

17. Roman Roads and Settlements along the Rhine and upper Danube

by SALVATORE ORTISI, Universität München

In the north of the Roman Empire, the existing pre-Roman infrastructure was rarely adopted on a one-to-one basis. Not only the road system, but also the central settlements were reorganised to meet the changing military and, above all, economic requirements of the early imperial period. Well-protected Iron Age centres, often located on difficult-to-access heights, were abandoned and replaced by new, more easily accessible locations. The pattern of Roman land development in the north-west provinces can be traced most clearly in the provinces of Raetia and Lower Germania, whose road system and settlement structure can probably be traced back to a 'master plan' of the Augustan period.¹

In contrast to most provinces in the Mediterranean region, there was no longer a functioning urban system on the Rhine and the Upper Danube at the time of the Roman conquest. The settlement structures and transport routes in the Rhine provinces of Upper and Lower Germania and in the Alpine Danube province of Raetia can therefore largely be attributed to Roman planning.² The major rivers Rhine and Danube, which were of great importance as communication and trade routes even in prehistoric times, are of course an exception here. Where not dictated by natural features (mountains, valleys, passes, rivers,

¹ A. Becker, *Waldgirmes: die Ausgrabungen in der spätaugusteischen Siedlung von Lahnau-Waldgirmes* (1993–2009). *Römisch-germanische Forschungen* 71 (Mainz 2015) bes. 74 f.; idem, *Waldgirmes und die augusteische Germanienpolitik – Administrative und logistische Aspekte*, in: Ch. Eger – S. Panzram – M. Trunk (eds.), *Armee und Romanisierung. Hispanien und Germanien im Vergleich. Beiträge zur internationalen Tagung von "Toletum", des Netzwerks zur Erforschung der Iberischen Halbinsel in der Antike 7.–9. Oktober 2021, LVR-RömerMuseum im Archäologischen Park Xanten, Xantener Berichte* 45 (Oppenheim 2024) 185–201.

² E. Walde – G. Grabherr (eds.), *Via Claudia Augusta und Römerstraßenforschung im östlichen Alpenraum*. *Ikarus* 1 (Innsbruck 2006); V. Galliazzo (ed.), *Via Claudia Augusta. Un'arteria alle origini dell'Europa. Ipotesi, problemi, prospettive. Eine Strasse am Ursprung Europas. Hypothesen, Probleme, Perspektiven. Atti del convegno internazionale, Feltre 24–25 settembre 1999* (Treviso 2002); Helmut Bender, *Römischer Straßen- und Reiseverkehr*, in: Ludwig Wamser (ed.), *Die Römer zwischen Alpen und Nordmeer. Landesausstellung Rosenheim 2000, Schriftenreihe der Archäologischen Staatssammlung* 1 (Mainz 2000) 255–263; W. Czysz, *Via Claudia Augusta*, in: W. Czysz – K. Dietz – Th. Fischer – H.-J. Kellner (eds.), *Die Römer in Bayern* (Stuttgart 1995) 528–532. – H.-G. Horn, *Die Verkehrswege zu Wasser und zu Land*, in: idem (ed.), *Die Römer in Nordrhein-Westfalen* (Stuttgart 1987) 148–154; J.-N. Andrikopoulou-Strack, *Straßen und Verkehr in Germania Inferior*, in: Ch. Eger (ed.), *Warenwege – Warenflüsse: Handel, Logistik und Transport am römischen Niederrhein: eine Ausstellung des LVR-Archäologischen Parks Xanten / LVR-RömerMuseums, Xantener Berichte* 32 (Mainz 2018) 201–219.

marshes, soils, etc.), administrative necessities were probably also decisive alongside strategic transport and military considerations. Neither in the Lower Rhine region nor in the Alpine foothills are any major pre-Roman central settlements known that continued to exist into the Imperial period.³ In a few cases, late Iron Age settlement sites were revisited in the early Imperial period, but this is almost always a case of site continuity and not true settlement continuity. However, as the Roman administrative system was essentially based on the municipal self-administration of the provincial population, new more or less urban settlement centres had to be created for the population in the conquered areas north of the Alps in addition to a transport infrastructure focused on the needs of the Roman military.⁴

Lower Germany

The area between the Rhine and the Schelde, which had already been conquered by Caesar, was finally established as a regular imperial province – the province of Germania Inferior – under Domitian between 85 and 90 AD (Fig. 1). The capital of the province and seat of the governor was Cologne/*Colonia Claudia Ara Agrippinensium*. The borders of Lower Germania are clear on three sides: in the south, the Vinxbach river marks the division between Upper and Lower Germanic territory, the further border is probably in the area of the Brohl valley, whose quarries were operated exclusively by the Lower Germanic troops. The Rhine in the east and the North Sea in the north form the borders of the province.⁵

³ H.-J. Kellner, Die Kelten im Alpenvorland, in: W. Czysz – K. Dietz – Th. Fischer – H.-J. Kellner (eds.), *Die Römer in Bayern* (Stuttgart 1995) 13–17; C.-M. Hüssen – W. Irlinger – W. Zanier (Hrsg.), *Spätlatènezeit und frühe römische Kaiserzeit zwischen Alpenrand und Donau: Akten des Kolloquiums in Ingolstadt am 11. und 12. Oktober 2001. Kolloquien zur Vor- und Frühgeschichte 8* (Bonn 2004) 73–91. – J. Kunow, Die Militärgeschichte Niedergermaniens, in: H.-G. Horn (ed.), *Die Römer in Nordrhein-Westfalen* (Stuttgart 1987) 27–109 especially 27–38.

⁴ A. Heising (ed.), *Neue Forschungen zu zivilen Kleinsiedlungen (vici) in den römischen Nordwest-Provinzen. Akten der Tagung Lahr 21.–23.10.2010* (Bonn 2013); B. Steidl, Einige Aspekte zur Verkehrsinfrastruktur und zu den Vici in Raetien, in: M. Pfeil (ed.), *Römische Vici und Verkehrsinfrastruktur in Raetien und Noricum. Colloquium Bedaium Seebruck. 26.–28. März 2015, Inhalte – Projekte – Dokumentationen. Schriftenreihe des Bayer. Landesamtes für Denkmalpflege 15* (München 2016) 68–83.

⁵ H.-G. Horn, *Landschaft und Besiedlung*, in: idem (ed.), *Die Römer in Nordrhein-Westfalen* (Stuttgart 1987) 139–148.

