Roman urban landscape. Towns and minor settlements from Aquileia to the Danube, Opera Instituti Archaeologici Sloveniae 47, 2024, 33–52. doi: https://doi.org/10.3986/9789610508281_02

THE URBAN CORRIDORS OF ROMAN PANNONIA

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Izvleček

[Urbani koridorji rimske Panonije]

Linearnost je med najočitnejšimi značilnostmi urbane geografije Panonije in številnih drugih provinc rimskega imperija. Urbanizacija je bila omejena na ozke pasove ob najpomembnejših naravnih komunikacijskih oseh, najpogosteje ob večjih rekah. Ti pasovi so bili glavni kanali pretoka informacij, virov in prebivalstva v provincah. Zato so bila območja, ki niso bila del teh koridorjev, slabo vključena v provincialni urbani sistem. Redko zasledimo imena naselij ali upravnih enot, ki niso nastali ob večjih prometnicah. Območja med urbanimi koridorji so bele lise na cestnem in poselitvenem zemljevidu rimske Panonije, zato ni mogoče rekonstruirati njihove poselitvene slike. Rimska Panonija ni osamljen primer te vrste urbane geografije. Tako kot v nekaterih drugih pogledih vzporednica prihaja iz novega sveta, kjer so prvič uporabili koncept urbanih koridorjev. Zaradi radikalno drugačnih gospodarskih in tehnoloških okoliščin model urbanega koridorja ni zlahka uporaben v rimskem ali katerem koli drugem starodavnem imperiju. Kljub temu gre za koncept, ki ponuja zanimiv pogled na urbani sistem rimske Panonije ter njegovo mesto in vlogo v gospodarstvu celotnega imperija.

Ključne besede: Panonija, rimska doba, urbana geografija, urbani koridor, teorija centralnih krajev

Abstract

Linearity is one of the most apparent features of the urban geography of Pannonia and of many other provinces of the Roman Empire. Urbanisation was limited to narrow belts along the main natural axes of communication, most typically major rivers. These belts were the main conduits of the flow of information, resources, and population in the provinces. As a result, the areas apart from these corridors were poorly integrated into the provincial urban system. We rarely hear the names of settlements or administrative units that were not founded on a major line of communication. The areas between the urban corridors are literally blank spots on the road and settlement map of Roman Pannonia. It is impossible to reconstruct their settlement geographies. Roman Pannonia is not an isolated example of this type of urban geography. As in some other aspects, the parallel comes from the New World, to which the concept of urban corridors was applied for the first time. Because of the radically different economic and technological circumstances, the urban corridor model is not readily applicable to the Roman Empire nor to any other ancient empire. Nonetheless, it is a concept that offers an interesting perspective on the urban system of Roman Pannonia and its place and role in the empire-wide economy.

Keywords: Pannonia, Roman period, urban geography, urban corridor, Central Place Theory

INTRODUCTION

In 1979, the American geographer Andrew F. Burghardt published a study on the origin and evolution of the road- and town-network in Roman Pannonia.[1] Writing from a geographer's perspective, Burghardt broke down the provincial urban network into a series of axes or "linear channels" that consisted of the main provincial roads and the towns located on these roads. Quite rightly, he saw the urbanization of Roman Pannonia as a centrally planned process, driven chiefly by the imperialistic ambitions of Rome. The urban geography of this province was created by a series of extraneous impulses – army movements, colonization and trade – that manifested materially in the construction of gravel or paved roads, military camps and towns. The first impulse came from Rome and Italy, and resulted in the urbanization of the Amber Road and the establishment of the earliest permanent camps on the Middle Danube. This early phase was followed by a second, primarily economic impulse that arrived from the west. It was epitomized by the intensified trade with eastern Gaul and the Rhineland and resulted in the urbanization of the Danube *Limes*. The final impulse was generated by the new capital of Constantinople and brought a short-lived growth and prosperity to the southeast corner of Pannonia.

Burghardt's study has been virtually ignored by archaeologists and historians who study Roman Pannonia. The vast corpus of scholarly literature on Roman Pannonia does not contain a single reference to this work. Published in a geographic journal, this study has likely passed unnoticed by most archaeologists and historians, which does not mean that it should have been unreservedly accepted as a model study. Leaving aside the factual errors, for which a geographer may be forgiven, Burghardt's approach to the urban network is too rigid and mechanistic, and some of his conclusions are difficult to digest. Most notably, his third impulse radiating from Constantinople is purely hypothetical and is likely confused with the promotion of Sirmium into an imperial capital during the Tetrarchy. The intensified trade with eastern Gaul and the Rhineland, identified as the second impulse, is but an impression based solely on the evidence of sigillata imports found at military forts.[2] But surely the most problematic part is his attempt to assign specific roles to individual towns in the genesis of the urban network. They are seen as little more than abstract elements of the impulse chain, each performing a specific function in the urbanization process. According to this model, each impulse chain consists of an impulse generator, a forward base of operation, a launching point, a gateway, a central communication node and a primary objective.[3] These abstract concepts are not easily translated into tangible aspects of the archaeology of the Pannonian towns and, consequently, his model is untestable. The roles assumed by individual towns are simply predetermined by their ordering along the impulse chain. It is no wonder the author is at pains to fit the urban geography of Roman Pannonia into this model whenever there are too many or too few towns along the impulse chains.

Notwithstanding its weaknesses, Burghardt's general perspective on the towns of Roman Pannonia offers a good starting point for this study. His method of sectoring the urban geography into linear units is counterintuitive to most scholars with a regional focus, but it has a sound rationale and, more importantly, it opens up a new level of analysis. In the present study, the structure of the urban geography of Roman Pannonia is examined by linear units or urban corridors. The other components of Burghardt's model are ignored. Instead, we shall focus on the patterns of status and size distribution.[4] Obviously, this whole analysis makes sense only in so far as the patterns observed can be related to some social or economic reality. It is therefore useful to take a closer look at the theory behind Burghardt's and this study.

THEORETICAL MODELS

Although cited only once, towards the end of his study, Burghardt was referring to a more general model of urban geography, known as the Urban Corridor model.[5] It was developed by historical geographers in North America, partly in reaction to the static character of classical Central Place Theory. The latter enjoyed great popularity in North America and has been successfully applied in modern regional studies, but it was greeted with less enthusiasm by geographers who studied the urbanization of the New World in the Early Colonial period. The concept of urban corridors was devised in the context of the sparse urban geography of the Americas during most of the colonial period. It describes the linear clustering of towns and other facilities along the roads that connected the coastal colonies to points or areas of interest in the interior. To some extent, this pattern was preconditioned by physical geography. Major roads were often built on old river-terraces, which happen to coincide with the best farmland in the area. However, far more important is the observation that these early corridors were almost entirely geared towards the control and exploitation of strategic resources by the colonial empires. Because of the narrow scope of this system, there would have been little incentive among coloniz-

[1] Burghardt 1979.

[2] The prevalent trends in the distribution of imported tableware in Pannonia were known at the time (Gabler 1978).

[3] Burghardt 1979, 6.

[4] Most of the data used in this study has been collected earlier (Donev 2020).

[5] Whebell 1969.

ers to invest in land-clearance and claim new farmland. Security concerns, the opportunities offered by the labor market and other amenities available along the primary corridors would have been far more attractive to the early settler than the expensive and uncertain prospect of conquering new land. Even in later stages, as the primary corridors started to branch out and interconnect, they had retained their primacy over the lateral corridors. This inertia of the urban geography, the prevalence of early foundations long after the system has changed or diversified its initial economic orientation, is the work of rational economic behavior or the agglomerative principle. New enterprises will always tend to appear in areas in which labor, transport infrastructure and other services and facilities are already available. For similar reasons, the first railways in the New World followed closely the courses of the older roads. The spread of ideas and inventions followed the same paths, first extending downwards along the corridors and, in a later phase, laterally, in the areas between the corridors.

On the surface, the central assumptions of this empirical model seem to contradict nearly all predicates of Central Place Theory.[6] Whereas Central Place Theory posits an equal distribution of population and resources, in the Urban Corridor model, opposite conditions define the initial stage. Both population and resources are concentrated along narrow corridors. The patterns predicted by Central Place Theory are the outcome of a long, autochthonous process, driven chiefly by the forces of market economy and rational consumer behavior. In contrast, the early urban corridors of the New World were created at once, by an outside force, and their purpose and direction were determined by strategic interests and political economy. The two-dimensional pattern of hexagonal lattices is optimally suited to the needs of internal trade and the provision of services to the hinterland. The one-dimensional corridors, on the other hand, are meant to serve but one end: the extraction and export of localized resources. The former model describes an absolutely inwards-looking system, the latter, its antipode. Interestingly, even when both models allude to rational economic behavior as a determinant, the outcomes are diametrically opposite. In Central Place Theory, logistics and price differentials help create and maintain a state of entropy; in the Urban Corridor model, the agglomeration of economies of scale perpetuates the initial inequalities in the system.

Surprising though it may seem, from a purely theoretical perspective, the gap between Central Place Theory and the Urban Corridor model is not unbridgeable. The Urban Corridor was conceived as a dynamic model that aimed to describe the historical evolution of early colonial urban geographies. In the later stages of development, coinciding with the proclamations of independence and the creation of integrated national economies in the New World countries, the urban corridors branch out and create two-dimensional patterns that start to approximate the predictions of Central Place Theory. C.F.J. Whebell, who was the first to coin this concept, was aware that the corridor model is an extreme variant of the Central Place Theory model as defined by the transportation principle.[7] Indeed, in his seminal study of the market systems in traditional Chinese society, G.W. Skinner has shown that, in conditions of narrow montane valleys, the Central Place Theory model continues to apply, albeit in a single dimension.[8] More intriguingly, critics of Central Place Theory have argued, partly on the grounds of A. Lösch's work, that heterogenous urban landscapes can develop from the inner workings of Central Place Theory, without any recourse to external historical events or physical geography.[9] Even within the isotropic plain of Central Place Theory, the agglomerative principle will favor the concentration of services and population in higher-ranking centres, eventually leading to the proliferation of city-rich and city-poor districts. Given that certain conditions are met, either model can be derived from the other.

A few points are of major relevance to this study. There is a point of convergence between these two models. It has been proven, both mathematically and empirically, that Central Place Theory can operate within linear regional units, whereas trends of linearization in the urban geography can be derived from the transportation principle.[10] It is more useful to see the Urban Corridor model as a variant of Central Place Theory than as an incompatible alternative. However, although the two models are not fully incompatible, they do imply very different social and economic realities. One can be associated with well-integrated economies and social and economic quasi-equality, the other, with poorly integrated, or at least overtly exploitative systems, marked by extreme inequality. Finally, and on a more practical level, urban corridors represent a viable unit of analysis. This is predetermined by the potentially much higher volume of traffic along than between the urban corridors. In an earlier study, it has been pointed out that, for various reasons, the individual provinces of the Roman Empire are not the ideal unit of analysis of urban systems.[11] In theory at least, there should be possible to observe a higher level of integration between the towns that belong to the same corridor, even if it crosses multiple provinces, than between towns that belong to the same administrative unit but to different corridors.

[6] For a concise summary of the latter see King 1985.

[7] Whebell 1969, 2.

[8] Skinner 1965.

[9] Portugali 1984.

[10] King 1985, 56.

[11] Donev 2020, 284; see also Kunow 1988, who has demonstrated the existence of two different urban systems in Germania Inferior, one pertaining to the civilian, the other to the military segment of this province.

