The urban Levant

Kloeg, P.; Willet, R.

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Paul Kloeg

This paper gives a preliminary overview of some of the results of a forthcoming PhD thesis on the urban system of the Roman Levant between the first and third centuries C.E. It looks at the patterns in urban development as had started to take shape in the Hellenistic period, and crystallized in the Roman period. As is virtually a given in any topic related to antiquity, our knowledge of Roman settlement systems, and perhaps especially when it concerns the Near East, contains several big lacunae. Notably, there is little direct evidence for the economic and demographic performance of the cities of the Syrian and Arabian provinces. What can be created though, is a reasonable overview of urban sizes and monumentality. In this paper patterns in urban size and geographic distribution will be placed in the perspective of natural constraints and agricultural productivity.

The following figures show the size distribution of settlements, grouped by province. Out of the settlements in the region that are considered to have been self-governing cities, for two thirds a size can be given for this period (fig. 1). Including local central places without civic autonomy (fig. 2), doubles the number of measured settlements. This means that for 40% of the settlements, a size could be ascertained. It should be noted however that besides a small number of more city-like places such as Jericho, Umm el Jimal and Nessana, lower order settlements were only possible to study in considerable detail in four focus areas: the Decapolis, the Negev, Galilee and the Antiochene. This is clearly reflected in figure 2, with almost no settlements of this order in the provinces of Syria Phoenice and Mesopotamia, where there was no adequate data for a comparable case study. While survey data has improved considerably over the past decades, especially for the Roman period, there are still considerable gaps in regional coverage. For villages lacking any indication of centrality (fig. 3), this study focused on those found in the Antiochene. In total size, the impact of these smaller settlements is evidently limited: they only add 356 hectares (secondary places) and 316 hectares (villages) to the far larger figure of 4630 hectares for the self-governing cities, only 12.6% of their combined total. If even in the most extreme case study of the Antiochene with its exceptionally large primate centre, the non-urban settlements make up over 40% of the size distribution, it is to be expected that there were many more of these towns and villages spread throughout the Roman Levant.

Looking at the urban level, it is immediately clear that Coele-Syria dominated the Levant in terms of urban scale. Antioch alone covers 10.6% of all cities combined, and the province contains well over a third of the urban surface area of the entire study area. The differences between Syria Palestina, Syria Phoenice and Arabia are not as pronounced, with respectively 22, 20 and 11% of the whole. Both Osrhoene and Mesopotamia are rather smaller, reflecting their different nature and development path compared to the other provinces. Of course, data limitations are especially visible here, where Osrhoene,

Published in: Rinse Willet (Ed.), The Economics of Urbanism in the Roman East, Panel 8.4, Archaeology and Economy in the Ancient World 43 (Heidelberg, Propylaeum 2020) 37–50. DOI: *https://doi.org/10.11588/propylaeum.571*

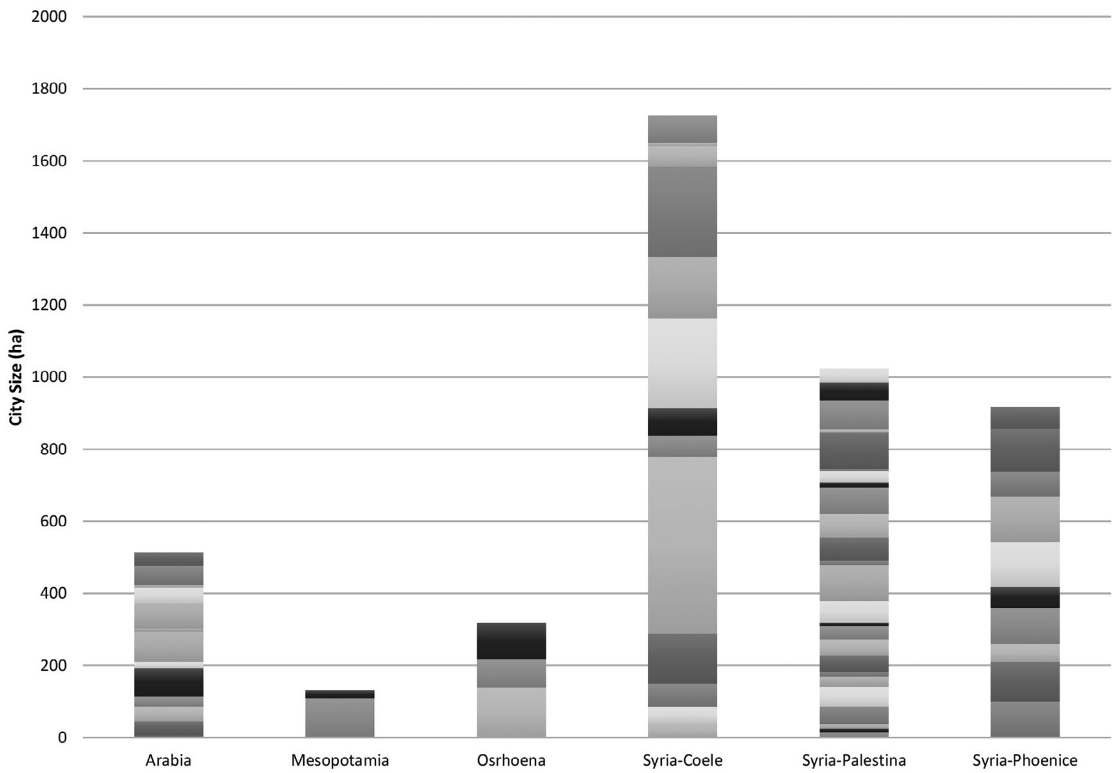

Fig. 1: Graph of self-governing city sizes per province.

the smaller of the two, only has sizes for two of its three Roman cities, Nisibis and Singara. A size for Amida would probably make quite a difference.

