia aedificia* or *tecta*) and the peripheral farms and villas, a greater number than Calza's should be assumed. Regardless, as we can see, population growth in the Imperial period was not at the level exhibited during the Republic. Yet Rome was still an expanding and evolving metropolis (see Witcher 2008), able to sustain and even increase a population of over 1 million inhabitants, despite a likely high urban mortality rate (Jongman 2003; Scheidel 2003). However, it seems that by the end of the first century A.D., Rome had ceased to expand at a dynamic rate.

Substantial economic growth appears to have accompanied this rise in population and urban expansion, although this is much harder to quantify (see Hopkins 1983; Bowman and Wilson 2009). That this growth took many forms, and was driven by various factors is evident in more recent studies on the Roman economy (notably Scheidel *et al.* 2007; Bowman and Wilson 2009), yet in order to judge whether Rome's economy was growing dynamically, at a rate of 0.6–1.2 percent per annum, we must examine the City's aggregate and per capita growth. Aggregate economic growth tends to go hand-in-hand with population (Bowman and Wilson 2009: 28), and the dramatic rise of Rome's populace from the third century B.C. to the first century A.D. surely stimulated economic production, consumption, and diversification not only in the City, but also throughout Italy and the Empire (Morley 1996: 52–54; Scheidel 2007: 11). Contrarily however, most models would predict that large population increases lead to decline in per capita

growth and overall living standards – that is, without technological innovations (see Bettencourt *et al.* 2007; Bettencourt and West 2010; Jongman 2009: 119–120).

According to work by Geoffrey West and Luis Bettencourt (Bettencourt *et al.* 2007; Bettencourt and West 2010), without major innovation cycles, population growth in cities cannot be sustained, leading to stagnation or collapse. Yet sustained and significant technological advances, such as hydraulic engineering, mastery of wind, water, and animal power, charcoal production, development of concrete, the mass production, standardization and distribution of goods, civil engineering, and the specialization and progression of agricultural technologies did occur in Rome. Each of these developments would have intensified production and created new economic avenues, helping propel the Roman economy and the city of Rome for many centuries.

Yet the question remains, do such technological advances represent dynamic (Ekistic) economic growth? Research by Bettencourt and West (2010) indicates that in modern contexts 'The bigger the city, the more the average citizen owns, produces and consumes, whether goods, resources or ideas...as city size increases, per capita socio-economic quantities such as wages, GDP, number of patents produced and number of educational and research institutions all increase by approximately 15% more than the expected linear growth'. For obvious reasons it would be tricky to apply the '15% rule' to ancient Rome; we also do not have enough information to determine if Rome experienced linear or exponential growth (or both at different times). However, recent archaeological work around Mexico City (see Ortman *et al.* 2014) has shown that urban scaling relations occurring in Pre-Hispanic Mexico are in fact analogues with those occurring in contemporary cities today, further solidifying a (long standing) correlation between population/urban growth and significant economic expansion in all sectors. Therefore, if large modern cities can expect a 15 percent increase in overall economy in respect to their linear growth, and settlements in Pre-Hispanic Mexico scaled in the same way – an economic growth rate (aggregate and per capita) of 0.6–1.2 percent per annum in Rome from the mid Republic to the early Empire is entirely plausible, if not expected.

Returning to the heart of the argument, technological advances in transportation were also crucial for the dynamic, physical expansion of a settlement. According to Doxiadis (1968: 244) if all physical conditions around a settlement are equal, and the settlement features the same system (and speed) of transportation and the same types of activities and buildings, then static growth will occur in the form of concentric circles. Yet static growth is uncommon, and even Von Thünen and later Chisholm (1979) stress their concentric circles were purely hypothetical and that the 'Isolated State' model would be affected in various ways by geographic and human factors (Fig. 1). Given the situation around Rome, with the undulating *agro Romano*, the 'marrane' (ditches/streams), the Tiber and Aniene rivers, and the Alban hills, it is clear equal physical conditions did not exist. As for transportation technology, Doxiadis (1968: 146) would argue that before the 18th century, settlements expanded statically, and in circular fashion, as movement within and outside a settlement was the same, and equal in all directions. While he admits different travel speeds existed (for example, man vs. cart vs. horse), he argues that these diverse speeds could not be maintained for long periods. He further posits that only modern settlements possessed the technology for dynamic physical expansion and only the varying speeds of man, horse, automobile, and train could lead to star-shaped, irregular expansion (Doxiadis 1968: 146–148).

Again, Doxiadis lacked an in-depth knowledge of ancient Rome's topography, technology, and economic history, and his own words – that advances in transportation technology will lead to dynamic physical expansion – can be used to argue against him in this respect. As mentioned, roads and travel speeds have been previously used in attempts to demarcate the extent of Rome's

suburban realm, yet they have only been explored on a relatively basic level. If we scrutinize both the modes of transportation and the transportation system of ancient Rome we can see that technological advances did take place that would significantly impact speed of travel, leading to dynamic physical expansion. To begin, the term ‘cart’ here is very vague, and examining the ancient iconography and literary sources it is evident that many different types of two and four wheeled vehicles existed, able to travel at diverse speeds (see Sartorio 1994; Laurence 1999). The *carruca* and *rheda*, both imported from Gaul in the Republican period, were the quickest and most common transport vehicles, featuring four wheels and often drawn by pairs or four-in-hand teams of mules or horses (Sartorio 1994: 54–61). The introduction and diffusion of these vehicles during the Republican period would have led to increased mobility at sustainable speeds, especially in a suburban context, where congestion would not have equaled that of the City (see Malmberg and Bjur 2011).