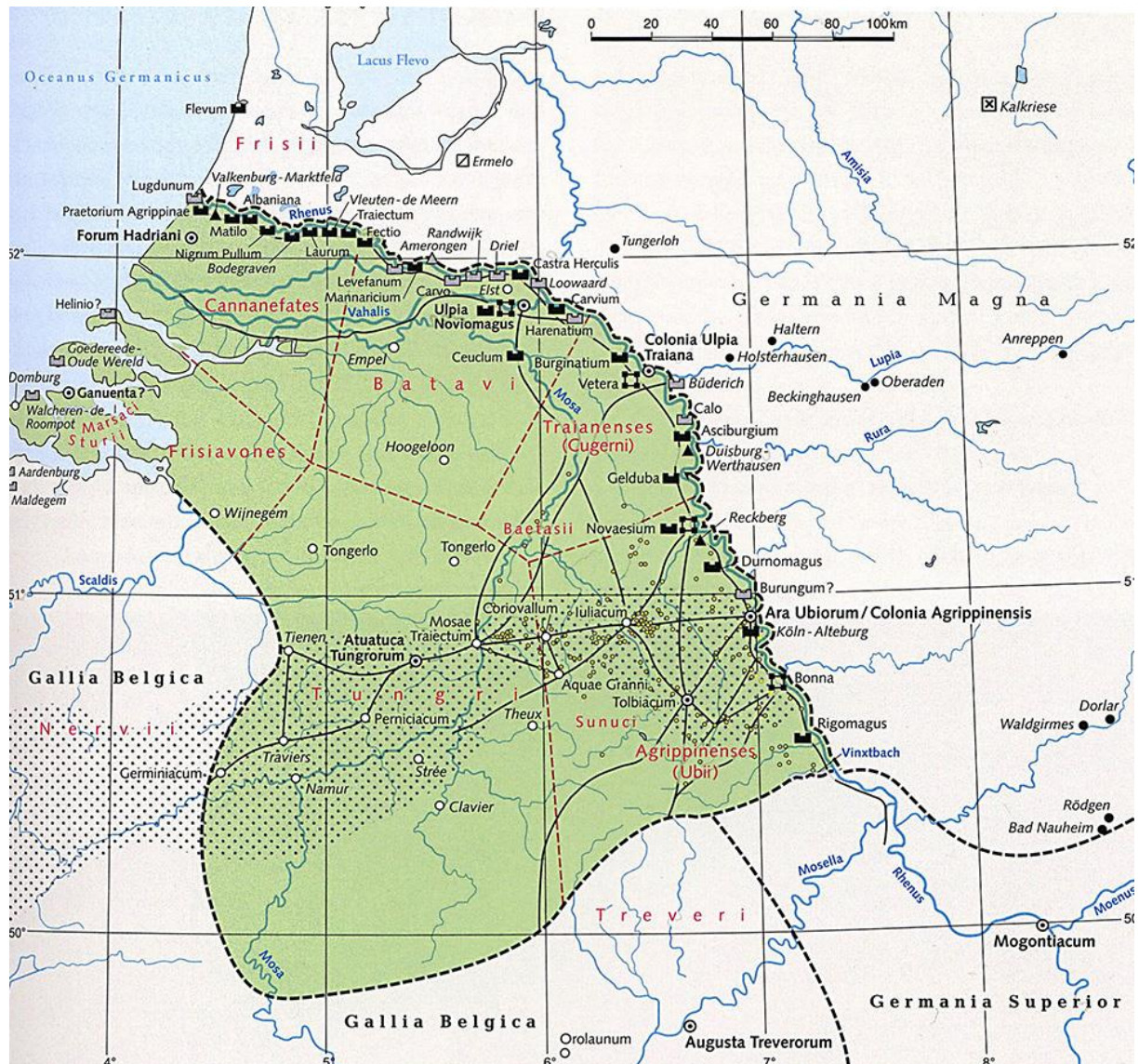


Fig. 1. Province Germania inferior.- T. Bechert, *Germania inferior* (Mainz 2007) 29 fig 18.

In the border provinces, after the military conquest, not only internal security (control of indigenous settlement centres and occupation of strategically important places (especially river crossings) but also external defence was of decisive importance. Accordingly, the conquered territories were opened up by roads, which were initially orientated primarily according to military necessities (supplies, troop movements). For the Lower Rhine, this meant on the one hand the connection to the Gallic hinterland through the development of the two major east-west routes, the *Via Belgica*, which ran from the *Oppidum Ubiorum*, the later CCAA - Cologne through the rich loess plains of northern Gaul to the English Channel, and the Agrippa Road from Cologne through the Eifel region, which was rich in mineral resources like iron, silver, lead, wood and lime to the Moselle (Fig. 2). As the two most important civilian settlements, Cologne

and Trier, the roads were probably planned and successively expanded in the last two decades before Christ.⁶

The route chosen was of particular importance, as the two main roads were subsequently also to form the main axes of access to rural areas.

