

Regional Economy, Settlement Patterns and the Road System in
Bithynia (4th century BC - 6th century AD)
Spatial and Quantitative Analysis

A Dissertation

Submitted in Partial Fulfillment of the Requirements
for the Degree of Ph.D.

to the Department of History and Cultural Studies
of the Freie Universität Berlin

by

Barbora Weissová

Berlin, 2017

Supervisor: Jun. Prof. Silvia Polla

Second examiner: Prof. Dr. Monika Trümper

Date of the viva voce / defense: the 3rd of November 2017

Volume 1

Text

Table of Contents

Volume 1 (Text)

Acknowledgements	26
Table of Contents	3
Abstract	7
Zusammenfassung	9
List of Tables	11
List of Figures	13
Abbreviations	16
Index of Literature Abbreviations	16
Index of Other Abbreviations	16
1. Introduction	18
1. 1. Research History.....	26
1. 1. 1. Bithynia.....	27
1. 1. 2. Excavations and Surveys.....	30
1. 1. 3. Studies of Epigraphic Evidence.....	31
1. 1. 4. Studies of Ancient Roads.....	33
1. 1. 5. Economic Studies.....	34
1. 1. 6. Digitised Datasets	35
1. 2. Main Objectives.....	38
1. 3. Chronological Frame	41
2. Sources of Data	43
2. 1. Bithynia in Greek and Latin Literary Sources	43
2. 1. 1. The Origin of Bithynians	44
2. 1. 2. Geography of Bithynia.....	45
2. 1. 3. Economic Situation	48
2. 1. 4. Earthquakes.....	51
2. 1. 5. Road System	53
2. 2. Travellers from the 18 th till the End of the 19 th Century	55
2. 2. 1. Travellers during the 18 th Century	56
2. 2. 2. Travellers during the 19 th Century	56
2. 3. Available Archaeological Sources.....	65
2. 3. 1. Archaeological Remains in the Main Urban Settlements and their Hinterlands	65
2. 3. 2. Archaeological Remains Detected by Surveys Conducted in the Macro-Region.....	76
2. 4. Epigraphic Evidence.....	76
2. 4. 1. Quantification of Published Inscriptions from all over the Macro-Region	76
2. 4. 2. Topical Analysis of the Assemblage.....	78

3. Physical Settings	81
3. 1. Macro-Region	81
3. 1. 1. Delimitation	82
3. 1. 2. Geographical Settings.....	83
3. 1. 3. Geological Settings	86
3. 1. 4. Climate.....	88
3. 2. Micro-Region	89
3. 2. 1. Delimitation	89
3. 2. 2. Geographical Settings.....	90
3. 2. 3. Geological Settings	92
4. Assessing Economic Trends in Bithynia	93
4. 1. Economic Proxies in the Macro-Region	96
4. 2. Economic Proxies in the Micro-Region	97
5. Epigraphic Evidence and Economic Development	98
5. 1. How Does the Epigraphic Evidence Reflect the Economic Situation?	99
5. 2. Methodology	101
5. 3. Quantification in Spatial Environment	104
5. 4. Spatial and Temporal Analyses	109
5. 4. 1. Quantified Temporal Analysis of Epigraphic Evidence in Respective Centres	110
5. 4. 2. Quantified Temporal Analysis of Epigraphic Evidence in the Macro-Region.....	127
5. 5. Topical Analyses of Epigraphic Evidence.....	130
5. 5. 1. Capital Investments.....	131
5. 5. 2. Evidence of Trade	139
5. 5. 3. Demonstrations of Food / Land Distributions.....	142
5. 5. 4. Evidence of Diverse Professions.....	143
5. 5. 5. Rural Settlements	145
5. 5. 6. Quantified Spatial and Temporal Analysis	148
5. 6. Conclusion	151
6. Urbanization and Development of the Settlement Patterns as an Economic Proxy	153
6. 1. How Does the Development of Settlement Patterns Reflect the Economic Situation?.....	153
6. 1. 1. Urbanization	155
6. 1. 2. Density and Spatial Distribution of Settlements except for Cities	157
6. 2. Methodology	158
6. 2. 1. Deficiency of the Analysed Dataset.....	160
6. 2. 2. Typology of Settlements.....	161
6. 2. 3. Applied GIS Tools and Resulting Settlement Models.....	162
6. 2. 4. Urbanization Models	164
6. 3. Reconstruction of Settlement Patterns during the Main Historical Periods	165
6. 3. 1. Hellenistic Settlement Patterns.....	166
6. 3. 2. Roman Settlement Patterns	175
6. 3. 3. Early Byzantine Settlement Patterns.....	184

6. 4. Urbanization from the Hellenistic till the Early Byzantine Period.....	195
6. 4. 1. Trends in the Urbanization.....	196
6. 4. 2. Comparative Analysis of Roman Urbanization in the Macro-Region and Asia Minor .	200
6. 5. Relative Density of Settlements except Cities.....	204
6. 5. 1. Comparative Analysis with Results of the Survey Projects in Paphlagonia and Pisidia	206
6. 6. Conclusion	210
7. Road System in the Light of Economic Development.....	212
7. 1. How Does the Development of the Road System Reflect the Economic Situation?	213
7. 2. Methodology	216
7. 2. 1. Development of Methodological Approaches	216
7. 2. 2. Least Cost Path Analysis (henceforth the LCPA)	219
7. 2. 3. Methodology Applied in the Present Study	220
7. 3. Comparative Analysis of the LCPA and Actual Archaeological Remains.....	222
7. 3. 1. The Supra-Regional ‘Pilgrim’s Road’	223
7. 3. 2. The Regional ‘Northern Road’	227
7. 3. 3. Regional Road ‘ <i>Nicaea – Prusias ad Mare</i> ’	230
7. 3. 4. Regional Roads in the NE Part of the Macro-Region.....	232
7. 4. Reconstruction of Road Systems during the Main Historical Periods	234
7. 4. 1. The Hellenistic Road System	234
7. 4. 2. The Roman Road System.....	237
7. 4. 3. The Early Byzantine Road System	240
7. 4. 4. An Issue in the Spatio-Temporal Analysis of the Road System.....	242
7. 5. Spatio-Temporal Analysis of Public Investments in Several Roads.....	243
7. 5. 1. The Supra-Regional ‘Pilgrim’s Road’	244
7. 5. 2. The Regional ‘Northern Road’	253
7. 5. 3. Regional Road ‘ <i>Cretia Flaviopolis – Tium</i> ’	255
7. 5. 4. Regional Road ‘ <i>Nicaea – Prusias ad Mare</i> ’	256
7. 5. 5. The Regional Road ‘ <i>Tium – Amastris</i> ’	258
7. 5. 6. Regional Roads ‘ <i>Prusa ad Olympon – Apamea / Caesarea Germanica</i> ’	259
7. 6. Conclusion	261
8. Micro-Regional Study of Economic Proxies in <i>Nicaea</i> and its Hinterland.....	265
8. 1. How Do Studies of one City and its Hinterland Contribute to the Current Discussion?.....	266
8. 2. Methodology	268
8. 2. 1. Survey Methodology	268
8. 2. 2. Selection of Data and Analysis	270
8. 2. 3. Applied GIS Analytical Tools	271
8. 3. Ways to Assess the Economic Development in <i>Nicaea</i>	272
8. 3. 1. Fortification Walls	272
8. 3. 2. Population	277
8. 3. 3. Diverse Professions Documented in Epigraphic Evidence	279
8. 3. 4. Capital Investments in <i>Nicaea</i>	280
8. 3. 5. Reconstruction of the Road Network in the Light of Economic Development.....	282

8. 4. Reconstruction of the Development of the Settlement Patterns in the Light of Economy.	285
8. 4. 1. The Hellenistic period	286
8. 4. 2. The Roman period	287
8. 4. 3. The Early Byzantine period	289
8. 4. 4. Functional Analysis of the Scatter Identified as no. 901	290
8. 4. 5. Density of Settlement Patterns from the Hellenistic till the Early Byzantine Period...	291
8. 4. 6. Density of Settlements in the Micro- and Macro-Region	293
8. 5. Local and Imported Marble	297
8. 6. Functional Analysis of the Hinterland of <i>Nicaea</i>	298
8. 7. Spatial Analysis of the Funerary Monuments	300
8. 8. Conclusion	305
9. Conclusion	309
10. Bibliography	323
10. 1. Ancient Sources	323
10. 2. Secondary Literature	325
10. 3. Index to Sources of the Greek and Latin Inscriptions	367
10. 4. Online Sources	373
10. 4. 1. Literature	373
10. 4. 2. Databases	373
10. 4. 3. Software and Technical Data	376
10. 4. 4. Institutions	377
11. Curriculum Vitae	382

Volume 2 (Addenda)

1. Catalogue of Maps	3
2. Catalogue of Epigraphic Evidence	50
3. Catalogue of Settlements	124
4. Catalogue of Bridges	135
5. Catalogue of Surface Concentrations Identified during the Iznik Survey Project	141
6. Catalogue of Ancient Marble Quarries in the Micro-Region	158

Abstract

The present thesis examines the economic development in NW Asia Minor, i.e. Bithynia, during the Hellenistic, Roman and Early Byzantine periods. Based on the available historical and archaeological data, the thesis demonstrates the development in the territory using as the main tool quantified spatial and temporal analyses. The analyses take an advantage of a multi-scalar approach, studying the data in the entire NW Asia Minor described as a macro-region and in one micro-region within, limited to the hinterland of *Nicaea*.

The thesis demonstrates the applicability of several analytical tools, lately frequently applied to assess the archaeological record. The tools include the Voronoi diagram / Thiessen polygons for the division of the territory, ring buffers for the determination of an urbanized area, the least cost path analysis for calculations of the most feasible roads, the line of sight and the viewshed analysis for the defining visibility between monuments.

The first four chapters represent a basis of data necessary for the analytical part. The first chapter introduces the research history, followed by the main objectives and chronological frame. The second chapter presents the sources of data including the list of relevant Greek and Latin literary sources, the notes of travellers, the archaeological sources and the epigraphic evidence. The third chapter assesses the physical settings for the macro- and micro-region separately, including delimitations of the analysed regions, geographical settings and climate. The last of the introductory chapters interprets the ways of assessing the economic situation in the present work, including the proxies defined for the macro- and micro-regions, further analysed in the following chapters.

The macro-regional analyses are presented in three chapters. They include the epigraphic evidence, studied in bulk as well as divided into topics relevant to the economic situation; the settlement patterns with an emphasis on the analysis of the urbanization; and the road system, with a special focus on the maintenance and the upkeep of roads documented by milestones.

The epigraphic evidence analysed in bulk revealed its peak during the 2nd half of the 2nd century AD and the beginning of the 3rd century AD. The building inscriptions feature the peak during the 2nd quarter of the 2nd century AD, the milestones during the 2nd half of the 3rd and the beginning of the 4th century AD.

The urbanization in the macro-region grows continuously during the analysed periods, reaching the densest coverage in the Early Byzantine era. The analysis of the urbanization models revealed a heterogeneous picture of the economic situation in the territory. The favourable distribution models in the SW and NE part of the territory on one side and cities largely impoverishing their hinterlands in the central part of the area on the other side.

Regarding the road system, the first investments in the regional roads date to the 2nd half of the 1st century and functioned as the drivers of the growth and following heyday of the territory during the 2nd half of the 2nd century AD. Constructions of the supra-regional roads date to the beginning of the 2nd century AD and follow until the beginning of the 4th century AD. The later chronology of the investments does not agree with the outlined peak of the region and, complemented with the analysis of the distribution of road stations, it suggests the transformation of the territory into a mainly transitional one during the Early Byzantine period.

The micro-regional study in the hinterland of *Nicaea* supplements the macro-regional datasets with the analysis of the areas of cities *intra muros* and with population estimates, putting *Nicaea* between the ten largest cities in Asia Minor, however, after *Nicomedia*.

The tools used for the analyses proved their applicability with the following caveats. The Voronoi diagram / Thiessen polygons divide the territory as equal as possible and, in this way, tend to cover up the irregularities between the analysed territories. Moreover, same as ring buffers, they do not take into consideration the accessibility of the terrain, i.e. natural borders. The anisotropic least cost path analysis is applicable without errors only under the conditions that the easiest way is also the shortest one. If not, it is frequently erroneous, since it always decides for the easiest route, regardless of its length. The line of sight and the viewshed analysis feature an analogous problem, since they both do not consider the vegetation possibly standing in the view. The resulting viewshed, therefore, may tend to be more erroneous.

Zusammenfassung

Die vorliegende Arbeit untersucht die ökonomische Entwicklung in NW Asia Minor, d. h. Bithynien, während der hellenistischen, römischen und frühbyzantinischen Epochen. Auf Grundlage der zur Verfügung stehenden historischen und archäologischen Daten, sowie mithilfe quantifizierter Raum-Zeit-Analysen, wird diese Entwicklung aufgezeigt. Dabei verfolgt die Arbeit einen multi-skalaren Ansatz und analysiert die Daten auf den Maßstabsebenen sowohl der Makro-Region ‚NW Asia Minor‘, als auch einer innerhalb dessen gelegenen Mikro-Region, des Hinterlands von *Nicaea*.

Die Arbeit demonstriert die Relevanz einiger analytischer Werkzeuge, die in jüngerer Zeit wiederholt zur Bewertung archäologischer Befunde genutzt werden. Zu diesen Werkzeugen zählen ‚Voronoi-Diagramm‘ / ‚Thiessen-Polygon‘ für die Zerlegung in Territorien, ‚Ring-Buffer‘ für die Bestimmung des urbanisierten Gebiets, die *Least-Cost-Path*-Analyse für die Vorhersage der am einfachsten realisierbaren Straßen, die *Line-of-Sight*- und die *Viewshed*-Analyse für die Sichtbarkeitsverhältnisse zwischen Monumenten.

Die ersten vier Kapitel bilden eine Basis für den analytischen Teil. Das erste Kapitel stellt die Forschungsgeschichte vor, gefolgt von den Zielen dieser Arbeit und ihrem chronologischen Zeitrahmen. Das zweite Kapitel präsentiert die Datenquellen, die eine Liste relevanter griechischer und lateinischer Schriftzeugnisse, die Notizen von Reisenden, die archäologischen Befunde, und epigraphische Zeugnisse umfassen. Das dritte Kapitel beschreibt die physischen Gegebenheiten der Makro- und der Mikro-Region separat, darunter die Grenzen der analysierten Region, sowie deren Topographie und Klima. Das letzte einleitende Kapitel erläutert, auf welchem Weg sich diese Arbeit der ökonomischen Situation nähert, und führt die Proxies ein, die zu diesem Zweck für die Makro- und Mikro-Regionen definiert wurden und in den analytischen Kapiteln behandelt werden.

Die Analysen der Makro-Region werden in drei Kapiteln behandelt und beleuchten die epigraphischen Zeugnisse in der Masse, sowie in ökonomisch relevante Themenblöcken, die Siedlungsmuster mit einem auf der Urbanisierung liegenden Schwerpunkt, und das Straßensystem, fokussiert auf seine von Meilensteinen dokumentierte Wartung und Pflege.

Die en gros analysierten epigraphischen Zeugnisse erreichen ihren Höchststand in der zweiten Hälfte des 2. Jahrhunderts und zu Beginn des 3. Jahrhunderts nach Christus. Die Bauinschriften hingegen sind durch ihr Maximum während des zweiten Viertels des

2. Jahrhunderts nach Christus, die Meilensteine durch Ihres während der zweiten Hälfte des 3. Jahrhunderts und zu Anfang des 4. Jahrhunderts nach Christus gekennzeichnet.

Die Urbanisierung in der Makro-Region nimmt im Laufe der analysierten Epochen kontinuierlich zu und erreicht die höchste Dichte in der frühbyzantinischen Zeit. Die Analyse der Urbanisierungsmodelle hat ein heterogenes Bild der ökonomischen Situation des Gebiets ergeben. Einerseits die günstigen Verteilungsmuster im SW und NO Teil des Territoriums, und andererseits zentral gelegene Städte, die ihr Hinterland in großem Maßstab verarmen.

Hinsichtlich des Straßensystems, datieren die ersten Investitionen in regionale Straßen in die zweite Hälfte des 1. Jahrhunderts; sie wirkten als Triebkräfte ökonomischen Wachstums und der folgenden Blütezeit des Territoriums in der zweiten Hälfte des 2. Jahrhunderts nach Christus. Die Anlage der supra-regionalen Straßen datieren in den Beginn des 2. Jahrhunderts nach Christus und werden bis zum Beginn des 4. Jahrhunderts nach Christus fortgesetzt. Die Chronologie dieser Investitionen stimmt nicht mit dem *Peak* der Region überein und suggeriert, unterstrichen von der Analyse der Verteilung von Straßenstationen, eine Transformation des Territoriums zum Durchgangsgebiet während der frühbyzantinischen Periode.

Die mikro-regionale, im Hinterland von *Nicaea* angesiedelte Studie, ergänzt die makro-regionalen Daten durch eine Analyse von Stadtgebieten *intra muros* und Populationsschätzungen, die *Nicaea* unter den zehn größten Städten in Asia Minor positioniert, jedoch hinter *Nicomedia*.

Die Analyse-Werkzeuge haben ihre Relevanz mit folgenden Einschränkungen bewiesen: Voronoi-Diagramm / Thiessen-Polygone zerlegen das Gebiet gleichmäßig wie möglich und tendieren aus diesem Grund dazu, Unregelmäßigkeiten der analysierten Territorien zu verdecken. Darüber hinaus berücksichtigen sie, ebenso wie *Ring Buffer*, nicht die Zugänglichkeit des Terrains, i.e. natürliche Grenzen. Die anisotrope *Least-Cost-Path*-Analyse ist nur unter der Bedingung, dass der einfachste Weg auch der Kürzeste ist, fehlerfrei anwendbar. Ist er es nicht, fällt die Analyse häufig fehlerhaft aus, da sie sich stets für die einfachste Route entscheidet, ohne ihre Länge zu in Betracht zu ziehen. Die *Line-of-Sight*- und *Viewshed*-Analysen sind beide mit demselben Problem behaftet: sie können mögliche Sichthindernisse, wie etwa Vegetation, nicht bedenken. Ihre Ergebnisse sind deshalb oftmals fehlerhaft.

List of Tables

Table 1: Designations of Periods and Chronological Ranges	41
Table 2: References to the Territory of Bithynia / Bithynians in Selected Greek and Latin Sources.....	45
Table 3: Delimitation, Geographical Settings and Settlements in Selected Greek and Latin Sources	47
Table 4: References to Political Geography and Economy in Selected Greek and Latin Sources.....	51
Table 5: List of Earthquakes in Bithynia in Selected Greek and Latin Sources	53
Table 6: List of Greek and Latin Sources Used for the Reconstruction of the Road System	55
Table 7: List of Travellers in Bithynia from the 18th till the End of the 19th Century	65
Table 8: Quantification of Inscriptions Connected with Economic Activities	79
Table 9: Overview of Elevation Ranges in the Macro-Region	85
Table 10: Rock Units and their Representation in the Macro-Region	88
Table 11: Overview of Elevation's Ranges in the Micro-Region	91
Table 12: Way of Assessing all the Possible Centuries Included in One Chronological Time Span ..	103
Table 13: Overview of Greek and Latin Inscriptions from Bithynia	105
Table 14: Dated Epigraphic Evidence in Each Urban Settlement Separately.....	110
Table 15: Capital Investments I – Building Activities except Milestones.....	133
Table 16: Capital Investments II - Milestones	137
Table 17: Epigraphic Evidence Pertain to Demonstrations of Trade	140
Table 18: Epigraphic Evidence Pertain to Demonstrations of Food / Land Divisions	142
Table 19: Epigraphic Evidence Pertain to the Evidence of Diverse Professions	144
Table 20: Names of Rural Settlements on Epigraphic Evidence	147
Table 21: Hellenistic Cities and their Origins	170
Table 22: Roman Cities and their Origins.....	180
Table 23: Early Byzantine Cities and their Origins.....	190
Table 24: Tabular Overview of Urbanization Estimates.....	196
Table 25: Urbanized Areas in the Macro-Region and Asia Minor.....	201
Table 26: Sizes of Thiessen Polygons in the Macro-Region and Asia Minor.....	202
Table 27: Table of Cities' Altitudes in the Macro-Region.....	203
Table 28: Density of Settlements in the Macro-Region Divided Based on Given Time Spans	205
Table 29: Density of Settlements in the Macro-Region and Asia Minor during the Roman Period	205
Table 30: Density of Settlements Divided Based on Altitudes during Given Periods.....	206
Table 31: Density of Settlements in the Macro-Region and in Paphlagonia in Given Periods.....	208
Table 32: Density of Settlements during Given Periods in Macro-Region and Paphlagonia Divided Based on Altitudes.....	209
Table 33: Overview of the Data Used for the Reconstruction of the 'Pilgrim's Road'	223
Table 34: Overview of the Data Used for the Reconstruction of the 'Northern Road'	227
Table 35: Overview of the Data Used for the Reconstruction of the Road Segment ' <i>Nicaea</i> - Prusias ad Mare'	230
Table 36: Overview of the Data Used for the Reconstruction of the Road Segment ' <i>Cretia Flaviopolis – Tium – Amastris</i> '	232

Table 37: Overview of Capital Investments in the 'Pilgrim's Road'	244
Table 38: Capital Investments in the 'Northern Road'	253
Table 39: Capital Investments in the Road 'Cretia Flaviopolis - Tium'	255
Table 40: Capital Investments in the Road ' <i>Nicaea</i> - Prusias ad Mare'.....	256
Table 41: Capital Investments in the Road 'Tium - Amastris'	258
Table 42: Capital Investments in the Roads radiating from 'Prusa ad Olympum'	259
Table 43: Extents of cities in the Macro-Region in the Hellenistic, Roman and Early Byzantine Periods.....	276
Table 44: Estimations of Inhabitants Living in <i>Nicaea</i> during the Hellenistic and Roman / Early Byzantine Periods.....	278
Table 45: Estimations of Sizes of Cities and Numbers of Inhabitants in the Macro-Region.....	278
Table 46: Epigraphic Evidence Demonstrating Diverse Professions in <i>Nicaea</i>	279
Table 47: Epigraphic Evidence Demonstrating Diverse Professions in <i>Nicomedia</i>	280
Table 48: Capital Investments in Public Buildings in <i>Nicaea</i> Based on the Epigraphic Evidence and Literary Sources.....	281
Table 49: The Investments in the Road System in the Micro-Region	283
Table 50: Density of Rural Settlements in the Micro-Region during the Given Periods.....	293
Table 51: Density of Settlements during the Given Periods in the Macro- and Micro-Region	293
Table 52: Density of Settlements in the Micro-Region during the Given Periods Divided Based on their Altitudes.....	294
Table 53: Density of Settlements in the Micro-Region during the Given Periods Divided Based on their Altitudes.....	294
Table 54: Comparison of Settlements' Density in the Macro and Micro-Region Divided by the Given Periods and Altitudes	295
Table 55: Density of Settlements in the Macro- and Micro-Region in Altitudes 0 - 500 m a. s. l....	296

List of Figures

Figure 1: Delimitations of the Macro-Region Based on the Spatial Distribution of Cities (Addendum 1. 4.).....	48
Figure 2: Remains of Ancient Roads Mentioned by Travellers (Addendum 1. 5.).....	63
Figure 3: Quantified Inscriptions Divided Based on Availability of Chronological Data Frame.....	78
Figure 4: Proportional Representation of Inscriptions Encompassing Economic Proxies.....	80
Figure 5: Geographical Delimitations of the Macro-Region Using the Ancient Terminology (Addendum 1. 6.).....	82
Figure 6: Geographical Settings of the Macro-Region (Addendum 1. 7.).....	85
Figure 7: Rock Units and the NAF in the Macro-Region (Addendum 1. 8.).....	87
Figure 8: Geographical Delimitations of the Micro-Region (Addendum 1. 9.).....	90
Figure 9: Geographical Settings and the NAF in the Micro-Region (Addendum 1. 10.).....	91
Figure 10: Rock Units and the NAF in the Micro-Region (Addendum 1. 11.).....	92
Figure 11: Spatial Distribution of Urban Settlements with Published Epigraphic Evidence (Addendum 1. 12.).....	102
Figure 12: Proportional Representations of Languages Used on Inscriptions in the Analysed Urban Settlements (Addendum 1. 13.).....	106
Figure 13: Quantified Spatial Analysis of the Epigraphic Evidence (Addendum 1. 14.).....	107
Figure 14: Temporal Analysis of Epigraphic Evidence from <i>Nicaea</i> and its Territory.....	111
Figure 15: Temporal Analysis of Epigraphic Evidence from Prusa ad Olympum and its Territory ..	112
Figure 16: Temporal Analysis of Epigraphic Evidence from <i>Nicomedia</i> and its Territory.....	113
Figure 17: Temporal Analysis of Epigraphic Evidence from Hadrianopolis and its Territory.....	114
Figure 18: Temporal Analysis of Epigraphic Evidence from <i>Apamea</i> and its Territory.....	115
Figure 19: Temporal Analysis of Epigraphic Evidence from Chalcedon and its Territory.....	116
Figure 20: Temporal Analysis of Epigraphic Evidence from Prusias ad Hypium and its Territory ...	117
Figure 21: Temporal Analysis of Epigraphic Evidence from Prusias ad Mare and its Territory.....	118
Figure 22: Temporal Analysis of Epigraphic Evidence from Claudiopolis and its Territory.....	119
Figure 23: Temporal Analysis of Epigraphic Evidence from Heraclea Pontica and its Territory.....	120
Figure 24: Temporal Analysis of Epigraphic Evidence from Tium and its Territory.....	121
Figure 25: Temporal Analysis of Epigraphic Evidence from Strobilos and its Territory.....	122
Figure 26: Temporal Analysis of the Epigraphic Evidence in Spatial Context (Addendum 1. 15.)...	126
Figure 27: Overview of the Development of the Epigraphic Evidence in Each of the Analysed Centres.....	128
Figure 28: Temporal Analysis of Epigraphic Evidence in the Macro-Region.....	129
Figure 29: Chronological Time Span of Investments in the Road System in the Macro-Region.....	138
Figure 30: Overview of the Epigraphic Evidence Directly Connected with Economic Development in each of the Analysed Centres.....	149
Figure 31: Temporal Analysis of Epigraphic Evidence Directly Connected with Economic Development in the Macro-Region.....	150
Figure 32: Settlements in the Hellenistic Period (Addendum 1. 16.).....	166
Figure 33: Urbanization in the Hellenistic Period (Addendum 1. 17.).....	170
Figure 34: Settlements in the Roman Period (Addendum 1. 18.).....	176

Figure 35: Urbanization in the Roman Period (Addendum 1. 19.)	181
Figure 36: Settlements in the Early Byzantine Period (Addendum 1. 20.)	185
Figure 37: Urbanization in the Early Byzantine Period (Addendum 1. 21.)	190
Figure 38: Bar Graph Depicting the Areas Directly Surveyed by Cities.....	198
Figure 39: Urbanization during the Hellenistic, Roman and Early Byzantine Periods	199
Figure 40: Linear Graph of the Altitudes of the Roman Cities in the Macro-Region	204
Figure 41: Direct Dependency of the Development of the Road System and Economic Situation, French 1980, 701.....	213
Figure 42: Sequence of Processes in Development of Road Systems, French 1980, 702	214
Figure 43: Reconstruction of the Supra-Regional 'Pilgrim's Road' (Addendum 1. 22.).....	226
Figure 44: Reconstruction of the Regional 'Northern Road' (Addendum 1. 23.)	230
Figure 45: Reconstruction of the Regional Road ' <i>Nicaea</i> - Prusias ad Mare' (Addendum 1. 24.) ...	231
Figure 46: Reconstruction of the Regional Roads ' <i>Cretia Flaviopolis</i> - Tium - Amastris' (Addendum 1. 25.).....	234
Figure 47: Reconstruction of the Supra-Regional and Regional Hellenistic Roads in the Macro- Region (Addendum 1. 26.)	236
Figure 48: Reconstruction of the Supra-Regional and Regional Roman Roads in the Macro-Region (Addendum 1. 27.).....	239
Figure 49: Reconstruction of the Supra-Regional and Regional Early Byzantine Roads in the Macro- Region (Addendum 1. 28.)	241
Figure 50: Spatial Distribution of Milestones Documenting the Investments in the 'Pilgrim's Road' (Addendum 1. 29.).....	245
Figure 51: Temporal Analysis of Dated Milestones Situated along the 'Pilgrim's Road'	247
Figure 52: Diversion of the Main Traffic along the 'Pilgrim's Road' during the Reign of Justinian I. (Addendum 1. 30.).....	251
Figure 53: Spatial Distribution of Milestones Documenting the Investments in the Regional 'Northern Road' (Addendum 1. 31.).....	254
Figure 54: Temporal Analysis of Dated Milestones Situated along the 'Northern Road'	255
Figure 55: Spatial Distribution of Milestones Documenting the Investments in the Regional road 'Cretia Flaviopolis - Tium' (Addendum 1. 32.).....	256
Figure 56: Spatial Distribution of Milestones Documenting the Investments in the Regional Road ' <i>Nicaea</i> - Prusias ad Mare' (Addendum 1. 33.).....	257
Figure 57: Spatial Distribution of Milestones Documenting the Investments in the Regional Road 'Tium - Amastris' (Addendum 1. 34.)	258
Figure 58: Spatial Distribution of Milestones Documenting the Investments in the Regional Roads 'Prusa ad Olypnum – <i>Apamea</i> / <i>Caesarea Germanica</i> ' (Addendum 1. 35.).....	260
Figure 59: Delimitations of <i>Nicaea</i> in the Hellenistic and Roman / Early Byzantine Periods (Addendum 1. 36.).....	274
Figure 60: Reconstruction of the Road Network in the Micro-Region with Spatial Distribution of Milestones (Addendum 1. 37.).....	284
Figure 61: Reconstruction of the Hinterland of <i>Nicaea</i> during the Hellenistic Period (Addendum 1. 38.).....	286
Figure 62: Reconstruction of the Hinterland of <i>Nicaea</i> during the Roman Period (Addendum 1. 39.).....	288

Figure 63: Reconstruction of the Hinterland of <i>Nicaea</i> during the Early Byzantine Period (Addendum 1. 40.).....	290
Figure 64: Map of Intensively Surveyed Scatter of Pottery Connected with Quarrying Activities (Addendum 1. 41.).....	291
Figure 65: Bar Graph Showing the Temporal Distribution of Dated Sarcophagi from Docimium Identified in the Micro-Region	298
Figure 66: Wine / Oil Presses from Hocaköy (left) and Dırazali (right) (photos by author).....	299
Figure 67: Functional Analysis of the Hinterland of <i>Nicaea</i> (Addendum 1. 42.)	300
Figure 68: Line of Sight similar to 36 per cent of Funerary Monuments towards <i>Nicaea</i>	302
Figure 69: Results of the Viewshed Analysis from all the Funerary Monuments (55) (Addendum 1. 43.).....	303
Figure 70: Results of the Viewshed Analysis from the ‘Pilgrim’s Road’ (Addendum 1. 44.)	305

Abbreviations

The present work follows the text guidelines of the German Archaeological Institute (DAI), published online and last updated in April 2014. For the guidelines, see URL:

<<http://www.dainst.org/publikationen/publizieren-beim-dai/richtlinien>> (26.03.2017).

The literature used in the text is abbreviated based on the author-year system and the full citations are included in the bibliography.

The lists of abbreviations used in the work include: ‘List of Abbreviations for Journals, Series, Lexica and Frequently Cited Works’ and ‘Suggestions for Other Abbreviations’.

Only the abbreviations which are not included in the DAI guidelines are listed here.

Index of Literature Abbreviations

AEMÖ	Archaeologisch-epigraphische Mittheilungen aus Oesterreich-Ungarn (Vienna)
BAtlas	R. J. A. Talbert (Ed.), Barrington Atlas of the Greek and Roman World 1/2. Atlas (Princeton 2000)
BE	Bulletin épigraphique, in: Revue des Études Grecques. Publication trimestrielle de l’Association pour l’Encouragement des Études Grecques (Paris)
CIRB	Corpus Inscriptionum Regni Bosporani (Moscow)
Gephyra	Gephyra. Zeitschrift für Geschichte und Kultur der Antike auf dem Gebiet der heutigen Türkei (Istanbul)

Index of Other Abbreviations

ASTER	Advance Spaceborne Thermal Emission and Reflection Radar
AWMC	Ancient World Mapping Center
BerGSAS	Berlin Graduate School of Ancient Studies
BIAA	British Institute of Archaeology at Ankara
ConcEyst	Konkordanzprogramm zur griechischen und lateinischen Epigraphik

CSV	Comma-Separated Values
DARMC	Digital Atlas of Roman and Medieval Civilizations
DEM	Digital Elevation Model
EAGLE	Europeana Network of Ancient Greek and Latin Epigraphy
EDH / HD	Epigraphic Database Heidelberg / Heidelberg Database
GIS	Geographic Information System
GRASS	Geographic Resource Analysis Support System
JSON	Java Script Object Notation
ISP / ISP15	Iznik Survey Project (2015)
KML	Keyhole Markup Language
LAA	Landscape Archaeology and Architecture
LCPA	Least Cost Path Analysis
m a. s. l.	Meters above the sea level
N/A	Not available
NAF / NAFZ	North Anatolian Fault (Zone)
NASA	United States National Aeronautics and Space Administration
NE	North-east
NW	North-west
OXREP	Oxford Roman Economy Project
PHI / PH	Packard Humanities Institute
RDF	Resource Description Framework
s. l.	sine loco
SHP	shapefile
SRTM	Shuttle Radar Topography Mission
SE	South-east
SW	South-west
TAVO	Tübinger Atlas des Vorderen Orients
UCL	University College of London
USGS	United States Geological Survey

1. Introduction

The present doctoral thesis assesses the economic development of ancient Bithynia situated in the NW territory of Asia Minor during the Hellenistic, Roman and Early Byzantine periods. The study draws for the most part on published data, enriched only modestly by research in the field. The work processes and analyses the data, in the main generally known, with new or hitherto not applied methods in NW Asia Minor, revealing in this way their unexpected potential.

The initial idea of the project originated in the TOPOI Excellence Cluster in Berlin.¹ The project was established in the group A-6 which is largely focused on studying the ‘economic spaces’. The projects included in the group analyse economic structures in space and examine the organisation of production and distribution.² Main aim of the project A-6-6, my research directly belongs to, is to investigate the economic landscape of the Hellenistic, Roman and Late Antique Bithynia.³

Although the central object of the research of the entire group A-6 is ceramics,⁴ my work examines diverse aspects of the economic development. My decision to divert from the main topic of the research group was initially caused by complications with collecting and sampling of the ceramics in the field. However, this initial challenge of the project forced me to look for diverse ways of assessing the economic development in Bithynia which, I believe, I managed to turn into an advantage in the final output.

My work was written as a part of the Berlin Graduate School of Ancient Studies (BerGSAS) and included in the program Landscape Archaeology and Architecture (LAA).⁵ The program focuses on various methods, research strategies and techniques suitable for the modelling and reconstruction of ancient structures and landscapes.⁶ As a member of the BerGSAS I had the

¹ URL: <<https://www.topoi.org/>> (26.03.2017).

² For a short description of the projects included in the TOPOI research group A-6, see URL: <<https://www.topoi.org/group/a-6/projects/>> (26.03.2017).

³ For a short description of the project, see URL: <<http://www.topoi.org/project/a-6-6/>> (26.03.2017).

⁴ The central point of the ceramic studies of the group A-6 create archaeometry studies, conducted under the supervision of M. Daszkiewicz and G. Schneider.

⁵ For a more detailed description of the program and the academic members, see URL: <<http://www.berliner-antike-kolleg.org/-/programm-laa?redirect=%2Fbergsas%2Fprograms>> (26.03.2017).

⁶ Especially helpful was the ‘Winter-school on modelling in Landscape Archaeology’ organised by D. Knitter, for a short description, see URL: <<https://www.topoi.org/event/23171/>> (26.03.2017).

opportunity to develop and consult my work in an inspiring environment of students⁷ and academic researchers asking very similar questions in various territories and scales and implementing different methods when looking for their solutions.

Apart from the scientific community in Berlin, I also had the possibility to present and consult the preliminary results of the work at several international conferences.⁸ The discussions largely contributed to the final results and enabled me to enlarge the scope of my work.⁹

In general, I brought together diverse datasets and studied their potential for demonstrating the economic development of the region, choosing for the resulting work the best fitting instances. The datasets I analyse to reconstruct the economic development of the NW Asia Minor include the epigraphic evidence, ancient literary sources, settlement patterns and road systems. All the data are digitised and presented within well-arranged tables and in their spatial environment, i.e. on maps. For the most part, the analysed data are available online.

The study can be characterised as a multi-scalar approach. The values under examination encompass macro-regional scale represented by the territory of NW Turkey, roughly corresponding with the ancient region of Bithynia, and micro-regional scale within, focused on the hinterland of Iznik, the ancient town *Nicaea*, one of the main centres in antiquity. The largest analysed scale focuses on the interpretation of one of the pottery scatters discovered during the Iznik Survey Project in the spring of 2015 (henceforth the ISP15) in the micro-region, which we covered by a

⁷ For an overview of other students and their projects, see URL: <<http://www.berliner-antike-kolleg.org/bergsas/doctoral-candidates>> (26.03.2017).

⁸ To the most enriching belong the following conferences: CAA Visegrad (Computer Applications & Quantitative Methods in Archaeology) held in Czieszyn, attended with the paper 'Reconstruction of Ancient Road System in Bithynia with Micro-Regional Focus on *Nicaea* and its Hinterland (nowadays Iznik, Turkey) - How the LCPA fits to the real archaeological data?'; Iznik/*Nicaea* on its Way to Become UNESCO World Heritage Site held in Iznik, attended with the paper 'Results of the Pilot Project Identifying Archaeological Monuments in the Hinterland of *Nicaea*'; Mapping the Past: G.I.S. Approaches to Ancient History held in North Carolina-Chapel Hill, attended with the paper 'Pilot GIS Project in the Hinterland of *Nicaea*, Bithynia, Asia Minor' and The fifth PeCIA (Perspectives of Classical Archaeology) held in Prague attended with the paper 'An Applicability of Thiessen Polygons / a Voronoi Diagram and Multiple Ring Buffers for Spatio-Temporal Analysis of Urbanization, Case Study in NW Asia Minor'.

⁹ Especially valuable were consultations with R. J. A. Talbert about the features depicted in the Barrington Atlas, with T. Elliott about the project Pleiades and cooperation with P. Pavúk which led to a separate study 'On Persistency of the Main Communication Routes from Prehistory until Today' (Weissová – Pavúk 2016, 11–21).

systematic survey. The assembled data are, where applicable, compared with results from the region of Paphlagonia¹⁰ and the supra-region represented by the entire Asia Minor.¹¹

This first chapter encompasses, beyond the introduction, the history of the research conducted in NW Asia Minor, labelled as the macro-region in the present work. The research history is presented in six subchapters, dividing the research as follows: the territory of Bithynia in general, excavations and surveys, studies focused on epigraphic evidence, ancient roads, economic studies and digitised datasets. The overview of the studies demonstrates the strengths and weaknesses of the research hitherto conducted in the macro-region. Based on the available data, I further define the main objectives of the present thesis. The objectives also outline the examined scale factors and their mutual interconnectivity. The chapter is accomplished by the determination of the chronological data frames, as used in the work.

The second chapter represents a summary of all the available sources and their relevance for the analyses. The sources are divided into four main groups as follows: Greek and Latin literary sources, records of travellers from the 18th till the end of the 19th century, archaeological sources and epigraphic evidence. The ancient literary sources represent a primary source of a great value, especially for the general perception of Bithynia as an ancient region, its inhabitants, border delimitations, geographical settings, settlement patterns and economic affairs. The notes of travellers crossing the region during the 18th and 19th century are mere observations of non-specialists but create an invaluable source of data, since they provide observations for the most no longer accessible. The archaeological sources mention results of the excavations and surveys conducted in the region. My aim is to point out to the actual remains in the terrain, confirmed by the archaeological studies. Although the data are largely insufficient, since most of the results come from rescue excavations and unsystematic surveys, they are of a foremost importance, verifying the information gained in the written sources. The epigraphic evidence, eventually, is represented in a separate subchapter, since it offers a basic dataset for the study.

The third chapter encompasses a brief introduction to the physical setting of the analysed area, divided accordingly into the macro- and micro-region. Both examined scales encompass

¹⁰ As a comparative study, I use the results of the survey project conducted in Paphlagonia and published by Matthews – Glatz 2009.

¹¹ Hanson 2011, 229–275.

delimitations of their territories, geographical settings, brief descriptions of the climate and geological settings. The latter introduces the Northern Anatolian Fault (henceforth NAF) as a decisive factor for the study, since it crosses directly through two major ancient cities, *Nicaea* and *Nicomedia*.

The fourth chapter outlines the ways of assessing the economic development as presented in diverse studies discussing the ancient economy. For the present thesis, I select several most fitting ways which I further argue for in detail within the analytical chapters.¹² The fourth chapter represents a basis of the further argumentation concerning the economic proxies and introduces the factors available for the macro- and micro-region separately.

The fifth chapter represents the first analytical chapter of the thesis. It examines the epigraphic evidence published for the territory of the macro-region in the light of the economic development. In the first part, I argue for the utilisation of the epigraphic evidence for the outlined purpose. I do not assess the epigraphic evidence as an epigrapher studying each single inscription separately. I evaluate the quantity and its fluctuations in the discussed time-span and within the spatial environment. The theory and applied methodology are presented in detail and followed by the quantification and results of the temporal as well as spatial analyses of the epigraphic evidence *en masse*. The second part of the chapter considers the texts of the inscriptions and points out to several topics directly relevant to the economy. The topics include capital investments, evidence of trade, demonstrations of food and land distributions, division of labour and documented settlements. The evidence is interpreted with respect to the chronology and spatial environment, where available.

The sixth chapter focuses on the analysis of the urbanization and the development of settlement patterns in the macro-region and their interpretation within the economic development. The basic reconstruction of settlement patterns is based on the Barrington Atlas of the Greek and Roman World¹³ which I further completed with the records of travellers and results of the current research. The first part of the chapter introduces the main theories discussing the connection of urbanization and the development of settlement patterns with the economic

¹² These are the chapters 5., 6., 7. and 8.

¹³ Talbert 2000.

growth. The second part is purely methodological and focuses on the explanations of the GIS tools applied for the division of the territory. These are the Voronoi diagram / Thiessen polygons and multiple ring buffers. The chapter represents the reconstruction of the settlements during the Hellenistic, Roman and Early Byzantine periods. The results are spatio-temporally analysed and explained within two basic distribution models; the central place and the primate-city distribution. The outcomes are further compared with the neighbouring Paphlagonia and with estimates pertaining to the entire Asia Minor.

The seventh chapter examines the complexity of the development of the road system in the macro-region and its interconnectivity with the economic situation. The first part of the study presents the methodology applied for the reconstruction of the communications. On the first place, I introduce the development of the methodologies, followed by the explanations of the GIS tool I applied, i.e. the least cost path analysis (henceforth the LCPA). The resulting routes, presented for the Hellenistic, Roman and Early Byzantine periods separately, are a combination of the historiographical records with the LCPA. The investments in particular roads are followed based on the spatial distribution of dated milestones. The investments in the road system are spatio-temporally analysed and used for demonstrating the gradual development of the economic situation in the macro-region.

The eighth chapter represents a complementary study to the economic development of the entire NW Asia Minor. The focus is on the quantifiable datasets available for *Nicaea* and its hinterland that can be used for characterising the economic situation in the micro-region. The field season, henceforth the Iznik Survey Project (ISP15), conducted in the territory in the spring of 2015, considerably enriched the analysed dataset. Therefore, the micro-regional study can be performed in a larger detail, including proxies for the entire macro-region inaccessible. The results are compared with the macro-region as well as with the entire Asia Minor.

The ninth chapter, conclusion, brings together the results achieved in the analytical chapters focused on particular types of evidence. Their mutual comparison enables to outline the complex picture of the development of the economic situation in the macro-region.

The study includes six addenda. The Addendum 1 encompasses 44 maps. The first three maps represent the archaeological maps available for the macro-region. The remaining 41 maps were created for the purpose of the present study. These maps are also presented in the text, in order to enable an instant overview of the discussed topics. However, the maps in the addendum are in a better resolution and with a greater detail. The main aim is to provide as much information as available for the analysed areas and topics.

The second and third addendum present the largest quantifiable datasets which I use during the analyses, accompanied by their main sources. The Addendum 2 includes a catalogue of the epigraphic evidence, ranked alphabetically based on the centres the inscriptions belong to. The catalogue represents a basis for the analysis of the epigraphic evidence described in the Chapter 5. The table encompasses numbers which allow finding the inscriptions in online databases. Since not all the inscriptions I use are available online, the table includes the original sources as well. The Addendum 2 offers an indispensable overview of all the sources since it enables to trace each single inscription used for the analysis. In this way, I aim for offering a synoptic and complete list which can be easily enriched with new evidence and used for future analyses.

The Addendum 3 concerns all the settlements used for the reconstruction of the settlement patterns. They are presented in three separate tables, divided based on the chronology. The settlements, similar to the epigraphic evidence, encompass an identifier number which allows their identification with an online database. The table includes the original source of the data.

The Addendum 4 presents an overview of bridges and their sources, depicted on the schematic map as well as in a table. The bridges were used for the spatial rectification of the road system presented in the Chapter 7. The addendum is complemented with photographic documentation of some of the bridges in order to demonstrate their outstanding preservation and proportions. All the listed photographs were taken during the ISP15 and show the state of the preservation of the bridges in March / April 2015.

The Addendum 5 focuses on the description of the surface concentrations located during the Iznik Survey Project in 2015. The catalogue presents the main characteristics of the newly discovered settlements, accompanied with the photographic documentation of the sites and of the surface finds. Since I was not allowed to collect the finds, all the photos had to be taken in the

field. The photographic documentation of the finds suffered from the restriction. The addendum includes the most representative photos in order to support my interpretations. The identified settlements are further analysed in Chapter 8.

Finally, the Addendum 6 presents marble quarries situated in the hinterland of *Nicaea*. The quarries were visited and described during the ISP15. The tabular overview encompasses brief descriptions of the quarries and it is completed by the photographic documentation taken in the field.

Note on the nomenclature

In terms of the spelling of ancient place names I use the Latin conventions throughout the work as a standard. Only when speaking about the cities during the Hellenistic and Early Byzantine periods, I use the Greek conventions with an aim to create the most authentic maps of the studied time-spans. To avoid any confusion in the present study, I provide a short glossary of the Latin and Greek transliterations of the names of the cities as used for the Hellenistic, Roman and Early Byzantine periods.

Hellenistic Name	Roman Name	Early Byzantine Name
<i>Apameia</i>	<i>Apamea</i>	<i>Apameia</i>
<i>Apollonia epi Ryndako</i>	<i>Apollonia ad Rhyndacum</i>	<i>Apollonias</i>
<i>Bithynion</i>	<i>Claudiopolis</i>	<i>Klaudiopolis</i>
<i>Chalkedon</i>	<i>Chalcedon</i>	<i>Chalkedon</i>
<i>Daskylaion</i>	<i>Dascyleion</i>	<i>Daskylion</i>
<i>Herakleia</i>	<i>Heraclea Pontica</i>	<i>Herakleia</i>
<i>Krateia</i>	<i>Cretia Flaviopolis</i>	<i>Kratia</i>
<i>Nikaia</i>	<i>Nicaea</i>	<i>Nikaia</i>
<i>Nikomedeia</i>	<i>Nicomedia</i>	<i>Nikomedeia</i>
<i>Prusias</i>	<i>Prusias ad Hypium</i>	<i>Prousa</i>
<i>Kios</i>	<i>Prusias ad Mare</i>	<i>Kios</i>
<i>Prousa</i>	<i>Prusa ad Olypnum</i>	<i>Prousius</i>
<i>Tios</i>	<i>Tium</i>	<i>Tios</i>
<i>N/A</i>	<i>Caesarea Germanica</i>	<i>Kaisareia</i>
<i>N/A</i>	<i>Hadrianopolis</i>	<i>Hadrianoupolis</i>
<i>N/A</i>	<i>Iuliopolis</i>	<i>Iounopolis</i>
<i>N/A</i>	<i>N/A</i>	<i>Prinetos</i>
<i>N/A</i>	<i>N/A</i>	<i>Basileinoupolis</i>
<i>N/A</i>	<i>N/A</i>	<i>Helenopolis</i>
<i>N/A</i>	<i>N/A</i>	<i>Regetataios</i>
<i>N/A</i>	<i>N/A</i>	<i>Regodories</i>

Acknowledgements

I would like to express my sincere gratitude to those who were the most responsible for the successful completion of this dissertation. To my first supervisor, Jun. Prof. Silvia Polla, I owe special thanks for initializing the entire project within TOPOI, for her consultations and help during the writing process. To my second supervisor, Prof. Dr. Monika Trümper, for her goodwill to undertake supervision of my thesis during the last year, and for her advices and constructive criticism of the work.

I also want to offer sincere thanks to Prof. Dr. Mustafa Şahin (Uludağ Üniversitesi, Bursa) and Prof. Dr. Christof Berns (Ruhr-Universität, Bochum), directors of the survey project conducted in the hinterland of *Nicaea* from respectively Turkish and German parts. My special thanks belong to Mr. Ahmet Ali Altın for his help during the field work and answering my numerous questions concerning publications written in Turkish. I owe Mr. Ali Altın great thanks not only for professional help but also for his friendship and pleasant companionship during the work.

My sincere gratitude belongs to Dr. Petra Janouchová for consultations during the initial processing of the epigraphic evidence and to Ms. Clarissa Haubenthal who helped me greatly with language issues when studying notes of German travellers from the 19th century. Finally, I would like to thank Mr. Rani Tolimat for language corrections.

1. 1. Research History

During the initial stage of my work, whilst putting together all the pieces of information published for the region, I realized its unique position in the history of research when compared with other regions of Asia Minor. Considered as a buffer territory between the two continents of Europe and Asia as well as between the western and eastern cultures, its importance and ‘transitional character’ have often been discussed on a theoretical level. However, archaeological research in the territory is far behind that in the other regions of Asia Minor. Whether it is caused by the continuous use of the ancient cities until today, by lesser amount of striking ancient monuments standing above the ground or simply by lack of financial resources, does not change the fact that there is hitherto not a single published systematic total coverage survey of the territory. A comparable situation concerns excavations. Except for rescue excavations, little large-scale planned excavations have been carried out.

The following text shows an overview of the research conducted in Bithynia, divided into six subchapters based on the discussed topics.

1. 1. 1. Bithynia

One of the first descriptions of the geography of Bithynia, mentioning also the major ancient cities, was provided by J. Rennell.¹⁴ Furthermore, J. A. Cramer’s ‘Geographical and Historical Description of Asia Minor’¹⁵ included an entire chapter focused on ancient Bithynia. Well-founded delimitations of the Bithynian territory were provided by G. Long in ‘The Dictionary of Greek and Roman Geography I’.¹⁶ A complex evidence concerning entire Bithynia, supplemented by a historical development and detailed description of major cities, was presented by C. Texier.¹⁷ The French archaeologist and architect C. Texier studied, as one of the first scholars, the Byzantine architecture as a topic of particular interest. C. Texier’s study includes observations he made during several travels through Asia Minor. Only ten years later, a French archaeologist, G. Perrot,

¹⁴ Rennell 1831, 102–115.

¹⁵ Cramer 1832, 167–215.

¹⁶ Long 1854, 404–406.

¹⁷ Texier 1862, 47–151.

published a detailed description of most of the major cities in Bithynia.¹⁸ W. M. Ramsay's¹⁹ extended study on the historical geography of the entire Asia Minor describes the cities in specific provinces as well as the Roman road system.

As a geographic map of the territory was still missing in the last third of the 19th century, an essential step was made by the geographic exploration of Asia Minor, published by H. Kiepert (Addendum 1. 1.).²⁰ H. Kiepert's maps, although still with several blank areas, considerably eased further archaeological exploration of the territory. The maps served as a basis for a number of travellers who further worked on completing of the blank areas.²¹

An overall study concerning the Roman rule in Asia Minor until the third century AD with overwhelming footnotes encompassing all the possible sources was published by D. Magie.²² A. H. M. Jones²³ devoted in his study of the cities of the eastern Roman provinces one chapter to Bithynia and Pontus, outlining, among others, also the development of urbanization from the Hellenistic till the Early Byzantine period. The history and development of the Hellenistic kingdom were shortly assessed by C. Michels.²⁴

A monograph concerning the Roman provinces Bithynia and Pontus was published by C. Marek²⁵ and brought an overview of events as well as monuments dated to the Roman presence in the territory of the double province. The impact of the Roman rule on Anatolia in general and its urbanization in particular, were discussed by S. Mitchell.²⁶ S. Mitchell also examined diverse religions and their impact on the development of Anatolia during the Roman Rule.²⁷ The Early Byzantine period in Bithynia was studied in detail by K. Belke who introduced a general overview of the history and geography²⁸ as well as a study focused on settlement patterns.²⁹ A database and

¹⁸ Perrot 1872, 1–68. The book includes *Nicomedia, Nicaea, Apamea Myrlea, Heraclea Pontica, Prusias ad Hypium, Bithynium, Prusa ad Olympum* and modern Modrenae.

¹⁹ Ramsay 1962 (reprint of the original book published in 1890).

²⁰ Kiepert 1884.

²¹ For a detailed description concerning H. Kiepert and travellers, see Chapter 2. 2. 2.

²² Magie 1950.

²³ Jones 1998, 148–174.

²⁴ Michels 2014, 135–140.

²⁵ Marek 2003.

²⁶ Mitchell 1995a, 59–159.

²⁷ Mitchell 1995b.

²⁸ Belke 2013, 83–109.

²⁹ Belke 2010b, 46–66.

subsequent analysis of settlement patterns in the coastal Pontic provinces³⁰ were provided by D. P. Drakoulis.³¹ D. P. Drakoulis' study is based on the Barrington Atlas of the Greek and Roman World³² and on Synecdemus.³³

Following the aforementioned work by C. Texier, Turkish historian H. R. Kaplanoğlu³⁴ published a book focused solely on Bithynia. H. R. Kaplanoğlu brought together essential ancient literary sources and modern research focused on the territory. He presented a brief history and discussed major settlements as well as road stations and roads based on *Itineraria*.

The Barrington Atlas of the Greek and Roman World³⁵ and its Map-by-Map Directory³⁶ form a heterogeneous collection of data encompassing settlements dated from the Archaic period till the Early Byzantine period, Roman bridges, roads, temples and mines.³⁷ The Atlas brings together a number of secondary sources and presents them in a spatial environment. The collection of data forms a backbone for analytical studies focused on processing an extensive number of features. An exemplary study based on the Barrington Atlas is the analysis of the urban system in the entire Asia Minor published by J. W. Hanson.³⁸ The maps published in the Barrington Atlas represent the most complete overview of settlements situated in the macro-region. Lately, the AWMC published a detailed map of Asia Minor in the 2nd century AD³⁹ (Addendum 1. 3.).

History, archaeology and preserved monuments in single cities and optionally including their vicinity are published in several monographs. In particular, these monographs encompass the cities of *Nicaea*,⁴⁰ *Heraclea Pontica*,⁴¹ *Nicomedia*⁴² and *Prusias ad Hypium*.⁴³ *Constantinopolis* and

³⁰ The database includes Honorias, Paphlagonia, Hellespontus and Pontus Polemoniacus.

³¹ Drakoulis 2011, 147–172; Drakoulis 2012, 79–96; Drakoulis 2013, 237–247.

³² Talbert 2000, Maps 52 and 53.

³³ Hierocles, Syn. 690–694. For details on Synecdemus, see Chapters 2. 1. 2. and 2. 1. 3.

³⁴ Kaplanoğlu 1997.

³⁵ Talbert 2000, Maps 52 (Byzantium), 53 (Bosphorus) and 86 (Paphlagonia).

³⁶ The data depicted on the Map 52 (Byzantium) were compiled by Foss in 1997 (Foss 2000a, 785–795); the data on the Map 53 (Bosphorus) in 1995 (Foss 2000b, 796–802) and the features on the Map 86 (Paphlagonia) also in 1995 (Foss 2000c, 1217–1225).

³⁷ For the Map 52 which depicts the major part of the macro-region, see Addendum 1. 2.

³⁸ Hanson 2011, 229–275.

³⁹ Talbert et al. 2017.

⁴⁰ Schneider 1943; Merkelbach 1987; Díaz 1997; Yalman 2000.

⁴¹ Schneiderwirth 1882; Hoepfner 1966.

⁴² Ross 2007.

⁴³ Zeyrek – Baran-Çelik 2005.

its hinterland, which territorially interferes to Bithynia, were published by C. Mango and G. Dragon.⁴⁴

Finally, G. Lang⁴⁵ published a companion to the Classical ancient cities in Anatolia in two volumes, offering an overview of numismatics, history, archaeology and art in 288 locations. G. Lang's companion includes *Apamea*,⁴⁶ *Apollonia ad Rhyndacum*,⁴⁷ *Chalcedon*,⁴⁸ *Dascyleion*,⁴⁹ *Heraclea Pontica*,⁵⁰ *Iuliopolis*,⁵¹ *Nicaea*,⁵² *Nicomedia*,⁵³ *Prusias ad Hypium*,⁵⁴ *Prusias ad Mare*,⁵⁵ *Prusa ad Olympum*⁵⁶ and *Tios*.⁵⁷

1. 1. 2. Excavations and Surveys

One of the first large rescue excavations in Bithynia was conducted in 1934 in the suburbs of *Nicomedia*, when building a new cellulose and paper factory Seka.⁵⁸ The excavations revealed a great deal of outstanding finds which were subsequently published. The overview of literature presenting the finds was introduced by A. Ç. Ross⁵⁹ who has conducted the survey project in *Nicomedia* since 2005. The project is focused on a general archaeological assessment of the town and examines the territory of *Nicomedia intra* as well as *extra muros*.

Concerning *Nicaea*, regular excavations have been conducted and annually reported since 1980 in the area of the Roman theatre.⁶⁰ Since 2013, an interdisciplinary non-destructive survey

⁴⁴ Mango – Dagron 1995.

⁴⁵ Lang 2003a; Lang 2003b.

⁴⁶ Lang 2003b, 132–135 (listed as *Myrleia*).

⁴⁷ Lang 2003a, 181 f. (listed as *Apollonia Rhyndakos*).

⁴⁸ Lang 2003a, 502–508 (listed as *Kalchedon*).

⁴⁹ Lang 2003a, 271–273 (listed as *Daskyleion*).

⁵⁰ Lang 2003a, 423–428 (listed as *Herakleia Pontike*).

⁵¹ Lang 2003a, 486 f. (listed as *Iuliopolis*).

⁵² Lang 2003b, 154–164 (listed as *Nikaia*).

⁵³ Lang 2003b, 165–171 (listed as *Nikomedeia*).

⁵⁴ Lang 2003b, 349–352 (listed as *Prusias*).

⁵⁵ Lang 2003a, 555–559 (listed as *Kios*).

⁵⁶ Lang 2003b, 345–348 (listed as *Prusa*).

⁵⁷ Lang 2003b, 570–573 (listed as *Tios*).

⁵⁸ Zeyrek – Asal 2005, 1–9.

⁵⁹ Ross 2007, 52.

⁶⁰ İznik Tiyatro Kazısı in *Kazı Sonuçları Toplantısı* by Yalman 1981, 31–34; Yalman 1983, 215–220; Yalman 1984, 459–467; Yalman 1985, 579–595; Yalman 1986, 233–257; Yalman 1987, 299–328; Yalman 1988, 339–382; Yalman 1989, 301–324; Yalman 1991, 379–404; Yalman 1992, 377–402; Yalman 1993, 181–203; Yalman 1996, 337–360; Yalman 2003, 127–138; Yalman 2004, 391–402.

has been conducted *intra* and *extra muros* of *Nicaea*,⁶¹ focused on the systematic survey of archaeological monuments. To the emphasised features belong *spolia*, used mainly in the massive fortification walls as well as dispersed throughout the town, the fortification itself⁶² and the funerary monuments. As shown in the study of G. Scardozi,⁶³ the territory of *Nicaea* offers a large unexplored potential. Based on an entirely non-destructive survey method, remote sensing of the satellite imagery, he examined the *centuriation* system in the hinterland of *Nicaea*.

Surveys carried out by Turkish archaeologists have been conducted all over Bithynia. However, these surveys were chiefly concentrated on recording diverse archaeological remains and *spolia* but not covering the fields in order to assess the density and character of potsherds dispersed on the surface. Numerous expeditions took place in the hinterlands of *Nicaea*,⁶⁴ *Nicomedia*,⁶⁵ *Apamea*,⁶⁶ *Claudiopolis*,⁶⁷ *Tium*,⁶⁸ *Hadrianopolis*⁶⁹ and in the surroundings of the Ulubat Lake, including *Apollonia ad Rhyndacum*.⁷⁰ Results of the expeditions are presented in Chapters 2. 3. 1. and 2. 3. 2, describing archaeological remains in the macro-region.

1. 1. 3. Studies of Epigraphic Evidence

The epigraphy as a science has a long cut tradition in the territory of Bithynia. Its initiator is F. K. Dörner, followed by numerous other authors and mainly by his pupil S. Şahin and by T. Corsten.

F. K. Dörner commenced the tradition of epigraphic research in Bithynia when publishing inscriptions from *Nicomedia* and its *chora*,⁷¹ later followed by inscriptions from the territories of

⁶¹ The project ‘Micro-Identities of Bithynia during the Hellenistic and Roman Imperial Times: Archaeological Survey in *Nicaea* (Iznik/Turkey)’ is conducted by the Ruhr University in Bochum in cooperation with the Uludağ University in Bursa. Additional project partners are the Institute of Geophysics of the Christian Albrechts University Kiel and the division of Remote Sensing and Geodesy of the Beuth University of Applied Sciences in Berlin. For the first results and description of the project, see Altın et al. 2015, 64–66.

⁶² Preliminary results by Dalyancı-Berns 2017, 417–426, detailed results in the upcoming PhD thesis of Dalyancı-Berns ‘The fortifications of Iznik / *Nicaea*: Documentation and Building History of the Late Roman-Byzantine Large Scale Construction’ conducted at the Technische Universität Berlin.

⁶³ Scardozi 2013, 875–886.

⁶⁴ Şahin et al. 2008, 11–26.

⁶⁵ Ross 2007.

⁶⁶ Şahin 2012, 11–26.

⁶⁷ Ortaç 2011, 329–348; Ortaç 2012, 129–154.

⁶⁸ Öztürk 2013, 147. 150.

⁶⁹ Lafli – Christof 2012, 28–31; Ritter 2015, 121 f.

⁷⁰ Aybek – Öz 2009, 327–342; Aybek – Öz 2010, 313–328.

⁷¹ Dörner 1941.

Prusias ad Hypium and *Claudiopolis*.⁷² The compendium of inscriptions from the entire Bithynia was published by L. Robert⁷³ and completed by S. Şahin⁷⁴ and T. Corsten.⁷⁵ S. Şahin followed the work of F. K. Dörner in the territory of *Nicomedia*⁷⁶ and then focused in particular detail on *Nicaea* and its hinterland.⁷⁷ Furthermore, S. Şahin participated in publishing the inscriptions from *Chalcedon*⁷⁸ and *Claudiopolis*.⁷⁹ Finally, the work of S. Şahin also considerably contributed to the recognition of historical geography of Asia Minor.⁸⁰ T. Corsten published inscriptions from *Prusias ad Mare*,⁸¹ *Apamea* and *Pylae*,⁸² *Dascyleion*,⁸³ *Caesarea Germanica*⁸⁴ and *Prusa ad Olympum*.⁸⁵ The list is completed by compendia of epigraphic evidence from *Tium*,⁸⁶ *Heraclea Pontica*⁸⁷ and *Hadrianopolis*.⁸⁸

Compendia of inscriptions from 12 cities⁸⁹ and articles concerning three cities⁹⁰ have been published so far. Furthermore, there is a striking number of articles distributed throughout diverse journals, usually presenting one single inscription or several pieces at most,⁹¹ coming from all over Bithynia. However, the core for the whole territory is included in the above-mentioned studies.

⁷² Dörner 1952.

⁷³ Robert 1970, 224–300.

⁷⁴ Şahin 1975; Şahin 1978; Şahin 1986a.

⁷⁵ Corsten 1991a, 79–102.

⁷⁶ Şahin 1974; Schwertheim – Şahin 1977.

⁷⁷ Şahin 1979; Şahin 1981; Şahin 1982; Şahin 1987.

⁷⁸ Merkelbach et al. 1980.

⁷⁹ Adak et al. 2008.

⁸⁰ Şahin 1986b; Şahin 1986c.

⁸¹ Corsten 1985.

⁸² Corsten 1987.

⁸³ Corsten 1988, 53–77; Corsten 1990a, 43–46.

⁸⁴ Corsten 1990b, 19–42.

⁸⁵ Corsten 1991b; Corsten 1993.

⁸⁶ Robert 1970, 266–296.

⁸⁷ Jonnes 1994.

⁸⁸ Marek 1993, 187–210; Lafli – Christof 2012, 35–112.

⁸⁹ The cities are (in the alphabetical order): *Apamea*, *Chalcedon*, *Claudiopolis*, *Hadrianopolis*, *Heraclea Pontica*, *Nicaea*, *Nicomedia*, *Prusias ad Hypium*, *Prusa ad Olympum*, *Prusias ad Mare*, *Pylae*, and *Tium*.

⁹⁰ The cities are (in the alphabetical order): *Apollonia ad Rhyndacum*, *Caesarea Germanica* and *Dascyleion*.

⁹¹ For instance, on *Cretia Flaviopolis* see AE 1900, 0149; AE 1986, 0645 (B); AE 1994, 1620–1630; GVI 302; SbBerlin 2, 874, 24; and SEG 36: 1150.

1. 1. 4. Studies of Ancient Roads

One of the first studies of roads discussing the possible routes and comparing distances stated in ancient *Itineraria* was published by J. Rennell.⁹² The extended evidence concerning the road system appeared in W. M. Ramsay's 'Historical Geography of Asia Minor'.⁹³ Although often criticized for his unorthodox conclusions, W. M. Ramsay wrote the fundamental work on the topic. S. F. Starr considerably contributed to the studies of the roads⁹⁴ and, especially, to the approaches to their reconstruction.⁹⁵ D. Winfield published a study focused on the Northern road leading through Anatolia.⁹⁶

Studies by D. H. French opened the possibility of a large-scale reconstruction of the road system. One of the most complex studies is his monograph focused on the course of the 'Pilgrim's road' as well as *mutatia* and *mansia* situated along it.⁹⁷ Moreover, D. H. French's theoretical studies on the Roman road system and its reconstructions,⁹⁸ identifications of the first paved roads in the territory⁹⁹ and a compendium of milestones published till 2012¹⁰⁰ created a fundamental source of information targeting the Roman road system in Bithynia.

Of the present Turkish research, K. Doğancı¹⁰¹ contributed to the description of Roman roads in the territory. However, his results are chiefly based on the aforementioned authors, especially on D. H. French and on ancient *Itineraria*. The development of the roads, especially from the Early Byzantine period onwards, was discussed by K. Belke¹⁰² and A. Avramea.¹⁰³

⁹² Rennell 1831, 179–203.

⁹³ Ramsay 1962, 27–81. 197–220.

⁹⁴ Starr 1963, 162–169.

⁹⁵ Starr's approaches were partially re-published and further commented by French 1974, 143–149.

⁹⁶ Winfield 1977, 151–166.

⁹⁷ French 1981.

⁹⁸ French 1980, 698–729.

⁹⁹ French 1997, 179–187.

¹⁰⁰ French 2013.

¹⁰¹ Doğancı 2007; Doğancı 2012, 93–104.

¹⁰² Belke 2008, 295–308; Belke 2010a, 45–58.

¹⁰³ Avramea 2002, 57–90.

1. 1. 5. Economic Studies

General studies explaining the overall characteristics of the economic development in Roman Asia Minor are numerous.¹⁰⁴ Although none of them is focused on the region of Bithynia in particular, I use the results as comparative examples for outcomes drawn from my analyses. As follows from the previous subchapters, the ancient literary sources and the systematically published inscriptions serve as a rich source of information.

A. Bowman and A. Wilson¹⁰⁵ introduced a list of possible proxies suitable for quantification of the Roman economy, their pros and cons as well as several case studies sustaining their theories.¹⁰⁶

To the several works focused on the macro-region belongs G. Salmeri's¹⁰⁷ brief study of the intervention of the central Roman power in the economy of the double province Bithynia et Pontus. T. Bekker-Nielsen¹⁰⁸ published a complex study interpreting the urban life and local politics in Roman Bithynia. The work is chiefly based on the municipal speeches of Dio Chrysostomos. A year later, J. M. Madsen¹⁰⁹ disclosed a study analysing the Greek response to the Roman rule. J. M. Madsen's work is based on the view of Dio Chrysostomos and enriched by the correspondence of Pliny the Younger with Trajan and records of the historian Cassius Dio.¹¹⁰

¹⁰⁴ On the economic studies during the Hellenistic period, see still vividly debated 'Social and Economic History of the Hellenistic World' by Rostovtzeff 1936; Rostovtzeff 1998 (reprint of the original publication from 1941). – From recent studies on the Hellenistic economy, see for instance Archibald et al. 2001; Archibald et al. 2011; Reger 2013, 460–483. – On the 'Social and Economic History of the Roman Empire', see Rostovtzeff 1926, followed by Gren 1941; Finley 1973; Jones 1974; Duncan-Jones 1974; Duncan-Jones 1994. – For the recent studies on the economic history of the Greco-Roman world, see collection of studies by Scheidel et al. 2013 and, especially, the study by Alcock 2013, 671–697 focused on the Eastern Mediterranean. – On the Early Roman economy, see Kay 2014, on the Roman economy, see Mitchell 1995a, 59–159; Harl 1996; De Blois – Rich 2002; Dignas 2002; Mitchell et al. 2005; Mattingly 2006, 283–297; Bowman – Wilson 2009; Bowman – Wilson 2011; Bowman – Wilson 2013; Scheidel 2014; Erdkamp et al. 2015. – The transition to the Late Antiquity was lately examined by Giardina 2013, 743–768; and from the Late Antiquity to the Middle Ages by Izdebski 2013b. – The sixth-century economy was published by Morrisson – Sodini 2002, 171–220 within a study 'The Economic History of Byzantium from the Seventh through the Fifteenth Century' (Laiou 2002).

¹⁰⁵ Bowman – Wilson 2009, 3–84.

¹⁰⁶ For details, see Chapter 4.

¹⁰⁷ Salmeri 2005, 187–206.

¹⁰⁸ Bekker-Nielsen 2008.

¹⁰⁹ Madsen 2009.

¹¹⁰ For details concerning the ancient literary sources, see Chapter 2. 1.

Exemplary studies based on the well published compendium of inscriptions are the analyses of elites in Bithynia written by H.-L. Fernoux¹¹¹ or work by P. G. Díaz¹¹² focused on *Nicaea* and delimitations of its hinterland. The study of P. G. Díaz was summarized and commented by A. Gonzales.¹¹³

H. Güney's¹¹⁴ doctoral thesis focuses on the economic situation of Roman *Nicomedia* and its hinterland. As the present study analyses the economic situation of the micro-region of *Nicaea* and its hinterland, the H. Güney's work offers an ideal comparative sample. Although H. Güney uses entirely different tools when assessing the economic development, his work offers several quantifiable results, suitable for the comparative analysis.¹¹⁵

The importance of the development, upkeep and maintenance of the road system for the interpretation of the economic situation was outlined by D. H. French.¹¹⁶ Based on D. H. French, the state of the road network directly mirrors military and administrative requirements and thus also the economic situation in the area.

An interesting aspect of church councils organised in the macro-region examines T. Kaçar¹¹⁷ who points to their economic dimension, since they required an efficient transport and considerably large amount of provisions in the place of the gathering.