Roman roads and the road network were even more crucial for dynamic physical expansion as they facilitated the travel of animal-drawn vehicles and served as high-speed corridors to and from Rome. The development of the road system from the fourth to the second century B.C. would have impacted hugely on the expansion of the City, as where and when roads were constructed would have dictated directions of urban spread (following Doxiadis’ own theories on settlement growth and those put forth by Arnaud 1998: 80–81 on the extent of the ‘*suburbium*’; see also, Quilici 1990: 38–40). While the construction of the road network itself can be seen as a technological advancement, the paving of roads was equally extremely significant. Not all roads were paved, or even paved in their entirety, and many experienced multiple phases of reconstruction and refurbishment. For example, in 296 BC the Via Appia was only paved up to the first mile marker, but in 293 BC this paving was extended to *Bovillae* – a distance of 18 km from Rome (Livy, 10.23.12). Under Trajan the road was repaved in its entirety in ‘*selce*’; however, preexisting traces of pavements in limestone have been identified from Rome to Terracina (Quilici 1990: 49). Again, when, where, and how roads were paved would have had a notable impact on transportation speed and urban expansion. Furthermore, work by Laurence (1999: 82) indicates that travel on a paved road was 33 percent faster than on an unpaved surface – a substantial increase by any standards. Advances in riverine transport and infrastructure (especially during the first century B.C – first century A.D.) will have also allowed for varied travel speeds, and the Tiber, the Aniene, and even the *Decennovium* (running from *Forum Appii* to Terracina) would have all served as reliable, high-speed corridors allowing for quicker long distance travel of both people and goods, thus bringing geographically further places ‘nearer’ in both thought and practice (see Purcell 2012: 377–378). These technological advances in road and river travel, coupled with the variable landscape around Rome, indicate that dynamic physical expansion was in fact occurring.

Mapping and Measuring an Evolving ‘Suburbium’

The next step therefore is to examine how this situation can be mapped to provide a visually accurate representation of the city and its suburban space, able to account for expansion over time. Existing maps of Rome’s ‘*suburbium*’ are relatively basic, primarily employing concentric circles with radii ranging from roughly 25–100 km (see Witcher 2008: 121–122). As shown, such maps cannot account for the complex boundaries exhibited in dynamically expanding settlements; however, by using isochronic distances, a new perspective of this space may be achieved. An isochron is a line on a map or diagram connecting points representing the same

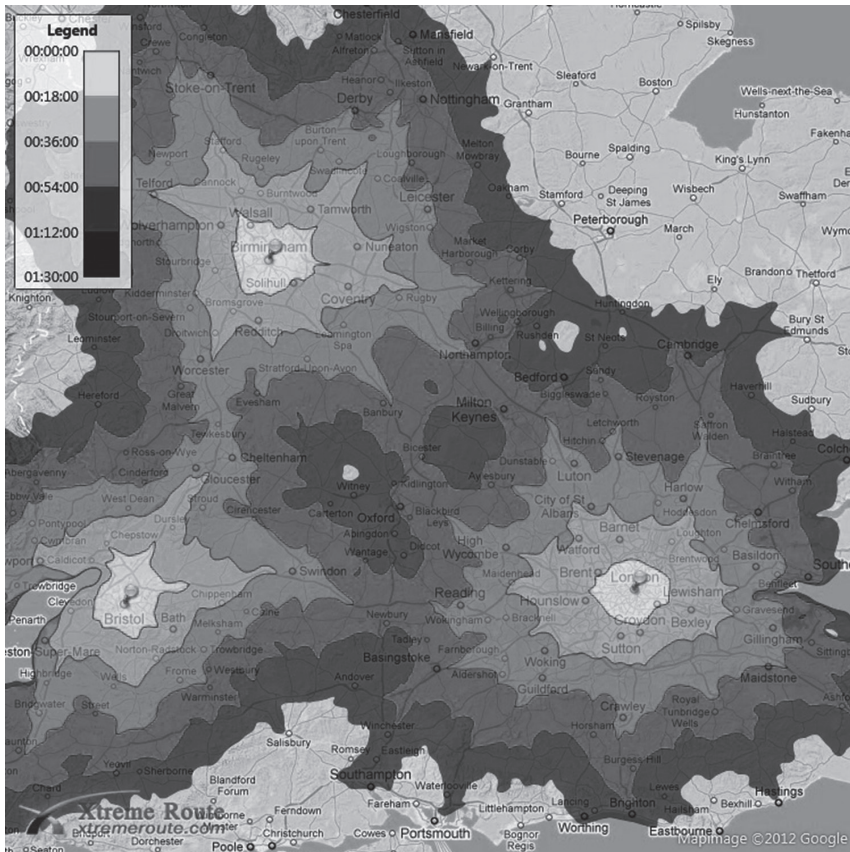


Figure 2: Example from SW England illustrating isochronic mapping and distances (http://xtremeoroute.com/#/routing_isochrones)

or equal times (i.e. a unit of time rather than a unit of length used to measure distance; Fig. 2). By applying isochronic distances rather than measured distances, areas of greater accessibility (i.e. temporally closer to Rome) are highlighted. For a hypothetical example, we can take one isochronic unit and set it to a value of one hour. If we limit the extent of our zone to four isochronic units then the distance reached after four hours of travel will be the extent of the zone. If we are traveling on a paved road at 10 km per hour a distance of 40 km will be reached after four hours. However, if traveling on an unpaved road at a speed thirty-three percent slower, then a distance of only 26.8 km will be reached in four isochronic units (four hours). For this reason, cities tend to expand along their roads, as vicinity to them allows one to be temporally closer to the city while at a greater measured distance. These different speeds (indicative of dynamic expansion), when mapped isochronically will produce a star-shaped pattern, which when applied to Rome, can provide a more realistic extent to the suburban realm (Fig. 3).