RECONSTRUCTING THE URBAN- AND ROAD-NETWORK OF ROMAN PANNONIA

By the time Burghardt published his study, the urban geography of Roman Pannonia had been by and large reconstructed.[12] However, these were essentially reconstructions of the administrative divisions of the province and were primarily concerned with the physical fabric of autonomous towns or centres of administration. In other words, they only include the upper tiers of the urban hierarchy. Settlements that provided central services of a lower-order, – markets and temples – but did not achieve an autonomous status and were less likely to draw the attention of ancient writers, were disregarded. This deficiency cannot be ignored, because the imprint of Central Place Theory should be most visible in these lower reaches of the urban and market system.[13] It is therefore necessary to broaden the criteria that define urbanity and include all settlements larger than five ha and in possession of public buildings.[14] This means that, in addition to the known autonomous towns, the urban map of the province should include most garrison sites and some roadside and spa-settlements. The archaeological study of lower-order central places, "small towns" or vici, in Roman Pannonia is still in its infancy and the maps presented in this study will likely need an update in the near future.[15]

Because of this state of the art in the study of the urbanism of Roman Pannonia, it is difficult to get rid of the feeling that the available data-set is incomplete. In view of the paucity of systematic archaeological surveys in many parts of Pannonia,[16] it is easily conceivable that settlements measuring between five and ten hectares and boasting one or two buildings of durable material will fail to get any notice. Hence, it is highly possible that this analysis looks at an unrepresentative segment of the integral system of towns and markets. Although not much can be done to remedy this problem, there are two arguments that reduce this uncertainty. Systematic regional surveys may not have been very popular in Roman Pannonia, but many parts of this province have had a century-old tradition of archaeological field research and recording of accidental finds.[17] Moreover, the campaigns of intensive road-construction and gasification in the past couple of decades have brought to light a great number of new archaeological sites, even in the most understudied corners of the province. This does not imply that coverage is anywhere near satisfactory, but it does give a very rough idea of what proportion of the original urban system is potentially missing in our maps. As we shall shortly see, the current knowledge of the non-autonomous central places in Roman Pannonia only reinforces the patterns observed in the distribution of autonomous towns. The sites in the countryside that could potentially perform central place functions are almost entirely limited to roadside settlements and auxiliary *vici*. Few, if any, sites located off the major roads can be assigned a central place role. It is important to reiterate that this is not to say that there were no central places apart from the main provincial roads, but this role did not materialize into archaeological aspects that can be readily recognized as urban. It would be wrong to see the urban geography of Roman Pannonia as a pure artefact of the current archaeological knowledge of its countryside. On the contrary, the uneven spread of urbanity is a stark reflection of the differential distribution of wealth and privilege.

The other component of the urban corridor model is the network of public roads. For the purposes of the present study, it is useful to distinguish between interprovincial and provincial roads.[18] The former refers to land-roads and navigable rivers that cut across the province and connect it to the neighbouring provinces and Italy, whereas the latter are essentially branches of the interprovincial roads that provide access to the remote corners of the province and connections between the interprovincial roads. This difference does not only imply a distinction in rank but, in some cases, also in chronology. In both aspects, the provincial roads are secondary to the interprovincial roads. Obviously, local roads are of little concern.

Although there is still a number of unknowns about the exact routes and the chronology of individual roads, the general framework of the road-network in Roman Pannonia has been reconstructed.[19] This applies both to the interprovincial and the provincial roads, even though many roads of the latter category are yet to be traced on the ground.[20] Details about the construction or the exact course of a road need not concern us here. All that matters is if the written sources and itineraries state that a particular town lies on a particular road. Whether this road passed through the town or the town was accessed via a *diverticultum* or a side-road is of little relevance to this study.

Although theoretically, roads are a meaningful unit of analysis, because they cross over different geographic and administrative entities they are not easily managed within provincial frames. Some of the interprovincial roads that formed a part of the Pannonian road-network extended for many hundreds of kilometers and passed

[12] Lengyel, Radan (eds.) 1980; see now, Šašel Kos, Scherrer (eds.) 2002–2004.

[13] Skinner 2002, 218.

[14] Donev 2020, 6-7.

[15] Horvat et al. (eds.) 2020.

[16] See, however, Szőke 1995.

[17] Horvat 1999; Migotti (ed.) 2012.

[18] These categories do not overlap with the legal categories used by the Romans (Rathmann 2003).

[19] Šašel 1975; Soproni 1980; Bojanovski 1984; Gračanin 2010.

[20] Bödőcs 2008.

through a number of different provinces. This paper is concerned only with the Pannonian segments of the interprovincial roads. The only exception is the Amber Road. Because only small segments of this road extend beyond the borders of Pannonia, both its Italian and Norican section are included in this analysis. By the same token, the roads that enter Pannonia from Dalmatia are disregarded, because they mostly ran through Dalmatian territory.

In some cases, the distinction between interprovincial and provincial roads is not as clear cut as it seems. For example, the road between Sirmium and Carnuntum falls entirely within the borders of Pannonia, but from a wider perspective, this is but a small segment of the road that led from Sirmium to Augusta Vindelicum and, ultimately, to Augusta Treverorum.[21] Similarly, the Drava Corridor can be extended to Virunum in Noricum, at which point it connects to the main Norican Road and the roads that led across the Alps into Italy.[22] But in reality, along most of their courses, these roads overlap with other interprovincial roads. On their way from Mursa to Virunum, travelers would have had to leave the Drava Valley in Poetovio and follow the Amber Road to Celeia, before continuing to Virunum. Similarly, the supraregional road between Sirmium and the Treveri recorded in the Antonine Itinerary is composed of segments of a number of roads that followed different courses. In principle, the independent segments of these roads are little more than links between the roads that have different terminal points. From a Pannonian perspective, both the Drava Road and the Transdanubian segment of the Sirmium–Treverorum Road were provincial roads that served as connections between the Amber and the *Limes* Road, and between the former and the Sava Road.

Ideally, the chronological focus of this study should be on the period in which the urban system reached its zenith. Many scholars would argue that, for Roman Pannonia, this was the early 3rd century or the period of the Severan dynasty. However, this is but a rough assessment of the general prosperity of the Pannonian provinces, and it is likely biased in favour of the classical period of Roman Antiquity.[23] Seen from a different angle and disregarding the apparent decline in the number of inscribed monuments, sculptures and reliefs, it can be argued that, after the 3rd century crisis, the Pannonian urban network became not only more extensive, but also more attuned to the local needs and interests than during the High Empire. Although settlement-size data have not been collected systematically for Late Roman Pannonia, there is a sufficient amount of information to catch a glimpse of the direction of the changes that took place towards the end of the 3rd century. The rest of the observations made in this study pertain to the early 3rd century AD.

THE URBAN MAP OF ROMAN PANNONIA

In total, there were 25 autonomous towns in our study area at the time of the Severan dynasty, 22 in the two Pannonian provinces, two, Aquileia and Emona, in Italy and one, Celeia, in Noricum.[24] Of these, 18, or nearly three-quarters were located on interprovincial roads (*Fig. 1*). Half of the remaining towns have not been located, and it should not be excluded that at least some of them were also situated on a major interprovincial road. However, because in that case their names would have been recorded in the itineraries, it is assumed that they were located off the main corridors, even if their locations are only provisional. On the maps that show the density of urban settlements in Pannonia, these towns are assigned a lower weighting factor than the towns that have been identified archaeologically. This approach to data visualization is necessary, because the distribution of autonomous status does not fully coincide with the distribution of urbanity. If the provisional locations of the unlocated towns are accepted as roughly correct, the distribution of formal status is fairly even, especially in Pannonia Superior. However, these locations are far from certain and even the few towns which have been positively identified fail to impress with their archaeological remains. Only two of the towns located off the interprovincial roads, Andautonia and, possibly Mursella, have so far produced any palpable archaeological evidence of their urban character in the period of the High Empire.[25] Although formally these were all autonomous towns, the lack of facilities normally encountered in Pannonian towns suggests that they had a lower level of centrality than the ordinary provincial town.

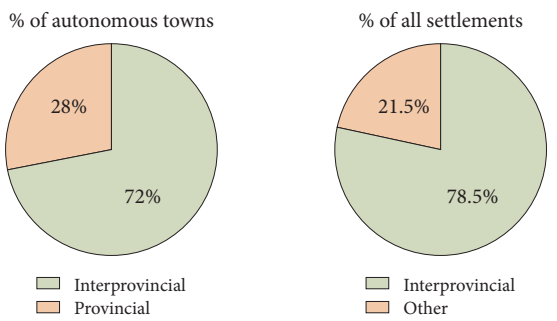

Fig. 1: The distribution of autonomous towns (left) and all central places (right) between interprovincial and provincial roads

[21] *It. Ant.* 232, https://topostext.org/work/687

[22] For the integral network of roads refer to the interactive map on https://orbis.stanford.edu

[23] Mócsy 1974.

[24] Cf. Šašel Kos, Scherrer (eds.) 2003–2004.

[25] Nemeth-Ehrlich, Kušan-Špalj 2003; Groh 2009; Szönyi 2004.

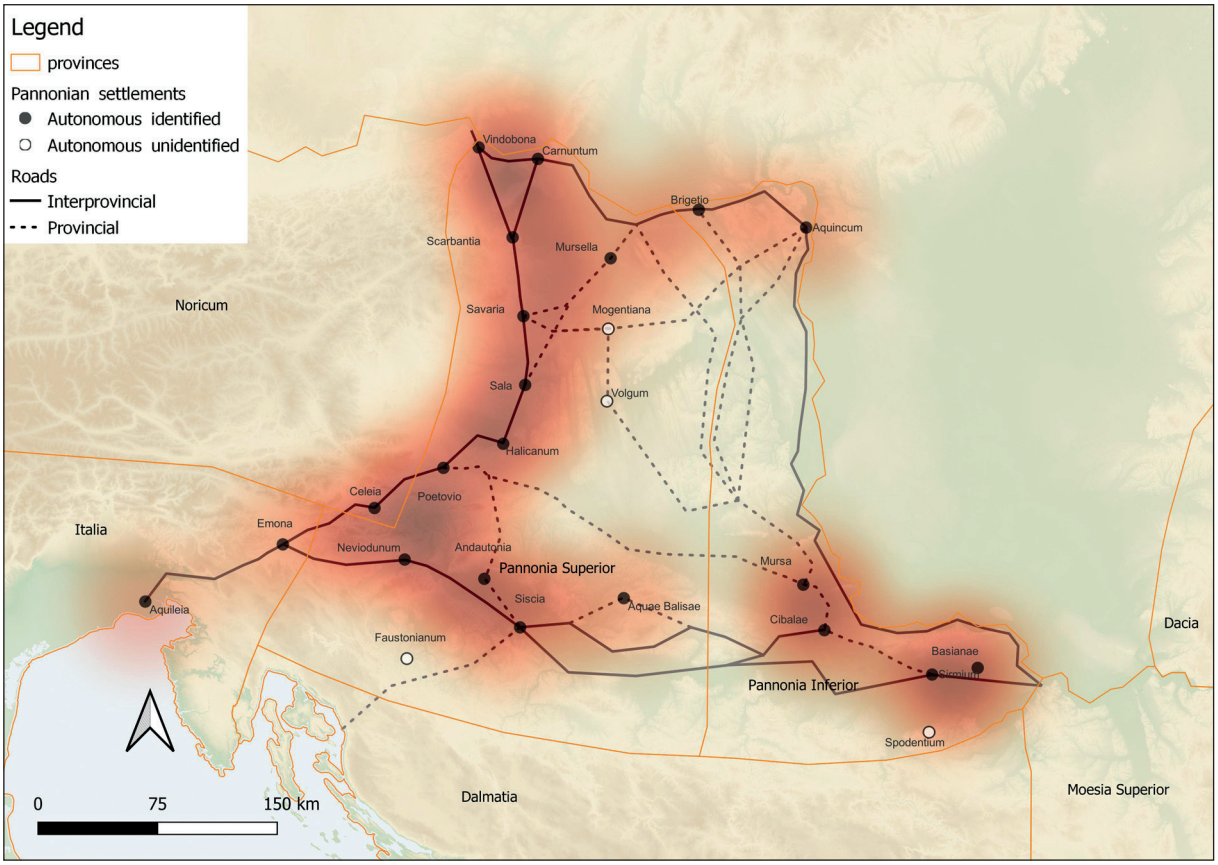

Fig. 2: Kernel density estimator for the autonomous towns in Roman Pannonia; kernel radius is 70 km, unidentified towns are assigned half the weight assigned to identified towns