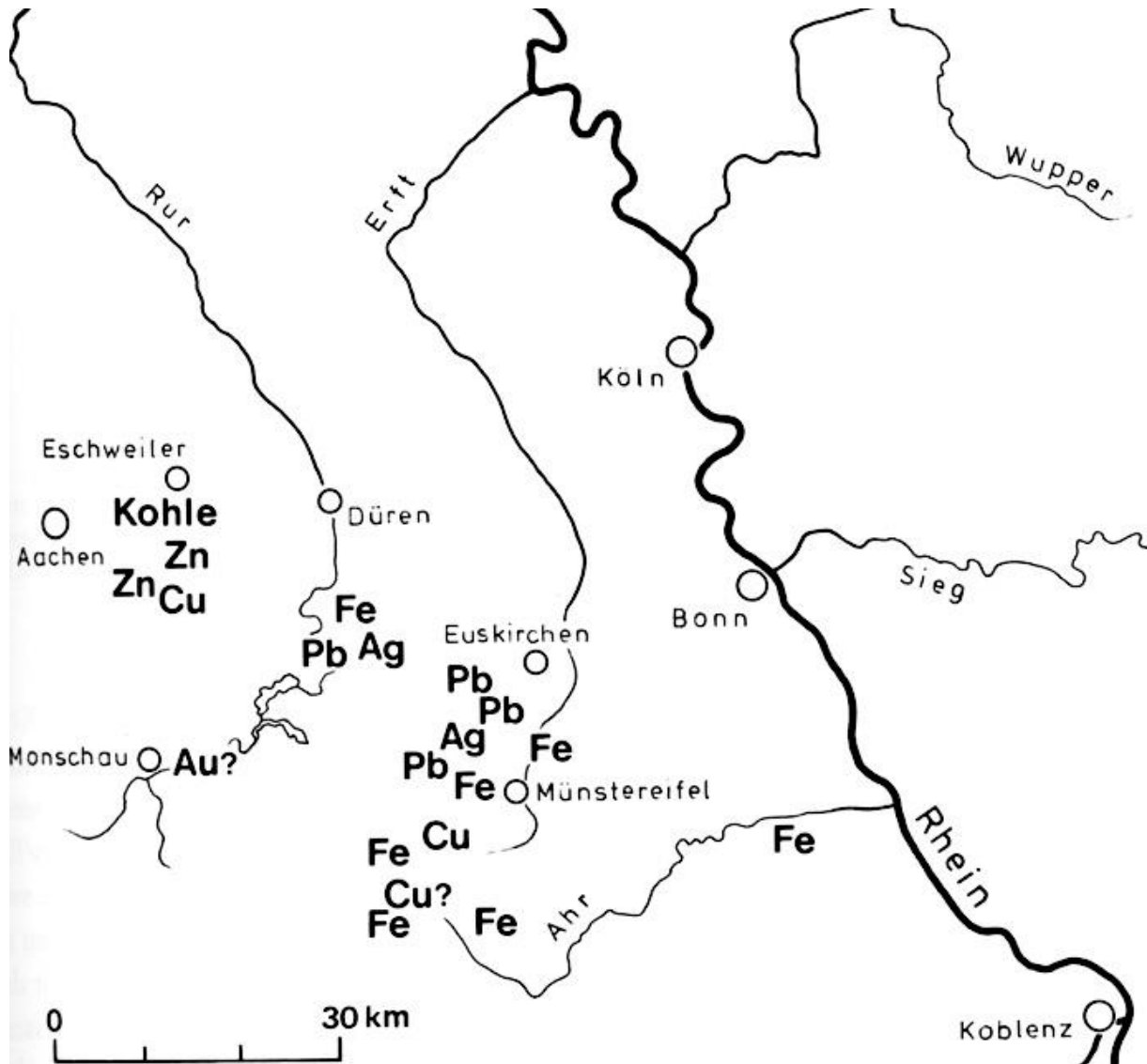


Fig. 2. Germania inferior mineral resources.- H.-G. Horn (ed.), *Die Römer in Nordrhein-Westfalen* (Stuttgart 1987) 155 fig. 90.

The military road along the western bank of the Rhine, which was probably built at the same time, was primarily of strategic importance as it connected the Alpine region with the North Sea coast and facilitated the rapid movement of

⁶ Cf. note 2.

troops along the so called Rhein *Limes*, which developed in the Tiberian period at the latest.

The most important civilian settlement on the Lower Rhine, the oppidum Ubi-
orum, was situated at the intersection of these three important long-distance
roads (Fig. 2), and not by chance. The settlement, which was probably estab-
lished in the last decade before Christ as a main centre for the Germanic tribe of
the Ubians, seems to have been intended as the (civil) administrative and eco-
nomic centre of a larger area when it was founded.⁷ The fact that the settlement
was able to retain its importance even after the loss of the territories on the right
bank of the Rhine in the year 9, in the *bellum Varianum*, may have been due to
its excellent strategic transport location and the very fertile loess soils of the sur-
rounding area. Under Claudius it was elevated to the status of *colonia* and by
the 80s at the latest it had become the capital of the province of Germania Infe-
rior, which was established under Domitian.

After the expansion of the most important long-distance roads, the first settle-
ments (*vici*) developed at strategically important locations, especially at cross-
roads and river crossings, about whose early settlement structures relatively lit-
tle can be said at the moment. However, it can be assumed that they were
initially small settlements, possibly with a military character, which, as guest-
houses, stations for guarding or changing horses (*mutationes*, *stationes*), primar-
ily served the transport infrastructure. In addition, the first administrative cen-
tres (*civitas capitals*) of the later province were also established along the most
important transport routes. This can be clearly seen in the example of Tongern,
Atuatuca Tungrorum, the capital of the Tungrians (Fig. 3), where a construction
team from the Roman army was engaged in building the road in the late Au-
gustan period.⁸

⁷ W. Eck, Köln in römischer Zeit: Geschichte einer Stadt im Rahmen des Imperium Roma-
num. Geschichte der Stadt Köln 1 (Köln 2004).

⁸ A. Vanderhoeven, Das vorflavishe Tongeren. Die früheste Entwicklung der Stadt anhand
von Funden und Befunden, in: G. Precht – N. Zieling (eds.), Genese, Struktur und Entwick-
lung römischer Städte im 1. Jahrhundert n. Chr. in Nieder- und Obergermanien: Kollo-
quium vom 17. bis 19. Februar 1998 im Regionalmuseum Xanten, Xantener Berichte 9
(Mainz 2001) 157–176.