Isochronic distances combined with travel costs, both monetary and physical, have also been employed to create relatively detailed accessibility and cost maps for the Italian peninsula (see Carreras and De Soto 2013; Fig. 4). While these focus on the peninsula as a whole, they are useful for examining Rome's suburban boundaries as well. As Scheidel (2007: 11) states: 'one

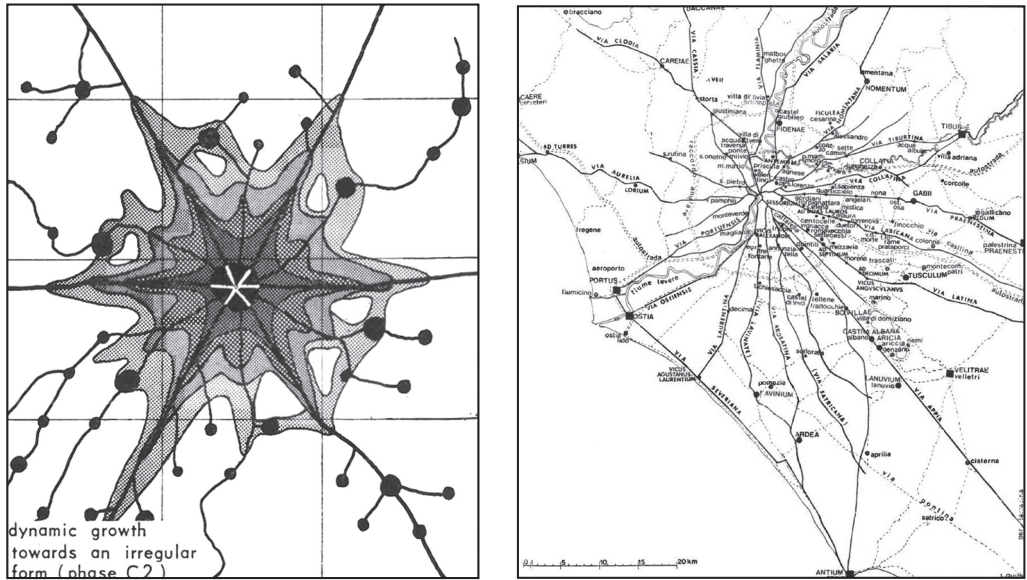


Figure 3: Rome's road network in the first century A.D. juxtaposed with an example of Ekistic dynamic growth towards an irregular form. (NB: Various zones, with complex, isochronic boundaries leading to star-shaped expansion). (Left, Quilici 1990: 39; right, Doxiadis 1968: 246)

could argue that areas such as Sicily or Sardinia or parts of North Africa had a stronger claim to being part of Rome's hinterland than the more insulated Po Valley'. The maps of Carreras and De Soto illustrate this concept well, and given the large cost discrepancies between maritime and terrestrial transportation (maritime being much cheaper), the macro margins of Rome's economic 'suburbium' probably included most of the coastal regions of the western Mediterranean. This would have been due to profit margins and economic rent theory – i.e. at what point is it cheaper (and more profitable) to import a product by sea than to get the same or similar product by land? Examining the map (Fig. 4), we see that costs increased substantially beginning at the pre-Apennine ranges, and it therefore seems probable that anything beyond these ranges was no longer part of Rome's economic suburb, given that similar products could be imported from further afield at lower cost.

The wider implications of this are indeed substantial and thus cannot be treated here. However, this further highlights the importance of cost analysis and economic rent theory for mapping the suburbs. Returning to Rome itself, these same factors would have played a vital role in determining the location and formation of functional suburban zones around the City. In the 'Isolated State' model, we see that the diverse agricultural zones presented are largely dependent on their distance from the urban center and its markets, as economic rents and agricultural margins tend to govern where and how these zones develop. As discussed by Carandini (1985: 66), similar zones seem to have existed around Rome, and each of these would have served specific functions for the City and vice versa. As Rome experienced dynamic growth, these zones would have been forced to move, and adapt, accordingly, yet the impacts of this are seldom discussed and very little has been done to map or track such changes in a meaningful way.

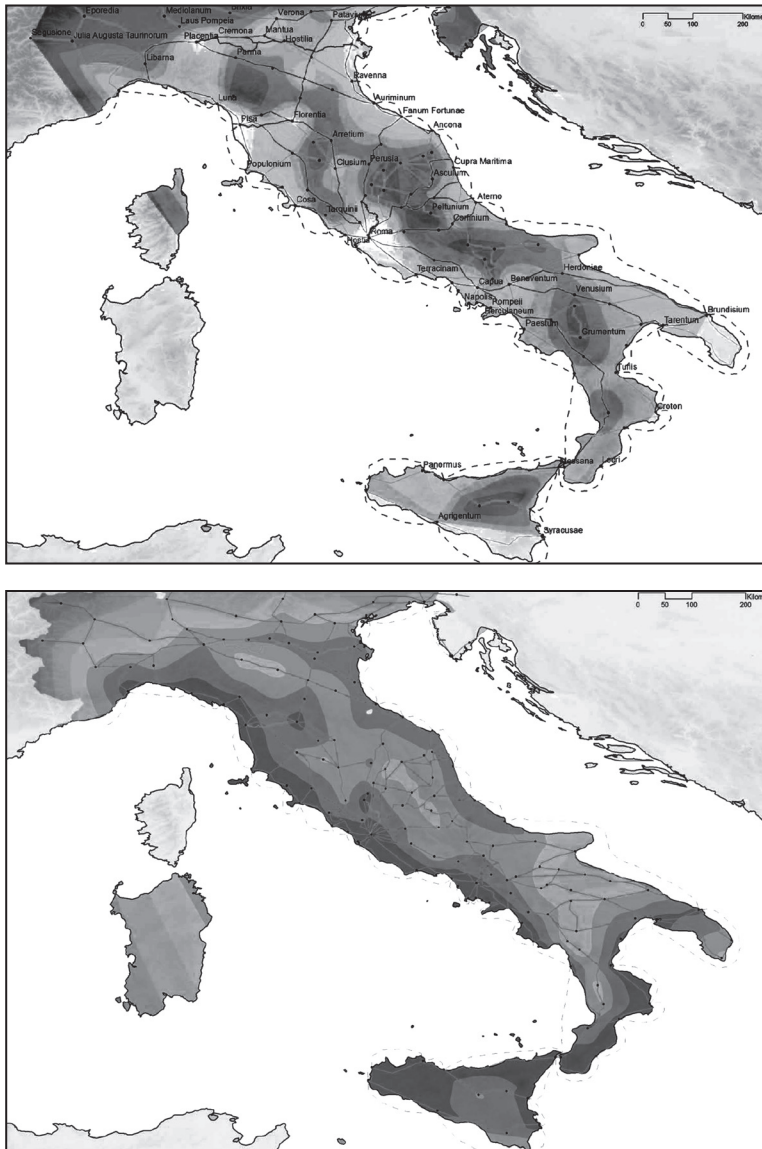


Figure 4: Accessibility (top) and Cost (bottom) maps for Roman Italy in the Imperial period. (Carreras and De Soto 2013)