1. 1. 6. Digitised Datasets

In the last subchapter, I bring together digitised datasets and point out their availability. Some of them can be downloaded online, the remaining part represents projects which describe their databases or work with spatial data but do not open them to the public for further processing / analyses. The open source data served as a starting point for the datasets I created and analysed.

¹¹¹ Fernoux 2004.

¹¹² Díaz 1997.

¹¹³ Gonzales 1997, 248–262.

¹¹⁴ Güney 2012.

¹¹⁵ For details, see Chapter 8.

¹¹⁶ French 1980, 700 f.

¹¹⁷ Kaçar 2005, 305–318.

The selected features from the aforementioned Barrington Atlas have been presented in a digitised form by the Ancient World Mapping Centre (henceforth AWMC)¹¹⁸ which offers datasets for free download,¹¹⁹ including Roman aqueducts, roads and bridges.¹²⁰ The project is interconnected with the Pleiades,¹²¹ 'a community-built gazetteer and a graph of ancient places'.¹²² Although often criticized for its inaccuracy, Pleiades brings together a collection of data which is unique in its amount. The database is regularly upgraded and improved, thus getting more precise with each update. Although occasionally erroneous, Pleiades is the source of a large amount of archaeological data that can be downloaded without difficulties in four different formats (JSON, CSV, KML and RDF), freely usable and further adjustable¹²³ according to the actual research question.

The Digital Atlas of Roman and Medieval Civilizations (henceforth the DARMC),¹²⁴ which is also available online, offers an extensive collection of all kinds of archaeological features. The DARMC allows for spatial and temporal analyses of all aspects of the western Eurasia in the first 1500 years of our era. However, the features dated to the Roman and Late Roman / Early Byzantine periods, which are depicted in the DARMC, are mainly based on the Barrington Atlas, i.e. published within the Pleiades. The advantage of the database offered by the DARMC is that the whole Atlas can be interconnected with any GIS program, and some of the features can be even downloaded as separate datasets (as SHP or CSV).¹²⁵

Focusing on smaller datasets and speaking in particular terms about the region of Bithynia, D. Drakoulis published the entire database of the Early Byzantine settlements in Bithynia in several articles (see above), presenting all the proxies he used. Although not accessible as an online source, the work is published in a tabular form and includes the structure and functionality of the database.

¹¹⁸ The AWMC is based at the University of North Carolina at Chapel Hill. For more information, see URL: <<http://awmc.unc.edu/wordpress/about/>> (26.03.2017).

¹¹⁹ The data are available under the Open Database Licence 1.0.

¹²⁰ URL: <http://awmc.unc.edu/awmc/map_data/> (26.03.2017).

¹²¹ The entire project is described and presented at URL: <<http://pleiades.stoa.org/>> (26.03.2017).

¹²² The list of contributors is available online at URL: <<http://pleiades.stoa.org/credits>> (26.03.2017).

¹²³ Sharing and remixing of the data is permitted under terms of the Creative Commons Attribution 3.0 Licence.

¹²⁴ URL: <<http://darmc.harvard.edu/>> (26.03.2017).

¹²⁵ Diverse datasets offered by DARMC can be downloaded at URL: <<http://darmc.harvard.edu/data-availability>> (26.03.2017).

The preliminary publication¹²⁶ concerning the research project conducted in *Nicomedia* and its hinterland mentions an emerging database. As the project appears to record all the possible architectural remains as well as funerary monuments and pottery scatters, the results are very promising.¹²⁷

The German-Turkish expedition conducted in *Nicaea* created a complex database of *spolia* used in the town as well as a digitised map of the fortification. Neither the data nor the database is available online, but they are being processed by several researchers and are subsequently published (as mentioned above).

Results of the Paphlagonia project, a multi-period, large-scale programme of regional survey, serve as one of the comparative studies for the present analysis. The interactive database and data collected during the survey, including research diaries and identified settlements organised into a tabular form, are freely accessible on the web pages of the University College of London (UCL).¹²⁸

The digital elevation model is based on the SRTM¹²⁹ produced by the United States National Aeronautics and Space Administration (henceforth NASA) and the ASTER¹³⁰ jointly released by the Ministry of Economy, Trade, and Industry (METI) of Japan and NASA. Both are freely available online. The United States Geological Survey (henceforth the USGS)¹³¹ offers a generalized geological map of Turkey open for a free download (SHP). The USGS also provides a dataset of geological faults, which is of a considerable importance for the researched territory.

Greek and Latin inscriptions create an ample collection of data which have been gradually digitised by several projects.¹³² A considerable amount of mainly Greek inscriptions from Bithynia preserves the database which is being created by The Packard Humanities Institute¹³³ (henceforth

¹²⁶ Ross 2007, 107.

¹²⁷ Final results were not published when accomplishing the present work.

¹²⁸ URL: <<http://www.ucl.ac.uk/paphlagonia/>> (26.03.2017).

¹²⁹ The Shuttle Radar Topography Mission (90 m precision); URL: <<http://www.cgiar-csi.org/data/srtm-90m-digital-elevation-database-v4-1#download>> (26.03.2017).

¹³⁰ The Advance Spaceborne Thermal Emission and Reflection Radiometer (30 m precision but often with error data, therefore supplemented by SRTM); URL: <<http://asterweb.jpl.nasa.gov/gdem.asp>> (26.03.2017).

¹³¹ URL: <<http://energy.usgs.gov/OilGas/AssessmentsData/WorldPetroleumAssessment/WorldGeologicMaps.aspx>> (26.03.2017).

¹³² On epigraphy and digital resources in general, see Elliott 2015, 78–85.

¹³³ URL: <<http://epigraphy.packhum.org/>> (26.03.2017).

the PHI) with centres at the Cornell and Ohio State Universities. The epigraphic database Heidelberg¹³⁴ (henceforth the EDH) offers a collection of almost 300 inscriptions from Bithynia and Pontus. Out of the entire amount, 205 are from Bithynia and 44 of them are not encompassed in the PHI database. The Katholische Universität Eichstätt Ingolstadt created a freely downloadable database of Greek and Latin inscriptions Conc Eyst,¹³⁵ which includes 137 corpora and journals. The Conc Eyst is connected with the EDH and moreover, with the EAGLE.¹³⁶ The EAGLE is a massive epigraphic database that allows to perform full-text searches using a simple interface, or to launch more advanced queries, including the possibility to upload an image and search for similar inscriptions. Most of the inscriptions published for the territory of Bithynia can be found online. However, inscriptions from the Corpus Inscriptiorum Latinarum (henceforth the CIL) and the ILS are not included in any of the databases. Therefore, an important supplementary work is an overview of Latin inscriptions in the database of the Berlin-Brandenburgische Akademie der Wissenschaften.¹³⁷

There is an important gap in the databases: the inscriptions published in *L'Année Épigraphique* are so far missing.¹³⁸ Although included in the abovementioned Conc Eyst, the inscriptions are published without their find-spots and thus it is necessary to review the original publication.

The numismatic database Nomisma¹³⁹ has been created by a wide community of scholars and institutions and offers information about the existence of mints and their production. The data can be downloaded in a tabular form.¹⁴⁰

1. 2. Main Objectives

The present thesis aims at investigating the economic development of NW Asia Minor in the defined borders of Bithynia during the Hellenistic, Roman and Early Byzantine periods. The work is

¹³⁴ URL: <<http://edh-www.adw.uni-heidelberg.de/home>> (26.03.2017).

¹³⁵ URL: <<http://www.ku.de/ggf/geschichte/altegesch/forschung/conceyst/>> (26.03.2017).

¹³⁶ URL: <<http://www.eagle-network.eu/resources/search-inscriptions/>> (26.03.2017).

¹³⁷ URL: <<http://cil.bbaw.de/>> (26.03.2017).

¹³⁸ In order to achieve as complete list of epigraphic evidence as possible, I digitised the inscriptions published in *L'Année Épigraphique* and supplemented the record derived from the existing databases.

¹³⁹ URL: <<http://www.nomisma.org/>> (26.03.2017).

¹⁴⁰ The database offers a CSV format.

conducted in several diverse scales in order to enable comparison of the results. Most of the data the thesis draws on are published and generally known.

The main objective of the whole thesis is to examine the published data with approaches and perspectives which were hitherto not applied in the territory. In general, I focus on quantifying and assessing the historical and archaeological records in their spatial contexts. This allows me a 'quantified spatial perspective', only rarely considered when exploring data from NW Asia Minor. Furthermore, I analyse the data with respect to the economic development. In this way, I aim to point out to the generally unexploited potential of relatively easily accessible datasets. In general, I intend to perform the analyses based on clearly explained and discussed methodologies, which I further support with well-arranged data. I attempt to collect and present the pertinent datasets available for NW Asia Minor with the view of making them easily accessible to the reader as well as for future studies. All the data used in the study will be digitised and published online. As such, the present work and data collected within can be used as a starting point for further analyses of the macro-region *en masse*, cities within, or for the comparative analysis with different regions in Asia Minor.

The research conducted in the territory of NW Asia Minor was mainly focused on studies of the Latin and Greek literary sources, epigraphic evidence, and observations in the terrain, with comparatively little surveys and excavations. Consequently, I focus on the data which allow me to follow fluctuations in their numbers and spatial distribution. Since the inscriptions have been systematically published, they contribute a key source of information for the whole region. Similarly, the development of the road system in the Roman period can be assessed, mainly due to the epigraphic evidence represented by milestones. The analysis of the urbanization is based on primary sources, supplemented with the observations in the terrain and with archaeological data. Furthermore, I include several comparative studies, considering data resulting from diverse scales which provide mutually supplementing and rectifying information. Unlike the studied territory, several regions were systematically surveyed and offer integrated datasets for comparison.¹⁴¹

¹⁴¹ Especially useful were results of the project conducted in Paphlagonia (Matthews 2007, 25–34; Matthews – Glatz 2009; Anderson – Robinson 2012, 13–27).

The methodological approaches applied in the work are presented and thoroughly discussed with an aim to enable their simple re-application. However, all the methodologies I use are not entirely new. I draw on the numerous works which are outlined in the research history (see above) and further presented and discussed in detail in each analytical chapter separately.¹⁴² The present work represents a compendium of several methodological studies, applied and re-evaluated in the under-explored territory of NW Asia Minor. In particular, I aim at examining the applicability of the following analytical tools: the Voronoi diagram / Thiessen polygons for estimating the territories of particular cities; ring buffers of diverse radii drawn around the cities for estimating the urbanized areas; the least cost path analysis for predicting the most feasible routes of the roads; the lines of sight for exploring the intervisibility between funerary monuments situated around *Nicaea* and *Nicaea* itself; the viewshed analysis to determine places that can be seen from the funerary monuments.

All the tools used in the thesis are described in a great detail, including their pros and cons. Each tool is accomplished with a straightforward and elementary guide concerning its technical implementation. The study itself represents a case study for their application. Hereby, I establish the methodology that can be used in works following similar aims, pointing out the caveats. Since I analyse different ratio scales, the study demonstrates the most suitable methods and analyses of data-processing in a certain scale factor. Therefore, it might serve as a guide through the analytical methods for compiling spatially referenced archaeological data in diverse scales in order to give an account of the economic development.

From the archaeological point of view, I aim at enriching the present estimations concerning the numbers of settlements distributed throughout the territory and at searching for possible patterns appearing in their distribution. Compiling data from diverse publications, I create as complete a picture of settlements as possible with the current knowledge. Moreover, I enrich the dataset with results of the archaeological survey conducted in the hinterland of one of the main centres, *Nicaea*. Thus, one of the outcomes are maps of settlements, for the Hellenistic, Roman and Early Byzantine periods, and subdivided by the types of settlements.

¹⁴² These are Chapters 5., 6., 7. and 8.

I hope that I can complement the currently available maps with several new settlements and roads. However useful it might be, the rectified distribution of settlement patterns and the road system are only a secondary product of the study. On the first place, I aim for enriching the current archaeological discussion concerning NW Asia Minor with innovative ideas relevant to methodological approaches that allow for assessing the economic development. I follow the approaches developed by the Oxford Roman Economic Project (OXREP) and applied for the large-scale studies of Roman economies. I show their applicability when used for analysing carefully compiled data from one macro-region. In this way, I attempt to define the methodologies best applicable for studying ancient economies in the macro- and micro-regional scale without conducting large scale survey in the terrain, and I argue the multidisciplinary approach is the most appropriate.

1. 3. Chronological Frame

The time span analysed in the present thesis stretches from the 4th century BC till the 6th century AD. In terms of historical periods, it encompasses the Hellenistic, Roman and Early Byzantine periods. The data available for the region are for the most part not dated more accurately than to these broad time spans. To avoid any inconsistencies, the following Table 1 presents the broad historical time spans and their delimitations in years as followed in the current work.

Period	Sub-period	Start (Year)	End (Year)
Hellenistic		336 BC	74 BC
Roman		74 BC	31 BC
	Early Imperial	31 BC	AD 69
	Middle Imperial	AD 69	AD 192
	Late Imperial	AD 193	AD 395
Byzantine	Early Byzantine	AD 395	AD 565

Table 1: Designations of Periods and Chronological Ranges

Generally, the chronological delimitations follow the commonly used frameworks. The specific date to be pointed out is the year 74 BC,¹⁴³ when Bithynia was given to the Romans in the

¹⁴³ Errington 2008, 287.

will of its last king Nicomedes III.¹⁴⁴ Therefore, the Roman hegemony in Bithynia commences with the year 74 BC.

The controversial date is the end of the Early Byzantine period. From all the data offered by researchers I decided to select the death of Justinian I.¹⁴⁵ as the end of the period and, as such, also as a chronological border of my research.

¹⁴⁴ Jones 1998, 157.

¹⁴⁵ Bury 1958.

2. Sources of Data

The following chapter represents a summary of all the relevant sources that I used for the analyses, divided into four main groups based on their character. The compendium encompasses ancient literary sources, records of travellers from the 18th till the end of the 19th century, archaeological sources and epigraphic evidence.

The ancient literary sources list the authors who discuss the origin of Bithynians, geographic delimitations of Bithynia, information concerning the economic situation, appearing earthquakes and their impacts and particulars concerning the road system.

The records of travellers from the 18th till the end of the 19th century list the authors chronologically and further divide their contributions pursuant to their interests and benefits to the recognition of the territory.

The available archaeological sources are divided into two subchapters, presenting the archaeological evidence in the main urban settlements and in their immediate hinterlands and archaeological remains detected by surveys.

The epigraphic evidence is discussed in an independent section since it represents the most consistent and richest source of data available for the macro-region. The presentation of the evidence *en masse* follows its spatial distribution. Finally, the evidence allowing for topical analyses relevant to economic situation is introduced in a separate subchapter.

2. 1. Bithynia in Greek and Latin Literary Sources

Our general perception of Bithynia as an ancient region, its inhabitants, border delimitations, geographical settings, settlement patterns and economic affairs is largely based on numerous ancient literary sources. In particular, the following text draws on works dated back to the 5th century BC and stretching till the 6th century AD, listing not only ancient historiographers and politicians but also authors of the Early Christian history.

In order to achieve an utmost lucidity when presenting the Greek and Latin literary sources, I introduce them organised in tables. The tables divide the literature into thematic and chronologically arranged subgroups. Some of the authors and works appear in more than one table, as they are relevant for several topics.

The aim of this section is not to present a full list of ancient sources mentioning Bithynia. Instead, I list all works central to this study and I outline difficulties connected with the utilisation of the retrieved data. The key information in each thematic area is discussed and supported by citations. The citations from the exemplary texts are listed in original, followed by English translations.

2. 1. 1. The Origin of the Bithynians

The first table of this section, Table 2, focuses on the earliest literary sources mentioning the existence of Bithynia as a territory situated in NW Asia Minor and their inhabitants, the Bithynians. The chronological time span of the listed works is considerably wide, stretching from the 5th century BC to the first half of the 2nd century AD. Yet, all the authors agree on the fact that both Bithynia as well as the Bithynians derive from the Thracian tribe *Bithyni*, who settled in NW Asia Minor. In general, the information given by all the authors agrees with Herodotus,¹⁴⁶ the earliest source mentioning Bithynia and the Bithynians:

‘Οοῦτοι δὲ διαβάντες ἐς τὴν ἐκλήθησαν Βιθυνοί, τὸ δὲ ἐκαλέοντο, ὡς αὐτοὶ λέγουσι, Στρυμόνιοι, οἰκέοντες ἐπὶ Στρυμόνι: ἔξαναστῆναι δὲ φασὶ ἐξ ἠθέων ὑπὸ Τευκρῶν τε καὶ Μυσῶν.’

‘They took the name of Bithynians after they crossed over to Asia; before that they were called (as they themselves say) Strymonians, since they lived by the Strymon; they say that they were driven from their homes by Teucrians and Mysians.’¹⁴⁷

Author	Chronological Frame	Book Reference
Herodotus	5 th century BC	Histories 1, 28, 1; 7, 75
Thucydides	5 th century BC	History of the Peloponnesian War 4, 75
Xenophon	400 BC	Anabasis 6, 4, 2
Pseudo-Skylax	4 th century BC	Periplus 92
Apollonius Rhodius	3 rd century BC	Argonautica 2, 774–811

¹⁴⁶ Hdt. 7, 75, 2.

¹⁴⁷ Translation by Godley 1922.

Author	Chronological Frame	Book Reference
Strabo	1 st century BC	Geography 12, 3, 3
Appian of Alexandria	AD 95–165	The Mithridatic Wars 1, 1
Arrian of Nicomedia	AD 123/4–131/2	Periplus Ponti Euxini 11–12
Arrian of Nicomedia	AD 123/4–131/2	Anabasis 1, 29, 5

Table 2: References to the Territory of Bithynia / Bithynians in the Selected Greek and Latin Sources

2. 1. 2. Geography of Bithynia

The second topical survey, with results listed in Table 3 below, presents sources mentioning delimitations of borders, often including also information concerning geographical settings, and aforementioned settlements situated in the territory of Bithynia. Unlike the references to Bithynia and its inhabitants, information concerning borders is frequently obscure and considerably varies from author to author. In the following, I include all the sources which I eventually used when defining borders of the analysed territory.

The fuzzy definition of borders in ancient sources appears, in my opinion, due to the following reason. The inhabitants were a Thracian warlike tribe without firmly established borders of their territory, living in numerous rural settlements and forts distributed in the fertile flatland and in the mountains, respectively.¹⁴⁸ They inhabited the NW part of Asia Minor without possessing any centralized political power, moving throughout the region depending on current conditions and needs. Therefore, it is not surprising that ancient authors encountered difficulties with an exact delimitation of their territory and that their definitions frequently differ. As an elegant solution, they mainly adhere to describing the borders based on defining peoples settled around the territory of the Bithynians or they point out distinctive geographic features that may have been parts of appropriate delimitations. The most detailed and in this way exemplary text, although written only during the 1st Century AD, is Strabo's description of the Bithynian territory:¹⁴⁹

‘Τὴν ἀπὸ τῆς ἀνατολῆς ὀρίζουσι Παφλαγόνες τε καὶ Μαριανδυνοὶ καὶ τῶν Ἐπικτήτων τινές, ἀπὸ δὲ τῶν ἄρκτων ἢ Ποντικῆ θάλαττα ἢ ἀπὸ τῶν ἐκβολῶν τοῦ Σαγγαρίου μέχρι

¹⁴⁸ Xen. an. 6, 4, 24.

¹⁴⁹ Strab. 12, 4, 1.

τοῦ στόματος τοῦ κατὰ Βυζάντιον καὶ Χαλκηδόνα, ἀπὸ δὲ δύσεως ἡ Προποντίς, πρὸς νότον δ' ἢ τε Μυσία καὶ ἡ ἐπίκτητος καλουμένη Φρυγία, ἡ δ' αὐτὴ καὶ Ἑλλησποντιακὴ Φρυγία.'

*'Bithynia is bounded on the east by the Paphlagonians and Mariandyni and some of the Epicteti; on the north by the Pontic Sea, from the outlets of the Sangarius River to the mouth of the sea at Byzantium and Chalcedon; on the west by the Propontis; and towards the south by Mysia and by Phrygia "Epictetus", as it is called, though the same is also called "Hellespontiac" Phrygia.'*¹⁵⁰

The only inland borderline defined by Strabo using definite geographic features is the eastern delimitation created by the course of the *Sangarius* River. When compared to the cities listed by Pliny the Elder¹⁵¹ as belonging to Bithynia, the border should run considerably further in the east to encompass also *Claudiopolis* (identified with modern Bolu). As results from the two listed examples, even the sources concerning roughly the same period differ significantly.

Examining the earliest source Pseudo-Skylax and his *Periplus*, the eastern border is defined by a different river, the River *Hypios*. The river delimitates the neighbouring peoples *Mariandyni*:¹⁵²

'Μετὰ δὲ Παφλαγονίαν Μαριάνδουνοί εἰσιν ἔθνος. Ἐνταῦθα πόλις ἐστὶν Ἡράκλεια Ἑλληνίς, καὶ ποταμὸς Λύκος καὶ ἄλλος ποταμὸς Ὑπιος. [92] Μετὰ δὲ Μαριανδύνους εἰσὶ Θραϊκεὺς Βιθυνοὶ ἔθνος, ...'

*'After Paphlagonia is the nation of the Mariandynoi. Here is a Hellenic city and river Lykos and another river Hypios. [92] After the Mariandynoi are Bithynian Thracians, a nation, ...'*¹⁵³

¹⁵⁰ Translation by Jones 1961.

¹⁵¹ Plin. nat. hist. 5, 43. The complete list of cities includes *Chalcedon, Caesarea Germanica, Prusias ad Mare, Prusias ad Hypium, Cretia Flaviopolis, Apamea, Prusa ad Olympum, Nicaea, Nicomedia, Iuliopolis, Claudiolis* and *Byzantium*.

¹⁵² Pseudo-Skyl. 91–92.

¹⁵³ Translation by Shipley 2011.

For the Early Byzantine period, the travellers' guide *Synecdemus*, written by Hierocles during the reign of Justinian, includes a table of administrative divisions of the empire and a list of its cities. Based on this list, the NW Asia Minor equals the '*eparchia Ponticae*' and '*eparchia Honoriadis*'; it includes several cities situated in the west, reaching as far as *Apollonia ad Rhyndacus*.¹⁵⁴ During the Early Byzantine period, it seems the border moved westwards, most probably up to the *Rhyndacus* River.

Except the initial problem with an unspecified territory, the obvious reason for changing the borderlines is the targeted time span, covering about 900 years. As the analysis examines three distinctive historical periods, several diverse political structures appear in the territory and, naturally, their frontiers differ. However, the existence of any of the new political structures did not bring clear delimitations in the preserved literary sources.

The ambiguous nature of the data coming from ancient sources led me in the present work to a congruent delimitation of the macro-region, applicable during all the discussed periods.¹⁵⁵ The borderlines are deduced by including all the settlements mentioned as belonging to the territory and combining their spatial distribution with geographic settings (see Figure 1). The analysed area thus possibly encompasses a larger territory than during any of the periods and includes also fractions of the surrounding territories. Nevertheless, the stable extension allows for higher levels of consistency in the analytical approach to the datasets.¹⁵⁶

Author	Chronological Frame	Book Reference
Pseudo-Skylax	330s BC	Periplus 91; 92
Strabo	1 st century BC	Geography 12, 3, 2; 12, 3, 7; 12, 4, 1–10
Pliny the Elder	AD 23/25–79	Naturalis Historia 5, 43
Appian of Alexandria	AD 95–165	Mithridatic wars 2, 10–2, 14
Arrian of Nicomedia	AD 123/4–131/2	Periplus Ponti Euxini 10–12
Hierocles	AD 527–528	Synecdemus 690–694

Table 3: Delimitation, Geographical Settings and Settlements in Selected Greek and Latin Sources

¹⁵⁴ The complete list of cities includes *Apameia*, *Apollonias*, *Basileinoupolis*, *Chalkedon*, *Daskylion*, *Hadrianoupolis*, *Helenopolis*, *Herakleia*, *Iounopolis*, *Kaisareia*, *Kios*, *Klaudiopolis*, *Kratia*, *Nikaia*, *Nikomedeia*, *Prinetos*, *Prousa*, *Prousius*, *Regetataios*, *Regodories*, *Tios*.

¹⁵⁵ An analogous approach is used by Jones 1998, 153.

¹⁵⁶ For the final delimitation and detailed geographic description, see Chapter 3.

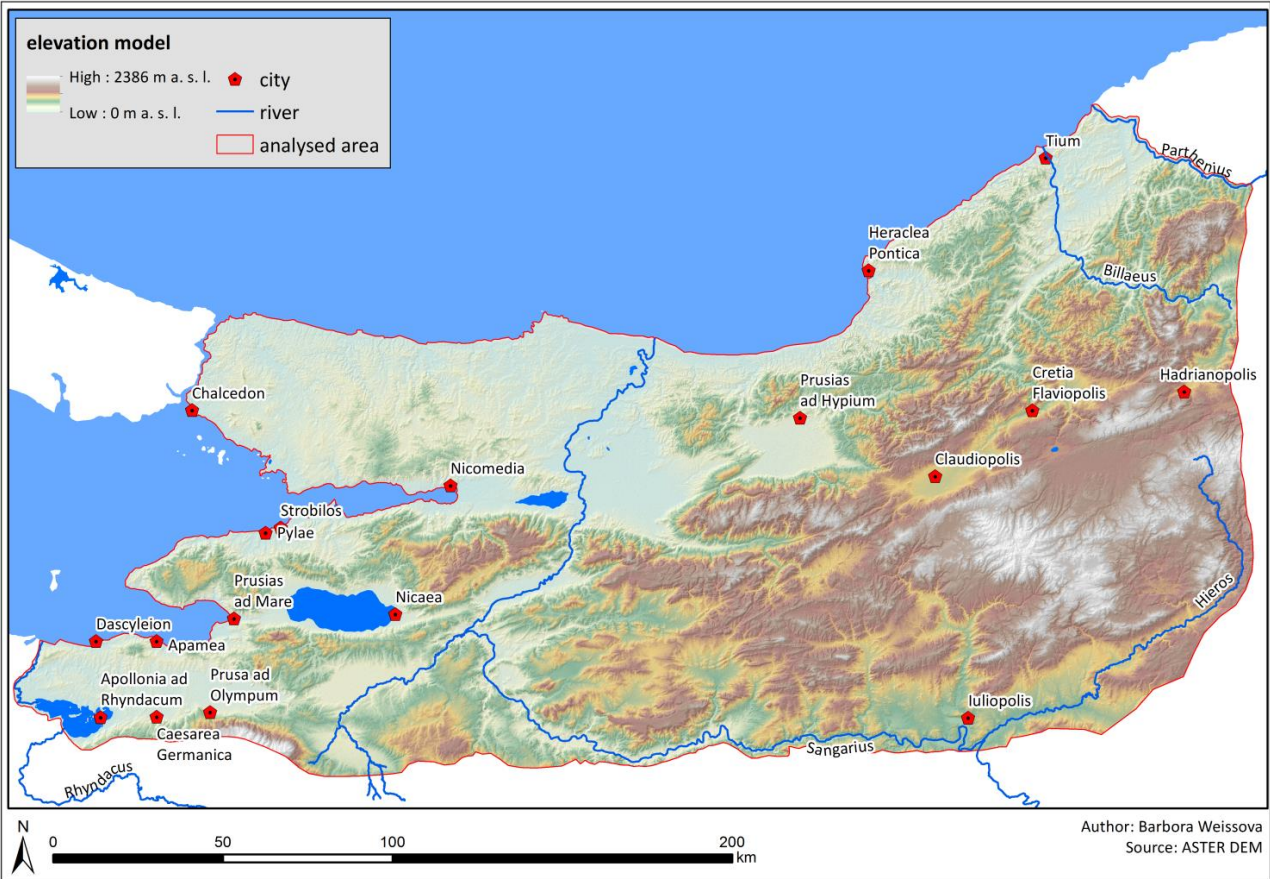


Figure 1: Delimitations of the Macro-Region Based on the Spatial Distribution of Cities (Addendum 1. 4.)

2. 1. 3. Economic Situation

The Table 4 lists the authors whose work allows for following tendencies in the development of the economic situation. From all the aspects usable for defining of the economic situation,¹⁵⁷ the most suitable for the present ad study is the information concerning the political geography, i.e. the urbanization, including the appearance of new cities as well as their maintenance. The sources mentioning different historical and political events are plentiful, mainly when examining the Roman presence in Bithynia. In the study, I discuss only the relevant fraction of them.

Two kinds of evidences, earthquakes and road system, are excluded from this overview and presented separately, since they create a comprehensive bulk of data. The earthquakes were extremely frequent in the territory, as the North Anatolian Fault crosses Bithynia from the east to

¹⁵⁷ For a further discussion on assessing the economic situation, see Chapter 4.

the west, and they had a largely destructive impact on the area.¹⁵⁸ Roads, road stations and connected investments create one of the main topics of the study.¹⁵⁹

The earliest source is represented by Xenophon who left a comment on the pre-Hellenistic urbanization in the territory of Bithynia. Xenophon claims that between the Bosphorus and *Heraclea*, there is no friendly or Hellenistic city, only the Thracians and the Bithynians.¹⁶⁰ Concerning the Hellenistic period, an account of the Bithynian dynasty is given in Memnon's 'History of Heraclea' and in the work of Diodorus Siculus. The principal information extracted from the sources concerns political geography, i.e. establishments of new cities during the Hellenistic period and re-establishments of old Greek colonies as cities by the Bithynian Kings, dated to a specific year or to the reign of one king. During the Roman rule, the sources are numerous and diverse in character. As the present list focuses on works containing information that should shed light on the economic situation in the territory, it mainly points out relevant economic affairs.

The outstanding possibility of comparative analysis is given by three authors writing about the situation and political events in Bithynia in the same chronological time span, in the beginning of the 2nd century AD, but from different points of view. These are the historian Cassius Dio, the local inhabitant Dio Chrysostomos and the Roman governor in service in *Nicaea*, Pliny the Younger. As the latter offers an insight into the problems a Roman governor had to face, it concurrently documents the fundamental urban changes, mainly in *Nicaea* and *Nicomedia*, that required financial support. From Pliny's letters (to the Emperor Trajan) we gain information about the need to build a new bath¹⁶¹ and about the financial fiasco when building a new aqueduct in *Nicomedia*.¹⁶² The surprising problems concerning a theatre building in *Nicaea* are also discussed.¹⁶³ The following text demonstrates the style of the letters; this time Pliny discusses with Trajan the building of a new bath at the place of an old house in *Prusa ad Olympum*:¹⁶⁴

¹⁵⁸ For a detailed listing of the earthquakes, see Chapter 2. 1. 4.

¹⁵⁹ For sources on the road system, see Chapter 2. 1. 5.

¹⁶⁰ Xen. an. 6, 4, 2.

¹⁶¹ Plin. epist. 10, 23, 1. (Pliny to Trajan).

¹⁶² Plin. epist. 10, 37 (Pliny to Trajan) and Plin. epist. 10, 38 (Trajan to Pliny).

¹⁶³ Plin. epist. 10, 39 and Plin. epist. 10, 40.

¹⁶⁴ Plin. epist. 10, 70, 1.

‘Quaerenti, domine, Prusae ubi posset balineum quod indulsisti fieri, placuit locus in quo fuit aliquando domus, ut audio, pulchra, nunc deformis ruinis. Per hoc enim consequemur, ut foedissima facies civitatis ornetur, atque etiam ut ipsa civitas ampliatur nec ulla aedificia tollantur, sed quae sunt vetustate sublapsa relaxentur in melius.’

‘When I was investigating whereabouts in Prusa the bath-house for which you had given permission could be built, the best site seemed to be one on which there was once a house, a beautiful one, so I am told, but which is now unsightly with ruins. For by this means we shall ensure that a most foul blot upon the city is beautiful and that at the same time the city itself is enhanced without any buildings being demolished, but that those which have crumbled away with age are enlarged and improved.’¹⁶⁵

A list of cities in the territory of NW Asia Minor during the Early Byzantine period documenting the urbanization of the territory is given by Hierocles in Synecdemos. For more details concerning this work see above.

Author	Chronological Frame	Book Reference
Xenophon	ca. 400 BC	Anabasis 6, 2, 17–19; 6, 4, 24
Xenophon	ca. 400 BC	Hellenica 1, 3, 1–4; 3, 2, 2–5; 3, 2, 3–5
Diodorus Siculus	60–30 BC	Library 36, 8
Titus Livius (Livy)	64 or 59 BC – AD 17	The History of Rome 38, 16
Memnon	1 st century AD	History of Heraclea
Lucius Mestrius Plutarchus (Plutarch)	1 st / 2 nd century AD	Sulla 22, 5
Lucius Mestrius Plutarchus (Plutarch)	1 st / 2 nd century AD	Alcibiades 29, 3; 37, 3
Dio Chrysostomos	1 st century AD	To the Nicomedians on Concord with the Nicaeans 38
Pliny the Younger	AD (?) 109–111	Epistulae 10 (Letters of Pliny)
Appian of Alexandria	AD 95–165	Mithridatic wars 2, 10–14
Cassius Dio	AD 155–236	Roman History 51–80
Hierocles	AD 527–528	Synecdemos 690–694

¹⁶⁵ Translation by Williams 1990.

Author	Chronological Frame	Book Reference
Procopius	AD 527–565	Historia Arcana 22, 17–18

Table 4: References to Political Geography and Economy in Selected Greek and Latin Sources

2. 1. 4. Earthquakes

The position of Bithynia on a tectonically active fault caused a lot of devastating earthquakes. As they often played a decisive role in the urbanization, investments and economic development of the territory in general, I consider them during the analysis. The table presents historical sources confirming the existence as well as destructive powers of the earthquakes, their precise allocation(s) and the year of the disaster.

The following passage from Ammianus Marcellinus describes a disastrous earthquake occurring in the territory of *Nicomedia*. The earthquake almost destroyed the whole city as well as the surrounding district:¹⁶⁶

‘Primo lucis exortu, diem nonum kal. Septembrium, concreti nubium globi nigrantium, laetam paulo ante caeli speciem confuderunt, et amendato, nec contigua vel apposita cernebantur; ita oculorum obtutu praestricto, humo involutus crassae caliginis squalor insedit.[3] Dein velut numine summo fatales contorquente manubias, ventosque ab ipsis excitante cardinibus, magnitudo furentium incubuit procellarum, cuius impetu pulsorum auditus est montium gemitus, et elisi litoris fragor, haecque secuti typhones atque presteres, cum horrifico tremore terrarum, civitatem et suburbana funditus everterunt. [4] Et quoniam acclivitate collium aedes pleraeque vehebantur, aliae super alias concidebant, reclangentibus cunctis sonitu ruinarum immenso. Inter quae clamoribus variis celsa culmina resultabant, quaeritantium coniugium liberosque, et siquid necessitudines artae constringunt.’

‘On the twenty-fourth of August, at the first break of day, thick masses of darkling clouds overcast the face of the sky, which had just before been brilliant; the sun’s splendour was dimmed, and not even objects near at hand or close by could be

¹⁶⁶ Amm. 17, 7, 2–4.

*discerned, so restricted was the range of vision, as a foul, dense mist rolled up and settled over the ground [3]. Then, as if the supreme deity were hurling his fateful bolts and raising the winds from their very quarters, a mighty tempest of raging gales burst forth; and at its onslaught were heard the groans of the smitten mountains and the crash of the wave-lashed shore; these were followed by whirlwinds and waterspouts, which, together with a terrific earthquake, completely overturned the city and its suburbs. [4] And since most of the houses were carried down the slopes of the hills, they fell one upon another, while everything resounded with the vast roar of their destruction. Meanwhile the highest points re-echoed all manner of outcries, of those seeking their wives, their children, and whatever near kinsfolk belonged to them.*¹⁶⁷

The disaster was followed by another one, only four years later, described by the same author.¹⁶⁸ According to the author, the following earthquake caused an entire destruction of the whole city or of what the inhabitants managed to repair after the catastrophe in AD 358 respectively.

As demonstrated in Table 5, most of the preserved sources focus on the two major cities in Bithynia, *Nicomedia* and *Nicaea*. The descriptions of the earthquakes as well as their consequences do not always concur throughout the sources. However, their existence and destructive powers are indisputable. The negative impact on the imperial finances is self-evident and needs to be considered in the analysis, as the emperors usually financially contributed to the reconstructions of the destroyed public buildings.

Author or Work	Year (AD)	Location	Description
Eusebius Chronicle Canon 780	29–32	<i>Nicaea</i>	great part of <i>Nicaea</i> ruined, many buildings destroyed
John Malalas 10, 43	68/69	<i>Nicomedia</i>	possibly two subsequent earthquakes, city greatly destroyed, rebuilding financed by the imperial treasury from Rome

¹⁶⁷ Translation by Rolfe 1935.

¹⁶⁸ Amm. 22, 13, 4–5.

Author or Work	Year (AD)	Location	Description
Eusebius Chronicle Canon 780	about 121	<i>Nicaea, Nicomedia</i>	both cities destroyed, repairs financed by Hadrian (new fortifications, agorai and fora)
John Malalas 12, 11	181	<i>Nicomedia</i>	severe damage as far as the River Sangarius, repairs financed by the Emperor Commodus
John Malalas 12, 28	268–270	<i>Nicomedia</i>	severe damage as far as the River Sangarius, repairs financed by the Emperor Claudius Apollianus
Ammianus Marcellinus 17, 7, 2–4	358	<i>Nicomedia</i>	entire region struck, city almost levelled to the ground (churches, public buildings, hippodrome and docks damaged), subsequent fire and floods
Ammianus Marcellinus 22, 13, 4–5 The Chronicle of John, Coptic Bishop of Nikiu 78, 8	362	<i>Nicaea, Nicomedia</i>	shortage of water, rest of <i>Nicomedia</i> (from 358) destroyed, <i>Nicaea</i> struck less
John Malalas 13, 35 The Chronicle of John, Coptic Bishop of Nikiu 82, 19	368	<i>Nicaea</i>	city razed to the ground, connected with sea wave (the Iznik Lake?)
John Malalas 14, 20	447	<i>Nicomedia</i>	destructive earthquake, possibly followed by a sea wave, rebuilding financed by Theodosius (public houses, bath, porticoes, gate, shrine of the martyr St. Anthimus and all churches)
John Malalas 15, 11	478	<i>Nicaea, Nicomedia, Helenopolis</i>	<i>Nicomedia</i> and <i>Helenopolis</i> destroyed, in <i>Nicaea</i> waters ‘rose up against the town and overwhelmed it’, the imperial treasury financed some repairs (the Emperor Zeno)
John Malalas 18, 118	554	<i>Nicomedia, Nicaea?</i>	extent of the damage differs according to sources, part of the city destroyed with certainty, aftershocks for 40 days

Table 5: List of Earthquakes in Bithynia in Selected Greek and Latin Sources

2. 1. 5. Road System

The last table, Table 6, presents a list of works relevant to the reconstruction of the road system.

The major sources are *Itineraria*, confirming the existence of roads by listing *mutatia* and *mansia*

situated along them. However, the *Itineraria* bring not only answers but also many questions and possible misinterpretations due to their inaccuracy.¹⁶⁹

Moreover, a great deal of information is scattered throughout works describing different topics. For instance, Strabo mentions the whereabouts concerning flows of different rivers and difficulties connected with their crossing. According to his description of the river between *Nicomedia* and *Nicaea*, it was necessary to cross it 24 times before reaching *Nicaea*.¹⁷⁰ We may thus assume that during his time, there was no regulation of the stream and most probably also no stone bridges built across.

Procopius, although possibly exaggerating at some points, documented in the description of Justinian's achievements several constructions connected with the road system. Especially valuable are remarks concerning new bridges.¹⁷¹ Moreover, one important regulation of the traffic diverted the section of the 'Pilgrim's road' between *Constantinopolis* and *Nicaea*. The overland road leading through *Nicomedia* was substituted with a direct way by the sea leading from *Constantinopolis* through *Helenopolis* to *Nicaea*:¹⁷²

Ἐὰ μὲν πρότερα ταύτη πη εἶχεν. ὁ δὲ αὐτοκράτωρ οὗτος πρῶτα μὲν τὸν ἐκ Καλχηδόνας ἄχρι ἐς Δακίβιζαν καθελῶν δρόμον ἠνάγκασε πάντας ἐκ Βυζαντίου εὐθύς ἄχρι ἐς τὴν Ἐλενούπολιν οὕτι ἐθελουσίους ναυτίλλεσθαι.'

*'But this Emperor first of all abolished the post from Chalcedon as far as Daciviza and compelled all the couriers, much against their will, to proceed from Byzantium directly to Helenopolis by sea.'*¹⁷³

¹⁶⁹ The utilization of *Itineraria* with its pros and cons concerning the reconstruction of the road system is discussed in detail in Chapter 7. 2. 1.

¹⁷⁰ Strab. 13, 1, 10.

¹⁷¹ Procop. aed. 5, 3, 4–6.

¹⁷² Procop. HA 30, 8.

¹⁷³ Translated by Dewing 1935.

Author or Work	Chronological Frame	Book Reference
Strabo	1 st century BC	Geography 13, 1, 10
Itinerarium Antonin	2 nd /3 rd century AD	Cuntz 1929, 20; Löhberg 2006a, 142–144. 146. 147; Löhberg 2006b, Karte 52.2
Itinerarium Burdigalense	AD 333/34	Cuntz 1929, 91 f.
Tabula Peutingeriana	4 th /5 th century AD	Miller 1916, 600–695
Procopius	AD 527–565	Historia Arcana 30, 8
Procopius	AD 527–565	Buildings 5, 3, 4–5

Table 6: List of Greek and Latin Sources Used for the Reconstruction of the Road System

2. 2. Travellers from the 18th till the End of the 19th Century

The following text mentions travellers whose notes brought new knowledge about the analysed territory of NW Asia Minor, with a special emphasis on *Nicaea* and its hinterland. Generally, I focused mainly on the contributions concerning the archaeological recognition of the territory. However, I also included several travellers describing the geographic and geological settings, as their studies considerably facilitated travels across the landscape by creating accurate maps of the territory.

Travellers from the Western Europe had been exploring Asia Minor from the 18th till the end of the 19th century. When studying their notes, I found a strikingly large amount of archaeological data including settlements, bridges and remains of road pavements, missing in the legacy data. Even though their identifications of remains with settlements known from ancient sources (mainly *Itineraria*) are frequently incorrect or at least questionable, they still point out an existence of archaeologically relevant features. Thus, I further consider their occurrence and characteristics in the present study. Moreover, the travellers mention ruins which are no more visible in the terrain and therefore often entirely forgotten in the present archaeological record.

By georeferencing the travellers' records, I managed to supply the dataset with a considerable number of archaeological features. As it is rather a challenging task to identify the described places, I use only features that, according to my opinion, can be safely located.

2. 2. 1. Travellers during the 18th Century

The beginning of the 18th century brought one of the first descriptions of *Nicaea* as well as of its hinterland. A French merchant and ‘antiquities hunter’ P. Lucas¹⁷⁴ stopped in the town on his travel to Bursa and described the ruins as well as several funerary monuments in the vicinity of *Nicaea*.

An English prelate and anthropologist R. Pococke¹⁷⁵ mentioned a few major cities during his travels. These were *Nicaea*, *Prusias ad Mare*, *Apamea Myrlea* and *Prusa ad Olypium*. His notes include observations concerning the present life, remarks on agriculture and descriptions of archaeological remains. R. Pococke was the first traveller who presented to western readers the drawing and description of a rare find in the hinterland of *Nicaea*, an obelisk situated NE of the town:

‘The people call it Besh-Tash (The five stones) because it consists only of that number; a drawing of it may be seen in the sixty-first plate; it is of grey marble and of a singular kind, for it is triangular, and stands on a base and pedestal, six feet nine inches square, and about eleven feet high. There is an inscription on the fourth side of it, from which one may conclude, that it was erected as a sepulchral monument, probably to some great citizen of Nice: The import of the inscription is, that C. Cassius Philiscus, the son of C. Cassius Asclepiodotus lived eighty-three years.’¹⁷⁶

2. 2. 2. Travellers during the 19th Century

During the 19th century, Asia Minor became one of the favoured destinations among travellers. In most of the cases, the travellers aimed for a longer journey continuing further south / east and only traversed the targeted territory of Bithynia. However, they left remarkable and considerably heterogeneous accounts about the area. The following overview introduces only the main or outstanding works which enriched the present study with new data.

¹⁷⁴ Lucas 1712, 80–91.

¹⁷⁵ Pococke 1745, 116–125.

¹⁷⁶ Pococke 1745, 123.

An English Lieutenant colonel, topographer and antiquarian W. M. Leake¹⁷⁷ travelled from *Constantinopolis* along the coast of the Marmara Sea, then by boat to Hersek, overland across the Samanlı Mountains to *Nicaea* and then further towards the south. The same journey was followed by number of travellers in the second third of the 19th century. W. M. Leake's style, however, is outstanding; systematic and precise. During the travel, he described everything he found interesting or relevant. The work brings all-round information about the topography, archaeological remains, prevailing agricultural products cultivated in the territory, current situation of the roads etc.

Notes made by a French antiquarian L. de Laborde¹⁷⁸ are especially valuable not only for the descriptions of monuments but mainly for excellent illustrations documenting the remarkable landscape and finds in the territory of *Nicomedia* and *Nicaea*.

The travel of a British archaeologist C. Fellows¹⁷⁹ brought more details about *Nicaea* and, moreover, copies of several inscriptions from the town. W. F. Ainsworth,¹⁸⁰ an English geographer and geologist, left valuable remarks about the geographical and geological settings. Especially notable and appearing in most of the sources is the dilapidation of *Nicaea*. The most vivid description can be found in the notes by a French geographer, engineer and traveller X. H. de Hell.¹⁸¹ X. H. de Hell gave an account about the city, during his visit best characterised as a '*malaric town with only several inhabitants*'.¹⁸²

W. J. Hamilton¹⁸³ considerably contributed to the geological recognition of Asia Minor and Armenia. Moreover, W. J. Hamilton's detailed descriptions of the territory include archaeological remains and copies of more than 400 ancient inscriptions. Although W. J. Hamilton entered Bithynia several times, he always only crossed its borders to reach some further destination. Thus, his notes concern the territory very superficially, not offering much additional information.

H. Barth, a German scholar and explorer specialized on Africa, left many interesting notes also from Asia Minor. Especially valuable are his copies of Greek and Latin inscriptions. Although

¹⁷⁷ Leake 1824, 1–14.

¹⁷⁸ De Laborde 1838, 29–45.

¹⁷⁹ Fellows 1839, 102–122.

¹⁸⁰ Ainsworth 1842, 41–57.

¹⁸¹ De Hell 1855, 296–298.

¹⁸² De Hell 1855, 296. From the French original translated by author.

¹⁸³ Hamilton 1984 (reprint of the original travel published in 1842).

one of his travels led through Bithynia, the bad weather unfortunately hindered his explorations in the region.¹⁸⁴

Finally, I have to mention the work of P. A. Tschihatscheff, although archaeological monuments were unfortunately only a very marginal topic for him.¹⁸⁵ P. A. Tschihatscheff managed to conduct seven travels throughout Asia Minor in 12 years (between the years 1847 and 1858)¹⁸⁶ and he considerably contributed to the scientific recognition of the land. His interests included geology, climatology, zoology, palaeontology and botany. The updated map published in his work served as a basis for H. Kiepert's map¹⁸⁷ and later on for a number of other travellers (see below).

The last two decades of the 19th century can be characterised by a very systematic approach of three German travellers. The travellers decided to subsequently complement blank areas contained in the map created by the German cartographer H. Kiepert. The utmost importance of H. Kiepert's cartographic work can be illustrated by the fact that even the local Turks used his map, translated into Turkish from German. The double translation (from Turkish to German by H. Kiepert and back to Turkish) brought some curious problems, as described by W. von Diest:¹⁸⁸

'Denn es gibt notorisch im osmanischen Reich keine anderen Karten als die in Europa bekannten, von Kiepert zusammengestellten; die Namen sind auf denselben häufig mit den aus der europäischen Schreibweise durch falsche Aussprache entstandenen Fehlern ins Türkische zurückübertragen!'

'There are no other maps in the Ottoman empire than the ones known in Europe and compiled by Kiepert; the names on these maps are translated back

¹⁸⁴ For example, *Nicaea* was during his visit completely under a snow cover. For details, see Barth 1860, 100.

¹⁸⁵ As follows from his own descriptions of archaeological monuments, see Tschihatscheff 1887, 173 f.

¹⁸⁶ A list of all the travels within Asia Minor is published in a table in Tschihatscheff 1867 and supplemented with a map created by Kiepert.

¹⁸⁷ Kiepert 1890–1892.

¹⁸⁸ Von Diest 1889, 62.

*to Turkish which leads to frequent errors emerging from the European misspelling of Turkish place names!*¹⁸⁹

The travellers W. von Diest, C. von der Goltz and M. Anton were well informed not only about hitherto conducted travels and their results, but also about the ancient literary sources, as their texts often mention *Itineraria* and historiographers. W. von Diest and M. Anton even planned their travels together,¹⁹⁰ visited each other before and after the travel or at least kept a vivid correspondence describing their discoveries. As their descriptions brought to light a number of presently forgotten ancient settlements, bridges and remains of Roman road pavements, I describe their work in a greater detail. The results following from their travels considerably enriched the collection of settlements and enabled a reconstruction of a denser road system than hitherto possible. The pavements of Roman roads resulting from their descriptions and possible to be spatially referenced are depicted on the map (Figure 2).

W. von Diest undertook three travels through Asia Minor and, fortunately, all of them led at least partially through the territory of Bithynia. During his first visit in 1886, W. von Diest¹⁹¹ entered Bithynia from the south on the way leading from Eskişehir to Bolu. From Bolu, he continued to the north to *Amastris* and then along the Black Sea coast as far as *Constantinopolis*. The second of W. von Diest's travels was carried out in 1892,¹⁹² roughly following the middle part of the *Sangarius* River. The third expedition was conducted in 1896, when W. von Diest¹⁹³ travelled on behalf of the railway company. He was sent to NW Asia Minor to survey all the railway tracks hitherto built in the territory. The travel led him from *Constantinopolis* through Lefke to Ankara and back to *Constantinopolis* through *Amastris*, along the Black Sea coast and southwards to *Nicomedia*. During the travel, he conducted a number of trips leading off the road, with the aim to discover as many archaeologically significant remains as possible. W. von Diest described basically all the features that could be connected with an ancient activity. However, remains of roads were his main interest, as he always devoted a major part of his time to their identification in the

¹⁸⁹ From the German original translated by author.

¹⁹⁰ Anton 1895, 41.

¹⁹¹ Von Diest 1889.

¹⁹² Von Diest 1895, 1–40.

¹⁹³ Von Diest 1898.

terrain. W. von Diest held the same view as later authors and researchers¹⁹⁴ specialized on the reconstruction of the road system. Without the course of the road, we are not able to use *Itineraria* for an identification of settlements mentioned in them.¹⁹⁵ Thus, he was eagerly looking for the roads and then connecting diverse architectural remains with places mentioned in *Itineraria*. Interestingly, his observations include burial mounds as indicators of routes of the roads. Furthermore, he describes ancient inscriptions, sarcophagi and other types of funerary monuments, worked architectural stones and even the places suitable for an ancient settlement, for example artificially flattened hills. As he based his travel on an actual map with an aim to enrich it, most of his observations can be located and used for the spatial analysis. A challenging part are names of the villages he uses when talking about allocations of archaeological remains. Some of the villages namely disappeared in the growing cities, have been renamed or simply abandoned. Fortunately, his descriptions include topographic information and thus most of the places can be identified based on the described features. Several of the accounts regarding the road remains are detailed enough to enable an interpretation of the importance / type of the road, as W. von Diest's notes encompass all the vital measurements:

*'Dieselbe ist dicht mit Nadelholz bestanden; auf ihrem schmalen Kamm findet Prinz Carolath im Walddickicht die antike, einst auf Modreni führende Straße. Sie ist in östlicher Richtung auf eine Strecke von 500 Schritt deutlich zu verfolgen und hat sorgfältiges Quaderpflaster in einer Breite von 12 Schritt. Drei Schritt vom nördlichen Rand ist eine erhöhte Steinlage sichtbar, welche augenscheinlich einen schmalern Teil für Fußgänger oder Reiter, oder für beide, von der breiteren Fahrstraße abteilte.'*¹⁹⁶

¹⁹⁴ French 1974, 143–149; French 1980, 699 f.; Starr 1962, 5 f.: as I find the work of Starr extremely important for the further development of approaches to reconstructions of the road system, I add also this note referring to his Doctoral thesis. However, I did not have the possibility to further consult this work as I was not able to get the offprint. Thus, I adopted the note from the French's publication 1974, 143.

¹⁹⁵ This issue is discussed in detail in Chapter 7. 2. 1.

¹⁹⁶ Von Diest 1889, 57.

*'The same [watershed between Sangarius and Mudurlu-Su]¹⁹⁷ is densely covered with coniferous wood; on its narrow ridge found Prince Carolath in the deepest forest an ancient road, once heading to Modreni. The road can be followed leading eastwards in the length of 500 steps, carefully built of ashlar stones and reaching the width of 12 steps. Three steps from the northern edge is an elevated stone path visible, which apparently divided a narrow path for pedestrians or riders, or for both, from the wider driveway.'*¹⁹⁸

C. von der Goltz worked and lived in *Constantinopolis* and thus his knowledge concerning current cultural events, habits, local inhabitants and their language etc. was considerably higher than the knowledge of a regular traveller.¹⁹⁹ C. von der Goltz's book 'Anatolische Ausflüge' encompasses eight articles. Two of them focus on general information about agriculture, new railways or possibilities for colonists. The remaining six chapters describe the trips throughout Bithynia and are accompanied by several maps which complement H. Kiepert's map. C. von der Goltz is neither a geographer and nor an archaeologist, but his observations are considerably accurate. He is the first traveller writing about the importance of the local names²⁰⁰ and pointing to the possible existence of ancient remains suggested by the modern name of the village / area.

*'Kaleh, d. h. Feste, nennen die Leute ihn; und es ist wohl möglich, daß auf der sonst quadratisch abgegrenzten Hochfläche, die Ruinen eines alten festen Schlosses zu finden sind. Auch der Name des am Fuße, in einer Schleife des Pursak am linken Ufer gelegenen Dorfes [Anm.: Adéhissar] deutet darauf hin.'*²⁰¹

'The place is called Kaleh, which means fortification, and it is highly probable that ruins of the old fortification are to be found on the square demarcated plateau. The village

¹⁹⁷ Note of author.

¹⁹⁸ From the German original translated by author.

¹⁹⁹ Von Diest 1895, 6 describes von der Goltz as a specialist on NW Asia Minor.

²⁰⁰ Von Diest adopted this technology during his second travel in 1892, for example: Von Diest 1985, 13 on Kara-viran.

²⁰¹ Von der Goltz 1896, 192.

*situated at the foothill, on the left bank of the River Pursak's meander, indicates the same, as its name is Adéhissar.*²⁰²

M. Anton²⁰³ travelled through the macro-region in 1893, entering Bithynia in the east, from the direction of Ancyra. His approach followed the one of W. von Diest and as he was interested in the same features and his inspiration to travel came directly from W. von Diest's work, he might be characterised as a scholar in 'W. von Diest's style'. M. Anton's main aim was to correct topographic and geographic settings still missing in H. Kiepert's map. Nevertheless, M. Anton's descriptions also include records concerning land use, occurrences of Greek and Latin inscriptions, remains of *necropolises*, ancient settlement and fortifications. M. Anton's observations are especially valuable regarding remains of road pavement and bridges, as he also determines their direction and tries to identify settlements that may have been connected by the roads.

*'Bei dem Dorf Gerze schwenkt der Fluss endgültig nach NO um. Hier erscheinen noch im Flußbett die Pfeilerreste einer antiken steinernen Brücke. Zwei Strompfeiler ragen noch ein ganzes Stück über den Wasserspiegel hinaus, die Landpfeiler sind teilweise oder ganz in den Fluß hinabgesunken. Die Richtung der alten Brücke entspricht dem Laufe des Längenthals, SW zu NO; deutlich erkennbare Reste einer alten Pflasterstraße bestätigen die Vermutung, daß hier eine Römerstraße nach SW in das Gebirge hineingeführt hat. Sehr wahrscheinlich haben wir es mit der Fortsetzung der von v. Diest im Thale des Alapli Tschai aufwärts bis zu den Überresten einer antiken Stadt verfolgten Straße zu thun. Eine Fortsetzung nach SO in der Richtung auf Dergene, wie sie auf der v. Diestschen Karte angedeutet, ist wegen der schwierigen Überwindung der dazwischenliegenden Aksu-jaila-Kette nicht wahrscheinlich.'*²⁰⁴

²⁰² From the German original translated by author.

²⁰³ Anton 1895, 41–115.

²⁰⁴ Anton 1895, 85.

‘At the village Gerze, the River [Boli-Su]²⁰⁵ turns to the NE. At this point appear in the river bed remains of an ancient stone bridge. Two of the pillars protrude high above the water level, the pillars on the banks were partially or entirely taken by the river flow. The direction of the old bridge corresponds with the direction of the valley, from the SW to NE; clearly recognizable remains of an old paved road confirm the presumption that there was a Roman road leading to the SW towards the mountains. Most likely it is a continuation of the road described by v. Diest in the valley of Alapli Tschai leading upwards to the remains of an ancient town. One continuation to the SE in the direction of Dergene, as it is depicted on v. Diest’s map, is due to the difficult terrain of the Aksu-jaila Mountains improbable.’²⁰⁶

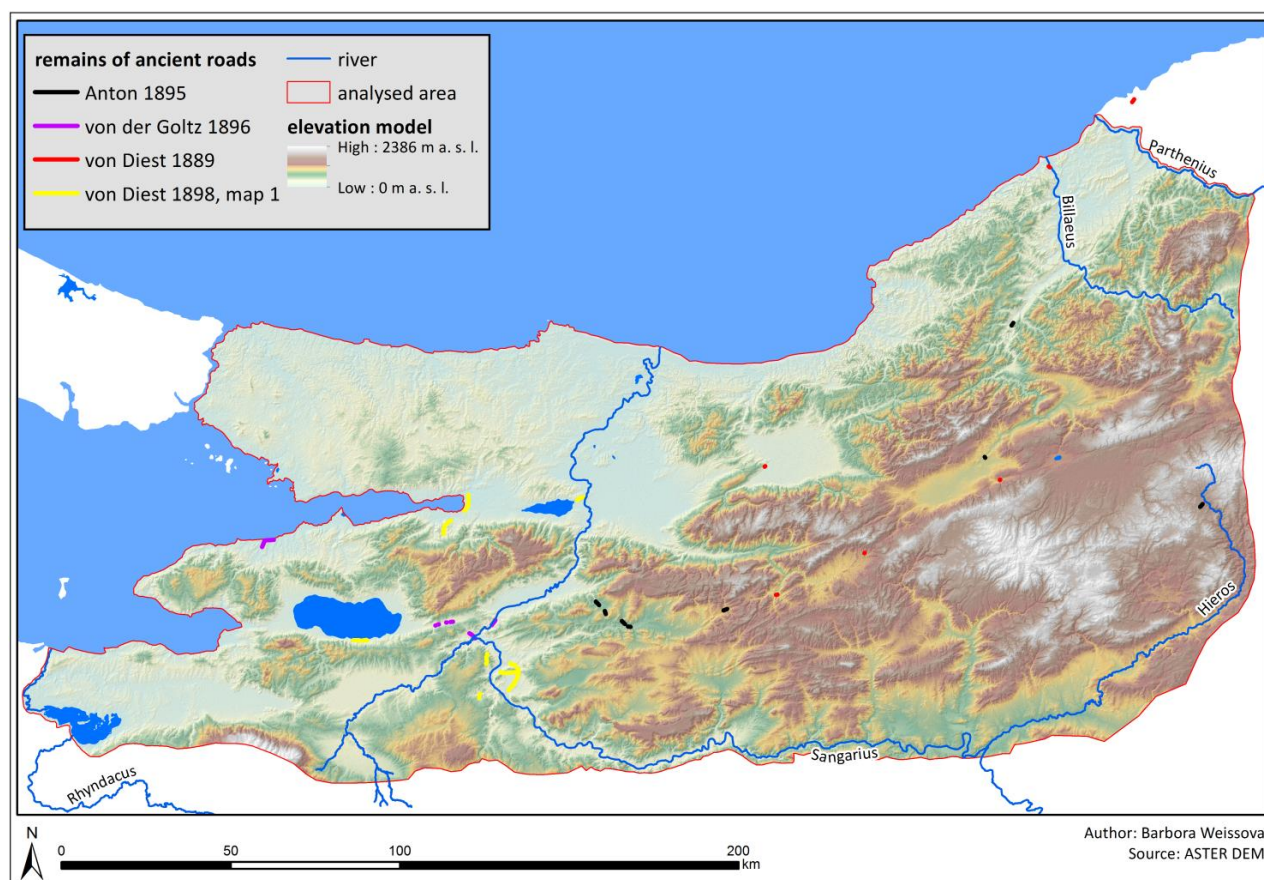


Figure 2: Remains of Ancient Roads Mentioned by Travellers (Addendum 1. 5.)

²⁰⁵ Note of author.

²⁰⁶ From the German original translated by author.

The map Figure 2 shows all the remains of Roman roads described by M. Anton, W. von Diest and C. von der Goltz in the territory of NW Asia Minor. I followed their descriptions concerning the location and length of each section of the road. Therefore, the depicted remains differ in lengths and shapes.²⁰⁷

The following Table 7 represents an overview of all the travellers mentioned in the text, listed in a chronological order based on the year(s) of the travel(s). The table further includes the profession, main interests of each traveller and benefits for the present work.

Name of the Traveller	Profession	Year(s) of Travel	Main Interests / Benefits
Paul Lucas	merchant and 'antiquities hunter'	1704–1708	lifestyle, inhabitants, archaeological remains in general
Richard Pococke	prelate and anthropologist	1737–1741	lifestyle, inhabitants, archaeological remains in general
Francis Leake	lieutenant colonel, topographer and antiquarian	1800	all-round information about the topography, agricultural products, archaeological remains etc.
Léon de Laborde	antiquarian	1825	archaeological remains, outstanding illustrations
Charles Fellows	archaeologist	1838	architectural remains in <i>Nicaea</i> , copies of several inscriptions
William Francis Ainsworth	geographer and geologist	1836–1840	geography and geology
Xavier Hommaire de Hell	geographer, engineer and traveller	1846–1848	geography, archaeological remnants in general, description of <i>Nicaea</i>
William John Hamilton	geologist	1835	geology, archaeological remains, inscriptions
Heinrich Barth	scholar and explorer specialized on Africa	1858	archaeological remains, inscriptions
Pjotr Alexandrowitsch Tschihatscheff	naturalist and geologist	1847–1858	geology, climatology, zoology, palaeontology and botany

²⁰⁷ The remains are used in the reconstruction of the road system and rectification of the courses of roads examined in Chapter 7.

Name of the Traveller	Profession	Year(s) of Travel	Main Interests / Benefits
Walther von Diest	officer	1886, 1892, 1896	geographical survey (springs of rivers, mountains etc.), archaeologically significant remains, roads, bridges, inscriptions
Colmar von der Goltz	officer and military historian	1889–1893	archaeologically significant remains, roads, bridges, inscriptions
Max Anton	officer	1893	rectification of topographic and geographic settings, archaeologically significant remains, roads, bridges, inscriptions, necropolises

Table 7: List of Travellers in Bithynia from the 18th till the End of the 19th Century

2. 3. Available Archaeological Sources

As mentioned in the introduction, all the major modern cities in the territory have been established and continuously inhabited since the Hellenistic or latest the Roman period. Therefore, any modern building activity usually reveals layers of preceding epochs. Such a situation is challenging and brings a number of difficulties for current inhabitants as well as for archaeologists trying to protect the heritage. Finally, it leads to losses of evidence, as it is simply impossible to preserve and / or archaeologically excavate all the remains.

Currently, numerous finds are archived in local museums, unfortunately often missing precise reference to a find spot. These finds come either from the rescue excavations within the towns²⁰⁸ or were brought to the museums by locals who found them ‘somewhere in the field’. Due to the large amount of the finds, only outstanding ones are being exhibited and / or published.²⁰⁹

2. 3. 1. Archaeological Remains in the Main Urban Settlements and their Hinterlands

With an aim to demonstrate the available amount of the archaeological data, the following chapter examines the archaeological evidence in each of the urban settlements and its immediate hinterland separately. I include all the names of the discussed cities, i.e. the Hellenistic, Roman and

²⁰⁸ For example, see the report on ancient finds from *Nicomedia* by Dörner 1941, 48–51.

²⁰⁹ Kaplanoğlu 1997, 23.

Early Byzantine, with the modern one in brackets, when available. The cities are listed alphabetically, based on their name during the Roman period, since it is the name I use throughout the entire study.

To the overall characteristic of the macro-region belongs a vast amount of ancient spolia scattered within the towns as well as all around their hinterlands.²¹⁰ I mention them in the following text only if they were used as spolia already during the examined periods.

Most of the ancient monuments described in the text are an outcome of observations above the surface. In the vast majority, the only available information about the architectural remains discovered under the surface are scarce remarks from rescue excavations. These ancient buildings were disturbed during the recent construction works and only briefly described before they were distracted or overbuilt.

The scarcity of regular excavations and surveys in the territory²¹¹ is not the only problem one should face. The other difficulty is the fact that the results of recent excavations, which are conducted by Turkish archaeologists, are published only in Turkish, albeit available online.²¹²

Apameia / (Colonia Ulpia Concordia) Apamea / Apameia (Mudanya)

M. Şahin,²¹³ who conducted an archaeological survey in the city in 2010, described Classical and Hellenistic pottery as well as architectural remains detected in the territory of a feasible acropolis.²¹⁴ Furthermore, M. Şahin²¹⁵ published a brief article concerning the research history and finds from the Mudanya tumulus. G. Lang²¹⁶ briefly mentioned remains of a theatre.

²¹⁰ Mitchell 1995a, 9. For examples in particular areas, see the descriptions of the hinterlands of *Nicomedia* by Dörner 1941, 27–33 and *Claudiopolis* by Ortaç 2011, 329–348; Ortaç 2012, 129–154.

²¹¹ Mitchell 1998/1999, 129.

²¹² The reports *Kazı Sonuçları Toplantısı* and *Araştırma Sonuçları Toplantısı* are published by the Turkish Ministry of Culture and Tourism and they inform about all the official archaeological activities in Turkey. The journals are available online at URL: <http://www.kulturvarliklari.gov.tr/TR,44760/kazi-sonuclari-toplantilari.html> and <http://www.kulturvarliklari.gov.tr/TR,44761/arastirma-sonuclari-toplantilari.html> respectively.

²¹³ For the entire report, see Şahin 2012, 11–26.

²¹⁴ Şahin 2012, 18.

²¹⁵ Şahin 2014b, 14–17.

²¹⁶ Lang 2003b, 145.

Apollonia epi Ryndako / Apollonia ad Rhyndacum / Apollonias (Gölyazı)

An archaeological survey had been conducted between 2002 and 2003 in the city of *Apollonia ad Rhyndacum* with an aim to document architectural structures and other archaeological remains above the surface.²¹⁷ The described monuments include fortification walls, a temple of Apollo, a theatre,²¹⁸ a stadium, an aqueduct and a necropolis.²¹⁹

Chalkedon / Chalcedon / Chalkedon (Kadıköy – the district of Istanbul)

The ancient *Chalcedon* is situated under the modern district Kadıköy, in the metropolis of Istanbul. *Chalcedon* had two ports, surrounding the city from the north and the SE.²²⁰ North of the city is a necropolis, excavated in 1976.²²¹ The excavations were initiated by the distraction of several graves during a road construction. The necropolis revealed 16 funerary stelae and 19 sarcophagi, dated from the Archaic till the Byzantine periods.²²²

Bithynion / Claudiopolis / Klaudiopolis (Bolu)

Hisar Tepe in the quarter Akpınar revealed a Temple of Antinoos.²²³ The southern slope of the area disclosed remains of a stadium dated to the reign of the Emperor Hadrian.²²⁴

The existence of a theatre was confirmed during the widening of the road to Istanbul. The investigations conducted by N. Fıratlı uncovered two rows of seats and a part of diazoma in section.²²⁵

²¹⁷ For preliminary reports, see Aybek – Öz 2004, 1–25; Aybek – Öz 2010, 314 f.

²¹⁸ Ruins of *cavea*, still observable in the terrain, are mentioned by Lang 2003a, 182.

²¹⁹ The recorded architecture is briefly described by Aybek – Öz 2004, 3–5.

²²⁰ See map published by Asgari – Fıratlı 1978, 5 Abb. 3.

²²¹ The report encompasses a considerably detailed description of funerary monuments as well as of several finds from *Chalcedon*. For more details, see Asgari – Fıratlı 1978, 1–92.

²²² Asgari – Fıratlı 1978, 6–52.

²²³ Mellink 1979, 342; Mellink 1980, 516.

²²⁴ The rescue excavation was conducted by the Bolu Museum in 2008 and the data were gained from the permanent exhibition in the museum. The information was kindly provided by D. Delchev who personally visited the museum in March 2014. Most probably, it is the same temple which was reported by Fıratlı already in 1965 and disturbed during the building activities in 1971 (Mellink 1973, 191).

²²⁵ Reported by Mellink 1973, 190.

Concerning funerary monuments in the modern city, Hisar Tepe in Akpınar disclosed four burial mounds.²²⁶ N. Fıratlı reported a necropolis situated west of the citadel.²²⁷ Two Hellenistic tumuli were announced as excavated and destroyed by robbers.²²⁸ The centre of the city revealed five sarcophagi with offerings.²²⁹ Three Roman graves dated to the 2nd and the 3rd century AD were discovered during an enlargement of the modern road in front of the Cultural Centre in 2006.²³⁰

Survey in the hinterland confirmed the existence of a number of funerary monuments including several rock cut graves, two rock cut tombs²³¹ and two tumuli.²³²

Daskylaion / Dascyleion / Daskylion (Hisartepe, 2 km west of Ergili)

The heyday of *Dascyleion* is dated to 480 – 370 BC and it is connected with the presence of the Persians. During the Hellenistic period, most of the early buildings were constructed from the material taken from the Persian palaces and temples. There is hardly any evidence of human activity in *Dascyleion* during the Roman period. During the Byzantine Era, the site of the Persian citadel was used for military purposes.²³³

The area Ergili revealed a building with the megaron. The building is dated, based on the pottery finds, to the 2nd century BC.²³⁴ The area of the Hisartepe disclosed habitation from the Hellenistic till the Byzantine periods. The West slope ware from *Dascyleion* was published by H. Bulut.²³⁵

²²⁶ Mellink 1979, 342; Mellink 1980, 516.

²²⁷ Mellink 1973, 191.

²²⁸ Fıratlı 1965, 365–367.

²²⁹ Four sarcophagi come from the Tepecik quarter, one from Kasaplar village. The rescue excavations were conducted by the Bolu Museum in 2007. The data are from the permanent exhibition in the museum. The sarcophagi are in the garden of the museum as an inherent part of an open-air exhibition. The information was kindly provided by D. Delchev who personally visited the museum in March 2014.

²³⁰ The rescue excavation was conducted by the Bolu Museum in 2006, information gained from the permanent exhibition in the museum. The information was kindly provided by D. Delchev who personally visited the museum in March 2014.

²³¹ Ortaç 2011, 338.

²³² Ortaç 2011, 338; Ortaç 2012, 137.

²³³ All the information was gained in the local museum in Balıkesir and kindly provided by D. Delchev who personally visited the museum in April 2014.

²³⁴ Mellink 1956, 383; Mellink 1959, 85; Mellink 1960, 68.

²³⁵ Bulut 2013, 75–127.