The core question for this paper is whether this size distribution can be explained by looking at the agricultural productivity within these cities' territories. As figure 4 shows, the majority of cities in the Fertile Crescent lie above the 300 mm isohyet – based on modern data. This meets what is considered the minimum level of rainfall for rain-fed cultivation of cereals.[1] Note that there is considerable difficulty in paleo-environmental modelling, but core samples from Lake Van, the Ghab valley and the Soreq cave suggest that the first to third century period may have been slightly more arid than nowadays, with humidity increasing again from the third century onwards.[2] As a thoroughly agricultural society, the expectation is that the more agricultural resources a city can control, the larger it's economic impact, and therefore demographic attraction. Essentially, the larger a cities' agricultural resources, the larger the city.

The most straightforward way to look at this is to consider an urban territory as its catchment area. Each site uses those resources around it that it can reach, and where there are multiple sites, their surroundings are divided between them. The assumption is that those sites with access to larger catchments or more resources will be able to sustain a larger population. In the Roman East there is little to suggest a more complex political hierarchy than that of provincial capitals above cities, and non-urban settlements below

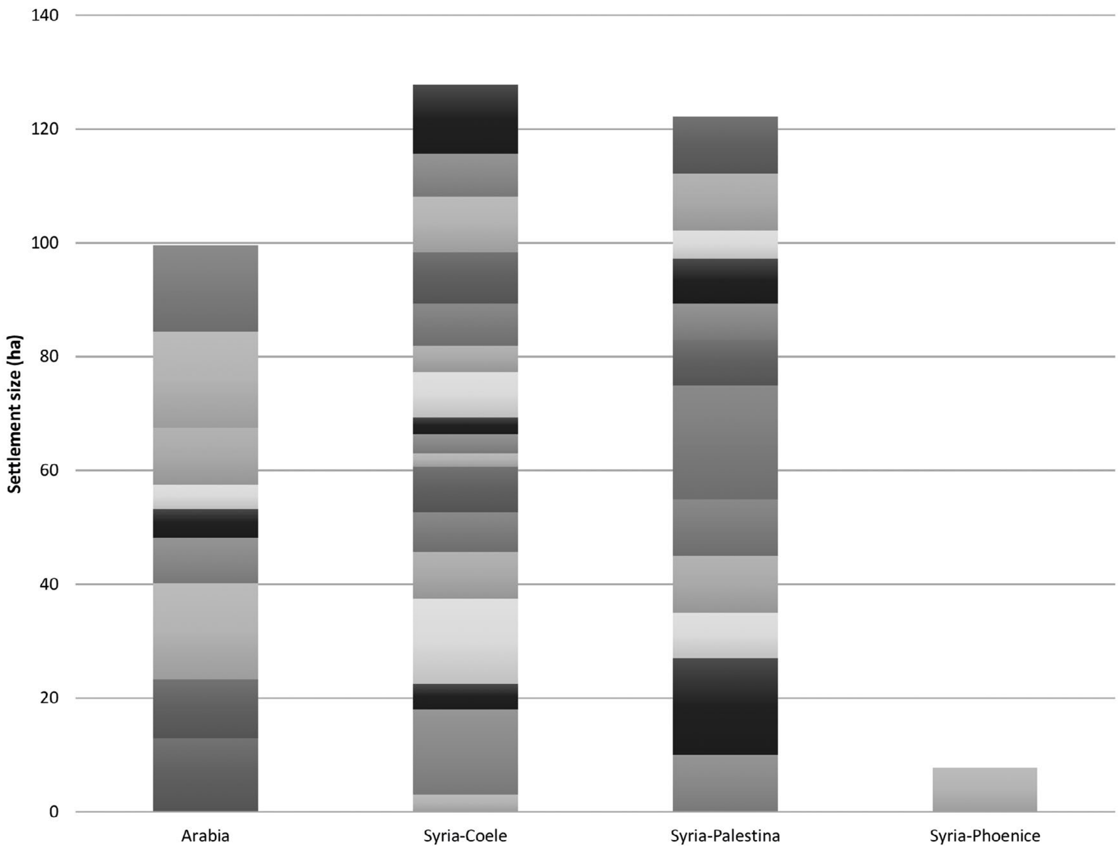

Fig. 2: Graph of secondary settlement sizes per province.

them. So a large number of cities with relatively equal status would make equal claims to their surrounding territory when dividing it between them.

Actual evidence for where urban territories lay in the Roman East is in fact very limited, with only a few indications from a handful of sites. There are for example decent suggestions for the extent of the Antiochene and there are some border stones known from Gerasa enclosing roughly 450 km^2.[3] Generally, it is therefore necessary to recreate territories using artificial means. The simplest approach to divide an area between a set of points (in this case our settlements), is to create Thiessen polygons. This method draws borders exactly halfway between each point and its neighbours, using Euclidean distance. As such, shapes are created where each originating point is the closest central point to any location within the surrounding shape. As was perhaps to be expected, there appears to be no correlation between settlement size and that of its surrounding Thiessen polygon (fig. 5). Naturally, this is exacerbated by the vast territories assigned to those settlements on the boundaries of the study area, or those bordering on the desert. But even if correcting for those, either by ignoring them, or by including boundary settlements from adjoining study areas and clipping away low rainfall zones, there is no correlation present.