Turning to studies on contemporary European cities, the PLUREL project has broken down extra urban areas into smaller zones, labeled based on their distance from the city center and characterized by land use patterns (Ravetz *et al.* 2013: 18–19) (Fig. 5). However, they acknowledge such zones are also influenced by social, economic, and geographic factors that shape each in various ways, creating complex, often fluid boundaries (Fig. 5, 'b'). These 'semi-realistic' boundaries coincide well with examples of dynamic growth presented by Doxiadis (Fig.

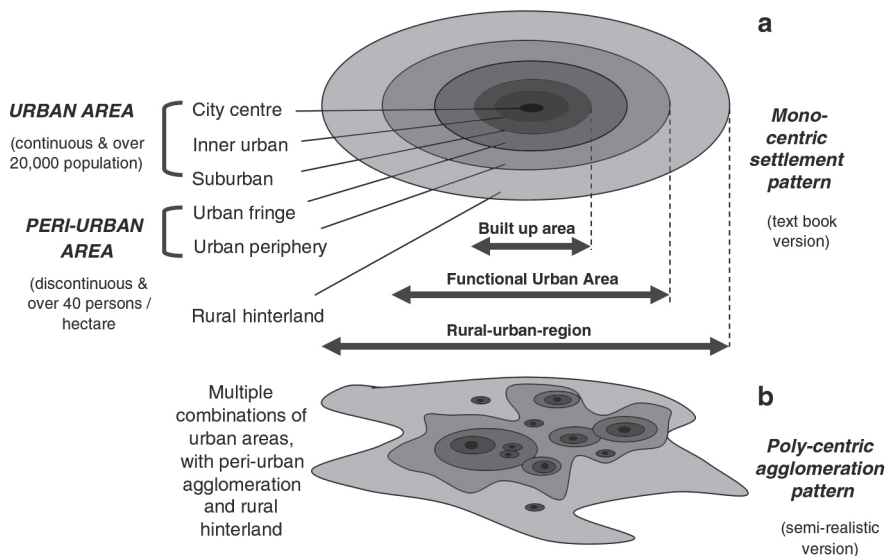


Figure 5: PLUREL concept of urban and extra-urban space. (NB: 'Poly-centric agglomeration pattern', 'b'). (Ravetz et al. 2013, 17)

3), and it seems likely that ancient Rome would have featured a similar system of functional zones and secondary settlements, each serving different purposes and conditioned largely by their distance from the city centre. As stated in Ravetz et al. (2013: 21) 'peri-urban change is a direct result of urban expansion'. Therefore, as a city grows economically and in population, demand for housing and commercial space increases, forcing urban areas to spread into previously peri-urban (extra-urban/suburban) areas, thus forcing these to encroach on previously rural areas (Ravetz et al. 2013: 21–23). This 'ripple effect' is a fundamental aspect of spatial change, and as Rome (and in particular, the *continentia aedificia*) continued to expand and outgrow pre-established urban boundaries such as the Servian Walls, the *pomerium*, and the *passus mille* from the mid Republic to early Empire (see Palmer 1980; Coarelli 1997), it is very unlikely that the boundaries and character of her suburban realm remained unchanged.

Separating Suburban Space: Complex Boundaries, Superimposed Suburbs, and Functional Zones

Returning to studies on the Roman '*suburbium*', we see that the majority of proposed delimitations for this space imply fixed, static boundaries, for example: 8 RM (Bruun 2003); 9 RM (La Regina 2001); 35 km (Spera 2003; Goodman 2007); 25 mi (Champlin 1982), 50 km (Witcher 2008); and 60 km (Agusta-Boularot 1998). These types of limits cannot account for the evolution of extra-urban space over time, or for the presence of functional zones and their conditioning factors. When reevaluated, they prove too simplistic and varied to be useful. However, they do highlight the glaring need for more uniform, informed definitions and interpretations of this space. Based

on the research presented, it seems that rather than searching for an elusive, fluctuating boundary, we should instead start from the *Urbs* and work outwards. This approach will allow for extra-urban zones to be better identified and tracked chronologically and geographically, emphasizing their mobility and the impacts of such movements on the archaeological record. While this phase of the project is still in preliminary stages, a brief example from Rome illustrating the effects of urban expansion will be presented along with some (preliminary) proposed zones.

The famed yet enigmatic *horti Romani* that encircled the City by the first century B.C. are a prime example of how direct urban expansion can impact surrounding areas. While these large estates have received much attention, it is important to note that smaller productive villas primarily engaged in horticulture and oliviculture do appear to have shared this same 'fringe' zone (as postulated by Carandini 1985; see also Jolivet 1997; Pavolini *et al.* 2003). The primary functions performed by these properties, and the zone they occupied, would have been to provide residential space, agricultural production, and (public) recreational areas (Carandini 1985: 66–67; Cima and Talamo 2008: 69–70). While the *horti* of the late Republic are well documented in the ancient sources, reports from the later Imperial period indicate these same properties were either entirely redeveloped, or persisted only as small green patches in a dense urban fabric (*Hist. Aug.* Gordians, 32; Purcell 2007: 299–302). Examining modern studies on urban growth, it seems likely that the *horti* district constituted what is known as a 'fringe belt', as such phenomena tend to form around defunct urban boundaries (the Servian Walls in this case) and are composed primarily of villa estates, public parks, market gardens, and cemeteries (*cf.* Conzen 2009: 33).