At the time of the High Empire, the urban core of Roman Pannonia was in the western periphery of the province, on the Norico-Pannonian border, partly extending into the Middle Sava Valley and along the northern Pannonian frontier (*Fig. 2*). There was a second, smaller and isolated concentration in the southeast corner of the province, near the strategically important junction of the Sava, the Drava and the Danube. Throughout the period of the Principate, the Pannonian interior, especially the northern half of Pannonia Inferior, was under-urbanized and the administrative arrangements in this part of the province continue to baffle scholars.[26]

As argued above, the administrative centres comprised the upper tiers of the urban hierarchy and the provision of goods and services to the countryside was not their primary purpose. In the case of Roman Pannonia, this would have been precluded by their uneven spread across the provincial territory. But adding the sites that can be qualified as subordinate central places on the map – the auxiliary *vici* and a small number of roadside and spa-settlements – the overall picture does not change dramatically. If anything, the asymmetry in the distribution of towns located on interprovincial and provincial or local roads grows even wider (*Fig. 1*). Of the 62 settlements that meet the urban criteria stated above, only 12 are located on provincial or local roads. Together with the autonomous towns, almost 80% of all urban and urban-like settlements in both Pannonian provinces were located on interprovincial roads. The resulting map of urban density, in which the unlocated autonomous towns and the subordinate central places are weighted by a factor twice as low as the weighing factor for the autonomous towns, shows a peripheral belt of high urban density framing the empty interior of the province (*Fig. 3*). Due to the addition of the auxiliary *vici*, for the greater part located on the *Limes* Road, the urban core of the province has shifted away from its western periphery. The areas with the highest urban density are now on the northern Pannonian frontier and in the southeast corner of the province.

Some would argue that this pattern is obviously predetermined by the decision to include the auxiliary *vici* in the analysis, but this is the largest category of non-autonomous settlements that exhibit some basic urban features – size larger than five hectares, evidence of crafts and production – and they cannot be ignored

[26] Cf. Kovács 1999.

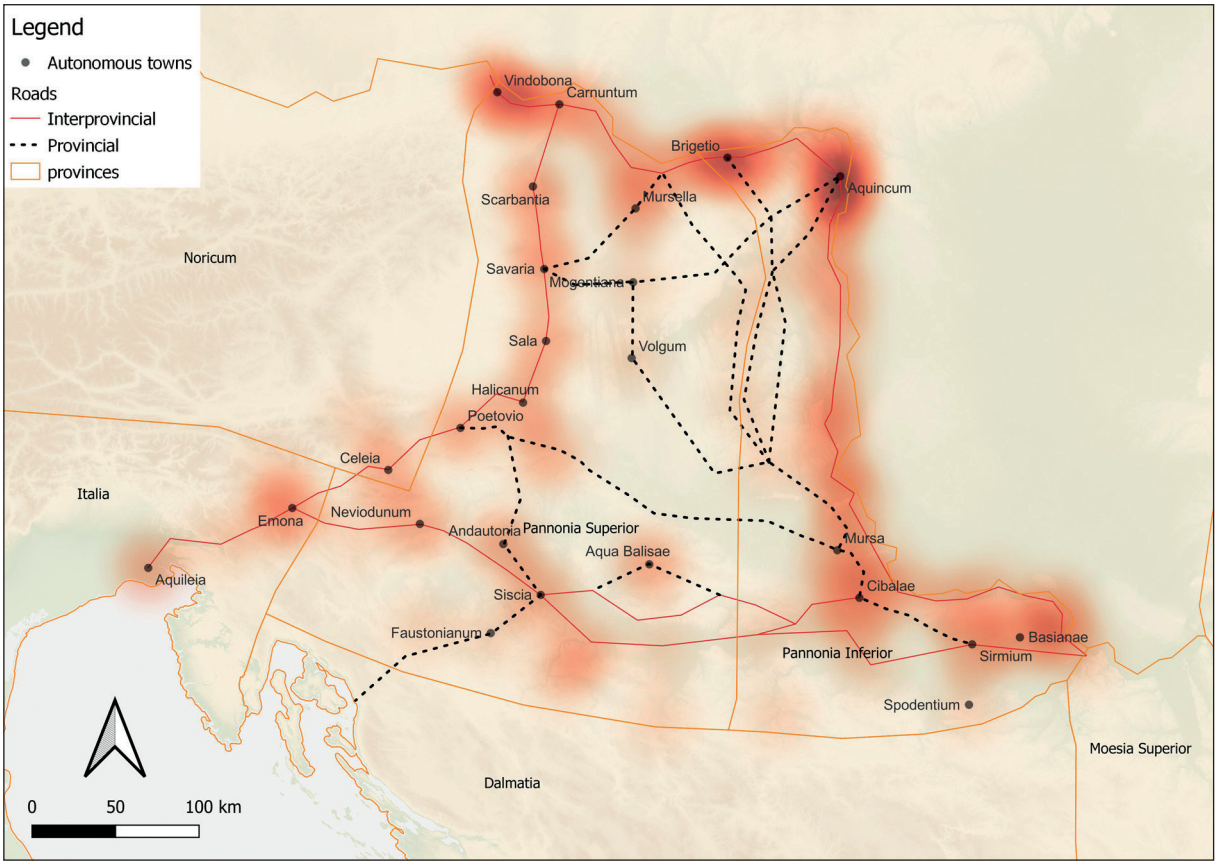

Fig. 3: Kernel density estimator for all central places in Roman Pannonia, kernel radius is 35 km; identified towns are weighted 10, unidentified towns and other settlements, 5

solely on the pretext of their military function. Despite all efforts to identify more civilian settlements of comparable size and characteristics in the interior of the province, the results were negative. The settlement near Ménfőcsanak, considered one of the largest rural sites in Pannonia, was an agglomeration of not more than 60 dugout houses, none of which could be identified as a public building.[27] Most of the pottery used by this community was made locally in the Late La Tène tradition. Even if this settlement assumed any central place functions, there are not too many signs that it was well-integrated in the provincial market system. Sites like Ménfőcsanak are few and far between. Most rural sites in Early Roman Pannonia were smaller and often attached to villa estates.[28] In fact, it can be argued that in its endeavor to offset the military bias, this study has slightly overestimated the degree of urbanization in the Pannonian interior. The map of central places includes some of the inner Pannonian forts, a group of fortified settlements in Transdanubia which show very little evidence of urbanity prior to Late Antiquity, and whose later role and status is still debated.[29]

Thus, neither the very lax criteria of urbanity nor the attentive study of the published data from the Pannonian countryside have resulted in a radically altered urban map of the Pannonian provinces. They only reinforced the pattern of linear clustering apparent in the distribution of autonomous towns. This constellation of central places could have provided efficient market coverage over 10 to 15km-wide belts on either side of the interprovincial roads, amounting to less than 20% of the provincial territory. Outside these narrow belts, both the administrative arrangements and the organization of economic life would have been based at non-urban sites. Throughout the period of the High Empire, the united Pannonian provinces conformed to the Urban Corridor model.

[27] Szőnyi 2003.

[28] Gabler 2003; Ottományi 2005; Rendić-Miočević, Leleković 2012.

[29] Mócsy 1974, 299ff.; Heinrich-Tamáska (ed.) 2011; Visy 2018.

THE URBAN CORRIDORS OF ROMAN PANNONIA AND THEIR CHRONOLOGY

All Pannonian towns located on interprovincial roads can be associated with one of the three corridors that passed through this province. These are the Amber Road (between Aquileia and Carnuntum and Vindobona), the Sava Road (between Emona and Sirmium) and the Pannonian leg of the *Limes* Road (between Vindobona and Burgenae). These three corridors were not merely major individual roads. They should be seen as bundles of transportation routes, including the hypothetical parallel roads for civilians, various detours and shortcuts and, in the case of the Sava and the *Limes* Road, the rivers. It is obviously assumed that, even if there were separate roads for the channeling of civilian traffic, they were built parallel to and at short distances from the roads reserved for the military and state officials.[30] Whether by chance or not, all three corridors led along the periphery of united Pannonia and the interior of the province was connected to these main roads via a series of lateral roads that also connected the main roads.

As mentioned before, the status of the road along the Drava is somewhat ambiguous. This was surely an important line of communication, both for land and river transport, but it is better treated as one of the most important provincial roads than as another interprovincial road. Near Poetovio, this road parts from the Drava Valley and links with the Amber Road. The ancient maps and itineraries know only of a road along the Lower Drava Valley, between Poetovio and Mursa.[31] This implies that Mursa, the last colony founded in Pannonia, also stood on a provincial road, but because Mursa was separated from the mouth of the Drava by a 15 km-wide stretch of marshes, it can equally be seen as a town on the *Limes* Road.[32] In fact, this is confirmed by a small group of milestones found near Mursa that measure the distance from Aquincum.[33]

Mursa is not the only town with an ambiguous position in the provincial road-network. This characteristic is shared by all towns located on major crossroads and it poses an obvious challenge to the goal of sorting all towns by individual corridors. Towns located at the junctions of provincial and interprovincial roads are less of a problem. They can be attributed to the interprovincial road, without giving much thought, but the same solution cannot be applied in a non-arbitrary way to towns located at the junctions of interprovincial roads. For a lack of a better solution, it was decided to attribute these towns to both corridors, essentially counting them twice in the analysis. This may not seem like the most elegant solution, but it serves the purpose of this study better than the option of adding and removing towns from individual corridors at will. After all, in reality, crossroad towns do belong to multiple roads.

The Urban Corridor model predicts that the relative importance of individual corridors is to a large extent determined by their age.[34] Because of the inertia of urban systems, the earliest corridors tend to retain their primacy irrespective of the dynamics of the urban system. It is therefore appropriate to begin by looking at the known chronology of the main Pannonian roads. Ancient roads are notoriously difficult to date, not least because they would have been constructed in stages and the maintenance of individual legs would not have been synchronized.[35] The only viable way of defining the chronology of the road-network is to look at the founding dates of the terminal points of individual roads. These can be compared to the evidence of milestones, which are often dated to the year, but which provide very general *ante quem* dates for the road construction.[36] In addition, the sheer distribution of milestones will highlight the relative importance of individual roads, i.e., those that had metalled surfaces and required regular maintenance. The absence of milestones does not necessarily imply the absence of roads, but is likely telling of their rudimentary character and of the low volume and frequency of traffic.[37]

Both the foundation dates of the terminal stations and the evidence of milestones indicate that the Amber Road is the earliest of the three Pannonian corridors (*Fig. 4*). Obviously, the origins of this road stretch much farther back in time, but the first proper Roman road was probably built under the Julio-Claudians.[38] Most of the towns and army camps along the Amber Road had been founded by the end of this dynasty.[39] This is further confirmed by the presence of early imports and settlers from Italy, as well as by the earliest milestone in Roman Pannonia, dated broadly to the 1st century AD.[40] There are some clues in the historical record that the road along the Sava was as old as the Amber Road.[41] This natural corridor was certainly used by the Roman army during

[30] For the hypothetical civilian section of the Amber Road, see, Groh, Sedlmayer 2019.

[31] *It. Ant.* 130, https://topostext.org/work/687; Talbert, Elliott 2010, grids 4A2-4A4, 5A1.

[32] Tino Leleković has also argued recently that Mursa should be seen as a *Limes* town. See Leleković 2024 in this volume.

[33] *ILJug* 3127; *CIL* 03, 10650; *CIL* 03, 10649; after https://edh.ub.uni-heidelberg.de/

[34] Whebell 1969, 4-5.