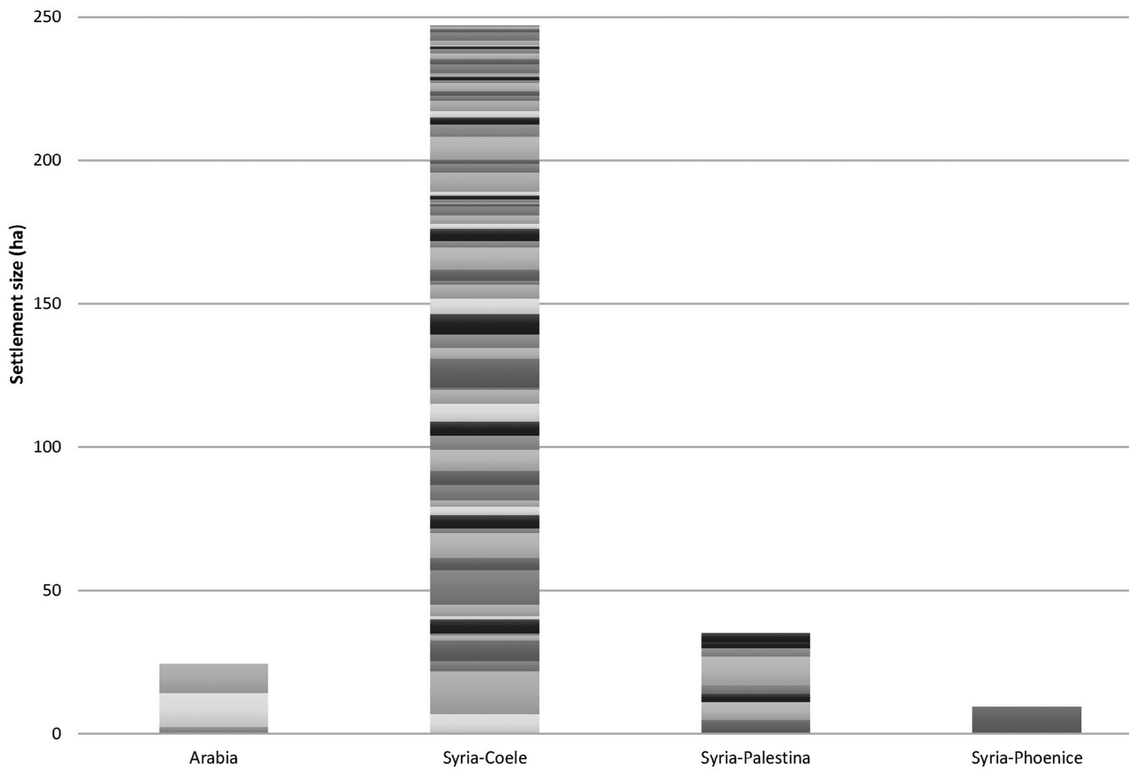

Fig. 3: Graph of non-urban settlement sizes per province.

Rather than using Euclidean distance, the same exercise could also be performed using travel time. The core concept is that by taking obstacles such as elevation, rivers and vegetation into account, one gets a more reliable indication of the potential extent of a territory. Figure 6 shows the reconstructed territories and travel time in hours on the basis of Tobler's hiking function, based on elevation alone as landcover cannot be reconstructed for antiquity in enough detail.[4]

As you can see, the differences from Euclidean distances are minimal, with only specific cases such as the Amanos Mountains and the Syrian coastal range causing considerable deviation. A detailed look shows that this result is not caused by an underestimation of terrain effects, but rather a logical effect of the distances involved. At shorter distances the influences of mountains are very pronounced, while at long distances the isochrones approach a circular Euclidean distance (in this case, due to limitations in the algorithm, it actually approaches an octagonal shape). The explanation lies in figure 7. Paths taken from the point of origin (in this case Antioch) to arrive at a random set of locations, shows that efforts are made to circumvent highly sloped areas. The further away, the more likely it is that there are alternative routes through passes or around mountains that cost far less time than going straight through them. When more time is spent travelling, the percentage of time lost to detours around obstacles decreases.