In total, 14 tumuli are distributed in the south and the east of the Hisartepe.²³⁶ One of the necropolises revealed numerous Greco-Persian funerary reliefs.²³⁷

Hadrianopolis / Hadrianoupolis (Eskipazar)

The city of *Hadrianopolis*²³⁸ does not offer much of ancient remains above the surface. Except a Roman theatron, the remains are dated to the Early Byzantine period and their function is connected with religious purposes.

The centre of the Roman city was identified with the Late Byzantine fortress. The vicinity of the fortification revealed various archaeological remains including a church dated to the 6th century AD, two public baths, one building in an apsidal form, a possible theatron, at least six necropolises, one vaulted building, one building with a domed roof and several other structures. At least five of the structures have floors decorated with mosaics. Out of the 25 identified buildings, most of them are dated to the 1st quarter of the 6th century AD.

The hinterland of *Hadrianopolis* revealed a number of graves dated to the Roman period²³⁹ and five ancient quarries.²⁴⁰ The surrounding fields are still visibly terraced in order to grow vine. The viniculture is confirmed by finds of the weights from wine presses, distributed all around the hinterland.²⁴¹

Herakleia / Heraclea Pontica / Herakleia (Ereğli)

Hellenistic, Roman and Byzantine fortification walls are still preserved at several places.²⁴² *Intra muros*, the city revealed remains of an ancient road and ruins of one building. W. Hoepfner²⁴³ interpreted the building as an open public hall. Basilica dated to the Early Byzantine period was identified under the modern mosque Orta Camii.²⁴⁴

²³⁶ Mellink 1990, 150; Mellink 1991, 152; Mellink 1993, 132.

²³⁷ Lang 2003, 272.

²³⁸ Lafli – Zäh 2008, 681–713; Lafli – Christof 2012, 1–13.

²³⁹ Lafli – Christof 2012, 19–25.

²⁴⁰ Lafli – Christof 2012, 1. 5 Abb. 10 (quarry in Mermer).

²⁴¹ Lafli – Christof 2012, 13.

²⁴² Hoepfner 1966, 37–47.

²⁴³ Hoepfner 1966, 52–55.

²⁴⁴ Hoepfner 1966, 93–97.

Extra muros, several necropolises are distributed around the town, mainly along the main road connecting *Heraclea Pontica* and *Prusias ad Hypium*. One more necropolis is situated NE of the town, together with remains of an aqueduct.²⁴⁵

Three caves, traditionally connected with the mythological descent of Heracles into the underworld, are situated along the northern fortification wall.²⁴⁶ The cave of Heracles disclosed architectural fragments of a church dated to the 6th century AD, illegally excavated by robbers.²⁴⁷

The function of *Heraclea* as a harbour is confirmed by remains of an ancient pier directly at the town as well as remnant of an ancient harbour and a large Roman building at Kilisecik.²⁴⁸

Iuliopolis / Iounopolis (Nallihan)

The ancient city is located under the Saryar dam built in 1950's. The excavations conducted in the city necropolis situated on an elevated position unearthed nearly 200 graves.²⁴⁹

(Helikore) Nikaia / Nicaea / Nikaia (Iznik)

Nicaea has outstanding and still preserved fortification walls with the first construction phase dated to the 1st century AD, rebuilt several times during the Roman and Byzantine periods.²⁵⁰ The fortification encompasses three monumental gates preserved *in situ*.²⁵¹ The Eastern gate features a canal for water coming from the aqueduct. Remains of the aqueduct are still visible in the terrain.²⁵²

The territory *intra muros* encompasses ruins of a Roman theatre²⁵³ dated to the beginning of the 2nd century AD (reign of the Emperor Trajan) and situated in the SW part of the town. The archaeological excavations of the theatre disclosed pottery dated from the Roman till the Ottoman

²⁴⁵ For more information concerning the spatial distribution of ancient remains, see Hoepfner 1966, Plan I and Plan II.

²⁴⁶ Hoepfner 1972, 40–46 Abb. 4. 5.

²⁴⁷ Mellink 1974, 129.

²⁴⁸ For more details, see Hoepfner 1972, 50–58.

²⁴⁹ The information was gained in the permanent exhibition in the Archaeological museum in Ancyra, which also carried out the excavations of the necropolis. The information was kindly provided by D. Delchev who personally visited the museum in March 2014.

²⁵⁰ Schneider – Karnapp 1938; Merkelbach 1987, 9; Dalyancı-Berns 2017, 417–426.

²⁵¹ Schneider – Karnapp 1938; Yalman 2000, 67–79; Şahin 2004, 18–20; Lang 2003b, 163.

²⁵² Yalman 2000, 90–93.

²⁵³ Schneider 1943, 8 f.; Yalman 2000, 81–89.

periods. The theatre was used as a source of building material for the reconstruction of the fortification walls in the 8th century AD,²⁵⁴ still well identifiable at some points. West of the theatre, remains of a Roman stadium were identified.²⁵⁵

The surface of an outstandingly well-preserved pavement of a Roman road, more than two meters under the current street level, was discovered during the restoration of the *Sultan Hamami* situated in the midst of *Nicaea*.²⁵⁶ I personally observed rescue excavations in the NE part of the town during the ISP15, connected with the construction of a new archaeological museum. The archaeological work promises to bring a new knowledge concerning the organisation of the town in this area.²⁵⁷

The basilica Hagia Sofia, with its first construction phase dated to the 4th century AD, was later modified to a mosque.²⁵⁸ Foundations of another basilica, dated to the late Roman period, are still visible in the Iznik Lake. The remnants are situated west of the city, about 20 m of the eastern shore of the lake.²⁵⁹ Geophysical prospection conducted in 2008 revealed one Byzantine basilica situated in the NW part of the town.²⁶⁰

The hinterland of *Nicaea* encompasses a number of archaeological remains including funerary monuments, bridges and aqueducts. The surrounding slopes of the Samanlı Mountains feature several ancient quarries.

The funerary monuments are the most numerous,²⁶¹ creating a group of miscellaneous types including *hypogea*,²⁶² flat tombs,²⁶³ vaulted grave chambers with *dromos*,²⁶⁴ one grave

²⁵⁴ Mellink 1982, 575.

²⁵⁵ Lang 2003b, 163.

²⁵⁶ The information is based on my own observations during the ISP15.

²⁵⁷ Results of the rescue excavations have not been published at the time of writing the present work.

²⁵⁸ Yalman 2000, 110–112. Further investigations by Möllers in Mellink 1987, 28.

²⁵⁹ The basilica is researched by the Archaeological Department of the Uludağ University and hitherto published in several preliminary and rather popularizing articles: Şahin et al. 2014, 42–45; Şahin 2014a, 2–5; Şahin 2016a, 48 f.; Şahin 2016b, 76–79; Şahin 2017, 78–81.

²⁶⁰ Niewöhner et al. 2010, 475–490; Niewöhner et al. 2011, 105–128.

²⁶¹ For a description of the graves and an outline of their spatial distribution, see Ermiş 2009, 202–236.

²⁶² Fıratlı 1974, 919–932; Yalman 2000, 121–125. 129; Ermiş 2009, 190–237; Ermiş 2011, 121–139.

²⁶³ Yalman 2000, 96–99. This type of graves is called *χαμοσόριον*, translation as a ‘flat grave’ based on the Online Liddell-Scott-Jones Greek-English Lexicon:

URL <http://stephanus.tlg.uci.edu/lsg/#eid=116310&context=lsg&action=from-search>.

²⁶⁴ Yalman 1994, 425–435 Figs. 161–188.

chamber in the form of a sarcophagus,²⁶⁵ one rock cut grave monument²⁶⁶ and one obelisk.²⁶⁷ Two more monuments, possibly connected with funerary activities, are the massive reef rising above the city of *Nicaea* which is decorated with rock cut busts²⁶⁸ and one rock cut sanctuary.²⁶⁹

The marble deposits of the Samanlı Mountains were exploited already during the antiquity. The published evidence suggests four large quarries with remains of the ancient quarrying techniques.²⁷⁰

The NW part of the hinterland encompasses two ancient bridges, Kuru Köprü²⁷¹ and Karasu Deresi Köprüsü.²⁷² They are located in agricultural fields and do not arch over any actual river. Both bridges are dated to the Early Byzantine period.

Remains of the aqueduct are visible between the Eastern gate (as mentioned above) and the village Dereköy situated NE of the city in the foothills of the Samanlı Mountains.²⁷³

Since none of the publications specifies the geographic positions of the monuments, a vast majority of them was not possible to be depicted on the map without visiting the hinterland. When trying to locate them in the terrain during the ISP15, most of them were identifiable only with the help of locals and some were not *in situ* anymore.

(*Astakus*) *Nikomedeia* / *Nicomedia* / *Nikomedeia* (Izmit)

Nicomedia revealed a number of remains of fortification walls.²⁷⁴ The Hellenistic fortification was used in the later Byzantine walls and it was built around the hilltop.²⁷⁵ The remnants of the massive

²⁶⁵ Pococke 1745, 122 f. pl. 60, I; de Laborde 1838, 38 pls. 15. 33; Texier 1882, 109; Schneider 1943, 7 f. Taf. 3; Rodenwaldt 1943, 5–7 Abb. 2. 3; Kleiner 1957, 8 Taf. 5, 2. 3, Berns 2003, 238 f. Taf. 21, 1. 2.

²⁶⁶ Yalman 2000, 96–99.

²⁶⁷ Pococke 1745, 123 pl. 61; Texier 1882, 109 f.; Schneider 1943, 7 Taf. 1. 2; Şahin 1979, no. 85; Merkelbach – Stauber 2001, 159–163; Berns 2003, 159. 162; Lang 2003b, 163; Şahin 2004, 21 f.

²⁶⁸ Şahin 1979 pl. 4. 5 no. 38.

²⁶⁹ Yalman 2000, 93 f.

²⁷⁰ Yalman 2000, 61–63; Şahin 2007, 17.

²⁷¹ Yalman 2000, 102; Şahin 2007, 18.

²⁷² Şahin 2007, 18; Ermiş 2009, 246–248.

²⁷³ Ermiş 2009, 238–245.

²⁷⁴ For a description of the fortification walls, see Foss 1996, 29–43 figs. 1–25 and Ross 2007, 96 f.

²⁷⁵ Foss 1996, 42.

and long fortification identified on several places around the entire city are dated to the time of the Emperor Diocletian and were in use until the 7th century AD.²⁷⁶

The first rescue excavations conducted in 1934 uncovered a Roman public bath and an agora situated in the SW part of the city.²⁷⁷ M. J. Mellink²⁷⁸ mentions a number of columns unearthed during the building activities nearby an ancient harbour and belonging either to a colonnade or to a temple. Based on the survey conducted in 2005 and 2006, A. Ç. Ross²⁷⁹ confirms a large amount of ancient remains situated *intra* as well as *extra muros*. The described remnants include a theatre *intra muros*, for the most part built-up with modern town. Due to its position on the slope, although not proved by the ruins, A. Ç. Ross dates the first construction phase to the Hellenistic period.

The hinterland of *Nicomedia* revealed remnants of aqueducts and canals,²⁸⁰ pavements of Roman roads,²⁸¹ three bridges²⁸² and several necropolises, for the most part uncovered during the rescue excavations.²⁸³

The district of Tepecik, situated in the southern part of the city, disclosed a large nymphaeum dated to the 2nd century AD. It is known due to findings since 1930, but the site is situated under a modern construction.²⁸⁴ The nymphaeum is described as one of the largest in Asia Minor.²⁸⁵

Prousa / Prusa ad Olympum / Prousa (Bursa)

The massive fortification wall encircling the Hisar Tepe, with its last construction phase dated to the Ottoman period, consists of a large amount of ancient spolia. The city was, however, entirely

²⁷⁶ Foss 1996, 29–31. 42; finds discovered during the excavations between 1934 and 1938 were revisited and republished by Zeyrek – Asal 2005, 1–10.

²⁷⁷ Bittel et al. 1939, 156–171; Ross 2007, 103.

²⁷⁸ Mellink 1976, 80.

²⁷⁹ Ross 2007, 97 f. 111. 122 f.

²⁸⁰ Lang 2003b, 171; Ross 2007, 98–100. 121.

²⁸¹ Ross 2007, 21. 116 f.

²⁸² Taşköprü ('Stone bridge') in the NW (Dörner 1941, 33–36 Taf. 7, 1–3), Justinian bridge in the east (Whitby 1985, 129–148; Şahin 1999, 634–658; Belke 2010, 89–99) and one more bridge in the south (Foss 2000a, 793).

²⁸³ Dörner 1941, 18; Fıratlı 1953, 15–25; 1960, 22–25; Meriçboyu – Atasoy 1969, 67–90; Turgut – Aksoy 1996, 399–414; Mellink 1960, 69; Mellink 1964, 164 f.; Mellink 1968, 145; for an outline of the spatial distribution of the necropolises, see Ross 2007, 111 f.

²⁸⁴ Mellink 1960, 69.

²⁸⁵ Lang 2003b, 171.

overbuilt during the Ottoman period and, consequently, it does not feature any ancient remains visible above the surface.

Several graves were found and reported during recent construction works: one in the area of the Uludağ University, based on the pottery dated to the first half of the 2nd century BC,²⁸⁶ and one rock cut tomb in the vicinity of the Hamza Bey Camii.²⁸⁷ The British museum exhibits a silver hoard from a tomb located in Bursa, with a more precise location unknown.²⁸⁸

Roman baths are situated two kilometres west of the fortified hill, in the midst of the modern city of Bursa, in the quarter Çekirge.²⁸⁹

Prousius / Prusias ad Hypium / Prousius (Konuralp)

The monuments still visible above the ground include remains of a fortification wall, a Roman theatre for 3000 people with 14 preserved rows of seats (dated to the 1st half of the 1st century AD) and aqueducts preserved at the Acropolis and in the village Kemer Asim.²⁹⁰

A Roman temple was identified *extra muros* during the construction of a road.²⁹¹ Another construction works, this time of a large canal south of the road from Konuralp to Düzce-Akçakoca, revealed part of a colonnaded street.²⁹²

The mosaic exhibited in the archaeological museum in Konuralp and depicting Orpheus was found in a villa Urbana. The villa encompassed one more room with mosaic floor displaying Achilles.²⁹³

²⁸⁶ Bulba 2011, 53–61.

²⁸⁷ Dörner 1941, 18–20.

²⁸⁸ The collection is available online, including a detailed description of each of the finds.

URL: https://www.britishmuseum.org/research/collection_online/search.aspx?searchText=Bursa,+tomb.

²⁸⁹ Corsten 1993, 10.

²⁹⁰ For a brief description of the monuments, see Ameling 1985, 13; Lang 2003b, 351 f., Zeyrek 2005.

²⁹¹ Mellink 1968, 145; Lang 2003b, 352.

²⁹² Mellink 1974, 128.

²⁹³ Tülek 2009, 144.

Kios / Prusias ad Mare / Kios (Gemlik)

I have not found any published information about the archaeological monuments in the modern town. T. Corsten²⁹⁴ describes three necropolises scattered *extra muros*. One along the road towards *Nicaea*, ca. 2 – 3 km east of the town. The other one SW of the town along the road to Bursa and the last one situated in the north of the town.²⁹⁵ Some of the tumuli were further described in detail, especially when distracted during the construction works or by robbers.²⁹⁶ B. Yalman²⁹⁷ refers about the devastation of an ancient necropolis situated in the area of Gemlik Umurbey next to the main road leading from *Prusias ad Hypium* to *Prusa ad Olypium*.

Tios / Tium / Tios (Filyos)

The monuments still standing above the ground include a theatre,²⁹⁸ a defensive tower, four arches of an aqueduct, a nymphaeum, a vaulted gallery, sea walls and a number of tombs, all dated to the Roman and the Early Byzantine periods.²⁹⁹ The excavations conducted in 2007 in the city centre revealed a Hellenistic fortification wall,³⁰⁰ a bath complex dated to the Roman Imperial period³⁰¹ and three sections of paved roads with a width of three meters.³⁰²

The excavations at the acropolis point to the continuous habitation from the Archaic to the Late Byzantine periods.³⁰³ The acropolis revealed remains of a temple³⁰⁴ dated to the Roman Imperial period.

²⁹⁴ Corsten 1985, 11–13.

²⁹⁵ The necropolis in the north is based on the information from the locals, Corsten (1985, 13) could not confirm its existence during his visit.

²⁹⁶ Mellink 1967, 173; Mansel 1974, 181–189.

²⁹⁷ Yalman 1993, 462 f.

²⁹⁸ Lang 2003b, 573 on the destruction of the theatre in the last 100 years; Atasoy et al. 2013, 297–312.

²⁹⁹ Atasoy 2012, 31 f.; Öztürk 2013, 147. 150.

³⁰⁰ Information gained in the local museum in Ereğli, confirmed by the permanent exhibition (visited in April 2015 by the author).

³⁰¹ Atasoy et al. 2013, 297–299.

³⁰² Atasoy 2012, 31 f.

³⁰³ Atasoy 2012, 31.

³⁰⁴ Atasoy et al. 2013, 300–303.

2. 3. 2. Archaeological Remains Detected by Surveys Conducted in the Macro-Region

The survey focused on the area around the Ulubat Lake³⁰⁵ registered three fortresses: Olag, Erintaş and Ürünlü. Olag fortress was, based on the pottery, dated to the Iron Age.³⁰⁶ Erintaş fortress did not reveal any pottery finds but, based on the architecture, it was dated to the Hellenistic period. Fortress Ürünlü situated ca. 15 km west of *Prusa ad Olympum* was dated very broadly as the ancient one.³⁰⁷ The survey also identified several necropolises, rock cut monuments and quarries distributed around the lake.³⁰⁸

2. 4. Epigraphic Evidence

The inscriptions constitute an individual and fundamental source of the data, as they are the only direct archaeological evidence which has been systematically studied and published. The corpuses of inscriptions³⁰⁹ found in major urban centres and their hinterlands³¹⁰ enable quantified and spatial analyses *en masse*, complemented with temporal and topical analyses of the relevant fraction of the inscriptions.

2. 4. 1. Quantification of Published Inscriptions from all over the Macro-Region

Firstly, I focused on the quantification of the extensive collection of the inscriptions from the entire Bithynia published in individual corpora³¹¹ and journals.³¹² This resulted in a collection of 2,878 inscriptions. Although I included all the corpuses concerning Bithynia as well as the journals

³⁰⁵ Aybek – Öz 2009, 327–342; Aybek – Öz 2010, 313–328.

³⁰⁶ Aybek – Öz 2009, 327.

³⁰⁷ Aybek – Öz 2010, 316.

³⁰⁸ Aybek – Öz 2009, 329 f.

³⁰⁹ For a detailed list of the works on the epigraphy, see Chapter 1. 1. 3.

³¹⁰ The centres which enabled quantification of the epigraphic evidence, listed from the most numerous to the least, include *Nicaea*, *Nicomedia*, *Prusa ad Olympum*, *Claudiopolis*, *Chalcedon*, *Prusias ad Hypium*, *Prusias ad Mare*, *Apamea*, *Hadrianopolis*, *Heraclea Pontica*, *Tios*, *Dascyleion*, *Pylae*, *Strobilos*, *Apollonia ad Rhyndacum*, *Cretia Flaviopolis*, *Caesarea Germanica*, *Iuliopolis*.

³¹¹ The main source represent the corpora published by the Universität of Köln and Österreichische Akademie der Wissenschaften in the series ‘Die Inschriften Griechischer Städte aus Kleinasien’ (shortened as IK and name of the particular city), supplemented by Supplementum Epigraphicum Graecum (SEG) and Tituli Asiae Minoris (TAM).

³¹² Mainly *L'Année épigraphique* (AE), *Epigraphica Anatolica* (EpigrAnat) and *Bulletin de correspondance hellénique* (BCH).

omitted in the corpuses or published recently (later than the individual corpus),³¹³ it is likely that some of the published inscriptions are still missing. However, since I encompassed all the main publications and periodicals, and crosschecked my data with the online databases,³¹⁴ the missed sample does not represent more than several inscriptions and thus it does not change the whole picture outlined for the territory.

The complete list of the inscriptions including locations in relation to the nearest urban centre, chronological data frames, languages and sources, is attached in a tabular form as Addendum 2. As most of the inscriptions are digitised and available online, the catalogue includes identification numbers from the two largest online databases of epigraphic evidence, marked PH (The Packard Humanities Institute) and HD (The Heidelberg Datenbank).³¹⁵ The numbers directly point to Greek and Latin texts published online. For an overview, the bar chart below (Figure 3) shows the groups encompassing more than ten inscriptions per centre in total and divided to dated and undated.³¹⁶

³¹³ The published evidence is systematically processed until 2015.

³¹⁴ The main source is the database of The Packard Humanities Institute (PH), URL: <http://epigraphy.packhum.org/>; completed by dataset from Epigraphische Datenbank Heidelberg (HD), URL: <http://edh-www.adw.uni-heidelberg.de/home>.

³¹⁵ For more details concerning the digitised datasets, see Chapter 1. 1. 5.

³¹⁶ The inscriptions are further processed in detail in Chapter 5.

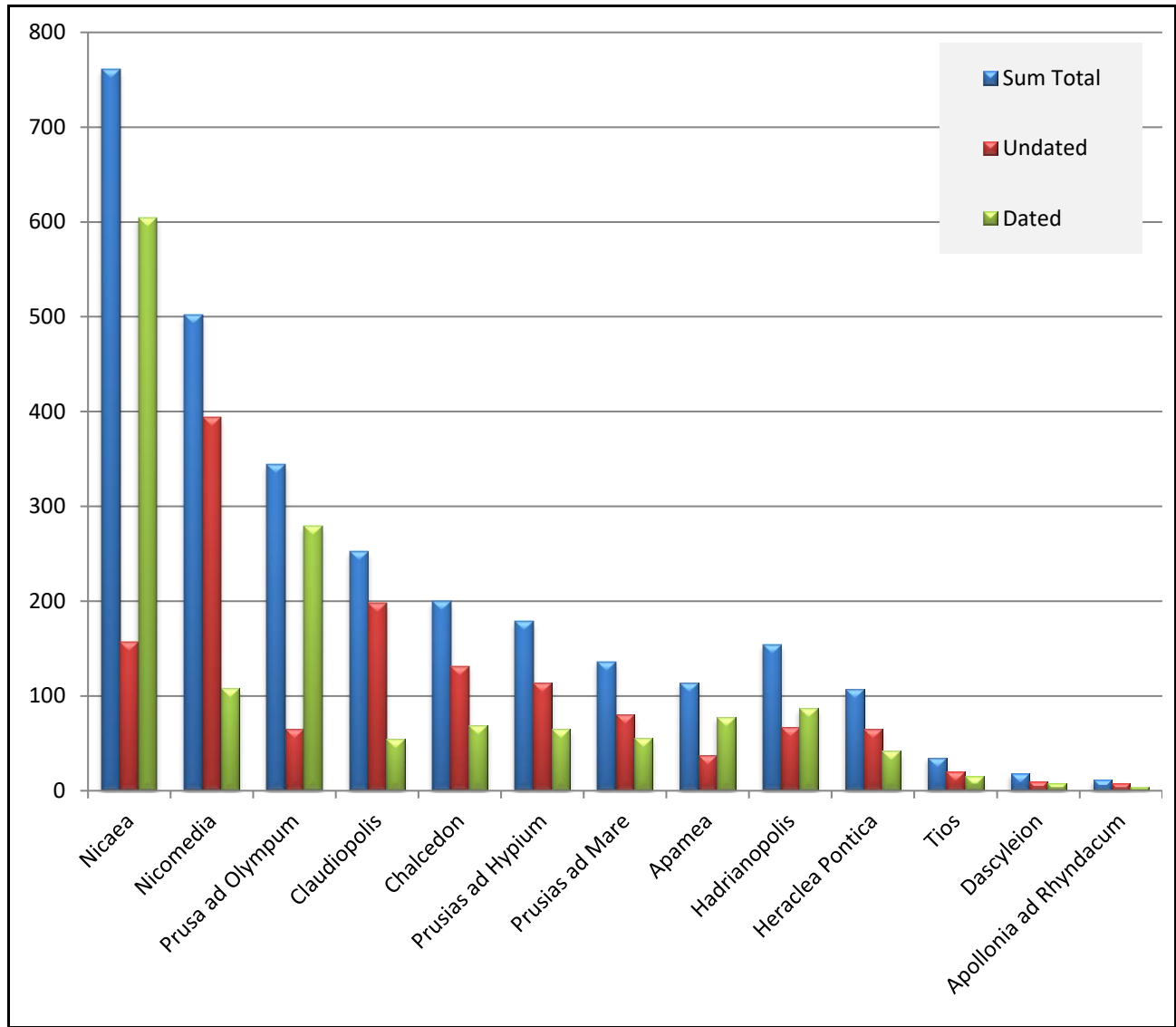


Figure 3: Quantified Inscriptions Divided Based on Availability of Chronological Data Frame

2. 4. 2. Topical Analysis of the Assemblage

I examined the text of each of the 2,878 inscriptions and determined the epigraphic evidence suitable for the analysis of the economic situation in the territory. Topical analysis of the inscriptions showed that their composition corresponds with the rest of the ancient world.³¹⁷ The most numerous monuments are the inscriptions commissioned on behalf of individuals (funerary inscriptions and dedications), followed by inscriptions issued by an official authority, such as a city, a village, or a ruler. The funerary inscriptions represent more than a half up to two thirds of all the

³¹⁷ Corroborated by Bekker-Nielsen 2008, 40.

preserved inscriptions. The texts of funerary inscriptions inform about the composition of the epigraphically active population,³¹⁸ their names point to their ethnic origin, and various details point to their occupation.³¹⁹

The inscriptions issued by the official political authority are far less numerous, but they often provide a particular information about the economy and social organisation.³²⁰ For identification of proxies pertaining to economy³²¹ I used the approach of A. Bowman and A. Wilson.³²² Pursuant to the proxies I specified five diverse groups in the assemblage from Bithynia, encompassing altogether 158 inscriptions. They include capital investments, demonstrations of trade, distribution of land / food and an appearance of diverse professions. Another group encompasses inscriptions mentioning names of *chorai*, which enrich the dataset of settlements in the area. Out of 158 in total, 125 inscriptions can be dated. All the inscriptions can be dated down to the centuries or more precisely, especially when analysing milestones, often down to a specific year. Table 8 shows the main topics encompassed in the collection, their quantification and available chronology. The specific dates are included in the Addendum 2.

Economic Proxy	Number of Inscriptions	Dated
capital investment	99	77
demonstrations of trade	18	10
food / land distribution	4	4
represented professions	14	2
settlements	32	1
TOTAL SUM	158	125

Table 8: Quantification of Inscriptions Connected with Economic Activities

The major part of the economic proxies listed as capital investments consists of milestones.³²³ Their value lies in a confirmation of the centralized power taking control over the long term move of inhabitants, army and goods. In other words, they point to building, repairs and

³¹⁸ Woolf 1997a, 344.

³¹⁹ For the main types of inscriptions, see Lloris 2015a, 89–110.

³²⁰ Lloris 2015a, 90–103.

³²¹ For a detailed description of the economic proxies, see Chapter 4.

³²² Bowman – Wilson 2009, 3–84.

³²³ French 2013.

upkeep of roads.³²⁴ As they create the largest and very specific group, the pie chart Figure 4 demonstrates milestones as a separate group, pointing out to their count not only within the public investments but in comparison with the remaining economic proxies.

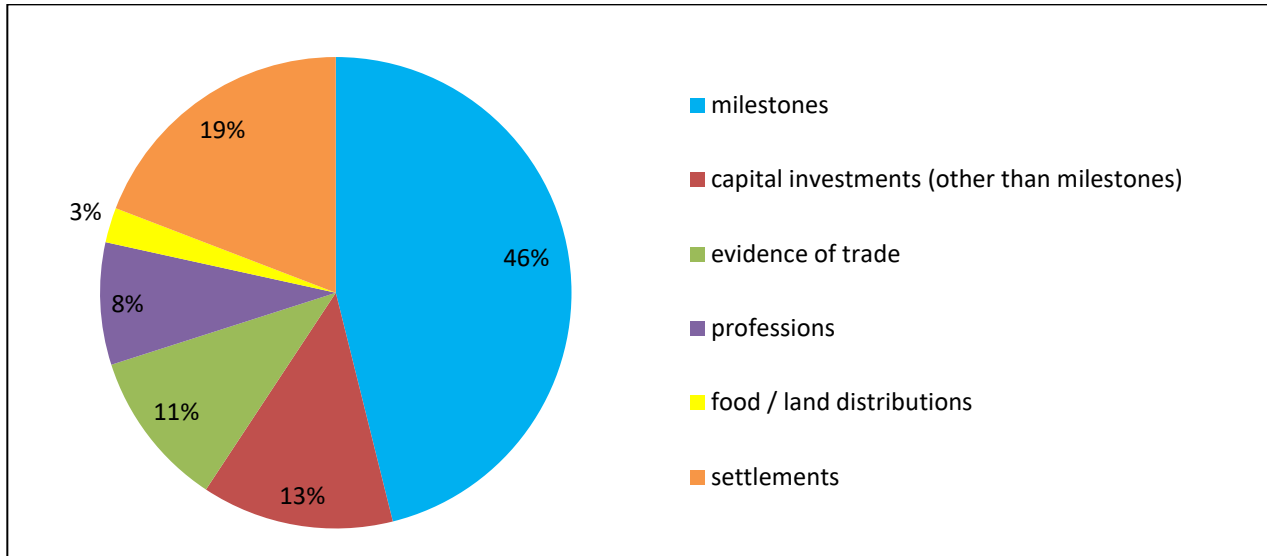


Figure 4: Proportional Representation of Inscriptions Encompassing Economic Proxies

As seen from the pie chart Figure 4, repairs of roads are the best documented investment in public buildings in Bithynia. They feature 80 per cent of the capital investment and almost 50 per cent of the entire preserved evidence. The milestones constitute the basis of one of the fundamental analyses of this study focused on the development of the road system and discussed in Chapter 7. The economic proxies *en masse* are examined in detail in Chapter 5 and settlement patterns are further interpreted in Chapter 6, underlying the economic development in the territory.

³²⁴ Lloris 2015a, 94.

3. Physical Settings

An understanding of physical settings in the macro- and micro-region plays a decisive role when choosing strategies for analytical approaches. This chapter presents an overview of fundamental factors as delimitation of the territory as well as geographical and geological settings. The text is divided into two main parts based on the scale of the analysed data; presenting the physical settings for the macro- and micro-region separately.

Geographical features are always referenced to with their modern form first, followed by the ancient name in brackets when known. The map focused on the delimitation of the macro-region features the ancient names, the remaining maps employ the contemporary terminology because of lacking the ancient one.

3. 1. Macro-Region

The macro-region is situated in NW Asia Minor and it is defined with an aim to encompass the entire area of the ancient Bithynia.³²⁵ Although the intention to include Bithynia may seem greatly straightforward, I had to face several fundamental obstructions. The exact borderline of ancient Bithynia has never been precisely delimited and, moreover, its extension changed several times during the periods under discussion.³²⁶

The extent of the macro-region results from several sources. I compared the information available in primary sources³²⁷ with recent studies elaborating alterations in the actual borders during the Hellenistic, Roman and Early Byzantine periods (for details see above).

Considering the inconclusive delimitations, for the purpose of the present study I decided to encompass as large an area as once conceivably belonged to the ancient Bithynia. I included all the urban settlements that were part of the territory³²⁸ and defined the borders according to the

³²⁵ The definition of Bithynia as a historical territory and its changes are discussed by a number of authors, for instance, see Rennell 1831, 102–106; Long 1854, 404; Şahin 1986b, 125–152; Marek 2003, 8–11; Strobel 2011; Olshausen 2012, 182 f.

³²⁶ A summary of the changes by Jones 1998, 148–174.

³²⁷ The western and northern borders are well defined by ancient geographers and historians respectively, stable during all the discussed periods. However, the southern and eastern borders vary – compare geographic outlines by Strab.12, 3–12, 4 and Plin. Nat. hist. 5, 43.

³²⁸ These are all the 12 cities mentioned by Pliny the Elder in *Naturalis Historiae* 5, 43.

natural delimitations of the area. The macro-region falls in two modern regions, the Marmara³²⁹ in the west and the Black Sea region³³⁰ in the east.

3. 1. 1. Delimitation

The analysed area includes 42,777 sq. km and it is delimited by natural borders. The following description starts with the western border and follows the delimitations clockwise. Their graphic depiction can be seen on the map Figure 5. The names used on the map follow the ancient terminology.

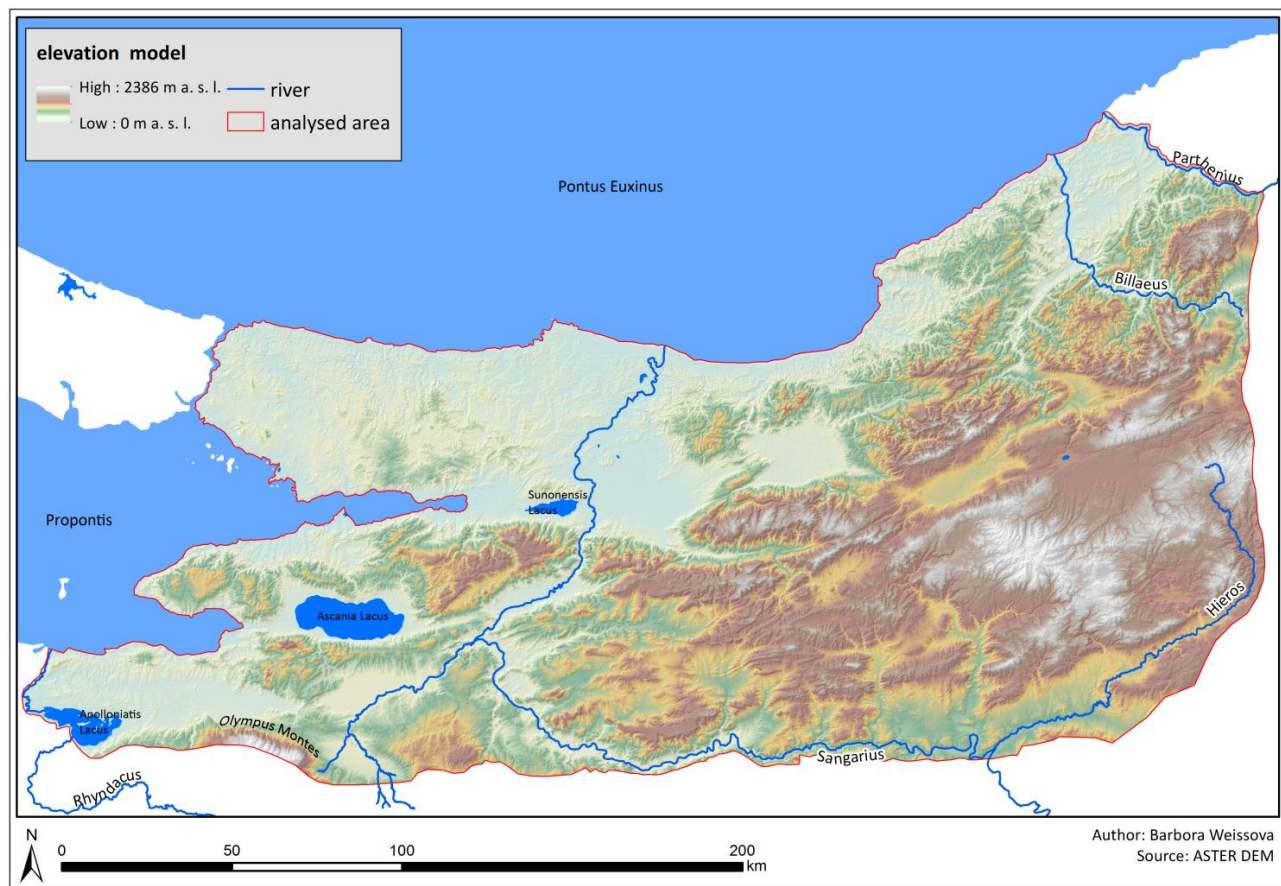


Figure 5: Geographical Delimitations of the Macro-Region Using the Ancient Terminology (Addendum 1. 6.)

³²⁹ On the description of the Marmara region, see Dewdney 1971, 151–161.

³³⁰ On the description of the Black Sea region, see Dewdney 1971, 168–174.

The western border encompasses the western bank of the Ulubat Lake (*Apolloniatis Lacus*) and further northwards it is formed by the Mustafakemalpaşa River (*Rhyndacus*), shores of the Marmara Sea (*Propontis*) and the Bosphorus (*Bosphorus*). The entire northern borderline follows the Black Sea coast (*Pontus Euxinus*), reaching in the east as far as the estuary of the River Bartın (*Parthenius*). The eastern boundary follows for the ca. 50 km the right bank of the Bartın River, from its estuary upstream towards SE. The river then turns eastwards, and the border continues to the south, crossing the plateau. As long as it follows the River Kirmir (*Hieros*), the border leads basically parallel with its left bank, with the maximum distance not exceeding 15 km south / SE from the river. The Kirmir River flows into the Sakarya River (*Sangarius*),³³¹ and thus joins the southern delimitation of the territory. The southern border is, in fact, a direct line, leading from the southern shore of the Ulubat Lake eastwards, including the northern slopes of the Uludağ Mountains (*Olympus*)³³² and continuing along the left bank of the River Sakarya, as far as the junction with the Kirmir River, as mentioned above.

3. 1. 2. Geographical Settings

The territory described as a macro-region³³³ and depicted on the map Figure 6 below is broadly characterised by a narrow strip of fertile land along the shores of the sea, with an elevation between 0 and 200 meters above the sea level. The western shore offers several places with more extensive areas of fertile land surrounding lakes.³³⁴ The lakes are situated not more than few dozen kilometres of the shore and include, listed here from the west to the east, the Ulubat Lake, the Iznik Lake and the Sapanca Lake. The fertility of these areas is sustained by numerous rivers coming from the mountainous inland, leading to the lakes and further continuing to the Marmara Sea. These fertile lands cover some 24 per cent of the entire territory. The micro-region described below in detail belongs to one of these flatlands since it is situated east of the Iznik Lake.

³³¹ Şahin 1987, 142–144 (IK Iznik, no. T65).

³³² Corsten 1991b, 3.

³³³ Philippson describes the geography of the region under the chapter named 'Westkleinasien', Philippson 1939, 142–147.

³³⁴ Foss 2000a, 785.

The fertile flatlands are divided from each other by mountainous ridges. The northernmost part creates the Kocaeli Peninsula, represented by lowlands with several hills. The highest mountain Karakayalı reaches 647 meters above the sea level and it is situated in the central southern part of the peninsula. Further to the south are the Samanlı and Katırlı Mountains. The southern border of the area is created by the mountain massive of Uludağ Mountains³³⁵ with the highest mountain Mount Olympus. Mount Olympus reaches 2,543 meters above the sea level and, as such, it is also the highest mountain of the entire macro-region.

The inland is for the most part hilly or mountainous, with a central ridge created by the Köroğlu Mountains running in the west – east direction, situated along the North Anatolian fault. The mountains are bordered in the west by the Sakarya River and they continue to the east beyond the analysed territory. The highest point, Köroğlu Tepesi, creates a plateau and reaches 2,499 meters above the sea level.

The central mountains are accompanied by mountainous ridges from the northern part, reaching as far as the Black Sea, leaving only a narrow area of lowland along the shore. These are the ridges of the Elmacık, Akçakoca and Bolu Mountains.

The drainage basins are the Marmara in the west and the Black Sea in the north. The main river emptying into the Marmara Sea is the Mustafakemalpaşa River. The major rivers leading to the Black Sea are from the west to the east: Sakarya, Filyos and Bartın. The largest and longest river is the Sakarya River which forms part of the southern border of the macro-region and crosses the territory from the south to the north.

The elevation levels in the entire region are presented in five broad groups between 0 – 200, 200 – 500, 500 – 1,000, 1,000 – 2,000 and above 2,000 meters above the sea level. The percentages in the entire macro-region are listed in the Table 9 below.

³³⁵ Long 1854, 406; Philippon 1968, 73–76.

Elevation (m a. s. l.)	Area (sq. km)	Representation of total (%)
0 – 200	10,266	24
200 – 500	8,555	20
500 – 1,000	12,405	29
1,000 – 2,000	10,695	25
above 2,000	856	2

Table 9: Overview of Elevation Ranges in the Macro-Region

The map Figure 6 shows the main geographical features described in the text and it follows the present-day terminology, since not all the features are known from the Greek and Latin sources.

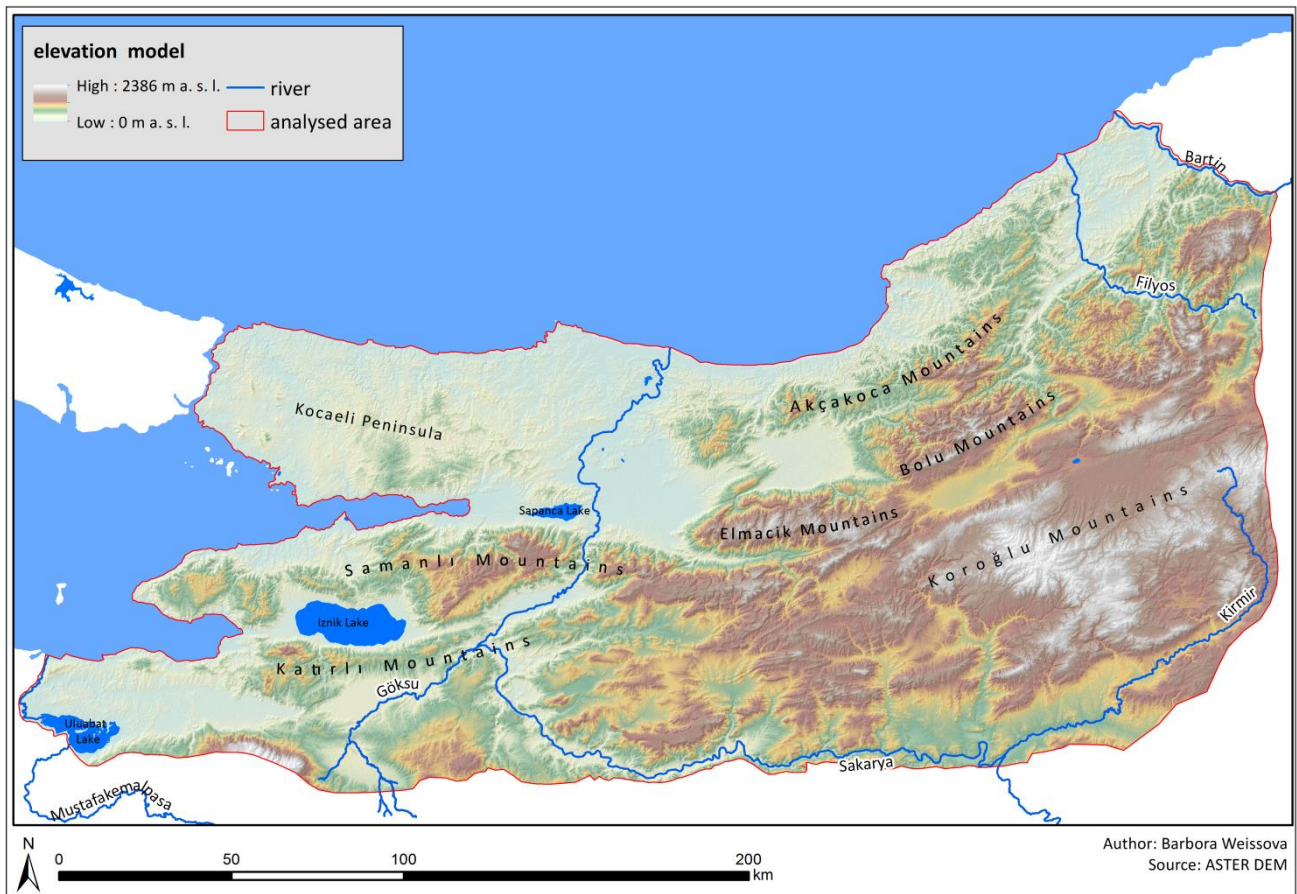


Figure 6: Geographical Settings of the Macro-Region (Addendum 1. 7.)

3. 1. 3. Geological Settings

The macro-region is, as the entire Asia Minor, part of the great Alpine belt that extends from the Atlantic Ocean to the Himalaya Mountains.³³⁶ The geological processes that lead to its creation are still active, causing a high seismicity in the territory of NW Asia Minor.³³⁷

The geology of the macro-region³³⁸ can be divided into two main zones; Istanbul and Sakarya-zone. The Istanbul zone covers approximately the northern two thirds of the territory and the last, the southernmost third, falls within the Sakarya zone. The following text describes their general characteristics.³³⁹ The map of rock units (Figure 7) is complemented with explanations in the Table 10.

The Istanbul terrane is characterised by gneiss, amphibolites, metavolcanic rocks, metaophiolite and voluminous Late Precambrian granitoids.³⁴⁰ The basement is mainly exposed in the Bolu Massif north of Bolu (Hellenistic *Bithynium* / Roman and Early Byzantine *Claudiopolis*) overlain by a continuous and well-developed sedimentary.³⁴¹

The Sakarya terrane is formed by the sedimentary sequences starting with Lower Jurassic sandstones which rest on a complex crystalline basement broadly divided into three types. A high grade Variscan metamorphic sequence of gneiss, amphibolites, marble and scarce metaperidotite, Palaeozoic granitoids and, finally, a low-grade metamorphic complex (the lower Karakaya Complex) dominated by Permo-Triassic metabasite with lesser amount of marble and phyllite. The Lower Karakaya Complex is overlain by a thick series of strongly deformed clastic and volcanic rocks with exotic blocks of Carboniferous and Permian limestone and radiolarian chert. This complex basement was overlain unevenly in the Early Jurassic by a sedimentary and volcanic succession.³⁴²

³³⁶ Hooglund 1996, 77.

³³⁷ For a further information concerning the situation of the plate tectonic in the Anatolian-Aegean region, see Mueller et al. 1997, 13–28.

³³⁸ For a detailed description, see Chaput 1936, 178–204; for a general description of the entire macro-region, see Dewdney 1971, 16–20.

³³⁹ For a detailed description of the Kocaeli Peninsula, see Philippson 1968, 65–73; for a description of the western Anatolia, see Yılmaz 1997, 31–54.

³⁴⁰ Ustaömer et al. 2005.

³⁴¹ Okay 2008, 25.

³⁴² Okay 2008, 27.

The region of NW Asia Minor is a tectonically highly active region, since the North Anatolian Fault (NAF), marking the boundary between the Anatolian and Eurasian plates, intersects the territory.³⁴³ The 1500 km long North Anatolian Fault Zone (NAFZ)³⁴⁴ bifurcates into three branches to the east of the Marmara Sea, affecting three major cities; Izmit (*Nicomedia*), Iznik (*Nicaea*) and Bursa (*Prusa ad Olympum*).³⁴⁵ Since the branches of NAF stand among others for formations of lowlands in the area, they created favourable conditions for the development of extensive settlements. It is, therefore, not surprising that most of the main centres situated in the territory are located directly on one of its branches or in their direct vicinity. This implies frequent earthquakes, directly affecting the major urban centres in the territory (viz. map Figure 7).³⁴⁶

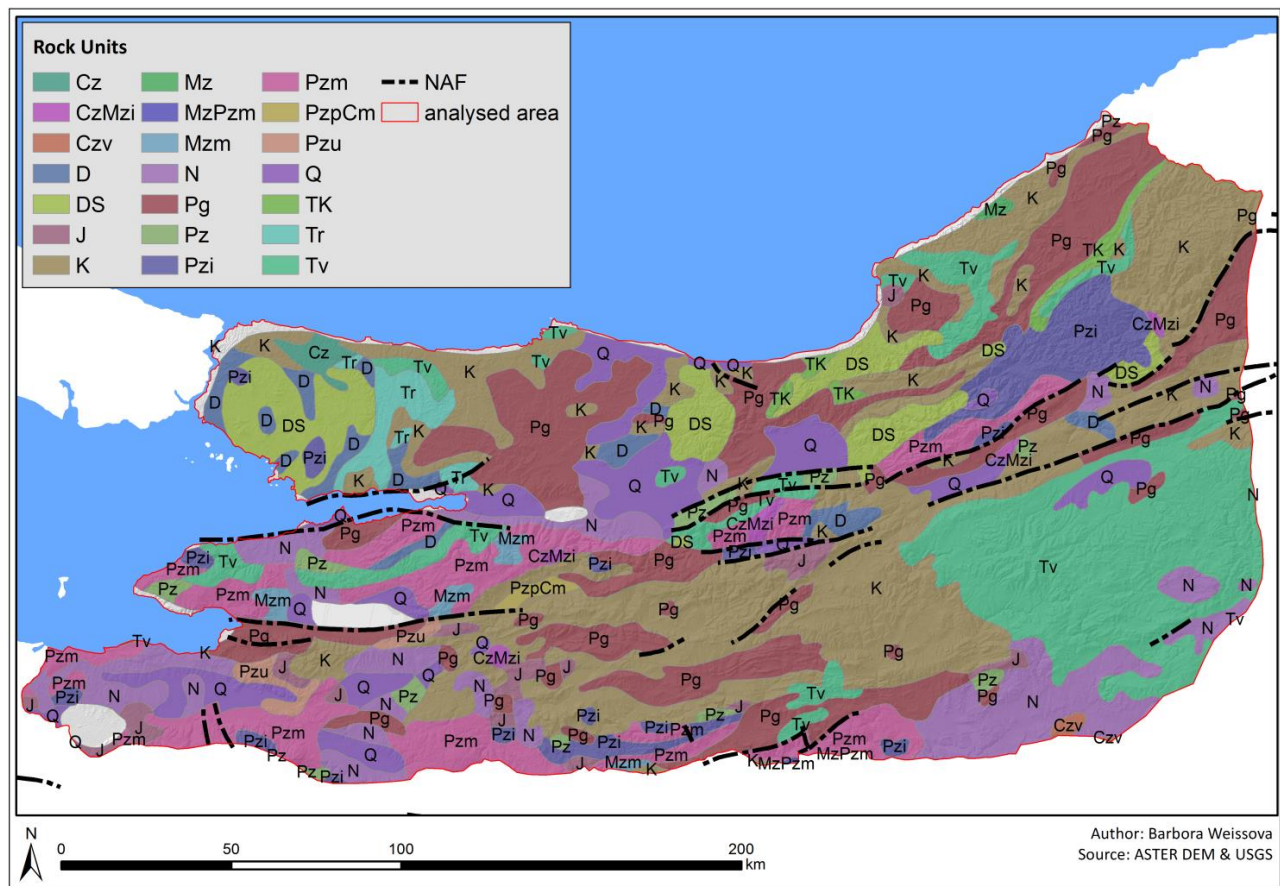


Figure 7: Rock Units and the NAF in the Macro-Region (Addendum 1. 8.)

³⁴³ Hütteroth 1982, 38–41; Hütteroth – Höhfeld 2002, 37–42; Alpar – Yaltrık 2002, 329.

³⁴⁴ For details concerning the NAFZ, see, for instance, Barka 1997, 55–88; Alpar – Yaltrık 2002, 329–350; Yaltrık 2002, 493–529; Yaltrık et al. 2012, 103–119.

³⁴⁵ Belke 2010b, 65.

³⁴⁶ The earthquakes described in historical records are listed in Chapter 2. 1. 4.

Map Description	Rock Unit	Rock Type	Area (sq. km)	Area of total (%)
Cz	undivided Cenozoic	sedimentary	214	0.54
CzMzi	Cenozoic-Mesozoic intrusive rock	igneous and metamorphic	494	1.24
Czv	Cenozoic volcanic rock	igneous and metamorphic	40	0.1
D	Devonian	sedimentary	292	0.74
DS	Devonian-Silurian	sedimentary	839	2.12
J	Jurassic	sedimentary	652	1.65
K	Cretaceous	sedimentary	5915	14.95
Mz	Mesozoic volcanic rock	igneous and metamorphic	219	0.55
Mzm	Mesozoic metamorphic rock	igneous and metamorphic	92	0.42
MzPzm	Mesozoic Precambrian	sedimentary	157	0.40
N	Neogene	sedimentary	3264	8.25
Pg	Paleogene	sedimentary	6859	17.34
Pz	Paleozoic	sedimentary	3540	8.95
Pzi	Paleozoic Intrusive rock	igneous and metamorphic	8	0.02
Pzm	Middle Paleozoic	sedimentary	1678	4.24
PzpCm	Paleozoic-Precambrian	sedimentary	385	0.97
Pzu	Upper Paleozoic	sedimentary	9662	24.43
Q	undivided Quaternary	sedimentary	2593	6.56
TK	Tertiary-Cretaceous	sedimentary	424	1.07
Tr	Triassic	sedimentary	173	0.44
Tv	Tertiary volcanic	igneous and metamorphic	2053	5.19

Table 10: Rock Units and their Representation in the Macro-Region

3. 1. 4. Climate

The climate in the macro-region³⁴⁷ can be divided into two distinctive zones, including the lands along the Black Sea coast and along the Sea of Marmara.

The Black Sea coastland³⁴⁸ is particularly strongly affected by maritime influences. Winters are rich in rain, whilst summers are dry. NW winds are the most common during the entire year. Winters are mild, with the average temperature in January equalling 6 degrees Celsius, summers feature temperatures over 20 degrees Celsius on average in July. The climate along the Black Sea coast is mild and moist, unlike elsewhere in Asia Minor. The combination of high temperatures and heavy rainfall gives conditions favourable for a dense and luxuriant vegetation cover as well as agriculture.³⁴⁹

³⁴⁷ On the climate and vegetation in Asia Minor in general, see Hütteroth – Höhfeld 2002, 73–114.

³⁴⁸ Dewdney 1971, 36–38.

³⁴⁹ Dewdney 1971, 114.

The Asiatic shores of Marmara³⁵⁰ are influenced by winter depressions which pass frequently through the Straits. The northerly winds of summer are much drier than along the Black Sea coast. Consequently, the precipitation is much lower and since the larger proportion falls during the winter months, the summer rainfall occurs in short and sharp downpours separated by long dry periods. The average temperature in January drops down to 2 degrees Celsius, while July brings 25 degrees in average for most of the area.

3. 2. Micro-Region

The micro-region is situated on the eastern shore of the largest freshwater lake in Bithynia, *videlicet* the Iznik Lake (*Ascania Lacus*).³⁵¹ It is defined with an aim to encompass the area directly surveyed by the city of Iznik (*Nicaea*), one of the major centres in Bithynia.³⁵² The area is depicted on the map Figure 8 below.

3. 2. 1. Delimitation

The micro-region covers altogether ca. 161 sq. km. The northern and NE borders of the hinterland of *Nicaea* are formed by the Samanlı Mountains. The eastern border is located in a distance of 18.5 km³⁵³ east of the city. The southern border is created by the Katırlı Mountains. The western border runs along the shores of the Iznik Lake (*Ascania Lacus*), encompassing approximately the eastern half of the lake.

Both ridges functioned during the discussed periods as natural protective zones. The western side of the town was protected by the lake and only the eastern side was opened to the plain leading further to the east.

³⁵⁰ Dewdney 1971, 38.

³⁵¹ Ülgen et al. 2012, 90.

³⁵² For geographical and topographical descriptions of the town and its hinterland based on information gained from ancient sources and inscriptions, see Şahin 1979, ix. x; Şahin 1987, 43–53.

³⁵³ The territory is estimated according to Bekker-Nielsen 1989, for details see Chapter 7. 2. 3.

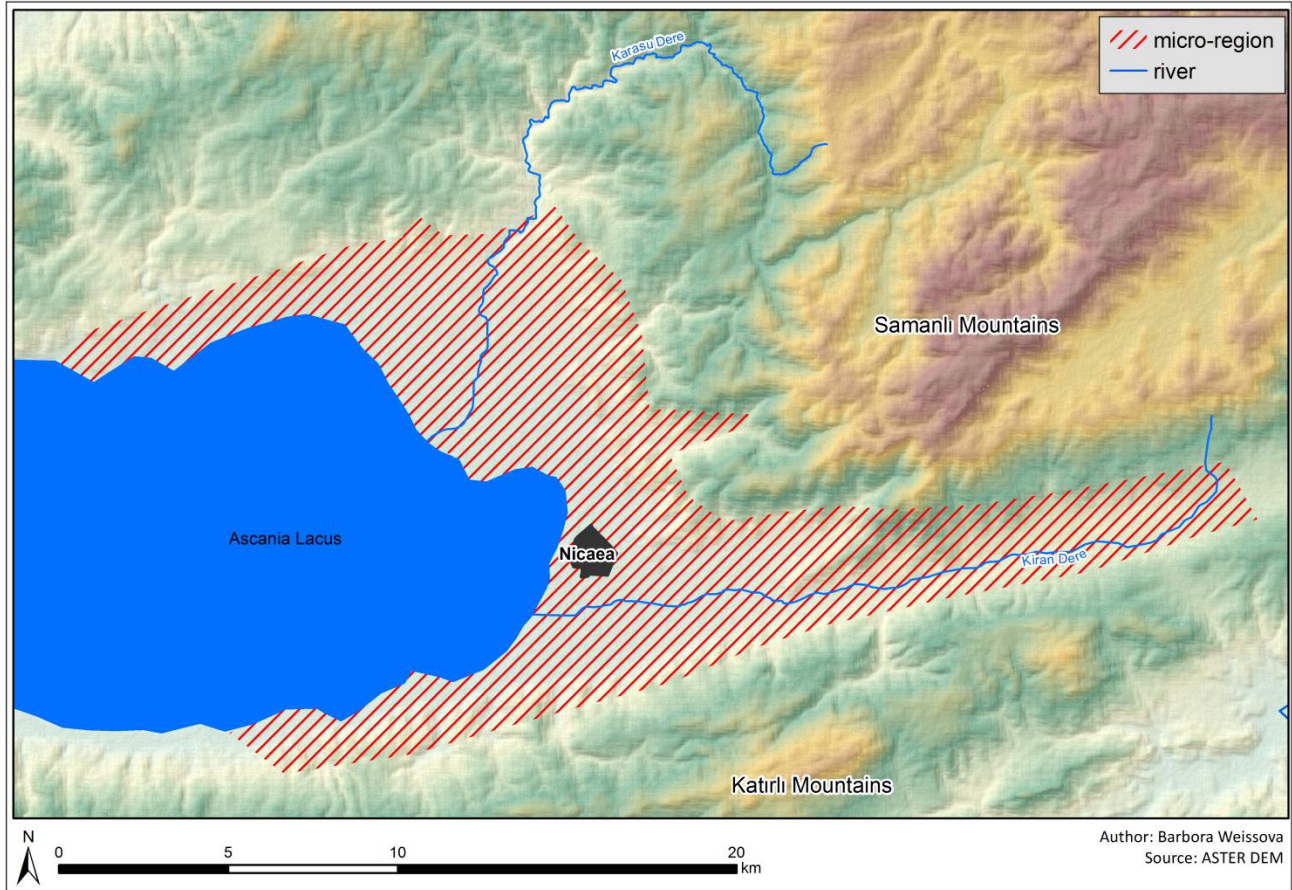


Figure 8: Geographical Delimitations of the Micro-Region (Addendum 1. 9.)

3. 2. 2. Geographical Settings

The micro-region includes fertile flatlands and foothills of the mountain ridges running north and south of the city. The northern ridge, the Samanlı Mountains, reaches 1,227 meters above the sea level and the southern ridge, the Katırlı Mountains, reaches 1,280 meters above the sea level.

Two rivers, Karasu Dere (*Pharmutios*)³⁵⁴ and Kıran Dere, dominate the river system. Both come from the Samanlı Mountains and empty to the Iznik Lake (*Ascania Lacus*), naturally supplying the area with fresh water used for the necessary irrigation system. The territory is connected with the Marmara Sea by the River Karsak (*Ascanius*)³⁵⁵ running from *Ascania Lacus* (the river empties at *Prusias ad Mare*).

³⁵⁴ Şahin 1987, 50–52. 137 (IK Iznik, nos. T30, T61).

³⁵⁵ Şahin 1987, 109–111 (IK Iznik, no. T47).

The Iznik Lake is the largest freshwater lake in the South Marmara Region as well as the fifth largest natural lake in Turkey. The length of the lake in the E - W direction is approximately 32 km while its widest part is 11.5 km. For the most part the lake is over 30 meters deep (with a maximum depth reaching 80 meters), making it one of the deepest lakes in Turkey.³⁵⁶

Concerning the climate, the micro-region belongs to the zone influenced by the Sea of Marmara. This means generally dry climate in comparison with the northern part of the territory, reaching during summer the average temperature of 25 degrees Celsius.

Elevation (m a. s. l.)	Area (sq. km)	Representation of total (%)
0–100	41.86	26
100–200	56.35	35
200–500	62.79	39

Table 11: Overview of Elevation's Ranges in the Micro-Region

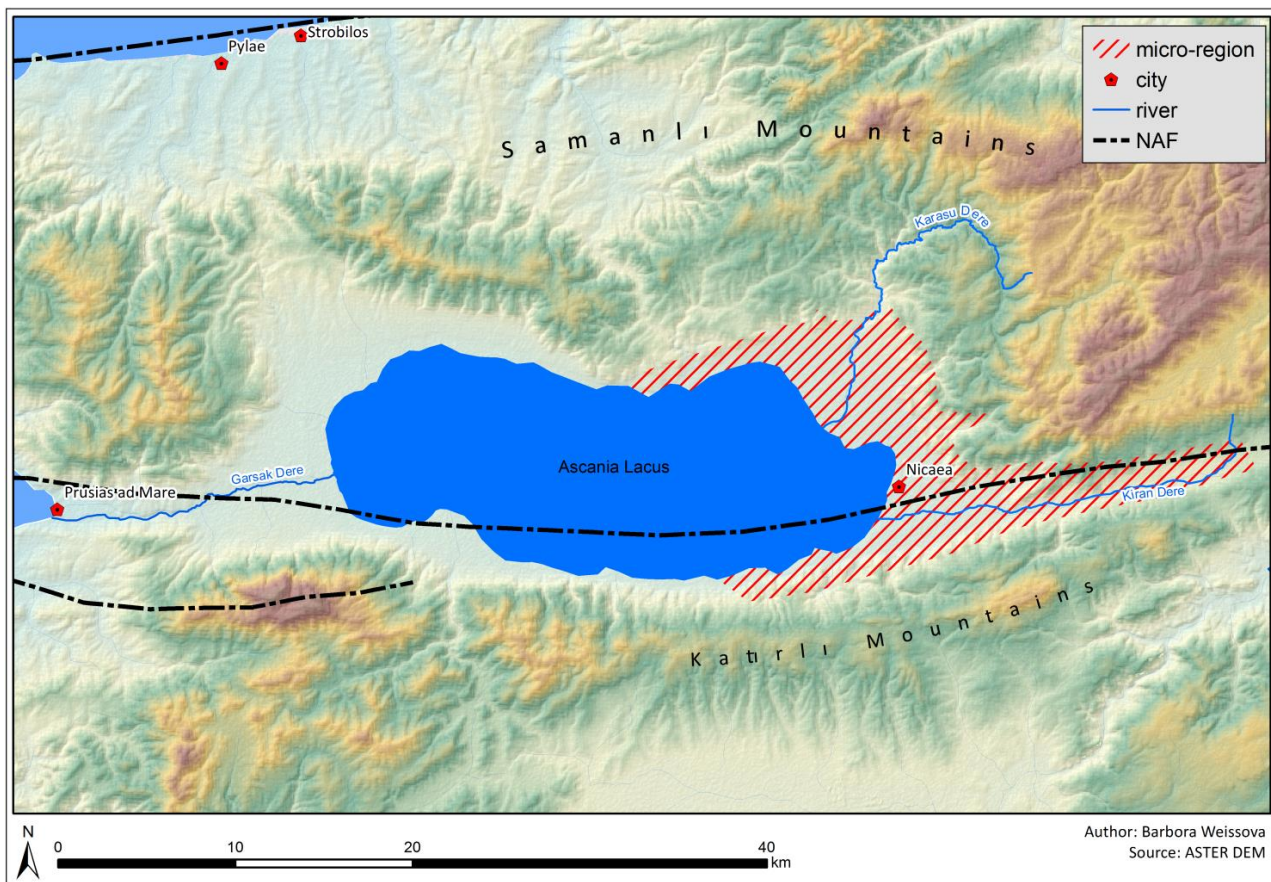


Figure 9: Geographical Settings and the NAF in the Micro-Region (Addendum 1. 10.)

³⁵⁶ Bahadır – Özdemir 2011, 4; Ülgen et al. 2012, 90.

The levels of elevations in the micro-region are presented in three broad groups between 0–100, 100–200, 200–500 meters above the sea level, as listed in the Table 11 above. The map Figure 9 depicts the entire region around the Iznik Lake (*Ascania Lacus*)³⁵⁷.

3. 2. 3. Geological Settings

The micro-region belongs to the Sakarya terrane.³⁵⁸ The massive of the Samanlı Mountains is formed of Middle Palaeozoic sedimentary rocks and Mesozoic metamorphic rocks. The mountains offer marble deposits of diverse quality. The deposits are discussed in detail in the analysis of the micro-regional economy. The Katırlı Mountains are formed from Upper Palaeozoic sedimentary rocks. The Iznik Lake is of a tectonic origin, located directly on the middle branch of the NAF.³⁵⁹

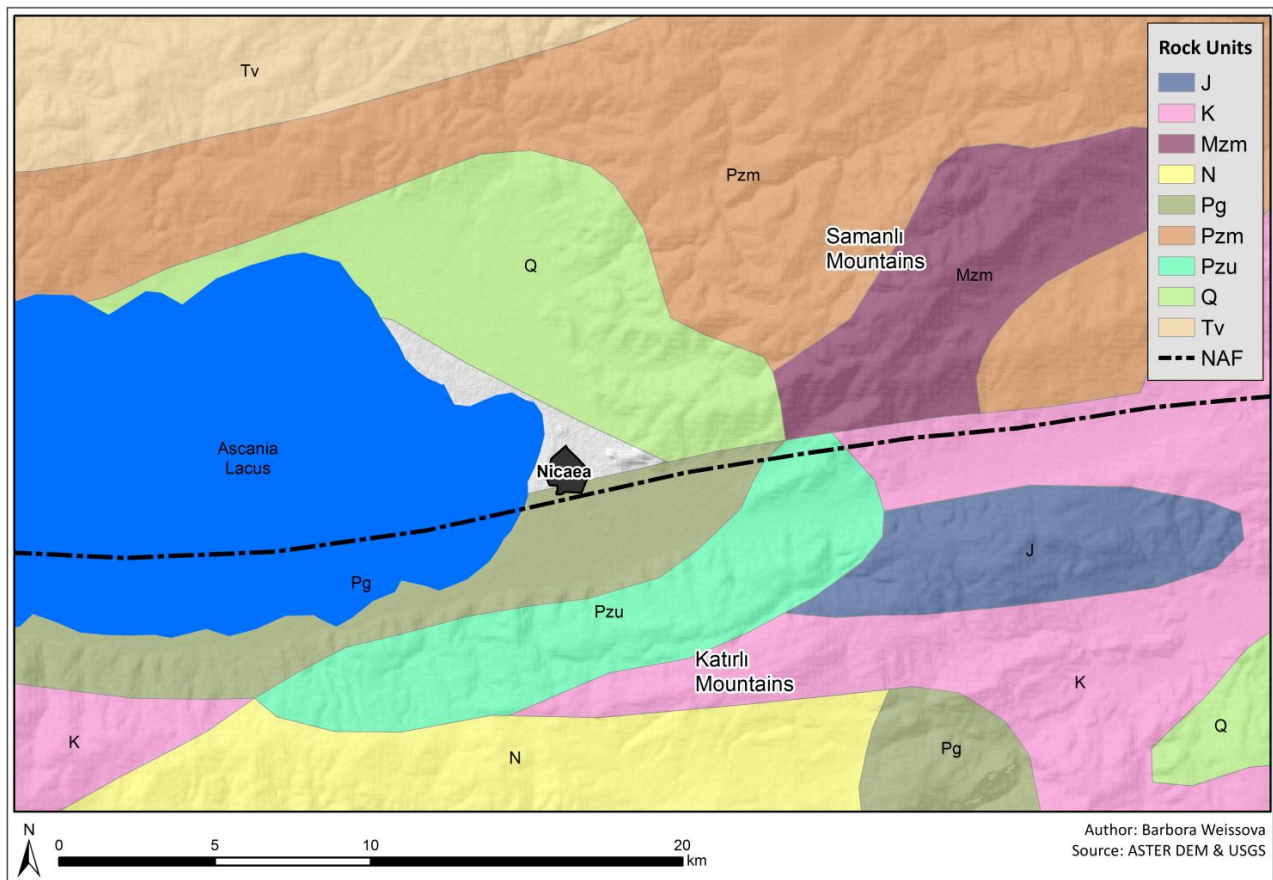


Figure 10: Rock Units and the NAF in the Micro-Region (Addendum 1. 11.)

³⁵⁷ Şahin 1987, 109 (IK Iznik, no. T46).

³⁵⁸ Okay 2008, 27.

³⁵⁹ Ülgen et al. 2012, 88.

4. Assessing Economic Trends in Bithynia

Questions concerning the history and the development of the Hellenistic,³⁶⁰ Roman³⁶¹ and Early Byzantine³⁶² economy have been asked and examined by numerous authors. The aim of the present study is not an analysis of the different approaches and models introduced throughout the research history of the ancient economy.³⁶³ I do not argue for any of the economic models in particular. Instead, I solely focus on finding possible ways of assessing the economic situation and its development in the territory of Bithynia, bearing in mind the scarcity of the available datasets.³⁶⁴ The generally known fact concerning the economy of the territory is that it was based on agriculture and forestry, and it benefited from the favourable location regarding transport and communication.³⁶⁵

The analysis performed in the entire macro-region is complemented by the micro-regional study in the hinterland of *Nicaea*. On one hand, the micro-region offers more details and larger diversity of the available datasets. On the other hand, it is too limited in its area to serve as a representative sample possible to be extrapolated to the development in the whole Bithynia. The micro-regional study rather accentuates the results revealed in the entire macro-region.

³⁶⁰ Rostovtzeff 1936; Rostovtzeff 1998 (reprint of the original publication from 1941); Archibald et al. 2001, Archibald et al. 2011; Reger 2013, 460–483.

³⁶¹ Rostovtzeff 1926, Gren 1941; Finley 1973; Jones 1974; Duncan-Jones 1974; Duncan-Jones 1994; Mitchell 1995a, 59–159; Harl 1996; De Blois – Rich 2002; Dignas 2002; Scheidel – von Reden 2002; Mitchell et al. 2005; Mattingly 2006, 283–297; Bowman – Wilson 2009; Bowman – Wilson 2011; Bowman – Wilson 2013; Scheidel et al. 2013; Scheidel 2014, Kay 2014; Erdkamp et al. 2015.

³⁶² Morrisson – Sodini 2002, 171–220; Giardina 2013, 743–768; Izdebski 2013b.

³⁶³ Due to the vivid debate concerning definitions of models and related interpretations of ancient economy, the theories and pertinent literature as well as their overviews are voluminous. Since the present work does not bring any new theory or approach to the ancient economy, I do not repeat here the history of economic studies published elsewhere. For a review of methods and theories applied for the study of ancient economies, see Smith 2004, 73–102 or Mattingly 2006, 283–286. Andreau (2002, 33–49) and Saller (2002, 251–269) examine theories and changes in the perception of the ancient economy after Finley's 'The Ancient Economy'. An overview of the development in the economic archaeology is presented by Feinman 2008, 1114–1120. 'Structure and Performance in the Roman Economy' (Erdkamp – Verboven 2015) discusses models and methods and offers case studies relating to the Roman economy and, finally, Zuiderhoek (2015, 1–17) discusses history and applicability of economic models when examining land and natural resources in the Roman world.

³⁶⁴ For a concise and apt definition of insufficiencies of available data for analysing the ancient economy in general, see Erdkamp 2015, 19 f.

³⁶⁵ See Strobel 2011 in Brill's New Pauly.