[35] Legally, the planning and construction of the network of public roads was almost entirely in the domain of the Emperor (Rathmann 2003, 56ff).

[36] The complete corpus of Pannonian milestones is available at https://edh.ub.uni-heidelberg.de/

[37] Cf. Laurence 1999.

[38] Šašel 1975, 74ff.; for the pre-Augustan segment of this road between Aquileia and Nauportus, see Horvat 2019.

[39] Šašel Kos 2010.

[40] Mráv 2013; Gregoratti 2013, *AÉ* 2000, 1195.

[41] Domić-Kunić 2012; Šašel Kos 2013.

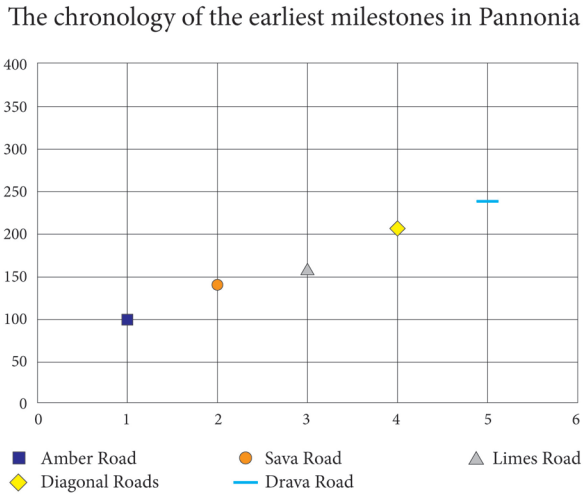

Fig. 4: The chronology of the earliest milestones on the major Pannonian roads; dates are *ante quem*

the conquest of Pannonia, but the urbanization of the Sava Valley was completed only under the Flavians, with the settling of veterans from the Misenian fleet and the founding of the colonies of Siscia and Sirmium.[42] This is corroborated by the earliest milestones found along this road, dated to the reign of Antoninus Pius.[43] The latest of the three interprovincial roads that passed through Roman Pannonia is the *Limes* Road. Although it is known that certain points on this corridor had already been occupied under the Julio-Claudians, most of the forts on the Middle Danube were constructed under Domitian and the *Limes* was established in its final form only after the conquest of Dacia.[44] Indeed, the earliest milestones along the *Limes* Road have been dated to the reign of Marcus Aurelius and certain sections of this road were only paved during the Severan dynasty.[45]

It is possible that some of the branches of the Amber Road pre-date the other two main corridors along the Sava and the Danube. The early dates of some of the forts on the Danube, like Arrabona or the one at Vizivaros near Aquincum, seem to suggest that the diagonal roads between Savaria and Arrabona and Savaria and Aquincum were already active in the 1st century AD.[46] However, the archaeological and epigraphic evidence of these roads is scarce and it does not predate the Severan period. The earliest milestones that can be associated with some of these provincial roads, including the one along the Drava, do not predate the 3rd century.[47] Even if the presumed early dating of the Savaria–Arrabona and Savaria–Aquincum roads is proven correct, it cannot undermine the impression that they were slow to evolve from their initial, miliary function.

Notwithstanding the sluggish pace of urbanization along the provincial roads, the direction in which the road-network was headed is clear (*Fig. 5*). The number of provincial roads grew constantly between the middle of the 1st and the early 4th century AD, improving the connectivity between the interprovincial corridors. By the end of this period, the Pannonian interior was serviced by a dense network of public roads. The Antonine Itinerary alone lists at least ten roads that crossed Pannonian territory, over half of which refer to the Late Roman provincial capitals as terminal points and must post-date the period of the Tetrarchy.[48] Some stations on these roads are referred to as major settlements in the Late Roman itineraries, surely hinting at their urban-like appearance, if not at their formal status.[49] Moreover, many of the inner Pannonian forts, the size and appearance of which certainly qualify them as urban, have been identified with road-stations mentioned in the cartographic sources. These are clear signs of a gradual or delayed transformation of an Urban Corridor into a Central Place Theory pattern, although this possibility cannot be explored without a detailed study of the Late Roman urban system.

THE URBAN CORRIDORS RANKED

The main property of urban corridors is the volume and frequency of traffic.[50] This is the variable used by geographers to compare and rank individual corridors. Obviously, this approach is not applicable to ancient urban systems and it is necessary to turn to the available proxy data. Because this paper is primarily about towns, it makes sense to rank the urban corridors of Pannonia by the number of towns and subordinate central places and the total area of these settlement categories. These data are available and more or less certain. New research will probably modify some of the current size-estimates and perhaps add a few new central places on the map, but it is unlikely to result in radical changes to the known urban map or the distribution of settlement size. More to the point, it stands to reason that the number and size of settlements is positively correlated to the volume of traffic along the corridors that connect them. Of course, this applies only to the extent to which the volume of traffic is dependent on population size. It is not inconceivable that the flow of people and goods between the terminal stations did not bring any real benefit to the rest of the communities along these roads.

[42] Šašel Kos 2010, 219.
[43] *AÉ* 2006, 1031; *CIL* 03, 04616.
[44] Visy (ed.) 2003.
[45] *CIL* 03, 03699; *CIL* 03, 06470, 3.
[46] Gabler 1999; Visy (ed.) 2003.
[47] *CIL* 03, 06465; *CIL* 03, 03720.
[48] For e.g., *It. Ant.* 264; https://topostext.org/work/687
[49] Thus, the Bordeaux Itinerary refers to Iovia, a station on the Drava Road, as a *civitas* (Stewart (trans.) 1887).
[50] Whebell 1969, 14ff.

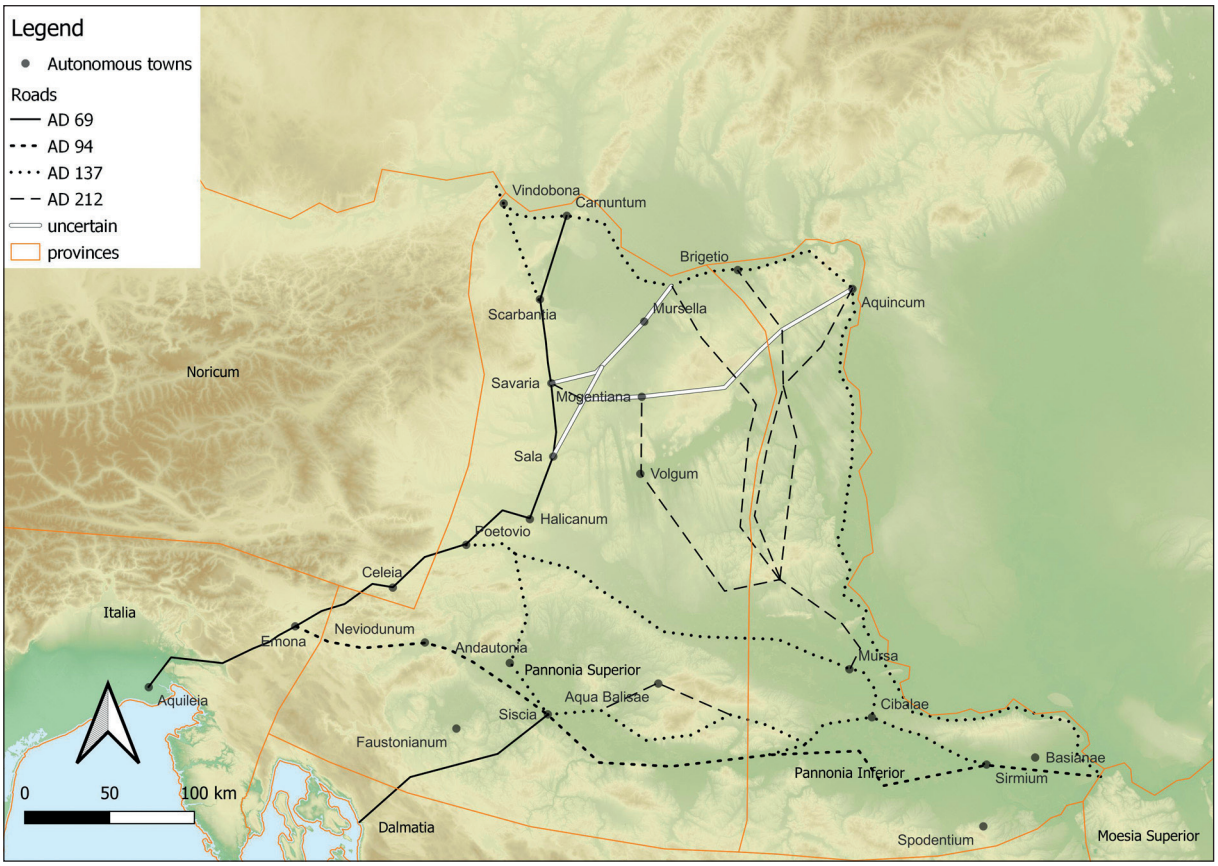

Fig. 5: The chronology of the major Pannonian roads

Corridor	Num. of settlements	Total area (min.)	Total area (max.)	Total length	Intercity distances
The *Limes* Road	41	630 ha	968 ha	662 km	16 km
The Amber Road	13	522 ha	784 ha	448 km	34 km
The Drava Road	5	255 ha	359 ha	357 km	71 km
The Sava Road	14	196 ha	284 ha	514 km	37 km

Tab. 1: Comparison of intercity distances and total settlement area between the urban corridors of Pannonia, High Empire

As mentioned earlier, the sum of the number of towns per corridor is greater than the total number of towns included in this study. This is because crossroad towns, like Mursa, Poetovio or Sirmium are counted twice. Andautonia was a station on the provincial road between Siscia and Poetovio, but because it is located on the right bank of the Sava, it is included among the towns of the Sava Corridor. For similar reasons, the road between Scarbantia and Vindobona is considered a branch of the Amber Road. Following an earlier study, the size-figures listed refer to the minimum and maximum size-estimates for individual settlements.[51] Needless to say, it is impossible to make fair comparisons between corridors unless they have comparable lengths. Although the differences between the lengths of the main Pannonian corridors are relatively small, the number of settlements per corridor is normalized by the corridor length (*Tab. 1*).

Contrary to the predictions of the Urban Corridor model, the corridor with the highest settlement density and the largest total settlement area is not the oldest, but the latest corridor in the Pannonian urban system. With a total of 41 towns and subordinate central places or an urban-like settlement at every 16 km, the *Limes* Road surpasses both the Amber and the Sava Road, by a great margin. Along the Amber Road, the average distance between neighbouring central places is 34 km and along

[51] Donev 2020.

Corridor	Num. of settlements	Increase in size	Decline/ Abandonment	Length	Average intercity distances
The Limes Road	41	0	41	662	16
The Amber Road	12	1	7	448	34
The Sava Road	13	4	1	514	40
Sirmium–Savaria	7	4	0	485	69
Sirmium–Aquincum	6	4	1	376	63

Tab. 2: Comparison of intercity distances and trends in total settlement area between the urban corridors of Pannonia, Late Antiquity

the Sava Road, 37 km, less if Andautonia is excluded. The differences in the total settlement area between the *Limes* and the Sava Roads are of a similar magnitude. However, it must be noted that the Amber Road does not lag too far behind the *Limes* Road with respect to the total settlement area. Although the number of central places on the Amber Road is only one third of the number of central places on the *Limes* Road, the sum of their built-up areas amounts to over 80% of the total settlement area along the latter. In other words, the central places along the Amber Road were on average much larger than the central places along the other two corridors. The average size of the Amber Road towns is 40 ha, whereas for the towns on the *Limes* and the Sava Road, it ranges between 15 and 20 ha. This comparison reveals an important difference in structure between the corridors, which is the topic of the last section of this paper. For the moment, it suffices to point out that the *Limes* Road holds the primacy in total settlement area only thanks to the very large size of the four double-towns on the northern Pannonian frontier. Vindobona, Carnuntum, Brigetio and Aquincum comprise more than half of the total settlement area on the Pannonian *Limes*.