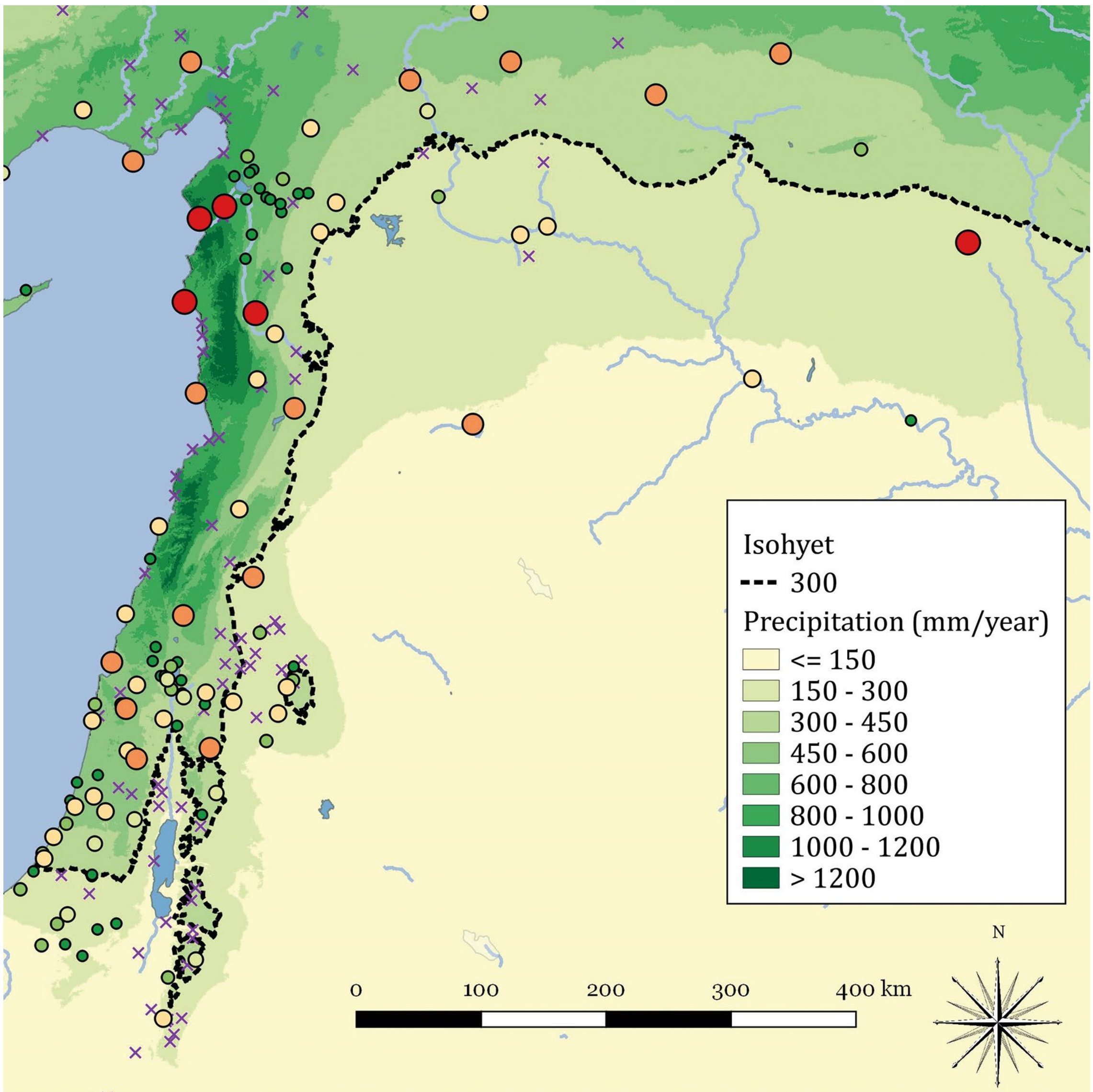

Fig. 4: Map of modern precipitation and Roman settlement distribution.

As the resultant areas approach those of regular Thiessen polygons, the same conclusions can be drawn as regards the relationship between territory size and urban area: there is none. Using isochrones does create the opportunity to look at only those areas reachable within a certain time limit. This links back to the concept of market distance and willingness to travel from a village to farmland. Within a hierarchical system, it can be assumed that a central settlement would for its food provision not only depend on its direct surroundings, but also on surplus generated by lower order settlements in its surroundings, in this case the villages within its territory. For the

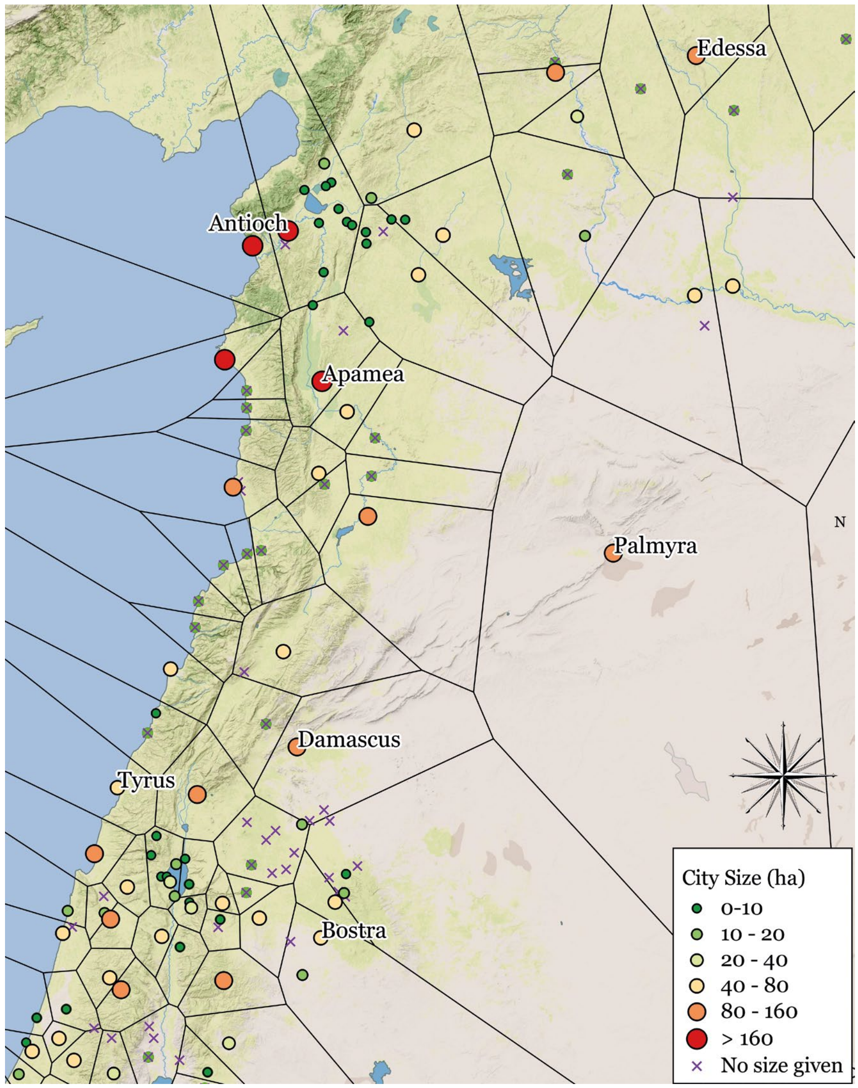

Fig. 5: Map of Thiessen polygons around Roman cities (basemap by the Ancient World Mapping Centre, CC BY-NC 3.0).

following, it is furthermore assumed that only those villages played a role in primary production for the settlement that lay within such a distance that would allow travel to the city, the sale of goods and a return trip within a single day. The commonly accepted maximum figure for such a single day return trip would be three hours.[5] As such, the resultant areas could be interpreted as an ideal model for what could have functioned as practical territories.