Examining the theoretical approaches to economy, W. Scheidel's³⁶⁶ description of Roman economy seems to me to be the most appropriate for the overall situation in the territory of Bithynia. W. Scheidel³⁶⁷ characterises Roman economy as a typical pre-modern economy in the sense that it was dominated by agriculture and production in households. W. Scheidel further states that in developmental terms it can be seen as a culmination and continuation of the Hellenistic economies of the Eastern Mediterranean. Near East, in turn, represented the mature phase of the political and economic growth which had commenced in the Early Iron Age. The Roman period witnessed the spread of Near Eastern, Hellenic and Hellenistic features such as the urbanization, monetization, market exchange, taxation, and chattel slavery into the western peripheries of Eurasia.

Applied to Bithynia, the gradual transformation of the Bithynian kingdom into the Roman Empire naturally involves greater economic integration than had existed earlier. How to assess this integration? How to grasp the developmental pattern? As we lack direct quantifiable indicators of the economic situation and its changes, i.e. records of how much was produced, traded and consumed, it is necessary to use different kinds of data as putative proxies of the economic development. In general terms, the understanding of economic performance and its change over time rests on the careful study of its visible manifestations. Material remains are in this case of a crucial importance.

This approach requires, in the first place, the determination of manifestations available for the studied territory,³⁶⁸ their careful collection and, finally, subsequent analysis. The suitable data should be quantifiable and equally available for the entire territory in order to assess the development over time and variations across the space. The analysis follows temporal and spatial variation in the quantity and quality of the proxies. These variations are further taken to reflect the economic change. My aim in assessing the economic development is to include as many relevant proxies as possible that allow for reconstructing the tendencies and trends.

³⁶⁶ Scheidel 2014, 1–18.

³⁶⁷ Scheidel 2014, 1.

³⁶⁸ For a vivid discussion on the definition of suitable proxies, see Scheidel 2009, 46–70 and the direct response to Scheidel's approach by Wilson 2009a, 71–82.

As a basis of the analytical approaches presented in the study, I use the 'Oxford Roman Economy Project' (henceforth the OXREP).³⁶⁹ The constituents of an economic growth were lately defined by A. Bowman and A. Wilson.³⁷⁰ The authors provided an overview of the proxies suitable for the assessment of the economic development. Moreover, A. Bowman and A. Wilson established a framework and a methodology for examining how the evidence might address the crucial questions and issues. Their list of proxies served as a starting point of my work. Based on the results of the OXREP, the drivers of growth encompass a development of a trade, capital investments, an improvement of a technology, an education of a workforce, institutional attitudes and stimuli, as well as an increased division of labour. A growth is further reflected by an urbanization,³⁷¹ a replacement of import, an increased consumption as well as standards of living.³⁷² Following the list, I brought together all the available evidence from Bithynia and investigated the possibility of using the parameters as economic proxies in the macro-region.

In the territory of Bithynia, the situation of archaeological research³⁷³ does not allow for basing the analysis on a large amount of diverse factors resulting from actual works in the field. The decrease or disappearance of certain factors may indicate a decline in economy or a simple lack of evidence for an explicit period of time. Since the archaeological evidence is neither rich nor comprehensive, I looked for proxies which are best published for the entire macro-region. When studying the available evidence, the aspect that fulfilled all the requirements of suitable economic proxy appeared to be the epigraphic evidence. Therefore, I use the quantification and the temporal analysis of this evidence in a spatial context as a basis of the analysis of the economic development. Further factors include the urbanization and the developments of settlement patterns as well as the investments in construction and upkeep of the road system.

I compile and present all the factors usable for capturing the economic development with the current knowledge about the macro-region. My approach to the assessment of the economic

³⁶⁹ URL: <http://www.romaneconomy.ox.ac.uk/>.

³⁷⁰ Bowman – Wilson 2009, 3–84.

³⁷¹ For a further information on the urbanization and the economic development, see Bowman – Wilson 2009, 50–53; Bagnall 2009 107–112; Lo Cascio 2009, 87–106; Bowman 2011, 317–358; Hanson 2011, 229–275; Keay – Earl 2011, 276–316; Marzano 2011, 196–228; Morley 2011, 143–160; Wilson 2011, 161–195; Erdkamp 2014, 241–265.

³⁷² Bowman – Wilson 2009, 12 f.

³⁷³ For an overview of the available archaeological sources, see Chapter 2. 3.

situation is presented in each analytical chapter separately, explaining the applied methodology when processing the particular type of data. All the data are analysed and presented in the framework of the spatial environment when possible.

The methods I use are wide-spread when approaching the ancient economy and at the same time much debated by the OXREP.³⁷⁴ It is necessary to point out that the variations of the utilized proxies are often ambiguous, which makes it difficult to relate them directly to the economic performance. The achieved results require careful interpretations, always considering possible variations related to each of the proxies in particular.

4. 1. Economic Proxies in the Macro-Region

The epigraphic evidence is the only consistent and quantifiable dataset available for the entire territory and for the whole analysed time span. The evidence is examined in bulk as well as divided by specific topics possible to be related to the economic situation. The topics include capital investments with a special focus on public buildings,³⁷⁵ evidence of trade, demonstrations of food / land distributions, evidence of diverse professions and hints on rural settlements. With an aim to assess the economic development of the macro-region, I follow the diverse aspects and impacts documented on the inscriptions.

Furthermore, the analysed proxies include the development of settlement patterns with a special focus on the urbanization. The main urban settlements enable to divide the whole territory on pertinent areas belonging to them.³⁷⁶ The distribution and density of the urban settlements is examined and interpreted in the context of the feasible economic situation in their territories and used for correlating numbers of inscriptions when analysed in bulk.³⁷⁷

Another proxy is the development of the road system using milestones as the direct evidence of the investments. The milestones encompass information concerning the creation, upkeep and maintenance of the Roman road system, documenting in this way the intensity of

³⁷⁴ Bowman – Wilson 2009; Bowman – Wilson 2011; Bowman – Wilson 2013.

³⁷⁵ Jongman 2013, 609 describes the construction of public buildings as the single most important non-agrarian economic activity.

³⁷⁶ The division of the area is based on the Voronoi diagram / Thiessen polygons. For details, see Chapter 6. 2. 3.

³⁷⁷ The development of the urbanization and settlement patterns is discussed in detail in Chapter 6. 4. 1.

capital investments in particular communications. Since the milestones are for the most part dated with a precision on several years, they enable detailed chronological division of the investments. The disadvantage of the whole dataset is that it only spreads in the time span from the 1st till the 4th century AD. The milestones I further combine with literary sources. This approach enables as complete a reconstruction of the road network and accompanying investments as possible with the current knowledge.³⁷⁸

4. 2. Economic Proxies in the Micro-Region

As the micro-region of *Nicaea* and its hinterland offers more detailed and diverse records,³⁷⁹ the analyses are performed in a greater depth and carried out with various aspects of the archaeological evidence. The basic analysis of the epigraphic evidence is supplemented with a detailed study of the development of the road system and rural settlements. These datasets were considerably enriched with the survey conducted in the terrain in 2015 (ISP15). Some of the data were hitherto unpublished. They create a supplementary sample for the results from the macro-region and allow for comparative analyses with estimates concerning densities of settlement published by J. W. Hanson³⁸⁰ for the entire Asia Minor.

Moreover, several researchers are currently processing datasets relevant for the economic studies, and they were kind enough to share the results with me. The work of A. A. Altın³⁸¹ provides information for a discussion of marble imports, notably *Docimium* marble, which was used for some of the sarcophagi found in the territory of *Nicaea*. The study of A. Dalyancı-Berns³⁸² focused on the fortification of *Nicaea* quantifies bricks used for its construction and points out the need of a considerably high number of workers as its erection was time limited.³⁸³

³⁷⁸ For a complete reconstruction of the investments, see Chapter 7.

³⁷⁹ The dataset includes a considerably large amount of new data collected during the ISP15.

³⁸⁰ Hanson 2011, 229–275.

³⁸¹ The information is based on personal consultations with Altın. Detailed results will be published in his doctoral thesis 'Die Nekropolen und Grabdenkmäler von Nikaia', Ruhr Universität Bochum.

³⁸² Dalyancı-Berns 2017, 417–426.

³⁸³ The aspects of the economic development are discussed in detail in Chapter 8.

5. Epigraphic Evidence and Economic Development

The present chapter introduces and examines the abundant epigraphic evidence published for the territory of the macro-region in the light of the economic development. The fluctuations in the numbers of the epigraphic evidence are interpreted as reflections of the economic situation. The chronology of the assemblage covers the entire time span of the study, from the 4th century BC until the 6th century AD. In order to avoid a possible distortion of the presented data, I included the epigraphic evidence until the 8th century AD. In this way, I aim at showing the possible continuity / discontinuity of the development. Nevertheless, I do not further elaborate the last two centuries.

First, I present the theoretical approaches to the topic. Studies on epigraphic evidence do not always unambiguously agree on its unequivocal connection with the economic development. I examine the main theories and methods, resulting in the approach used here.

Second, I discuss the methodological approaches used when performing the analyses. I present the main sources of the epigraphic records, analyse their completeness and refer to their weak points. I present several ways how to avoid discrepancies in the analyses, for the most part dealing with the ambiguous division of the territories they belong to and possible duplications in the listed records.

Third, I focus directly on the results of the quantification of the epigraphic evidence from the entire macro-region, examined in the spatial environment. The study presents the epigraphic evidence published from all over the territory of Bithynia *en masse*, further divided according to the find spots, chronology and languages.

The fourth step focuses solely on the dated evidence. The quantification of the assemblage is followed by tracing the developmental tendencies in the spatial distribution, considering the chronology as a decisive factor. The evidence is analysed within each city including its hinterland and it is interpreted as the direct indicator of the economic development.

The fifth subchapter analyses selectively the epigraphic evidence which can be directly connected with economic activities. In other words, it focuses on the topical analysis of the texts. The topics include capital investments, demonstrations of trading activities, demonstrations of food and / or land distributions, diverse professions, and evidences concerning the existence of rural settlements.

The results of the quantified analysis represent a starting point to which I refer when presenting results of the other analyses. The spatial and temporal analyses as well as the topical analyses include conclusions interpreting the development in the territory *en masse* and comparing the results with the topical analyses.

5. 1. How Does the Epigraphic Evidence Reflect the Economic Situation?

An appearance, utilisation and distribution of inscribed monuments are natural indicators of a developed society.³⁸⁴ Judging from relative numbers of epigraphic evidence, one can distinguish the epigraphically active population from the population not engaged in this habit.³⁸⁵

When assessing the ancient economic performance, it is often impossible to isolate economic elements from moral, social and political aspects.³⁸⁶ The following text introduces several main theories used when interpreting fluctuations in numbers of epigraphic evidences, pointing to the cultural and economic aspects of the phenomenon.

The utilization of a literacy resulting in the epigraphic evidence is undoubtedly strongly connected with cultural habits, namely with the epigraphic habit. Roman epigraphic behaviour has been interpreted by a number of authors³⁸⁷ as a sort of crude barometer of ‘Romanization’. In other words, the adoption of Latin language is regarded as an individual or collective claim to identity, power and / or status. A detailed insight into the Roman epigraphy is offered by E. A. Meyer³⁸⁸ in her study on the epigraphic habit. E. A. Meyer connects the striking growth of funerary monuments during the 2nd century AD with a peaking competition in the expression of the status between the inhabitants.

Based on B. H. McLean’s estimation,³⁸⁹ the occurrence of epigraphic evidence might be considered as a measure of an economic prosperity. The groups of people producing inscriptions most likely belonged to the middle to upper class, as commissioning an inscription was

³⁸⁴ Lloris 2015b, 131–148.

³⁸⁵ For sample results of the study of the distribution of inscriptions in Gaul, see Woolf 1997a, 344.

³⁸⁶ Scheidel 2012, 27.

³⁸⁷ On the epigraphic habit, see MacMullen 1982, 239; Meyer 2013, 453–505; and, finally, Bodel 2015, 755 who offers a complementary list of authors on the topic.

³⁸⁸ Meyer 1990, 89.

³⁸⁹ McLean 2002, 13 f.

considerably costly and exceeded day-to-day expenses. R. MacMullen,³⁹⁰ when examining the numbers of papyri in Roman Egypt, accordingly explains their fluctuation by the development of the economic situation. He identifies a direct relationship between the numbers of private inscriptions and economic fortunes of the province. In another study, briefly discussing frequency of inscriptions in Lydia, R. MacMullen³⁹¹ points out to one important phenomenon. The rise and the fall in the quantity of inscriptions fit to the developmental curve of the Roman Empire. In this way, the study demonstrates how the quantified analysis of the inscriptions directly mirrors the economic situation.

J. Bodel³⁹² suggests comparing the number of specific types of inscriptions, in bulk, to demonstrate the broad chronological or demographic developments. J. Bodel further points out the necessity of attempting to charge the changes only broadly, over centuries rather than over decades, to avoid some of the risks that any analysis of inscriptions in bulk is bound to entail.

Taking both into account, the epigraphic habit as a cultural phenomenon as well as its economic aspect, I examine the evidence from the macro-region. I consider the absolute numbers of the epigraphic evidence as indicators of the economic situation. Considering the costly production, I agree with B. H. McLean (see above) that it was only possible during the favourable economic conditions. Yet, there is an important fact to be pointed out. The appearance and numbers of inscriptions are not a consequence of an economic prosperity but of an educated and developed society. Nevertheless, since their production is an expensive process, the economic aspect is to be considered. As such, their quantification allows for outlining the economic situation in the territory.

In the following study, I consider the fluctuations within the quantified analysis of the epigraphic evidence as a direct reflection of the economic situation: increasing numbers as a growth, constant numbers as a stable situation and decreasing numbers as a decline. In other words, I take the epigraphic evidence as a reflexion of the number of people in the middle to upper class, and thus as one of the representatives of an overall economic situation.

³⁹⁰ MacMullen 1982, 237.

³⁹¹ MacMullen 1986, 237 f.

³⁹² Bodel 2001, 38 f.

The analysis of the topics directly connected with the economic performance for demonstrating the economic change and stability has been acknowledged by several studies.³⁹³ As a last contribution to the discussion on the interconnection between epigraphic evidence and economic situation I use the words of A. Wilson, pointing out the direct dependence of honorific inscriptions and the economy:

*'Differences in the pattern between different types of inscriptions suggest that there is something more at stake than a vague notion of 'epigraphic habit' that is somehow unconnected with the economy; monumental writing is expensive, and often reflects even greater expenditure on other things, and responds to wider economic trends.'*³⁹⁴

5. 2. Methodology

The analysed assemblage consists of 2,878 inscriptions found in the territory of the macro-region. The inscriptions were for the most part published in individual corpuses, focused on one centre and its hinterland. Since the corpuses do not encompass all the published evidence, mainly because the odd evidence post-dates the publication date of the particular corpus, I accomplished the assemblage with inscriptions published elsewhere. The list of all the inscriptions used in the following analyses is included in The Catalogue of Greek and Latin Inscriptions (Addendum 2).

The assemblage of inscriptions is further subdivided according to the geographic location and assignment to particular centres (Table 13 below). The assignment to centres means that the spatial analysis of the inscriptions is not based on the distribution of their actual find-spots, but on the proximity of the find-spots to urban settlements. In other words, the inscriptions are organized in groups based on their clustering around the nearest urban centre. The urban centres discussed in the text are depicted on the following map Figure 11.

³⁹³ For a similar methodology using epigraphic evidence mentioning building activities for demonstrating the economic stability and change, see Duncan-Jones 1990, 59–76; Wilson 2011, 163–167.

³⁹⁴ Wilson 2011, 167.

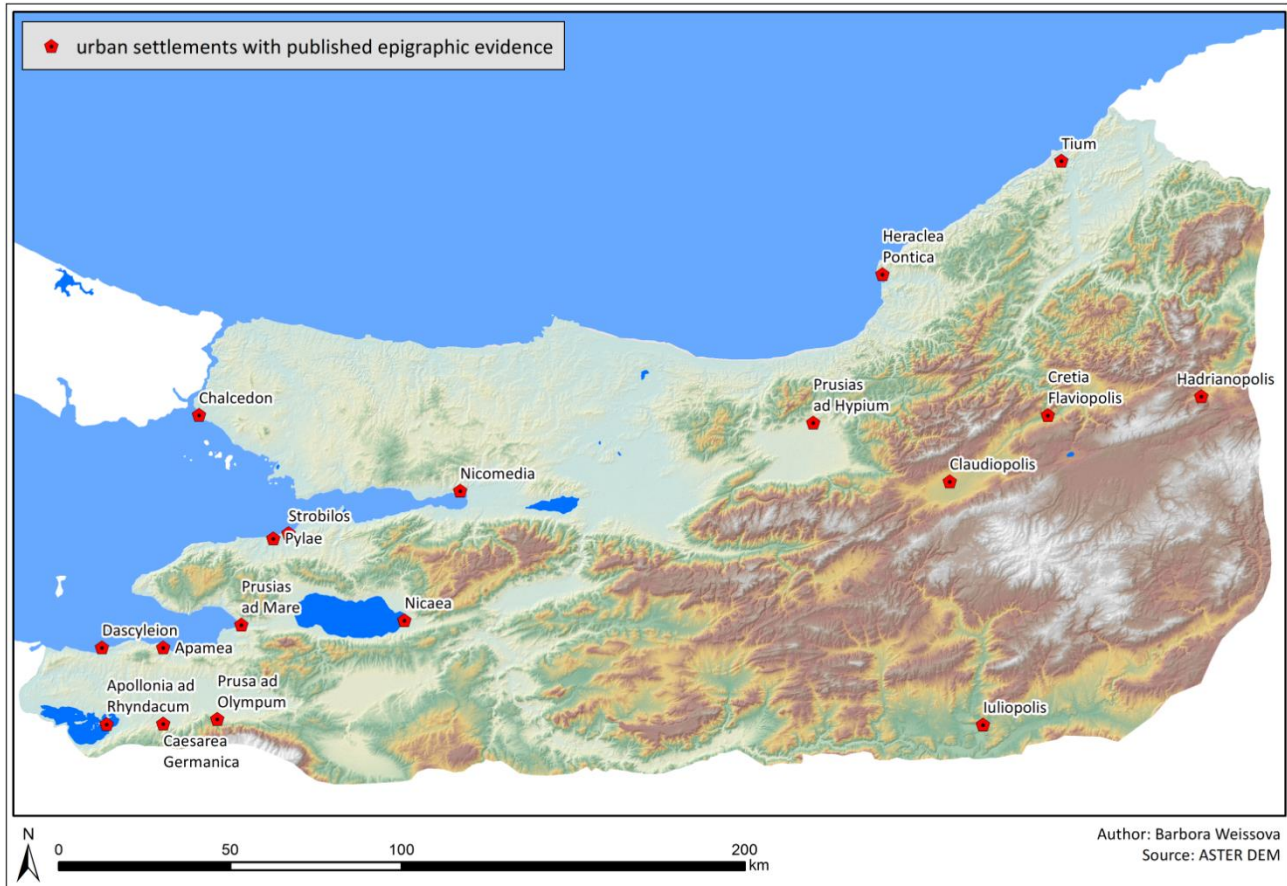


Figure 11: Spatial Distribution of Urban Settlements with Published Epigraphic Evidence (Addendum 1. 12.)

The assignment to centres introduced a specific problem during the study. Since the corpora of inscriptions were naturally published subsequently, in different years and by diverse authors, I expected the view of researchers on the indicative allocation of particular territories (*chora*) to be a subject to change. Therefore, one of the necessary steps undertaken during the data processing was to follow the descriptions of individual territories,³⁹⁵ draw a comparison between them and, eventually, decide for one of the allocations. Depending on the division, it was

³⁹⁵ Descriptions of the territories of cities are listed in alphabetical order: *Apamea* by Corsten 1987, 1 f.; *Caesarea Germanica* by Corsten 1990b, 19–28; *Chalcedon* by Merkelbach et al. 1980, maps of the city on page 142 and of the hinterland on page 143; *Claudiopolis* by Becker-Bertau 1986, vii. 191 (Karte 1) and 193 (Karte 2); *Cretia Flaviopolis* with shifted location by French 1984, 49–58; *Dascyleion* by Corsten 1988, 54–57; *Heraclea Pontica* by Ameling in Jonnes 1994, 1 f.; milestones with *caput viae Iuliopolis* by French 2013, nos. 91–94; *Hadrianopolis* by Marek 2003, 122–125, with a more detailed specification by Lafli – Christof 2012, 1–35; the territory of *Nicaea* by Şahin 1981, with spatial distribution of find-spots depicted on the map 1 in the attachment; *Nicomedia* by Dörner 1941, 12–14; the territory of *Prusias ad Hypium* by Ameling 1985, 295; *Prusias ad Mare* by Corsten 1985, 9 f.; *Prusa ad Olympum* by Corsten 1991b, 3; *Pylae* by Corsten 1987, 101–107, encompassing *Strobilos* on pages 115–117; *Tium* by Robert 1970, 270–282.

necessary to examine the inscriptions in the overlapping areas for possible repetitions. Concordances of the inscriptions published in the corpora were of a great help, shedding light on possible reduplications of the published evidence.

Despite diverse authors and publication data, the detailed study of the evidence brought strikingly consistent results. The only discrepancy I identified was thoroughly described in the pertinent corpora. It concerns the border between *Prusias ad Mare* and *Nicaea*. Based on the convincing explanation published by T. Corsten,³⁹⁶ I decided to follow the border shifted to the east, towards *Nicaea*, and thus remove several inscriptions from the assemblage published by S. Şahin³⁹⁷ for the territory of *Nicaea*, since the same ones are also included by T. Corsten³⁹⁸ in the territory of *Prusias ad Mare*.

Another decisive factor, the chronology of each dated inscription, has been taken from published evidence. Since it is out of the scope of the present study, I did not re-evaluate the chronology of the inscriptions, but relied on the published data. To perform a temporal analysis, I had to solve an initial and crucial problem caused by the character of the dated evidence. This is the fact that the chronological data frame of each record often spreads over several centuries. I decided to approach the task by ascribing the particular evidence to each possible century separately. As a random example, I present an inscription from *Claudiopolis*.³⁹⁹ The inscription is dated roughly to the entire time span of the Roman Imperial period. Such a broad time span means that all the centuries between the 1st and the 4th century AD need to be considered as possible dates for the inscription. In the digitised record and in the following temporal analyses, I deal with this problem as demonstrated in the Table 12 below.

Inscription no.	Time Span	4BC	3BC	2BC	1BC	1AD	2AD	3AD	4AD	5AD	6AD
PH279837	Roman Imperial	0	0	0	0	1	1	1	1	0	0

Table 12: Way of Assessing all the Possible Centuries Included in One Chronological Time Span

³⁹⁶ Corsten 1985, 9 f. An assignment of some of the inscriptions to the territory of *Prusias ad Mare* was suggested by Şahin himself (1981, 4).

³⁹⁷ IK Iznik nos. 576. 701. 702. 725–727. 751–769. 801 and 802 are excluded from the assemblage of inscriptions ascribed to *Nicaea* and its territory.

³⁹⁸ Inscriptions excluded from the territory of *Nicaea* are published in the territory of *Prusias ad Mare* under nos. 120. 27. 3. 26. 7. 115. 98. 102. 91. 103. 97. 105. 104. 94. 93. 101. 113. 90. 99. 106. 96. 100. 107. 95. 92. 118. 117 (following the sequence of IK Iznik).

³⁹⁹ SEG 36: 1151, 2.

In this way, all possible centuries are included in the temporal analyses. However, it is important to keep in mind that the resulting graphs include more inscriptions than exist in reality. As the PH 279837 in Table 12 demonstrated, the analysis includes four different entries but represents one single inscription.

After solving the initial problems caused by obscure allocations and broad chronological time spans, I performed temporal analysis of each of the centres separately as well as of all the dated evidence together.

An independent step was the topical analysis of the epigraphic evidence. I examined the texts of all the inscriptions, looking for key words suggesting a connection with activities of possible economic performance. The identified topics include capital investments, trade, food / land distributions, evidence of diverse professions as well as names of '*chorai*' enriching the number of rural settlements. I further performed spatial and temporal analyses of each of the groups separately as well as all together.

5. 3. Quantification in Spatial Environment

The assemblage of 2,878 inscriptions I divided into 19 groups based on their spatial distribution: 18 groups include inscriptions from respective urban settlements and their hinterlands, while the last one encompasses all the remaining epigraphic evidence coming from Bithynia but missing a more precise location. The following overview in Table 13 shows their numbers in individual centres and further sub-divides the assemblages into two groups according to the availability of chronological data frame and used language(s). The groups are listed from the largest assemblage to the smallest; in case of identical numbers they follow the alphabetical order.

Location	Sum Total	Chronology		Language		
City and its Territory	Number	Undated	Dated	Greek	Latin	Gr/Lat
<i>Nicaea</i>	761	157	604	705	44	12
<i>Nicomedia</i>	502	394	108	465	28	9
<i>Prusa ad Olypium</i>	344	65	279	333	11	0
<i>Claudiopolis</i>	252	198	54	241	10	1
<i>Chalcedon</i>	200	131	69	194	6	0
<i>Prusias ad Hypium</i>	179	114	65	175	4	0
<i>Hadrianopolis</i>	154	67	87	152	2	0

Location	Sum Total	Chronology		Language		
City and its Territory	Number	Undated	Dated	Greek	Latin	Gr/Lat
<i>Prusias ad Mare</i>	136	80	56	134	2	0
<i>Apamea</i>	114	37	77	102	10	2
<i>Heraclea Pontica</i>	107	65	42	102	4	1
<i>Tium</i>	35	20	15	33	1	1
<i>Dascyleion</i>	18	10	8	18	0	0
<i>Apollonia ad Rhyndacum</i>	12	8	4	12	0	0
<i>Cretia Flaviopolis</i>	12	5	7	10	2	0
<i>Strobilos</i>	10	0	10	10	0	0
<i>Pylae</i>	9	7	2	9	0	0
<i>Caesarea Germanica</i>	5	1	4	5	0	0
<i>Iuliopolis</i>	7	0	7	3	1	3
Unknown	21	3	18	21	0	0
Bithynia	2878	1362	1516	2724	125	29

Table 13: Overview of Greek and Latin Inscriptions from Bithynia

As shown by the overview, more than 50 per cent (52.6%) of the published inscriptions are dated. However, the chronological time span is predominantly considerably broad including an entire historical period and thus several centuries. Only about 28 per cent of the entire assemblage can be narrowed to one century. Considering the language, the prevailing language is Greek, comprising more than 94 per cent of the assemblage. The remaining six per cent is divided between Latin and a combination of Latin and Greek texts.

The following map Figure 12 shows the languages used in the centres as depicted on pie charts. The map brings a suitable overview but comes with one caveat: proportional representations of languages might be misleading without taking the real numbers into account. For instance, *Iuliopolis* provides only seven inscriptions and, thus, the inscriptions combining Greek and Latin, sharply visible on the map, are in reality only three. Looking at the pie chart concerning *Nicaea* in a larger detail, the part displaying Latin inscriptions is considerably smaller than the one discussed in *Iuliopolis*; nevertheless, this assemblage encompasses not less than 44 Latin inscriptions.

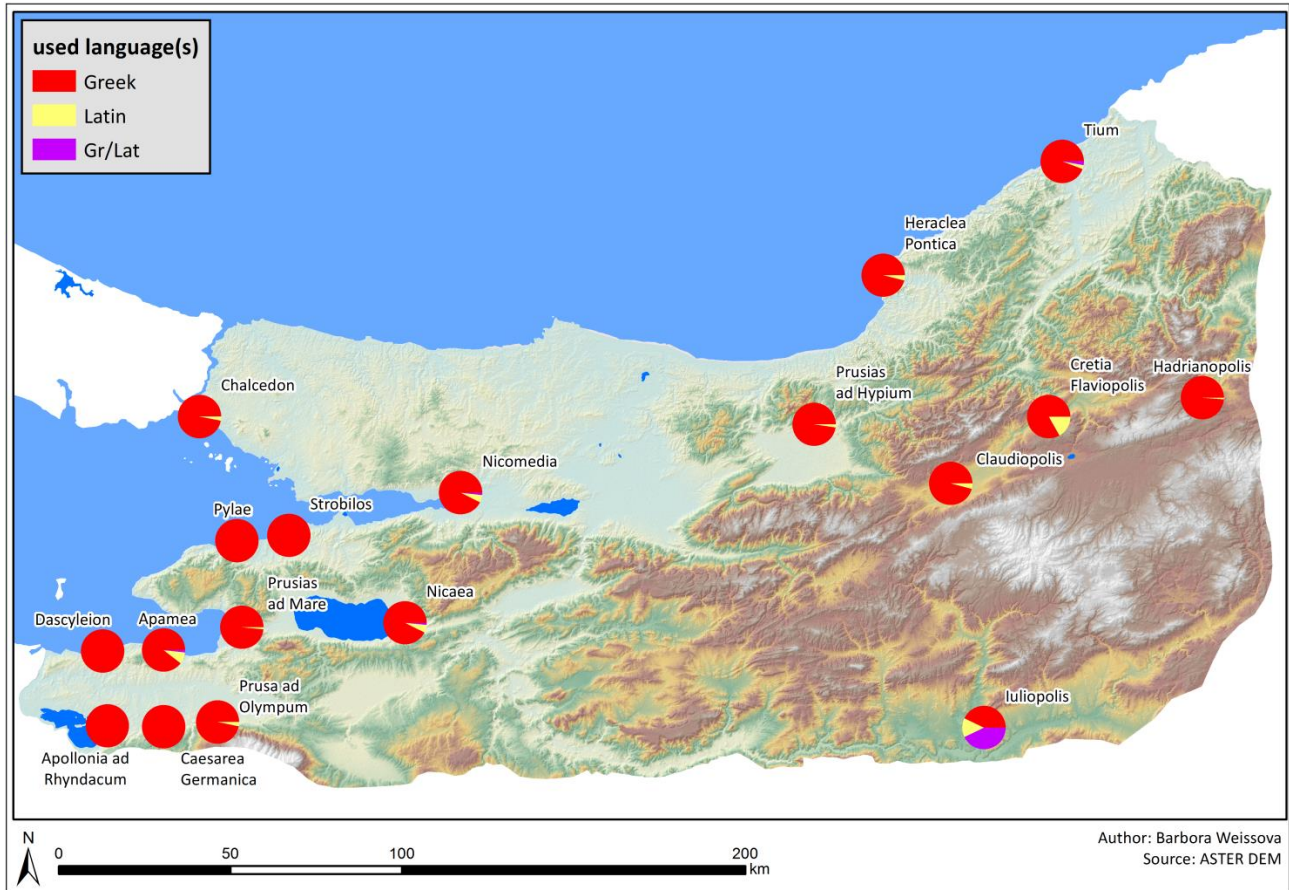


Figure 12: Proportional Representations of Languages Used on Inscriptions in the Analysed Urban Settlements (Addendum 1. 13.)

The spatial distribution of languages does not show any traceable pattern. Consequently, one can state that the situation was relatively equal throughout the entire macro-region, featuring Greek as the predominant language, which is typical for the eastern territories of the empire.⁴⁰⁰ Latin appears solely on official documents issued by the state. Even then, as in the case of milestones, the decisive information necessary to be understood by the locals is written in Greek (for example the number indicating the distance to the *caput viae*).

⁴⁰⁰ For a general discussion on the utilization of the Greek language in the Eastern provinces, see Petzl 2012, 47–60 and, especially, 49 f.; and Jones 1974, 90 f. – The language and identity in Asia Minor are studied by Gatzke 2013. – For a comparison with neighbouring provinces, see the utilization of the Greek and Latin language in ancient Thrace by Sharankov 2011, 135–155. – For analogous results achieved in two particular areas of the ancient Thrace, the Kazanlak valley and the Yambol district, see the study by Janouchová (forthcoming 2018, 385–404).

The quantified analysis of the entire epigraphic evidence is represented in the spatial environment on the following map Figure 13. The inscriptions are grouped into seven clusters based on their total sum, depicted as proportional charts.

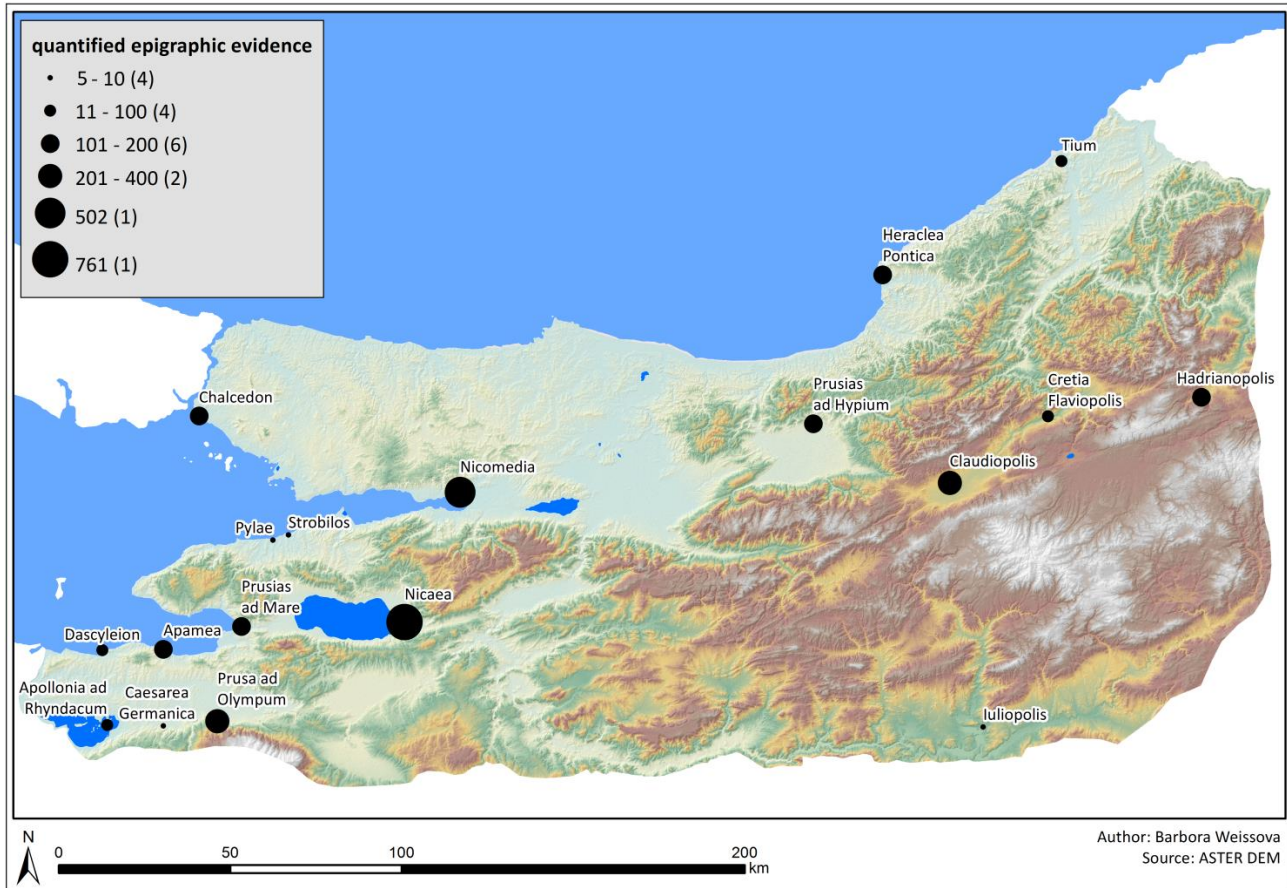


Figure 13: Quantified Spatial Analysis of the Epigraphic Evidence (Addendum 1. 14.)

The largest number of inscriptions was found in the territory of *Nicaea*, followed by the assemblage encountered in *Nicomedia*. The considerably significant difference of over 250 inscriptions between the two centres requires a careful interpretation. Following from my study of the possible reasons of this discrepancy, I tend to attribute them to two external factors. The first is the fact that the territory of *Nicaea* spreads over a larger area than the territory of *Nicomedia*. Although the precise measurements are not determined, the possible divisions suggest that the area of *Nicaea* is more than twice the area of *Nicomedia*. The second factor is the impact of numerous earthquakes, which had a more destructive effect on the city of *Nicomedia*. As the city

had several times literally slid down the hill it was built on,⁴⁰¹ it is highly probable that a great deal of the epigraphic evidence was destroyed or buried deep under the earth. In conclusion, the importance of both centres, when assessing the epigraphic evidence, needs to be seen as more or less equal.

The third group, encompassing between 201 and 400 inscriptions, is created by *Prusa ad Olympum* (344 inscriptions) and *Claudiopolis* (252 inscriptions), two centres of considerable importance, both situated inland.⁴⁰²

The fourth group of 101 to 200 inscriptions includes six settlements. Three are situated on the shores of the Marmara Sea, one on the Black Sea shore and the remaining two inland, clustered in the NE part of the territory. The group at the Marmara Sea encompasses the clusters of inscriptions located in the territories of *Chalcedon* (200 inscriptions), *Prusias ad Mare* (136 inscriptions) and *Apamea* (114 inscriptions). The city situated on the Black Sea coast is *Heraclea Pontica* (117 inscriptions). Considering the historic significance of *Heraclea Pontica*, the city revealed a remarkably limited number of inscriptions, most likely caused by the fact that the modern city is situated above the ancient one and simply covers most of the evidence.⁴⁰³ The remaining two cities situated inland include *Prusias ad Hypium* (179 inscriptions) and *Hadrianopolis*⁴⁰⁴ (154 inscriptions).

The group between 11 and 100 inscriptions comprises four cities: *Tium* (35 inscriptions), *Dascyleion* (18 inscriptions), *Cretia Flaviopolis* (12 inscriptions) and *Apollonia ad Rhyndacum* (12 inscriptions). *Dascyleion* is situated on the shores of the Marmara, *Tium* at the Black Sea shore. The remaining two cities are located inland. The largest assemblage of 35 inscriptions comes from *Tium*. It is necessary to point out that the situation of *Tium* is currently changing, as excavations have been conducted in the city since 2006⁴⁰⁵ and a regular survey since 2012.⁴⁰⁶ The epigraphic

⁴⁰¹ The earthquakes striking *Nicomedia* and confirmed by the literary evidence are nine, dated between the years AD 68 and AD 554. For an overview and basic descriptions of their impacts, see Table 5 in Chapter 2. 1. 4.

⁴⁰² The significance of *Prusa ad Olympum* and *Claudiopolis* is further assessed in Chapter 6. 3. when examining the models of urbanization.

⁴⁰³ Ameling in Jonnes 1994, 1 f.

⁴⁰⁴ The assemblage from *Hadrianopolis* was considerably enriched with the recent excavations and surveys introduced in Lafli – Christof 2012, 28–31.

⁴⁰⁵ Öztürk 2013, 147.

⁴⁰⁶ Öztürk 2013, 150.

material discovered during this research has not been fully published yet. Therefore, I decided not to include the scarce remarks hitherto published in short articles⁴⁰⁷ into the present work in order to avoid further confusion when building upon the presented results. I solely included the epigraphic evidence published in official corpora.⁴⁰⁸ Nevertheless, the situation in *Tium* will soon reveal an assemblage of new epigraphic evidence, completing the outlined picture. The other three cities are also potentially rich in evidence. The reason for the low numbers of inscriptions is a lack of field work.

The last group of four settlements encompasses the centres with a number of inscriptions between five and ten. These are *Strobilos* (ten inscriptions), *Pylae* (nine inscriptions), *Iuliopolis* (seven inscriptions) and *Caesarea Germanica* (five inscriptions). I suppose an analogous situation in these settlements and their territories as for the preceding group. Surveys and excavations will certainly reveal new epigraphic evidence confirming the importance of these centres.

The quantified analysis in the spatial environment shows the general importance, development and education of inhabitants of the urban centres and their territories. However, it lacks a chronological differentiation and as such is possibly misleading, since the centres might be of a changing importance over the analysed time span. The analysis requires specification in the form of chronological division, *videlicet* temporal analysis in the spatial context.

5. 4. Spatial and Temporal Analyses

The following analyses consider the spatial distribution as well as the chronology of the available inscriptions. Only the dated evidence that can be ascribed to a particular centre is included in the analysis.

Concerning the spatial information, 21 inscriptions out of the 2,878 have to be excluded, as they cannot be ascribed to a more precise location than the entire territory of Bithynia. The lack of chronological information causes a much more dramatic reduction of the assemblage, as 1363 inscriptions are not dated. Thus, the final assemblage available for the analysis includes 1498 inscriptions, as shown in the Table 14.

⁴⁰⁷ See Öztürk 2013, 147–164.

⁴⁰⁸ For the most part SEG.

The analysis includes several independent steps. In the first step, I examined records for each location separately. I interpreted the quantified temporal analysis of the epigraphic record in respective centres as a delineation of their economic situation. The second step encompasses a quantified temporal analysis in the macro-region, which simply puts together all the previously presented records and interprets them as one comprehensive assemblage of data.

5. 4. 1. Quantified Temporal Analysis of Epigraphic Evidence in Respective Centres

The text assesses quantified changes in the dated assemblage, divided into 12 centuries from the 4th century BC until the 8th century AD. Evidence from each centre is first discussed separately. Analyses are supplemented with line graphs and the developmental tendencies are pointed out in brief summaries, highlighting the peak of the evidence as well as the main growths and declines. Results of the analyses in particular centres are brought together in a brief conclusion at the end of this subchapter.

The following list of centres is organised based on the total sum of dated epigraphic evidence, from the most numerous to the least. Since the last six centres encompass insignificant assemblages of evidence, I only describe their character, without depicting them on the line graph, as I find this approach in their cases misleading.

Location	Sum Total
<i>Nicaea</i>	604
<i>Prusa ad Olypium</i>	279
<i>Nicomedia</i>	108
<i>Hadrianopolis</i>	87
<i>Apamea</i>	77
<i>Chalcedon</i>	69
<i>Prusias ad Hypium</i>	65
<i>Prusias ad Mare</i>	56
<i>Claudiopolis</i>	54
<i>Heraclea Pontica</i>	42
<i>Tium</i>	15
<i>Strobilos</i>	10
<i>Dascyleion</i>	8
<i>Cretia Flaviopolis</i>	7
<i>Caesarea Germanica</i>	4
<i>Apollonia ad Rhyndacum</i>	4
<i>Iuliopolis</i>	7
<i>Pylae</i>	2
Bithynia	1498

Table 14: Dated Epigraphic Evidence in Each Urban Settlement Separately

Nicaea (Figure 14)

The dated inscriptions published for the territory of *Nicaea* equal 604 out of 761. The earliest are dated to the 4th century BC. A dramatic increase in their number occurs in the 1st century AD and it is even amplified during the 2nd century AD. This is followed by a gradual decline in the total number of the dated evidence – most notably in the 5th century AD. The 6th century AD onwards reveals a small amount epigraphic evidence, dated to the extensive time span of several centuries.

A summary of the developmental tendencies

- Stability: 4th – 1st century BC
- Dramatic increase: 2nd half of the 1st century BC – 2nd century AD
- **Peak: 2nd century AD**
- Decrease: 3rd – 4th century AD
- Dramatic decrease: 5th century AD
- Stability: 6th – 8th century AD

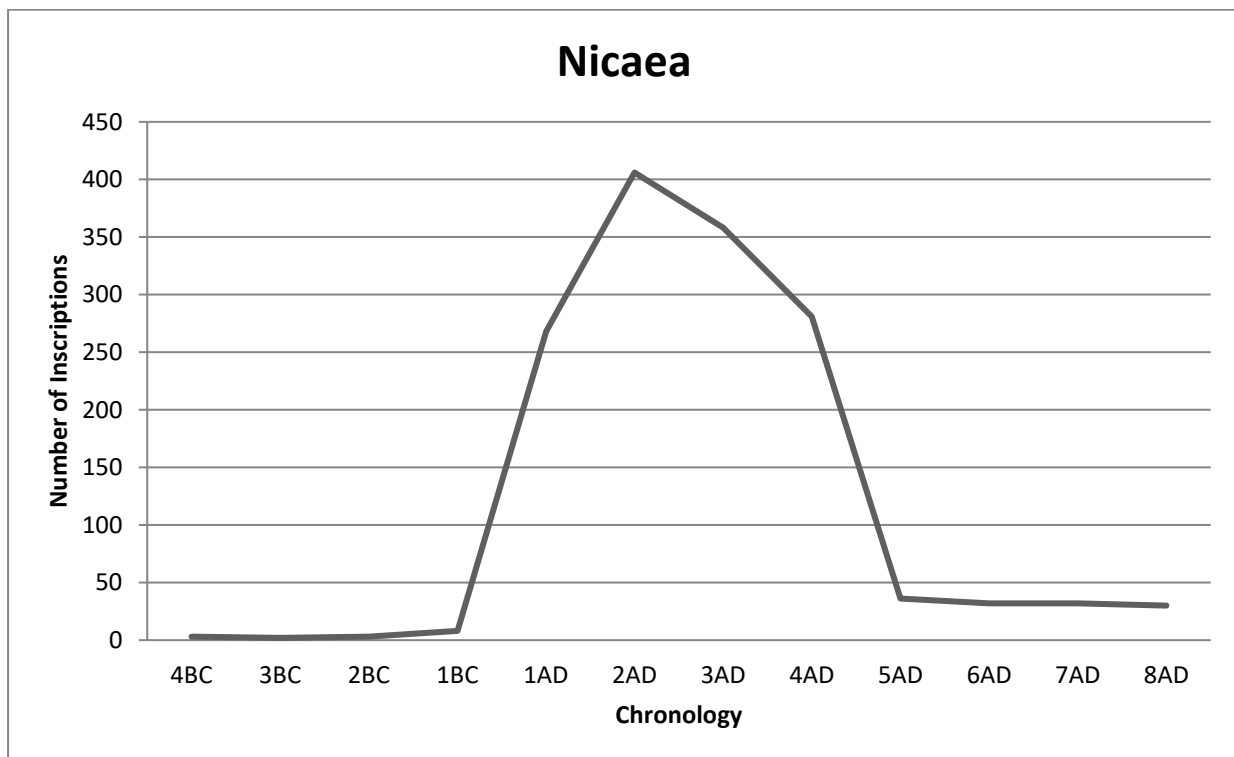


Figure 14: Temporal Analysis of Epigraphic Evidence from *Nicaea* and its Territory

Prusa ad Olympum (Figure 15)

The dated inscriptions equal 279 out of 344 in total. The gradual rise of the evidence encountered from the 3rd century BC onwards includes the first noticeable increase in the 1st century BC.

The 1st century AD is represented by a steep climb, peaking in the 2nd century AD. On the other hand, the 3rd century AD sees a dramatic decline, followed by a moderate one during the 4th and the 5th century AD. From the 5th century AD onwards, the situation of the epigraphic evidence remains constant, characterised by minor fluctuations.

A summary of the developmental tendencies

- Increase: 3rd century BC – 1st century BC
- Dramatic increase: 1st – 2nd century AD
- **Peak: 2nd century AD**
- Dramatic decrease: 3rd century AD
- Slight decrease: 4th – 5th century AD
- Stability: 6th – 8th century AD

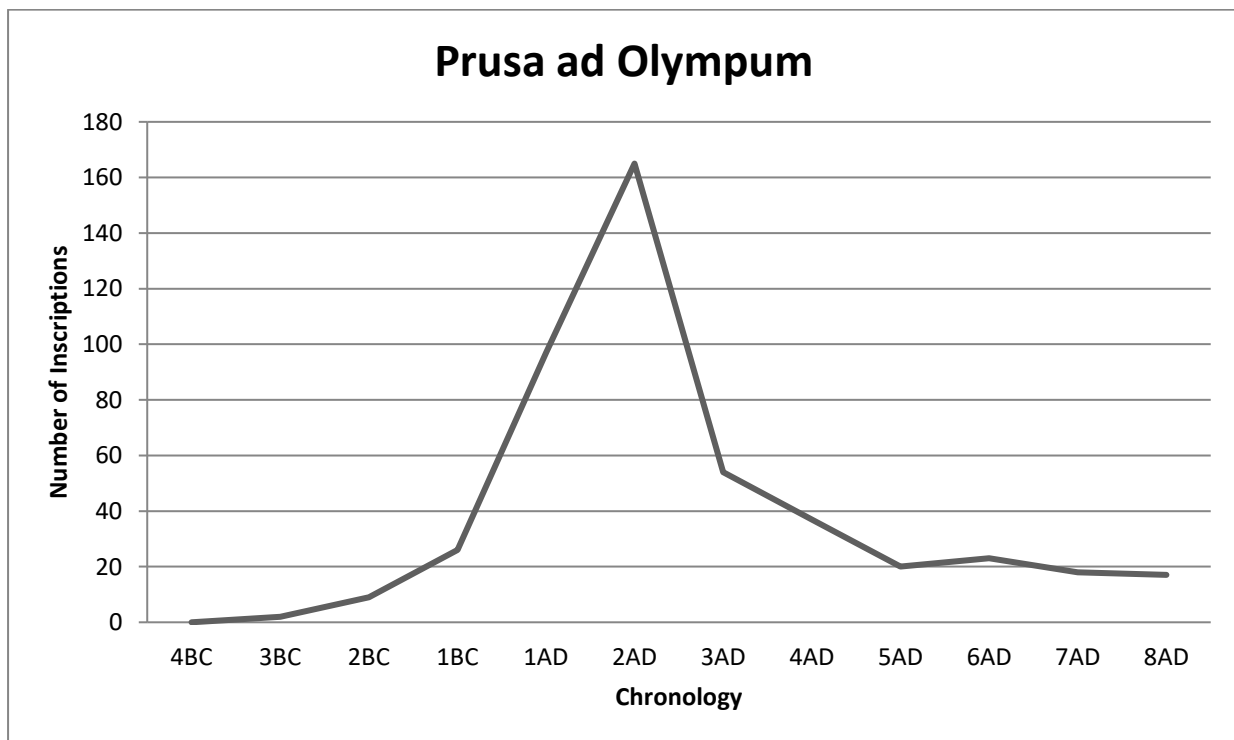


Figure 15: Temporal Analysis of Epigraphic Evidence from *Prusa ad Olympum* and its Territory

Nicomedia (Figure 16)

The dated inscriptions identified in *Nicomedia* and its territory equal mere 108 out of 502 in total. The gradual growth in the numbers of the evidence from the 3rd century BC onwards includes the first measurable increase during the 1st century BC, rising again during the 1st and 2nd century AD. The dramatic increase in the 2nd century AD equals the peak. The 3rd century AD is represented by a moderate decline, followed by a sharp one during the 4th and the 5th century AD.

A summary of the developmental tendencies

- Increase: 4th century BC – 1st century BC
- Dramatic increase: 1st – 2nd century AD
- **Peak: 2nd century AD**
- Slight decrease: 3rd century AD
- Dramatic decrease 4th – 5th century AD
- Stability: 6th century AD

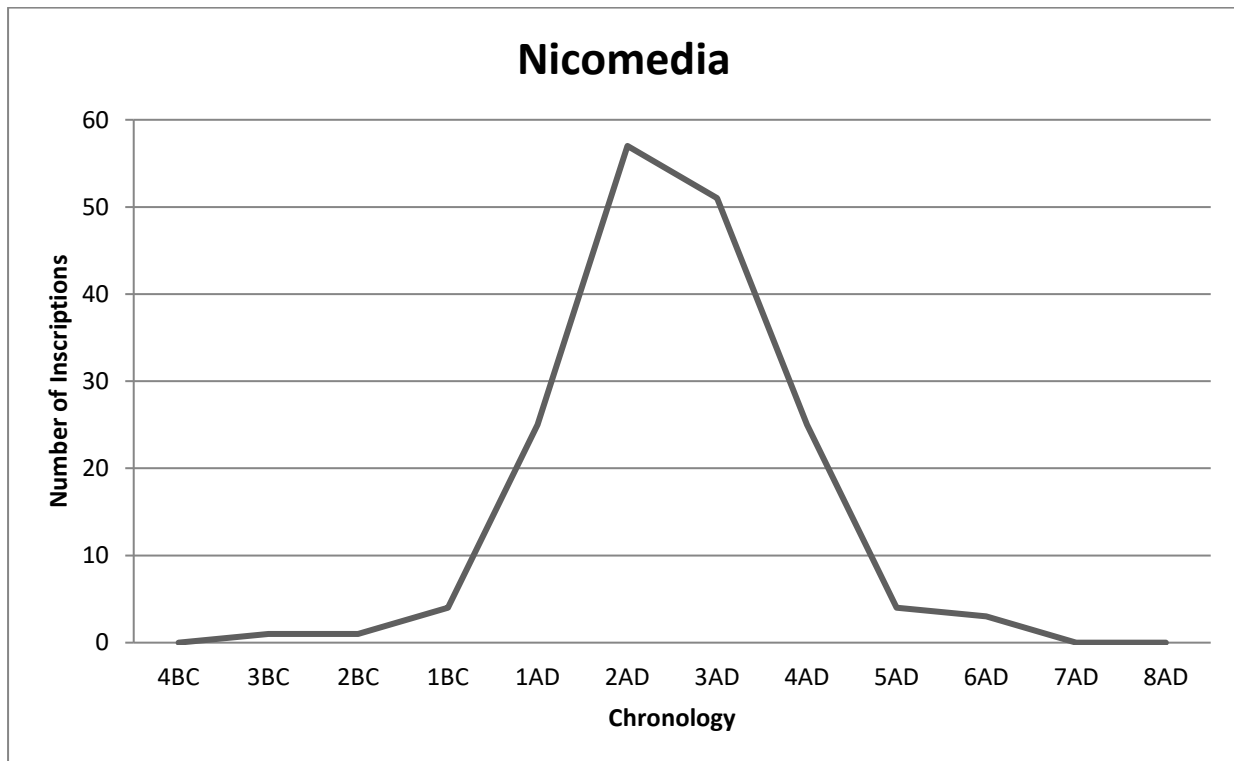


Figure 16: Temporal Analysis of Epigraphic Evidence from *Nicomedia* and its Territory

Hadrianopolis (Figure 17)

The dated inscriptions identified in *Hadrianopolis* and its territory equal 87 out of 154 in total. The first evidence appears during the 1st century AD, followed by a dramatic increase in the 2nd and the 3rd century AD, with its peak during the latter. The dramatic decrease in the period of the 4th and the 5th century AD is followed by another increase during the 1st half of the 6th century AD, reaching its peak in the 6th century AD. The decrease succeeds in the 1st half of the 7th century AD.

A summary of the developmental tendencies

- Increases: 1st – 3rd and 6th century AD
- Dramatic increases: 2nd – 3rd century AD and 1st half of the 6th century AD
- **Peaks: 3rd century AD and 6th century AD**
- Dramatic decreases: 4th – 5th century AD and 7th century AD
- Increase: 6th century AD

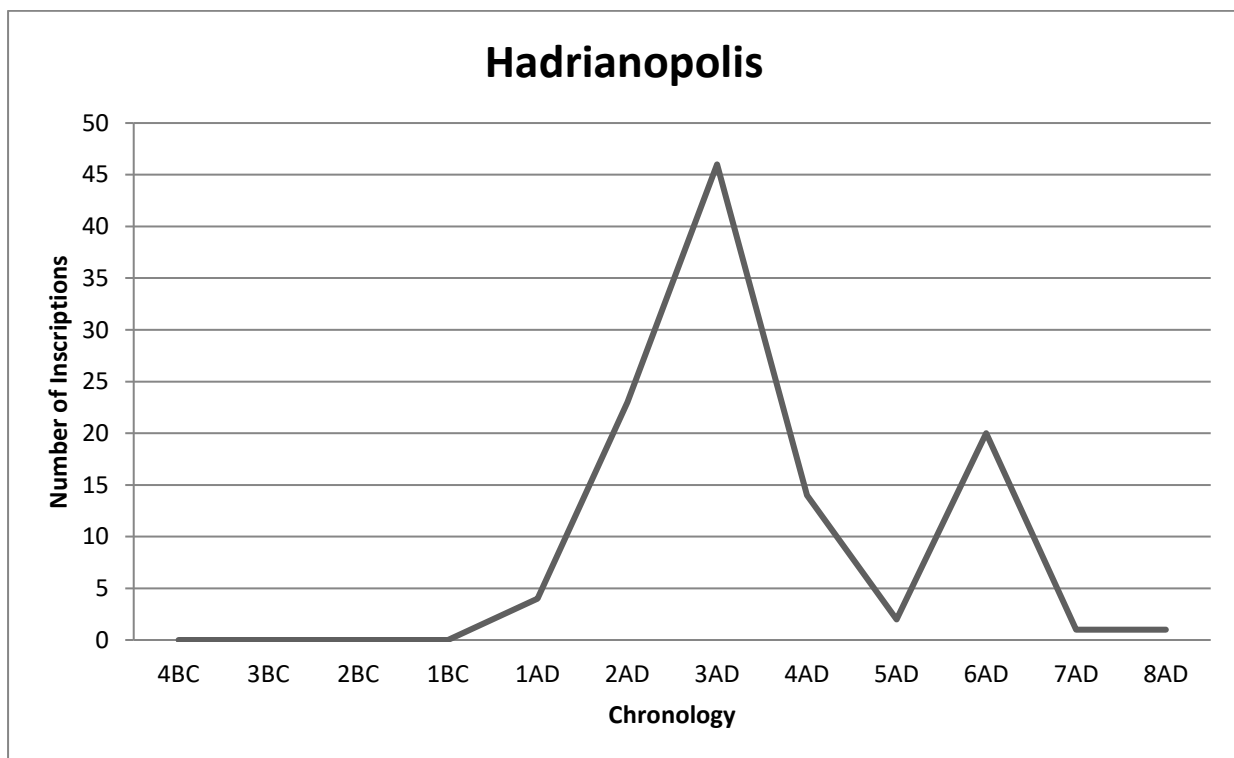


Figure 17: Temporal Analysis of Epigraphic Evidence from *Hadrianopolis* and its Territory

Apamea (Figure 18)

The dated inscriptions identified in *Apamea* and its territory equal 75 out of 112 in total. The gradual rise of the evidence during the 4th and the 3rd century BC is followed by a slight increase in the 2nd century BC. A constant evidence with no change in the number of dated inscriptions can be observed until the middle of the 1st BC, followed by a dramatic increase during the 2nd half of the 1st century BC and in the 1st century AD. From the 1st century AD onwards, the situation is relatively constant, changing little-by-little each century, with its highest peak during the 4th century AD.

A summary of the developmental tendencies

- Increase: 4th century BC – 4th century AD
- Dramatic increase: 1st century AD
- **Peak: 1st – 4th century AD**
- Stability: 1st – 6th century AD
- Slight decreases: 5th century AD and 7th – 8th century AD

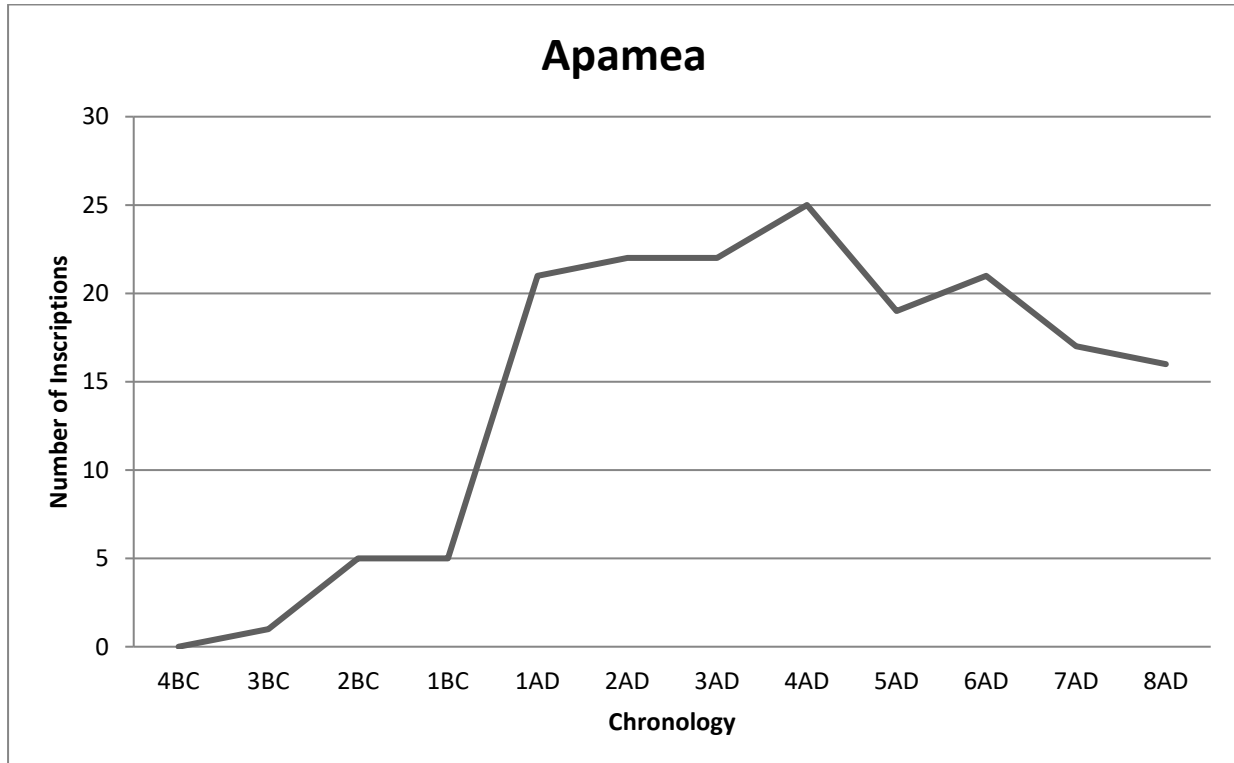


Figure 18: Temporal Analysis of Epigraphic Evidence from *Apamea* and its Territory

Chalcedon (Figure 19)

The dated inscriptions identified in *Chalcedon* and its territory equal 69 out of 200 in total. The evidence changes only moderately from the 4th century BC to the 6th century AD, containing several minor peaks and declines. A dramatic decrease of the evidence is dated to the 7th and the 8th century AD.

A summary of the developmental tendencies

- Stable: 4th century BC – 6th century AD
- **Peak: not identifiable**
- Dramatic decrease: 7th – 8th century AD

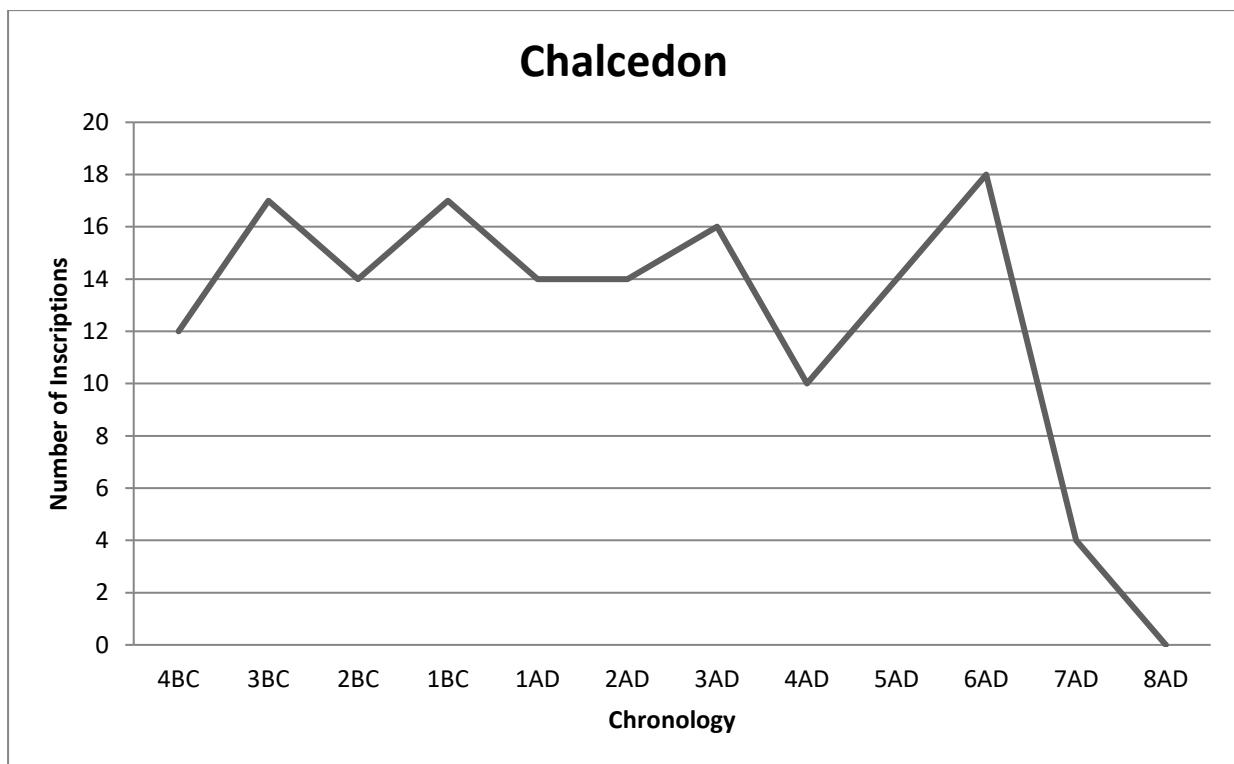


Figure 19: Temporal Analysis of Epigraphic Evidence from Chalcedon and its Territory

Prusias ad Hypium (Figure 20)

The dated inscriptions equal 65 out of 179 in total. The first evidence appears in *Prusias ad Hypium* during the 1st century AD. The period between the 1st and the 3rd century AD is characterised by a dramatic increase, while the 4th century features a steep decrease. The 3rd century AD represents the peak of the dated evidence. The situation between the 5th and the 7th century AD remains stable, followed by a sharp decrease in the 8th century AD.

A summary of the developmental tendencies

- Dramatic increase: 1st – 3rd century AD
- **Peak: 3rd century AD**
- Dramatic decreases: 4th and 8th century AD
- Stability: 5th – 7th century AD

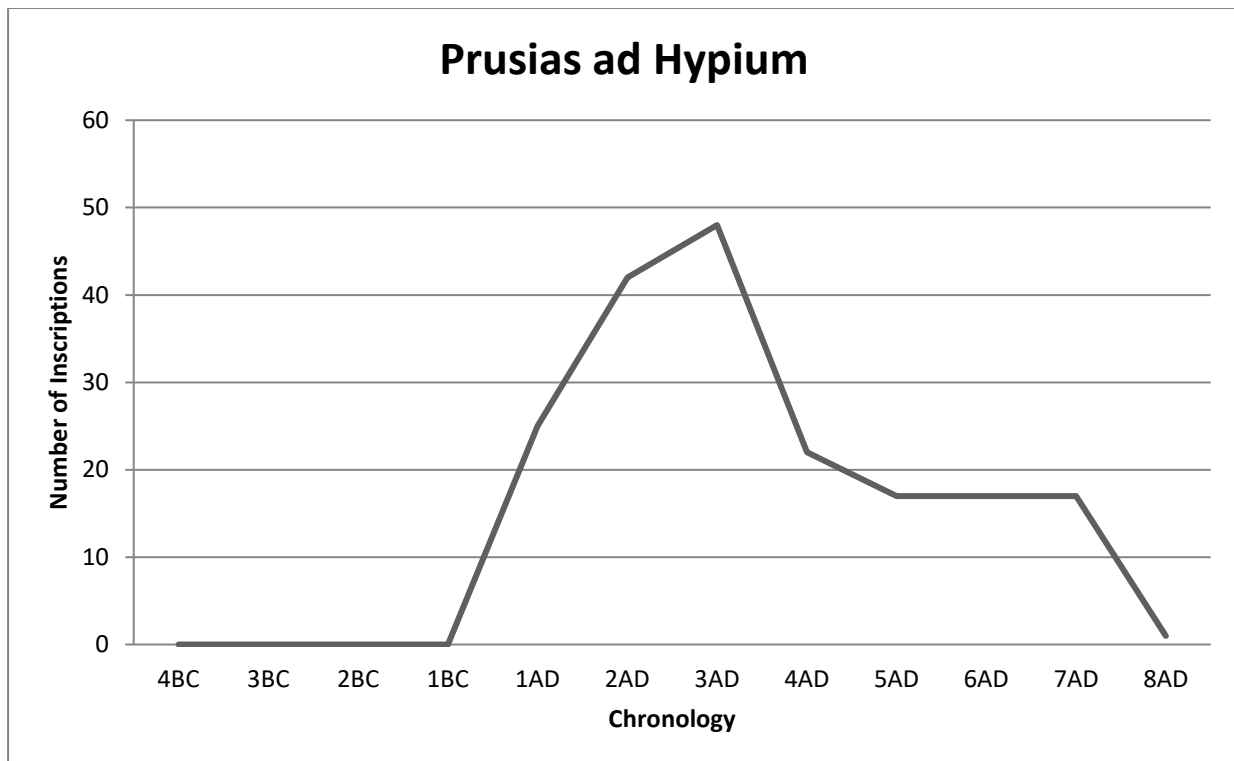


Figure 20: Temporal Analysis of Epigraphic Evidence from *Prusias ad Hypium* and its Territory

Prusias ad Mare (Figure 21)

The dated inscriptions identified in *Prusias ad Mare* and its territory equal 56 out of 136 in total. The relatively continuous increase from the 4th century BC until the 2nd century AD is interrupted by a slight decline in the 3rd century BC and a constant situation of evidence during the 1st century BC. The peak in the 2nd and 3rd century AD is followed by a dramatic decline in the time span between the 4th and the 5th century AD. The record is stabilised during the 5th and 7th century. The 8th century is characterised by an ultimate decline.

A summary of the developmental tendencies

- Increasing tendency: 2nd century BC – 2nd century AD
- Dramatic increases: 2nd century BC and 1st – 2nd century AD
- **Peaks: 2nd and 3rd century AD**
- Dramatic decreases: 4th – 5th century AD and 8th century AD
- Stability: 1st century BC and 6th – 7th century AD

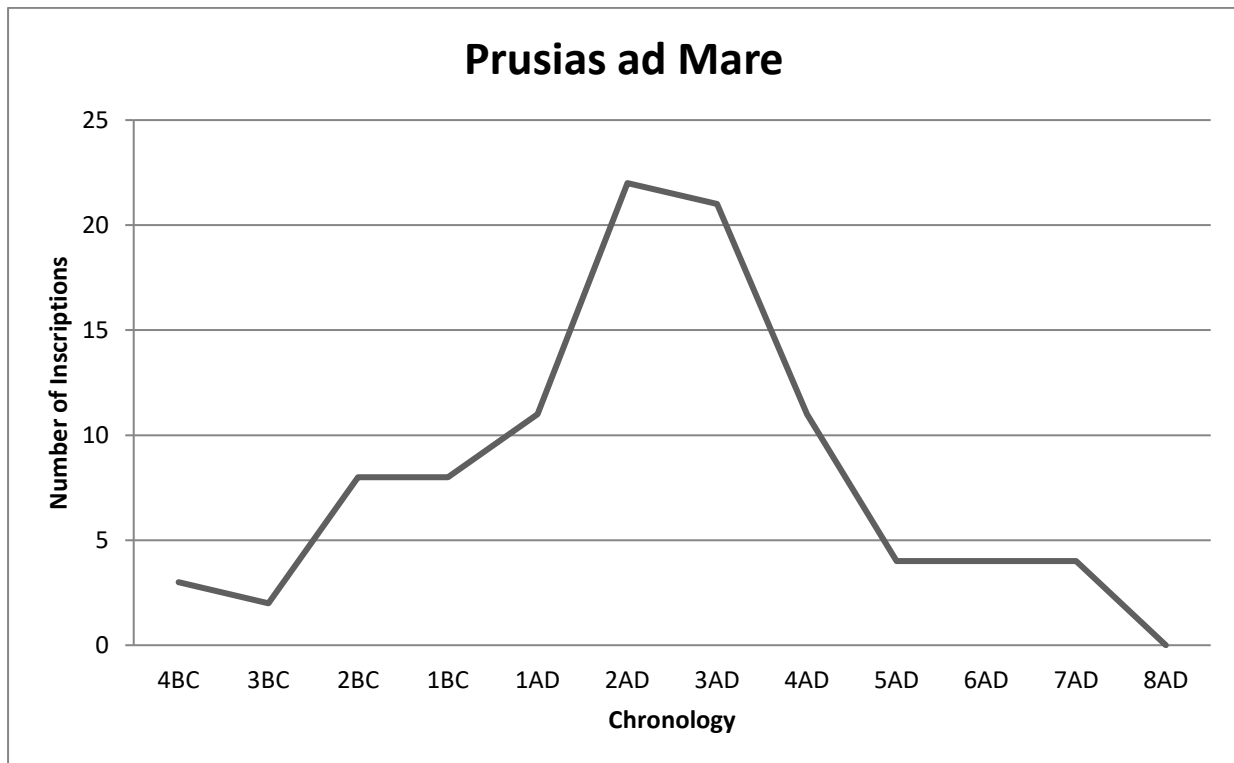


Figure 21: Temporal Analysis of Epigraphic Evidence from *Prusias ad Mare* and its Territory

Claudiopolis (Figure 22)

The dated inscriptions identified in *Claudiopolis* and its territory equal 54 out of 252 in total. The first evidence appears during the 1st century AD, followed by its dramatic increase during the 2nd century AD. The peak oscillates between the 2nd and 3rd century AD. The dramatic decrease in the period of the 4th and 5th century AD is followed by a stable situation of evidence between the 5th and 7th century AD. During the 8th century AD appears another decrease in evidence.