Whereas the Amber Road did retain some degree of preeminence in the Pannonian urban system, the same cannot be said of the second oldest corridor in Pannonia, the Sava Road. It lags far behind the other two corridors, both in settlement density and total settlement area. In fact, the urban properties of the Sava Road, the average intercity distances and the total settlement area, are comparable or even inferior to those of the major provincial roads, the Lower Drava Road or the Transdanubian Diagonal Road between Savaria and Aquincum. These comparisons are not entirely straightforward, because the terminal points of the provincial roads belong primarily to the interprovincial corridors, but they do point to a significant deviation from the prediction of the Urban Corridor model. In the eyes of historians and geographers, both ancient and modern, the Sava was one of the most important lines of communication, not only in Pannonia, but in the wider region of Southeast Europe.[52] Nonetheless, this was hardly reflected in the urban geography of the Sava Valley. With the exception of a few towns located towards the ends of this corridor, most of the Sava Valley lacked any recognizable central place.

Burghardt was right to observe a reorientation of the main axis of the Pannonian urban system at the beginning of the 2nd century AD, but he was mistaken about the reasons for this shift. The *Limes* Road surpassed the Amber Road not because of the intensified trade with the Alpine provinces and eastern Gaul, but because of the privileged position of the military sector in Pannonian society and in the political economy of the Roman Empire in general.[53] Nearly all of the central places on the *Limes* Road were garrison settlements, constructed by and for the Roman army. They were certainly not an outgrowth of the wealth accumulated through the supposed trade with the western provinces. If anything, the study of this trade relationship has pointed out that the army camps on the Middle Danube were primarily consumers.[54] The large legionary towns and the numerous auxiliary *vici* were the product of direct state intervention, motivated primarily by political and strategic considerations. Understandably, the system of army camps and civilian settlements that comprise the *Limes* could only be sustained and kept operational by securing constant supplies of pay, food and equipment for the army. The high connectivity of the Danube was doubtless a very important precondition for the successful functioning of the *Limes*, but it should not be seen as the most decisive factor of growth.[55]

Comparative data for the size of the Pannonian central places in Late Antiquity have not been compiled. However, as noted earlier, there are numerous indicators that the provincial urban system underwent a profound transformation after the 3rd century crisis. There are not too many changes in the number of settlements per corridor (*Tab. 2*). The intercity distances on the provincial roads are still greater than on the main corridors, although the number of new foundations in the interior is probably underestimated by the decision

[52] See, for e.g., Fodorean 2017.

[53] Cf. Mócsy 1974, 226.

[54] Fitz 1980, 323; Kelemen 1993.

[55] Whittaker 1994; for the Alpine provinces in particular, see, Pazmany 2019.

to include the inner Pannonian fortifications and some other road-side settlements in the 3rd century map of urban sites. Far more dramatic are the changes in settlement-size which, because of the lack of concrete size-estimates, are difficult to illustrate. *Tab. 2* compares the number of sites per urban corridor which were newly founded or grew in size to the number of sites which show evidence of abandonment or reduction of the built-up area. Although imprecise, this indicator clearly reveals the direction and the scope of the transformation of the urban system. Excluding the newly-founded 4th century military fortifications on the Danube, the old network of legionary towns and auxiliary *vici* entered a period of a complete and irreversible decline. Precise figures are lacking, but the general consensus is that the civilian parts of nearly all garrison settlements on the Danube were abandoned and the population retreated behind the walls of the forts.[56] This implies that the *Limes* Corridor saw a contraction of the total urban area by at least 70%. The Amber Road fared only slightly better. General decline or a reduction of the built-up area has been evidenced at over half of the urban and urban-like settlements. In addition to Carnuntum and Vindobona, which also belonged to the *Limes* Corridor, the built-up area of Poetovio shrank by at least 50%.[57]

The opposite trend prevailed in the Sava Corridor and along the provincial roads. Nearly one-third of the settlements in the least urbanized of the three Pannonian urban corridors grew in size in the period of the Tetrarchy and under the Constantinian dynasty. This percentage is even higher along some of the provincial roads, like those between Sirmium and Aquincum and Sirmium and Savaria. Overall, almost three-quarters of the settlements which expanded during this period are located in the interior of the province, off the main corridors. It should be underlined that this figure does not account for the new category of fortified hilltop-settlements, at least some of which could have performed central place functions.[58]

It is unfortunate that we lack concrete size-estimates to grasp the scale of these changes. The severity of the urban contraction on the Danube seems to suggest an overall urban decline. It is unlikely that this trend was offset by the growth of towns in the interior. None of the inner Pannonian fortifications were larger than 20 ha.[59] Thus, nearly all of these sites can be fitted into a single canabae settlement on the Danube. It is also uncertain if the Sava Corridor really took over the primacy among the urban corridors of Pannonia. With the exception of Sirmium, one of the new imperial capitals and the likely cause of the short-lived growth along the Sava, the other expanding settlements on this corridor were road-stations, which did not achieve a formal urban status and could not have rivaled in size the older towns. However, this observation cannot undermine the significance of the changes in the urban geography. By the early-4th century AD, the Urban Corridor model had been replaced by a two-dimensional pattern of sparse, but regularly spaced central places across the Pannonian interior.

EVIDENCE OF STRUCTURE ALONG THE CORRIDORS

As argued at the beginning of this paper, both theoretical considerations and empirical studies have demonstrated that Central Place Theory can apply to linear systems of towns. This fit cannot be examined as thoroughly as in studies of more recent urban systems, because the available data are not adequate to reconstruct the hierarchy of central places.[60] The only functional distinction that can be readily made is that between autonomous towns and subordinate central places.[61] Settlement size can also be used to group the central places into different ranks, but not without risks. In general, settlement-size should be positively correlated to functional size, but in the absence of the means to measure functional size or centrality independently, this correlation can only be assumed. No less problematic is the positive correlation between formal status and settlement-size.[62] In short, settlement-size is neither an independent variable nor is it entirely determined by settlement function. Therefore, it is best used alongside other variables directly linked to function. In this study, it will be used in conjunction with evidence of higher-order, administrative or religious functions. This results in a three-pronged hierarchy of settlements, consisting of major centres of administration, autonomous towns and subordinate central places. The chronological focus of the analysis is the period of the Severan dynasty.

The spacing of autonomous towns along the Amber Road is surprisingly regular (*Fig. 6*). Especially in the flat sections of this road in Transdanubia, autonomous towns appear at every 50 km. There are a few deviations from this pattern, but these can either be related to local geographic circumstances or to the dynamics of the urban system unaccounted for in the static pattern. The greater intercity distances in the southern segment of this corridor are obviously related to the mountainous terrain. These gaps more or less coincide with the pass over the Julian Alps and the border of Italy, between Emona and Celeia.[63] On the other hand, the overlaps

[56] Láng 2018.

[57] Horvat et al. 2003.

[58] See, for e.g., Modrijan 2020.

[59] Moreover, many scholars would disagree that these were civilian settlements in the first place (Visy 2018).

[60] Cf. Bekker-Nielsen 2020.

[61] Cf. Hodder, Hassal 1971.

[62] Donev 2020, 279ff.

[63] Šašel Kos 2002.

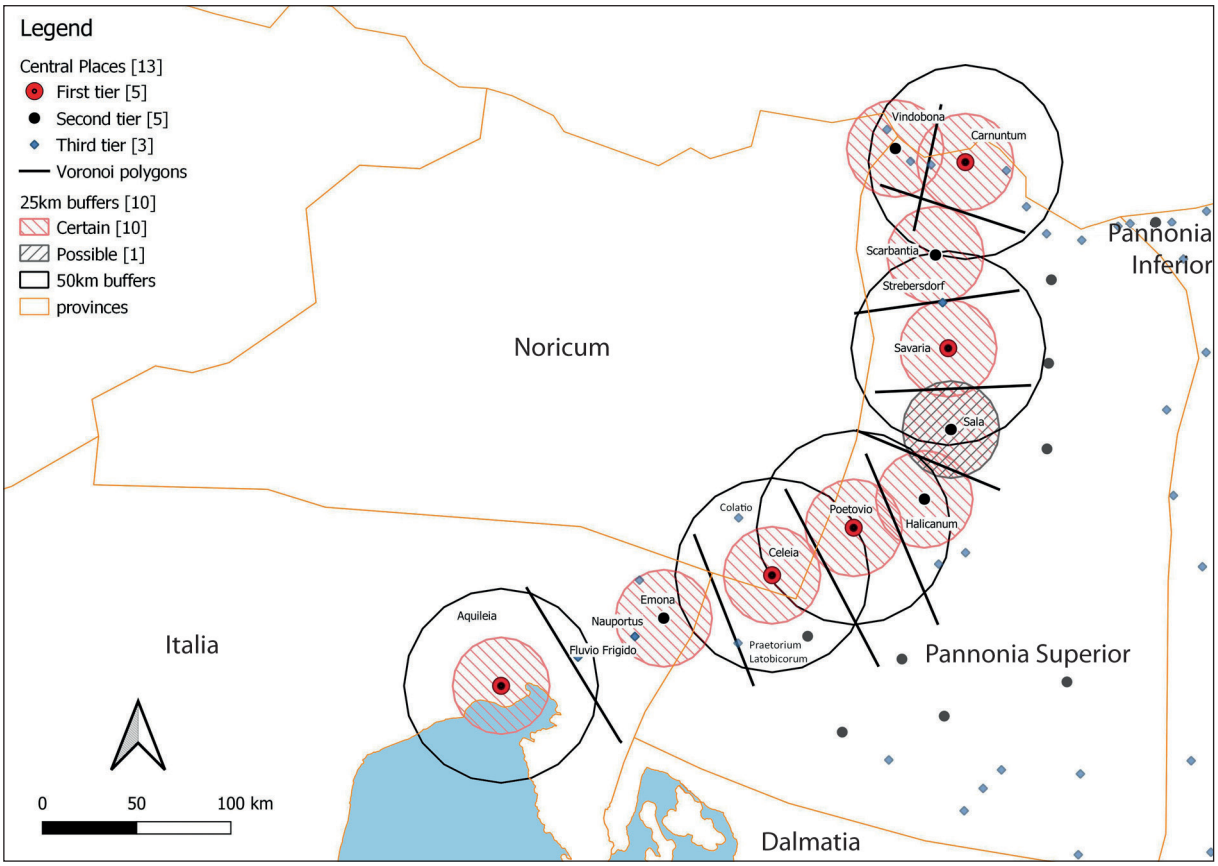

Fig. 6: The distribution of central places by hierarchical tiers on the Amber Road

between the notional urban territories in the Transdanubian section of the road are better attributed to poor synchronization than to increased urban density. Vindobona was granted an autonomy only towards the end of the period under consideration, whereas Sala was practically abandoned after the Marcomannic wars, although it is unclear if its autonomy had been promptly revoked.[64]

Even more significant is the distribution of the third-tier settlements or the subordinate central places. Almost all of these sites appear roughly halfway between two neighbouring towns. In fact, in the territories of Carnuntum and Vindobona along the *Limes* Corridor, third-tier settlements appear both halfway between two neighbouring towns and at roughly one-quarter of the intercity distances. This pattern continues along some of the roads that branch out from the corridor, with the roadside settlement Colatio located just outside the 25km-buffer around Celeia and Praetorium Latobicorum, located halfway between Emona and Neviodunum. The only exception is Fluvio Frigido, but it was shown that this settlement belongs to a mountainous zone characterized by greater intercity distances. In fact, Fluvio Frigido is not an exception because it is also located roughly halfway between Emona and Aquileia. Fluvio Frigido was one of the largest roadside settlements along the Amber Road, rivaling some of the small *municipia* in Transdanubia, like Sala or Halicanum.[65] It should not be excluded that the exceptional growth of this station was largely due to the empty niche between Emona and Aquileia, but the mountainous terrain prevented it from evolving into an official town.