Territory size alone does not seem sufficient to explain urban size. Perhaps then, the answer lies in what those territories could actually produce. While in the last case, correlation between recreated territory and urban size was as weak as in the previous examples,

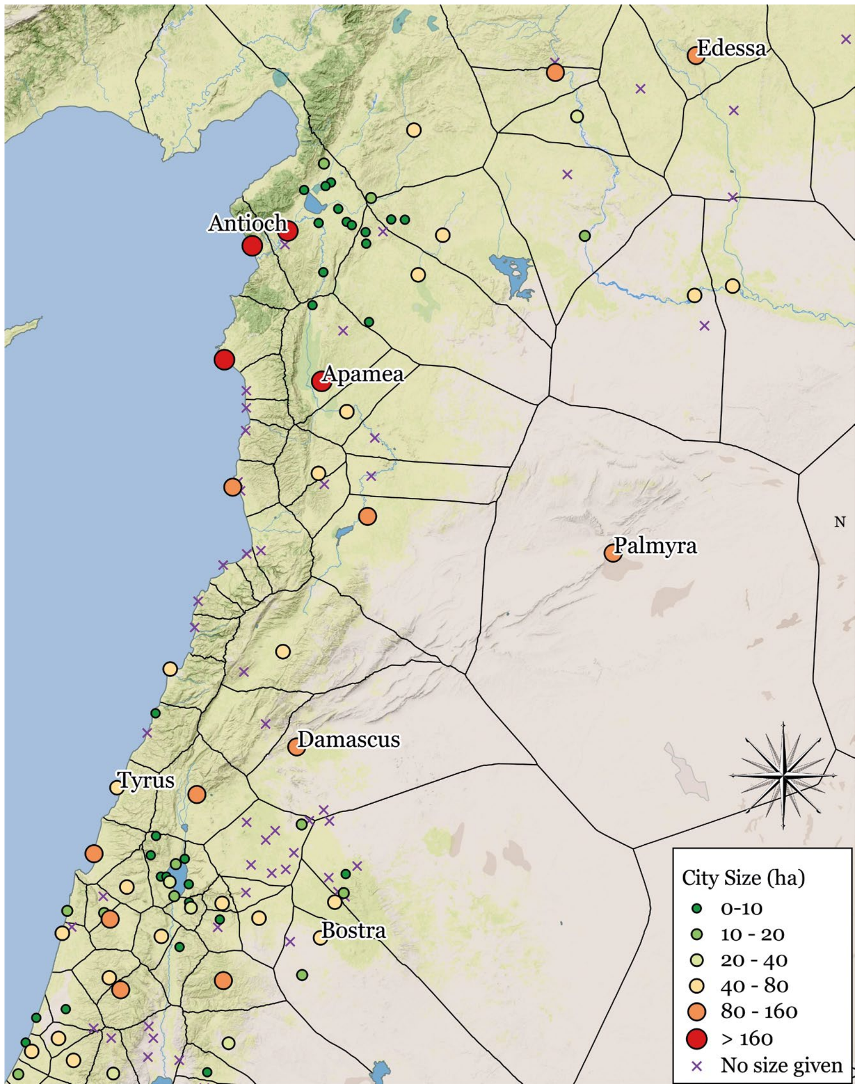

Fig. 6: Map of terrain-weighted cost distance around Roman cities (basemap by the Ancient World Mapping Centre, CC BY-NC 3.0).

the recreated functional territories do give the best basic regional unit for the following calculations, as they are less vulnerable to the influence of border effects and missing data points than Thiessen polygons, terrain-weighted or not. Several additional assumptions need to be made however concerning the translation of urban area to actual population, the rate of urbanisation and food consumption. It has to be conceded that these figures may have differed considerably in reality, with regional differences in urban layouts and diet, as well as locally varying rates of urbanisation – and there remains discussion on any of these topics for the Roman period.[6] For this exercise though, the following parameters are used: 20% urbanisation rate (so for each city-dweller, 4 people in its surrounding territory), a diet