A summary of the developmental tendencies

- Increase: 1st – 2nd century AD
- Dramatic increase: 2nd century AD
- **Peak: 2nd and 3rd century AD**
- Dramatic decrease: 4th – 5th century AD
- Remains constant: 5th – 7th century AD
- Decrease: 8th century AD

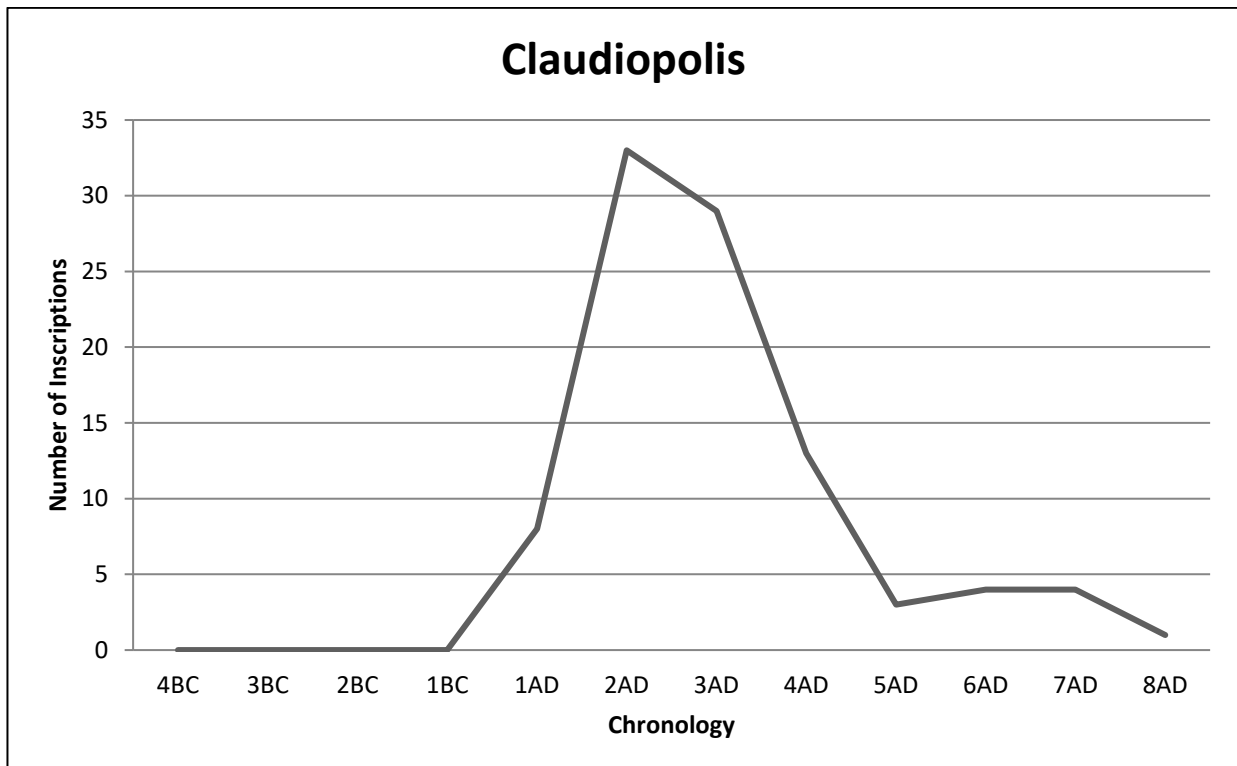


Figure 22: Temporal Analysis of Epigraphic Evidence from *Claudiopolis* and its Territory

Heraclea Pontica (Figure 23)

The dated inscriptions identified in *Heraclea Pontica* and its territory equal mere 42 out of 107 in total. The first evidence appears during the 1st century AD and dramatically increases until the 2nd century AD. The peak in the 2nd century AD is followed by a sudden decline in the 3rd century AD. The situation between the 3rd and the 4th century AD remains relatively constant and decreases dramatically not earlier than during the 5th century AD. The period between the 5th and 8th century AD reveals another constant situation of the evidence.

A summary of the developmental tendencies

- Dramatic increase: 1st – 2nd century AD
- **Peak: 2nd century AD**
- Dramatic decreases: 3rd century AD and 5th century AD
- Slight decrease: 4th century AD
- Stability: 5th – 8th century AD

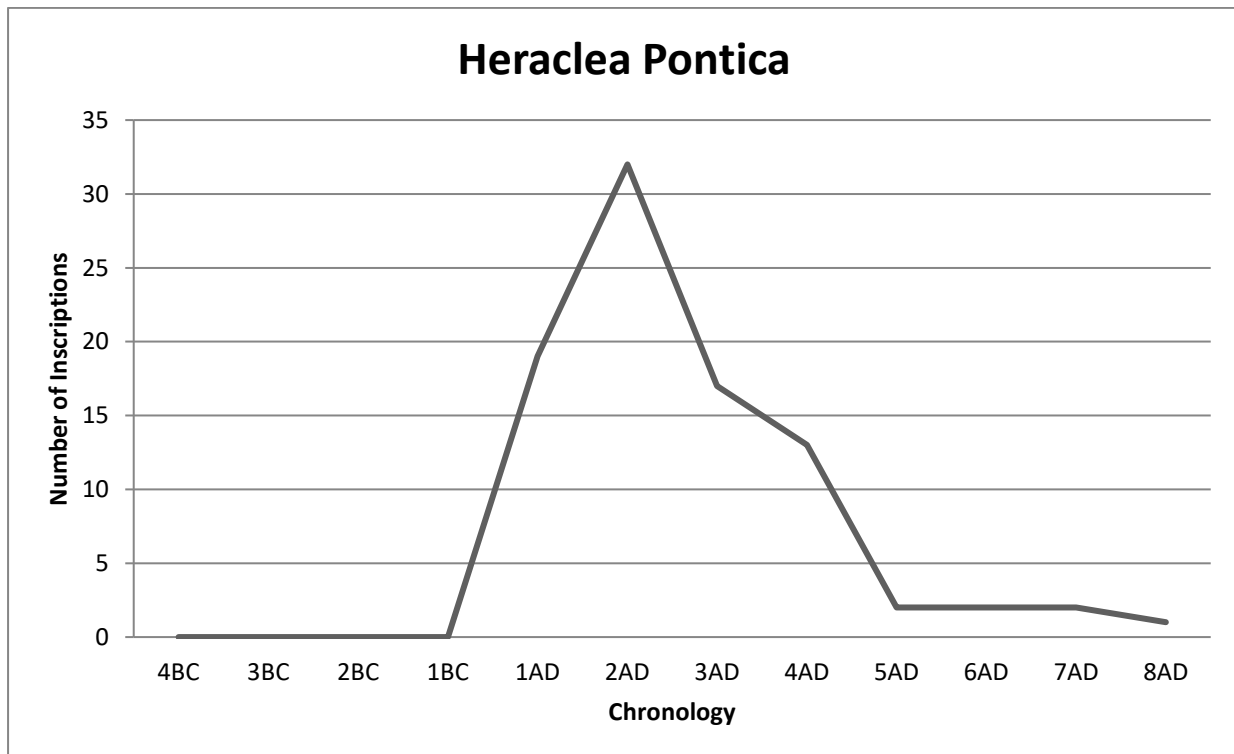


Figure 23: Temporal Analysis of Epigraphic Evidence from *Heraclea Pontica* and its Territory

Tium (Figure 24)

The dated inscriptions identified in *Tium* and its territory equal 15 out of 35 in total. The evidence, since it is only a small assemblage, does not allow for following the development. Nevertheless, it enables to outline the general tendencies. The first inscriptions appear in the 1st century AD, followed by an increase in the evidence, with an upright peak during the 2nd century AD. The evidence subsequently decreases and since the 5th century onwards, there is a lack of any evidence.

A summary of the developmental tendencies

- Increase: 1st – 2nd century AD
- **Peak: 2nd century AD**
- Dramatic decreases: 3rd century and 5th century AD
- Stability: 4th century AD

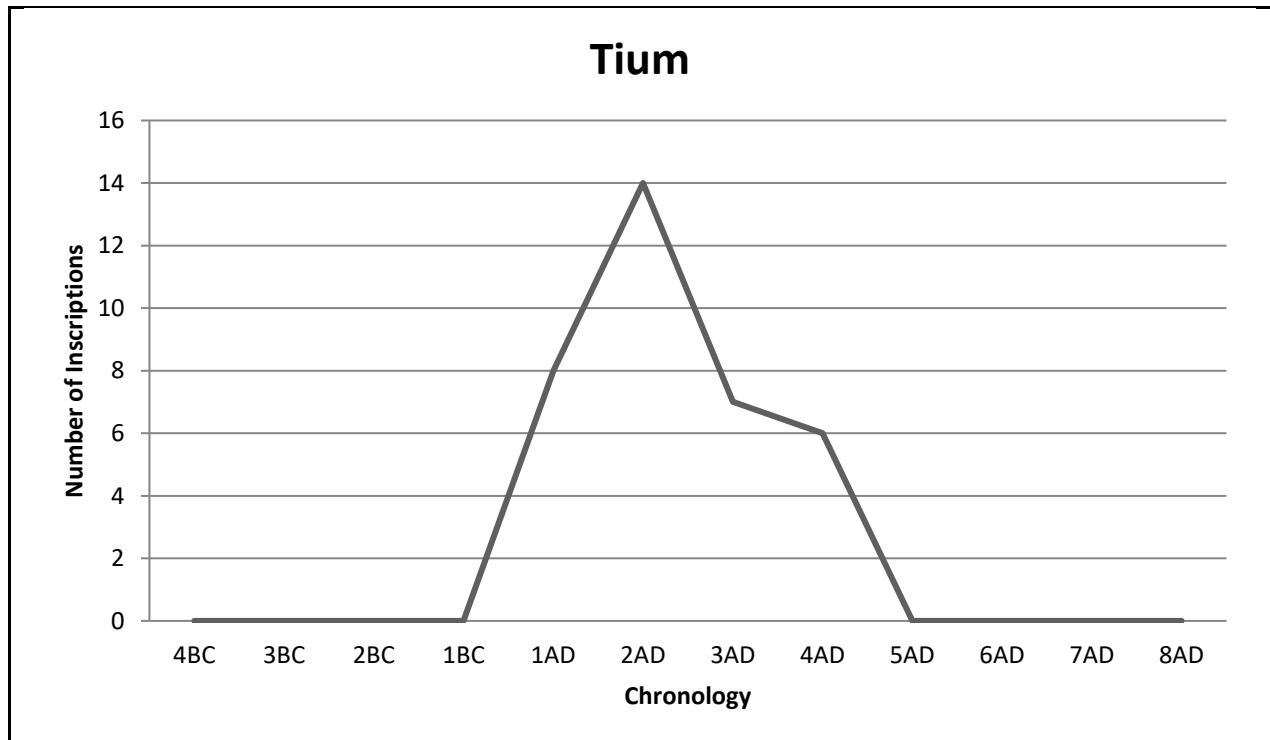


Figure 24: Temporal Analysis of Epigraphic Evidence from *Tium* and its Territory

Strobilos (Figure 24)

All the inscriptions identified in *Strobilos* and its territory are dated. However, the total sum equals merely ten. The first evidence appears during the 1st century AD; the 2nd and the 3rd centuries remain constant. A noticeable increase appears during the 4th century AD, followed by a levelled off record until the 8th century AD, with no explicit growths or declines during the periods. As the assemblage is small, the step-by-step changes observable on the line graph are irrelevant.

A summary of the developmental tendencies

- Increase: 1st – 3rd century AD
- Sharp increase: 4th century AD
- **Peak: 4th century AD**
- Stability: 2nd century AD and 5th – 8th century AD

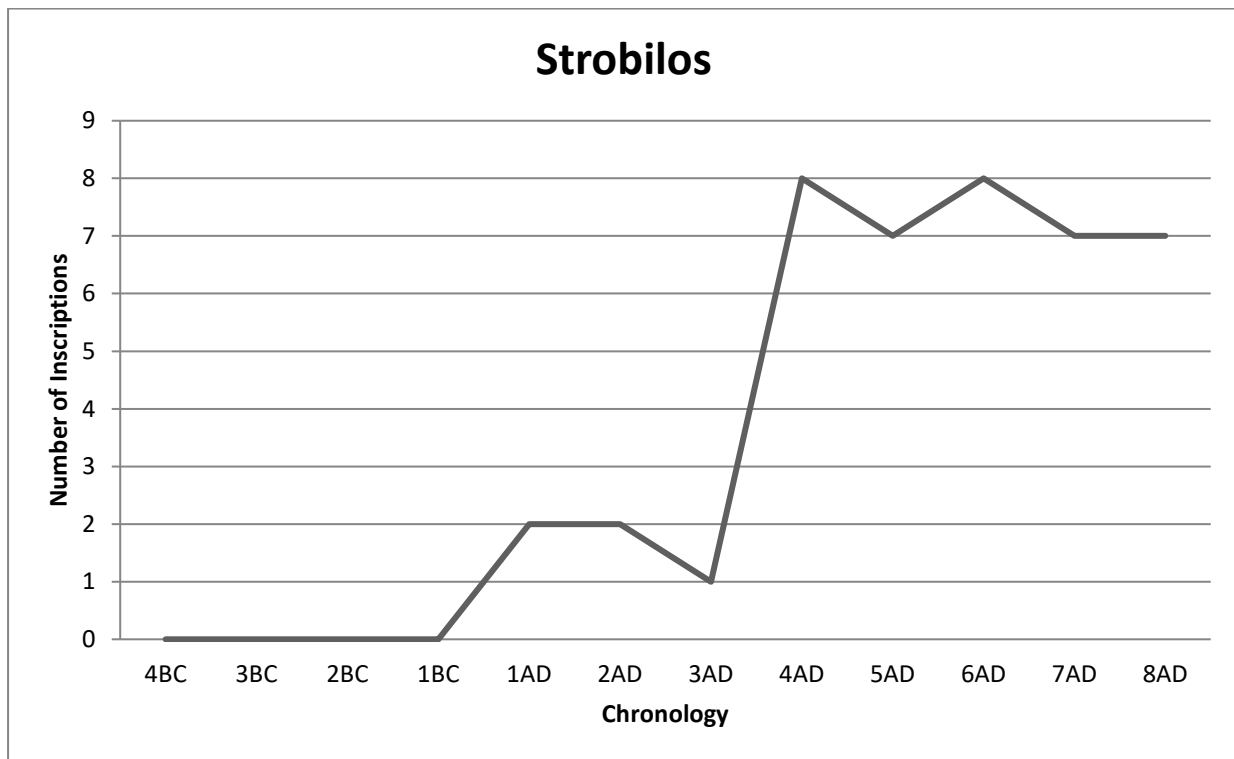


Figure 25: Temporal Analysis of Epigraphic Evidence from Strobilos and its Territory

Centres with less than 10 dated inscriptions

The remaining centres of *Dascyleion*, *Cretia Flaviopolis*, *Apollonia ad Rhyndacum*, *Iuliopolis*, *Caesarea Germanica* and *Pylae* do not encompass representative samples of inscriptions to demonstrate the developmental tendencies.

The dated inscriptions from *Dascyleion* include eight out of 18 in total, with six of them falling in the 2nd and 3rd century AD, one predating the peak and dated to the year 70 BC and the last one dated broadly to the entire Byzantine period.

In the territory of *Cretia Flaviopolis*, seven out of 12 inscriptions are dated and fall within the time span between the 1st and the 3rd century AD.

The assemblage from *Apollonia ad Rhyndacum* includes four dated inscriptions out of 12 in total. Two of the four are dated to the 2nd century AD, one to the beginning of the 3rd century AD and the last one falls within the broader time span of the Roman Imperial period.

Iuliopolis is represented by seven dated inscriptions. Four date back to the 3rd century AD, two to the time span of the Roman Imperial period and the last one to even a broader chronology from the Roman to the Early Byzantine era.

The assemblage of *Caesarea Germanica* is represented by four dated inscriptions out of five in total, revealing the same time span as the epigraphic evidence from *Cretia Flaviopolis*, between the 1st and the 3rd century AD.

Pylae is represented by mere two inscriptions out of nine in total, dated to the broad time span from the 1st until the 7th century AD.

Conclusion

The separate analyses of the dated epigraphic evidence from within each centre make it possible to point out their peaks and to divide the assemblage into two distinctive groups. The first is a group of nine cities. The second group encompasses three outliers. The analysis was performed for 12 out of the 18 centres, since the remaining six do not encompass a sufficient number of the dated evidence.

Out of 12 analysed assemblages, six of them reveal peaks during the 2nd century AD, with a slight decrease in evidence during the 3rd century AD. The group includes *Nicaea*, *Nicomedia*,

Prusias ad Mare, *Claudiopolis*, *Heraclea Pontica* and *Tium*. Four of the centres are situated directly along the shores of the Marmara or the Black Sea, *Nicaea* and *Claudiopolis* inland. *Nicaea*, though situated inland, had direct overland communication connecting it with the sea by a ‘one day road’ and ports in their service at the shore. Moreover, it is situated on the ‘Pilgrim’s road’.⁴⁰⁹ *Claudiopolis*, again, is situated deeper inland. However, it is located on the main W – E regional road leading through the area⁴¹⁰ and it is ‘two days’ way’ from the Black Sea coast.

Prusa ad Olympum reveals its peak during the 2nd century AD which allows for including it in the group. *Prusa ad Olympum* is situated inland, ‘one day away’ from the Marmara Sea.

Prusias ad Hypium can also be included in the first group. Although the evidence has its peak during the 3rd century AD, there is only a slight difference between the 2nd and the 3rd century. The city is situated inland, ‘one day way’ from the Black sea coast and at the inter-regional ‘Northern road’.

The city *Hadrianopolis* has its peak during the 3rd century AD, followed by a minor peak during the 6th century AD. The second peak is a result of the recent excavations conducted in the city and revealing dozens of inscriptions connected with the Early Byzantine church.⁴¹¹

Considering the minor differences in evidence, I suggest including the cities of *Claudiopolis*, *Heraclea Pontica*, *Hadrianopolis*, *Nicaea*, *Nicomedia*, *Prusias ad Hypium*, *Prusias ad Mare*, *Prusa ad Olympum*, and *Tium* into one group, which has its peak during the 2nd and the 3rd century AD respectively.

The genuine outliers are represented in the evidence from *Apamea*, *Chalcedon* and *Strobilos*. *Strobilos* reaches the peak during the 4th century AD and the evidence remains constant until the 8th century AD. This outlier might be explained by an increase in its importance when it started to be used as one of the ports connecting *Constantinopolis* and *Helenopolis*. This way was later on declared as the only possible official route by the Emperor Justinian.⁴¹² The supra-regional

⁴⁰⁹ The main road leading from the NW to the SE and connecting *Chalcedon* – *Nicomedia* – *Nicaea* – *Iuliopolis* – further eastwards. For a detailed description and reconstruction, see Chapter 7. 4. 1.

⁴¹⁰ The road is named in the present work the ‘Northern road’ and it connects *Nicomedia* – *Claudiopolis* – *Cretia Flaviopolis* – *Hadrianopolis* – further eastwards (Pontus). For a detailed description and reconstruction, see Chapter 7. 4. 2.

⁴¹¹ Lafli – Christof 2012, 42–52.

⁴¹² Procop. HA 30, 8. For a full text of the citation, see Chapter 2. 1. 5. The regulation of traffic and its impact on the regional economy are discussed in detail in Chapter 7. 4. 1.

'Pilgrim's road' between Dacybiza and *Helenopolis* was replaced by the route leading over the sea, directly to *Helenopolis* and most likely using *Strobilos* as one of the ports. The small province town *Strobilos* gained in this way considerable importance which is also mirrored in the encountered numbers of inscriptions.

The case of *Chalcedon* is different; it is basically missing any peak in its evidence. Based on the epigraphic evidence, the city was an important centre from the 4th century BC until the 6th century AD. This assumption corresponds to reality, as the favourable geographic position of *Chalcedon* enabled its constant economic activity. *Chalcedon* controlled the entrance to the Bosphorus strait, a natural connection between the Marmara and the Black Sea.

The last discussed centre is *Apamea*, having its peak from the 1st century AD to the 8th century AD. The situation of *Apamea* can be most likely interpreted as an outcome of its position at the Marmara Sea, functioning as a port for *Prusa ad Olympum*⁴¹³ and as one of the main ports during the Early Byzantine era connected with the establishment of *Constantinopolis*. Therefore, its importance remained constant during the considerably extensive time span.

Strobilos, *Chalcedon* and *Apamea* cannot be taken as typical representatives of the situation in Bithynia, but rather as outliers with their own independent development. They were influenced by external factors that noticeably did not have a strong impact on the situation in the entire macro-region but solely on the local situation in their territories.

The last six centres, *Dascyleion*, *Cretia Flaviopolis*, *Apollonia ad Rhyndacum*, *Caesarea Germanica*, *Iuliopolis* and *Pylae* are excluded from the overall analysis as they are not representative enough due to a small amount of the total number of dated inscriptions. However, it is necessary to point out that none of them encompasses any outliers that would not comply with the results outlined above. The lack of inscriptions in these centres might be explained by their minor or only short-term importance, as it is with the town *Pylae*. *Pylae* had a very similar development to *Strobilos*, gaining in importance when the main traffic was moved to the road over the sea. However, the remaining settlements including *Dascyleion*, *Cretia Flaviopolis*, *Apollonia ad Rhyndacum*, *Caesarea Germanica* and *Iuliopolis* are of a different character. Their territories most

⁴¹³ Marek 2013, 37.

probably miss the quantifiable body of epigraphic evidence due to a lacking research. Therefore, I expect a possible dramatic change of the results when they are archaeologically explored.

Regarding the geographic position, *Cretia Flaviopolis*, *Caesarea Germanica*, *Iuliopolis* and *Apollonia ad Rhyndacum* are situated inland. *Pylae* and *Dascyleion* lie at the shores of the Marmara Sea.

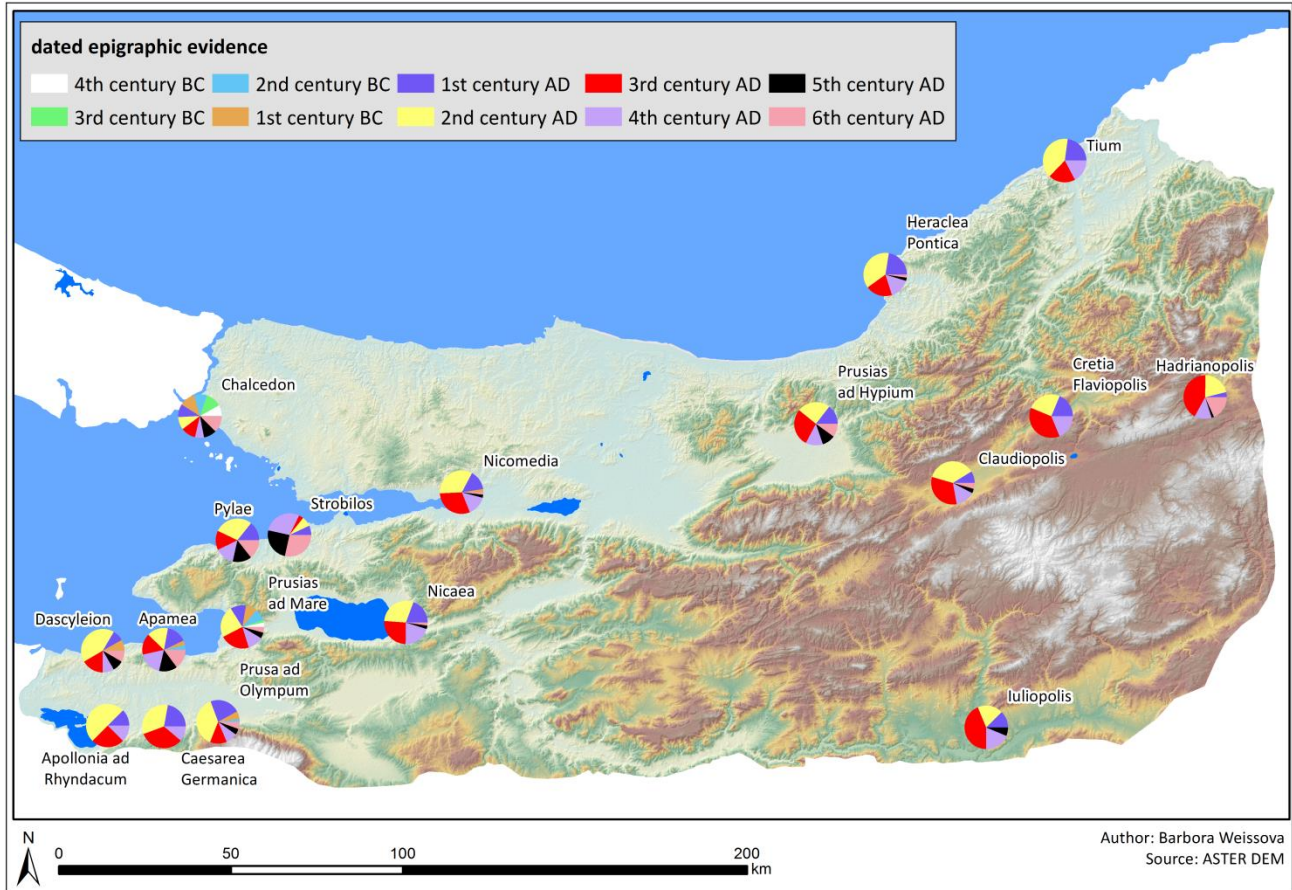


Figure 26: Temporal Analysis of the Epigraphic Evidence in Spatial Context (Addendum 1. 15.)

The map Figure 26 shows the analysed centres in their spatial environment as described in the text. The pie charts display proportional representations of the chronological periods in each centre, supplementing in this way the outlined descriptions and interpretations. *Prima facie* can be observed the prevailing appearance of the red hue in the pie charts, directly followed by the yellow one. The colours stand for the epigraphic evidence dated to the 2nd and the 3rd century AD, respectively.

Only three pie charts are visually excluded from the pattern; they represent inscriptions identified in *Chalcedon*, *Apamea* and *Strobilos*. Proportional representations in these three urban settlements can be categorized as anomalous within the assemblage. The possible reasons for their exclusion from the general developmental pattern are outlined above.

5. 4. 2. Quantified Temporal Analysis of Epigraphic Evidence in the Macro-Region

The separate analyses performed for each centre can be used to outline an overall tendency in the entire macro-region. The results are not only indicators of the economic development of the particular urban settlement and its territory, but also indicators of the situation in the macro-region when presented together as one complex.

Whereas the peak values vary considerably throughout the analysed assemblages, the lower values culminating in the bottom of the graph are not clearly separable from another (Figure 27). However, the graph shows that there are no outstanding outliers in the analyses. The second graph (Figure 28) depicts the overall tendency in the macro-region by presenting all the dated evidence together in one line. In fact, I added up all the data falling within each century into one dataset in order to facilitate their clear visualisation.

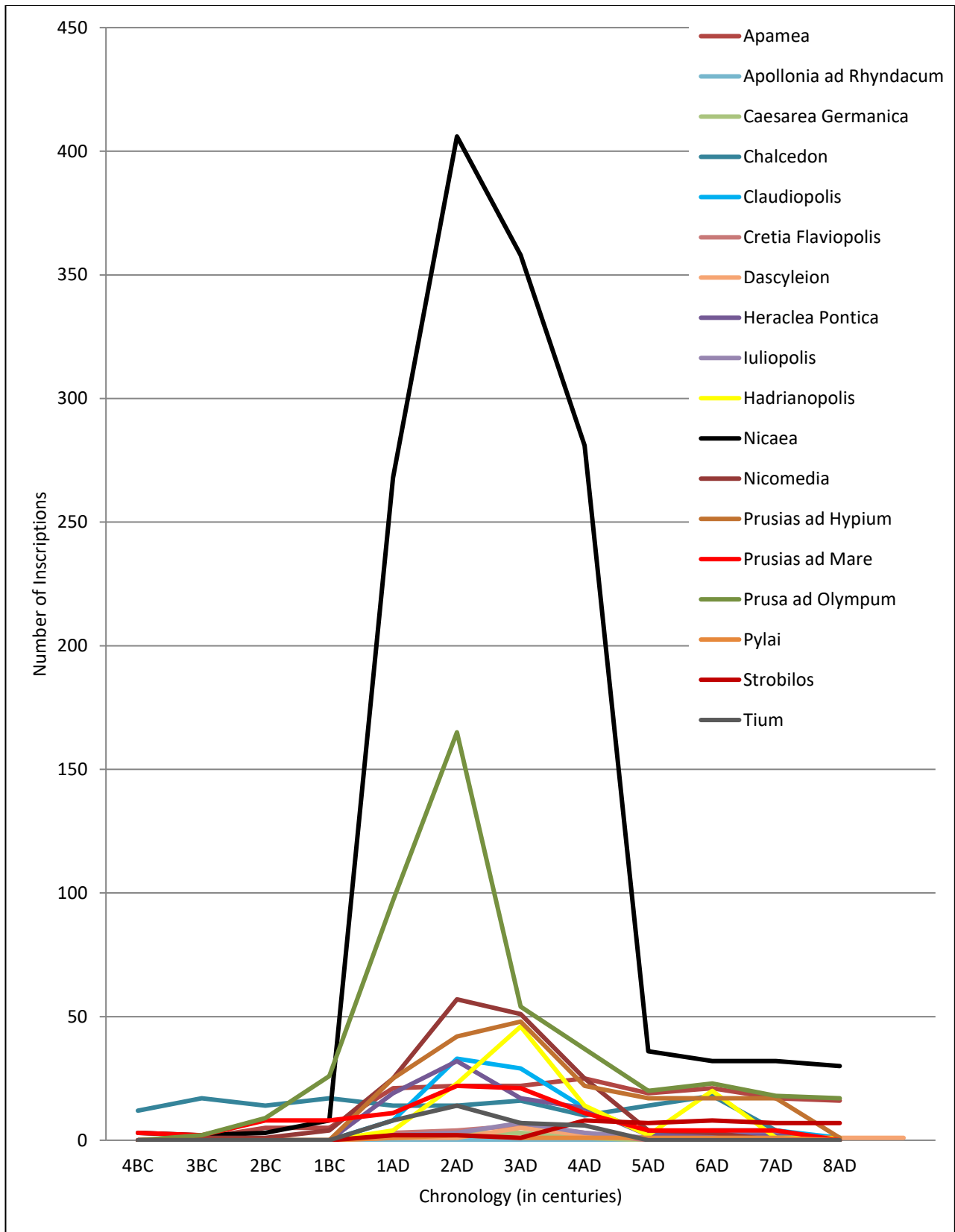


Figure 27: Overview of the Development of the Epigraphic Evidence in Each of the Analysed Centres

The line graph representing all the dated epigraphic evidence from the territory of Bithynia shows a moderate increase from the 4th until the 1st century BC, followed by a dramatic increase during the 1st and the 2nd century AD. The upright peak in the 2nd century AD is followed by a decrease in the period between the 3rd and the 5th century AD. The constant situation between the 5th and the 6th century AD is followed by a slight decline during the 7th and the 8th century AD.

A summary of the developmental tendencies

- Moderate increase: 4th – 1st century BC
- Dramatic increase: 1st – 2nd century AD
- **Peak: 2nd century AD**
- Dramatic decrease: 3rd – 5th century AD
- Stability: 5th – 6th century AD

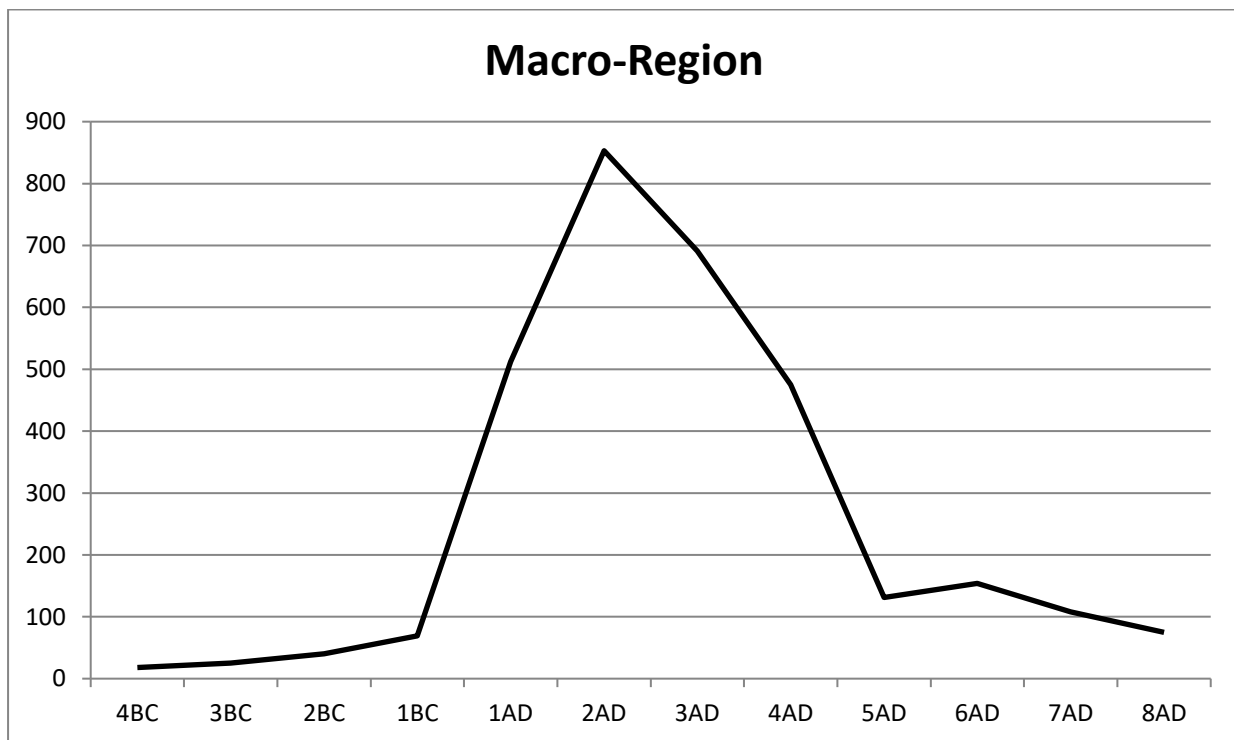


Figure 28: Temporal Analysis of Epigraphic Evidence in the Macro-Region

Conclusion

The quantified temporal analysis of the epigraphic evidence in the spatial context narrows down the peak of the development in the entire macro-region to the 2nd century AD. Nevertheless, in most of the places this peak is followed by a relatively balanced situation during the 3rd century AD, containing only slight decreases or increases in the numbers of the evidence. The peak during the 2nd century AD as shown on Figure 28 is caused by the considerably large assemblage encountered in the territory of *Nicaea*.

Considering the minor differences in evidence when comparing each centre separately, I include the cities of *Claudiopolis*, *Heraclea Pontica*, *Hadrianopolis*, *Nicaea*, *Nicomedia*, *Prusias ad Hypium*, *Prusias ad Mare*, *Prusa ad Olymum*, and *Tium* into one group which has its peak(s) during the 2nd and 3rd century AD. The decline then comes during the 4th century AD. Exceptions are represented by the territories of *Chalcedon*, *Apamea* and *Strobilos*. The development of *Chalcedon* does not encompass any identifiable peak and it had been in a considerably balanced economic situation throughout the entire researched time span. *Apamea* gained in importance during the 1st century AD and features stable evidence until the 8th century AD. *Strobilos* became an official port during the 4th century AD and, as well as *Chalcedon* and *Apamea*, remains stable in evidence until the 8th century AD.

How realistic is the picture of the economic development based on the epigraphic evidence? The developmental tendencies resulting from the entire assemblage I further enrich with an analysis of inscriptions that can be interpreted as directly connected with economic activities. These inscriptions are confronted with the present results and used for confirming or refuting the outcomes outlined in this chapter.

5. 5. Topical Analyses of Epigraphic Evidence

I examined the topics of the entire assemblage of 2,878 inscriptions with an aim to determine the epigraphic evidence conclusive for assessing the economic situation and development. Out of 2,878 inscriptions, merely 158 texts can be characterised as indicators of the economic growth and

attributed to five wide topics:⁴¹⁴ capital investments (99 inscriptions), demonstrations of trade (18 inscriptions), demonstrations of food / land divisions (four inscriptions), evidences of diverse professions (14 inscriptions) and evidences of rural settlements (32 inscriptions). Some of the inscriptions are relevant to more than one of the topics and appear in the following analyses several times.

Each single inscription represents a unique evidence concerning the economic affairs. However, the scarcity of the direct evidence does not allow us to solely base the developmental tendencies on this analysis. Instead, I use the results for underlying pertinent problems and developmental tendencies resulting from the spatial and temporal analyses.

I further explore the inscriptions in the framework of the defined topics. The discussed inscriptions are presented in tabular forms, for each topic separately.

5. 5. 1. Capital Investments

The group referring to the public buildings encompasses 99 inscriptions. The inscriptions revealed 20 public buildings⁴¹⁵ and 79 notes concerning the development, upkeep and maintenance of the road system. Out of these 79 records, 77 are milestones.⁴¹⁶ As the milestones encompass a unique and different type of information than the other inscriptions, I present them in a separate table (no. 16).

Table 15 shows 22 inscriptions. Altogether, the inscriptions describe 20 public buildings in nine cities and two building activities connected with the maintenance of the road system in the hinterland of *Nicaea*.

The inscriptions are listed based on an alphabetical order of places they appertain to. Classification of the sponsorship of each of the buildings follows H. L. Fernoux.⁴¹⁷

⁴¹⁴ The definition of topics related to the economy is based on Bowman – Wilson 2009, 3–84.

⁴¹⁵ For building inscriptions in general, see Lloris 2015a, 93 f.; Duncan-Jones 1990, 59 f.

⁴¹⁶ For milestones and their functionality in general, see Meyer 1973, 61–64; Lloris 2015a, 94.

⁴¹⁷ Fernoux 2004, 389 f.

Territory	Chronology	Type of Inscription	Type of Building	Financed by	Corpus, No.
<i>Apamea</i>	AD 128/9	honorific	public bath	Emperor Hadrian	IK Apameia (Bith.) u. Pylae, 4
<i>Apamea</i>	2 nd century AD	dedicatory (Asclepius)	stoa	notable C. Naevius Iustus	IK Apameia (Bith.) u. Pylae, 5
<i>Apollonia ad Rhyndacum</i>	AD 117–138	honorific	fortification wall (?)	Emperor Hadrian	JHS 17, 270, 11
<i>Chalcedon</i>	AD 450	honorific	shrine of martyr	notable Eufemios	IK Chalcedon, 22
<i>Claudiopolis</i>	AD 130–138	honorific	stadium	Emperor Hadrian	SEG 58: 1420
<i>Claudiopolis</i>	AD 117–138	Honorific, probably honorific	theatre	the city (?)	IK Klaudiopolis, 1. 2
<i>Nicaea</i>	AD 58/9	honorific/ building inscription	road	Emperor Nero	IK Iznik, 13
<i>Nicaea</i>	AD 70–72	all honorific	monumental gate	notable C. Cassius Chrestus	IK Iznik, 25. 26. 27. 28
<i>Nicaea</i>	AD 123	honorific	aqueduct	Emperor Hadrian	IK Iznik, 1
<i>Nicaea</i>	AD 123	honorific	bridge(s) for 'animals with four legs'	Emperor Hadrian	IK Iznik, 1
<i>Nicaea</i>	AD 119–138	honorific	aqueduct	Emperor Hadrian	IK Iznik, 55
<i>Nicomedia</i>	AD 117–138	probably honorific	nymphaeum	Emperor Hadrian	TAM IV, 10
<i>Nicomedia</i>	after AD 214/215	honorific	bath	Emperor Caracalla (restored by Diocletian)	TAM IV, 10
<i>Prusa ad Olympum</i>	N/A	honorific	stoa	notable	IK Prusa ad Olympum, 8
<i>Prusias ad Hypium</i>	AD 76–78	honorific	gymnasium	notable [Cla]udius Nestor	IK Prusias ad Hypium, 42
<i>Prusias ad Hypium</i>	2 nd century AD	honorific	aqueduct	notable P. Domitius Iulianus	IK Prusias ad Hypium, 19
<i>Prusias ad Hypium</i>	after AD 202	honorific	agora	notable M. Iulius Gavinus Sacerdos	IK Prusias ad Hypium, 20
<i>Prusias ad Hypium</i>	after AD 202	honorific	canalisation	notable M. Iulius Gavinus Sacerdos	IK Prusias ad Hypium, 20

Territory	Chronology	Type of Inscription	Type of Building	Financed by	Corpus, No.
<i>Prusias ad Hypium</i>	AD 202–211	honorific	bath of Domitian	notable M. Iulius Gavinius Sacerdos	IK Prusias ad Hypium, 20
<i>Prusias ad Hypium</i>	AD 211	honorific	avenue with colonnade and public square	notable M. Aurelius Philippianus Iason	IK Prusias ad Hypium, 9
<i>Prusias ad Hypium</i>	after AD 212	honorific	agora (?)	notable L. Aurelius Diogenianus Callicles	IK Prusias ad Hypium, 48
<i>Prusias ad Mare</i>	AD 138–180	honorific	temple of Zeus	notable	IK Kios, 15

Table 15: Capital Investments I – Building Activities except Milestones

Character and chronology of the assemblage

Out of 20 documented constructions of public buildings, 11 date to the 2nd century AD and eight of the 11, specifically, to the reign of the Emperor Hadrian.⁴¹⁸ The steep increase of investments during the time of Hadrian was, most likely, connected with the necessary repairs after the devastating earthquake dated to about AD 121.⁴¹⁹ The assemblage revealed 12 buildings which were financed by local notables, confirming the existence of considerably rich and reputable persons living in the cities.

Examining the inscription from each city separately, *Apamea* revealed two inscriptions, both dated to the 2nd century AD. The building of the public bath was initiated and financed by the Emperor Hadrian, the stoa by the local notable C. Naevius Iustus. The inscription found in *Apollonia ad Rhynadum* is a testimony of the munificent patronage of Hadrian. It was dedicated to Hadrian by a grateful community and built into a fortification wall. Although it does not further specify Hadrian's sponsorship, it is most likely connected with the (re)construction of the fortification. The stadium and the theatre built in *Claudiopolis* are congruently dated to the reign of Hadrian.

⁴¹⁸ For the imperial policy concerning capital investments in buildings destroyed by natural catastrophes, see Winter 1996, 94–108 and for the time of the Emperor Hadrian in particular, see 90. 95 f.

⁴¹⁹ Eusebius Chronicle Canon 780.

Nicaea revealed more heterogeneous record. The earliest record dates to the time of the Emperor Nero and it is one of the two inscriptions concerning the maintenance of the road system. The following evidence, dated as well to the second half of the 1st century AD, confirms the construction of a monumental town gate financed by the local notable C. Cassius Chrestus. Three more inscriptions found in *Nicaea* are connected with building activities during the reign of Hadrian. Two of them mention aqueducts and one describes a construction of bridge(s). Based on the description, the bridge should enable to cross the river to four-footed animals. This description means that it was a considerably wide bridge(s), most likely situated on the supra-regional 'Pilgrim's road'.⁴²⁰

Construction activities in *Nicomedia* are documented by two inscriptions mentioning a nymphaeum built during the reign of Hadrian and a bath built almost a century later, during the reign of the Emperor Caracalla.

Prusa ad Olympum revealed mere one inscription confirming the building of a stoa financed by a local notable, unfortunately missing chronological information. The evidence in *Chalcedon* brought to light one inscription dated to AD 450 and mentioning the building of a shrine of martyr financed by the local notable Eufemios.

An outstanding number of seven different public buildings is confirmed by the epigraphic evidence found in *Prusias ad Hypium*. The building of a gymnasium is dated to the 2nd half of the 1st century AD, the aqueduct to the 2nd century AD. The remaining five inscriptions date to the beginning of the 3rd century AD and they include two repairs of an agora, the construction of a canalisation, a bath of Domitian and an avenue with colonnade and public square. Interestingly, all the public buildings were financed by the local notables (see Table 15).

The honorific inscription found in *Prusias ad Mare* confirms investments in the Temple of Zeus by a local notable and it is dated to the reign of Antoninus Pius or Marcus Aurelius.

⁴²⁰ According to the archaeological remains, there were two bridges situated north / NE of *Nicaea* and, possibly, both of them were (re)constructed during the reign of Hadrian. For a detailed discussion concerning the chronology of the construction phases of the bridges, see Weissová – Pavúk 2016, 16.

The evidence from the entire Asia Minor features the same characteristics. The building activities confirmed by epigraphic evidence peak in the middle of the 2nd century AD and the evidence drops markedly after the Severan period.⁴²¹

The second Table 16 encompasses 77 milestones, confirming the building, upkeep and maintenance of roads. Their order follows numbering used by D. H. French.⁴²² The table encompasses an actual find spot of each milestone followed by the information concerning its archaeological context (reused / found *in situ*). Next follows the *caput viae* and the related distance in miles from the town as introduced on the milestone itself. The chronology is divided into the possible earliest and latest dates the milestone can be dated to.

Spot	Reuse	Caput Viae	Distance (miles)	Chronology Start / End (AD)	ID French 2013
Bursa	N/A	<i>Prusa ad Olympum</i>	N/A	78 / 78	1
Beşevler	N/A	<i>Prusa ad Olympum</i>	4	197 / 198	2
Aşağı Ihsaniye	Y	N/A	N/A	78 / 78	4a
Aşağı Ihsaniye	N/A	N/A	N/A	N/A	4b
Yukarı Ihsaniye	N/A	<i>Tium</i>	8	140 / 141	5a
Yukarı Ihsaniye	N/A	<i>Tium</i>	8	197 / 198	5b
Bartın	N/A	<i>Amastris</i>	N/A	197 / 198	6
Çaycuma	N/A	<i>Tium</i>	15	313 / 317	17a
Çaycuma	Y	<i>Tium</i>	8	293 / 305	17b
Çaycuma	Y	<i>Tium</i>	8	213 / 217	17c
Çaycuma	Y	<i>Tium</i>	8	249 / 306	17d
Yenişehir	N/A	<i>Nicaea</i>	6	235 / 238	23
Gemlik	Y	<i>Prusias ad Mare</i>	1	251 / 253	25
Mustafalı	N/A	<i>Nicaea</i>	9	249 / 250	27
Mamcalar	N/A	<i>Nicaea</i>	N/A	128 / 128	28
Darıyeriyörükler	N/A	<i>Claudiopolis</i>	N/A	114 / 114	33
Karaköy	Y	<i>Claudiopolis</i>	8	218 / 218	34
Bolu	Y	<i>Claudiopolis</i>	7	249 / 250	35a
Bolu	N/A	<i>Claudiopolis</i>	N/A	305 / 306	35b
Gökçesu	N/A	<i>Cretia Flaviopolis</i>	N/A	222 / 222	36
Düzağaç	Y	N/A	N/A	293 / 305	37
Kadiköy	Y	<i>Chalcedon</i>	N/A	293 / 305	61
Gebze	Y	<i>Nicomedia</i>	31	239 / 239	62

⁴²¹ For a summary of the development, see Russell 2013, 17.

⁴²² For a detailed list of the milestones, including the separate description of each of them, see French 2013.

Spot	Reuse	Caput Viae	Distance (miles)	Chronology Start / End (AD)	ID French 2013
Gebze, Dil Deresi	N/A	<i>Nicomedia</i>	22	239 / 239	63a
Gebze, Dil Deresi	N/A	<i>Nicomedia</i>	23	239 / 239	63b
Gebze, Dil Deresi	N/A	<i>Nicomedia</i>	23	244 / 249	63c
Gebze, Dil Deresi	N/A	<i>Nicomedia</i>	22	253 / 253	63d
Gebze, Dil Deresi	N/A	<i>Nicomedia</i>	24	260 / 260	63e
Gebze, Dil Deresi	N/A	<i>Nicomedia</i>	N/A	275 / 275	63f
Gebze, Dil Deresi	N/A	<i>Nicomedia</i>	22	293 / 305	63h
Yarımca, Şirin Yalısı	Y	<i>Nicomedia</i>	N/A	115 / 116	64
Izmit	Y	<i>Nicomedia</i>	N/A	197 / 198	65a
Izmit	Y	<i>Nicomedia</i>	N/A	200 / 222	65b
Köse, Reşit Bey Çiftlik	Y	<i>Nicomedia</i>	1	115 / 116	66
Orhaniye	N/A	N/A	N/A	N/A	67
Izmit	N/A	<i>Nicaea</i>	N/A	238 / 244	68
Karadin	Y	<i>Nicaea</i>	N/A	293 / 305	69
Osmaneli (Lefke)	Y	<i>Nicaea</i>	17	N/A	70
Paşalar	N/A	N/A	N/A	N/A	71
Medetli	In Situ	<i>Nicaea</i>	25	293 / 305	72a
Medetli	Y	<i>Nicaea</i>	25	337 / 340	72b
Medetli	Y	<i>Nicaea</i>	N/A	114 / 114	72c
Üyük	Y	<i>Nicaea</i>	27	N/A	73a
Üyük	N/A	<i>Nicaea</i>	26	293 / 305	73b
Karaagaç	Y	<i>Nicaea</i>	28	N/A	74
Gölpazarı, Dikenli Geçit	N/A	<i>Nicaea</i>	32	197 / 198	75a
Gölpazarı, Dikenli Geçit	Y	N/A	N/A	N/A	75b
Gölpazarı, Dikenli Geçit	Y	N/A	N/A	N/A	75c
Gölpazarı, Dikenli Geçit	N/A	N/A	N/A	N/A	75d
Gölpazarı, Dikenli Geçit	N/A	N/A	N/A	N/A	75e
Gölpazarı, Dikenli Geçit	N/A	N/A	N/A	N/A	75f
Aktaş, Beşevler	N/A	<i>Nicaea</i>	N/A	337 / 367	76
Beşevler	N/A	<i>Nicaea</i>	N/A	293 / 305	77
Gölpazarı, Mezarlık	Y	<i>Nicaea</i>	N/A	N/A	78a
Gölpazarı, Mezarlık	Y	<i>Nicaea</i>	N/A	N/A	78b
Çımışkı	Y	N/A	N/A	N/A	79
Doğancılar	Y	<i>Nicaea</i>	40	293 / 305	80
Sarıhacılar	Y	<i>Nicaea</i>	N/A	337 / 340	81
Gökçeözü	Y	<i>Nicaea</i>	N/A	364 / 367	82
Duman	Y	<i>Nicaea</i>	N/A	337 / 340	83
Narzanlar	Y	N/A	N/A	N/A	84a
Narzanlar	Y	N/A	N/A	N/A	84b
Kayabaşı	N/A	<i>Nicaea</i>	N/A	364 / 367	85
Çay	Y	<i>Nicaea</i>	64	244 / 244	86a

Spot	Reuse	Caput Viae	Distance (miles)	Chronology Start / End (AD)	ID French 2013
Çay	Y	<i>Nicaea</i>	64	218 / 222	86b
Çay	Y	N/A	N/A	N/A	86c
Himmetoğlu	Y	<i>Nicaea</i>	N/A	361 / 363	87a
Himmetoğlu	Y	<i>Nicaea</i>	N/A	218 / 222	87b
Bölücekova	N/A	N/A	N/A	N/A	88a
Bölücekova	Y	<i>Nicaea</i>	N/A	337 / 340	88b
Bölücekova	N/A	<i>Nicaea</i>	N/A	364 / 367	88c
Ahmetbeyler	Y	<i>Nicaea</i>	69	293 / 367	89
Subaşı (Çive)	N/A	N/A	N/A	N/A	90
Sobran	N/A	<i>Iuliopolis</i>	N/A	215 / 216	91
Çayırhan	In Situ	<i>Iuliopolis</i>	9	215 / 216	92
Çayırhan	In Situ	<i>Iuliopolis</i>	5	215 / 216	93
Çayırhan	In Situ	<i>Iuliopolis</i>	8	215 / 216	94

Table 16: Capital Investments II - Milestones

Character and chronology of the assemblage

The considerably high number of dated inscriptions represented by 58 out of 77 in total enables their temporal analysis. Moreover, the inscription concerning the road building and listed in Table 15 falls within this assemblage and, therefore, it is included in the temporal analysis of the investments in the road system. One of the milestones, in the table enlisted as the first one (French 01), was published by T. Corsten⁴²³ in a special group. T. Corsten excluded it from milestones and published it as the epigraphic evidence concerning the activities connected with the building of the road, since the inscription was found carved into a rock above the road and not, as usual in case of the milestones, carved into a slab of stone standing next to the road. However, since the inscription encompasses all the data usually carved on milestones, I include it in the group of milestones.

The line graph Figure 29 shows the chronology of the dated milestones and it includes also the investment in bridge(s) during the reign of the Emperor Hadrian (see above).

⁴²³ Corsten 1991b, 22 (IK Prusa ad Olympum, no. 9).

A summary of the developmental tendencies

- The first moderate increase: 2nd half of the 1st century AD
- The second sharper increase: 2nd half of the 2nd century AD
- Dramatic increase: 2nd half of the 3rd century AD
- **Peak: 2nd half of the 3rd – beginning of the 4th century AD**
- The ultimate decrease: mid of the 4th century AD

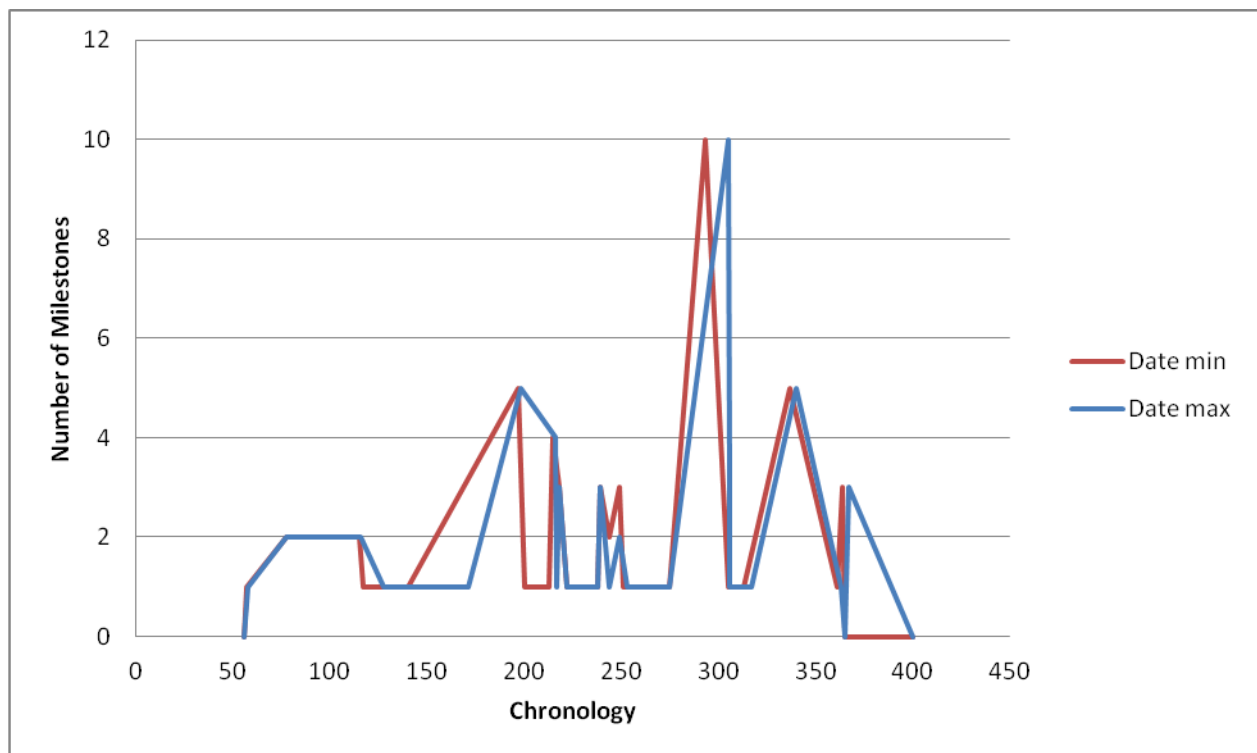


Figure 29: Chronological Time Span of Investments in the Road System in the Macro-Region

The chronology of milestones indicates several identifiable sharp increases of the investments in the road system. The first appears during the 1st century AD,⁴²⁴ then another during the second half of the 2nd century AD and the beginning of the 3rd century AD. The peak falls within the end of the 3rd century AD, and the last investments in the road system documented on milestones are dated to around the middle of the 4th century AD.

⁴²⁴ The first repairs are connected with the name of the financial procurator of Bithynia L. Antonius Naso. The procurator was, in all probability, asked by the Emperor Vespasian to take care of the roads in the region (Pekáry 1968, 80 f.).

As shown by the temporal analysis, the investments in the road system feature the main peak a century later than the epigraphic evidence in general. As the milestones mention the name of the particular emperor responsible for the building, upkeep and maintenance of the road, the data allows for tracking the investments during the reigns of the respective emperors.

Although the milestones were, for the most part, not found *in situ*, I assume they were not shifted more than several kilometres from their original position. Thus, their spatial distribution roughly outlines courses of the roads they once stood along. When combined with the chronology offered by the dated milestones, they allow for following the capital investments in the spatial environment. As the proper spatio-temporal analysis of the road system requires reconstructions of the roads, including remains of actual road pavements, bridges and considerations of route alterations due to environmental changes, it cannot be based on the study of the epigraphic evidence alone. The reconstruction and further spatial and temporal analyses of the road system are assessed in a separate chapter.⁴²⁵

5. 5. 2. Evidence of Trade

The following group of 18 inscriptions encompasses all the texts that can be connected with trading activities. Out of 18, ten encompass occupations directly related to the trade, five consider decrees resulting from the trade, two concern regulations of the trade and the remaining one confirms the existence of an *emporion* in *Nicomedia*.

The inscriptions in Table 17 are listed in an alphabetical order based on the places they belong to and, in the case of more inscriptions per one centre, in a chronological order.

Territory	Chronology	Type / Keyword	Interpretation	Corpus, No.
<i>Chalcedon (Hieron)</i>	4 th century BC	regulation / trade	Borysthenes regulations of trade	IK Kalchedon, 16
<i>Nicomedia</i>	N/A	funerary / <i>naukleros</i>	ship-owner and merchant	TAM IV, 1, 304
<i>Nicomedia</i>	AD 69–79	regulation / <i>naukleros</i>	regulation concerning ship-owners and merchants	TAM IV, 1, 22

⁴²⁵ For a detailed study of the road system, see Chapter 7.

Territory	Chronology	Type / Keyword	Interpretation	Corpus, No.
<i>Nicomedia</i>	2 nd century AD	funerary / <i>naukleros</i>	ship-owner and merchant	SEG 29, 1346
<i>Nicomedia</i>	3 rd – 4 th century AD	funerary / <i>emporion</i>	emporion of Nicomedia in Kalos Agros	SEG 37, 1072
<i>Nicomedia</i>	N/A	funerary / <i>naukleros</i>	ship-owner and merchant	SEG 32, 1256
<i>Nicomedia</i>	N/A	funerary / <i>naukleros</i>	ship-owner and merchant	SEG 32, 1257
<i>Nicomedia</i>	N/A	funerary / <i>naukleros</i>	ship-owner and merchant	TAM IV, 1, 127
<i>Nicomedia</i>	N/A	funerary / <i>naukleros</i>	ship-owner and merchant	TAM IV, 1, 195
<i>Nicomedia</i>	N/A	funerary / <i>naukleros</i>	ship-owner and merchant	TAM IV, 1, 197
<i>Prusias ad Hypium</i>	AD 193–211	phyle decree / olive oil trade	oil economy, sources of income	IK Prusias ad Hypium, 13
<i>Prusias ad Hypium</i>	2 nd century AD or later	phyle decree / olive oil trade	oil economy, sources of income	IK Prusias ad Hypium, 46
<i>Prusias ad Hypium</i>	AD 202–212	phyle decree / olive oil trade	oil economy, sources of income	IK Prusias ad Hypium, 1
<i>Prusias ad Hypium</i>	AD 211	phyle decree / olive oil trade	oil economy, sources of income	IK Prusias ad Hypium, 9
<i>Prusias ad Hypium</i>	After AD 212	decree / <i>emporion</i>	revenues from emporion of Prusias, Damatrios took part in establishing it and secured the revenues	IK Prusias ad Hypium, 29
<i>Prusias ad Mare</i>	N/A	funerary / <i>naukleros</i>	ship-owner and merchant	IK Kios, 71
<i>Tium</i>	AD 200–250	funerary / <i>naukleros</i>	ship-owner and merchant	CIRB, 732
<i>Tium</i>	N/A	funerary / <i>naukleros</i>	ship-owner and merchant	EtAnat 272, 1

Table 17: Epigraphic Evidence Pertain to Demonstrations of Trade

Character and chronology of the assemblage

Out of the 18 inscriptions, ten are dated. The following text examines the records territory by territory, places them into particular context of each of the cities and collates the curve of the development resulting from the quantification of the assemblage in bulk as performed above.

The single inscription found in *Hieron*, which is in the area of *Chalcedon*, regulates the trade and dates to the 4th century AD. As the entire evidence from *Chalcedon*, it does not fall in the pre-defined peak of the 2nd century AD.

The funerary inscriptions found in *Tium* confirm the existence of ship-owners and merchants in the territory. Only one of the two is dated, notably to the 1st half of the 3rd century AD.

The epigraphic evidence from *Nicomedia* is considerably richer, including nine inscriptions. All the documents concern the sea-trade: regulations of ship-owners and merchants come from the second half of the 1st century AD and the inscription documenting the existence of an *emporion* belonging to *Nicomedia* is dated to the 3rd and 4th century AD. The remaining seven are funerary monuments, all belonging to ship-owners and merchants. Unfortunately, only one of those seven is dated, notably to the 2nd century AD. The case of *Nicomedia* shows the importance of the sea-trade in the territory, which might be interpreted as one of the main drivers of growth in the area of the city.

The evidence from *Prusias ad Hypium* includes five inscriptions; four of them document the production of oil as a commodity of the trade and one confirms the connection of *Prusias ad Hypium* with its *emporion* situated at the Black Sea shore. As all the decrees come from the territory of one city, they provide an insight into the source of the city's income. It is likely that oil was an important commodity produced in the territory of *Prusias ad Hypium*. Such a specialised industry indicates a specialized market;⁴²⁶ on the one hand an essentially positive aspect, on the other hand, high specialization of a local market often leads to a lack of manpower in other branches of the agricultural production. In extreme cases, the territory and its inhabitants are dependent on imports of other products and such a dependency frequently eventuates in famines. Based on the epigraphic evidence examined in Chapter 5. 5. 3. below, it is exactly the case of *Prusias ad Hypium*. The chronological time span of the assemblage falls within the end of the 2nd and the beginning of the 3rd century AD and it coincides with the outlined peak.

The last group of two inscriptions belongs to the territory of *Tium*. The port situated at the eastern border of the analysed macro-region revealed one funerary inscription of a ship-owner and

⁴²⁶ Erdkamp 2015, 20–22.

a merchant, unfortunately not dated. The other inscription of the same kind dates to the 1st half of the 3rd century AD and it was found in *Panticapaeum*. It is included in the assemblage since the inscription is dedicated to a *‘Τιανός ναύκληρος’*. Moreover, the text further informs that the funerary *stela* was sent by the parents of the deceased from *Tium*. Thus, it is directly connected with the economy of the town itself and shows the richness of the family, wealthy enough to send the inscription across the Black Sea to honour their descendant.⁴²⁷

The number of inscriptions does not allow reconstructing any developmental tendencies. Each inscription is to be taken as a single confirmation of the existence of the mentioned activity *per se*.

5. 5. 3. Demonstrations of Food / Land Distributions

All the inscriptions documenting the distribution of food and / or land come from *Prusias ad Hypium*. One of them refers to an analogous situation in *Nicomedia*.

Territory	Chronology	Type / Keyword	Interpretation	Corpus, No.
<i>Prusias ad Hypium</i>	2 nd century AD	<i>phyle</i> decree / distribution of food	distribution of food to those in need	IK Prusias ad Hypium, 19
<i>Prusias ad Hypium (Nicomedia)</i>	2 nd / 3 rd century AD	<i>phyle</i> decree / division of land	Titus Ulpius Aelianus Papianus divided land (as it was already happening in <i>Nicomedia</i>) and gave 2 nomas (fields) to selected people living outside the city	IK Prusias ad Hypium, 17
<i>Prusias ad Hypium</i>	2 nd century AD	<i>phyle</i> decree / distribution of food	distribution of grain, oil, wine and silver to those in need	IK Prusias ad Hypium, 18
<i>Prusias ad Hypium</i>	after AD 212	<i>phyle</i> decree / division of land	division of food (might be also land) from own sources to prevent riots due to hunger and famine	IK Prusias ad Hypium, 6

Table 18: Epigraphic Evidence Pertain to Demonstrations of Food / Land Divisions

⁴²⁷ For a further discussion on *Tium* and its relations with the cities along the Black Sea shore documented in epigraphic evidence, see Robert 1977, 59–62.

Character and chronology of the assemblage

Out of four in total, three inscriptions document imminent famines forestalled by distributing food to those in need. Beyond the unstable situation in the territory, these documents testify to the existence of reserves in city / state granaries that can provide food to inhabitants in case of a shortage. The sufficient reserves are an indicator of a generally good economic situation in the territory.

The last inscription found in *Prusias ad Hypium* documents the division of the land performed outside the city, referring to the exact number, i.e. two *nomas*, allotted to selected inhabitants. Based on the text, an analogous situation took place in the territory of *Nicomedia*. The inscription documents the tendency of distributing the state land to private owners. This activity points towards an increasing support of local and regional economies. It is not clear if the text of the inscription refers to the situation during another famine or, rather, to a genuine tactic of dealing with the state lands. More likely, as the other three inscriptions directly mention the imminent famines, this one in fact refers to a state policy in general.

Since the chronological time span of the assemblage falls within the 2nd century AD and the end of the 2nd and the beginning of the 3rd century AD, it agrees with the peak of dated epigraphic evidence analysed *en masse*.⁴²⁸

5. 5. 4. Evidence of Diverse Professions

The group includes 14 inscriptions pointing to five diverse professions. All the professions are mentioned on funerary monuments. The number is not sufficient to be used for an analysis of different labours in the centres; however, it may serve as a simple documentation of their existence and the possible above-average economic situation of people holding the mentioned offices. Their sequence in the list follows the alphabetical order of pertinent centres.

Territory	Chronology	Type / Keyword	Interpretation	Corpus, No.
<i>Nicaea</i>	N/A	funerary / <i>lachanopoles</i>	greengrocer	IK Iznik, 197
<i>Nicaea</i>	N/A	funerary / <i>artopoles</i>	baker	IK Iznik, 553

⁴²⁸ As presented in Chapter 5. 4.

Territory	Chronology	Type / Keyword	Interpretation	Corpus, No.
<i>Nicomedia</i>	2 nd century AD	funerary / <i>naukleros</i>	ship-owner and merchant	SEG 29, 1346
<i>Nicomedia</i>	N/A	funerary / <i>naukleros</i>	ship-owner and merchant	SEG 32, 1256
<i>Nicomedia</i>	N/A	funerary / <i>naukleros</i>	ship-owner and merchant	TAM IV, 1, 110
<i>Nicomedia</i>	N/A	funerary / <i>naukleros</i>	ship-owner and merchant	SEG 32, 1257
<i>Nicomedia</i>	N/A	funerary / <i>naukleros</i>	ship-owner and merchant	TAM IV, 1, 127
<i>Nicomedia</i>	N/A	funerary / <i>naukleros</i>	ship-owner and merchant	TAM IV, 1, 195
<i>Nicomedia</i>	N/A	funerary / <i>naukleros</i>	ship-owner and merchant	TAM IV, 1, 197
<i>Nicomedia</i>	N/A	funerary / <i>erioples</i>	wool merchant	TAM IV, 1, 174
<i>Prusias ad Hypium</i>	N/A	funerary / <i>kreopoles</i>	butcher family	IK Prusias ad Hypium, 108
<i>Prusias ad Mare</i>	N/A	funerary / <i>naukleros</i>	ship-owner and merchant	IK Kios, 71
<i>Tium</i>	AD 200–250	funerary / <i>naukleros</i>	ship-owner and merchant	CIRB, 732
<i>Tium</i>	N/A	funerary / <i>naukleros</i>	ship-owner and merchant	EtAnat 272, 1

Table 19: Epigraphic Evidence Pertain to the Evidence of Diverse Professions

Character and chronology of the assemblage

The dataset indicates that the most frequent profession documented on funerary inscriptions was a ship-owner and merchant. Out of ten, seven come from the territory of *Nicomedia*, two from *Tium*⁴²⁹ and one was found in *Prusias ad Mare*. *Nicomedia* and *Prusias ad Mare* are situated at the shore of the Marmara and the territory of *Nicomedia* encompasses the shore of the Black Sea as well. *Tium* lies at the Black sea coast. The evidence from *Nicaea* documents the professions of a greengrocer and a baker, whereas the funerary monument of a butcher's family was found in *Prusias ad Hypium*. *Nicaea* and *Prusias ad Hypium* are both situated inland.

Naturally, the preserved epigraphic evidence does not document all the existing professions. It merely shows that the inhabitants involved in the mentioned activities could afford an inscribed funerary monument. The division of labour itself is encouraged by the concentration of the demand evoked by cities providing large central markets, with institutions reducing the transaction costs and supporting the exchange.⁴³⁰ The division of labour can be taken as a direct consequence of the prosperous urbanization. However, the existence of several inscriptions mentioning diverse profession during the Roman Imperial period does not mean that these

⁴²⁹ One of them was found in *Pantikapaion*, for details see above in Chapter 5. 5. 2.

⁴³⁰ Wilson 2011, 162.

professions only appear during that time. The division of labour is a necessary precondition already during an inception of the city and the more prosperous the city is, the more specialized professions it requires and enables.

Analysing the nature of the documented professions, 11 out of 14 are not directly connected with the food production.⁴³¹ Thus, these people lived from the surplus of those who produced food. Such a phenomenon confirms the existence of a developed agriculture which produces more food by one person than the family can consume.

Out of the 14 inscriptions, only two are dated. The time span covers the 2nd and 1st half of the 3rd century AD. Although the chronology corroborates the outlined peak, the assemblage is too small to allow any further observations concerning the development.