Looking closer at 'fringe belt' theory, we see that as fringes are internalised, a further removed belt is predicted to form, replacing its predecessor and serving the same or similar functions (Baarke 1990: 283). However, given the incomplete nature of the archaeological record (De Franceschini 2005: xiii) and the challenges around the empirical investigation of fringe belts (Conzen 2009: 37) it is difficult to confirm if additional belts existed around ancient Rome. That being said, recent archaeological work in the Roman suburbs has uncovered numerous types of field systems cut into the natural tuff banks around the City that may provide clues as where and when certain fringe belts formed. These systems are often indicative of certain types of agricultural practices (e.g. viticulture, horticulture, arboriculture etc.) and many feature multiple phases with clear changes in aspect and function. For example, field systems used for horticulture were discovered during recent excavations connected to the installation of Rome's Metro C line, near Porta Maggiore (in the modern neighbourhood of Pigneto), dating to the mid Republican period (Buccellato 2010: 245). The traces of such agricultural activities in this zone and during this period correspond well with what fringe belt theory and economic rent theory would predict – i.e. intensive horticulture on the urban fringe. Similar field systems designed for intensive horticulture (overlying previous systems designed for viticulture) have also been discovered further away from the City – for example, at Tor di Mezzavia di Frascati (on the via Anagnina) that date to the second century A.D. (Foddai 2002: 114). These field systems could then be representative of a new fringe belt, indicating the migration or 'translation' of activities to a further removed area due to the reduction of the previous fringe belt (see Conzen 2009: 32–39). The construction of numerous large villas in the second century A.D. with similar characteristics as the *horti Romani*, located primarily between the 3rd and 7th miles of the consular *viae* (see Coarelli 1986; Jolivet 1997; De Franceschini 2005) could then also be associated with the creation of this new urban fringe. At the very least, this example alludes to how functional zones and activities could move and adapt due to the pressures of urban expansion. Therefore,

to properly understand and demarcate Rome's suburban realm diachronically we must be aware of this fluidity and mobility and factor this into any spatial estimations.

Outlined below in Table 1 are my provisional 'suburban zones', based on isochronic and physical distance from the edge of the *Urbs* (or rather, the *continentia aedificia*), social and agricultural functions performed (for Rome), and frequency of contact with the City. The isochronic distances are based on carriage speed (C Units) set at 10 km per hour (without traffic on a paved road). This is of course subject to change, and as these zones are mapped using GIS and spatial analysis it is likely that the maximum extent of each zone will only be reached along paved roads, creating star-shaped irregular boundaries for each (similar to Fig. 3). The frequency of contact with each zone and the City can also determine function(s), as social and agricultural (economic) activities taking place in the 'daily zone' would not be the same as those in the 'monthly zone' (Fig. 1; see also Viitanen 2010: 162–164). A distance of 7 km has been set for the daily zone given that 5–7 km are frequently cited to demarcate the 'urban daily system' or 'immediate suburban zone', as this equates to roughly a 1–2 hour commute on foot (Doxiadis 1968: 142; 1970: 396; Pavolini *et al.* 2003: 59). Yet as the City expanded dynamically, these suburban zones should be expected to scale accordingly, as the daily zone in the Archaic period, would necessarily be smaller than that of the early Imperial period (see above). It is also worth noting that the weekly and daily zones may feature some overlap when dealing with agricultural or economic functions, since important markets (as those in Rome) could exhibit a 'pull' of up to 15–20 km, or a three to four hour commute on foot (Doxiadis 1968: 142; Malmberg and Bjur 2011: 365).

In addition, social and agricultural functions performed for the City have been included in Table 1 as these aspects are often taken as two separate approaches to studying suburban space (see Thomas 1974 for wider discussion), but should not be seen independently of each other, especially when considering suburban roles, interactions and city-hinterland movement. In archaeological theory, these coexisting, yet diversely conditioned suburbs could be seen as examples of man-land vs. man-man relationships (see Roper 1979: 119). In general, the land use suburb is defined by geographical criteria and physical evidence, and the locations of its properties are determined by economic rents, the agricultural margin, and the 'proximity-access-principle' (see Stone 1996: 18; Munton 1974: 208). On the other hand, the social suburb is governed by factors such as residential behaviours (satellite communities, desire for urban periphery), employment opportunities, population, and social hierarchies (see Thomas 1974: 18–22; Clout 1974: 101). These distinct, superimposed aspects of the same area can create confusion in definitions of suburban space, as they are usually not given the specific attention they require. Yet despite the differing elements that conditioned them, it should be stressed that these individual suburbs were linked by the same commonalities that dictated other aspects of the suburban realm, that is, namely infrastructure (in particular, roads and aqueducts) and functional relationship(s) with the City. Therefore, the overlapping activities and functions defined by each should also be expected to adjust accordingly, the closer or further away they were from Rome.

Again, the table proposed below is preliminary and not designed to provide fixed boundaries, and/or distances. Rather, it should be seen as a way in which to view and assess the various aspects of suburban space, in the process highlighting key functional zones present around the City. This table is also subject to change, as the dynamic physical, demographic, and economic expansion of the City will have impacted these zones in various ways, forcing them to scale allometrically. As the project progresses, questions concerning the impacts of building cycles, fringe belt formation and succession, and the growth and diversification of the market system

Table 1: Proposed (preliminary) suburban zones.

Zone Number	1	2	3	4	5
Isochronic Limits	.1–.5 C Units	1 C Units	1–2 C Units	2–4 C Units	4–8 C Units
Approx. Width of Zone	1 km	6 km	13 km	20 km	40 km
Avg. Distance from <i>continentia aedificia</i>	–	1–7 km	7–20 km	20–40 km	40–80 km
Frequency System	Daily	Daily	Weekly	Bi-Weekly/ Monthly	Seasonal/Annual
Social Functions Performed	Residential, recreation, employment	Residential, recreation, employment	Residential, recreation	Residential, recreation, vacation	Recreation, vacation
Agric. Functions Performed	Horticulture, olericulture	Horticulture, arboriculture, (viticulture), <i>pastio villatica</i>	Viticulture, oleoculture, (cereals), <i>pastio villatica</i>	Viticulture, oleoculture, cereals, <i>pastio villatica</i>	Viticulture, oleoculture, cereals, ranching/livestock
Zone Name	Urban Fringe	Daily Zone	Peri-Urban Zone	Functional Urban Area (FUA)	Rural Hinterland

on these zones will also be addressed. A series of isochronic maps, and additional tables, will then be created, highlighting these functional suburban zones and their inevitable alterations during the period in which Rome experienced dynamic urban growth.