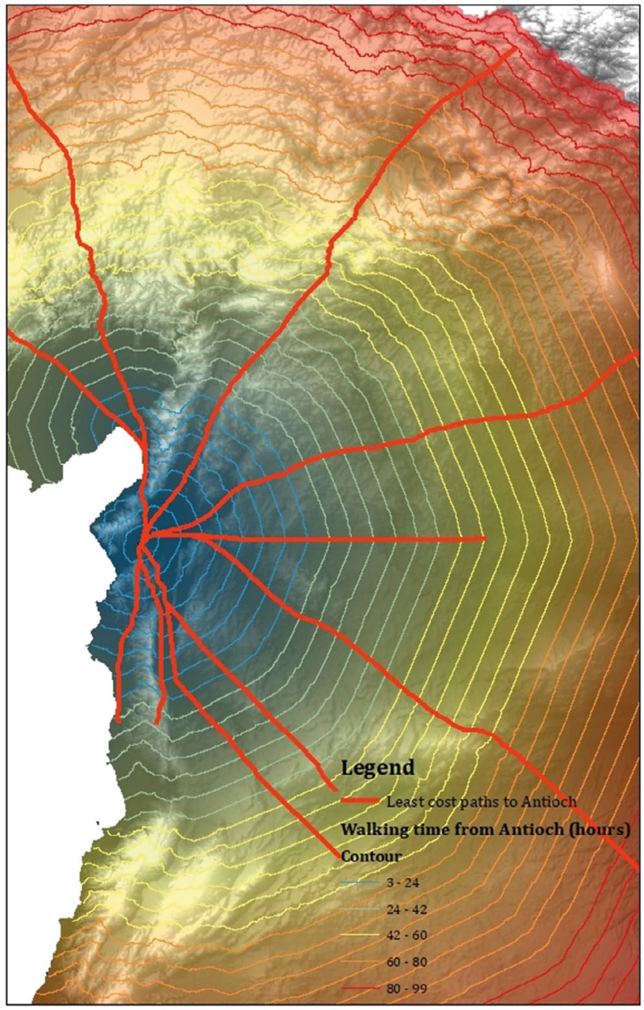

Fig. 7: Map of least cost paths from Antioch to random locations.

of 250 kg of cereals or equivalent per year per person, and an urban population density of 250 people per hectare. For levels of agricultural production, the lowest potential production estimates were used from the global agro-ecological zones (GAEZ) dataset of the United Nations Food and Agricultural Organisation (FAO).[7] Figure 8 gives an overview of all the cities and places with potentially central roles, as well as those that can clearly be identified as cities. They show that for a majority of central settlements, local production within a 3 hour distance would be able to sustain an urban population plus four times as many people in its surrounding countryside.

Figure 8 shows that within the given parameters and when using the average potential yield figures from the FAO, only 28 out of 177 areas would not be able to sustain their population, 10 of which being areas not having a known size for the area of the urban centre, but only able to sustain a population under 10.000. As expected, barring a handful of

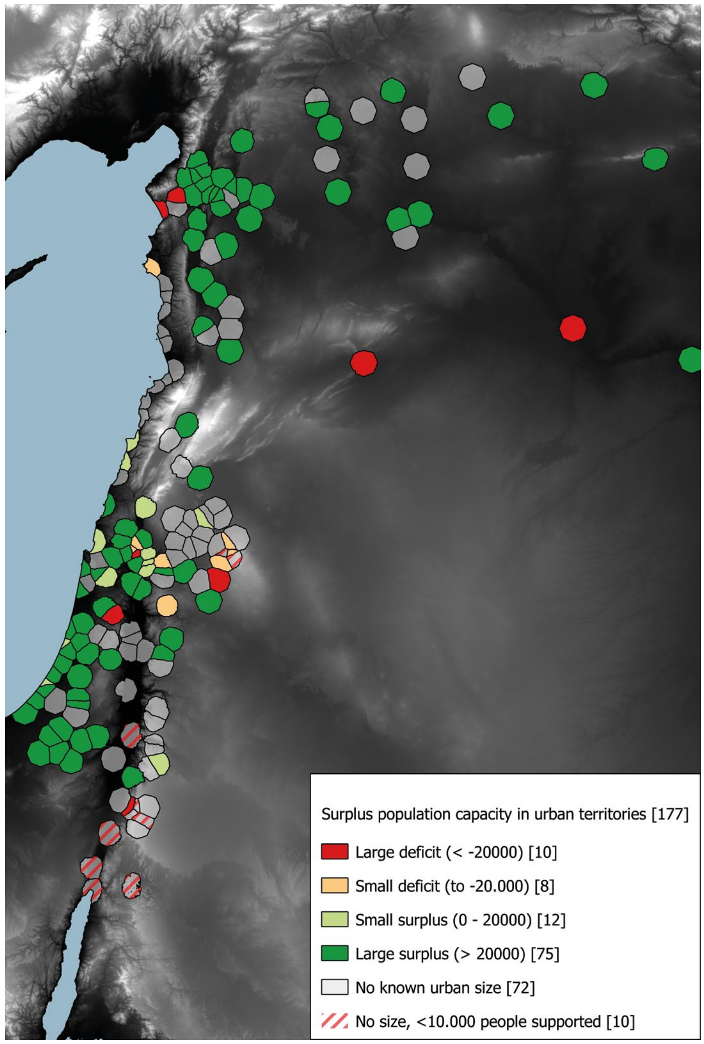

Fig. 8: Map of surplus carrying capacity of settlement territories.

exceptions, lower yield zones are concentrated around the desert edge, with larger areas in fact producing less due to limited rainfall. For some of these ten that may in fact be a realistic limit for the population of the settlement, based on sizes for earlier or later periods: the port of Aila for instance, was under three hectares in the early Islamic period, and if Parker's map of 1997 gives a good estimation of the Roman period size, that would have been even smaller.[8] 87 regions would be able to sustain their populations, and a further 72 areas with no known urban size, but able to support total populations over 10.000 people. Furthermore, almost all sites below 125 hectares fell within areas that could sustain them.

The concept of carrying capacity, and especially when it involves humans, is not without its critiques. A core issue as a scientific tool is that it expects the formation of a stable equilibrium.[9] It ignores that there can be a number of factors that may influence population dynamics, such as migration. Similarly, a number of assumptions are made about diet, resource availability, production and acquisition methods, which impose the population ceiling for a given area. Human agency allows reality to divert considerably from this ideal model. Changes in diet, specialised methods for resource acquisition, and trade allow populations to adapt and shift the initial population cap. These very limitations are however exactly the reasons why this analysis does have value: it allows for making the distinction between regions that fit within the model, and places where people live despite the model suggesting otherwise. This allows us to investigate how and why people lived in less than ideal places.