5. 5. 5. Rural Settlements

The urbanization of Bithynia is documented in an abundant assemblage of ancient literary sources⁴³² complemented by actual remains found in the terrain; although not all the remnants were excavated, they are still visible above the surface and possible to be rectified *in situ*. A comparable situation concerns road stations described in *Itineraria*,⁴³³ though they are not always safely identifiable in the terrain, and their allocations often change based on changing reconstructions of routes of the Roman roads.

The situation concerning rural settlements is fundamentally different. There are no direct literary sources mentioning allocations or numbers of rural settlements in the territory. Since there is no systematic archaeological survey, the evidence of the settlements is insufficient and, for the most part, accidental. The epigraphic evidence provides an opportunity to enrich the assemblage with confirmed rural settlements. The following Table 20 shows 32 inscriptions found in the macro-region which mention names of *chorai*, i.e. of villages situated in the area. Based on the find spots of the inscriptions, travellers as well as researchers focusing on epigraphic evidence roughly localised the ancient villages. Although not precisely allocated, their affiliation to particular urban

⁴³¹ For more details on the topic, see Erdkamp 2014, 253–255.

⁴³² For more details, see Chapter 2. 1. 2.

⁴³³ For a detailed information concerning the *Itineraria*, see Chapter 7.2.

settlements, as listed below, is without any doubt. The kind of epigraphic evidence mentioning the rural settlements is diverse, including for the most part funerary and dedicatory inscriptions. Since the original purpose of the inscriptions is not relevant in the present analysis, I do not further dwell on it.

The names of the villages are divided based on their distribution to the urban centre and ordered alphabetically according to the name of the centre.

Territory	Rural settlement name	Chronology	Source
<i>Nicaea</i>	Eirakla	Roman	IK Iznik, 1331
<i>Nicaea</i>	Kizoura	Roman	TAM IV, 1, 57; EpigrAnat 3, 106, 1
<i>Nicaea</i>	Mossynea	Roman	IK Iznik, 1206
<i>Nicaea</i>	Oka	Roman	BCH 24, 415–416, 112 ⁴³⁴
<i>Nicaea</i>	Ontoraita	Roman	IK Iznik, 27
<i>Nicaea</i>	Ploketta	Roman	IK Iznik, 21
<i>Nicaea</i>	Syllanta	Roman	IK Iznik, 1127
<i>Nicomedia</i>	Arbeila	Roman	TAM IV, 1, 326
<i>Nicomedia</i>	Baradendromia	Roman	TAM IV, 1, 100
<i>Nicomedia</i>	Byzapena	Roman	TAM IV, 1, 72
<i>Nicomedia</i>	Chelaita	Roman	TAM IV, 1, 102
<i>Nicomedia</i>	Desa	Roman	TAM IV, 1, 243
<i>Nicomedia</i>	Kalasyrta	Roman	TAM IV, 1, 66; Şahin 1974, 90
<i>Nicomedia</i>	Kassa	Roman	TAM IV, 1, 117
<i>Nicomedia</i>	Koubaita	Roman	TAM IV, 1, 56
<i>Nicomedia</i>	Kypra	Roman	TAM IV, 1, 267
<i>Nicomedia</i>	Leptoia	Roman	TAM IV, 1, 329
<i>Nicomedia</i>	Morzapena	Roman	TAM IV, 1, 65
<i>Nicomedia</i>	Nerola	Roman	TAM IV, 1, 87
<i>Nicomedia</i>	Triknaita / Pentephyle	Roman	TAM IV, 1, 269
<i>Nicomedia</i>	Petrozetoï	Roman	TAM IV, 1, 60
<i>Nicomedia</i>	Prepa	Roman	TAM IV, 1, 231
<i>Nicomedia</i>	Prindea	Roman	TAM IV, 1, 23
<i>Nicomedia</i>	Psarela	Roman	TAM IV, 1, 51
<i>Nicomedia</i>	Soka	Roman	TAM IV, 1, 249
<i>Nicomedia</i>	Tenba	Roman	TAM IV, 1, 68

⁴³⁴ The find-spot cannot be safely identified (Ruge 1937). Mendel (1900, 415 f.) describes the place as Hammalar, a village lying between Tarakly (*Dableis*) and Bolu (*Bithynion, Claudiopolis*). Since I was not able to localise the village, I adopt the identification published in the Barrington Atlas which puts the Roman village Oka to the modern village Harmanlar (Foss 2000a, 790). However, the place does not fit to the Mendel's description of the geography (Mendel 1900, 412).

Territory	Rural settlement name	Chronology	Source
<i>Nicomedia</i>	(Tes)Deramoska	Roman	TAM IV, 1, 19
<i>Nicomedia</i>	Trikomia	Roman	TAM IV, 1, 95
<i>Nicomedia</i>	Sirkanos	Roman	TAM IV, 1, 49
<i>Prusias ad Hypium</i>	Kelesa (emporion)	Roman	BE 1963, 178, 264
<i>Prusias ad Mare</i>	Charmidea	Roman	IK Kios, 10. 11
<i>Prusias ad Mare</i>	Pratomysia	2 nd century AD	SEG 41: 1102; EpigrAnat 17, 81–87, 1

Table 20: Names of Rural Settlements on Epigraphic Evidence

Character and chronology of the assemblage

The group of 32 names mentioned in the inscriptions can be classified into four territories of cities. The largest is the territory of *Nicomedia*, encompassing 22 inscriptions, followed by *Nicaea* with seven inscriptions and then considerably smaller assemblages in *Prusias ad Mare* (two inscriptions) and *Prusias ad Hypium* (merely one piece of evidence).

The numbers of inscriptions can be taken neither as final numbers of rural settlements, nor can be used for a comparative analysis between the regions. Their existence solely confirms the existence of a minimum number of rural settlements. However, their value lies in the fact that inhabitant(s) of the rural settlements mentioned in the epigraphic evidence could afford the production of an inscription. These villages were rich enough to produce an essential surplus.

This approach points out the territory of *Nicomedia* as the richest one, followed by *Nicaea*. Considering the smaller number of documented settlements in *Nicaea* and the extension of its territory, exceeding twice the area of *Nicomedia*, the difference between the two centres is actually larger than it appears on the first place.

The entire assemblage of 32 inscriptions is dated to the Roman period. A more precise chronology is unfortunately not possible. Nevertheless, the assemblage confirms the favourable situation in the territory of *Nicomedia* during the Roman period, followed by *Nicaea*.

5. 5. 6. Quantified Spatial and Temporal Analysis

Temporal analyses performed in each centre separately (Figure 30) can be also used to outline the numbers of epigraphic evidence directly connected with the economic development in the entire macro-region.

The peak values of evidences from *Nicomedia*, *Nicaea* and *Prusias ad Hypium* are clearly identifiable, but the lower values culminate in the bottom of the graph and do not allow for an unambiguous separation one from another. Analogous to the quantification of epigraphic evidence *en masse*, the graph of the inscriptions connected with economic activity shows no outstanding outliers. Therefore, it enables to perform the joint analysis, without somehow fundamentally corrupting the dataset. All the data falling within each century are added up to the line graph in the Figure 31, summing up the overall tendency in the macro-region.

The line graph represents all the dated epigraphic evidence that can be directly connected with the economic development. The graph shows a dramatic increase from the 1st to the 3rd century AD, followed by a dramatic decrease during the 4th and the 5th century AD. The upright peak falls within the 3rd century AD. A constant situation can be observed from the 5th century AD onwards.

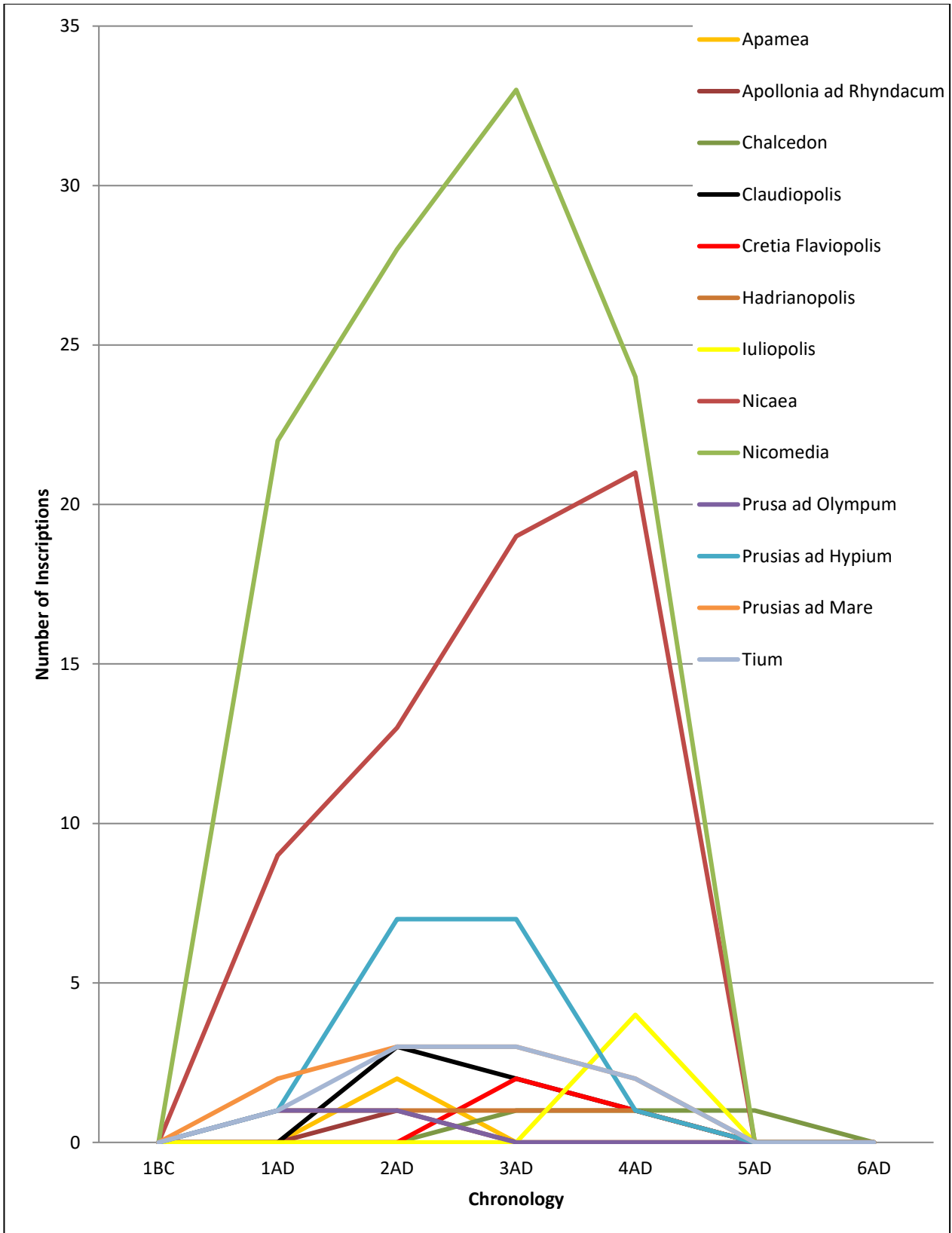


Figure 30: Overview of the Epigraphic Evidence Directly Connected with Economic Development in each of the Analysed Centres

A Summary of the developmental tendencies

- Dramatic increase: 1st – 3rd century AD
- **Peak: 3rd century AD**
- Slight decrease: 4th century AD
- Dramatic decrease: 5th century AD

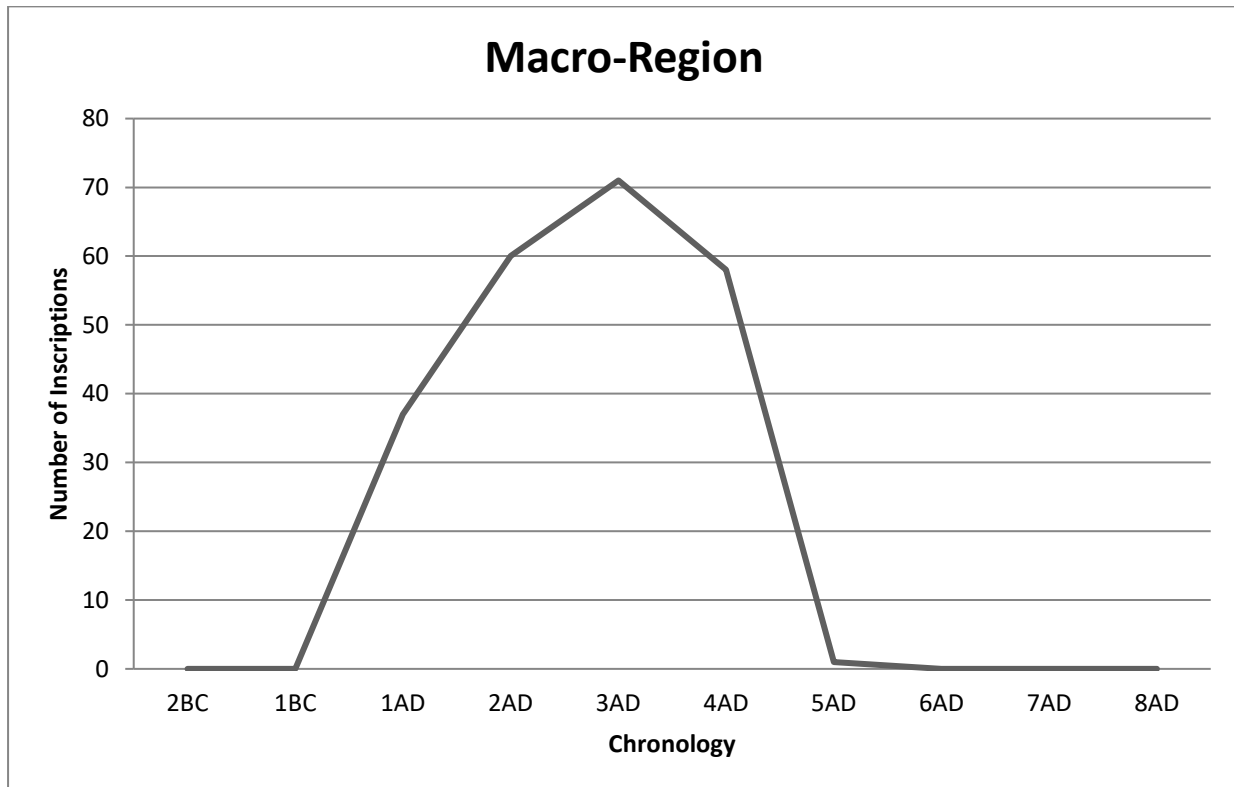


Figure 31: Temporal Analysis of Epigraphic Evidence Directly Connected with Economic Development in the Macro-Region

As shown by the quantified and temporal analysis of the epigraphic evidence directly connected with the economic topics, the number of inscriptions peaks during the 3rd century AD. The 2nd and the 4th century, however, show only a modest decrease of the evidence.

5. 6. Conclusion

The entire epigraphic evidence from the macro-region equals 2,878 inscriptions that can be divided into 18 groups, based on the centres they belong to. The centres include *Apamea*, *Apollonia ad Rhyndacum*, *Caesarea Germanica*, *Chalcedon*, *Claudiopolis*, *Cretia Flaviopolis*, *Dascyleion*, *Heraclea Pontica*, *Iuliopolis*, *Nicaea*, *Nicomedia*, *Hadrianopolis*, *Prusias ad Hypium*, *Prusias ad Mare*, *Prusa ad Olympum*, *Pylae*, *Strobilos* and *Tium*.

Out of the 18 identified centres, 12 allow for a temporal analysis. The quantified temporal analysis of the epigraphic evidence *en bloc* reveals a developmental peak during the 2nd century AD. Examining each centre separately, the peak stretches between the 2nd and the 3rd century AD. This situation concerns *Claudiopolis*, *Heraclea Pontica*, *Hadrianopolis*, *Nicaea*, *Nicomedia*, *Prusias ad Hypium*, *Prusias ad Mare*, *Prusa ad Olympum*, and *Tium*. The remaining cities of *Apamea*, *Chalcedon* and *Strobilos* are outliers with their own independent developments influenced by external factors with a local impact.

Examining results of analyses of the epigraphic evidence from different parts of Asia Minor, it congruently dates to the 2nd half of the 2nd century AD and to the beginning of the 3rd century AD.⁴³⁵ The growth and peak of the evidence in Asia Minor corroborates the peak defined for the entire Roman world.⁴³⁶

The epigraphic evidence that can be directly connected with the economic topics equals 158 inscriptions. Their quantified temporal analysis *en masse* reveals the peak during the 3rd century AD, followed by a slight decrease of the evidence during the 4th century AD. The decline occurs during the 5th century AD.

The developmental curve outlined by the inscriptions directly connected with the economic performance in the macro-region falls within the developmental curve in other provinces.⁴³⁷

⁴³⁵ French's work on inscriptions from *Amasia* shows that the peak of the dated gravestones is dated to the mid to the late 2nd century AD, with the decline after the Severan period (French 1991, 66–68). MacMullen describes the peak of the epigraphic evidence in Lydia to continue until the middle of the 3rd century AD (MacMullen 1986, 237).

⁴³⁶ The growth between 100 BC and AD 200 is defined based on a strong archaeological evidence and a rise in a Mediterranean shipping, urban manufacturing and the non-agriculture sector of economy (Mattingly 2006, 286).

⁴³⁷ Based on the Epigraphische Datenbank Heidelberg, Wilson (Wilson 2009a, 74–75; Wilson 2011, 166 f.) performed an analysis of the honorific inscriptions from the entire Roman Empire datable to within 20 years and reached the peak of the evidence at the end of the 2nd and the beginning of the 3rd century AD, with a sharp drop during the 2nd half of the 3rd century AD.

Examining the building inscriptions, they peak during the 2nd quarter of the 2nd century AD. Based on the evidence published in CIL, R. Duncan-Jones⁴³⁸ performed an analysis of several assemblages of building inscriptions from different regions of the Roman Empire. In particular, the assemblages were from Spain, Syria, Italy, Leptis Magna and Sabratha in Libya and Thugga in Tunisia. All the assemblages feature a peak of the evidence during the 2nd and the 1st half of the 3rd century AD. B. Russell⁴³⁹ confirmed the peak of building activities in Asia Minor in the 2nd century AD, with a drastic drop after the Severans. Later periods reveal only documents concerning the repairs of fortifications. Although the peak defined for the macro-region directly follows the devastating earthquake in about AD 121⁴⁴⁰ and the investments could be a mere necessity, they agree with the common peaks of the investments observable elsewhere.

The comparative analysis of the results following from the assessment of the epigraphic evidence *en bloc* and from the selective interpretation of inscriptions with an economic topic reveals a shift of almost an entire century. The shift is for the most part caused by the milestones, since their peak appears during the 2nd half of the 3rd and at the beginning of the 4th century AD.

I rather see the economic peak of the macro-region during the 2nd century AD and the first half of the 3rd century AD. This peak is analogous with the entire Asia Minor. The later peak is exceptional, and it is an outcome of the massive investments in the road system. Although certainly important, these investments seem to aim for the fastest interconnectivity of *Constantinopolis* with the east, for a maintenance of the 'Pilgrim's road', but do not necessarily document the economic situation in the macro-region.

⁴³⁸ Duncan-Jones 1990, 59–67.

⁴³⁹ Russell 2013, 17.

⁴⁴⁰ Eusebius Chronicle Canon 780.

6. Urbanization and Development of the Settlement Patterns as an Economic Proxy

This chapter focuses on an urbanization and a development of the densities of settlements, analysed and interpreted in the light of the economic development. The chronology of the evidence allows for assessing the datasets only in the broad time spans of the Hellenistic, Roman and Early Byzantine periods. The urbanization during the Roman period is supplemented with a comparative study, contextualizing the results from the macro-region in the territory of Asia Minor.

The first part presents miscellaneous approaches to the topic, pointing out theories that discuss the economic significance of the urbanization as well as of the density and spatial distribution of other settlements, introducing them as possible proxies of the economic growth.

The second part discusses the approach I used during the study. Step by step, it examines the sources of data, their reliability, and the methodology suitable for their analysis. Furthermore, I include a general description of the categories of the settlements, the applied GIS tools and the urbanization models.

The third section presents results of the reconstructions, divided into the Hellenistic, Roman and Early Byzantine periods respectively. Each chronological section encompasses an analysis of the distribution of the settlements, divided into individual categories based on their type. An emphasis is put on the interpretation of the urbanization models, discussed in the economic context of the macro-region.

The fourth part summarizes results of the developments of the urbanization presented in each chronological time span and further examines their tendencies as mirrored in the economic situation.

In its last section, the chapter presents a comparative analysis of the urbanization in the macro-region and in entire Asia Minor during the Roman period. Implicit differences are further elaborated and interpreted in terms of the results achieved in this study.

6. 1. How Does the Development of Settlement Patterns Reflect the Economic Situation?

The term settlements encompasses all the types of habitations, from *poleis / civitates* to rural settlements including villas, isolated farms, hamlets etc. The diverse types of habitations have different consequences when analysing the economic trends in the territory.

Examining causes of their distribution, locations of urban settlements depend on a number of factors, for the most part connected with the administrative purposes dictated by a current government. On the other hand, small farms and agriculture settlements are admittedly tied to the land.⁴⁴¹ As such, the spatial distribution of cities naturally offers a different kind of information when analysing the economic situation than the rural settlements, most likely simply scattered around a productive ground.

In this context, it is also necessary to point out the strong interrelation between the cities and the land. The entire territory of the macro-region was divided between the urban settlements and the cities had a direct control over their territories (*chorai*).⁴⁴² In this way, the number and character of habitations situated in the specific *chora* influenced the economic situation of the pertinent city. Analyses of the *chorai* offer an unparalleled opportunity to investigate the relationship between the agricultural populations and those of the urban centres. Moreover, they reveal much about the organisation of the agricultural territory,⁴⁴³ further relevant to the economic situation.

The macro-region lacks a uniform record concerning delimitations of the territories of the cities⁴⁴⁴ and a number as well as character of settlements situated in each of them.⁴⁴⁵ Therefore, further analyses of the individual *chorai* are not applicable with the available datasets.

⁴⁴¹ Hanson 2011, 235.

⁴⁴² Kolb 2004, ix.

⁴⁴³ Carter et al. 2004, 127.

⁴⁴⁴ The division based on the epigraphic evidence and pertinent methodological problems are discussed in Chapter 5. 2. The partition of the terrain between the cities in the macro-region requires further examination in the terrain. For case studies offering methodology for the research of *chorai*, see for instance Kolb – Thomsen 2004, 1–42 (*chora* of *Kyaneai* in Lycia); Bintliff – Howard 2004, 43–78 (*chora* of *Thespia* in Boeotia); Iplikçioğlu 2004, 103–125 (*chora* of *Termessos* in Pisidia).

⁴⁴⁵ As pointed out by Kolb 2004, xv, the lack of information about *chorai* is not a phenomenon characteristic only for the macro-region, survey of *chorai* has been in general hitherto underestimated.

6. 1. 1. Urbanization

An urbanization as a proxy of the demographic and economic growth was examined and discussed by numerous authors.⁴⁴⁶ The discussion intensified since the topic became a scope of the recent studies of the OXREP.⁴⁴⁷

First, the term urbanization needs to be defined for the present work, since its application differs from a study to study.⁴⁴⁸ Unlike E. Lo Cascio,⁴⁴⁹ who refers to the urbanization as to a *'numerical and dimensional increase of nucleated settlements above some threshold of population,'* I adhere to the Greek and Latin literary sources and their lists of the cities (*poleis* and *civitates*). It is necessary to point out that I find E. Lo Cascio's methodology generally more correct and efficient, only I do not have the data to evaluate the settlements except for the literary sources. E. Lo Cascio's definition expects archaeological surveys and excavations defining the areas and numbers of nucleated settlements.

As expressed by A. Wilson,⁴⁵⁰ there is a strong correlation between the rates of urbanism on one hand and the economic performance and development on the other. Nevertheless, I find it crucial to combine the rates of urbanization with other economic proxies. In this way, I support the developments outlined by the analysis of urban settlements, as the urbanization *per se* is not necessarily and exclusively connected with the economic growth.⁴⁵¹ If other economic proxies connected with an increased production do not change, the economic growth, even suggested by the increased number of the urban centres, needs to be re-evaluated.

In his study on the city sizes and the urbanization, A. Wilson⁴⁵² introduced an apt description of the correlation between the development of the urban settlements and the economic growth:

⁴⁴⁶ Bekker-Nielsen 1989, 52–68; Mitchell 1995a, 257–259; Woolf 1997b, 1–14; Erdkamp 2012, 241–265; Scheidel 2012, 80–82; Erdkamp 2015, 18 f.

⁴⁴⁷ Bowman – Wilson 2011.

⁴⁴⁸ For a brief explanation of the main problems connected with the definition of an urban and a rural settlement, see Woolf 1997b, 1–3.

⁴⁴⁹ Lo Cascio 2009, 88.

⁴⁵⁰ Wilson 2011, 161 f.

⁴⁵¹ Lo Cascio 2009, 91 f.

⁴⁵² Wilson 2011, 162. A similar thought published also by Scheidel 2012, 80.

'Cities are an index of economic development in that the bulk of their population is usually engaged in non-agricultural activities; they must therefore be fed from a surplus produced by the agriculture sector. The higher the urban population as a proportion of total population, the greater the surplus, and therefore the greater the per capita production implied.'

During the Roman hegemony, as pointed out by J. W. Hanson,⁴⁵³ the urban system has a great potential to reveal the impact of Rome on the region, and the effects of wider connections offered by the integration into the Roman Empire.⁴⁵⁴

One more fact is that the cities require certain official architecture serving the administrative purposes and representing their wealth and power.⁴⁵⁵ From this point of view, the investments connected with the development and the upkeep of the public buildings⁴⁵⁶ concurrently document the intensity of the growth of the urban settlements.⁴⁵⁷

In addition, there is a number of diverse ways how to assess the economic performance using as a proxy the urbanization of a particular territory.⁴⁵⁸ The character of the available data allows for meaningful analyses of the density and the spatial as well as the temporal distribution of the cities. Capital investments in the public buildings are included only partially since the attainable information is admittedly deficient.

The nature of the data in the micro-region allows for a more detailed analysis of the urban settlement within, of *Nicaea*.⁴⁵⁹ The study offers information concerning changes in the extension of the city during the analysed periods, enabling to examine other aspects of the economic growth.⁴⁶⁰

⁴⁵³ Hanson 2011, 230.

⁴⁵⁴ This phenomenon is conjoined with the construction and maintenance of the road system which is explored in Chapter 7.

⁴⁵⁵ For a definition of institutions and accompanying architecture required by the early *polis*, see Miller 1995, 201–244; *polis* by Welwei 2006 / *city* by Kolb 2006.

⁴⁵⁶ The inscriptions pertaining to the public buildings are discussed in Chapter 5. 5. 1.

⁴⁵⁷ Wilson 2011, 163–167.

⁴⁵⁸ For instance, methods based on the comparison with numbers of urban populations are suggested by Wilson 2011, 161–195.

⁴⁵⁹ See Chapter 8.

⁴⁶⁰ Wilson 2011, 167.

6. 1. 2. Density and Spatial Distribution of Settlements except for Cities

I use a broad and vague term ‘settlements except for cities’ to encompass all the settlements I was able to locate on the map and which do not have the status of *poleis / civitates*. These settlements, when divided in more specific groups based on their character and functionality, enrich the economic proxies and reflect the development of the economic situation.

Looking at the distribution of rural settlements, the density can be taken as a precondition necessary for an inception of a city. This statement is based on the study by E. Lo Cascio⁴⁶¹ who claims that the initial appearance and existence of a city primarily depends on demographic factors. E. Lo Cascio supposes that the rise of an urban settlement is only possible with a sufficient size and density of rural population in a limited area. The rural settlements need to reach a certain number of inhabitants to achieve an adequate technology to produce a substantial amount of surplus. The surplus of production is a prerequisite which further enables a specialization of some of the inhabitants in diverse kinds of labour, not directly connected with the production of food.⁴⁶² This stage of the development of the rural settlements enables an urban settlement to emerge. In principle, E. Lo Cascio’s point of view leads to the interpretation of rural settlements as one of the prerequisites of the urbanization.

Examining the processes of the formation of the urban settlements in the macro-region, one can see the direct connecting line between the newly established *poleis / civitates* and the current hegemony ruling over the country. Therefore, I suggest seeing the cities as administrative units on the first place. Nevertheless, without the support of an agricultural hinterland, they would not survive; a dense distribution of rural settlements in their fertile hinterlands, although not explored yet, can be surely anticipated.

An important role of rural settlements in Asia Minor was supported by the study of K. Ruffing⁴⁶³ who pointed out that these habitations had their own specialized economies, presumably with a relatively strong impact on the economic trends in the territory.

⁴⁶¹ Lo Cascio 2009, 89.

⁴⁶² For the division of labour as an economic proxy, see Bowman – Wilson 2009, 32 f.

⁴⁶³ Ruffing 2009, 127–145.

Other types of settlements that can be identified in the macro-region are road stations and forts. The density and spatial distribution of these settlements correlate with the development of the road network.

As they are both distributed along the roads and thus connected with the development of the road system, I present them together in this section. One may state that: a) the denser the distribution of forts, *mansiones* and *mutationes*, the safer and faster becomes the transport and b) the efficiency of transportation is undoubtedly directly connected with the development of the economic situation in the area.⁴⁶⁴ However, the existence of forts does not only point to the safeness of the transport. It also suggests that there was a need to safeguard the roads, i.e. it anticipates an unstable (political?) situation in the territory.

6. 2. Methodology

The most important source of data is represented by the assemblage of settlements published in the Barrington Atlas of the Greek and Roman World.⁴⁶⁵ The sources used for the creation of the maps as well as brief descriptions of the territories are published separately in the Map by Map Directories. In particular, these are the maps 52 (Byzantium),⁴⁶⁶ 53 (Bosphorus)⁴⁶⁷ and 86 (Paphlagonia).⁴⁶⁸ None of the maps is completely encompassed in the macro-region, as each of them overlaps with the surrounding regions. The analysed assemblage thus represents a selection from the three maps, following the location of each of the settlements.

First, I investigated and verified the sources used in the Barrington Atlas, reassessing the existence, type and chronology of each single settlement encompassed in the original dataset. The data published in the Barrington Atlas proved to be correct without exception.

The second step focused on the digitizing of the entire assemblage of features. Since the Barrington Atlas was digitised in the framework of the Pleiades,⁴⁶⁹ I used their dataset as a primary

⁴⁶⁴ In detail discussed in Chapter 7.

⁴⁶⁵ Hanson (2011, 237) compares the Barrington Atlas of the Greek and Roman World with other sources and confirms that the Atlas is the most informative and thorough source for Asia Minor.

⁴⁶⁶ Compiled by Foss in 1997 (Foss 2000a, 785–795). URL: http://press.princeton.edu/B_ATLAS/BATL052_.pdf.

⁴⁶⁷ Compiled by Foss in 1995 (Foss 2000b, 796–802). URL: http://press.princeton.edu/B_ATLAS/BATL053_.pdf.

⁴⁶⁸ Compiled by Foss in 1995 (Foss 2000c, 1217–1225). URL: http://press.princeton.edu/B_ATLAS/BATL086_.pdf.

⁴⁶⁹ URL: <http://pleiades.stoa.org/>.

source. Therefore, I did not need to create an entirely new shapefile with all the points. I crosschecked the data downloaded from the Pleiades with the data published in the Barrington Atlas. As their numbers, types and chronology appeared to be in accordance, I focused on their spatial rectification. The error in their original location reached 3 km in some cases, most probably caused during digitizing due to the small scale of the source maps in the Barrington Atlas.⁴⁷⁰ The only settlement I entirely dislocated to a different position is *Cretia Flaviopolis*.⁴⁷¹ Based on the relief, the course of the main regional 'Northern road' and the spatial distribution of other cities, I decided for a position offered by D. H. French as a more plausible. In particular, I moved the settlement from the modern town Gerece to Gökçeşu, in crow-fly distance 23 km to the NW.

The bulk of data derived from the Barrington Atlas is further supplemented with settlements published elsewhere. I examined all the possible sources relevant to the topic. As a result, most of the complementary data come from travellers' accounts⁴⁷² recorded during the 19th century AD. Outcomes of the Iznik Survey Project conducted in 2015 are also included, constituting the second most important source. Unfortunately, no systematic surveys have hitherto been published, although some have been announced.⁴⁷³ However, several newly discovered settlements were published, mainly by Turkish archaeologists, and are also included in the following analysis.⁴⁷⁴

All the settlements depicted on the maps are listed in a tabular form in Addendum 3. Since their status and name change during the discussed periods, the tables are divided according to the chronology into the Hellenistic,⁴⁷⁵ Roman⁴⁷⁶ and Early Byzantine one.⁴⁷⁷ Their rectified positions are available on the Pleiades.⁴⁷⁸

⁴⁷⁰ On a digitizing of maps, possible errors and accuracy, see Gregory 2003, 19–22.

⁴⁷¹ The shift is based on a study published by French 1984, 49–58. French argues that the connection of *Cretia Flaviopolis* and Gerece is based solely on the resemblance of the names. The scarcity of ancient remains in the territory of Gerece is only one of the arguments introduced by French and leading to the shift of the ancient town to Gökçeşu.

⁴⁷² Mainly Anton 1895, 41–115; von Diest 1889; von Diest 1895, 1–40; von Diest 1898; von der Goltz 1896. For a more detailed information, see Chapter 2. 2. 2.

⁴⁷³ Ross published in 2007 preliminary results of the systematic survey conducted in the hinterland of *Nicomedia*.

⁴⁷⁴ Aybek – Öz 2009, 327–342; Aybek – Öz 2010, 313–328.

⁴⁷⁵ Addendum 3. 1.

⁴⁷⁶ Addendum 3. 2.

⁴⁷⁷ Addendum 3. 3.

⁴⁷⁸ URL: <http://pleiades.stoa.org/>.

The settlements are analysed based on their chronology and type,⁴⁷⁹ following methodological standards suggested by the OXREP. In particular, the examination of the urbanization bases upon an adjusted methodology used by J. W. Hanson⁴⁸⁰ for the territory of the entire Asia Minor.

6. 2. 1. Deficiency of the Analysed Dataset

Despite my endeavour to put together all the available data, I still face a fundamental problem. Strictly speaking, it is a lack of a substantial body of information. At this point, I use the words of J. W. Hanson,⁴⁸¹ whose criticism of the current state of the studies of the urban system of Asia Minor exactly depicts my observations:

‘This picture of Asia’s urban system has not received adequate treatment, however, despite the fact that an examination of the urban system has great potential to inform us about the impact of Rome on the region and the effects of wider connections offered by integration into the Roman Empire. No recent systematic study of Roman Asia has been undertaken, based on a comprehensive catalogue and distribution maps of sites.’

Nevertheless, the existence and number of *poleis* and *civitates* in Bithynia is well documented in ancient literary sources⁴⁸² and, therefore, it does not pose a great problem. In contrast, the general recognition of rural settlements has unfortunately not changed since S. Mitchell’s⁴⁸³ description published in 1995:

‘The core of any general investigation of Asia Minor must be a study of the countryside. Since there have been virtually no archaeological surveys or excavations devoted to rural settlements between the Hellenistic and Byzantine periods, attention must be

⁴⁷⁹ For the typological subdivision, see chapter 6. 2. 2.

⁴⁸⁰ Hanson 2011, 229–275.

⁴⁸¹ Hanson 2011, 236.

⁴⁸² For details, see above in chapter 2. 1.; for an overview, see below within the individual studies of urbanization divided by chronological time spans (Tables 21, 22 and 23).

⁴⁸³ Mitchell 1995a, 9.

focused on the country regions which have produced large numbers of gravestones, votive steles, and other inscriptions...'

S. Mitchell speaks about Anatolia in general, where several systematic surveys took place, changing the state of knowledge.⁴⁸⁴ Unfortunately, none of them was carried out in the analysed macro-region. An actual systematic survey is a necessary methodological approach to elucidate a number of questions concerning the function and exploitation of the Bithynian hinterland.

6. 2. 2. Typology of Settlements

The settlements depicted on the maps and further analysed are divided into four groups including cities, road stations, forts and settlements. The last and the most numerous group, the settlements, encompasses all the habitations which do not offer a sufficient information to be further classified.

Cities

The cities are indicated on the maps as *poleis* during the Hellenistic period and *civitates* during the Roman and the Early Byzantine eras. Their typology is for the most part based on the ancient literary sources. Since the sources are numerous and mutually corroborating, I suggest seeing the numbers of the cities as nearly complete.

Road Stations

The second type of settlements in the macro-region are the road stations. The information concerning the existence of *mansiones* and *mutationes* comes from the ancient *Itinerarii*.⁴⁸⁵ The allocation of most of them was further confirmed / suggested by observations in the field.⁴⁸⁶ Nevertheless, as discussed in detail in Chapter 7, since courses of the roads are not entirely

⁴⁸⁴ For example, the surveys conducted in Paphlagonia (Matthews – Glatz 2009; Düring – Glatz 2015a); on the border of Bithynia and Paphlagonia, in the hinterland of *Tios* (Öztürk 2013, 147–164); in Pisidia (Waelkens 1993, Waelkens – Poblome 1993; Waelkens – Poblome 1995; Waelkens – Poblome 1997; Waelkens – Loots 2000; Degryse – Waelkens 2008); in the hinterland of *Sinop* (Doonan 2004); and in Cilicia (Blanton 2000).

⁴⁸⁵ Tab. Peut. (Miller 1916); Itin. Anton. (Cuntz 1929); Itin. Burdig. (Cuntz 1929).

⁴⁸⁶ French 1981, 15–32.

definite, and locations of the road stations directly depend on them, some are possibly dislocated.⁴⁸⁷

Forts

The third group encompasses the forts, for the most part as described by travellers in the 19th century. These are situated on elevated positions, usually guarding and sometimes also closing the mountain passes and roads leading through them. The forts were well defended; in relation to their elevated position, they were also fortified and overall hardly accessible. Their primary function was safeguarding and based on their limited sizes, they did not offer conditions suitable for long-term living. In general terms, the forts are an inherent part of the military infrastructure.

Settlements

The last and the largest group is broadly called the settlements. It consists of rural settlements, urban settlements and ports. Since there is a lack of more detailed assessments of their statuses, I cover them all under one broad term settlements.⁴⁸⁸

6. 2. 3. Applied GIS Tools and Resulting Settlement Models

I use GIS tools to divide the territory and subsequently analyse the spatial distribution of the cities.⁴⁸⁹ The division is performed in two different ways, by the Voronoi diagram / Thiessen polygons and by multiple ring buffers. The Voronoi diagram calculates territories of the cities, the multiple ring buffers of given distances drawn around each of the cities determine the territories directly surveyed by the city.

Results of the GIS analyses enable to further examine the spatial distribution of the cities and the urbanization of the territory. The interpretations are based on two fundamental models.

⁴⁸⁷ For instance, the route of the road between *Nicaea* and *Nicomedia* is not confirmed and herewith the road stations are not clearly identified. For diverse reconstructions, see French 1981 and the map published by Şahin 1987 (map in the attachment of the book). The topic is examined in Chapter 7 where I introduce a third version of the route.

⁴⁸⁸ Although a further subdivision of the settlements into common categories including villas, farms, villages etc. would greatly contribute to the analysis of the economic trends in the territory, it is not possible with the current record.

⁴⁸⁹ On models used for the analysis of the settlement patterns, see Haggett 1966, 87–152.

These are the central place distribution⁴⁹⁰ and the primate-city distribution⁴⁹¹ models. Based on the spatial distributions and sizes of the cities, the models help to elucidate the development of the economic situation in the studied macro-region.

Establishing the territories of the cities

The territory of Bithynia was divided up into territories, each attributed to one urban centre.⁴⁹² A Voronoi diagram, or alternatively also described as Thiessen polygons, is a GIS function that is often used for establishing territories of cities in dependence on the spatial distribution of all the cities in a given territory. The Thiessen polygons demonstrate the division of the territory considering crow-fly distances between the analysed cities.⁴⁹³ The Thiessen polygons define an area of the influence around its sample point (in this case the city) so that any location inside the emergent polygon is closer to that point than to any of the other sample points. The fundamental weakness of the analysis is the fact that it does not consider the terrain. Since the natural borders are often decisive, the model resulting from the Thiessen polygons needs to be re-evaluated in the context of the geographic characteristics of the terrain.

I present the results for each of the analysed time spans and I further discuss the calculated partition. Since the preserved historical records often point out to the actual partition of the territory, the current study enables to verify the functionality of the Thiessen polygons for dividing the territory.

Establishing the area directly controlled by a city

The definition of a territory under the direct control of a city was provided by J. W. Hanson.⁴⁹⁴ J. W. Hanson's model is based on estimations for a most probable day's travel distance calculated by T. Bekker-Nielsen.⁴⁹⁵ T. Bekker-Nielsen introduced as a maximum figure for a day's travel the distance of 37 km. J. W. Hanson further elaborates on this calculation and given the difficulty of the terrain

⁴⁹⁰ Christaller 1968; Lössch 1954; for a short synopsis, see Woolf 1997b, 8 f.

⁴⁹¹ Jefferson 1939.

⁴⁹² Woolf 1997b, 3.

⁴⁹³ For an explanation of the Voronoi diagram, see Leusen 2002, Chapter 6, 4–5; Gregory 2003, 26–28.

⁴⁹⁴ Hanson 2011, 237–241.

⁴⁹⁵ The methodological approach was introduced by Bekker-Nielsen 1989, 9–32.

in Asia Minor, he suggests cutting this estimate in half. Subsequently, the minimum estimate of 18.5 km is the distance that can be safely reached in a days' travel and the distance of 37 km is the largest probable territory under the 'one day' control. The actual distance controlled by the city most likely varied in each particular location based on the passability of the terrain. Nevertheless, this variation is encompassed in the crow-fly distance between 18.5 and 37 km from each city.

In the present work, I follow the methodology established by J. W. Hanson for analysing the Roman urbanization. I introduce the model for each time span separately, drawing two radii of given distances of 18.5 and 37 km around each city.⁴⁹⁶ Although the terrain differs around each of the cities and the transport velocity varied during the discussed time spans,⁴⁹⁷ I use the same distances. I argue that the figures of 18.5 km as the minimum and 37 km as the maximum offer an extensive range, including these deviations. As the current knowledge does not enable to define actual borders of each of the cities and, the ring buffers represent an appropriate solution.

It is necessary to point out that I find naturally hard and ambiguous to assess the territory of a city based on the crow-fly distance since it is dependent on a number of diverse criteria as the size of the city itself, terrain model, available road system etc. However, for the comparison of the rates of urbanization between the different time-spans, given that the analysis is conducted in the same territory and as such the conditions do not change greatly, the ring buffers offer a considerably valuable tool.

6. 2. 4. Urbanization Models

The spatial distribution of cities is a decisive factor when examining the economic situation in the territory. The present work is largely inspired by the approach used by J. W. Hanson⁴⁹⁸ who uses two diverse models of urbanization, the central place and primate-city distribution when analysing the spatial distribution of cities in entire Asia Minor. Following the same criteria as used by J. W. Hanson allows for a comparative analysis of the results.

⁴⁹⁶ ArcToolbox: Analyst Tools -> Proximity -> Multiple Ring Buffer.

⁴⁹⁷ Belke 2010a, 45–58.

⁴⁹⁸ Hanson 2011, 242.

a) A central place distribution

The central place distribution model⁴⁹⁹ argues that on an isotropic, homogenous and unbounded plain, with an even distribution of resources, an even distribution of urban settlements will result. The model further implies a small number of large cities, offering high-order goods and spaced at large distances from one another, underlined by a greater number of smaller sites, offering low-order goods to a small region, and spaced more closely together. Both orders should then be evenly distributed across the territory to serve the whole region. When examined by the Voronoi diagram, their territories need to create a lattice of hexagons or triangles.⁵⁰⁰

b) A primate-city distribution

The primate-city distribution model⁵⁰¹ reckons with similar conditions like the central place model but assumes a different result. One of the cities in the territory grows much stronger than the others and exceeds the second-largest one twice or even three times in the size. In reality, this model anticipates one large city and a number of considerably smaller settlements. The primate-city distribution model is essentially positive but may lead to a negative outcome described as *hypercephalie*.⁵⁰² *Hypercephalie* implies that the large city reaches an extreme level of growth, whilst the countryside again becomes impoverished.⁵⁰³ This phenomenon might be a result of colonial rule or intervention and thus it is expectable in the territory of the studied macro-region.

6. 3. Reconstruction of Settlement Patterns during the Main Historical Periods

The following study presents reconstructions of all the settlement patterns, as complete as possible with current knowledge. The datasets do not allow for a more precise division of the data than into the three broad historical periods; the Hellenistic, the Roman and the Early Byzantine. All the temporal studies are accompanied with two maps. The first one depicts settlements divided

⁴⁹⁹ The model was introduced by Christaller 1968 (first published 1933) and further acknowledged by Lösch 1954, discussion on its applicability by Haggett et al. 1977, 143–153. The Christaller's model was approved in the recent study by Wilson 2011, 241.

⁵⁰⁰ Hanson 2011, 241.

⁵⁰¹ The model was introduced by Jefferson 1939.

⁵⁰² Johnson 1970.

⁵⁰³ For an example of a hypercephalie in other regions, see for instance the study on the hinterland of Patras by Rizakis 1997, 28.

based on their category; the second one is focused on the analysis of the urbanization. The cities and pertinent sources are presented in tables, information concerning other settlements is included in the Addendum 3.

6. 3. 1. Hellenistic Settlement Patterns

Examining the evidence of the Hellenistic settlements, the first glance on the map Figure 32 reveals an alarmingly fragmentary record. However, the cities still offer a considerably well documented body of data. The dataset of the cities is further analysed for the Hellenistic urbanization. The scantiness of settlements and forts, rather than elucidating the situation, opens new questions. The majority of the questions requires a systematic survey in the terrain.

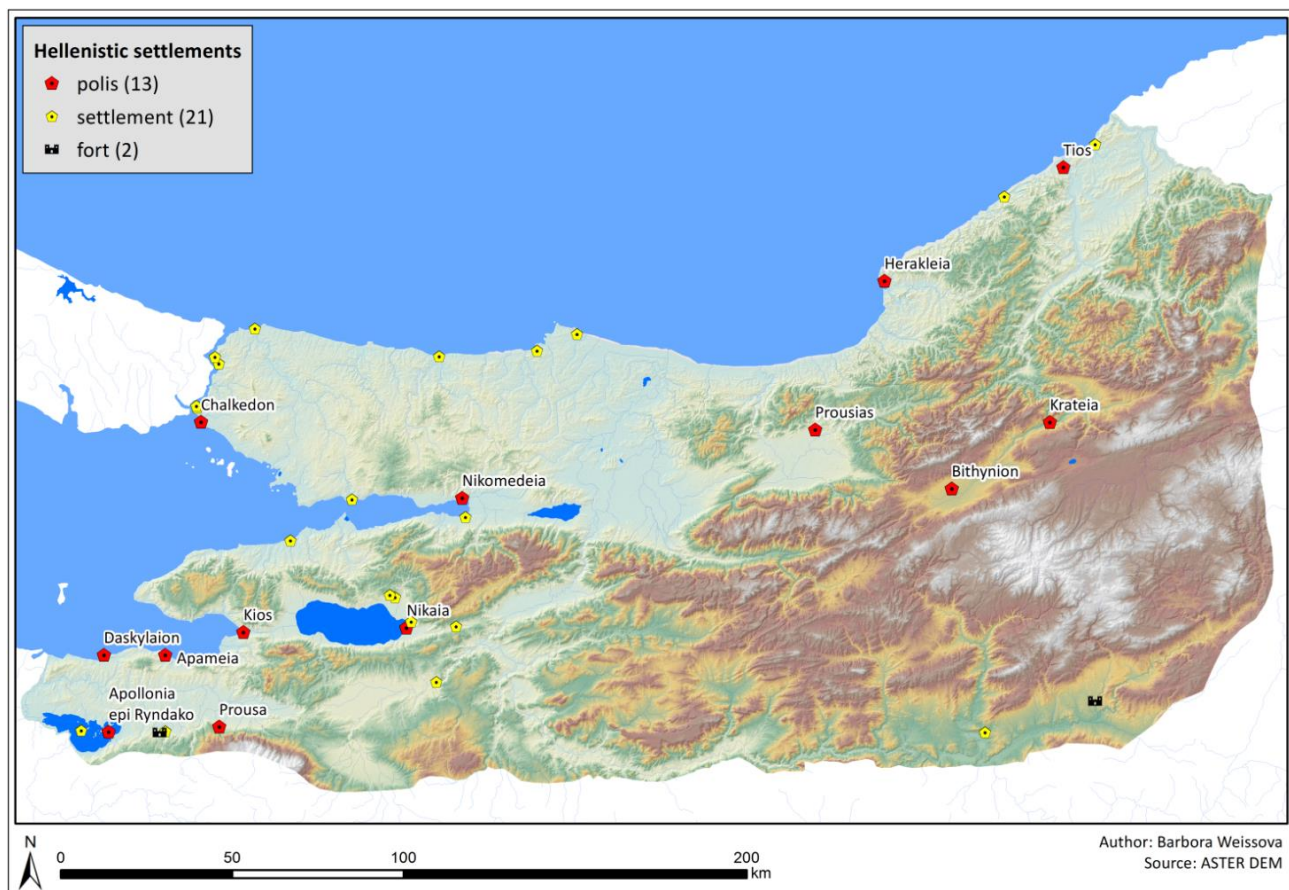


Figure 32: Settlements in the Hellenistic Period (Addendum 1. 16.)

Cities (13)

Looking at the historical development, the density and spatial distribution of hitherto identified cities did not undergo any dramatic changes with an appearance of the Bithynian kingdom. Although the royal policy was largely focused on establishing new cities, most of them were re-foundations of cities founded by Greek colonists;⁵⁰⁴ including *Apameia*, *Nikaia*, *Nikomedeia*, *Prousius*, *Kios* and *Tios*. *Krateia* represents a Paphlagonian city colonized by the Bithynian king Ziales.⁵⁰⁵ Apollonia epi Ryndako and Daskylaion are situated out of the territory of the Bithynian Kingdom. Chalkedon and Herakleia are Greek colonies which keep their independency under the Bithynian Kingdom. Only two of the Bithynian cities are of a completely new foundations: *Prousa* and *Bithynion*.⁵⁰⁶

On the one hand, the information concerning establishments and re-establishments of some of the cities is considerably sufficient. For instance, according to primary sources, the Greek *polis Astakos* was destroyed in 281 BC and its inhabitants were relocated and used for inhabiting the newly established *polis Nikomedeia*.⁵⁰⁷ *Nikomedeia* itself was founded by *Nicomedes* and it was most likely built at the location of another Greek colony, *Olbia*, in 262 BC. *Nikomedeia* became a capital of the Bithynian Kingdom.

On the other hand, there are seven cities hitherto not localised in the terrain but mentioned in the literary sources. These are *Antigonea*, *Epiphanea*, *Hellenopolis*, *Nikomedion*, *Nikopolis*, *Zeila* and *Zipoition*.⁵⁰⁸ Thus in theory, Hellenistic urbanization exceeds that of the following Roman period.

The spatial distribution of the cities features the following characteristics: out of 13 identified cities, seven are situated directly on the sea coast (five along the Marmara Sea and two

⁵⁰⁴ The information concerning the Greek colonies on the shores of the Bithynian territory was summarised by Marek 1993, 15 f. The historic development during the Hellenistic period is also examined by Marek 1993, 20–25.

⁵⁰⁵ Jones 1998, 155.

⁵⁰⁶ Jones 1998, 151 f.; Marek 2003, 35.

⁵⁰⁷ Strab. 12, 4, 2; Paus. 5, 12, 7.

⁵⁰⁸ The list of hitherto not localised *poleis* derives from the compendium of the Hellenistic *poleis* and pertinent ancient sources published by Cohen 1995, 391–409. On *Antigonea*, see 391 f., on *Epiphanea* page 397, on *Hellenopolis* 397 f., on *Nikomedion* page 402, on *Nikopolis* page 402, on *Zeila* page 408 and on *Zipoition* 408 f.

along the Black Sea coast) and another four no further than one day's travel from the sea.⁵⁰⁹ The spatial distribution of the *poleis* points to the crucial importance of the connection with the sea trade, oriented mostly towards the Marmara Sea.

Settlements (21)

Unlike in case of the cities, we lack any written sources referring to rural settlements in general, let alone their numbers.⁵¹⁰ The existence of rural settlements is undeniable, but hitherto not proved by archaeological surveys. The trivial number of settlements consists mainly of ports distributed along the shores and several rural settlements inland. The four settlements depicted in the hinterland of *Nicaea* (8) are scatters of pottery discovered during the ISP15.⁵¹¹

Interestingly, one of the Hellenistic scatters (no. 901) is a multi-period one, during the Roman and the Early Byzantine periods interpreted as the road station *Ad Schinae*.⁵¹² Considering that the Hellenistic road followed the same route as the Roman one,⁵¹³ it is feasible that the function of the Hellenistic scatter related to the existence of the road as well.

Forts (2)

Merely two forts are documented as dating to the Hellenistic period. Although I tried to supplement the insufficient archaeological record with notes of the travellers from the 19th century, their descriptions are for the most part focused on the Roman and / or Byzantine eras. Their observations cannot be safely related to pre-Roman remains.

The fort depicted between the two cities of *Apollonia epi Ryndako* and *Prusa ad Olympum* was found during a Turkish survey⁵¹⁴ conducted in the territory and enriches the primary record

⁵⁰⁹ This estimate and all the others concerning the accessibility of the sea in one day include the city of *Nicaea*. Although situated two days walk of the Marmara Sea, I suppose that the *Ascania Lacus* was used for part of the travel making it possible to reach the sea in one day.

⁵¹⁰ Xen. an. 6, 4, 24. Xenophon offers a vague picture of the spatial distribution of rural settlements when describing Thracians who 'lived in rural settlements and forts distributed within the fertile flatland and in the mountains respectively'.

⁵¹¹ For their description, see Chapter 8 and Addendum 5.

⁵¹² *Mutation Ad Schinae* is listed in *Tabula Peutingeriana* (Miller 1916, 657) and *Itinerarium Burdigalense* (Cuntz 1929, 92), mentioning the distance between *Nicaea* and *Ad Schinae* to equal eight Roman miles, i.e. 13 km. The identification with the place was confirmed by French 1981, 29 and Şahin 1981, 10; Şahin 1987, 145.

⁵¹³ Weissová – Pavúk 2016, 14–16.

⁵¹⁴ Aybek – Öz 2009, 328.

from the Barrington Atlas. The fort supposedly guarded the Hellenistic road between the two *poleis*.

The fort situated in the SE part of the macro-region is listed in the Barrington Atlas. It probably functioned as a guarding post above the mountain pass created by the *Hieron* River. An existence of a road leading along the river, although hitherto not documented, is highly probable.

Hellenistic Urbanization as an Economic Proxy

The following overview in Table 21 lists all the localised *poleis* that can be dated to the Hellenistic period. Their chronology is largely based on primary literary sources. Since Cohen⁵¹⁵ summarised the main research on *poleis* in the macro-region, I use his work as a stepping stone.⁵¹⁶ Corpora of epigraphic evidence introducing summaries of primary sources create a supplementary reference. In case of a lack of a major study, I use single articles pertaining to particular settlements and their history during the Hellenistic period.

The Pleiades number listed in the table enables to identify the city in the online database as well as in the overview table of the Hellenistic settlements in Addendum 3. 1.

Pleiades No.	Hellenistic Name	Origin of the City	Main Source(s)
511194	<i>Apameia</i>	Greek Colony , 202 BC destroyed by Philip V., re-founded by Prusias I. and later by Nicomedes II.	Corsten 1987, 9–13; Cohen 1995, 392 f.
511151	<i>Apollonia epi Ryndako</i>	Milesian Colony	Cohen 1995, 393–395
844879	<i>Bithynion</i>	newly established by Nicomedes, the territory under control since 198 or 196 BC	Becker-Bertau 1986, 1 f.; Cohen 1995, 395–397
520988	<i>Chalkedon</i>	independent Megarian Colony	Merkelbach et al. 1980, 94–96. 99–141
511226	<i>Daskylaion</i>	Milesian (?) Colony	Corsten 1988, 57–61. 64–66; Cohen 1995, 391 f.
844944	<i>Herakleia</i>	independent Greek Colony (Boeotian and Megarian)	Schneiderwirth 1882, 1–25
844991	<i>Krateia</i>	Paphlagonian city colonized by Ziales	Jones 1998, 155

⁵¹⁵ Cohen 1995, 391–409.

⁵¹⁶ Cohen mentions the research in *Apamea Myrlea*, *Apollonia epi Ryndako*, *Bithynion*, *Daskylaion*, *Nikaia*, *Nikomedeia*, *Prusias*, *Kios* and *Prousa*.

Pleiades No.	Hellenistic Name	Origin of the City	Main Source(s)
511268	<i>Nikaia</i>	Greek Colony re-founded by Nicomedes	Şahin 1987, 1–5; Cohen 1995, 398–400
511337	<i>Nikomedeia</i>	based on synoecism of <i>Astakos</i> , destroyed by Lysimachos, founded by Nicomedes shortly before 260BC	Cohen 1995, 400–402; Ross 2007, 34–37. 58–68
845049	<i>Prusias</i>	Greek Colony re-founded by Prusias I.	Ameling 1985, 1–4; Cohen 1995, 406 f.
511385	<i>Kios</i>	Milesian Colony destroyed by Philip V., re-founded by Prusias I.	Corsten 1985, 22–41; Cohen 1995, 405 f.
511384	<i>Prousa</i>	newly established by Prusias I. in 188–183 BC	Corsten 1993, 21–31; Cohen 1995, 403 f.
845084	<i>Tios</i>	Milesian Colony	Marek 1993, 21; Öztürk 2013, 149

Table 21: Hellenistic Cities and their Origins

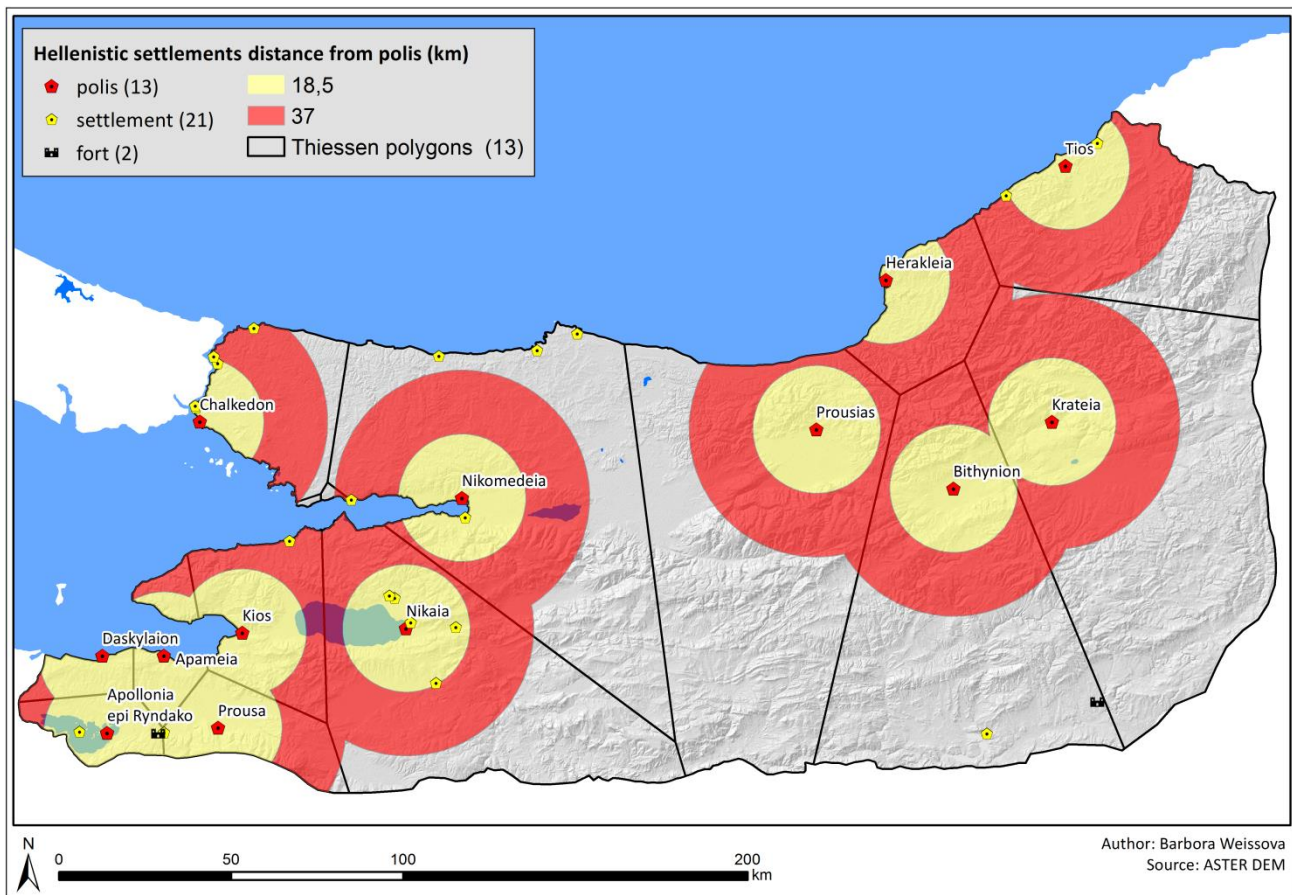


Figure 33: Urbanization in the Hellenistic Period (Addendum 1. 17.)

Examining the urbanization of the territory (map Figure 33), we can observe eccentric locations of the cities, clustering in two cardinal directions. More than 60 per cent of the cities (eight in number) are clustered in the west / SW, the remaining 40 per cent (five in total) in the NE part of the territory. The cities are further analysed in the two clusters and their spatial distribution is interpreted using the models of the central place and primate-city distributions.

The more numerous group, the one in the west / SW, keeps the closest distance with the Marmara Sea. Examining the geographic allocations, out of the eight cities in total, five are situated directly at the sea shore. The remaining three cities are located inland, but their distance from the sea does not exceed one day's travel. An exception is the town of *Nikaia* when considering the overland route. However, provided the fact the lake situated between *Nikaia* and *Kios* (*Askania*) can be used for transport, it also falls within the one day's route distance.

The group of five cities (*Apollonia epi Ryndako*, *Apameia*, *Daskylaion*, *Kios* and *Prousa*) creates a dense and regular distribution pattern. The orderly cluster probably mirrors the central place distribution model. However, it is not unambiguously possible to determine which one of the five cities in the cluster was the one to offer the high order goods. Examining the cities from the west to the east, *Daskylaion* was already decaying after its heyday during the 5th and the 4th century BC.⁵¹⁷ *Apollonia epi Ryndako* was a Milesian colony with a considerable importance, however, not much information is available to allow assessing its role in the territory during the Hellenistic period. *Apameia* was destroyed in 202 BC and built again, most probably during the reign of Prusias I.⁵¹⁸ Therefore, I would exclude it as a stable source for the market. Finally, *Prousa* was only established by Prusias I. in 188–183 BC. From this short overview follows that the role of the city offering high order goods probably shifted within the cluster, based on the current situation.

Kios, although fitting to the cluster, was a *polis* of the high rank. *Kios* surveyed the territory reaching in the north as far as the *Astakenos* Gulf and in the east bordering the territory of *Nicaea*.⁵¹⁹ Examining the distribution model, it tends towards the primate-city distribution during the Hellenistic period. Since the territory is neither extremely fertile, nor large enough to support

⁵¹⁷ See Chapter 2. 3. 1.

⁵¹⁸ For the discussion on its destruction by Filip V. and the re-foundation by Prusias I., see Corsten 1987, 9–11.

⁵¹⁹ Corsten 1985, 9.

an enormous growth of the city, I interpret the city as the positive stage of the primate-city model. The economy of *Kios* was based on the trade and the city offered high-order goods in exchange for agricultural products to its hinterland, without impoverishing it.

The remaining three cities situated in the west do not belong to the group. Assessing them from the north to the south, the first is *Chalkedon*, an independent Greek city.⁵²⁰ It represents a self-sufficient economic unit profiting from its favourable position at the Marmara Sea and at the mouth of Bosphorus, the only entrance to the oversea road leading to the Black Sea.⁵²¹ The economy of *Chalkedon* was largely based on the trade and its revenues. Although there are no documents of rural settlements, the immediate hinterland of *Chalkedon* was most likely used for agriculture activities providing the city with necessary products. Since the current agglomeration of Istanbul outgrew and destroyed the territory of *Chalcedon*, we can only guess how the hinterland of *Chalkedon* once looked like.⁵²²

Nikomedeia became the capital of the entire Bithynian Kingdom.⁵²³ Regarding its territory, in the west, it bordered with the area of *Chalkedon*. In the north, the territory most likely extended as far as the Black Sea coast. The ridge of the Samanlı Mountains created the southern border between the area of *Nikomedeia* and *Nikaia*. Only the eastern border is uncertain. Looking at the map, the River *Sangarius* seems to be the most apparent natural border. But did the *Sangarius* River form the border between the territory of *Nikomedeia* and *Prousius*? Although this theory is a suggestive one, I think it is more probable that the territory of *Nikomedeia* reached east of the *Sangarius* River, as far as the Çamdağı Mountains situated west of *Prousius*. The presumption is based on the fact that *Nikomedeia* as the largest city of Bithynia necessitated an extensive hinterland.

Nikaia became a part of the Bithynian Kingdom when Nicomedes conquered it.⁵²⁴ The hinterland of *Nikaia* was partially surveyed by the ISP15⁵²⁵ and this case study shows the potential for the entire macro-region, since the territory includes a considerably dense distribution of rural

⁵²⁰ Jones 1998, 153.

⁵²¹ Jones 1998, 149.

⁵²² Fernoux 2004, 28 describes the *chora* of *Chalcedon* to be situated in the direction to the SE, as far as Dacibyza.

⁵²³ Jones 1998, 151 f.

⁵²⁴ Şahin 1987, 2; Jones 1998, 151.

⁵²⁵ For more details, see Addendum 5.

settlements. *Nikaia* stands out for another reason, namely its rather extensive territory. The northern and western borders are delimited by *Nikomedeia* and *Kios* respectively. The southern and eastern borders are, however, unclear. As there are no more *poleis* situated in the territory east of the city, it is likely that the territory of *Nikaia* encompassed a considerably large part of the area. However, the size of territory is only a hypothetical estimation.

Analysing the economic development of the three territories, *Chalkedon* was a rich independent city profiting from the sea trade and most probably not having interest much further than the borders of its immediate hinterland. In contrast, the cities of *Nikomedeia* and *Nikaia* surveyed considerably larger territories spreading eastwards, with a lack of other large cities occurring in these areas. This situation prompts an inception of the primate-city model in the territories of *Nikomedeia* and *Nikaia*. I assume the existence of a number of small urban settlements in the territory. These settlements were under the direct control of the main city and served as administrative and market units, since it was impossible to cover such a large territory without them. Based on the current record, the territories of *Nikomedeia* and *Nikaia* reached the negative outcome of the primate-city model described as *hypercephalie*; they grew at the expense of the countryside.

The second cluster situated in the NE part of the territory includes five cities. Out of five, two are Greek colonies situated directly on the Black sea shore; *Herakleia* and *Tios*. The remaining three cities situated inland are from the west to the east *Prouusias*, *Bithynion* and *Krateia*.

Herakleia retains its independence and its economy is, similar to that of *Chalkedon*, largely based on the trade. Specifically, *Herakleia* was the first main port when turning to the east after entering the Black Sea (in other words, it was the first *polis* situated on the Black Sea coast when travelling from the Bosphorus eastwards⁵²⁶).

The city of *Tios* is situated directly on the border between Bithynia and Paphlagonia and it was a subject to diverse kingdoms appearing in the area during the Hellenistic period.⁵²⁷ However,

⁵²⁶ Xen. An. 6, 4, 2.

⁵²⁷ Öztürk 2013, 149.

it seems the city kept an economic stability based on its position on the shores of the sea and at the mouth of the River *Billaïos* (modern Filyos), both fastening extensive trading activities.⁵²⁸

The cities situated inland include *Bithynion*, *Krateia* and *Proucias*. They were most likely of a moderate size and a local importance in comparison with centres like *Nikomedeia* or *Nikaia*. I suppose they served as administrative units,⁵²⁹ surveyed the surrounding territories and functioned as places of central market inland. Their regular spatial distribution suggests an equal division of the area and herewith also the distribution of power. The cities are significantly smaller than *Nikomedeia* and *Nikaia* and the entire urbanization model seems to reach in this territory the positive stage of the primate-city model. Similar to *Kios*, they provide their surroundings with high-order goods in exchange for the agricultural surplus produced in the hinterland. It is necessary to point out that the hinterlands were less fertile than that of *Nikaia* or *Nikomedeia*, since the cities are located on the mountainous plateau of the Köroğlu Mountains.

The Voronoi diagram / Thiessen polygons

Examining results of the partition of the territory by the Voronoi diagram, I focus on the discrepancies between the calculated results and anticipated divisions based on the available historiographical data. In the following, I examine causes of the mistakes in order to avoid possible misinterpretations when using the Voronoi diagram without the possibility of a comparative analysis, i.e. with a lack of historiographical data.

The partition of the territory revealed correct results in lowlands. The subdivision of the territory of *Prusa ad Olympum* is consistent with the historiographical record.⁵³⁰

The cluster described as the north / NE one is situated in the mountainous plateau. The spatial distribution of the cities is regular and the division by Thiessen polygons outlined between each pair of the cities follows the reality. However, unlike the actual territories, the polygons are considerably prolonged to the south. The inconsistency is by the absence of a city in the southern part of the area. Another city would stretch its territory towards the north / NE cluster and thus

⁵²⁸ Öztürk 2013, 150.

⁵²⁹ As pointed out by Jones 1998, 154, we have no information concerning the administrative system of the kingdom of Bithynia. The interpretations are based solely on the analysis of the urbanization.

⁵³⁰ For the description of the borders of Prousa based on the historiographical record, see Corsten 1991b, 3.

reduce the territories of *Prouusias*, *Bithynion* and *Krateia*. Based on the terrain model, the actual territories situated further south across the mountains were rather part of the territory of *Nikaia*.⁵³¹

Multiple ring buffers

Considering the smaller ring buffers of 18.5 km, the area under the direct control of any *polis* reaches 22 per cent of the entire macro-region. Enlarged to 37 km around each *polis*, the territory encompassed in the buffers reaches 34 per cent. As follows, the area which was under the direct control of any city during the Hellenistic period falls between 22 and 34 per cent out of the territory of the entire macro-region.

6. 3. 2. Roman Settlement Patterns

Records concerning spatial distribution of settlements dated to the Roman period are substantially richer than the Hellenistic ones, as demonstrated on the map Figure 34. Nevertheless, Roman settlements were also not systematically surveyed, and the record is in principle random; the increased density of points results from a numerous epigraphic evidence⁵³² and from records of the travellers.⁵³³

The cities are still the best documented type of settlements considering the consistency of the record and enable an analysis of the urbanization. The other settlements, road stations and forts, are described below. Despite the randomness of the records, their quantification and spatial distribution allows for elucidating the economic situation in the area.

⁵³¹ This assumption is further sustained when examining the road system, namely the 'Pilgrim's road' enabling direct connection of *Nicaea* and the SE part of the macro-region (for details, see Chapter 7. 4. 1.).

⁵³² For details concerning the epigraphic evidence connected with the rural settlements, see Chapter 5. 5. 5.

⁵³³ For details concerning the travellers' records, see Chapter 2. 2.