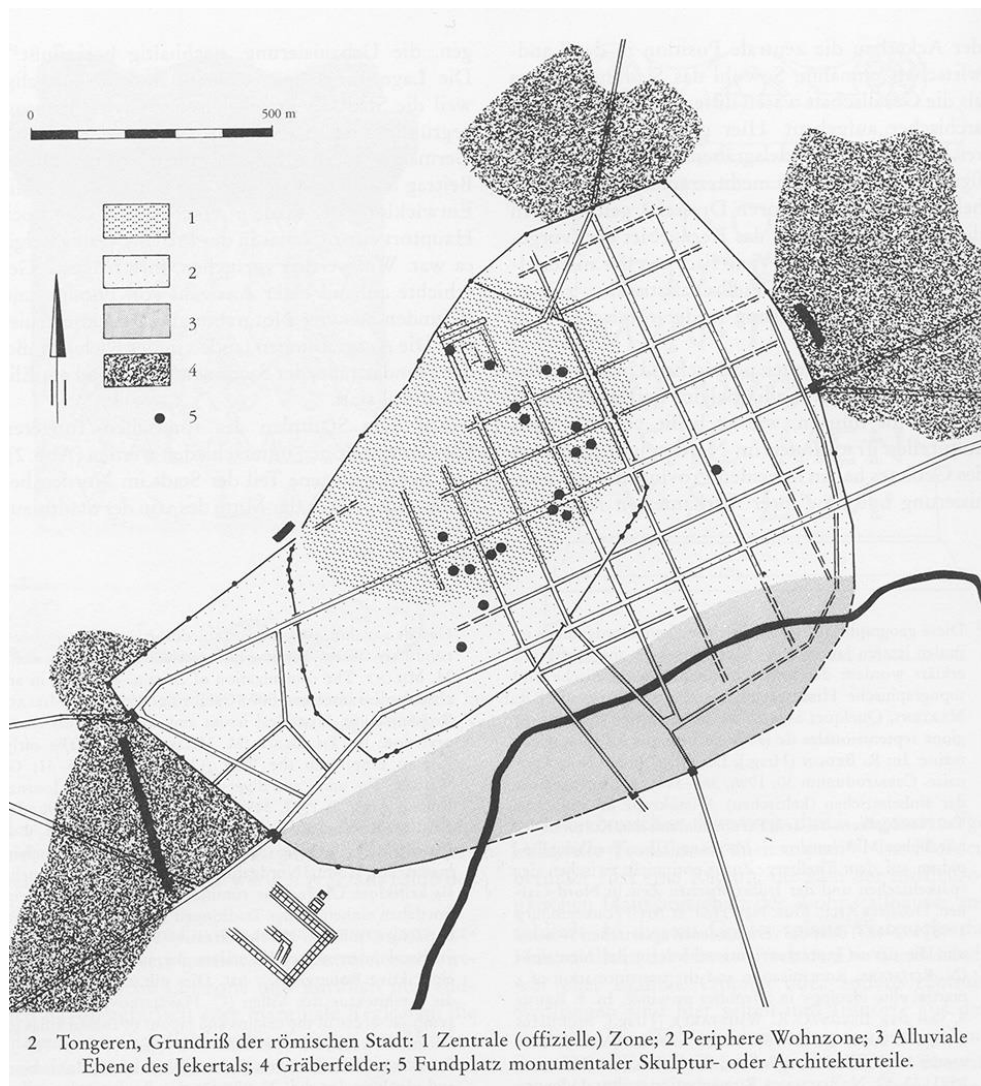


Fig. 3. Tongeren. – G. Precht – N. Zielsing (eds.), *Genese, Struktur und Entwicklung römischer Städte im 1. Jahrhundert n. Chr. in Nieder- und Obergermanien*, Xantener Berichte 9 (Mainz 2001) 160 fig. 2.

The first roadside villages, such as Rimbürg on the *Via Belgica*, were already established when the road was built. In Roman times, a bridge crossed the River Wurm here, which today forms the border between the Dutch province of Limburg and North Rhine-Westphalia. On both the western and eastern banks, the remains of strip houses of an elongated street settlement typical of the Gallic region have been observed.⁹ Remarkable is a finding that was recorded on the western side: similar to Tongern, the long-distance road, which is almost 18 metres wide at this point, initially only consists of an unpaved trackway accompanied by two drainage ditches. In a small pit at the edge of this track a sigillata

⁹ U. Schröder – H. Vanneste, *Die Ausgrabungen im römischen Vicus von Rimbürg beiderseits der deutsch-niederländischen Grenze*, BJB 219, 2019, 53–202.

plate from the time around the birth of Christ was found. It marks the first tangible settlement activity in the area of the later *vicus*.

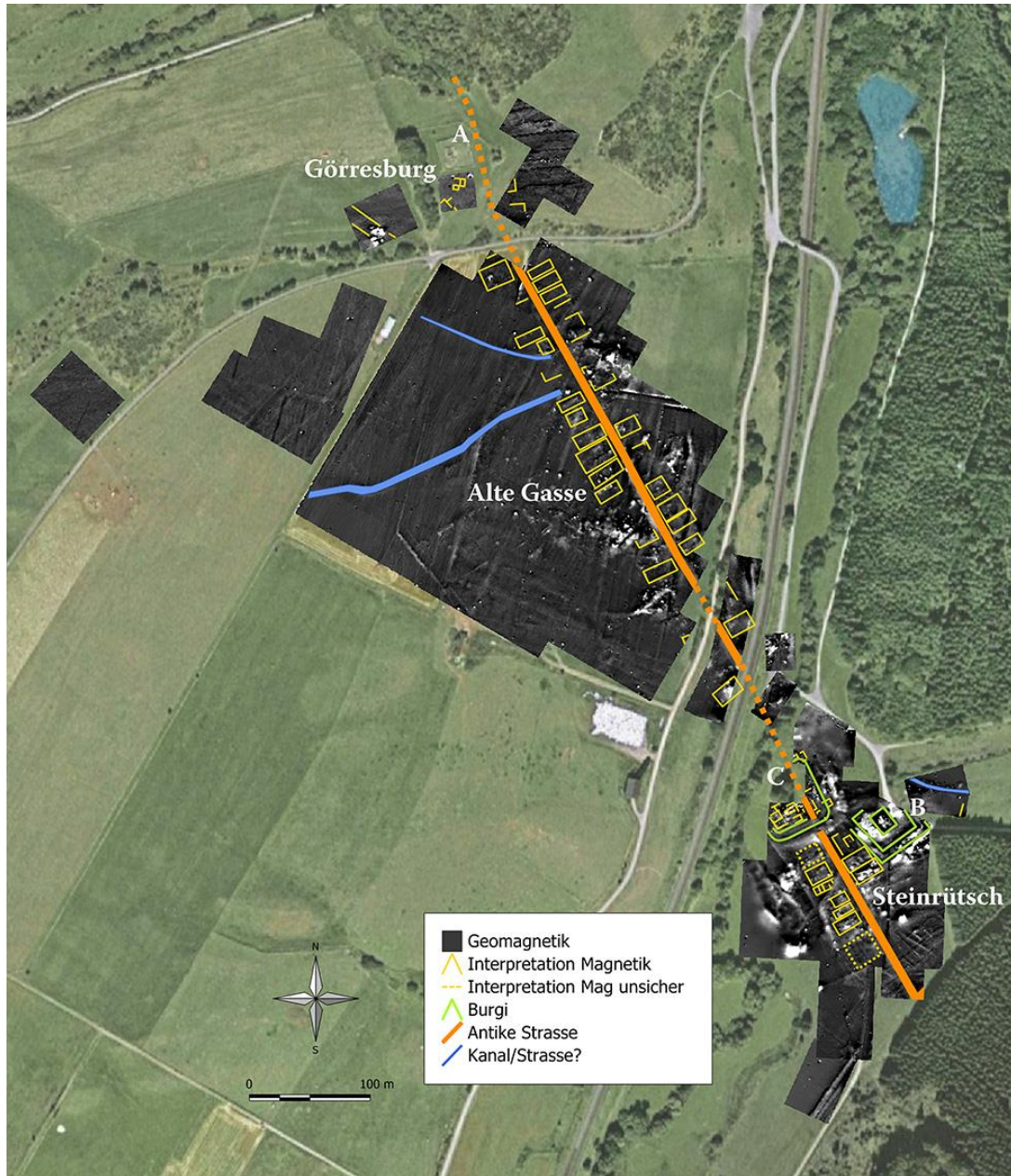


Fig. 4. Nettersheim Geophysical survey.- Nettersheimarchiv LMU.