As such, carrying capacity offers a solid baseline for the majority of these settlements, not suggesting that they necessarily depended on their hinterlands, but nonetheless probably could within the given parameters. For the remainder, the explanations for why the various cities were larger than the constrains of their surrounding territories should be sought in the very limitations of the model: better adaptation to the terrain using terracing and alternative methods to provide enough water and nutrients to crops, larger territories, different diets or the acquisition of foodstuffs through trade. Here, we will only look at some of the examples of how a local population could cope with a problematic territory.

In his 2016 study, Will Kennedy calculates the possible extent of Petra's effective agricultural hinterland using similar methods to those above, looking at travel cost on the basis of slope. Within the larger part of this area, containing the sandstone slopes of what Paula Kouki classifies as the Escarpment Zone, the annual average rainfall of at most 150 mm would hardly be sufficient for the farming of barley. As Kouki further adds, the nutrient-poor and shallow soils would require manuring to support the cultivation of more demanding plants over longer periods of time.[10] On the eastern side Petra's hinterland also includes the western side of the Jabal ash-Shara. This area is somewhat better suited for rain-fed farming: the higher elevation of this area results in a higher mean annual rainfall of 200 mm, lower temperatures and therefore lower evaporation rates. In addition, a diverse lithology of permeable limestones and nonpermeable sandstone layers furthermore allows for the existence of numerous springs.[11]

Even this more favourable agricultural zone had clear limitations. As is the case for the whole Levant, most of the rain here falls between December and April, and most heavily between January and March. Furthermore, interannual variation can be considerable, with dry years only reaching a third of the average, and usually several dry years following each other.[12] In order to deal with this, the people of the Petra region practiced run-off cultivation. By building dams in wadi-beds and terraces on hillslopes, during the rainy months water was diverted towards lower lying agricultural plots. Furthermore, terracing was also necessary to counter soil erosion on the steep slopes of the Ash-Shara.[13] Numerous structures related to run-off cultivation could be clearly dated to the Roman period around the Jabal Harun, to the southwest of Petra, but there are also good indications for Nabatean or Roman dates for water diversion structures throughout the rest of the region. In addition, to deal with annual and interannual variation in rainfall, both collected run-off water, as well as water from springs would be stored in reservoirs, with cisterns found everywhere both in the escarpment and the Jabal ash-Shara regions. The locations of reservoirs and water conduits within agricultural fields further show that stored water was not just used for domestic use, but clearly intended for irrigation as well.[14]

In the other drier parts of the Levant similar practices can be found. Throughout Nabatean lands there are indications of terracing, run-off irrigation and ground-level aqueducts. John Peter Oleson gives an overview of various examples from Zoara down to Humayma, and includes an interesting example from the Babatha archive, where two papyri give an irrigation schedule for when which landowners were allowed to irrigate their crops.[15]

Another notable example lies somewhat further to the north. Jericho, and the other villages and estates lying in the lower Jordan valley, also based their irrigation on water from springs. In the case of Jericho, the main source of water is the Ain al-Sultan spring (Elisha's Spring), which is fed from the watershed of the Judean Highlands, and its high volume and perennial water flow have always been the basis of that settlement and agriculture around it. Jericho's water supply is furthermore augmented by two other clusters of springs along the Wadi al-Qelt and the Wadi Nueima.[16] While the Roman period settlement is poorly studied, its plantations were well known in antiquity, and counted among the domains that Marc Antony had given to Cleopatra. Pliny, Strabo and Josephus mention the cultivation of cash crops in the irrigated Jericho plain, with a focus on dates and balsam.[17]

The Negev, another arid region, would flourish in the fourth century with irrigated viticulture geared towards export through the city of Gaza.[18] Before that time however, there is only some evidence of small-scale, limited agriculture based on the capture of spring-water around Nabatean sites and road stations. It should be no surprise then that up to that point settlements remained comparatively small and limited in number, with a larger focus on pastoralism and trade.[19] An indication that agriculture was limited comes from a study by Ruth Shahack-Gross et al. analysing livestock dung, showing how at an Iron IIA site in the Negev animals were only fed by free grazing, while at a late Roman and Umayyad site their diet included cultivated grains.[20]

It is apparent that the size distributions for the Roman Levant cannot easily and directly be explained by looking just at urban territories or their agricultural potential. The majority of settlements lay well within the parts of the Fertile Crescent that could sustain them, and most were small enough that they did not reach the productive ceiling of their hinterlands. The distribution of sizes mostly tapers off at the point where this ceiling is reached, but a number of exceptions break free from the model. As shown in the examples above, in the case of those places found in the more arid regions of the Levant, the explanation can lie in better adaptation to the demands of a harsher environment, with specialised forms of agriculture and water management.

Notes

[1] Wirth 1971.
[2] Wilkinson 2003, 20; Kouki 2012, 64–68; Lawrence et al. 2016, 9.
[3] Balty 2000, 169; Kennedy 1998, 48–50.
[4] Tobler 1993.
[5] Wilkinson et al. 1994.
[6] To give but a small insight compare the following: Kennedy 2006; Wilson 2011; Garnsey 2004; Willet 2012.
[7] Fischer et al. 2012.
[8] Parker 1997, 27.
[9] Brush 1975.
[10] Kennedy 2016, 144; Kouki 2012, 103.
[11] Besançon 2010, 39.
[12] Besançon 2010, 28–29; Kouki 2012, 104.
[13] Kouki 2012, 104–106.
[14] Kouki 2012, 106–108.
[15] Oleson 2007.
[16] Jennings 2015, 16, 122.
[17] Jennings 2015, 96–97.
[18] Erickson-Gini 2012.
[19] Erickson-Gini 2012; Rosen 2007.
[20] Shahack-Gross et al. 2014.