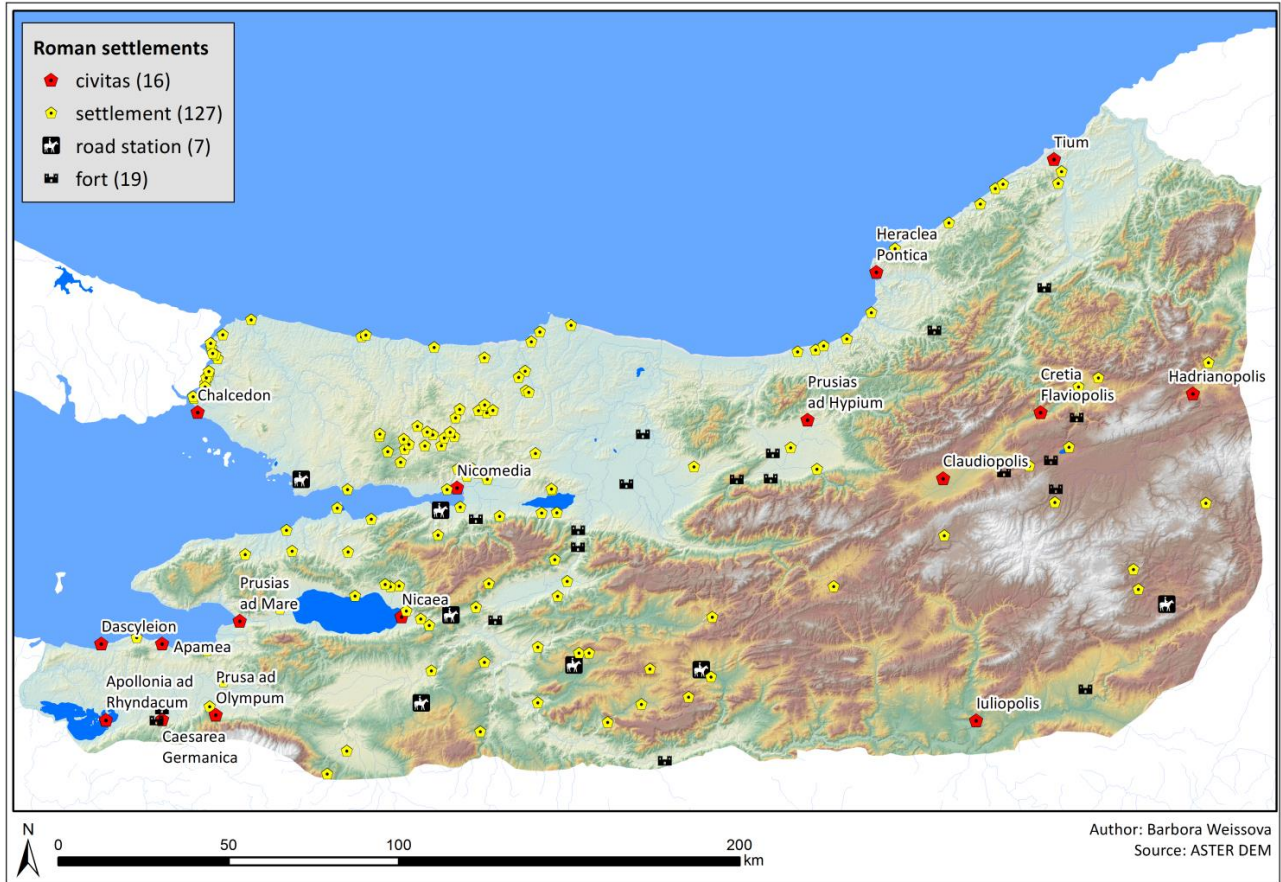


Figure 34: Settlements in the Roman Period (Addendum 1. 18.)

Cities (16)

Numerous primary sources⁵³⁴ and modern researchers⁵³⁵ document in general an essentially increased urbanization during the Roman period. This rule, however, does not seem to apply to the territory of Bithynia. Comparing with the urbanization during the Hellenistic period, the increase is rather trivial. Speaking in numbers, out of 16 cities identified in the territory, 13 of them flourished already in the Hellenistic period.

Based on observations of other developmental aspects as gradual investments in the road system,⁵³⁶ construction works in the existent cities⁵³⁷ and an immense growth of the epigraphic

⁵³⁴ List of ancient authors relevant to the increase of urbanization during the Roman period in Hanson 2011, 229.

⁵³⁵ Morley 2011, 143 f.; Hanson 2011, 229 f.

⁵³⁶ On the importance of the interconnected network of cities as an inherent part of the Roman urbanization, see Woolf 1997b, 1.

⁵³⁷ The overview based on inscriptions interpreted in the scope of the capital investments is given in Chapter 5. 5. 1., investments concerning *Nicaea* and combining the epigraphic evidence with the literary sources and the results of excavations are presented in Chapter 8. 4.

evidence,⁵³⁸ I claim the small increase in the urbanization is not because Bithynia would have been omitted by the Romans. The reason lies in the high level of urbanization of the territory already during the Hellenistic period, typical for entire Asia Minor.⁵³⁹ Subsequently, there was not a great need for establishing new cities with the accession of the Roman Empire. The existing *poleis* were adopted and modified by the new Empire and only three cities were founded; *Caesarea Germanica*, *Hadrianopolis* and *Iuliopolis*.

Although the number of cities did not fundamentally grow, their extension certainly did. Since there is not sufficient information concerning all the cities, the possible shift in extension is shown and analysed in the case study of the fortification of *Nicaea*, supplemented with the extension of *Heraclea Pontica*.⁵⁴⁰ The gradual evolvement of cities⁵⁴¹ is accompanied by capital investments in changes in the cities, mostly in public buildings.⁵⁴²

The spatial distribution of the cities features the following characteristics: out of 16 *civitates*, seven are situated directly on the sea coast (five along the Marmara Sea and two along the Black Sea coast) and another five in a day travel away from the sea. Only four of them are deeper inland, two or more days of walk away from the sea. When combined with the reconstructed Roman road system (see Figure 34), the linear distribution of the inland cities, clustering along the two major roads, is immediately obvious. These are the 'Pilgrim's road' and the 'Northern road'. The analysis of the spatial distribution shows the importance of trade and fast transport, both necessary preconditions for an existence of a city in the analysed territory.

Settlements (127)

On the first place, it is necessary to point out a fact which is clear to everybody who ever visited modern villages in Asia Minor. Most of the villages are full of ancient *spolia*. The *spolia* usually

⁵³⁸ See Chapter 5.

⁵³⁹ A similar situation of the pre-existing high level of urbanization is described by Woolf 1997b, 13; Pleket 2003, 87–95; Alcock 2007, 671.

⁵⁴⁰ See Chapter 8. 2. 1.

⁵⁴¹ As stated by Schuler 2015, 252; the political culture of the city-state was not immediately modified under the Roman hegemony; it only gradually evolved. I expect this gradual evolvement to be accompanied with investments in the changes, for the most part traceable within public buildings.

⁵⁴² These investments documented in epigraphic evidence are interpreted in Chapter 5. 5. 1.

allow for dating to the Roman or Byzantine period.⁵⁴³ Their origin is, however, generally unknown. Although one expects that the *spolia* were not transported for long distances, the current knowledge does not allow assessing where they were taken from. Does each village with *spolia* stand for an ancient settlement / cemetery? Or, more probably,⁵⁴⁴ does the ancient 'quarry' stand somewhere in the middle distance from several villages and, thus, several villages encompassing ancient *spolia* stand for one ancient settlement?

Only systematic archaeological survey can answer these questions. Since the current knowledge does not allow us to take the ancient *spolia* as a decisive factor, only the epigraphic evidence mentioning the particular name of a settlement is considered as a real settlement and, as such, depicted on the map.⁵⁴⁵ The majority of the epigraphic evidence comes from the territory of *Nicomedia* and, therefore, the cluster of settlements is most densely distributed in its territory.⁵⁴⁶

Concerning the spatial distribution of the settlements, 70 per cent are situated inland which suggests that they were most likely connected with the exploitation of the land, mainly focused on agricultural and pastoral activities, eventually supplied with forestry and / or quarrying activities as explored in detail in the micro-regional study.⁵⁴⁷ The remaining 30 per cent are located on the coast, possibly functioning as local ports.

Road Stations (7)

Out of seven road stations identified in the macro region, five are situated along the 'Pilgrim's road'. One is located next to the road connecting *Nicaea* and *Dorylaion*, situated on the map in the south / SW part.⁵⁴⁸ The last road station is in the mountains in the SE of the macro-region.

The emergence of road stations is connected with the constructions of roads during the Roman period and, from this point of view, also with the economic growth of the territory.⁵⁴⁹

⁵⁴³ For instance, on the territory of *Nicomedia*, see Dörner 1941, 12–33.

⁵⁴⁴ As suggested by the preliminary results of the ISP15, for details see in Chapter 8.

⁵⁴⁵ A comprehensive list of the epigraphic evidence is available in Chapter 5. 5. 1.

⁵⁴⁶ The discrepancy is most probably caused by the work of Dörner (1941) who focused on interpretations of the texts of the inscriptions, and especially on the search for possible names mentioned on them.

⁵⁴⁷ For the functional analysis of settlements discovered in the hinterland of *Nicaea*, see Chapter 8. 5.

⁵⁴⁸ The road is depicted on Tab. Peut. (Miller 1916, 687 f).

⁵⁴⁹ For the reconstruction of the Roman road system, see Chapter 7. 3. 2.

Forts (19)

The first glance on the spatial distribution of the forts reveals seemingly random pattern. Nevertheless, when compared with the road system,⁵⁵⁰ out of 19 forts 16 cluster directly along the reconstructed Roman roads. The remaining three are isolated in the terrain. I expect that they were also situated along the roads but, since there are no other indicators confirming the presence of the road, I did not reconstruct them.

The main function of the forts seems to relate to the road system. Operating as guarding posts, they are all situated at elevated positions either in the mountains or in the midst of the lowlands, overseeing the gates, valleys and surrounding plains, respectively.

Roman Urbanization as Economic Proxy

The Roman urbanization naturally results from the Hellenistic urban system, described in the preceding subchapter. In the following text, I do not discuss all the cities and clusters in detail, since some of them are identical. I only point out changes of the previously suggested models.

The following overview (Table 22) of Roman cities presents names of the cities, their statuses and main sources. For a better orientation in the text, the table lists also the Greek name of the city, as used during the analysis of the Hellenistic urbanization. Since the ancient sources concerning the Roman period are numerous, I include studies presenting their summaries.

Pleiades No.	Roman Name	Hellenistic Name/ Changes in the City Status	Main Source(s)
511194	<i>Apamea</i>	<i>Apameia</i> / rebuilt acc. to the Roman model of city	Corsten 1987, 13–18
511151	<i>Apollonia ad Rhyndacum</i>	<i>Apollonia epi Ryndako</i> / rebuilt acc. to the Roman model of city	Jones 1998, 88
511267	<i>Caesarea Germanica</i>	newly established by Germanicus (AD 17–19)	Corsten 1990b, 20. 28–30
520988	<i>Chalcedon</i>	<i>Chalkedon</i> / independent city	Merkelbach et al. 1980, 96 f. 99–141
844879	<i>Claudiopolis</i>	<i>Bithynion</i> / rebuilt acc. to the Roman model of city	Becker-Bertau 1986, 2–5

⁵⁵⁰ For details, see Chapter 7. 3. 2. Figure 45.

Pleiades No.	Roman Name	Hellenistic Name/ Changes in the City Status	Main Source(s)
844991	Cretia Flaviopolis	<i>Krateia</i> / rebuilt acc. to the Roman model of city	Corsten 1990b, 20; Jones 1998, 160 f.
511226	Dascyleion	<i>Daskylaion</i> / loses its independency in favour of Caesarea Germanica	Corsten 1988, 57–61. 66–69
844959	Hadrianopolis	newly established by king Philadelphus or Augustus, first mentioned in early years of Trajan	Jones 1998, 169
844944	Heraclea Pontica	<i>Herakleia</i> / lost liberty by admitting a garrison of Mithridates	Jones 1998, 159; Schneiderwirth 1882, 26–28
844935	Iuliopolis	gains status of city during the reign of Augustus	Jones 1998, 165
511268	Nicaea	<i>Nikaia</i> / rebuilt acc. to the Roman model of city	Şahin 1987, 5–22
511337	Nicomedia	<i>Nikomedeia</i> / rebuilt acc. to the Roman model of city	Ross 2007, 37–44. 68–81
845049	Prusias ad Hypium	<i>Prousius</i> / rebuilt acc. to the Roman model of city	Ameling 1985, 4–17
511385	Prusias ad Mare	<i>Kios</i> / rebuilt acc. to the Roman model of city	Corsten 1985, 41–45
511384	Prusa ad Olympum	<i>Prousa</i> / enlargement of the city council (ca. AD 101–103)	Corsten 1993, 31–51
845084	Tium	<i>Tios</i> / considerable renewal and urban development	Öztürk 2013, 149 f.

Table 22: Roman Cities and their Origins

Similar to the Hellenistic period, there are two major clusters of cities encountered in the macro-region; one in the west / SW and the other one in the NE. The cluster in the SW is enriched with one city, *Caesarea Germanica*. The cluster in the NE is identically enriched with one more city, *Hadrianopolis*. The last new city established during the Roman period, *Iuliopolis*, appears south of the NE cluster, creating an isolated settlement since it is standing noticeably far from the others.

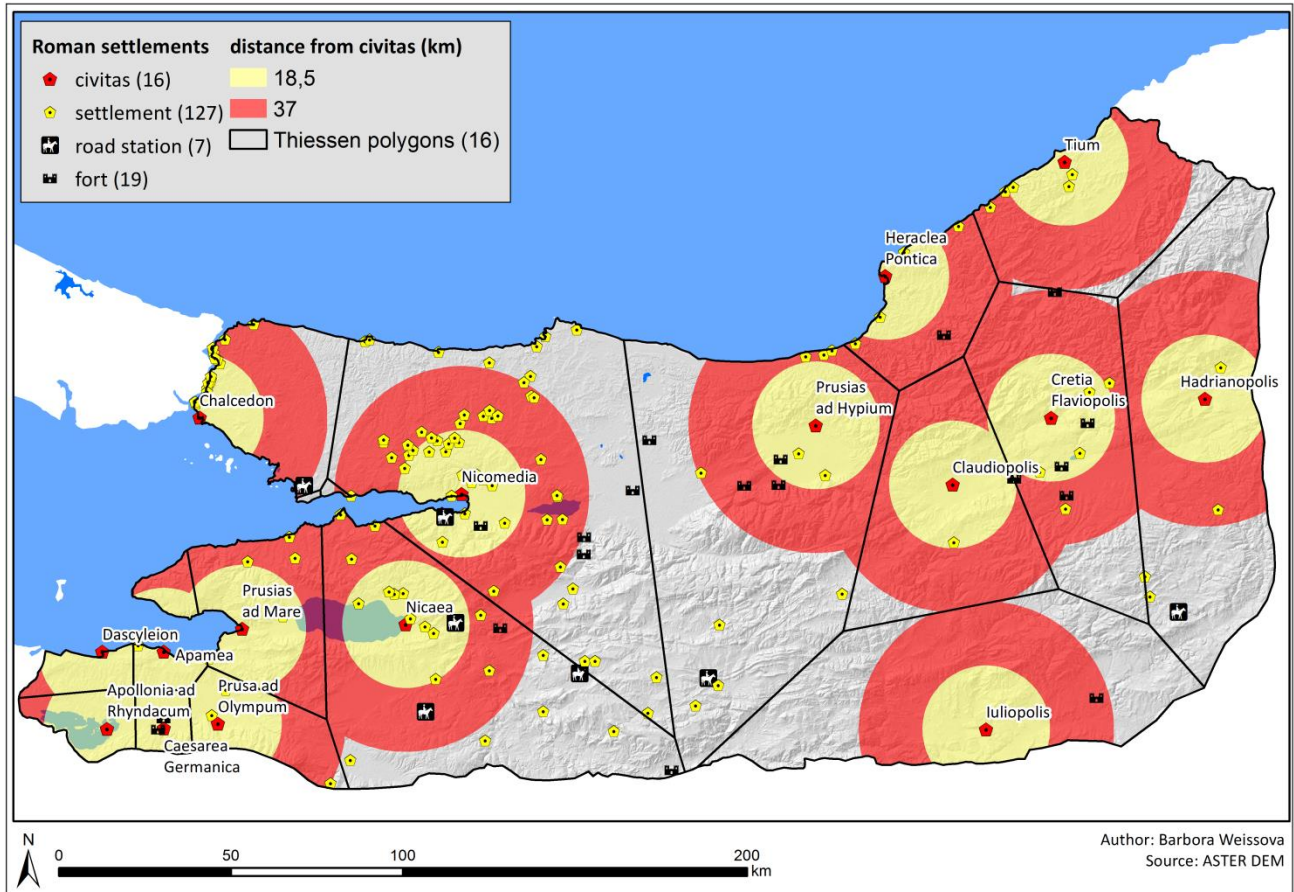


Figure 35: Urbanization in the Roman Period (Addendum 1. 19.)

Examining the development in the SW cluster, the central place distribution model suggested during the Hellenistic period is confirmed during the Roman period. Establishing of *Caesarea Germanica* results in a regular distribution pattern of the cities, which is accordant with the model. The situation in the territory thus seems to be economically stable. The expected change during the Roman period is the inception of a stable place offering high order goods. Since *Prusa ad Olympum* was considerably enlarged, I tend to interpret it as the strongest city in the area. Nevertheless, most of the goods still needed to be transported to the city from its port situated in *Apamea*. As such, the position of the actual market remains unclear.⁵⁵¹

⁵⁵¹ Based on the two speeches given by Dio Chrysostomos (one in *Prusa ad Olympum* Dion. Chrys. Oratio 23. 40 and one in *Apamea* Dion. Chrys. Oratio 24. 41), the relationship between *Prusa ad Olympum* and *Apamea* was problematic. Although not clearly defined, the issues most likely considered the financial situation or the division of the territory. For the discussion on the topic, see Corsten 1987, 14–17.

Prusias ad Mare and *Chalcedon* keep a similar status as during the Hellenistic period. Both cities tend to the primate-city distribution model, without impoverishing their hinterlands. *Nicaea* and *Nicomedia*, on the contrary, create two primate-city models which most likely reach *hypercephalie*.⁵⁵² The suggested *hypercephalie* appearing in the countryside during the 2nd century AD is confirmed by Galen,⁵⁵³ a doctor active in the time of Marcus Aurelius. Galen describes the situation of food reserves in the rural countryside and in the city as follows:

*'The city dwellers, as it was their custom to collect and store enough corn for the whole of the next year immediately after the harvest, carried off all the wheat, barley, beans, and lentils, and left to the peasants various kinds of pulse—after taking quite a large proportion of these to the city. After consuming what was left in the course of the winter, the country people had to resort to unhealthy foods in the spring; they ate twigs and shoots of trees and bushes and bulbs and roots of inedible plants.'*⁵⁵⁴

One city, *Iuliopolis*,⁵⁵⁵ represents an outlier in the group, since it does not directly belong to any of the described clusters. *Iuliopolis* is situated east of *Nicaea* and it is not clear if it created its own independent territory or if it was directly dependent on *Nicaea*. Although an extremely small city,⁵⁵⁶ it was situated considerably far away from *Nicaea*, which would prompt its independence. However, it was situated directly on the 'Pilgrim's road', the fastest way across the territory; despite the distance, it was considerably easy to reach *Iuliopolis* from *Nicaea*. Therefore, I expect the city of *Iuliopolis* to be an inherent part of the territory of *Nicaea*.

Considering this assumption, I postulate that the primate-city model suggested for the territory of *Nicaea* during the Hellenistic period did not change. Newly established *Iuliopolis* was a considerably smaller city, belonging into the territory of *Nicaea*. Its primary function was an

⁵⁵² On problems with food shortages and resulting food riots in the Roman world between 100 BC and AD 400, see Erdkamp 2002, 93–140.

⁵⁵³ Galen lived AD 129 – ca. AD 210 and had an excellent education in the medicine and philosophy. For more information on Galen and his work, see Powell 2003, 1–20.

⁵⁵⁴ Millar 1981, 208.

⁵⁵⁵ Jones 1998, 165.

⁵⁵⁶ Plin. epist. 10, 77 (Pliny to Trajan).

administrative base in the east of the territory of *Nicaea*, since such an extensive dominion was administratively untenable from one point situated at its western periphery.

The situation of Chalcedon features relatively stable situation, prospering from its favourable position at the Bosphorus.

The NE cluster is, as compared to the Hellenistic period, enriched with the city of *Hadrianopolis*. The city fits to the regular distribution pattern of the cities, extending the cluster eastwards. The spatial distribution in the cluster confirms the primate-city distribution model. Considering the regular distribution and relatively short distances between the examined centres, the model is in its positive phase. The distances equal one or maximal two days' travel. The cities are several times larger than any other settlement in their territory; they offer access to the market and other services usually provided by an administrative centre. Their hinterlands, in return, feed the cities with the agriculture surplus that is produced in the fertile territory.

The Voronoi diagram / Thiessen polygons

Examining the results of the Voronoi diagram, the division within the SW cluster is even more regular due to the establishment of *Caesarea Germanica* and it confirms the economic stability of the territory, outlining the central place distribution model.

When studying the north / NE cluster, the territories of the cities became smaller by the emerge of *Iuliopolis* and seem to be closer to their actual territories. Only the territories of *Nicomedia* and *Prusias ad Hypium* are still much prolonged towards the south. The error is caused again by the fact that the analysis does not consider the terrain model. Large mountains clearly divide the territory between *Nicaea* and *Nicomedia* / *Prusias ad Hypium* respectively.

Concerning *Nicaea*, it loses within the diagram a large part of its territory which is certainly incorrect. Yet, the outlined division during the Roman period corresponds with reality⁵⁵⁷ a lot more than the preceding diagram. The lower error rate is caused by the denser urbanization pattern, prompting more equal division of the territory.

⁵⁵⁷ For the division of the territory based on the literary and epigraphic sources, see Fernoux 2004, 133–135.

Multiple ring buffers

The smaller ring buffers of 18.5 km encompass the area of 26 per cent of the macro-region, the ring buffers of 37 km include 41 per cent of the macro-region. The area under direct control of any city during the Roman period falls between 26 and 41 per cent of the entire territory.

6. 3. 3. Early Byzantine Settlement Patterns

Similar to the preceding periods, the most consistent information concerning the settlements during the Early Byzantine era derives from literary sources. Hierocles⁵⁵⁸ represents an important source of information when listing the cities in his compendium of Byzantine administrative units. On top of that, the Early Byzantine era provides the unique opportunity of another quantifiable type of settlements described in primary sources; road stations. The road stations are listed in ancient *Itineraria*⁵⁵⁹ and create, together with cities, the base of the present knowledge of the Early Byzantine settlements in the macro-region.

The Early Byzantine settlements offer a unique opportunity in the scope of the study, since they have been examined by several researchers⁵⁶⁰ and the results achieved in the present work allow for a comparative analysis.

⁵⁵⁸ Hierocles, Syn. 690–696. – For details on the contribution of Hierocles to the current knowledge, see Belke 2010b, 48–50.

⁵⁵⁹ Tab. Peut. (Miller 1916); Itin. Anton. (Cuntz 1929); Itin. Burdig. (Cuntz 1929).

⁵⁶⁰ Belke 2010b, 46–66; Belke 2013, 83–109; Drakoulis 2011, 147–172; Drakoulis 2012, 79–95; Drakoulis 2013, 237–247.

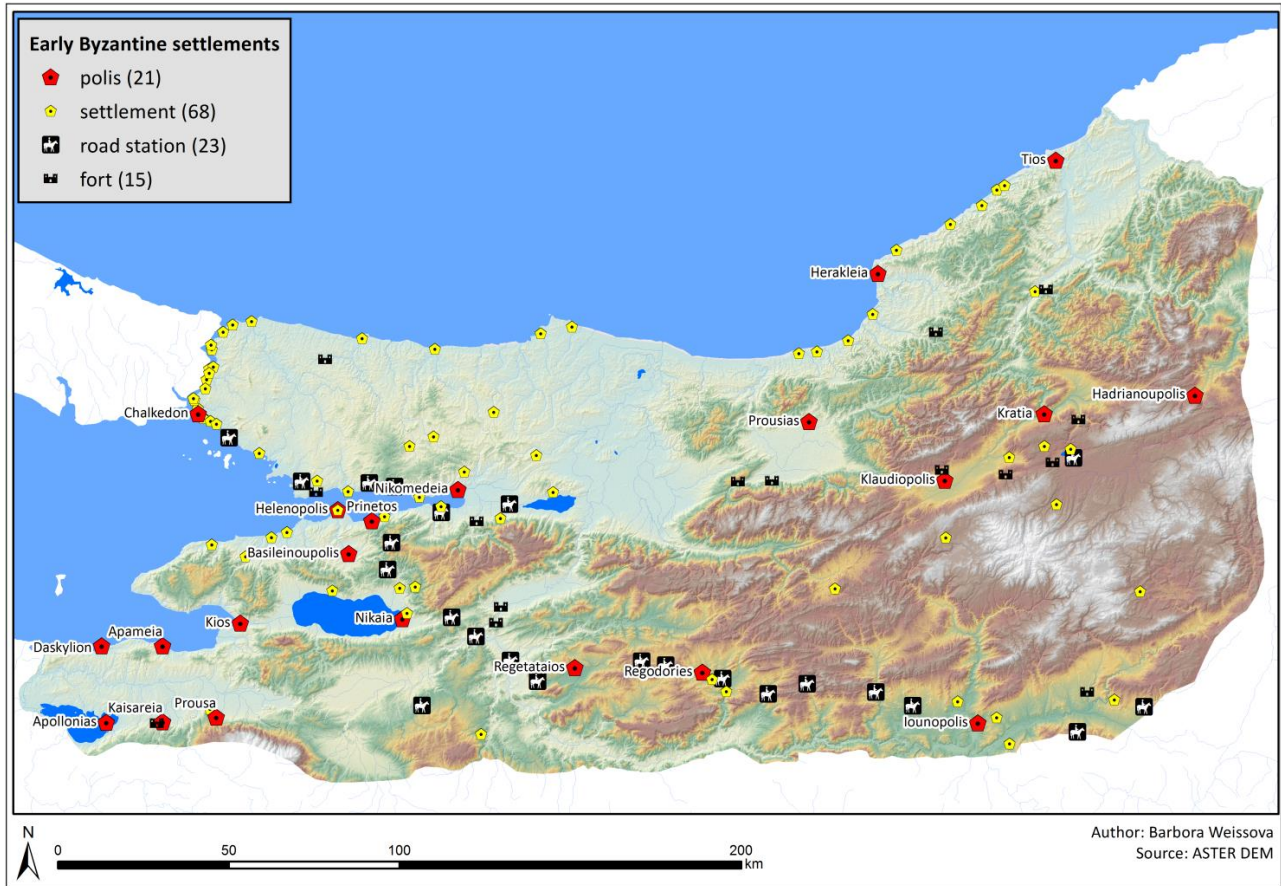


Figure 36: Settlements in the Early Byzantine Period (Addendum 1. 20.)

Cities (21)

The main source of our knowledge, Hierocles,⁵⁶¹ mentions three administrative regions which fall within the examined macro-region: *Pontikes*, *Honoriados* and *Paphlagonias*. The province *Pontikes* encompasses 16 cities. The administrative capital was *Nikomedeia* and the remaining cities were: *Chalkedon*, *Prinetos*, *Helenopolis*, *Nikaia*, *Basileinoupolis*, *Kios*, *Apameia*, *Prousa*, *Kaisareia*, *Apollonias*, *Daskylion*, *Neokaisareia*, *Hadrianoi*, *Regetataius* and *Regodories*. Out of 16 cities, two, *videlicet* *Neokaisareia* and *Hadrianoi*, are not included in the following analysis. *Neokaisareia* was hitherto not localised⁵⁶² and *Hadrianoi* is situated outside the macro-region.⁵⁶³

⁵⁶¹ Hierocles, Syn. 690–695. The source dates back to AD 527 / 528.

⁵⁶² Drakoulis 2013, 244.

⁵⁶³ *Hadrianoi* was identified with the modern town Orhaneli situated SW of the territory by Drakoulis 2013, 244.

Regetataius and *Regodories* are identified with the road stations *Tattaios* and *Doris*.⁵⁶⁴ Despite the fact that the settlements gained the official status of a city several centuries later, they featured all the necessary requirements already during the Early Byzantine period.⁵⁶⁵ It means that their administrative functions were the same as if they were cities; only the official nomination was missing. Therefore, I encompass them as cities in the map Figure 36 and in the analysis of the urbanization below.

The second province, *Honoriados*, encompasses six cities: *Klaudiopolis*, *Prouσίας*, *Herakleia*, *Tios*, *Kratia* and *Hadrianoupolis*. All of them were localised and they are depicted on the map Figure 36.

The third province, *Paphlagonia*, is for its most part situated east of the analysed area. However, its western border overlaps with the macro-region and encompasses the city of Iounopolis.

The spatial distribution of the cities features the following characteristics: out of 21 identified cities, nine are situated directly on the sea coast (seven along the Marmara Sea and two along the Black Sea coast) and another six in a day travel away from the sea. The remaining six are situated deeper inland, two or more days of walk from the sea. When completed with the reconstructed Early Byzantine road system, one can see that, similarly to the previous period, the inland cities are distributed along the two major roads crossing the NW Asia Minor, along the 'Pilgrim's road' and the 'Northern road'. The analysis of the spatial distribution confirms the importance of trade and fast transport pointed in the Roman period as presumptions for an existence of a city in the analysed territory.

Settlements (68)

The number of settlements equals 68 in total which is a mere 50 per cent of the sites documented during the Roman period. The dramatic decrease in the total number cannot be, however, considered as a final outcome. As pointed out in the analysis of Roman settlements (see above), modern villages are rich in *spolia* dated to the Roman and Byzantine periods. The existence of

⁵⁶⁴ Belke 2010b, 51 f.; Belke 2013, 89.

⁵⁶⁵ Belke 2013, 91.

spolia per se can be taken as an evidence of the existence of settlements in the vicinity of the villages. However, numbers and original locations of the settlements are unknown. As the inscriptions dated to the Byzantine period, unlike the Roman evidence, do not mention names of the villages, they are not considered as representatives of settlements.

Concerning the spatial distribution of Byzantine settlements, 57 per cent are distributed along the coastline and a mere 43 per cent are situated inland. Such results suggest an even more dramatic decline of rural settlements than resulting from the total number. However, as proved by pollen analyses,⁵⁶⁶ there is no observable break in agriculture activities between the Roman and Early Byzantine periods. On the contrary, the large population of the new capital required an enormous amount of food. Thus, the number of agricultural settlements able to produce surplus presumably rather increased in order to satisfy the needs of the new capital.⁵⁶⁷ As follows from the abovementioned facts, the lower number of rural settlements results from the insufficiency of the current record.

Road stations (23)

The striking emergence of road stations during the Early Byzantine period results from the nature of preserved records, since the ancient *Itineraria* documenting their existence cannot be dated with certainty earlier than to the Early Byzantine period.⁵⁶⁸ Does the appearance of literary evidence corroborates an emerge of the documented road stations or do we merely miss the records dated to the preceding period(s)? I aim for elucidating this question in the framework of the following chapter when I examine the chronology of investments in roads documented on milestones.

The map Figure 36 includes 23 road stations. Some 20 are situated along the ‘Pilgrim’s road’,⁵⁶⁹ two are along the ‘Northern road’⁵⁷⁰ and one is on the road connecting *Nicaea* and *Dorylaeum*.⁵⁷¹ The number of road stations was actually higher, since the two *towns (Regetataios*

⁵⁶⁶ Izdebski 2013a, 343–376.

⁵⁶⁷ Belke 2013, 86; Drakoulis 2013, 246.

⁵⁶⁸ Dilke 1985, 125–129.

⁵⁶⁹ Tab. Peut. (Miller 1916, 655–658); Itin. Anton. (Cuntz 1929, 20); Itin. Burdig. (Cuntz 1929, 92).

⁵⁷⁰ Tab. Peut. (Miller 1916, 667 f.).

⁵⁷¹ Tab. Peut. (Miller 1916, 687 f.).

and *Regodories*) which I decided to include into the group of cities held an official status of a road station. Thus, the initial number of road stations along the ‘Pilgrim’s road’ equalled 22 and, following, the entire assemblage in the macro-region 25 in total.

Despite the fact that one can face a mere consequence of the preserved evidence, the number of road stations is three times greater than during the Roman period. This enormous increase in the record points to the striking growth of the importance of the roads during the Early Byzantine era.

Forts (15)

Forts follow the same pattern as during the preceding periods. They cluster along the roads and their main function seems to relate to the road system. Situated on elevated positions either in the mountains or in the midst of the lowlands, they served as guarding posts.

Early Byzantine Urbanization as Economic Proxy

The development of cities in NW Asia Minor during the Early Byzantine era was investigated by a number of authors⁵⁷² which allows for a comparative analysis of outcomes of their studies with results achieved in this work. In general terms, all the cities established during the preceding periods keep their statuses and importance.⁵⁷³ Beyond that, five new cities appear in the macro-region.

The following table represents the names of the Early Byzantine cities as introduced by Hierocles,⁵⁷⁴ their statuses, and the main sources used for their identification.

Pleiades No.	Early Byzantine Name	Roman Name / Changes in City Status	Main Source(s)
511194	<i>Apameia</i>	<i>Apamea</i> / independent metropolis	Hierocles, Syn. 692, 4; Corsten 1987, 42–46
511151	<i>Apollonias</i>	<i>Apollonia ad Rhyndacum</i> / bishopric city	Hierocles, Syn. 693, 2

⁵⁷² Ramsay 1962, 179–186; Drakoulis 2013, 239; Belke 2013, 83–109.

⁵⁷³ Except for the city of *Nikomedeia* which was excluded from the main road during the traffic diverting and slowly shrank, more details in Belke 2010b, 54.

⁵⁷⁴ Hierocles, Syn. 690–695.

Pleiades No.	Early Byzantine Name	Roman Name / Changes in City Status	Main Source(s)
511180	<i>Basileinoupolis</i>	newly established by Caesar Julian I. (AD 332 – 363)	Hierocles, Syn. 692, 2; Şahin 1987, 112 (IK Iznik T48)
520988	<i>Chalkedon</i>	<i>Chalcedon</i> / independent metropolis	Hierocles, Syn. 690, 4; Merkelbach et al. 1980, 97. 99–141
511226	<i>Daskylion</i>	<i>Dascyleion</i> / regains its independency and becomes bishopric city	Hierocles, Syn. 693, 3; Corsten 1988, 61–63. 69–71
844959	<i>Hadrianoupolis</i>	<i>Hadrianopolis</i> / bishopric city	Hierocles, Syn. 695, 3
511240	<i>Helenopolis</i>	newly established by Constantin AD 318 as bishopric city	Hierocles, Syn. 691, 3; Ramsay 1962, 187
844944	<i>Herakleia</i>	<i>Heraclea Pontica</i> / independent metropolis	Hierocles, Syn. 694, 6
844935	<i>Iounopolis</i>	<i>Iuliopolis</i> / bishopric city since AD 314	Hierocles, Syn. 696, 2; Belke 1984, 181 f.
511267	<i>Kaisareia</i>	<i>Caesarea Germanica</i> / bishopric city	Hierocles, Syn. 693, 1; Corsten 1990b, 20–23. 30–33
511385	<i>Kios</i>	<i>Prusias ad Mare</i> / independent metropolis	Hierocles, Syn. 692, 3; Corsten 1985, 45–48
844991	<i>Kratia</i>	<i>Cretia Flaviopolis</i> / bishopric city	Hierocles, Syn. 695, 2
844879	<i>Klaudiopolis</i>	<i>Claudiopolis</i> / bishopric city, AD 535 becomes metropolis	Hierocles, Syn. 694, 4; Becker-Bertau 1986, 5–10
511268	<i>Nikaia</i>	<i>Nicaea</i> / independent metropolis	Hierocles, Syn. 692, 1; Şahin 1987, 22–42
511337	<i>Nikomedeia</i>	<i>Nicomedia</i> / administrative capital of province Bithynia	Hierocles, Syn. 691, 1; Ross 2007, 81–83
511372	<i>Prinetos</i>	newly established bishopric city	Hierocles, Syn. 691, 2
511384	<i>Prousa</i>	<i>Prusa ad Olympum</i> / bishopric city	Hierocles, Syn. 692, 5
845049	<i>Prousius</i>	<i>Prusias ad Hypium</i> / bishopric city	Hierocles, Syn. 694, 5; Ameling 1985, 17 f.
511431	<i>Regetataios</i>	newly established town with all institutions required for a city status	Hierocles, Syn. 694, 1; Şahin 1987, 145–147 (IK Iznik T68); Belke 2013, 88 f.

Pleiades No.	Early Byzantine Name	Roman Name / Changes in City Status	Main Source(s)
844900	<i>Regodories</i>	newly established town with all institutions required for a city status	Hierocles, Syn. 694, 2; Şahin 1987, 116–118 (IK Iznik T50. T51); Belke 2013, 89
845084	<i>Tios</i>	<i>Tium</i> / bishopric city	Hierocles, Syn. 695, 1; Öztürk 2013, 161

Table 23: Early Byzantine Cities and their Origins

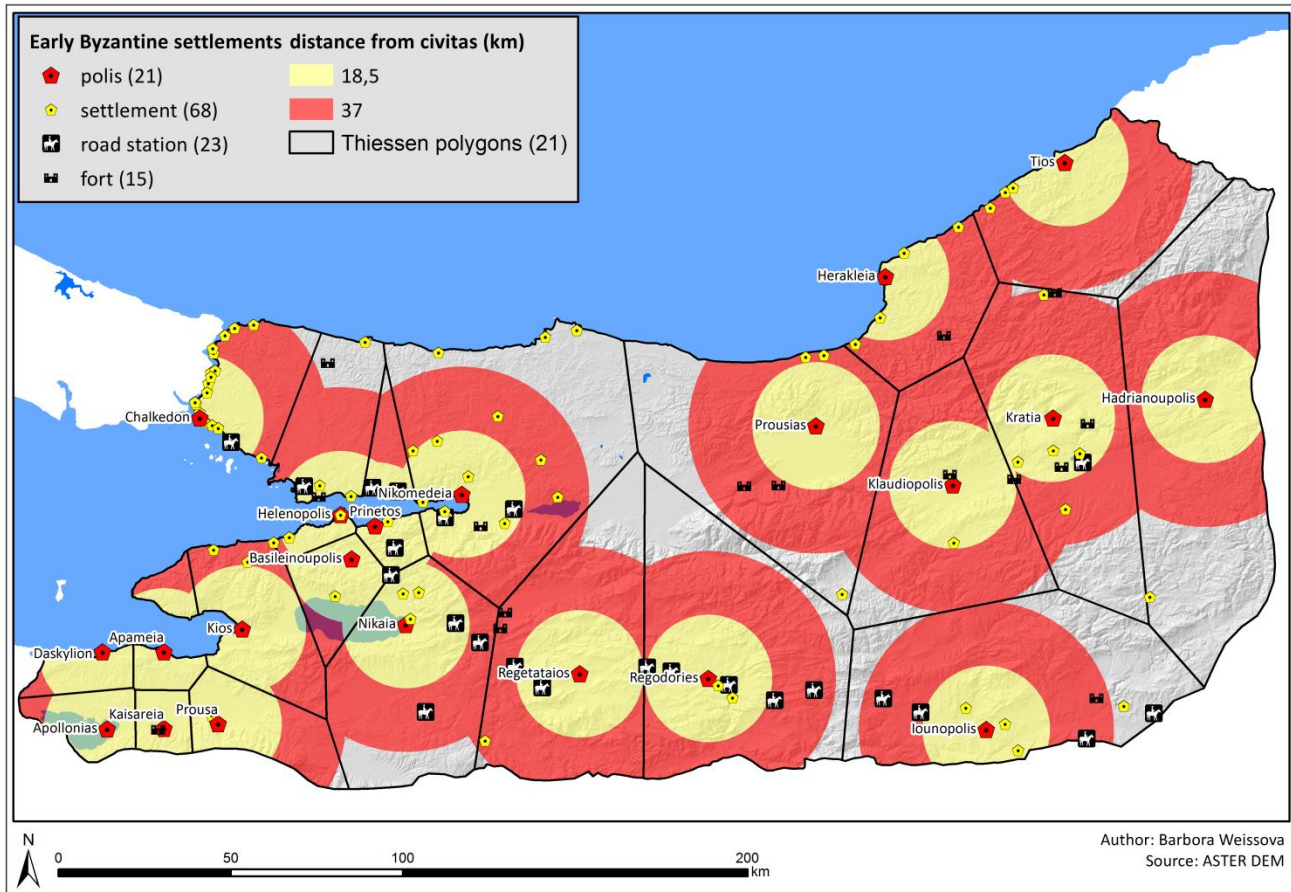


Figure 37: Urbanization in the Early Byzantine Period (Addendum 1. 21.)

The Early Byzantine urbanization strongly cumulates towards the west. The area is enriched with three more cities: *Basileinoupolis*, *Helenopolis* and *Prinetos*, all of them weighted towards *Konstantinopolis* and directly connected with the metropolis. The south / SW and the north / NE clusters remain constant. Dramatic changes occurred in the territory of *Nikaia*, which gained two more cities situated along the ‘Pilgrim’s road’, *Regetataios* and *Regodories*.

Examining the west / SW cluster, it does not encounter any changes in the distribution of the cities. Based on the list of cities by Hierocles,⁵⁷⁵ *Daskylion* regained independency from *Kaisareia*. Keeping in mind this fact, the distribution is more equal than during the Roman period.

The cluster of the three cities newly established on the northern slopes of the Samanlı Mountains consists of *Prinetos*, *Helenopolis* and *Basileinoupolis*. *Prinetos* and *Helenopolis* are situated along the Gulf of *Nicomedia* and *Basileinoupolis* is located inland in the valley crossing the Samanlı Mountains in the North – South direction.⁵⁷⁶ Their allocation is most likely connected with the emerge of *Konstantinopolis* as a new capital, prompting the intensification of production, denser and regulated traffic,⁵⁷⁷ and immense construction works. Building activities took place not only in the metropolis itself, but also in its surroundings. Becoming a periphery of *Konstantinopolis*,⁵⁷⁸ the entire Gulf of *Nicomedia* was built-up with new palaces and monasteries. Since the new cities lack actual fertile hinterlands and are situated directly along the diverted course of the ‘Pilgrim’s road’, their emergence and function relate to the traffic.

Although connected with the existence of *Konstantinopolis*, *Prinetos* and *Helenopolis* belonged in administrative terms to the territory of *Nikomedeia*.⁵⁷⁹ *Basileinoupolis* belonged either to the territory of *Nikaia* or to *Nikomedeia*.⁵⁸⁰ Thus, the territory of *Nikomedeia* gained two (or possibly three if including *Basileinoupolis*) cities. All of them were considerably smaller than *Nikomedeia* and it seems that the city keeps its ‘head position’ in the primate-city distribution model suggested for the preceding periods.

The administration of the territory of *Nikaia* changed considerably. Whether *Basileinoupolis* belonged to the territory of *Nikaia* or *Nikomedeia* does not play such a decisive role. The fundamental changes appear east of *Nikaia* along the course of the ‘Pilgrim’s road’. Two more cities, *Regetataios* and *Regodories*, appear in the area, forming a linear distribution clustering

⁵⁷⁵ Hierocles, Syn. 693, 3; discussed by Belke 2010b, 52; Belke 2013, 88.

⁵⁷⁶ On the discussion of the geographic allocation of *Basileinoupolis*, see Şahin 1981, 4; Şahin 1987, 112–115 (IK Iznik, no. T48).

⁵⁷⁷ Procop. HA 30, 8. For details, see Chapter 7. 4. 1.

⁵⁷⁸ Belke 2013, 85 f.

⁵⁷⁹ Hierocles, Syn. 691.

⁵⁸⁰ On the documents confirming the rows about the city of *Basileinoupolis* between *Nicaea* and *Nicomedia*, see Şahin 1987, 37–41.

along the 'Pilgrim's road'. Despite the emergence of new cities,⁵⁸¹ I interpret the situation in the territory of *Nikaia* as during the preceding periods; the primate-city distribution model with *Nikaia* as the strongest and largest city in the entire territory. The other cities are mere administrative centres, considerably smaller than *Nikaia* and under its direct control.

The north / NE cluster did not encounter any changes in comparison with the Roman period. The cluster encompasses six cities, regularly distributed throughout the NE part of the macro-region. I expect the economic situation in the NE part of the macro-region to be relative stable.

Despite the denser urbanization, it is obvious that the cities were of smaller sizes than most of the cities of the Hellenistic and Roman periods.⁵⁸² Unfortunately, the current state of research does not allow more precise estimations of their actual variation in extension.⁵⁸³

Examining the urbanization, one naturally expects massive capital investments at the moment of an establishment of a new city, since the act *per se* requires immense construction works. This assumption is, however, not entirely confirmed by primary sources. Procopius⁵⁸⁴ describes the city of *Helenopolis*, officially established by Constantine in AD 318,⁵⁸⁵ as missing number of basic buildings during the reign of Justinian I., i.e. two centuries later:

*'But Constantine, by way of repaying the debt of her nurture, endowed this place with the name and dignity of a city. However, he has built there nothing in a style of imperial magnificence, but, though the place remained outwardly as it had been before, it will now boast merely of the title of city and pride itself in the name of its foster-child Helen.'*⁵⁸⁶

⁵⁸¹ Listed from the west to the east, the cities in the territory of *Nikaia* include *Basileinoupolis* (?), *Regetataios*, *Regodorios* and *Iounopolis*. All of the newly established cities cluster along the 'Pilgrim's road'.

⁵⁸² On the importance of the sizes of cities and their role in the economic development, see Wilson 2011, 161–195.

⁵⁸³ For more details on the topic, see Chapter 8. 3. 1.

⁵⁸⁴ Proc. aed. 5, 2, 1.

⁵⁸⁵ Ramsay 1962, 187 f.

⁵⁸⁶ Proc. aed. 5, 2, 2. Translation by Dewing 1940.

By the time of Justinian, the city was equipped with a new aqueduct, a public bath, churches, a palace, stoas and a lodging for magistrates.⁵⁸⁷ Procopius anticipates that the establishment of the city did not require as massive investments as expected.

Investigating the economic development of the macro-region *en bloc*, it is generally expected that the NW part of Asia Minor underwent a fundamental economic change with the emergence of *Constantinopolis*.⁵⁸⁸ All the resources and surpluses of production were transported to the new metropolis to be used for extensive construction works and to feed the numerous population respectively. This phenomenon can be observed in the new urbanization pattern, weighted towards the city or clustered along the main artery connecting the city with the east, the 'Pilgrim's road'.

It is hard to postulate if the development of the new city had a positive or negative impact on the economic situation in the macro-region. On the one hand, the metropolis certainly exploited the hinterland; on the other hand, the newly established empire brought foundations of new cities and maintenance of the old cities and roads, raising in this way the standard of living in the entire macro-region.⁵⁸⁹

The generally accepted decline of the territory by the end of the Early Byzantine⁵⁹⁰ era is not confirmed by the numbers of cities, gradually growing since the Hellenistic period. However, the decline of the large ancient *metropolises* is certain. Belke⁵⁹¹ points out the factors leading to the gradual decay of the two major cities in the territory, *Nikomedeia* and *Nikaia*.⁵⁹² The preserved records concerning the other cities are too scarce to reconstruct their development.

Another theory, largely accepted as a fact, is that the hinterland suffered due to large demands of production required by the new capital.⁵⁹³ This would have entailed a complete destruction of local economic systems. This assumption has been lately infirmed by the study of A.

⁵⁸⁷ Proc. aed. 5, 2, 3–5.

⁵⁸⁸ Belke 2013, 86; Grünbart 2013, 111–130.

⁵⁸⁹ Extensive building activities are documented during the time of Justinian by Procopius in Proc. aed. 5, 2–5, 4.

⁵⁹⁰ The theory of the decline is outlined and infirmed by Morrisson – Sodini 2002, 190 f.; Belke 2010b, 46 f.

⁵⁹¹ Belke 2010b, 53–59.

⁵⁹² One of the factors are frequent earthquakes, increasing in number and strength during the Early Byzantine period. The sources document five earthquakes in *Nikomedeia* (AD 358, 362, 447, 478, 554) and three (four?) earthquakes in *Nikaia* (AD 362, 368, 478, 554?). For details on their strokes, see Chapter 2. 1. 4.

⁵⁹³ Belke 2013, 86.

Izdebski.⁵⁹⁴ Based on pollen analyses, A. Izdebski claims that the agricultural production was densely distributed throughout the entire NW Asia Minor, regardless of the proximity to the transport network enabling connection with the capital. Resulting from this fact, A. Izdebski argues for an existence of vital and complex local economies spread throughout the Early Byzantine countryside.

In conclusion, the latest observations suggest a developmental change in the territory, specified by K. Belke as ruralisation.⁵⁹⁵ This change does not necessarily imply the fundamental decline of the economic situation. More likely, it indicates changes from the primate-city distribution models towards, in long term view more sustainable, local economies based on the local production. The decisive role of *Konstantinopolis* cannot be denied, however, its impact on the macro-region does not seem to be as catastrophic as previously often assumed.

The Voronoi diagram / Thiessen polygons

Two new cities appearing along the 'Pilgrim's road' have a major impact on the results of the Voronoi diagram. The territories of *Regodories* and *Regetataios* spread along the 'Pilgrim's road' and reduce the exaggerated extensions of *Nikomedeia* and *Prouσίας* suggested by the diagrams during the preceding periods. On the contrary, the territories of the cities this time reach far to the north, overlapping with the actual territory of *Nikomedeia*.

The Voronoi diagram using cities dated to the Early Byzantine period produces a division of territory which represents the best fit to reality from all the analysed time spans.

Multiple ring buffers

The ring buffers of 18.5 km cover 34 per cent of the entire macro-region, the larger ring buffers of 37 km encompass 46 per cent. It seems that almost half of the territory was under the direct control of a city.

⁵⁹⁴ Izdebski 2012, 47–66 for the northern Anatolia; Izdebski 2013a, 343–376 and especially 354 for the territory of the macro-region.

⁵⁹⁵ The transformation of towns into rural settlements is confirmed by Morrisson – Sodini 2002, 190.

6. 4. Urbanization from the Hellenistic till the Early Byzantine Period

The following text summarizes the results and analyses of the urbanization throughout the discussed periods, pointing out trends appearing in the macro-region. Furthermore, I compare the results of the Roman period with the outcomes of the urbanization in entire Asia Minor.⁵⁹⁶

Examining the urbanization of the analysed territory from its origins, one needs to look back to the periods preceding the Hellenistic era. The shores of NW Asia Minor, occupied during the Early Iron Age by Thracian tribes,⁵⁹⁷ were since the 7th century BC subsequently urbanized by Greek colonizers.⁵⁹⁸ The Greeks settled along the coastal territories of the Marmara, the Bosphorus and the Black Sea coast.⁵⁹⁹

During the Hellenistic period, directly connected with the Bithynian Kingdom, the urban settlements appear in the inland of Bithynia.⁶⁰⁰ The urban development during the Hellenistic period created a stepping stone for the upcoming Roman presence in the area. The existing *poleis* were adopted by the Romans and pursuant to the considerably dense Hellenistic urbanization, only three new cities were founded. The subsequent decline of the Roman Empire and the rise of the Byzantine Empire brought a subdivision of the area into smaller territories. This development required an establishment of more cities which functioned as administrative units.⁶⁰¹

This description, a largely simplified picture of the development in the area during nine centuries, is for the most part based on the study of ancient sources and sustained with archaeological remains. Examining the changes in the density of the urban settlements, they feature a continuous growth in the territory; ‘from the tribal state to the Roman colony’. The general tendency, however, needs to be reconsidered with the following premise: the economic situation of the Roman Empire itself was not stable.⁶⁰² Therefore, during the Roman occupation, changes took place also in the territory of Bithynia and the development cannot be considered as an uninterrupted growth. The Early Byzantine period saw long-term transformations in the

⁵⁹⁶ The comparative analysis was enabled by the results published by Hanson 2011, 229–275.

⁵⁹⁷ Doğancı 2013, 45–51; Hdt 7, 75, 2; Strab. 12, 3, 3.

⁵⁹⁸ Tsetskhladze 2006, lxvi.

⁵⁹⁹ Avram et al. 2004, 924–973; Avram 2004, 974–999.

⁶⁰⁰ Jones 1998, 151 f.; Marek 2003, 35.

⁶⁰¹ Drakoulis 2013, 245; Morrison – Sodini 2002, 189.

⁶⁰² Bowman – Wilson 2009, 3.

economic development of the territory.⁶⁰³ The NW part of Asia Minor was influenced in particular, since it happened to be part of the extensive hinterland of the newly established capital of *Constantinopolis*.⁶⁰⁴ Construction works connected with the new capital required an immense amount of material and products to be carried to the rising metropolis. Feeding such a large city was considerably fastidious, too. Therefore, the emergence of *Constantinopolis* should have had a fundamental impact on the situation in the macro-region. A new demand for resources explains the denser urbanization, since the food and stock supplies required more administrative centres controlling the production and the transport to the *Constantinopolis*.

6. 4. 1. Trends in the Urbanization

The area of the entire macro-region covers 42,777 sq. km. Quantifications presented in the Table 24 are based on estimations published in the study of T. Bekker-Nielsen⁶⁰⁵ and further specified for the area of Asia Minor (given the difficulties of the terrain) by J. W. Hanson.⁶⁰⁶

Multiple ring buffers

Areas encompassed in the buffers drawn around the cities represent the areas under a direct economic impact of a city, including the proximity of a market place, a service centre and a centre of administration and politics. The territories included in the buffers can certainly be described as urbanized.

The estimates listed in the following Table 24 represent total numbers of areas covered within the two ring buffers and per centages of the territories in relation to the macro-region.

Chronological Time Span	Hellenistic		Roman		Early Byzantine	
buffer (km)	18.5	37	18.5	37	18.5	37
covered area (sq. km)	9390	14417	11269	17339	14474	19857
urbanized area (in % of total)	22	34	26	41	34	46

Table 24: Tabular Overview of Urbanization Estimates

⁶⁰³ Morrison – Sodini 2002, 171–221.

⁶⁰⁴ Mango 1995; Laiou 2002, 702. 725; Drakoulis 2013, 237.

⁶⁰⁵ Bekker-Nielsen 1989.

⁶⁰⁶ Hanson 2011, 237–241.

The lower estimates, resulting from the buffer of 18.5 km drawn around each of the cities, show the minimum territory reachable from a city in a day's travel. The figure of 18.5 km covers an extremely difficult terrain, most likely in mountainous areas. The second figure results from the buffer of 37 km drawn around each city, reachable under favourable conditions. I introduce results of both estimates, since I expect the real area surveyed by each of the analysed cities to fluctuate somewhere between the two, based on individual conditions as the elevation model and the roads in the area. For instance, the 'Pilgrim's road', even though crossing the mountainous plateau in the SE part of the macro-region, is a considerably fast and safe way through the mountains. Given that the road was well maintained, it possibly enabled faster travel speed through the mountains than an unmaintained road leading through a flatland.

The urbanised area, or better an area under direct control of a city, is expressed in percentages and results from a simple formula using the entire territory of 42,777 sq. km as 100 per cent of the analysed territory.

The changes observable between the areas covered by the two estimates are considerably smaller than expected on the first place, since the larger buffer overlays almost four times (3.98) the territory included in the smaller one. Analogous results revealed the analysis of J. W. Hanson⁶⁰⁷ who interprets the limited increase between applying the first and the second radius itself as an outcome of a dense and well-distributed density of cities.

However, it is necessary to keep in mind that J. W. Hanson examined a territory that is more than seven times larger than the macro-region under study, including areas situated deeper inland and with greater variations in elevation. The outcome might be, therefore, affected by the possible outliers appearing in the assemblage. To confirm the results in the macro-region, I examined the individual maps depicting spatial distributions of the cities and their possible territories during the researched time spans (Figures 33, 35 and 37).

Since the cities are densely clustered in the SW, the buffers naturally overlap. In this way, most of the area is already covered by the buffers of 18.5 km and the larger ones do not cause any difference (the buffers of 37 km lap over the 18.5 km buffers only on the edges of the cluster).

⁶⁰⁷ Hanson 2011, 244.

The dense clustering of settlements in the SW part of the macro-region also means that the actual urbanized territory is smaller than assumed when examining the number of cities in relation to the area of the entire macro-region. In other words, the extremely dense urbanization in one cluster and scarce urbanization in the other part of the territory, when averaged for the total area, result in a seemingly relatively dense urbanization all over the macro-region. This picture is apparently misleading and points to the necessity of correlating the statistical data with the actual spatial distribution of the cities.

The phenomenon of relatively faint differences between the territories encompassed in the two clusters is clearly observable on the bar chart Figure 38 below, showing the percentages of the urbanized territories falling into both buffers during all the three chronological time spans.

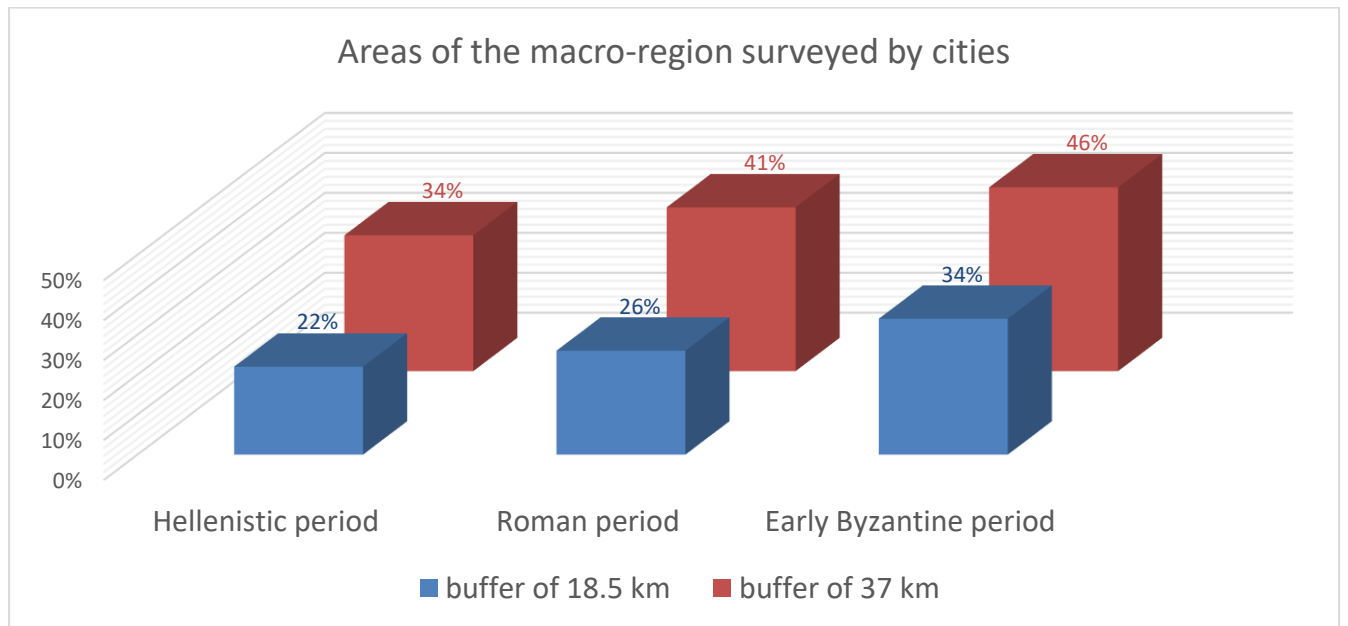


Figure 38: Bar Graph Depicting the Areas Directly Surveyed by Cities

Except for the discrepancies caused by the dense clustering of cities at some points, following the changes in relative percentages enables to trace the fluctuations of urbanization. The urbanization in the macro-region grows continuously during the analysed periods, reaching the densest coverage in the Early Byzantine era. The changes between the studied periods are relatively even since there is a lack of any clearly observable growth of the urbanization during one of them. The urbanization of the territory develops gradually and it most likely follows the needs of the newly established government and its administration.

Looking at the simplified maps Figure 39 showing the urbanization, an important phenomenon can be observed. When comparing the urbanization during the Hellenistic and Roman periods, the cluster situated in the SW is relatively dense already during the Hellenistic era. Thus, the newly established city during the Roman period, *Caesarea Germanica*, has no impact on the results of the analysis.

Moreover, the territories of *Iuliopolis* and *Hadrianopolis* are cut by the border of the macro-region

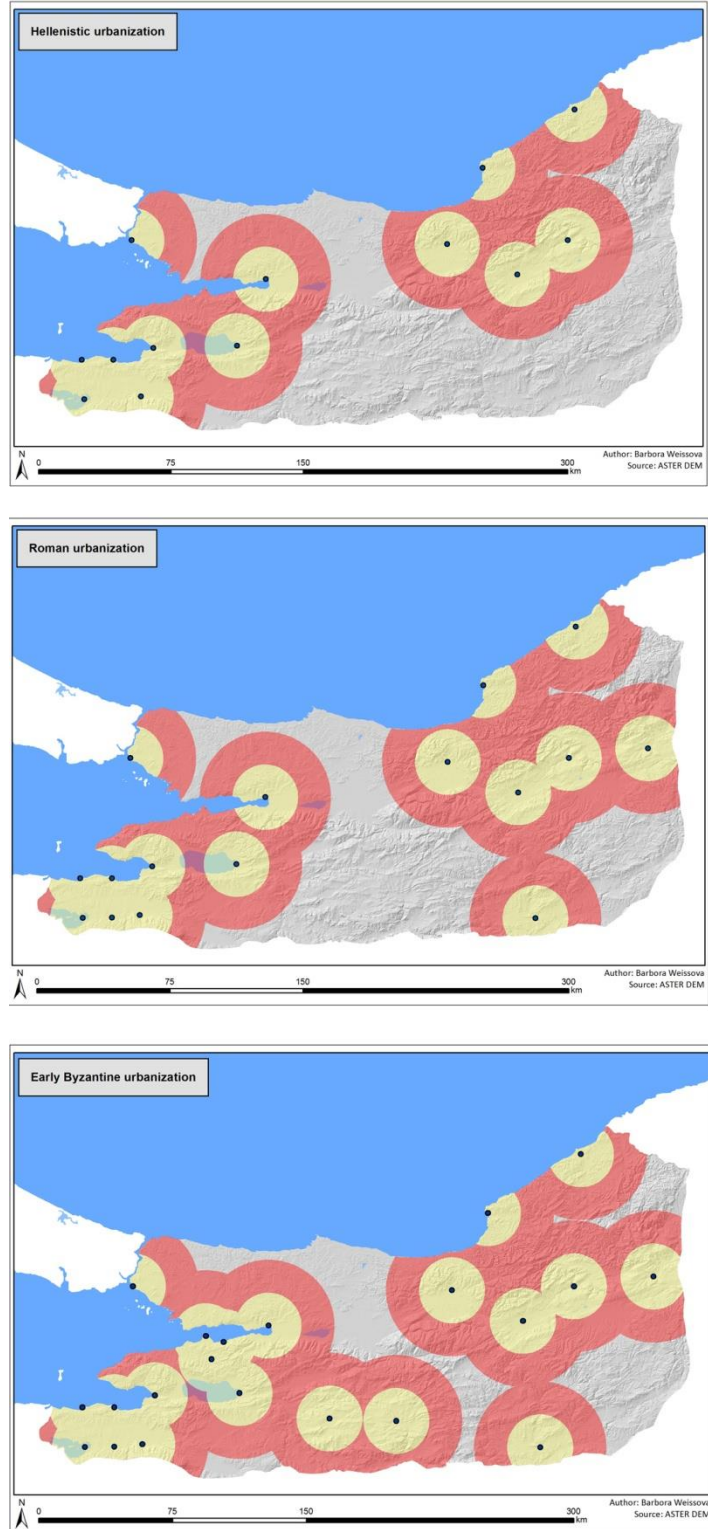


Figure 39: Urbanization during the Hellenistic, Roman and Early Byzantine Periods

itself. These phenomena are reasons for the negligible differences between the Hellenistic and Roman urbanization, when comparing the buffers of 18.5 km.

The analysis of urbanization yielded an even growth and, thus, relatively balanced development of the territory. Although affected by numerous catastrophes including devastating earthquakes⁶⁰⁸ and famines,⁶⁰⁹ they do not seem to have had a negative long-term impact on the gradual development of the macro-regional economy.

The Voronoi diagram / Thiessen polygons

I did not include the Voronoi diagrams into the overview maps of urbanization in Figure 39, since they do not allow for a meaningful analysis. The Thiessen polygons naturally create as even a division of the territory as possible. Since the reality is irregular and some of the cities govern considerably larger territories than the others, this type of the terrain analysis is not appropriate.

Based on my observations, the Thiessen polygons generate results which are misleading. Since the partition of the territory aims for as even one as possible, it models a considerably more even distribution than existed in reality. To avoid this unfavourable effect, it is always necessary to combine results of the Voronoi diagrams with historiographical data and terrain model.

6. 4. 2. Comparative Analysis of Roman Urbanization in the Macro-Region and Asia Minor

The study of Roman urbanization of the entire territory of Asia Minor⁶¹⁰ allowed for a comparative analysis of its results with the outcomes outlined here. The following comparisons are based on analyses of:

- a) areas directly surveyed by cities outlined by buffers of 18.5 and 37 km respectively
- b) territories of cities outlined by the Voronoi diagrams
- c) altitudes of the cities

⁶⁰⁸ For the list of earthquakes documented in the territory, see Chapter 2. 1. 4.

⁶⁰⁹ Some of them are documented by epigraphic evidence, for details see IK Prusias ad Hypium, nos. 6. 18. 19; for the analysis of the inscriptions in the scope of the economic development, see Chapter 5. 5. 3.

⁶¹⁰ Hanson 2011, 229–275.

a) Areas directly surveyed by cities outlined with buffers of 18.5 and 37 km radii respectively

The following Table 25 shows territories of NW Asia Minor and the entire Asia Minor encompassed in the buffers of 18.5 km and 37 km drawn around each city. The covered areas are introduced in square kilometres and the aliquot parts of the urbanized territories within are expressed in percentage.

Analysed Territory	Macro-Region		Asia Minor (based on Hanson 2011)	
	18.5	37	18.5	37
buffer (km)	18.5	37	18.5	37
covered area (sq. km)	11,269	17,339	126,000	260,000
urbanized area (in % of total)	26	41	41	84

Table 25: Urbanized Areas in the Macro-Region and Asia Minor

The results presented in the Table 25 show a striking difference between the urbanization of Asia Minor and the macro-region. The area defined as surveyed by a city is doubled in Asia Minor. Since the observations apply to both buffers, it is obvious that the urbanization of the macro-region was considerably underdeveloped in comparison with Asia Minor.

The differences in urbanization are caused by the extremely large territories of *Nicaea* and *Nicomedia*. However, the results of the comparative analysis come with one decisive caveat. Although there is a sufficient information pertaining to Roman *civitates* in the macro-region, it is based solely on the primary sources and the sources do not mention urban settlements without an official status of the city. It is presumable that the density of urban settlements in the macro-region was much higher. This assumption is supported by observation of the travellers in the 19th century, who mention the existence of such kinds of settlements.⁶¹¹ Since their descriptions were never confirmed by archaeological research, I do not include these observations into the analysis. However, future surveys in the territory have a great potential of enriching the list of cities. In spite of an official city status, the function of these urban settlements as central market places and administrative centres would qualify them to be included in the urbanization patterns.

⁶¹¹ For instance, see the descriptions of urban settlements by von Diest 1895, 8. 12; von der Goltz 1896, 151–153; von Diest 1898, 73.

In conclusion, the current picture of the urbanization in NW Asia Minor proofs an underestimated urban development, but new investigations in the field might easily shift the outlined picture.

b) Territories of cities outlined by the Voronoi diagram / Thiessen polygons

Despite the issues with the Voronoi diagram and their utilization in the territory, I use the results for a comparative analysis with the results presented by J. W. Hanson.⁶¹² J. W. Hanson computed and interpreted the Voronoi diagram for the entire territory of Asia Minor, taking the shapes and sizes of the resulting polygons as indicators of a well-distributed network of sites. The network encompasses a large number of evenly sized hinterlands and a small range between the smallest and the biggest hinterlands in the centre of the system. J. W. Hanson interprets the setting as a result of a well-organized control of the land, corresponding to a relatively even hierarchy, although fairly small hinterlands are most common. Large hinterlands are described only in the less urbanized regions of Paphlagonia and Cappadocia. J. W. Hanson explains the scarcity of cities in these two territories as a consequence of the distant Mediterranean. The results are listed in the Table 26 below, next to the results achieved in the macro-region.

Thiessen polygon	Macro-Region (sq. km)	Asia Minor (sq. km)
Minimal size	288	211
Maximal size	6,712	25,800
Mean	2,674	2,310
Median	1,950	1,460

Table 26: Sizes of the Thiessen Polygons in the Macro-Region and in Asia Minor

Comparing sizes of the Thiessen polygons computed for the macro-region and for the entire Asia Minor, they show lesser variations between the smallest and the largest polygon. Even though the largest polygon in the macro-region equals one quarter of the largest polygon in the entire Asia Minor, the values of the mean and median sizes are higher in the macro-region. One can clearly see that the analysis of urbanization based on Thiessen polygons shows concurrent results with the

⁶¹² Hanson 2011, 246.

analysis based on radii drawn around cities; the urbanization in NW Asia Minor seems to be considerably scant, at least with the current dataset.

Considering the abovementioned problems appearing when applying Thiessen polygons, one needs to ask a crucial question relevant for entire Asia Minor. How scarce should the spatial distribution of cities in Paphlagonia and Cappadocia be, since the Thiessen polygons create so large and uneven areas? This question, though important, is out of the scope of the present study.

c) Altitudes of the cities

The Roman cities in the entire Asia Minor are distributed relatively equally within the territory, occupying lowland regions of the western and southern shores, the higher regions of the central plateau, and even up to an altitude of 1,500 meters above the sea level. The number of sites at this altitude is smaller but the relief itself seems to have a relatively negligible influence.⁶¹³

The Roman cities in the macro-region revealed a distinct pattern. The elevation values in the macro-region vary between 0 – 2,386 meters above the sea level, whereas a mere 14 per cent fall within the elevation between 0 – 100 meters above the sea level. The Table 27 shows average altitudes

City	Elevation (m a. s. l.)
<i>Dascyleion</i>	0
<i>Prusias ad Mare</i>	3
<i>Apollonia ad Rhyndacum</i>	10
<i>Apamea</i>	24
<i>Chalcedon</i>	28
<i>Tium</i>	48
<i>Heraclea Pontica</i>	61
<i>Nicomedia</i>	61
<i>Nicaea</i>	85
<i>Caesarea Germanica</i>	100
<i>Prusias ad Hypium</i>	189
<i>Prusa ad Olypium</i>	237
<i>Iuliopolis</i>	489
<i>Cretia Flaviopolis</i>	538
<i>Hadrianopolis</i>	726
<i>Claudiopolis</i>	840

Table 27: Table of Cities' Altitudes in the Macro-Region

of the cities in the macro-region, listed from the lowest to the highest elevation. The combination of the altitudes with the list of cities and their elevations shows, unlike in the entire Asia Minor, that the elevation plays an important role. Out of 16 Roman cities, ten (63 per cent) are situated in an altitude range not exceeding 100 meters above the sea level. Only the remaining six cities are located in areas with higher elevation values, reaching 840 meters above the sea level at

⁶¹³ Hanson 2011, 242.

maximum. The linear graph Figure 40 below shows an overview of altitudes of the cities in the macro-region.

To conclude, although the mean elevation of the region equals 650 meters above the sea level, the median for the elevations of the cities is 145 meters above the sea level, indicating that the elevation was a decisive factor for locations of cities in NW Asia Minor.