Conclusions

In sum, this paper has argued that the suburban space of ancient Rome merits reassessment with modern eyes and modern concepts of extra-urban space, dynamic growth, and functionality. Early Imperial Rome, with its vast population, its diverse, expansive economy, and rapidly growing urban core was wholly atypical of the ancient world, and in order to gain a better understanding of its suburban realm we must begin to ask different questions. Rather than just looking for a beginning or an end, we need to recognize this space as an integral part of a greater system, and investigate its role and composition in a far more detailed fashion. Through the application of Ekistics, and modern theories on urban growth, fringe-belts, and urban scaling we move closer, I argue, to a more realistic view of this still 'hazy' and poorly preserved zone. By accounting for the changing demands of the growing ancient City (economic, social, and physical), and the responses of the hinterland to such demands, we can begin to model the urban-rural system of ancient Rome more precisely. The use of isochrones, combined with knowledge of the Roman road network and physical landscape around the City, will allow for more accurate mapping and visual representations of this space, accounting for its evolution and expansion over time. Therefore, incorporating a wide range of material, modern as well as ancient, and taking an interdisciplinary approach seems to be the only way forward if we wish to properly enhance

our understanding of arguably the most dynamic and complex of all ancient cities. This paper is not an answer, however, and it does not mean that we have understood Rome's suburbs, but it does, arguably, push us closer, if not to a new definition, then at least to a new perspective and appreciation of the diversity, mobility, and adaptability of this vital space from which new definitions may be formed.

School of Archaeology and Ancient History, University of Leicester

Acknowledgements

This paper is part of my ongoing PhD thesis at the University of Leicester. Accordingly, I would like to thank my primary supervisor Dr. Neil Christie for his advice, encouragement, and proofing. I would also like to thank Prof. David Mattingly for his comments, support, and feedback. Any remaining mistakes are my own. Many thanks also go to the TRAC 2014 organising committee for giving me the opportunity to present this paper at the University of Reading. Finally, I would like to thank my parents for their unwavering support, patience, and care.

Bibliography

Ancient Sources

- Cato ((Translated by W.D. Hooper and H.B. Ash 1934) *On Farming*. London: Harvard University Press.
- Cicero (Translated by C.D. Yonge 1901) *Against Verres*. London: George Bell and Sons.
- Cicero (Translated by C.D. Yonge 1901) *For Sextus Roscius of Ameria*. London: George Bell and Sons.
- Cicero (Translated by E.S. Shuckburgh 1908) *Letters to Atticus*. London: George Bell and Sons.
- Cicero (Translated by J.S. Watson 1896) *Letters to his Brother Quintus*. London: George Bell.
- Cicero (Translated E.W. Sutton 1871) *On Orators: Volumes I and II*. London: Heinemann.
- Cicero (Translated by D.R. Shackleton 2009) *Philippics*. London: Harvard University press.
- Columella (Translated by H.B. Ash 1941) *On Agriculture*. Cambridge: Harvard University Press.
- The Digest (Translated by P. Kruegar and T. Mommsen, 1967–1973). *Corpus iuris civilis I*. Berlin: Weidmann.
- Dionysius of Halicarnassus (Translated by E. Cary 1937–1950) *Roman Antiquities*. London: Harvard University Press
- The Historia Augusta (Translated by D. Magie 1921) London: Harvard University Press.
- Livy (Translated by B.O. Foster 1919) *History of Rome: Books I and II*. London: Heinemann.
- Ovid (Translated by A.J. Boyle and R.D. Woodard 2000) *Fasti*. London: Penguin.
- Pliny the Younger (Translated by B. Radice 1963). *Letters*. London: Penguin.
- Propertius (Translated by H.F. Butler 1964) *The Elegies of Propertius*. Hildesheim: Olms.
- Varro (Translated by W.D. Hooper and H.B. Ash 1934) *On Agriculture*. London: Harvard University Press.

Modern Sources

- Agusta-Boularot, S. 1998. Banlieue et faubourgs de Rome: approche linguistique et définition spatiale. In: R. Bedon (ed.) *Caesarodunum 32, Suburbia: Les faubourgs en Gaule Romaine et dans les Régions Voisnes*. Pulim: Limoges: 35–62.
- Arnaud, P. 1998. Vers une définition géodynamique des suburbia: Éléments pour une zonation des zones péri-urbaines. In: R. Bedon (ed.) *Caesarodunum 32, Suburbia: Les faubourgs en Gaule Romaine et dans les Régions Voisnes*. Pulim: Limoges: 63–81.
- Barke, M. 1990. Morphogenesis, fringe belts and urban size: An exploratory essay. In: T.R. Slater (ed.) *The Built Form of Western Cities*. Leicester: Leicester University Press: 279–299.