The regular spacing of settlements of the same rank continues into the highest reaches of the urban hierarchy. Half of the autonomous towns on the Amber Road performed some higher-order economic or administrative function on a provincial or regional level. These are Aquileia, the main entrepot of the Adriatic, Celeia, possibly the Norican capital during the 1st century AD with evidence of a continued presence of the governor's staff, Poetovio the seat of the financial procurator and the Illyrian customs office, Savaria, the seat of the provincial council and Carnuntum, the capital of Pannonia Superior.[66] All of these towns have built-up areas greater

[64] Vindobona: Mader 2004; Sala: Redő 2003.

[65] Žerjal, Tratnik 2020.

[66] These data are synthesized in the relevant contributions in Šašel Kos, Scherrer (eds.) 2002–2004; Aquileia: Pavan 1987.

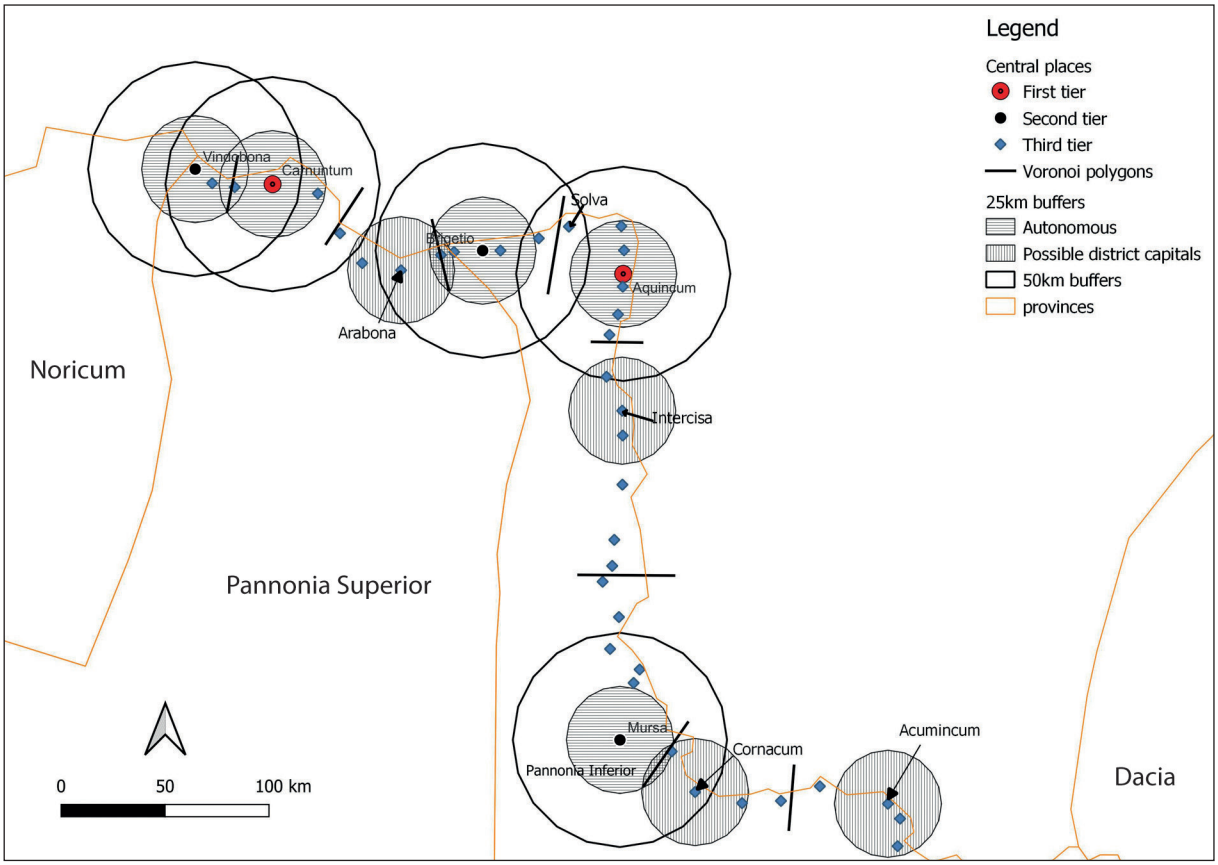

Fig. 7: The distribution of central places by hierarchical tiers on the *Limes* Road

than 50 ha and, at least in the Transdanubian section of the Amber Road, appear consistently at every 100 km. The distance between Poetovio and Celeia is too short, but this can either be related to the move of the provincial seat to Virunum in the 2nd century AD or to the provincial borders between Pannonia and Noricum. Far more important is the observation that the 25km-buffers drawn around the autonomous towns nest comfortably within the 50km-buffer around the major provincial centres. Excluding the mountainous area of the Julian Alps, ordinary autonomous towns appear consistently halfway between two first-tier centres and subordinate central places at one-quarter of this distance.

This analysis failed to reveal any intelligible patterns in the distribution of central places along the other Pannonian corridors. The *Limes* Road, which boasts the most complete data-set has too few first- and second-order settlements (*Fig. 7*). Moreover, these are not distributed evenly. All four autonomous towns on the Pannonian *Limes* are located close to or on the northern frontier and, here, they are distributed in closely spaced pairs, separated by long, under-urbanized stretches. Even if the second tier of the hierarchy is broadened to include Mursa and the auxiliary forts that possibly functioned as administrative centres of some of the Pannonian *civitates*, the ensuing pattern does not become any more regular.[67] Now, there is a considerable overlap between these centres in the north, whereas the eastern Pannonian *Limes* is poorly serviced. Only the third-tier settlements in this corridor conform to the predictions of Central Place Theory. Like on the Amber Road, they tend to appear close to the edges of the 25km-buffers and at halfway between these points and the autonomous towns. Obviously, this frame would have been ideally suited to provide effective market coverage along the entire *Limes* Road. With average intercity distances of 16 km, all inhabitants of this corridor would have been within a two-hours walk from the nearest *vicus*. However, because of the military character of the *Limes* Corridor, it is likely that the regular spacing of the auxiliary *vici* had more to do with logistical and strategic considerations than with the need to secure a dense web of markets for the farming communities along the Danube. The main reason for this regular spacing of military outposts would have been the need to ensure that each military fort on the *Limes* was reachable from the nearest camp within a day's march.

[67] Donev 2020, 218.

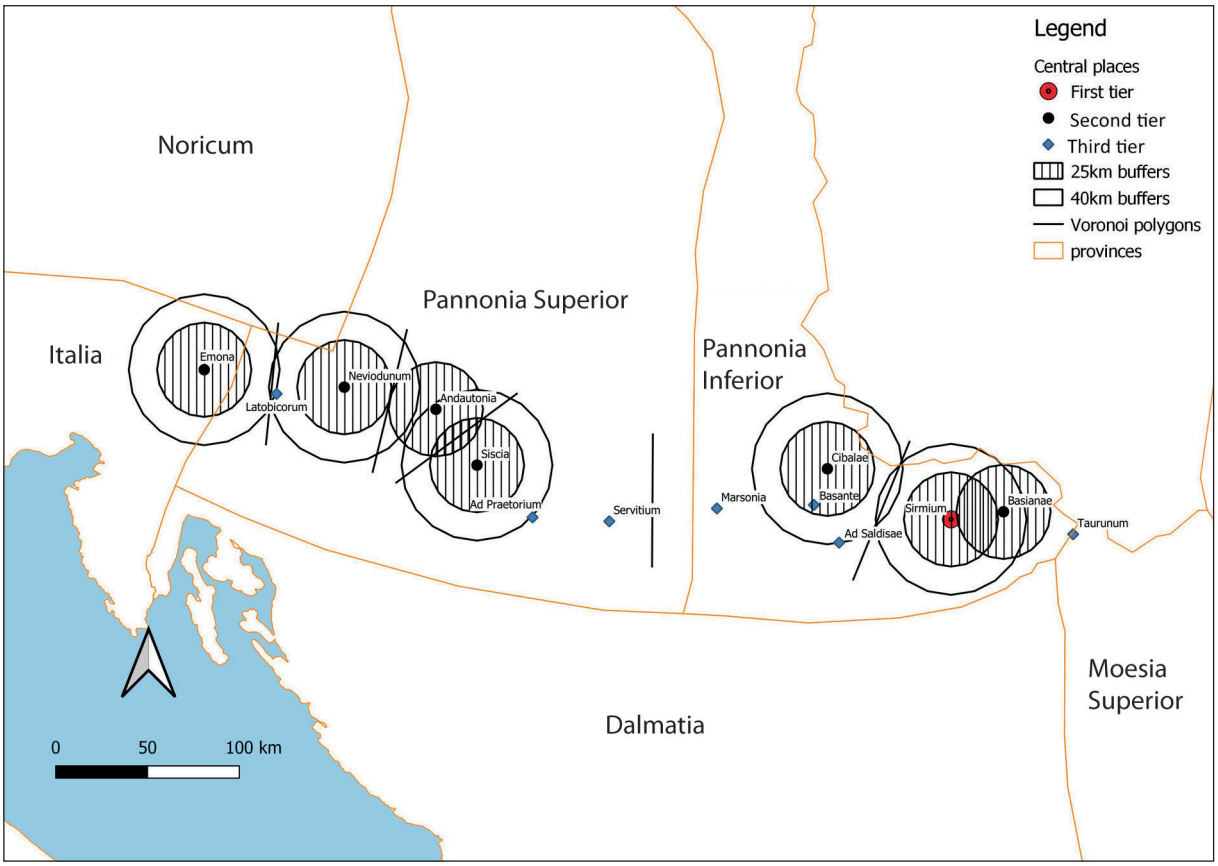

Fig. 8: The distribution of central places by hierarchical tiers on the Sava Road

Urban geography and spatial patterns in general can only tell that much. To understand the extent to which this system was put to civilian and commercial use, it is necessary to look at other aspects of the archaeology of the frontier zone. Yet, it cannot be denied that the local communities along most of the Pannonian *Limes* would have enjoyed a very limited access to higher-order goods and services, chiefly through the local markets at the nearest auxiliary *vicus*.

On the surface, the distribution of size and autonomous status is equally irregular along the Sava, and this cannot be attributed solely to the lack of data for the third-tier settlements (*Fig. 8*). None of the towns on the Sava can be qualified as first-tier settlements. The two colonies, Siscia and Sirmium, are significantly larger than the rest of the central places along this corridor and both became provincial capitals in Late Antiquity, but the distribution of the second- and third-tier centres within their vast notional territories does not show any clear signs of patterning. Of the seven autonomous towns that belonged to this corridor, including Andautonia, four are located in the 160 km-long stretch in the Middle Sava Valley and the other three are in the Lower Sava, at the eastern end of this corridor. The result is clustering in the terminal segments of the corridor and a 200 km-long empty stretch between Siscia and Cibalae.

But, if Andautonia is excluded from this corridor, which would not be entirely justified, the distances between the second-tier centres evens out at 40 km. Furthermore, the few archaeologically confirmed subordinate centres are all located halfway between two second-tier centres. In this scenario, Andautonia, located close to the intersection of the 40km-buffers around Siscia and Neviodunum, behaves like a third-tier settlement.[68] Similarly, Bassianae, possibly the last autonomous town founded in this corridor, falls just outside the 25km-buffer around Sirmium, which had evolved into a first-tier settlement by Late Antiquity. Outside the Sava Corridor, this pattern continues and even grows slightly more complex. In addition to the group of third-tier settlements located 40 km from the autonomous towns, there emerges an inner ring of settlements at a distance of 25 km from the autonomous towns. It should be observed however, that these con-

[68] In no way is this reflected in the archaeological or historical record. If anything, Andautonia was larger than the neighbouring municipium Neviodunum; Cf. Nemeth-Ehrlich, Kušan- Špalj 2003, and Lovenjak 2003.

centric patterns can be followed only along the terminal sections of the Sava Road, close to the junctions with the Amber and the *Limes* Road, and they can easily result from the overlap of two different patterns.