In other places, however, such as Nettersheim in the Eifel (Fig. 4), the Roman Marcomagus, the first buildings do not appear to date until the Claudian period,¹⁰ a good 30 years after the construction of the road, which is dendrochron-

¹⁰ S. Ortisi, Der vicus bei Nettersheim (Kr. Euskirchen) und die römische Besiedlung des oberen Urfttals, in: M. Grünewald – St. Wenzel (eds.), *Römische Landnutzung in der Eifel*.

ologically dated to the late Augustan period (Fig. 5).¹¹ The first *villae rusticae* in this region of the northern Eifel were probably built at the same time. In fact, the development of most roadside villas, as relay stations and market towns, seems to have been closely linked to the development of the surrounding rural area.



Fig. 5. Nettersheim, Agrippastrasse, roadside palisade of early imperial date.-Nettersheimarchiv LMU.

In the immediate border area, on the other hand, the military was the dominant factor. The *Limes* road, which ran parallel to the Rhine, connected the individual garrison towns and facilitated the rapid movement of troops. Goods were probably mainly transported on the Rhine.

In the course of the 2nd century, especially under the emperors Trajan and Hadrian, the urbanisation of the northern part of the province, which until then had still been characterised mainly by small rural settlements (Germanic-type

Neue Grabungen und Forschungen. Tagung in Mayen vom 3. bis 6. November 2011, RGZM-Tagungen 16 (Mainz 2012) 279–288; idem, Neue Forschungen im vicus von Nettersheim, in: A. Heising (ed.), Neue Forschungen zu zivilen Kleinsiedlungen (vici) in den römischen Nordwest-Provinzen, Akten der Tagung Lahr 21.–23.10.2010 (Bonn 2013) 41–52.

¹¹ Ortisi (in preparation).

dwellings) and vici was driven forward by the foundation of the veteran colony *colonia Ulpia Trajana* (CUT) near Vetera-Xanten (around 100) and the Civitas capitals of Noviomagus and Forum Hadriani.¹²

Four of the five large urban centres were thus located in the Rhine zone, the colony cities of Cologne and Xanten as well as the municipalities of Nijmegen and Voorburg-Arentsburg (Fig. 1). Only the municipium of Tongern was located on the main road from Cologne to Boulogne-sur-mer on the Channel coast, which led to northern Gaul and is known today as the '*Via Belgica*'. By the 2nd century at the latest, they all were also the administrative centres of a *civitas*, i.e. a regional tribal association.

Raetia

The Raetian Alpine foothills present a similar picture, where the large oppida along the Danube were already destroyed or abandoned around the middle of the 1st century, several decades before the arrival of the Romans.¹³

Following the archaeological records, the Alpine foothills appear to have been only sparsely populated at the time of the Roman conquest. The area occupied by Rome during Augustus' Alpine campaign in 15 BC and organised as the Roman province of Raetia before the middle of the 1st century AD comprised south-eastern Switzerland, Voralberg and parts of Tyrol and large areas of the central Alps (Fig. 6). The largest part of Raetia, however, lies in the northern Alpine foothills between Lake Constance, the Danube and the Inn, or the Raetian *Limes* area north of the Danube.

¹² M. Müller – H.-J. Schalles – N. Zielsing (eds.), *Colonia Ulpia Traiana. Xantener Berichte, Sonderband 1* (Xanten 2008). – H. van Enckefort – E. N. A. Heirbaut, Nijmegen, from oppidum Batavorum to Ulpia Noviomagus, civitas of the Batavi. In: *La naissance des capitales de cités en Gaule Chevelue*, Gallia 72, 1 (2015) 285–298; H. van Enckefort, Der Hauptort der Bataver in Nijmegen im 1. Jahrhundert n. Chr., in: G. Precht – N. Zielsing (eds.), *Genese, Struktur und Entwicklung römischer Städte im 1. Jahrhundert n. Chr. in Nieder- und Obergermanien: Kolloquium vom 17. bis 19. Februar 1998 im Regionalmuseum Xanten*, Xantener Berichte 9 (Mainz 2001) 87–110. – Nijmegen, W. de Jonge – J. Bazelmans – D. de Jager, *Forum Hadriani van Romeinse stad tot monument* (Utrecht 2006).

¹³ C.-M. Hüssen – W. Irlinger – W. Zanier (eds.), *Spätlatènezeit und frühe römische Kaiserzeit zwischen Alpenrand und Donau: Akten des Kolloquiums in Ingolstadt am 11. und 12. Oktober 2001. Kolloquien zur Vor- und Frühgeschichte 8* (Bonn 2004); W. Zanier (ed.), *Kulturwandel um Christi Geburt: Spätlatène- und frühe römische Kaiserzeit in den mittleren Alpen zwischen Südbayern und Gardasee: Akten des Kolloquiums in Innsbruck am 18. und 19. Oktober 2017*, MüBeitrVFG 67 (München 2019).