- Bettencourt, L., Lobo, J., Helbing, D., Kühnert, C. and West, G. 2007. Growth, innovation, scaling, and the pace of life in cities. *Proceedings of the National Academy of Sciences of the United States of America*. Vol. 104: No. 17: 7301–7306.
- Bettencourt, L. and West, G. 2010. A unified theory of urban living. *Nature*. No. 467: Oct.: 912–913.
- Bowman, A. and Wilson, A. (eds) 2009. *Quantifying the Roman Economy*. Oxford: Oxford University Press.
- Bowman, A. and Wilson, A. 2009. Quantifying the Roman economy: Integration, growth, decline? In: A. Bowman and A. Wilson (eds) *Quantifying the Roman Economy*. Oxford: Oxford University Press: 3–69.
- Bradley, K. 1994. *Slavery and Society at Rome*. Cambridge: Cambridge University Press.
- Brunt, P.A. 1971. *Italian Manpower, 225 B.C.–A.D. 14*. Oxford: Clarendon Press.
- Bruun, C. 2003. Fistule acquarie e proprietari terrieri nel *suburbium*. In: P. Pergola, R. Santangeli Valenzani and R. Volpe (eds) *Suburbium: Il Suburbio di Roma dalla Crisi del Sistema delle Ville a Gregorio Magno*. Rome: École Française de Rome: 485–501.
- Buccellato, A. 2010. La linea C nel VI municipio. Note sul paesaggio suburbano e la metodologia di scavo archeologico. In: R. Egidi, F. Filippi, and S. Martone (eds) *Bollettino d'Arte Volume Speciale: Archeologia e Infrastrutture, Il Tracciato Fondamentale della Linea C della Metropolitana di Roma: Prime Indagini Archeologiche*. Florence, Casa Editrice Leo S. Olschki: 243–258.
- Carandini, A. 1985. Orti e frutteti intorno a Roma. In: R. Bussi, and V. Vandelli (eds) *Misurare la Terra: Centuriazione e Coloni nel Mondo Romano. Città, Agricoltura e Commercio: Materiale da Roma e dal Suburbio*. Modena: Edizioni Panini: 66–74.
- Carreras, C. and De Soto, P. 2013. The Roman transport network: A precedent for the integration of the European mobility. *Historical Methods: A Journal of Quantitative and Interdisciplinary History*. Vol. 46: No. 3: 117–133.
- Champlin, E. 1982. The *suburbium* of Rome. *American Journal of Ancient History*. Vol. 7: 97–117.
- Cima, M. and Talamo, E. (eds) 2008. *Gli Horti di Roma Antica*. Milan: Mondadori Electa.
- Chisholm, M. 1979. *Rural Settlement and Land Use: An Essay in Location*. London: Hutchinson.
- Christaller, W. 1933. *Die zentralen Orte in Süddeutschland*. Jena: Gustav Fischer.
- Clout, H.D. 1974. The growth of second-home ownership; An example of seasonal suburbanization. In: J.H. Johnson (ed.) *Suburban Growth, Geographical Processes at the Edge of the Western City*. London: John Wiley and Sons: 101–128.
- Coarelli, F. 1986. L'Urbs e il suburbio. In: A. Giardina (ed.) *Società Romana e Impero Tardoantico. Roma: Politica, Economia, Paesaggio Urbano*. Rome: Editori Laterza: 1–58.
- Coarelli, F. 1997. La consistenza della città nel periodo imperiale: *Pomerium, vici, insulae*. In: *La Rome impériale: Démographie et logistique. Actes de la table ronde (Rome, 25 mars 1994)*. Rome: École Française de Rome: 89–109.
- Conzen, M.P. 2009. How cities internalize their former urban fringes: A cross cultural comparison. *Journal of Urban Morphology*. Vol. 13: 29–54.
- De Franceschini, M. 2005. *Ville dell'Agro Romano*. Rome: L'Erma di Bretschneider.
- Doxiadis, C.A. 1968. *Ekistics: An Introduction to the Science of Human Settlements*. London: Hutchinson.
- Doxiadis, C.A. 1970. Ekistics, the science of human settlements. *Science*. Vol. 170, no. 3956, Oct.: 393–404.
- Dyson, S. 2010. *Rome: A Living Portrait of an Ancient City*. Baltimore: Johns Hopkins University Press.
- Foddai, E., Di Blasi, L., De Marco, L., Fellak, M. 2002. Elementi e linee ricostruttive di un paesaggio agrario del suburbio di Roma. In: S. Quilici Gigli and L. Quilici (eds) *Campagna e Paesaggio nell'Italia Antica*. Rome: L'Erma di Bretschneider: 95–114.
- Fulminante, F. 2014. *The Urbanization of Rome and Latium Vetus. From the Bronze Age to the Archaic Era*. Cambridge: Cambridge University Press.
- Goodman, P. 2007. *The Roman City and its Periphery. From Rome to Gaul*. New York: Routledge.
- Hermansen, G. 1978. The population of imperial Rome: The regionaries. *Historia: Zeitschrift für Alte Geschichte*. Bd. 27, H. 1, 1st Qtr.: 129–168.
- Jolivet, V. 1997. Croissance urbaine et espaces verts à Rome. In: *La Rome impériale: Démographie et logistique Actes de la table ronde (Rome, 25 mars 1994)*. Rome: École Française de Rome: 193–205.