Be this as it may, the gap in the middle segment of the Sava Corridor is impossible to fit into this scheme. A major third-tier settlement roughly at the border between the two Pannonias would have salvaged this 40km-module, but the known sites in this area barely qualify as third-tier settlements. Interestingly, the Sava would have been navigable for larger vessels only downstream from Siscia.[69] This is repeated in the Lower Drava Valley, where downstream from the point at which the river becomes navigable – occupied by Poetovio – there are neither autonomous towns nor any recognizable subordinate central places. A possible explanation can be sought in the changed transport medium for bulk goods. The river transport would have effectively shortened travel-time in the lower courses of these rivers. Once loaded with goods at Siscia and Poetovio, it would have been unnecessary to make any further stops until the final destinations, Sirmium and Mursa. This arrangement might have been functional for bulk transport, but it would have been entirely inadequate for the provision of local market services. Others have pointed to the unfavorable hydrologic conditions in the Lower Sava Valley, and in particular, the extensive marshland on the left bank of the river.[70] The hypothetical central places servicing the small population of this area would have lacked the capacity to grow and differentiate from the ordinary rural settlements. Yet, archaeologically recognizable central places can neither be found on the taller, right bank of the Sava nor along the northern Sava Road, at a safe distance from the river marshes. But the third and the most straightforward explanation seems the likeliest: like the *Limes* Road, the primary purpose of the Sava Road was freight and army transport. Only along certain sections were these corridors incorporated into the local system of towns and markets. It is no accident that, until the end of Antiquity, both rivers were patrolled by the Roman fleets.[71]

CONCLUSIONS

The basic properties of the urban geography of Roman Pannonia prior to the third-century crisis bear all the defining marks of the Urban Corridor model. Almost 80% of all archaeologically recognizable central places were located on the three corridors that traversed the periphery of united Pannonia. Although extreme, this urban geography is not without parallels and has a very rational explanation.[72] The three principal corridors connected the province to Italy and the rest of the Roman Empire and Barbaricum, and offered the safest and fastest routes of travel for soldiers, state-officials and merchants. All novel goods and ideas would have entered the Pannonian provinces by one of these corridors and the strength of these impulses would have receded with growing distance from the corridors. Seen from Rome, the creator of this urban system, the Pannonian provinces were little more than a transit area to the Danube. This goes a long way towards explaining why all three urban corridors extended along the periphery of Pannonia, skirting the Pannonian heartland. Pannonia was not exceptionally rich in precious natural resources or raw-materials of interest to the Roman state. The main assets of this province were its large standing armies, its proximity to Italy and the strategic importance of the Pannonian sector of the Danube *Limes*. This subsidiary role in the economic geography of the Roman Empire was duly reflected in the urban geography of Pannonia. The main purpose of the earliest two corridors was to link Italy to the Danube frontier, which quickly grew into a third urban corridor and surpassed the other two. This system was designed to channel a two-way traffic, with supplies flowing from Rome to the frontier and taxes and the occasional spoils of war in the opposite direction. It would have provided the communities along these corridors with the opportunity to take part in these transactions, either as producers or, more likely, mediators and transporters, but it would have had little to offer to the rest of the provincial population. This was not the optimal arrangement for the efficient exploitation of natural riches or the syphoning off of surplus production. The so-called dendritic urban systems, encountered in Early Modern colonial contexts, but also in Roman Dalmatia, would have been much better placed to secure these goals than the Urban Corridor model.[73]

The overview of the dates of road-construction and town-foundation has demonstrated that this extremely linear urban system was gradually evolving into a two-dimensional pattern of central places of variable rank, as predicted by Central Place Theory. The ever-growing number of side-roads or branches of the main corridors slowly paved the way to the urbanization of the Pannonian interior. By the early 4th century, at least two new corridors had emerged in Transdanubia, along the Sopiana–Aquincum and the Raba Road. Thus, the gap between the Amber Road and the eastern Pannonian frontier was closed and along all axes, the intercity distances fell below 70 km. This must have diminished the

[69] Leleković 2021.

[70] Bojanovski 1984; Leleković 2021, 265-270.

[71] Visy (ed.) 2003; Radman-Livaja 2012.

[72] Cf. the case of Roman Dacia, where almost 90% of the autonomous towns were located on the Dierna-Porolissum road (Fodorean 2013).

[73] Smith (ed.) 1976.

preeminence of at least some of the earlier corridors, but these trends are easily overlooked in the general image of urban decline.

The uncertain chronology and status of many of the Late Roman settlements in the interior of Pannonia prevent us from observing the details of this new pattern and its dynamics. However, the known historical developments seem to associate the final demise of the Urban Corridor model in Pannonia with the military reforms of the late 3rd century and the transfer of the military and administration from the Danube *Limes* to the interior of the province.[74] Once the main centre of gravity in the system was removed, the integral urban geography of this province was bound to change. This is further supported by the measures taken by the government to boost agricultural production in Late Roman Pannonia and the scattered written evidence of Pannonian exports to Italy and the East.[75] Both increased local production and an export-oriented economy would have required a web of towns and markets far more intricate than that provided by the urban corridors. But at the present state of knowledge, it is impossible to declare categorically if this transformation was programmatically implemented by the emperors at the time of the Tetrarchy and Constantine's dynasty or if it was the conclusion of a process that had been already under way.

Urban growth did not progress at the same pace along the individual urban corridors in Roman Pannonia. Contrary to the propositions of the Urban Corridor model, the highest urban density and the largest total settlement area were observed along the latest, not along the earliest corridors in the Pannonian urban system. Within half a century after its establishment, the Danube frontier, the primary objective during the conquest of Pannonia, had become the largest and most important urban corridor in the Pannonian provinces. This is no doubt a major deviation from the urban corridor model. Not only were the infrastructure and the other amenities available along the early corridors avoided, but urbanization was concentrated along the political and cultural frontier of the system. Obviously, this would have been inconceivable without the direct intervention of Rome. The garrison settlements on the Danube were the product of a military strategy. They were not rooted in the demographic or economic realities of the frontier zone. The principle reason for their regular spacing was to ensure the security of individual bases and the control of traffic across and along the frontier. In theory, this network could have provided a complete market coverage of the areas that gravitated towards the *Limes*, but this would have been a secondary development and, at best, a hypothetical one. As shown in this study, most of the communities along the eastern Pannonian frontier did not have a direct access to higher-order goods and services. Similarly, the size of the settlements on the *Limes* was entirely dependent on the size of the military contingents garrisoned nearby. It would be wrong to argue that there was no room for differential growth among these settlements. Future, in-depth studies of the auxiliary *vici* could very well bring to light evidence of differentiation in size and function, and greater regularity in the distribution of the central places along the Danube, but it would be pointless to search for an economic or administrative rationale behind the settlement patterns along the *Limes* Road.[76]

Although the Amber Corridor had much fewer central places and a smaller total urban area than the *Limes* Road, it was arguably the most urbanized of all three Pannonian corridors. It boasted the highest number of autonomous towns and the average size of these towns was much greater than the average size of the towns in the other two corridors. Almost the entire civilian administration of Roman Pannonia was based in the major towns on the Amber Road, and trade and, to a lesser extent, local production are well-attested.[77] The true urban nature of this corridor is most evident in the regular spacing of central places of various rank. The Amber Road is the only segment of the Pannonian urban system in which it is possible to observe settlement patterns that comply with Central Place Theory. This structure can neither be attributed to chance nor to deliberate interventions by the central or provincial government and it must be read as a reflection of the prevailing demographic and economic conditions along this corridor. Surely, the Amber Road was of great strategic importance for Rome, but by and in itself, this would not have necessarily led to such regular patterning of settlement rank. The factors that generated this pattern must be sought in the relatively even distribution of wealth and population and the high degree of economic integration, both within and between urban territories. It can be predicted that the Amber Road would have retained its absolute primacy in the urban system of Roman Pannonia had the Romans pushed their frontier beyond the Danube.

From a strategic point of view, the Sava Road was of no lesser importance than the Amber Road. It too provided a direct link between Italy and the Danube *Limes* and, in view of the navigability of the Sava, a more convenient one than the Amber Road. Nevertheless, throughout the period in question, the Sava Road lagged far behind the other two Pannonian corridors. In fact, in terms of intercity distances and total settlement area, the urban corridor along the Sava did not differ greatly from the minor provincial roads. It was possible to observe a poorly articulated pattern

[74] Mócsy 1974, 266ff; Poulter (ed.) 2007.

[75] Mócsy 1974, 297ff.

[76] Cf. the case of Germania Inferior (Kunow 1988).

[77] Trading families: Šašel 1987; Gregoratti 2013; local production: Horvat et al. 2003, 180–181 (Poetovio); Lazar 2008 (Celeia); Scherrer 2003, Varga 2009 (Savaria).

of distribution of differently ranked settlements, but only along certain sections of this corridor and not without modifications to the original data set. Whereas the *Limes* Road was densely populated by seemingly undifferentiated garrison settlements, long sections along the Sava and the provincial roads lack sites that can be identified as central places. The road-stations known from the Late Antique itineraries have so far proven impossible to identify in the field. These gaps in the settlement system along the Sava and in the interior of the province are too wide to be attributed to specific environmental factors or to the lack of field research. Sometimes the absence of evidence is best taken for what it is. Neither were conditions in this area favorable for its full integration into the provincial urban system nor was the government particularly interested in investing in the colonization of the Pannonian heartland prior to Late Antiquity.

Abbreviations and online resources

AÉ = L'Année Epigraphique. Revue de publications épigraphiques relatives à l'Antiquité romaine, Paris.

CIL = Corpus inscriptionum Latinarum.

ILJug = Šašel, A., J. Šašel (eds.) (1963, 1978, 1986). *Inscriptiones Latinae in Iugoslavia repertae*. I–III, Ljubljana.

EDH = Epigraphische Datenbank Heidelberg (Service provider: Heidelberger Akademie der Wissenschaften). https://edh.ub.uni-heidelberg.de/ [last accessed 22. 02. 2023].

It. Ant. = Itinerarium Antonini Augusti (https://topostext.org/work/687)

ORBIS = *The Stanford Geospatial Network Model of the Roman World* (Service provider: Stanford University). https://orbis.stanford.edu [last accessed 22. 02. 2023].

BEKKER-NIELSEN, T. 2020, The Roman city as a central place. – In: Mæhle, I.B., P.B. Ravnå, E.H. Seland (eds.) *Methods and models in ancient history. Essays in honor of Jørgen Christian Meyer*, 81–97, Athens.

BOJANOVSKI, I. 1984, Prilozi za topografiju rimskih i predrimskih komunikacija i naselja u rimskoj provinciji Dalmaciji (s posebnim obzirom na područje Bosne i Hercegovine) IV. – Rimska cesta Siscia–Sirmium (Tab. Peut.) i njena topografija. Arheološko-topografska studija (Die Römerstraße Siscia – Sirmium (Tab. Peut.) und ihre Topographie (Eine archäologisch-topographische Studie). – *Godišnjak* XXII, *Centar za balkanološka ispitivanja, knjiga 20*, 145–265.

BÖDŐCS, A. 2008, *A Study of the Roman Road Network in Hungary, using GIS / A római kori úthálózat térinformatikai vizsgálata a mai Magyarország területén*. – PhD thesis, Eötvös Loránd University, Budapest.

BURGHARDT, A.F. 1979, The origin of the road and city network of Roman Pannonia. – *Journal of Historical Geography* 5/1, 1–20.

DOMIĆ-KUNIĆ A. 2012, Literary sources before the Marcomannic Wars. – In: Migotti, B. (ed.) 2012, 29–69.