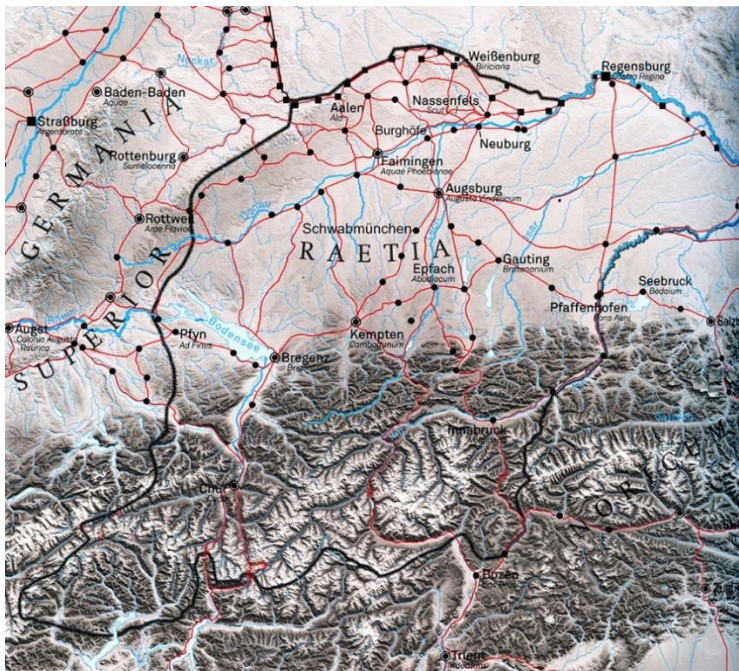


Fig. 6. Main roads and settlements in Raetia.- Steidl, in: Colloquium Bedaium (2015) 68 Abb. 1.

In addition to the *Via (Claudia) Augusta*, the first important artificial road in the Alpine foothills was the south-west-north-east axis from Bregenz via Kempten, the Lech crossing at Epfach, Gauting to Salzburg, the so-called Northern Alpine Road, which was the most important transport link in the province for a long time. At the Lech crossing, the *Via (Claudia) Augusta* coming from the south branched off northwards towards the Danube as a second important road connection. From the late Augustan period at the latest, the military centre of the newly conquered territories was located here at the confluence of the Lech and Wertach rivers, in Augsburg-Oberhausen.¹⁴ The first settlements, also characterised by military activity, were built at the same time along these roads at important crossroads and river crossings, such as on the Lorenzberg near Epfach (Fig. 6).¹⁵

Almost at the same time as the early military bases, in the late Augustan period, a first urban settlement was founded on the River Iller in Cambodunum-Kempten¹⁶. Strabon describes the site in his *Geographica* as the 'city' (*polis*) of the Estiones¹⁷. The fact that it must actually have been a planned city modelled on

¹⁴ S. von Schnurbein, Die Funde von Augsburg-Oberhausen und die Besetzung des Alpenvorlandes durch die Römer. In: Forschungen zur Provinzialrömischen Archäologie in Bayerisch-Schwaben, Schwäbische Geschichtsquellen und Forschungen 14 (Augsburg 1985) 15–43.

¹⁵ Lorenzberg bei Epfach.

¹⁶ G. Weber, Kempten – Cambodunum, erste Hauptstadt in der römischen Alpenprovinz Raetien?, Zeitschrift des Historischen Vereins für Schwaben 102, 2010, 39–83.

¹⁷ Strabon, Geogr. 4, 6, 8.

the Mediterranean is evident from the first wooden construction phase, which was already aligned with the orthogonal street system of the later stone buildings (Fig. 7).¹⁸

Recent excavations in Insula 1 (Fig. 8) and in the earlier forum area of Cambo

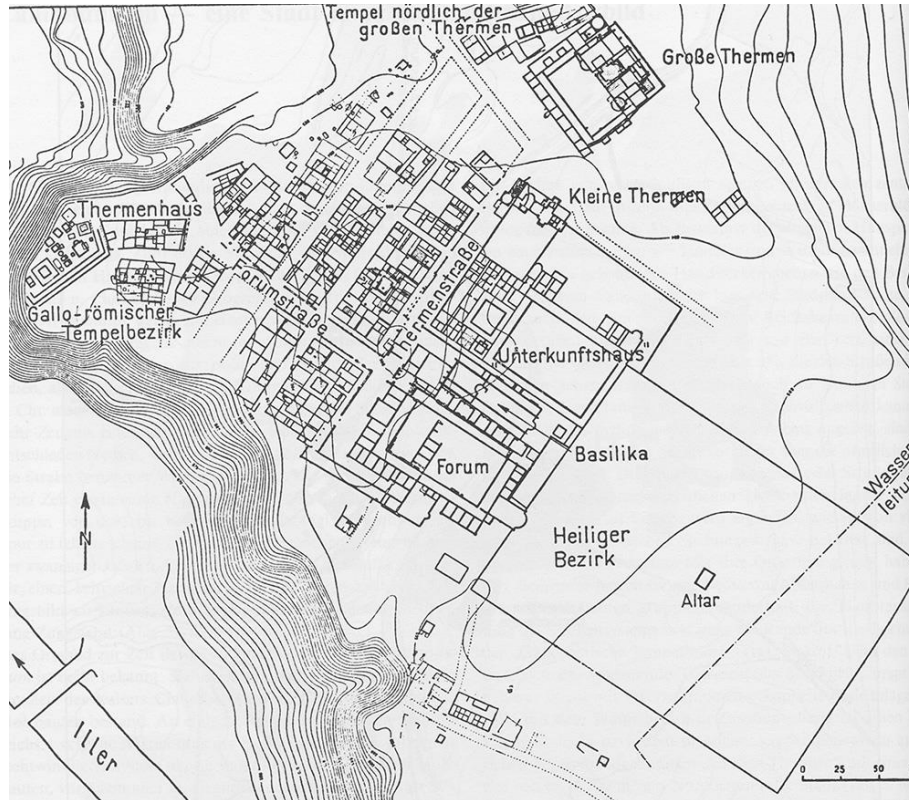


Fig. 7. Cambodunum-Kempten.- Romer in Schwaben (1985) 62 fig. 37.

dunum have shown that both the residential buildings of the insula and the public buildings on the early imperial forum were built in stone from the Tiberian period onwards.¹⁹ At the same time, large representative building complexes such as the 'Praetorium' or the 'Altar District' were constructed, which led to the assumption that this was the early seat of the Raetian governor and thus the administrative centre of the province.²⁰

¹⁸ M. Sieler, Frühkaiserzeitliche Holzbauten im Bereich der kleinen Thermen von Cambodunum – Kempten, *Cambodunumforschungen* 8 = Materialhefte zur bayerischen Vorgeschichte A93 (Kallmünz 2009).

¹⁹ S. Ortisi – M. Sieler, Rom an der Iller. Die Insula 1 von Cambodunum/Kempten und die älteste Steinbauphase der städtischen Wohnbebauung, *BerBayDenkmPfl* 62, 2021, 245–251.