- Jongman, W. 2003. Slavery and the growth of Rome: The transformation of Italy in the second and first centuries BCE. In: C. Edwards and G. Woolf (eds) *Rome the Cosmopolis*. Cambridge, Cambridge University Press: 100–122.
- Jongman, W. 2009. Archaeology, demography and Roman economic growth. In: A. Bowman and A. Wilson (eds) *Quantifying the Roman Economy*. Oxford: Oxford University Press: 115–125.
- Hopkins, K. 1978. *Conquerors and Slaves*. Cambridge: Cambridge University Press.
- Hopkins, K. 1983. Introduction. In: P. Garnsey, K. Hopkins, and C.R. Whittaker (eds) *Trade in the Ancient Economy*. London: The Hogarth Press: ix–xxv.
- La Regina 2001. *Lexicon Topographicum Urbis Romae -Suburbium Vol. 1*. Rome: Editore Quasar.
- Laurence, R. 1999. *The Roads of Roman Italy*. London: Routledge.
- Lo Cascio, E. 1997. Le procedure di recensus dalla tarda repubblica al tardoantico e il calcolo della popolazione di Roma. In: *La Rome impériale: Démographie et logistique. Actes de la table ronde (Rome, 25 mars 1994)*. Rome: École Française de Rome: 3–76.
- Lo Cascio, E. 2001. Recruitment and the size of the Roman population from the third to the first century BCE. In: W. Scheidel (ed.) *Debating Roman Demography*. Leiden: Brill: 111–138.
- Malmberg, S. and Bjur, H. 2011. Movement and urban development at two city gates in Rome: The porta Esquilina and the porta Tiburtina. In: R. Laurence and D.J. Newsome (eds) *Rome, Ostia, Pompeii: Movement and Space*. Oxford: Oxford University Press: 361–385.
- Mayer, J.W. 2005. *Imus ad villam. Studien zur Villeggiatur im stadtrömischen Suburbium in spätern Republik und frühen Kaiserzeit*. Munich: Printservice Decker and Bokor.
- Morley, N. 1996. *Metropolis and Hinterland: The city of Rome and the Italian Economy, 200 B.C.–A.D.200*. Cambridge: Cambridge University Press.
- Munton, R.J.C. 1974. Farming on the urban fringe. In: J.H. Johnson (ed.) *Suburban Growth, Geographical Processes at the Edge of the Western City*. London: John Wiley and Sons: 201–224.
- Ortman, S.G., Cabaniss, A.H.F., Sturm, J.O., Bettencourt, L.M.A. 2014. The pre-history of urban scaling. *PLoS ONE* 9(2): <http://dx.doi.org/10.1371/journal.pone.0087902>.
- Palmer, R.E.A. (1980) Customs on market goods imported into the city of Rome. *Memoirs of the American Academy in Rome, Vol. 36, The Seaborne Commerce of Ancient Rome: Studies in Archaeology and History*. Ann Arbor: University of Michigan Press: 217–233.
- Pavolini, C., Dinuzzi, S., Cupito, C. and Fusco, U. 2003. Fra Tevere, Aniene, e via Nomentana. In: P. Pergola, R. Santangeli Valenzani and R. Volpe (eds) *Suburbium: Il Suburbio di Roma dalla Crisi del Sistema delle Ville a Gregorio Magno*. Rome: École Française de Rome: 47–95.
- Pisani Sartorio, G. 1994. *Mezzi di Trasporto e Traffico (2nd ed.)*. Rome: Edizioni Quasar.
- Purcell, N. 2007. The horti of Rome and the landscape of property. In: *Res bene gestae: Ricerche di storia urbana su Roma antica in onore di Eva Margaret Steinby (Festschrift M. Steinby)*. Rome: 362–378.
- Purcell, N. 2012. Rivers and the geography of power. *PALLAS*, 90: 373–387.
- Quilici, L. 1990. *Le Strade. Viabilità tra Roma e Lazio*. Rome: Edizioni Quasar.
- Ravetz, J., Fertner, C., and Nielson, T.S. 2013. The dynamics of peri-urbanization. In: K. Nilsson et al. (eds) *Peri-urban Futures: Scenarios and Models for Land Use Change in Europe*. Berlin: Springer-Verlag: 13–44.
- Rickman, G. 1980. *The Corn Supply of Ancient Rome*. Oxford: Clarendon Press.
- Roper, D.C. 1979. The method and theory of site catchment analysis: A review. *Advances in Archaeological Method and Theory*. Vol. 2: 119–140.
- Roy, C. 2005. *Traditional Festivals: A Multicultural Encyclopedia*. Santa Barbera, ABC-CLIO Inc.
- Scheidel, W. 2001. Progress and problems in Roman demography. In: W. Scheidel (ed.) *Debating Roman Demography*. Leiden: Brill: 1–82.
- Scheidel, W. 2003. Germs for Rome. In: C. Edwards and G. Woolf (eds) *Rome the Cosmopolis*. Cambridge: Cambridge University Press: 158–176.
- Scheidel, W. 2007. Demography. In: W. Scheidel, I. Morris, and R. Saller (eds) *The Cambridge Economic History of the Greco-Roman World*. Cambridge: Cambridge University Press: 38–86.

- Scheidel, W., Morris, I, and Saller, R. (eds) 2009. *The Cambridge Economic History of the Greco-Roman World*. Cambridge: Cambridge University Press.
- Spera, L., 2003. The Christianization of Space along the Via Appia: Changing Landscape in the Suburbs of Rome. *American Journal of Archaeology*, Vol. 107, No. 1, Jan.: 23–43.
- Stone, G.D. 1996. *Settlement Ecology: The Social and Spatial Organization of Kofyar Agriculture*. Tuscon: University of Arizona Press.
- Thomas, D. 1974. The urban fringe: Approaches and attitudes. In: J.H. Johnson (ed.) *Suburban Growth, Geographical Processes at the Edge of the Western City*. London: John Wiley and Sons: 17–30.
- Viitanen, E. 2010. Locus Bonus. *The Relationship of the Roman Villa to its Environment in the Vicinity of Rome*. Academic Dissertation: University of Helsinki. Helsinki: Helsinki University Print.
- Von Thünen, J. 1966. *Von Thünen's Isolated State: An English Edition*. Translated by Carla M. Wartenberg. Oxford: Pergamon Press.
- Wilson, A. 2009. Villas, horticulture and irrigation infrastructure in the Tiber Valley. In: F. Coarelli and H. Patterson (eds) *Mercator Placidissimus: The Tiber Valley in Antiquity. New Research in the Upper and Middle River Valley*. Rome: Edizioni Quasar: 731–768.
- Witcher, R. 2005. The hinterlands of Rome: Settlement diversity in the early imperial landscape of *Regio VII Etruria*. In: P. Attema, A.J. Nijboer, A. Zifferero, and O. Satijn (eds) *Papers in Italian Archaeology, Communities and Settlements from the Neolithic to the Early Medieval period: Proceedings of the 6th Conference of Italian Archaeology held at the University of Groningen, Groningen Institute of Archaeology, the Netherlands, April 15–17, 2003*. BAR International Series 1452, Vol. 2. Oxford: Archaeopress: 1045–1055.
- Witcher, R. E. 2008. The extended metropolis: urbs, *suburbium* and population. *Journal of Roman Archaeology*, 18: 120–138.
- Witcher, R. 2013. (Sub) urban surroundings. In: P. Erdkamp (ed.) *The Cambridge Companion to Ancient Rome*. Cambridge: Cambridge University Press: 205–225.