DONEV, D. 2020, *The Busy Periphery: Urban Systems of the Balkan and Danube Provinces (2nd–3rd c. AD)*. – Oxford.

FITZ, J. 1980, Economic life. – In: Lengyel, A., G.T.B. Radan (eds.)1980, 323–335.

FODOREAN, F. 2013, *The topography and the landscape of Roman Dacia*. – BAR International Series 2501, Oxford.

FODOREAN, F. 2017, Praetorium and the Emona–Siscia–Sirmium–Tauruno road in the ancient geographical and epigraphic sources (Praetorium in cesta Emona–Siscia–Sirmium–Tauruno v antičnih geografskih in epigrafskih virih). – *Arheološki vestnik* 68, 337–348.

GABLER, D. 1978, Die Sigillaten von Pffafenhofen in Pannonien. – *Acta Archaeologica Academiae Scientiarum Hungaricae* 30/1–2, 77–147.

GABLER, D. 1999, The Flavian Limes in the Danube-bend (eastern Pannonia). – *Communicationes Archaeologicae Hungariae* 1999, 75–86.

GABLER, D. 2003, Rural settlements in Pannonia. – In: Visy, Z., *Hungarian Archaeology at the Turn of the Millenium*, Budapest, 241–243.

GRAČANIN, H. 2010, Rimske prometnice i komunikacije u kasnoantičkoj južnoj Panoniji. – *Scrinia Slavonica* 10/1, 9–69.

GREGORATTI, L. 2013, North Italic settlers along the "Amber Route". – *Studia Antiqua et Archaeologia* XIX, 133–153.

GROH, S. 2009, Neues zur Urbanistik des Munizipiums Andautonia-Šćitarjevo (Pannonia Superior, Kroatien): Auswertung und archäologisch-historische Interpretation der geophysikalischen Messungen 2012 / Novosti u urbanizmu municipija Andautonije-Šćitarjevo (Gornja Panonija, Hrvatska): analiza i arheološko-povijesna interpretacija geofizičkih mjerenja iz 2012. godine. – *Vjestnik Arheološkog muzeja u Zagrebu* 46/1, 89–113.

GROH, S., H. SEDLMAYER, 2019, Via publica vel militaris: Die Bernsteinstraße in spätantoninischer und severischer Zeit. – In: Kolb, A. (ed.) *Roman Roads. New evidence-new perspectives*, 191–214, Berlin/Boston.

HEINRICH-TAMÁSKA, O. (ed.) 2011, *Keszthely-Fenékpuszta im Kontext spätantiker Kontinuitätsforschung zwischen Noricum und Moesia*. – Castellum Pannonicum Pelsonense 2.

HODDER, I., M. HASSAL 1971, The non-random spacing of Romano-British walled towns. – *Man* 6/3, 391–407.

HORVAT, J. 1999, Roman Provincial Archaeology in Slovenia Following the year 1965: Settlement and Small Finds / Rimska provincialna arheologija v Sloveniji po letu 1965: poselitvena slika in drobna materialna kultura. – *Arheološki vestnik* 50, 215–257.

HORVAT, J. 2019, Roman road network and secondary settlements in the hinterland of Caput Adriae. – In: Fioriello, C.S., F. Tassaux (eds.) *I paesaggi costieri dell'Adriatico tra Antichità e Altomedioevo*, 75–99, Bordeaux.

HORVAT et al. 2003 = Horvat, J., M. Lovenjak, A. Dolenc Vičić, M. Lubšina-Tušek, M. Tomanič-Jevremov, Z. Šubic 2003, Poetovio, development and topography. – In: Šašel Kos, M., P. Scherrer (eds.) 2003, 153–189.

HORVAT et al. 2020 = Horvat, J., I. Lazar, A. Gaspari (eds.) 2020, *Manjša rimska naselja na slovenskem prostoru / Minor Roman Settlements in Slovenia*. – Opera Instituti Archaeologici Sloveniae 40.

KELEMEN, M. 1993, Roman amphorae in Pannonia IV. – *Acta Archaeologica Academiae Scientiarum Hungaricae* 45, 45–73.

KING, L.J. 1985, (Reprint 2020), *Central Place Theory*. – Charleston.

KOVÁCS, P. 1999, Civitas Eraviscorum. – *Antaeus* 24, 278–295.

KUNOW, J. 1988, Zentrale Orte in der Germania inferior. – *Archäologisches Korrespondenzblatt* 18, 55–67.

LAURENCE, R. 1999, *The Roads of Roman Italy. Mobility and Cultural Change*. – London.

LAZAR, I. 2008, New evidence about glass production in *Celeia (Noricum)*. – *Zeitschrift für Schweizerische Archäologie und Kunstgeschichte* 65, 137–140.

LÁNG, O. 2018, Is that really the end, or what happened in the civil town of Aquincum in the 4th century AD? – *Acta Archaeologica Academiae Scientiarum Hungaricae* 69, 143–168.

LELEKOVIĆ, T. 2021, Regionalism in southern Pannonia. – In: Mitthof, F., C. Cenati, L. Zerbini (eds.) *AD RIPAM FLUMINIS DANUVI*, Papers of the 3rd International Conference on the Roman Danubian Provinces, Vienna 11t-14th November, 2015, Wien, 251–278.

LELEKOVIĆ, T. 2024, Aelia Mursa Reimagined: A Comprehensive Study of Urban Evolution Through Archaeological Insights. – In: J. Horvat, St. Groh, K. Strobel, M. Belak (eds.) 2024, *Roman urban landscape. Towns and minor settlements from Aquileia to the Danube,* Opera Instituti Archaeologici Sloveniae 47, 2024, 471–502. (doi: https://doi.org/10.3986/9789610508281_24)

LENGYEL, A., G.T.B. RADAN (eds.) 1980, *The Archaeology of Roman Pannonia*. – Budapest.

LOVENJAK, M. 2003, Municipium Flavium Latobicorum Neviodunum. – In: Šašel Kos, M., P. Scherrer (eds.) 2003, 93–105.

MADER, I. 2004, Vindobona, die zivile Siedlung. – In: Šašel Kos, M., P. Scherrer (eds.) 2004, 67–74.

MIGOTTI, B. (ed.) 2012, *The Archaeology of Roman Southern Pannonia: The State of Research and Selected Problems in the Croatian Part of the Roman Province of Pannonia*. – BAR International Series 2393.

MODRIJAN, Z. 2020, Ančnikovo Gradišče. – In: Horvat et al. (eds.) 2020, 349–362.

MÓCSY, A. 1974, *Pannonia and Upper Moesia. A history of the Middle Danube Provinces of the Roman Empire*. – London.

MRÁV, Z. 2013, The Roman army along the Amber Road between Poetovio and Carnuntum in the 1st century AD – archaeological evidence. – *Communicationes Archaeologicae Hungariae* 2010–2013, 49–100.

NEMETH-EHRLICH, D., D. KUŠANJ ŠPALJ 2003, Andautonia. – In: Šašel Kos, M., P. Scherrer (eds.) 2003, 107–129.

OTTOMÁNYI, K. 2005, Die Grabungen in der spätlatènezeitlich-römischen Siedlung von Budaörs. – *Acta Archaeologica Academiae Scientiarum Hungaricae* 56/1–3, 67–131.

PAVAN, M. 1987, Aquileia, città di frontiera. – *Antichità Altoadriatiche* 29/1, 17–55.

PAZMANY, K. 2019, *Between mountains and frontiers: the Roman settlement system in the provinces of Germania Superior, Raetia and Noricum*. – Unpublished PhD thesis, Leiden.

PORTUGALI, J. 1984, Location theory in Geography and Archaeology. – *Geography Research Forum* 7, 43–60.

POULTER, A.G. (ed.) 2007, *The Transition to Late Antiquity, on the Danube and Beyond*. – Proceedings of the British Academy 141.

RADMAN-LIVAJA, I. 2012, The Roman Army. – In: Migotti, B. (ed.) 2012, 159–189.

RATHMANN, M. 2003, *Untersuchungen zu den Reichsstrassen in den westlichen Provinzen des Imperium Romanum*. – Mainz.

REDŐ, F. 2003, Municipium Aelium Salla. – In: Šašel Kos, M., P. Scherrer (eds.) 2003, 191–235.

RENDIĆ-MIOČEVIĆ, A., T. LELEKOVIĆ, 2012, Rural settlements. – In: Migotti, B. (ed.) 2012, 279–311.

SCHERRER, P. 2003, Savaria. – In: Šašel Kos, M., P. Scherrer (eds.) 2003, 53–77.

SKINNER, G.W. 1965 (Reprint 2002), Marketing and social structure in rural China. - *Études rurales* 161–162, 217–262.

SMITH. C.A. (ed.) 1976, *Regional Analysis I: Economic Systems*. – New York.

SOPRONI, S. 1980, Roads. – In: Lengyel, A., G.T.B. Radan (eds.) 1980, 207–217.

STEWART, A (trans.) 1887, *Itinerary from Bordeaux to Jerusalem*: the *Bordeaux* pilgrim (333 A.D.). – London.

SZŐNYI, E. 2003, Römische Brunnen in der kleinen Tiefebene. – *Antaeus* 26, 141–158.

SZÖNYI, E. 2004, Mursella. – In: Šašel Kos, M., P. Scherrer (eds.) 2004, 85–97.

SZŐKE, M.B. 1995, Borderland of cultures. Settlement history research in the Hahót Basin (aims, methods, results). – *Antaeus* 22, 13–34.

ŠAŠEL, J. 1975, Rimske ceste v Sloveniji. – In: *Arheološka najdišča Slovenije*, 74–87, Ljubljana.

ŠAŠEL, J. 1987, La famiglie romane e la loro economia di base. – *Antichità Altoadriatiche* 29/1, 145–152.

ŠAŠEL KOS, M. 2002, The boundary stone between Aquileia and Emona / Mejnik med Akvilejo in Emono. – *Arheološki vestnik* 53, 373–382.

ŠAŠEL KOS, M. 2010, The early urbanization of Noricum and Pannonia. – In: Zerbini, L. (ed.) *Roma e le province del Danubio*, Atti del I Convengo Internazionale Ferrara-Cento 15-17 Ottobre 2009, Rubbettino, 209–230.

ŠAŠEL KOS, M. 2013, The Roman conquest of Illyricum (Dalmatia and Pannonia) and the problem of the northeastern border of Italy. – *Studia Europaea Gnesnensia* 7, 169–200.

ŠAŠEL KOS, M., P. SCHERRER (eds.) 2002, *The Autonomous Towns of Noricum and Pannonia. Noricum*. – Situla 40.

ŠAŠEL KOS, M., P. SCHERRER (eds.) 2003, *The Autonomous Towns of Noricum and Pannonia. Pannonia* I – Situla 41.

ŠAŠEL KOS, M., P. SCHERRER (eds.) 2004, *The Autonomous Towns of Noricum and Pannonia. Pannonia* II – Situla 42.

TALBERT, R.J.A., T. ELLIOTT 2010, *Reconsidering the Tabula Peutingeriana, a cartographic masterpiece*. – Cambridge.

VARGA, N. 2009, Raetiai típusú kerámiát gyártó műhely Savariában. – *Communicationes Archaeologicae Hungariae* 2009, 209–260.

VISY, Z. (ed.) 2003, *The Roman Army in Pannonia: An archaeological guide of the Ripa Pannonica*. – Budapest.

VISY, Z. 2018, A pannoniai késő római „belső erődök". – *Archaeologiai Értesítő* 143, 233–246.

WHEBELL, C.F.J, 1969. Corridors: a theory of urban systems. – *Annals of the Association of American Geographers* 59/1, 1–26.

WHITTAKER, C.R. 1994, *Frontiers of the Roman Empire: a social and economic study*. – Baltimore.

ŽERJAL, T., V. TRATNIK 2020, Fluvio Frigido, Castra – Ajdovščina. – In: Horvat et al. (eds.) 2020, 9–46.

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