²⁰ Weber (note 16).



Fig. 8. Kempten Excavations in Insula 1 (2020).- Kemptenarchiv LMU.

In Tiberian times, the military camp in Augsburg-Oberhausen was also transferred to the flood-proof high terrace between the Lech and Wertach rivers. An extensive settlement quickly developed around the fort measuring around 10 hectares (Fig. 9).²¹ After the withdrawal of the garrison in the Flavian period, the large former military settlement quickly took on central local functions. Central areas of the abandoned fort were converted into a forum and large thermal baths were built. There is much to suggest that the settlement, which was located on the now expanded *Via Claudia*, was deliberately transformed into the new provincial centre, i.e. the provincial capital, after the withdrawal of the military. Under Hadrian, Augusta Vindelicum was granted the town charter of a municipium.²²

As in Lower Germania, rural settlement with *villae rusticae* first began a few decades after the occupation, in the Tiberian-Claudian period. At the same time, new vici emerged along the roads as market centres, often in combination with road stations.²³ On the *Via Claudia*, the *vicus* of Schwabmünchen (Fig. 6) devel-

²¹ A. Schaub – L. Bakker, Zur Stadtentwicklung des römischen Augsburg, in: G. Precht – N. Zielsing (eds.), *Genese, Struktur und Entwicklung römischer Städte im 1. Jahrhundert n. Chr. in Nieder- und Obergermanien: Kolloquium vom 17. bis 19. Februar 1998 im Regionalmuseum Xanten*, Xantener Berichte 9 (Mainz 2001) 177–189; B. Tremmel, *Der Kastellvicus des 1. Jahrhunderts n. Chr. von Augusta Vindelicum*, Augsburg, *Augsburger Beiträge zur Archäologie* 6 (Augsburg 2012).

²² L. Bakker, *Das municipium Aelium Augustum und seine Verwaltung*, in: *Die Römer in Schwaben: Jubiläumsausstellung 2000 Jahre Augsburg*, Zeughaus, 23. Mai bis 3. November 1985, *Arbeitshefte des Bayerischen Landesamts für Denkmalpflege* 28 (München 1985) 96–98.

²³ W. Czysz, *Zwischen Stadt und Land – Gestalt und Wesen römischer vici in der Provinz Raetien*, in: A. Heising (ed.), *Neue Forschungen zu zivilen Kleinsiedlungen (vici) in den römischen Nordwest-Provinzen. Akten der Tagung Lahr 21.–23.10.2010* (Bonn 2013) 261–378.

oped into an important production centre for high-quality ceramics, which from the Flavian period onwards not only satisfied the needs of the flourishing prov-

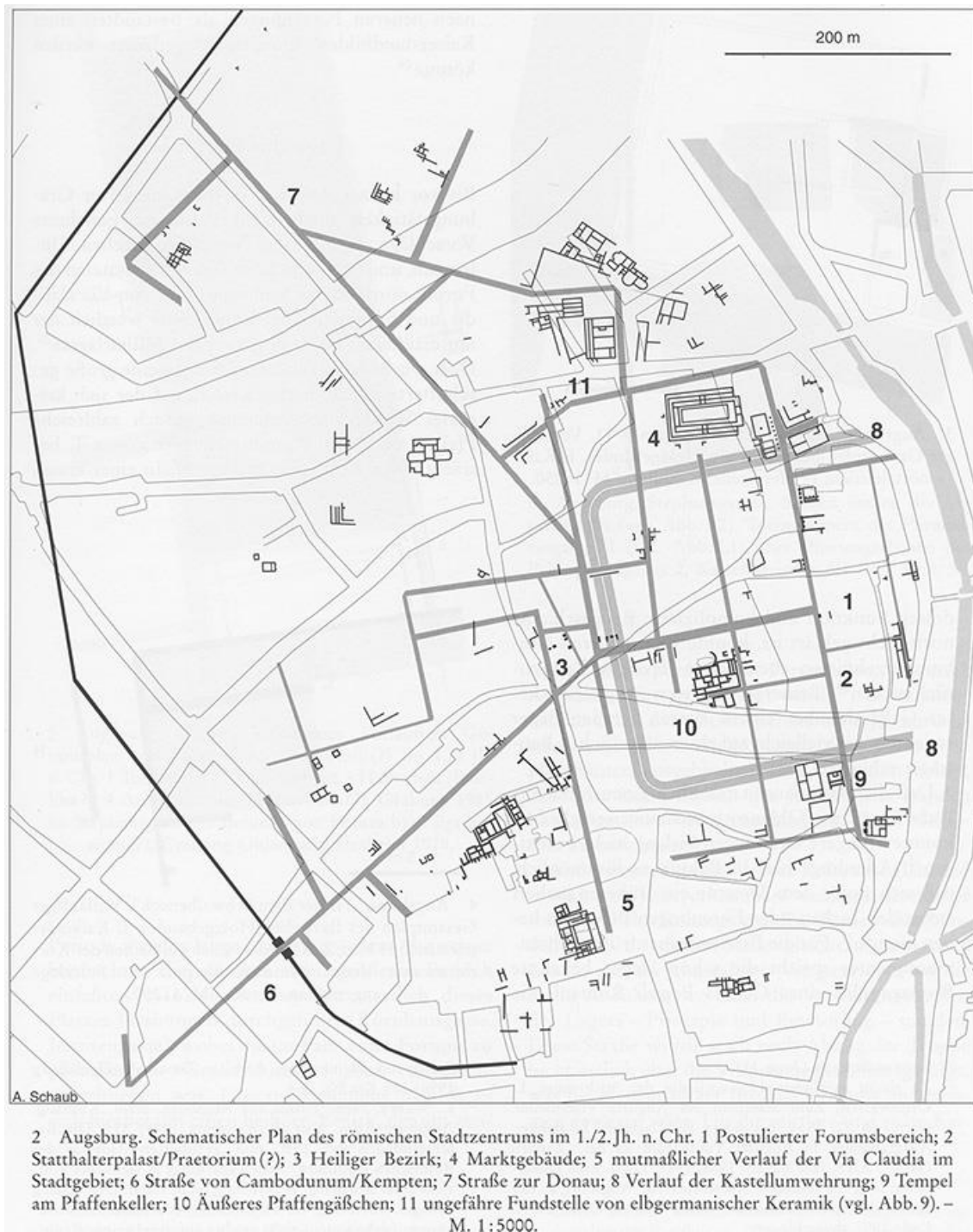


Fig. 9. Augsburg Kastell Altstadt.- Schaubb – Bakker, Xantener Berichte 9 (2001) 181 fig. 2
ince but also exported its products as far as Pannonia.²⁴