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References

Balty 2000
J.-C. Balty, Apamée. Mutations et permanences de l’espace urbain, de la fondation hellénistique à la ville romano-byzantine, BEtOr 52, 2000, 167–185.

Besançon 2010
J. Besançon, Géographie, environnements et potentiels productifs de la région de Pétra (Jordanie), in: P.-L. Gatier, B. Geyer, M.-O. Rousset (eds.), Entre nomades et sédentaires. Prospections en Syrie du Nord et en Jordanie du Sud, Travaux de la Maison de l’Orient 55 (Lyon 2010) 19–71.

Brush 1975

S. B. Brush, The Concept of Carrying Capacity for Systems of Shifting Cultivation, American Anthropologist 77, 1975, 799–811.

Erickson-Gini 2012

T. Erickson-Gini, Nabataean Agriculture: Myth and Reality, Journal of Arid Environments 86, 2012, 50–54.

Fischer et al. 2012

G. Fischer – F. O. Nachtergaele – S. Prieler – E. Teixeira – G. Toth – H. van Velthuizen – L. Verelst – D. Wiberg, Global Agro-Ecological Zones (GAEZ v3.0) – Model Documentation, <http://www.fao.org/fileadmin/user_upload/gaez/docs/GAEZ_Model_Documentation.pdf> (06.02.2019).

Garnsey 2004

P. Garnsey, Cities, Peasants and Food in Classical Antiquity. Essays in Social and Economic History (Cambridge 2004).

Jennings 2015

M. Jennings, Beyond the Walls of Jericho. Khirbet Al-Mafjar and the Signature Landscapes of the Jericho Plain (Ph.D., University of Chicago 2015).

Kennedy 1998

D. Kennedy, The Identity of Roman Gerasa. An Archaeological Approach, MedA 11, 1998, 39–69.

Kennedy 2006

D. Kennedy, Demography, the Population of Syria and the Census of Q. Aemilius Secundus, Levant 38, 2006, 109–124.

Kennedy 2016

W. M. Kennedy, Reassessing the Impact of Natural Landscape Factors on Spatial Strategies in the Petra Hinterland in Nabataean-Roman Times, Proceedings of the Seminar for Arabian Studies 46, 2016, 137–154.

Kouki 2012

P. Kouki, The Hinterland of a City: Rural Settlement and Land Use in the Petra Region from the Nabataean-Roman to the Early Islamic Period (Ph.D. diss. University of Helsinki 2012).

Lawrence et al. 2016

D. Lawrence – G. Philip - H. Hunt - L. Snape-Kennedy – T. J. Wilkinson, Long Term Population, City Size and Climate Trends in the Fertile Crescent. A First Approximation, PLOS ONE 11, 2016, >e0152563< (06.02.2019).

Oleson 2007

J. P. Oleson, Nabataean Water Supply, Irrigation, and Agriculture. An Overview, in: K. D. Politis (ed.), The World of the Nabataeans: Volume 2 of the International Conference, The World of the Herods and the Nabataeans, Held at the British Museum, 17–19 April 2001, Oriens et Occidens 15 (Stuttgart 2007) 217–250.

Parker 1997

S. T. Parker, Preliminary Report on the 1994 Season of the Roman Aqaba Project, BASOR 305, 1997, 19–44.

Rosen 2007

S. A. Rosen, The Nabateans as Pastoral Nomads. An Archaeological Perspective, in: K. D. Politis (ed.), The World of the Nabataeans. Volume 2 of the International Conference, The World of the Herods and the Nabataeans, Held at the British Museum, 17–19 April 2001, Oriens et Occidens 15 (Stuttgart 2007) 345–374.

Shahack-Gross et al. 2014

R. Shahack-Gross – E. Boaretto - D. Cabanes – O. Katz – I. Finkelstein, Subsistence Economy in the Negev Highlands. The Iron Age and the Byzantine/Early Islamic Period, Levant 46, 2014, 98–117.

Tobler 1993

W. Tobler, Three Presentations on Geographical Analysis and Modeling, NCGIA Technical Report, 1993, <https://escholarship.org/uc/item/05r820mz> (06.02.2019).

Wilkinson 2003

T. J. Wilkinson, Archaeological Landscapes of the Near East (Tucson 2003).

Wilkinson et al. 1994

T. J. Wilkinson – J. Bintliff – H. H. Curvers – P. Halstead – P. L. Kohl – M. Liverani – J. McCorriston – J. Oates – G. M. Schwartz – I. Thuesen – H. Weiss – M.-A. Courty, The Structure and Dynamics of Dry-Farming States in Upper Mesopotamia, Current Anthropology 35, 1994, 483–520.

Willet 2012

R. Willet, Whirlwind of Numbers. Demographic Experiments for Roman Corinth, AncSoc 42, 2012, 127–158.

Wilson 2011

A. Wilson, City Sizes and Urbanization in the Roman Empire, in: A. Bowman – A. Wilson (eds.), Settlement, Urbanization, and Population (Oxford 2011) 161–195.

Wirth 1971

E. Wirth, Syrien. Eine geographische Landeskunde (Darmstadt 1971).