²⁴ R. Sölch, Die Terra-Sigillata-Manufaktur von Schwabmünchen-Schwabegg. Materialhefte zur bayerischen Vorgeschichte A81 (Kallmünz 1999); D. Ebner, Das römische Gräberfeld

Along the Danube, the civilian settlements of the fort sites that had been abandoned due to the successive advance of the *Limes* to the north took on central functions. A good example of this is the *vicus* of Submontorium-Burghöfe, which, situated at the crossroads of the *Via Claudia* and the southern Danube road (Fig. 6), developed into an important centre of commerce after the withdrawal of the garrison.²⁵

As on the Rhine, the *Limes* area itself was characterised by the needs of the military. Here, the military *vici* assumed centralised functions and the rural settlements (Gallo-Roman *villae rusticae*), which were probably largely supported by veterans, primarily served to supply the *Limes* garrisons. With the arrival of *Legio III italica* in Regensburg in 179 AD, the previously sparsely populated eastern part of the province was also more intensively colonised. The stationing of 6000 legionaries with their families and the resulting veteran settlements had a lasting effect on the settlement pattern of the region.²⁶ Thomas Fischer has shown this very well for the immediate surroundings of the legionary camp (Fig. 10). However, the stationing of the legion also meant that previously secondary road connections, such as the road leading from the Alps through the Isar valley to the Danube and to Regensburg, became more important as development axes and, as a result, new *villae rusticae* also emerged in the wider hinterland of the legion.

With the civil wars and Germanic invasions of the 3rd century, the development of the border regions on the Rhine and the upper Danube outlined here came to an end (Fig. 10). In the 4th and 5th centuries, military concerns then increasingly determined the settlement pattern of the provinces.

von Schwabmünchen, Landkreis Augsburg. Materialhefte zur bayerischen Vorgeschichte A73 (Kallmünz 1997).

²⁵ M. Mackensen – F. Schimmer (eds.), *Der römische Militärplatz Submuntorium/Burghöfe an der oberen Donau: archäologische Untersuchungen im spätrömischen Kastell und Vicus 2001–2007*, MüBeitrVFG 4 (Wiesbaden 2013) especially 201–205; 422–426.

²⁶ Th. Fischer, *Das Umland des römischen Regensburg*, MüBeitrVFG 42 (München 1990).

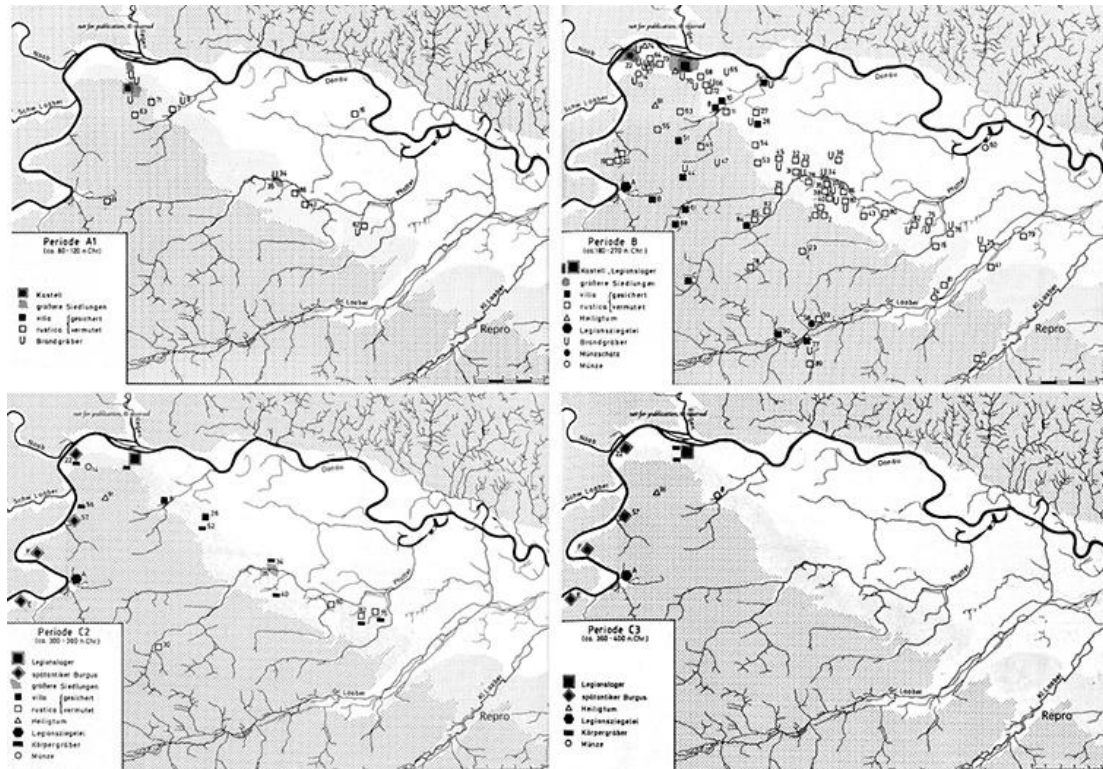


Fig. 10. Regensburg, Villa landscape 2-5th c.- Th. Fischer, Umland des römischen Regensburg (1990).

Conclusion

The central element for the development of land in the provinces north of the Alps were the long distance roads, which connected large military bases and civil centers across provinces and opened up the respective territories over a wide area. In the border regions there were in addition secondary roads connecting the advanced military camps and their *vici* with each other and with their hinterland.

With or shortly after the construction of the roads mostly military settlements emerged at strategically important traffic points (river crossings and intersections) to control the central communication axes.

With the colonisation of the hinterland, which often started several decades after the conquest, further *vici* emerged at the main roads as administrative centers and marketplaces.

The military played a central role in the frontier provinces, both in the construction of major routes and in the development and expansion of civil settlements.

Former military settlements could continue to exist as civil centers even after the withdrawal of the garrison. As the example of Augsburg shows, they could even develop into a true ancient metropolis.

Salvatore Ortisi
Ludwig-Maximilians-Universität München
E-Mail: s.ortisi@lmu.de