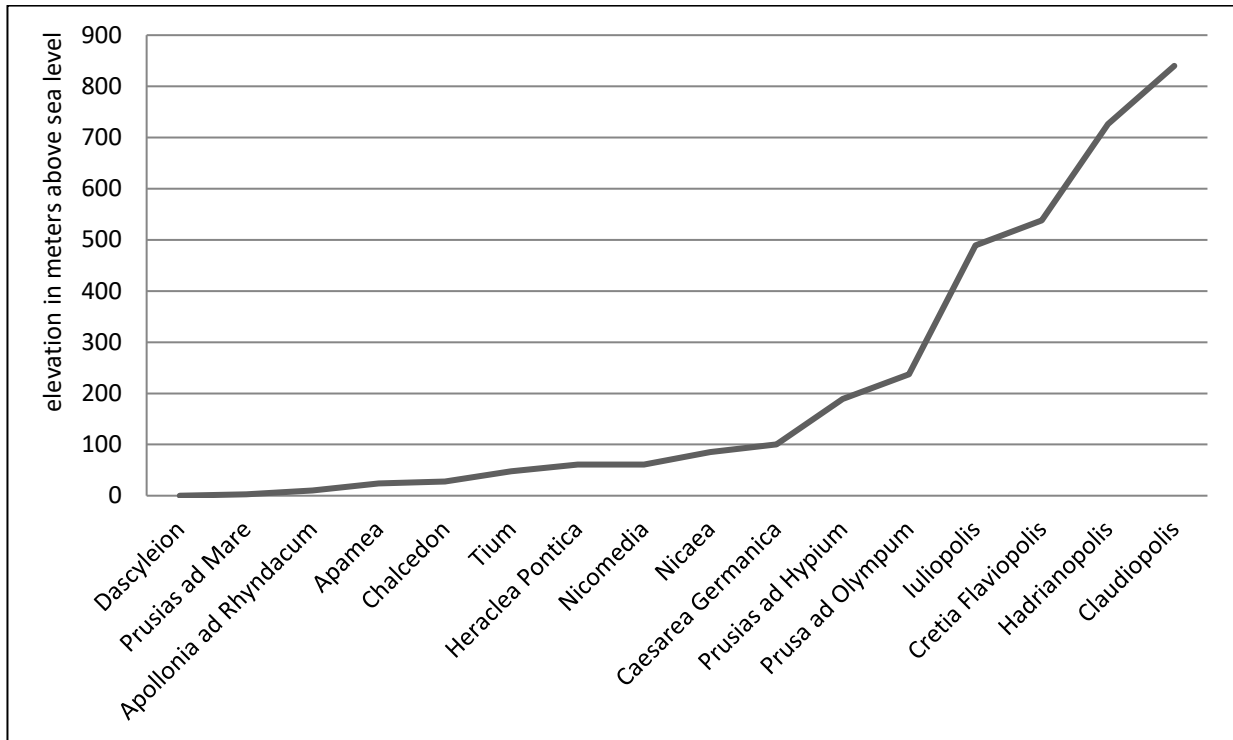


Figure 40: Linear Graph of the Altitudes of the Roman Cities in the Macro-Region

6. 5. Relative Density of Settlements except Cities

The scarce and uneven record concerning rural settlements might be used for increasing the density of points on a map but does not bring much more information concerning the precise chronology, extension and function of settlements. Since J. W. Hanson works with similar assemblage of data collected within the entire Asia Minor, the last comparative analysis presented in this study concerns the density of ‘non-urban’ settlements.

Table 28 shows the density of settlements divided into given time spans. As the Roman settlements feature the largest density, I regard them as 100 per cent of possible record and

include the percentage representations of numbers of settlements during the Hellenistic and Early Byzantine periods in order to clearly demonstrate the differences between the densities.

Chronology	Macro-Region		
	Total No.	Density (territory per settlement in sq. km)	Percentage of settlements (expressed proportionally to Roman as 100 %)
Hellenistic	23	1860	18%
Roman	127	280	100%
Byzantine	106	404	83%

Table 28: Density of Settlements in the Macro-Region Divided Based on Given Time Spans

J. W. Hanson’s study revealed results for the entire Asia Minor, showing the density of settlements to be one per 221 sq. km, with a radius of 8 km. The macro-region features one settlement per 280 sq. km and the radius of 9.5 km, as shown in Table 29 below.

The density of ‘non-urban’ settlements is, similarly as in the case of urban settlements, lower in the macro-region than in the entire Asia Minor.

Territory per settlement	Macro-Region	Asia Minor
Area (sq. km)	280	221
Radius (km)	9.5	8

Table 29: Density of Settlements in the Macro-Region and Asia Minor during the Roman Period

Looking at the distribution of settlements on the map Figure 34 (Addendum 1. 18.), one can clearly observe clustering of points in the lowland areas. Since altitude proved to be a decisive factor of locations of cities in NW Asia Minor, I decided to divide the territory based on elevation estimates and count the density of settlements within each estimate separately. The following Table 30 demonstrates the results of such an exercise, dividing the territory into lowlands reaching 200 meters above the sea level, hilly areas between 200 and 500 meters above the sea level, mountainous areas between 500 and 1000 meters above the sea level and mountains exceeding 1000 meters above the sea level. Interestingly, the elevation estimates in the area are generally equally divided, ranging between 20 and 29 per cent per defined territory except the highest elevation, reaching mere two per cent of the territory.

Macro-Region Elevation (m a. s. l.)	Area (sq. km) / % of total	Settlements Nos. / % of Total (23) Hellenistic	Settlements Nos. / % of Total (153) Roman	Settlements Nos. / % of Total (106) Early Byzantine
0 – 200	10,266 / 24%	17 / 74%	81 / 54%	61 / 58%
200 – 500	8,555 / 20%	5 / 22%	37 / 24%	11 / 10%
500 – 1,000	12,405 / 29%	1 / 4%	25 / 16%	28 / 26%
1,000 – 2,000	10,695 / 25%	0	10 / 6%	6 / 6%
above 2,000	856 / 2%	0	0	0

Table 30: Density of Settlements Divided Based on Altitudes during Given Periods

Table 30 confirms the expectation that the percentages of settlements situated in the lowland are considerably higher than all the others, representing more than 50 per cent of the entire assemblage during each of the discussed periods.

Examining the changes period by period, the Hellenistic settlements almost exclusively concentrate in the lowland areas, with 74 per cent of settlements situated in elevations between 0 and 200 meters above the sea level. The Roman period features a more equal distribution of the settlements which noticeably move towards the hilly and mountainous areas. The Early Byzantine period is characterised by a continuing shift of settlements towards the elevated areas. Whereas numbers of settlements in lowlands and hilly areas decrease from the Roman to the Early Byzantine era, numbers of settlements increase in the areas situated in the mountains and reaching elevations between 500 and 1000 meters above the sea level.

6. 5. 1. Comparative Analysis with Results of the Survey Projects in Paphlagonia and Pisidia

The territory of Paphlagonia offers a unique opportunity of an interregional comparative sample of the datasets since it was surveyed by two projects, the Paphlagonia Project⁶¹⁴ and the Cide Archaeological Project.⁶¹⁵

The area surveyed by the Paphlagonia Project is situated on the eastern border of the macro-region and covers 8,454 sq. km. The region spreads over a mountainous area with

⁶¹⁴ Matthews – Glatz 2009.

⁶¹⁵ Düring – Glatz 2015a.

elevations ranging between 428 and 2122 meters above the sea level,⁶¹⁶ with the most concentrated elevations at about 1,300 meters above the sea level.

The Cide archaeological project surveyed the coastal region Cide and the neighbouring inland region Şenpazar, stretching over an area of 930 sq. km.⁶¹⁷ Although the survey seemed to have a great potential, it brought only scarce results concerning the Hellenistic, Roman and Early Byzantine periods. Examining the numbers of the datable fragments of pottery, the Roman and Early Byzantine periods revealed mere 211 pieces in total.⁶¹⁸ Accordingly, the final reports of the project do not interpret the numbers of settlements and, rather, describe the particular pieces. However, I examined the sparse clusters in order to achieve a relative density of settlements in the region. The Hellenistic period revealed seven in total.⁶¹⁹ Five of them are situated in the coastal hinterland, two inland. The Roman and Early Byzantine ceramics were identified within 14 scatters, 12 of them clustered along the Black Sea shore and two situated inland.

The territory of *Sagalassos* in Pisidia was surveyed by the Pisidia Project and results of the surveys were published in a great detail.⁶²⁰ The area encompasses 1,800 sq. km⁶²¹ and it is situated in the western part of the Taurus Mountains, stretched on the mountainous plateau. The elevations of the surveyed territory range between 840 and 1,833 meters above the sea level.⁶²² In order to achieve a comparable sample with the macro-region, I had to reduce the numbers of sites published by the project.⁶²³ The sites encompassed all the patterns, including funerary

⁶¹⁶ Marsh et al. 2009, 43–45.

⁶¹⁷ Düring – Glatz 2015b, 9.

⁶¹⁸ The pottery creates 14 clusters; 12 of them are situated in the lowland along the shore. For details, see Bes 2015a, 260–293; Bes 2015b, 23–42.

⁶¹⁹ Şerifoğlu – Bakan 2015, 249.

⁶²⁰ For the first general observations, see Waelkens 1993, for a detailed report on the survey during 1996 and 1997, see Waelkens et al. 2000, 17–216; for a complex evaluation of the settlement patterns, see Vanhaverbeke – Waelkens 2003.

⁶²¹ The territory was defined based on the geographical borders. For a detailed description of the borders, see Vanhaverbeke et al. 2003, 60–62.

⁶²² The surveyed area is divided into ten regions based on their geographical characteristics. For their detailed descriptions, see Vanhaverbeke et al. 2003, 62–67.

⁶²³ For the description of the Hellenistic sites, see Vanhaverbeke 2003, 217–240; the Roman sites are described by Vanhaverbeke 2003, 241–283; and, finally, the sites dated to the Early Byzantine period are examined by Vanhaverbeke 2003, 285–301.

monuments, quarries and isolated finds. I reduced the final quantities to features including only settlements, i.e. villages, farms and forts.

The density of settlements acquired during the Paphlagonia, Cide and Pisidia projects are displayed next to the results from the macro-region in Table 31 below. Since Paphlagonia Project describes the decline of rural settlements during the 5th and the 6th century, but it is not clearly to be followed based on the finds from the survey, the numbers of settlements follow the Roman estimates.⁶²⁴ The extent of the territory calculated per one rural settlement during the Early Byzantine period is, therefore, most likely appropriate during the beginning of the era and, subsequently, it gets larger, as the density of settlements declines.

Chronology	Density of Settlements (territory per settlement in sq. km)			
	Macro-Region	Paphlagonia Project	Cide Archaeological Project	Pisidia Project
Hellenistic period	1,860	939	132	95
Roman period	280	352	66	23
Early Byzantine period	404	352 (min. estimate)	66	56

Table 31: Density of Settlements in the Macro-Region and in Paphlagonia in Given Periods

Compared with the results of the Paphlagonia Project, the density of the Hellenistic settlements is twice larger in Paphlagonia than in the macro-region. Roman settlements are, on the contrary, slightly denser in the macro-region and, again, the Early Byzantine settlements are slightly denser in Paphlagonia. Except the Hellenistic record, apparently deficient in the macro-region, the estimates are generally corresponding, featuring relatively trivial differences.

The results of the Cide Project revealed very different numbers. The densities of the scatters are considerably higher than in the macro-region during all the examined periods. However, due to the scarcity of the collected material, I am rather cautious with further interpretations of the results. Since it is not entirely clear if each of the identified scatters represents an individual settlement, I do not further dwell on the numbers.

⁶²⁴ Matthews – Glatz 2009, 247 f.

The results of the project conducted in Pisidia brought considerably higher densities of settlements than the macro-region. It is, however, hard to assess if the results are caused by a vast insufficiency of the archaeological record in the macro-region or by originally different densities of settlements in both of the regions. The region of Pisidia is situated in the mountainous plateau in SW Asia Minor and it features generally different characteristics than the macro-region.⁶²⁵ Moreover, all the settlements in the surveyed territory of *Sagalassos* belong to the group of elevations ranging between 500 and 2,000 meters above the sea level. The densities of settlements in the macro-region are in these elevation estimates even lower (as demonstrated in Table 32 below). I introduce the densities achieved in Pisidia to demonstrate the differences between the regions, but I do not further dwell on the results. I argue that it is vitally important to cover a comparable area of the macro-region with the survey to enable a meaningful comparative analysis. With the current record, the estimates from Pisidia seem rather exaggerated for NW Asia Minor.

Since the results from the Cide project are too scarce and Pisidia seems to be not suitable for the comparison due to completely different characteristics of the territory, I focus in the following comparison on the results of the Paphlagonia Project. The results enable a comparative analysis concerning the elevations between 500 and 2,000 meters above the sea level and create a complementary sample for the entire macro-region.

Elevation (m a. s. l.)	Density of Settlements (territory per settlement in sq. km) Macro-Region / Paphlagonia		
	Hellenistic	Roman	Early Byzantine
500–2,000	23,956 / 939	684 / 352	705 / 352

Table 32: Density of Settlements during Given Periods in Macro-Region and Paphlagonia Divided Based on Altitudes

The comparative analysis shows the following results. The strikingly denser settlement patterns in Paphlagonia during the Hellenistic period, in particular numbers reaching 26 times higher density, confirm the previous suggestions (as demonstrated in Table 31). In other words, the deficiency of the record concerning the Hellenistic settlements outlined above is implicitly

⁶²⁵ For the general characteristics of Pisidia, see Brandt – Kolb 2005, 12–19. 20. 21. On Pisidia during the Hellenistic period, see Bracke 1993, 15–35.

confirmed. The results achieved in Paphlagonia suggest that the larger density of Hellenistic settlements in the lowland, as suggested based on the macro-regional estimates, is only an outcome of the lack of data in the macro-region.

The Roman settlements in Paphlagonia are almost twice as dense as in the macro-region. Examining the general numbers concerning the entire macro-region, I suggest expecting a slight increase of Roman settlements in the higher elevations falling between 500 and 2,000 meters above the sea level.

The Byzantine period saw a decline of rural settlements and a shift of habitation to fortified settlements situated on hilltops.⁶²⁶ This result corresponds with the development suggested for the hinterland of *Nicaea*.⁶²⁷

6. 6. Conclusion

J. W. Hanson⁶²⁸ suggests that we should change our view on the economic situation in Roman Asia Minor. Rather than seeing the region as under-populated and under-exploited, we should consider the central place distribution of the sites, indicating a well-distributed control and an even exploitation of the resources. J. W. Hanson implies a high degree of urbanism and a more even distribution of sites when compared with other regions of the empire.

Since the comparative analysis of the urbanization implicitly shows lower values in the territory of the macro-region than estimated for entire Asia Minor, J. W. Hanson's view seems rather too optimistic; not necessarily incorrect, but not entirely fitting to the NW part of the territory.

I would rather see the economic situation in the territory as heterogeneous. The macro-region is divided into several clusters, featuring diverse urbanization models which simply coexisted. I expect an analogous situation in entire Asia Minor. Densely urbanized territories, with cities situated a half day walk from each other on the one side, and extensive areas with one large metropolis several days away from another city on the other side. I assume the decisive factor was

⁶²⁶ Although not visible in the evidence, 12 settlements in Paphlagonia shifted towards the hilltops (Matthews – Glatz 2009, 248).

⁶²⁷ For details, see Chapter 8. 4. 3., map Figure 63 (Addendum 1. 40.), and especially settlement no. 906.

⁶²⁸ Hanson 2011, 249.

the terrain model, notably accessibility and fertility of the area. The central place distribution might be detected in lowland areas highly favourable for living and with a uniform access to resources. The primate-city distribution model originates in a more difficult terrain, but an evenly and moderately difficult terrain. For instance, it was relevant to the mountainous and hilly areas with similar fluctuations in altitudes and with evenly difficult access to resources. These cities are distributed 'one to two days away' from each other. The larger distances are most probably caused by the less fertile hinterlands than in the central place distribution model. Judging from NW Asia Minor, *hypercephalie* appears in territories which are somehow easy to be embraced, territorially as well as politically; in other words, which can be governed from one centre. The centre is situated in the fertile flatland, with an easy access to trade due to its position on a main road. The same road enables the interconnectivity of the centre with its extensive territory. The territory is heterogeneous; fertile flatland appears in the immediate hinterland of the centre and the remaining area, no matter what particular type, is not favourable for an establishment of an influential centre.

This implies that it is not possible to characterise the economic development in the area *en bloc*. It is necessary to consider diverse characteristics, including the terrain model, accessibility of resources and archaeological investigations. As pointed out by G. Woolf,⁶²⁹ communication in its broadest sense is the key to understand how any urban network functions and how it is sustained. Nevertheless, a systematic study, as published by J. W. Hanson, offers a unique opportunity for a comparative analysis and it is a priceless stepping stone for more detailed studies of urbanization in smaller regions in Asia Minor. The study enables to refer the macro-regional results to a larger supra-regional picture, showing in this way the differences in the development of one particular area as compared to the whole unit.

⁶²⁹ Woolf 1997b, 8.

7. Road System in the Light of Economic Development

The present chapter examines the complexity of the road system, its development in the macro-region and its interconnectivity with the economic situation. The study presents reconstruction of the communications during the Hellenistic, Roman and Early Byzantine periods. Investments in the roads are studied and interpreted in the light of capital investments, where applicable. The study is complemented with spatio-temporal analysis of the investments, demonstrating in this way a gradual development of the economic situation in the macro-region.

In the first part, I present theoretical approaches to the topic, pointing to the direct connection between the development of the road system and the economic situation.⁶³⁰ The approaches base on explanatory models introduced by D. H. French,⁶³¹ directly associating investments in the road system with the regional economy.

The second part focuses on the methodological approaches used during the reconstruction of communication routes. I briefly introduce the history of their development, the state of research and the resultant methodology I developed for the present study. The methodology is based on the combination of previous approaches and a GIS analysis. In the end, the section also includes a brief description of applied GIS tools, in particular the least cost path analysis (henceforth the LCPA).

The third part represents the applicability of the LCPA when reconstructing the routes of Roman roads. Based on comparison of the results of an anisotropic LCPA and spatial distribution of archaeological evidence, I demonstrate the possible errors which might occur when basing the reconstructions solely on the LCPA.

The fourth part presents the reconstructed road networks, divided into broad time spans of the Hellenistic, Roman and Early Byzantine periods. The reconstructions stem from a complex study based on diverse sources. However, as most of the roads are not confirmed by archaeological evidence but modelled by the least cost path analysis, the results are hypothetical. Rather, we can speak about the most probable courses of roads which may change with new discoveries in the field. Nevertheless, the existence of the presented roads is based on

⁶³⁰ Greene 1986, 17. 35 f.

⁶³¹ French 1980, 700–702.

undisputable data and the changes may include either entirely new road connections or only modest modifications of reconstructed courses.

The gradual investments in the road system are examined in the last, fifth section. As the main source, I consider the spatio-temporal analysis of the dated epigraphic evidence, for the most part milestones, in relation to the reconstructed communications. The data are further supplemented with references to road constructions mentioned in ancient literary sources.

7. 1. How Does the Development of the Road System Reflect the Economic Situation?

The direct connection between the road system and the economic situation was elucidated by D. H. French.⁶³² D. H. French links the development and the maintenance of the road network with the control of the territory and the exploitation of resources by military and administrative means. The military and administrative requirements initiate processes of the development of the road system and sustain the processes of its upkeep. Therefore, when the military and / or administrative control decrease or are destroyed, the road system subsequently declines or is destroyed. The dependency is shown on the schematic diagram below (Figure 41).

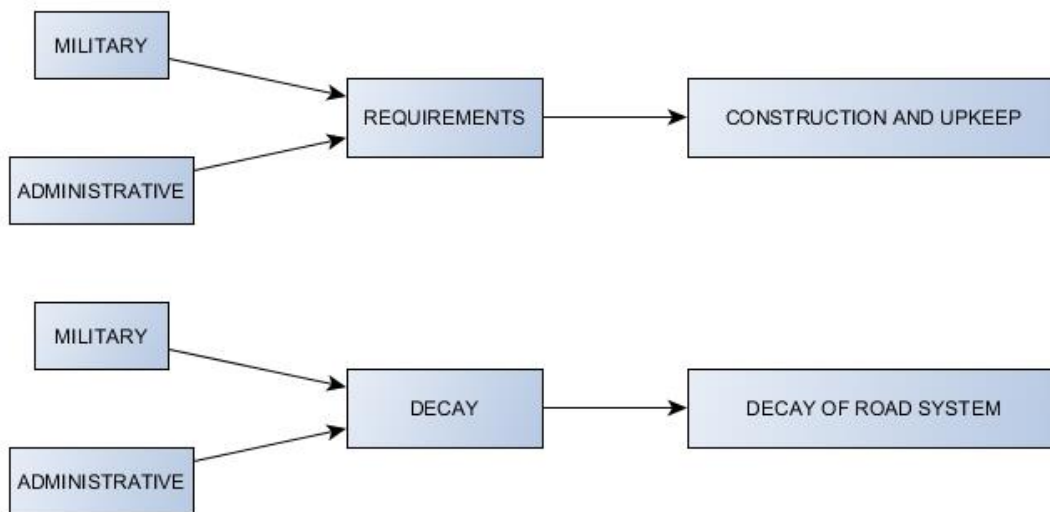


Figure 41: Direct Dependency of the Development of the Road System and Economic Situation (French 1980, 701)

⁶³² French 1980, 700.

B. Levick⁶³³ accordingly connects the development of the road system with the economic situation by claiming that the government and the army created a network that had an economic dimension and economic consequences.

R. B. Hitchner⁶³⁴ examines roads directly in relation to economic performance in the Roman Empire, pointing out that the *'continued maintenance of road network as a fixed legacy system is probably the most telling indicator of its fundamental importance to the infrastructure of the Roman economy.'* Furthermore, R. B. Hitchner states that *'the continued maintenance has greater significance as a sign of the lasting vitality of the economy than the more often cited record of municipal building and investment by local aristocrats.'*⁶³⁵

Finally, P. Erdkamp⁶³⁶ points out that the improvements in communication during the first centuries of our era lead to a considerable reduction in transaction costs. These reductions have a positive impact on the development of trade and on market integration.

Following these assumptions, I further consider the road system as an indicator of the economic situation and examine its character and development in the entire macro-region.

What are the main factors that influence the planning and execution of the road construction program? D. H. French⁶³⁷ suggests a clarification of the sequential processes connected with the development of the road system in a schematic diagram (Figure 42).

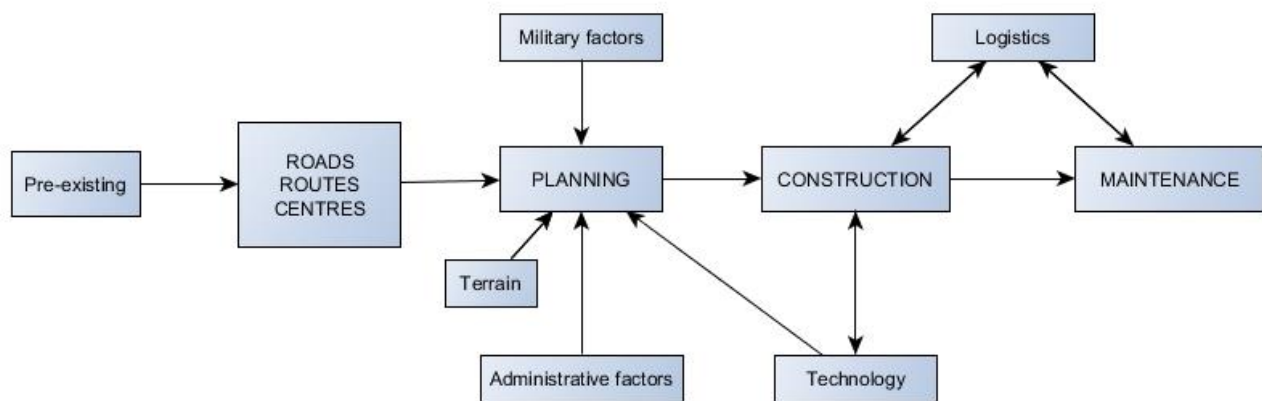


Figure 42: Sequence of Processes in Development of Road Systems (French 1980, 702)

⁶³³ Levick 2004, 181.

⁶³⁴ Hitchner 2012, 222–234.

⁶³⁵ Hitchner 2012, 226.

⁶³⁶ Erdkamp 2015, 34–37.

⁶³⁷ French 1980, 702.

The diagram suggests the pre-existence of roads, routes and settlements in the territory. The planning is directly based on the previous system and considers the military and administrative factors, as well as the terrain model. The planning and subsequent constructions are enabled by the technological development, the constructions and the maintenance are directly dependent on the logistics.

Examining the diagram, it is necessary to bear in mind that all these processes are, with respect to the surviving evidence, for the first time traceable during the Roman Imperial period. As follows from the sequential model, Romans followed routes used by their predecessors, which generally applies to peoples since the Prehistory.⁶³⁸ However, the Romans were the first who approached the construction and upkeep in a comprehensive way, as the roads were vital to the maintenance and development of the Empire. The roads were built to provide the most efficient means for the overland movement of armies, officials and civilians. Moreover, the road system allowed for the inland carriages of official communications and trade goods.⁶³⁹ All these requirements are vital to any control over a territory. The fundamental difference lies in the size of the Roman Empire which required higher efficiency of communications to enable a timely control.

The explanation of the direct connection between the roads and the economic situation, however, does not answer the resultant question: How to trace the construction, the maintenance and the upkeep of the public road system? How to assess the state investments? The answer is outlined in Chapter 5. 3. 1. which lists the epigraphic evidence that relates to the investments in the road network. As the earliest milestones date to the 1st century AD and the latest to the third quarter of the 4th century AD, the epigraphic evidence allows an analysis of the investments in the road system during the Roman and the beginning of the Early Byzantine periods. The preceding Hellenistic era as well as the end of the Early Byzantine period lack this type of evidence.

As a matter of fact, roads were not paved during the Hellenistic period.⁶⁴⁰ Thus, there is a lack of any traceable archaeological information concerning their existence. The Hellenistic road system⁶⁴¹ is a direct predecessor of the system of the paved roads which appears during the

⁶³⁸ Weissová – Pavúk 2016, 18.

⁶³⁹ On Roman roads in general, see Pekáry 1968; Chevallier 1976; Barow 2013.

⁶⁴⁰ French 1980, 704.

⁶⁴¹ For the reconstruction of the Hellenistic road system, see Chapter 7. 4. 1.

Roman period. However, it is not a direct indicator of the economic development during the Hellenistic times. Since we lack documents referring to the conditions of the roads as well as the evidence that can be connected with their construction and upkeep, an economic analysis is not possible. Nevertheless, although hardly to be assessed, the economic role of the communications during the Hellenistic period is obvious.

Investments during the 5th and the 6th centuries AD are not documented on milestones, as the utilisation of milestones most probably went out of fashion.⁶⁴² Concerning investments during the 5th century, there is a lack of any information. On the contrary, the 6th century AD brings a rich evidence surviving in the books by Procopius.⁶⁴³ Procopius describes new constructions as well as upkeep of roads during the reign of the Emperor Justinian I. Since the evidence is of a diverse character and thus provides different types of data, I discuss them separately, apart from the analysis based on milestones.

7. 2. Methodology

7. 2. 1. Development of Methodological Approaches

Looking back in the history of applied methodological approaches when identifying ancient routes of roads in Asia Minor and reconstructing their courses, W. M. Ramsay⁶⁴⁴ is not to be omitted. W. M. Ramsay, as one of the first researchers, largely focused his work on reconstructions of the main Roman roads, considering information from ancient *Itineraria*. However, his research in the field was based on looking for cities / road stations mentioned in the *Itineraria* and not on the reconstruction of the routes themselves. Later on, S. F. Starr⁶⁴⁵ critically commented his approach:

⁶⁴² Hogarth 1893, 75 f.

⁶⁴³ Procop. HA and Procop. aed.

⁶⁴⁴ Ramsay 1962, 27–81. 197–220.

⁶⁴⁵ Starr 1962, 5 f. As I find the work of Starr extremely important for the further development of approaches to the reconstruction of the road system, I add also this note referring to his Doctoral thesis. However, I did not have the possibility to further consult this work as I was not able to get the offprint. Thus, I adopted the note from French's publication 1974, 143.

‘Only by searching first for the roads can be the Ancient *Itineraria* profitably used for the identification of a city. Obviously, until the course of the road is positively known, it is impossible to speculate on the possible location of the cities along it.’

S. F. Starr criticizes works based on *Itineraria* which state distances between the cities and road stations, or simply nodes – as used in this analysis. In other words, in case of the utilization of the distances between the nodes for the determination of possible locations of settlements, one needs to know the course of the road first, to be able to measure the distances along a correct line. S. F. Starr suggests an improved approach focused on studies of ancient sources on the first place, then targeting a corresponding area for research in the field – looking for remains of pavements of the road – and, subsequently, reassessing the ancient sources, this time in the light of the newly gained data in the field. This method was later approved by D. H. French.⁶⁴⁶

Unfortunately, the method successfully acknowledged by researchers several decades ago is not applicable here. When revisiting the remains of the ‘Pilgrim’s road’ described by D. H. French,⁶⁴⁷ I could not find any of the remnants he mentions in the territory of the macro-region.⁶⁴⁸ The majority of the ‘key road remains’, that could be found in the 1970’s *in situ* and used by D. H. French for the reconstruction of the ‘Pilgrim’s road’, is entirely destroyed.

Judging from my own observations in the terrain, the reason for the alarming rate of destruction of ancient roads are the massive constructions and maintenances of new roads in the last three decades. As an exemplary and indeed appealing case of the building activities may serve the section of the road between *Chalcedon* and *Nicomedia*. The first 30 km of the Roman road succumbed to the agglomeration of Istanbul and its extensive suburb, the remaining course of ca. 50 km was overbuilt with several kinds of communications; a new highway, a main road along it, and at intervals also a local road, plus a railway track. Altogether, the new communications have affected a strip of land reaching ca. 200 m in width. Since the entire area represents a narrow strip between the highland and the Marmara Sea, there is not much left for remains of the Roman road to be preserved. Moreover, considering the past, the first modern road leading from

⁶⁴⁶ French 1981 applies the method suggested by Starr in the identification and reconstruction of the route of the ‘Pilgrim’s road’.

⁶⁴⁷ French 1981, 15–17.

⁶⁴⁸ The state of preservation is to the spring 2015 (the ISP15 was conducted in March / April).

Constantinopolis to Nicaea is already described by C. Fellows in 1939⁶⁴⁹ as the only well-constructed road in entire Asia Minor. Thus, there are at least 80 years of modern road constructions in the territory, possibly destroying all the ancient remains. The calculated width of the 'Pilgrim's road' as the main road leading through the territory is 3.25 m for each direction, i.e. 6.5 m altogether⁶⁵⁰ and, presumably, it is fully destroyed.

Assuming that the original pavement has been destroyed in most of the places, it is necessary to look for innovative ways of reconstructing courses of the ancient roads. Besides Greek and Latin sources⁶⁵¹ as well as earlier travellers who often mention preserved pavements of the roads,⁶⁵² I used a computer-based calculation of the cheapest road, the least cost path analysis. The LCPA has been examined and revisited by numerous studies in the last decade in order to demonstrate its applicability for the archaeological work.⁶⁵³ Many ways have been discussed and further developed in order to assess with an utmost correctness all the relevant data.⁶⁵⁴ For the present study, I decided to consider the terrain model as the main criteria.

In general, the LCPA is based on interconnecting two nodes, i.e. urban settlements. In this case, I use the two nearest settlements with confirmed geographic allocations (two nodal points). The LCPA then calculates the road between them, including the given constrains. As the LCPA offers the cheapest and thus, presumably, the most probable courses of roads, the results can further be used for the prediction of settlements positioned along the roads: for example, the ones mentioned in *Itineraria* and still not located, using the distances as a decisive factor for their positioning.⁶⁵⁵ This method is in accordance with the approach suggested by S. F. Starr and discussed above.

⁶⁴⁹ Fellows 1839, 103.

⁶⁵⁰ French 1980, 713.

⁶⁵¹ For Greek and Latin literary sources, see Chapter 2. 1.

⁶⁵² For travellers, see Chapter 2. 2.

⁶⁵³ Herzog – Posluschny 2011, 236–242 on problems encountered with slope dependent LCPA, Polla et al. 2013, 299–302 on a comparison of results of the LCPA and regional archaeological information; Verhagen 2013, 383–389 on problems of using the LCPA and other indicators of accessibility for the purposes of the predictive modelling; collection of case studies on the LCPA edited by White – Surface-Evans 2012; Paliou et al. 2014.

⁶⁵⁴ On applications of the tool, see Bell – Lock 2000, 89–91; Herzog 2013, 237–248; Leusen 2002, Chapter 6, 1–23; Polla – Verhagen (ed.) 2014; on other studies using the LCPA in Asia Minor for instance Newhard et al. 2008, 87–102, Verhagen et al. 2014, 73–98.

⁶⁵⁵ Since *Itineraria* in most of the cases do not correspond in the distances they introduce (for comparison between the distances in *Itineraria*, see Rennell 1831, 179–190; Şahin 1981, 6), it is necessary to check all the possible intervals. Nevertheless, the suggested methodology considerably facilitates the process of allocating the road stations.

7. 2. 2. Least Cost Path Analysis (henceforth the LCPA)

Considering the data available for the macro-region, I decided for applying an anisotropic LCPA⁶⁵⁶ which I calculated in the GRASS GIS.⁶⁵⁷ The anisotropic LCPA means that the cost-of-passage is largely determined by the slope of the land.⁶⁵⁸ Only the seas surrounding the territory from the west and from the north and the large lakes⁶⁵⁹ I excluded from the raster as impossible to be crossed.

As a basic source of information, I used a digital elevation model created from ASTER which I further smoothed by the number nine (as it appeared to be the most suitable for the quality of the raster available for the region). Then I calculated the slope to which I further applied the equation

$$\text{'tan (Slope) / tan (1)'}^{660}$$

in order to produce a relative cost raster for the entire territory of the macro-region. As the next step, I created a high cost raster for the seas and the lakes and combined it with the relative cost raster. The adjusted cost raster shows the higher cost-of-passage the steeper the slope. In case of the seas and lakes, the numbers are so high that they appear in the analysis as in fact impassable. In this way, the LCPA avoids the seas and lakes entirely and the resulting routes never cross them. The adjusted relative cost raster I used as a basis for the road equations between the nodal points I expect to be interconnected by a communication. I calculated an accumulated cost raster and, finally, a drain between each pair of the nodal points.

Initially, I intended to recalculate rivers in the same way as seas and lakes and use them as natural borders for the LCPA. Nevertheless, I reconsidered this idea based on my observations of the unstable situation of river sheds in the territory. Due to flow regulations and possibly also due to frequent earthquakes, courses of the rivers considerably varied in time. As such, it is possible and

⁶⁵⁶ For details on possibilities of the LCPA, see overview of studies given by Leusen 2002, Chapter 6, 1–23.

⁶⁵⁷ Free software, available at: <https://grass.osgeo.org/download/>. On the utilization of GRASS GIS for the LCPA, see the case study in the Göksu valley by Bikoulis 2012, 35–59, and especially 42.

⁶⁵⁸ Bell – Lock 2000, 88.

⁶⁵⁹ These are from the west to the east: the Ulubat Lake (*Apollontias Lacus*), the Iznik Lake (*Ascania Lacus*) and the Sapanca Lake (*Sunonensis Lacus*).

⁶⁶⁰ Bell – Lock 2000, 89.

highly probable that the ancient rivers followed different courses and their inclusion might cause errors in the analysis. This assumption corroborates the strikingly large number of ancient bridges currently standing in the midst of dry fields and not arching over any river. The phenomenon is discussed below when analysing the routes of the particular roads.

7. 2. 3. Methodology Applied in the Present Study

The methodological approach follows several independent steps. The first step is an analytical one. In order to model the cheapest routes, I calculate the LCPA between the nearest nodal points. The nodal points are represented by the cities.

The second step includes the careful study of all the relevant publications⁶⁶¹ that focused on roads in Bithynia as well as in different regions,⁶⁶² the latter in order to examine the applied methodologies and to find the suitable one for the present work. The recent studies directed my further research towards numerous records of travellers relevant to the description of pavements of Roman roads and remains of bridges in the terrain. I read through records of travellers who explored the macro-region in the 19th century⁶⁶³ and found their notes astonishingly informative. They helped to enrich the archaeological record of 28 remains of pavements and nine bridges. However, the entries required careful evaluation, as none of the travellers was an archaeologist by training. In general terms, the observations of the travellers are an invaluable source of data but, they need to be re-evaluated in the frame of the data gained from other sources.

The third step encompasses peruse of the Roman and Greek literary sources.⁶⁶⁴ Similarly as in the case of the travellers' records, these data cannot be taken at full value. Especially, when using records concerning deeds of emperors, it is necessary to keep in mind that the literary sources might be influenced by political needs. In other words, they might have been written to

⁶⁶¹ Starr 1963, 162–169; Winfield 1977, 151–166; French 1974, 143–149; French 1980, 698–729; French 1981; French 1997, 179–187; Doğancı 2007; Doğancı 2012, 93–104.

⁶⁶² For a complex study on Roman roads and milestones in the entire Asia Minor, see French 2016; for Bulgaria, see Madzharov 2009. For studies on road systems in particular provinces of Asia Minor, see Hild 1977 on Cappadocia; Hild 2014 on Caria, Bekker-Nielsen – Czichon 2015, 296–305 on Veziköprü district in Pontus.

⁶⁶³ Von Diest 1889; 1895, 1–40; 1898; von der Goltz 1896; Anton 1895, 41–115.

⁶⁶⁴ These are in chronological order: Strab. 12, 4, 7; Itin. Anton. (Cuntz 1929, 1–85); Itin. Burdig. (Cuntz 1929, 86–102), Tab. Peut. (Miller 1916), Procop. HA and Procop. aed.

popularize the emperor without corresponding to the reality. This issue, however, concerns more the investments than the existence of the road system *per se*.

The studies of published material are supplemented with my own observation in the terrain during the ISP campaign in 2015. I enriched the record with two sections of roads and, for the prediction of communication routes the most beneficial, I rectified the geographic position of six bridges, further mentioned in descriptions of the relevant roads and presented in Addendum 4.

At last, I digitised all the data collected in the aforementioned sources and completed them with the spatial information. Their collation brought to light a number of points which rectify the actual courses of the roads.

The fourth step is a comparative analysis of the outcomes of the LCPA connecting two nodal points with the archaeological data, for the most part remains of roads and bridges preserved in the terrain. This comparison results in the final reconstruction of the most feasible road network.⁶⁶⁵ As the evidence corroborating the routes of the roads is relatively rich, it enabled in several cases the rectification of the reliability of the results of the LCPA. As follows, the final results not only show the rectified road system in the studied area, but they enable the verification of the outcomes of the LCPA, when compared with archaeological records. I explain possible irregularities between the actual road remains and calculated courses in the following text. I draw attention to the issues which one needs to keep in mind when reconstructing the course of the road based solely on the LCPA. In case of a lack of archaeological datasets, the particular roads are not discussed in detail and the reconstructions presented for each time span are based solely on the LCPA between the two nodal points.

Examining the road network in each given era separately, the Hellenistic period represents the assemblage with very scarce evidence. The Hellenistic road system lacks any archaeological remains and its descriptions in literary sources are scanty. The situation in the Roman and Early Byzantine periods differs considerably since the sources concerning the roads are numerous. As the case study I conducted in the region of the Iznik Lake confirmed the high degree of

⁶⁶⁵ The applied methodology combining geographic, historic and literary sources was inspired by the study by Polla et al. 2013, 299–302, which compares the historical record with results of the LCPA, and by the case study by Verhagen et al. 2014, 74–85.

continuity in the communication routes from the prehistory until today,⁶⁶⁶ I decided to use the archaeological remains for the rectification of the road system *en bloc*. Therefore, the courses of the roads in the studied periods are identical, only the density of the road network varies based on the number of the available nodal points.

Generally, the applied methodological approach is rather a challenging task. Yet it brings to light as complete and rectified a reconstruction of the road system as possible. In my opinion, only works conducted in the terrain will enable further rectification and completion of the road system in the macro-region. In the frame of current knowledge, further predictions would be nothing else than a guesswork.

The sources used for the reconstruction of the settlements which represent nodal points for the LCPA are discussed in detail in Chapter 6 and listed in Addendum 3. Moreover, the following maps include new features which were hitherto not mentioned in the preceding chapters. These are 26 bridges; 25 of them are shown on the reconstruction of the Roman road system, all 26 then on the Early Byzantine road system. Out of the 26 bridges in total, 16 are situated on the roads further discussed in the spatio-temporal analysis of public investments below. The complete list of the bridges with an overview map and relevant sources I used for their reconstruction is listed in the Addendum 4.

7. 3. Comparative Analysis of the LCPA and Actual Archaeological Remains

In order to keep an utmost lucidity in the study, I decided to devote one entire chapter to the comparison of the results of the LCPA and the available archaeological remains. The evidence from the macro-region enables comparison of the LCPA and archaeological remains along the courses of five roads in total. These are the 'Pilgrim's road', the 'Northern road', and the sections of regional roads between 'Cretia Flaviopolis – Tium', 'Tium – Amastris' and 'Nicaea – Prusias ad Mare'.

Each section of the road is described separately and accomplished with a table giving an overview of all the relevant data I used for the reconstruction. Main nodes, ancient and recent sources, bridges, pavements and numbers of milestones are supplemented with the reconstructed

⁶⁶⁶ Estimated deviations between the prehistoric and modern roads are smaller than 1 km in the region of the Iznik Lake. For details on the reconstructions, see Weissová – Pavúk 2016, 16. 19.

lengths. The overview offers a short notice about the applicability of the LCPA, further discussed in the text.

The text explains distortions between the archaeological sources and the results of the LCPA and argues for the final results of the reconstructions. All the data and reconstructions of the roads are depicted on the maps.

7. 3. 1. The Supra-Regional ‘Pilgrim’s Road’

The Supra-Regional ‘Pilgrim’s Road’	
map Figure 43, Addendum 1. 22.	
route	<i>Chalcedon – Nicomedia – Nicaea – (Regetataios) – (Regodories) – Iuliopolis</i> – further to the SE
research history	Ramsay 1962, 199–207; French 1981; Şahin 1987, 50; Doğanci 2012, 94–97
ancient literary sources	Strab. 13, 1, 10; Tab. Peut. (Miller 1916, 655–658); Itin. Anton. (Cuntz 1929, 20); Itin. Burdig. (Cuntz 1929, 92); Procop. aed. 5, 2, 6–13; 5, 3, 5–6; 5, 4, 1
bridges nos. 1–8 (see Figure 43)	1 (Şahin 1974, 73; BAtlas 52), 2 (Ermış 2009, 246–248; Şahin 1981, 9), 3 (Yalman 2000, 102; Şahin 1981, 9), 4 (von Diest 1898, 13; von der Goltz 1896, 451), 5 (BAtlas 52), 6 (von Diest 1898, 17), 7 (French 1981, map 1), 8 (BAtlas 52) geographic position of 2, 3, 4 and 5 rectified by the ISP15
remains of road pavement	von der Goltz 1896, 11. 18. 75; von Diest 1896, 407. 450 f.; Ross 2007, 116
description	ten steps wide (von Diest 1898, 18); hard sandstone (von der Goltz 1896, 450 f.)
milestones	55 in total (French 2013, nos. 61. 62. 63a–g. 64. 65a–b. 67. 68. 69. 70. 71. 72a–c. 73a. 73b. 74. 75a–f. 76. 77. 78a–b. 79. 80–83. 84a–b. 85. 86a–c. 87a–b. 88a–c. 89. 90. 91–94)
reconstructed length	353 km by author / 356 km by D. H. French / 310 km overland + 4.5 km oversea after Justinian’s reforms
the LCPA	applicable with minor changes for the section <i>Chalcedon – Nicomedia – Nicaea</i> – as far as the bridge no. 6 not applicable for the section bridge no. 6 – <i>Iuliopolis</i>

Table 33: Overview of the Data Used for the Reconstruction of the 'Pilgrim's Road'

The 'Pilgrim's road'⁶⁶⁷ leads from *Constantinopolis* to the south / SE. The entire road stretches from *Constantinopolis* through the nodal point of *Ancyra* further to *Tarsus* and *Antioch* as far as *Jerusalem*.⁶⁶⁸ It is generally recognised that the road became the most significant artery leading through Asia Minor from the fourth century onwards, i.e. during the Early Byzantine period. Its peak of utilisation is connected with the rising Christianity. As Christianity became the official religion, the pilgrimage to Jerusalem dramatically increased. On military grounds, however, the eastern direction towards the *Euphrates limes* was of higher importance than the pilgrimage. Based on this assumption, one can expect investments in the road already during the Flavian dynasty, as the Eastern *limes* was established by *Vespasian*.⁶⁶⁹

The reconstructed segment of the road stretches between the nodal points *Chalcedon* – *Nicomedia* – *Nicaea* – (*Regetataius*) – (*Regodories*)⁶⁷⁰ – *Iuliopolis*. The first part between *Chalcedon* and *Nicomedia* follows the shore of the Marmara Sea. There are no doubts about this section of the road, however, its precise course is not known. The route based on the LCPA stretches directly along the Marmara Sea which is in reality unsafe. Therefore, I shifted the resulting road at some points northwards. The route basically follows the modern road.

In *Nicomedia*, the road turns to the south and crosses the Samanlı Mountains to reach *Nicaea*. The route of the road between *Nicomedia* and *Nicaea* has always been a topic of discussion regarding its course. The mountains are difficult to be crossed and the valleys with lower elevations have steep slopes, with rivers dominating the lowest parts. Examining the results of the LCPA, it is again misled by the lowest elevations along the Marmara Sea and follows its shore as long as possible before it turns to the south towards *Nicaea*. The reconstruction based on the LCPA agrees with the reconstruction published by D. H. French.⁶⁷¹ On the first place, I took this course as the most probable. However, when reading observations of the German traveller W. von Diest⁶⁷² who describes the existence of remains of an ancient road leading to the south only 5 km

⁶⁶⁷ The name 'Pilgrim's road' was popularized by Ramsay (1962). Although the name clearly points to the utilization of the road by pilgrims during the Early Byzantine period, I use it as a general term throughout all the discussed periods, as it considerably simplifies the description.

⁶⁶⁸ French 1981, 13.

⁶⁶⁹ Magie 1950, 571; French 1980, 709.

⁶⁷⁰ *Regetataius* and *Regodories* are used as nodal points only for the Early Byzantine reconstruction.

⁶⁷¹ For details of the reconstruction and available sources, see French 1981.

⁶⁷² Von Diest 1898, 11.

east of the French's reconstruction, I decided to re-evaluate the course. S. Şahin⁶⁷³ also reconstructs the road taking the eastern course, though with question marks along its course.

Before reaching *Nicaea*, the road crosses over two bridges standing in the hinterland of the city (nos. 2 and 3 in Figure 43). Their first construction is most probably dated to the reign of the Emperor Hadrian,⁶⁷⁴ as it is described by Strabo as hardly crossable, thus without any bridge.⁶⁷⁵ Interestingly, both of the bridges currently stand in the midst of dry fields.

From *Nicaea*, the road aims eastwards, following the wide valley of the Kiran Dere. Remains of the road were observed in this section on several places by C. von der Goltz.⁶⁷⁶ As the road turns to the south across the eastern foothills of the Katırlı Mountains, it reaches the Göksu River. C. von der Goltz⁶⁷⁷ also described remains of the road paved with hard sandstone right before it crosses the river with a bridge, presently still arching over its flow (no. 4). Only 3 km south of the bridge, one can observe mighty remains of another bridge, the so called 'Constantinus Bridge' (no. 5). The bridge was destroyed by the strong flow of the *Sangarius* River, but the remains point to a massive construction. Another bridge (no. 6) and the following remains of the road were described by W. von Diest.⁶⁷⁸ The section between *Nicaea* and the bridge no. 6 demonstrates a perfect fit of the archaeological data and the results of the LCPA.

The following section between the bridge no. 6 and *Iuliopolis* did not reveal any remains of roads or bridges. However, based on the distribution of the milestones, one can roughly estimate the course of the road. This section of the road, interestingly, does not fit at all to the course predicted by the LCP analysis. Based on the LCPA, the route should have taken much easier way, leading to the south / SE, along the *Sangarius* River. However, as we know from descriptions of W. von Diest,⁶⁷⁹ the area along the river is at several points not crossable due to steep rocks surrounding the river and at other places it is too flat and open and thus often flooded by the river. Therefore, the road through the mountains, though certainly more demanding due changes in the

⁶⁷³ Şahin 1987, map in the attachment.

⁶⁷⁴ IK Iznik, no. 1.

⁶⁷⁵ Strab. 13, 1, 10.

⁶⁷⁶ Von der Goltz 1896, 407.

⁶⁷⁷ Von der Goltz 1896, 450 f.

⁶⁷⁸ Von Diest 1898, 17 f.

⁶⁷⁹ The passability along the *Sangarius* River is described by von Diest 1892 who conducted one entire travel focused on following the course of the Sangarius River.

elevation, is much more secure. Even more importantly, since the ‘Pilgrim’s road’ was the main artery going through the region, the mountainous course was passable all year long.

Even when recalculating the course of the road with two more nodal points, the Early Byzantine cities *Regetataius* and *Regodories*, the results of the LCPA are applicable only partially. As soon as the predicted road passes both of the cities, it immediately turns southwards, in order to continue along the flow of the Sangarius River.

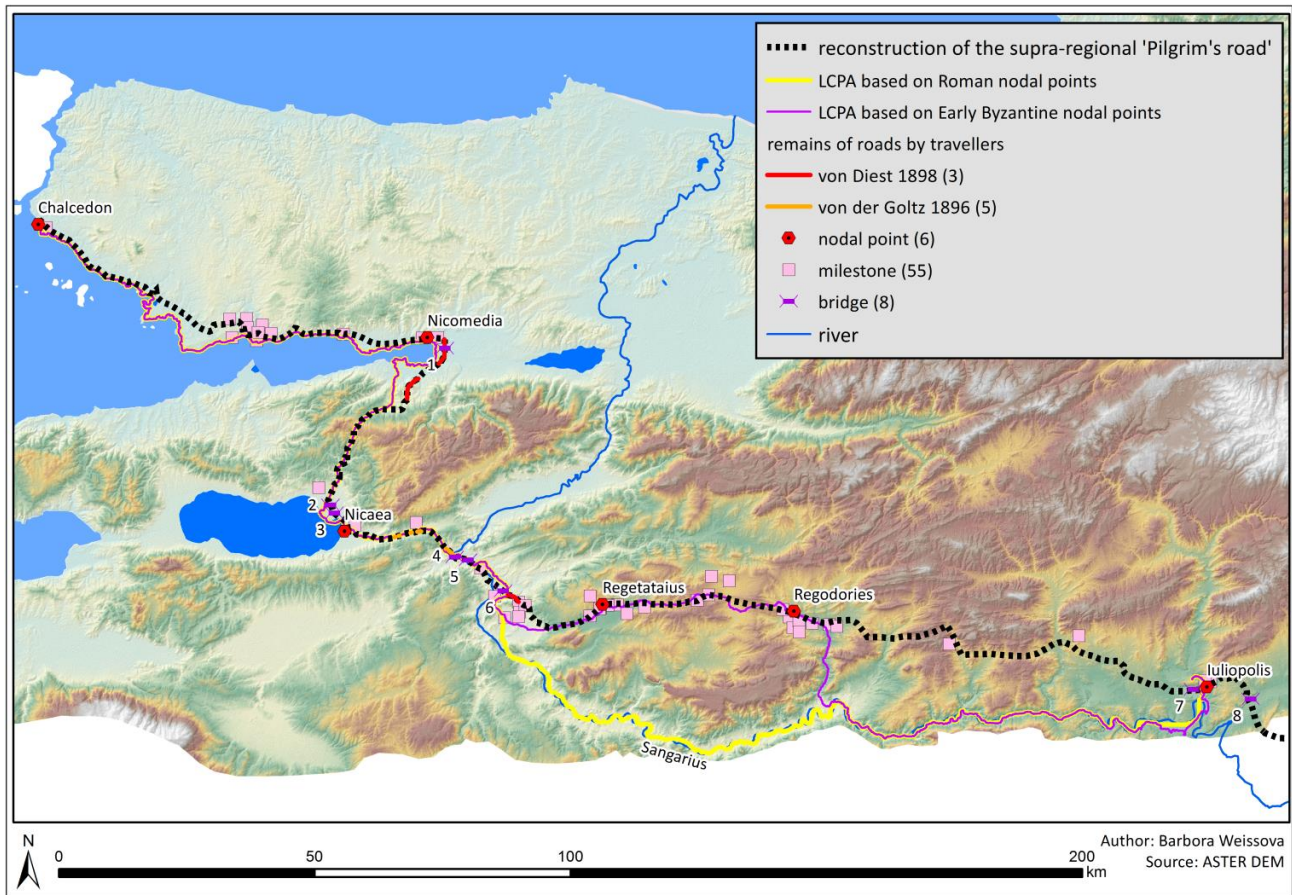


Figure 43: Reconstruction of the Supra-Regional ‘Pilgrim’s Road’ (Addendum 1. 22.)

To conclude, the section of the ‘Pilgrim’s road’ between *Nicaea* and *Iuliopolis* seems to overcome environmental constrains in order to connect places as fast as possible, an issue with using the LCPA, lately pointed out especially for the case of *viae publicae* by S. Polla et al.⁶⁸⁰

⁶⁸⁰ Polla et al. 2013, 299–302.

The entire section leading across the mountains is based on the reconstruction published by D. H. French.⁶⁸¹ Right before reaching *Iuliopolis*, the road crosses the River Çayırhan over a bridge (no. 7) and the last section encompasses one more bridge (no. 8) arching over the River *Siberis*.

The ‘Pilgrim’s road’ encountered a decisive change of its course during the reign of Emperor Justinian. The diverted course, based on the results of the LCPA, was approximately 50 km shorter than the original one. Since there are no archaeological remains along the course and its reconstruction is based solely on the LCPA, I do not elaborate on the reconstruction in this chapter. The investments connected with the modified course as well as the reconstruction itself are presented in Chapter 7. 5. 1. below.

7. 3. 2. The Regional ‘Northern Road’

The Regional ‘Northern road’	
map Figure 44, Addendum 1. 23.	
route	<i>Nicomedia – Prusias ad Hypium – Claudiopolis – Cretia Flaviopolis – Hadrianopolis</i>
research history	Winfield 1977, 151; Doğanci 2012, 98; BAtlas 58. 86; French 1984, 49–58, esp. map on page 50
ancient literary sources	Tab. Peut. (Miller 1916, 667 f.), Procop. aed. 5, 3, 8–11
bridges nos. 1 – 3 (see Figure 44)	1 (Şahin 1999, 643–658; BAtlas 52), 2 (Ortaç 2010, 336), 3 (Anton 1895, 80)
remains of road pavements	von Diest 1898, Map 1; Ortaç 2010, 331; Anton 1895, 80
description	N/A
milestones	8 in total (French 2013, nos. 33. 34. 35a–b. 36. 37. 65a–b; Şahin 1984a, 101–105)
reconstructed length	281 km
the LCPA	applicable, minor changes in the section <i>Nicomedia – Prusias ad Hypium</i>

Table 34: Overview of the Data Used for the Reconstruction of the ‘Northern Road’

The ‘Northern road’ led from *Nicomedia* to the east. In practice, it was connected with *Constantinopolis* too, as between *Constantinopolis* and *Nicomedia* led the ‘Pilgrim’s road’. The ‘Pilgrim’s road’ turned southwards towards *Nicaea* (as described above), whilst the ‘Northern road’

⁶⁸¹ French 1981, 31.

continued eastwards. The 'Northern road' reaches beyond the borders of Bithynia, connecting the examined territory with Pontus. I argue that it creates the vital regional artery connecting the west and the east. Since the section between *Chalcedon* and *Nicomedia* is thoroughly discussed above, I concentrate in this chapter on the section of the road between *Nicomedia* and *Hadrianopolis*.

The nodal points included in the analysis are *Nicomedia – Prusias ad Hypium - Claudiopolis – Cretia Flaviopolis – Hadrianopolis*. Studying the first section of the communication between *Nicomedia* and *Prusias ad Hypium*, the road crossed the fertile flatland situated east of the city and, when reaching the Sapanca Lake, it leads along its northern shore. Although the LCPA calculated the cheapest road along the southern shore, the final reconstruction follows the northern one. It is based on archaeological remains which were described by W. von Diest.⁶⁸² W. von Diest observed remains of the road pavement NE of the lake and depicted them on one of his maps. The remains were most probably part of the course of the road used during the Roman period. The following so called 'Justinian Bridge' (no. 1),⁶⁸³ which was built during the 6th century AD, is situated south of the remains and does not fit to their course. The 'Justinian Bridge' is one of the most discussed engineering works in Bithynia. Except for being an impressive architectural work, it also does not arch over any river and, based on numerous studies, it seems to be impossible it ever did.⁶⁸⁴ Reconsidering the entire situation, I finally decided to reconstruct the road leading through the bridge, as it apparently once did. The slight change of the course during the studied periods in the north / south direction is highly probable, but not decisive for the present work and, therefore, I do not further elaborate on this point. The road continues to the east / NE across the flatland of Akova, and then, between the hills Evteni in the south and Kalayk in the north. The road enters another flatland area and continues along the foothills of the Akçakoca Mountains as far as *Prusias ad Hypium*.

From *Prusias ad Hypium*, the road continues to the SE, along the foothills of the Bolu Mountains, and then it crosses the mountain ridge again and reaches the flatland around *Claudiopolis*. The existence of the road is confirmed by two milestones.

⁶⁸² Von Diest 1898, map 1.

⁶⁸³ Procop. aed. 5, 3, 8–11.

⁶⁸⁴ On questions concerning the Justinian Bridge, see the detailed study by Şahin 1999, 643–658.

The following section between *Claudiopolis* and *Cretia Flaviopolis* is, again, confirmed by two milestones. Moreover, there are remains of two ancient bridges and pavements of roads are registered on two places. Remains of the bridge (no. 2) described by M. Ortaç⁶⁸⁵ as pillars standing in the midst of a dry field are supplemented with remains of the pavement of the road localised east of the bridge.⁶⁸⁶ The German traveller M. Anton⁶⁸⁷ described the next bridge (no. 3) depicted on the map as a Roman one. At the same time, he mentioned the pointed arch, which suggests a later date. I still depict the bridge on the map as it perfectly fits to the course of the road reconstructed based on the LCPA. It is probable the bridge observed by M. Anton was indeed of a later date, but it was built on foundations of the Roman bridge. Furthermore, based on M. Anton's descriptions, actual remains of a Roman pavement were observable *in situ*, leading towards the bridge.

The road continues to the east and reaches *Hadrianopolis*, the last *civitas* situated in the analysed territory. This part of the road is not confirmed by archaeological remains but by two milestones. The reconstructed course follows the results of the LCPA. The road then turns to the north / NE, continuing out of the macro-region and entering the territory of Pontus.

The reconstruction based on the results of the LCPA fits with only one exception to the reconstruction based on the archaeological data. The exception creates the section along the Sapanca Lake. However, the route calculated by the LCPA along the southern shore is not entirely wrong. It seems probable that there was another road leading along the southern shore,⁶⁸⁸ confirmed by the distribution of settlements. The two roads were most likely coexisting at one point. However, based on the location of the Justinian Bridge, the northern road seems to represent the main artery. Therefore, I reconstruct the course of the 'Northern road' along the northern shore of the Lake.

⁶⁸⁵ Ortaç 2011, 336.

⁶⁸⁶ Ortaç 2011, 331.

⁶⁸⁷ Anton 1895, 80.

⁶⁸⁸ For the reconstruction of regional roads in the entire macro-region, see map Figure 48 or Addendum 1. 27.

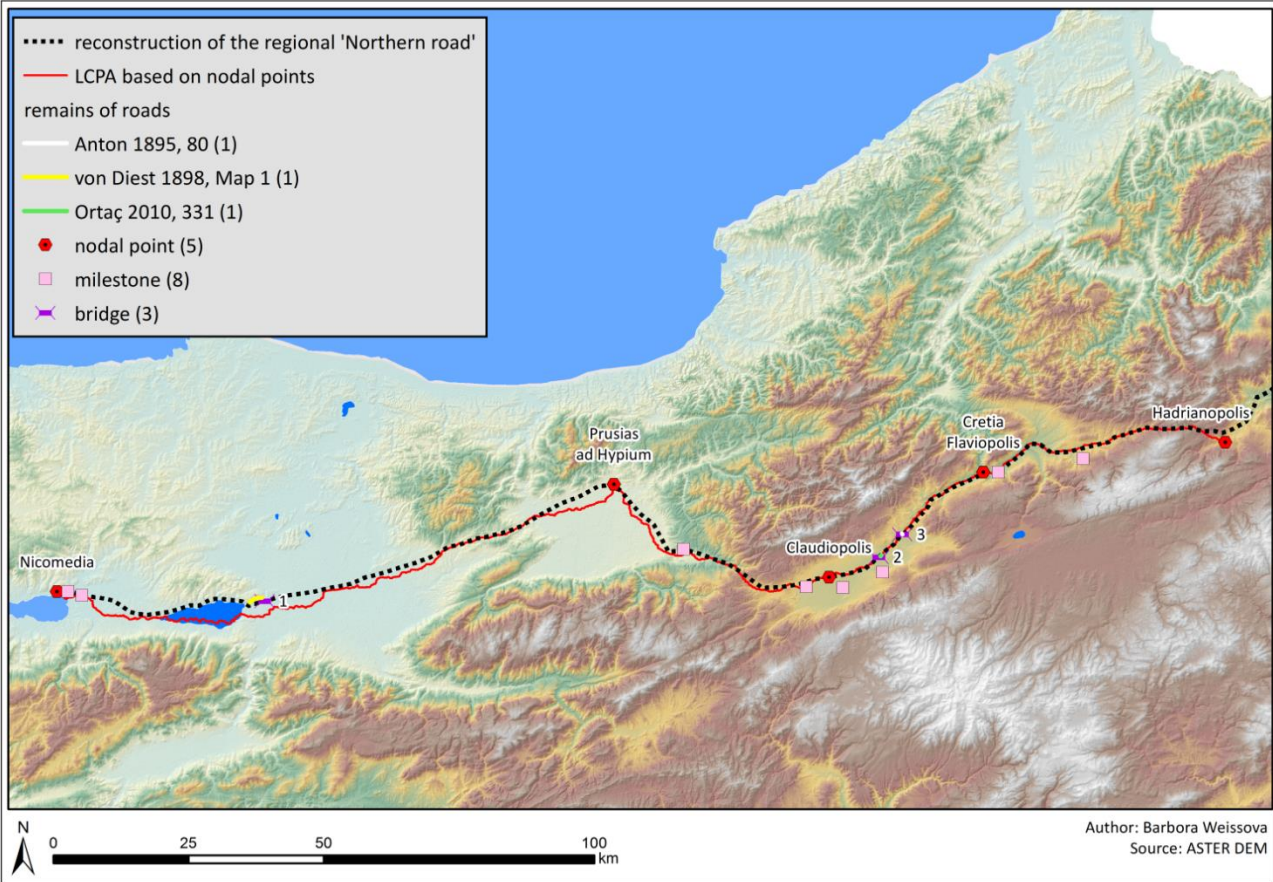


Figure 44: Reconstruction of the Regional 'Northern Road' (Addendum 1. 23.)

7. 3. 3. Regional Road 'Nicaea – Prusias ad Mare'

The Regional Road Along the Southern Shore of the <i>Ascania Lacus</i>	
map Figure 45, Addendum 1. 24.	
nodal points	<i>Nicaea – Prusias ad Mare</i>
research history	Texier 1862, 108; French 1980, 707. 715
ancient literary sources	Tab. Peut. (Miller 1916, 694)
bridges	N/A
remains of the road pavements	von Diest 1898, Map 1
description	N/A
epigraphic evidence	3 milestones (French 2013, nos. 25. 27. 28); 1 rock inscription (CIL III, no. 1.346; French 1980, 715)
reconstructed length	51 km / 2 days' travel
the LCPA	not applicable

Table 35: Overview of the Data Used for the Reconstruction of the Road Segment 'Nicaea - Prusias ad Mare'

The regional road connected *Nicaea* with the Marmara Sea and its port lying at the shore, the city of *Prusias ad Mare*. The road left *Nicaea* through the Southern gate, currently called 'Eskişehir Kapı' (based on the fact the modern road leads via the town Eskişehir). The road forked approximately 1.5 km south of the city. One branch led southwards, in direction to *Dorylaion*. The discussed segment turned to the west, leading along the southern shore of the *Ascania Lacus*. At the western edge, it joined the *Ascanius* River and led along its flow as far as the Marmara Sea, reaching *Prusias ad Mare*.

The reconstructed course of the road is based on the archaeological remains including two milestones and one rock cut relief informing about the repairs of the road and situated south of the lake. Moreover, W. von Diest observed remains of a pavement of the road south of the lake.

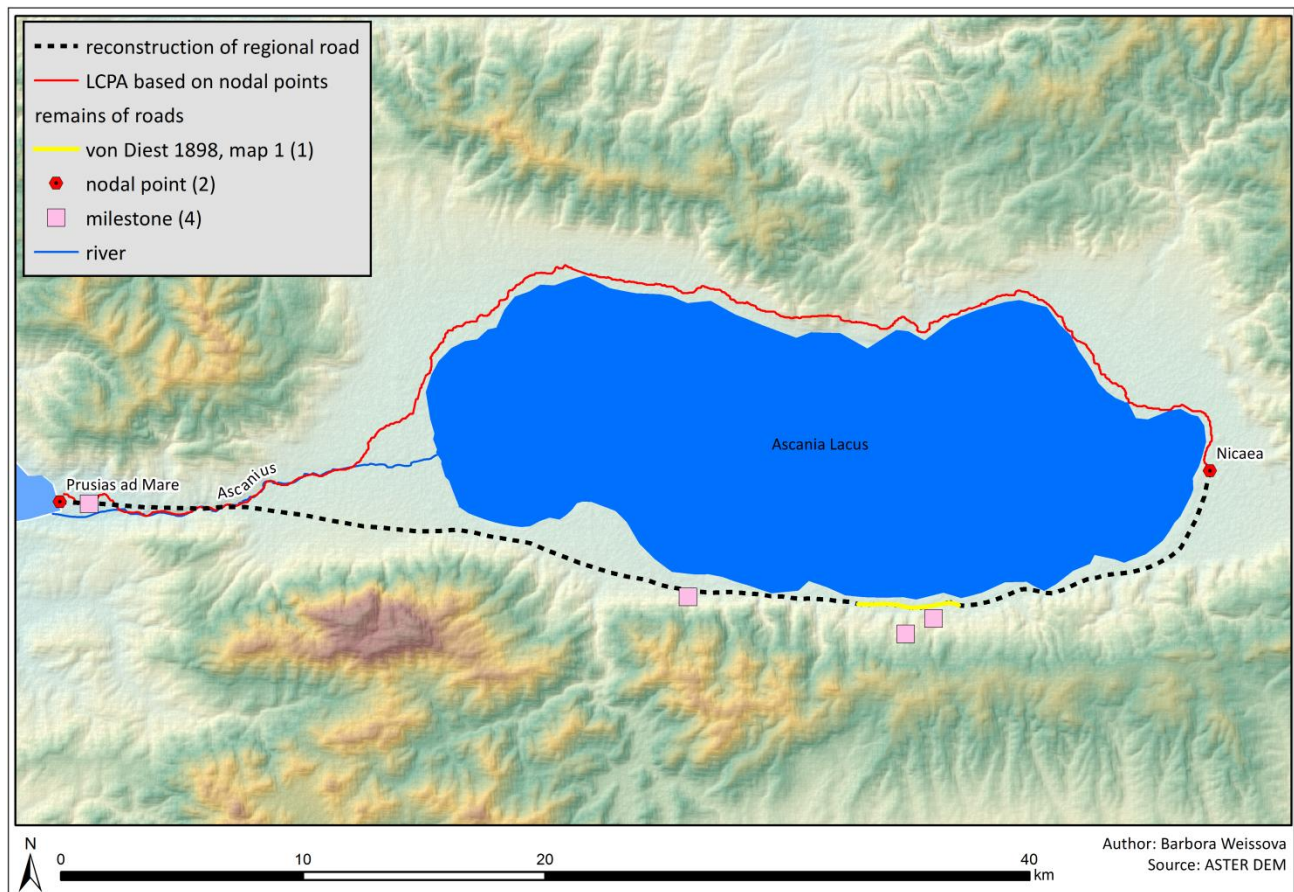


Figure 45: Reconstruction of the Regional Road 'Nicaea - Prusias ad Mare' (Addendum 1. 24.)

However, the LCPA calculated the course leading along the northern shore. Based on a careful diachronic study,⁶⁸⁹ it is feasible the road led along the northern shore during the prehistory. The possible explanation of the shift of the road to the south might be the efficiency of the transport, since the reconstructed road is 13 km shorter than the northern course.

7. 3. 4. Regional Roads in the NE Part of the Macro-Region

The Regional Roads in the NE part of the Macro-Region	
map Figure 46, Addendum 1. 25.	
route	<i>Cretia Flaviopolis – Tium – Amastris</i>
research history	BAtlas 86; Öztürk 2013, 149 f.
ancient literary sources	Tab. Peut. (Miller 1916, 640)
bridges nos. 1 – 3 (see Figure 46)	1 (Anton 1895, 85); 2 (BAtlas 52); 3 (BAtlas 86)
remains of road pavement	Anton 1895, 85; von Diest 1889, 68. 73
description	remains of a paved road without further specification
milestones	9 in total (French 2013, nos. 4a-b. 5a-b. 6. 17a-d)
reconstructed length	90 km / 3 days' travel for the sections <i>Cretia Flaviopolis – Tium</i> 41 km / 2 days' travel for the section <i>Tium – Amastris</i>
the LCPA	partially applicable

Table 36: Overview of the Data Used for the Reconstruction of the Road Segment '*Cretia Flaviopolis – Tium – Amastris*'

The NE part of the studied territory offers two sections of roads which enable comparison between the results of the LCPA and the archaeological evidence. The first section leads between *Cretia Flaviopolis* and *Tium*, the second section continues from *Tium* to *Amastris*.

Examining the course in the direction from *Cretia Flaviopolis* to *Tium*, it entered the mountains from the south and led through the valley of the *Filyos* River, keeping the northern direction for the first third of the road. Based on observations of the German traveller M. Anton,⁶⁹⁰ I depicted the first bridge (no. 1) on the map. M. Anton describes its remnants as pillars still visible in the River *Filyos*. Moreover, M. Anton also mentions remains of a pavement of the road

⁶⁸⁹ Weissová – Pavúk 2016, 11–21.

⁶⁹⁰ Anton 1895, 85.

preserved right next to the bridge. Since I have the descriptions provided by M. Anton, I reconstruct the first third of the road based on his observations. In this case, it does not fit to the LCPA which found an easier way east of the reconstructed road. It is hard to assess the actual reasons for leading the road through a less accessible terrain. However, one of the obvious reasons is the length. The route predicted by the LCPA is more than 20 km longer than the reconstruction based on the archaeological evidence. In other words, this means one more day on the road to reach the destination.

The second third of the road led to the NE, keeping the track along the river. When reaching the bridge (no. 2), the road turned to the north again, following the river as far as the city and port *Tium*. The section between the bridges (nos. 2 and 3) follows the LCPA, since no archaeological evidence is available.

The last third of the road leads along the River *Filyos* again. This time, unlike the LCPA, I reconstruct the course of the road along the left bank of the river. The reason is the epigraphic evidence; six milestones were found on the left bank, confirming the course of the road.

Merely several hundred meters south of *Tium*, the road reaches a crossroad with the road leading along the Black Sea coast. The branch turns eastwards towards *Amastris* and crosses the *Filyos* River (bridge no. 3). Unlike the route resulting from the LCPA, my reconstruction does not lead directly along the sea shore. The segment of the road belonging with the analysed territory is relatively short, reaching about 30 km in length. Despite the shortness, the road in the inland is confirmed by three milestones. The course of the road between *Tium* and *Amastris* reaches 41 km.

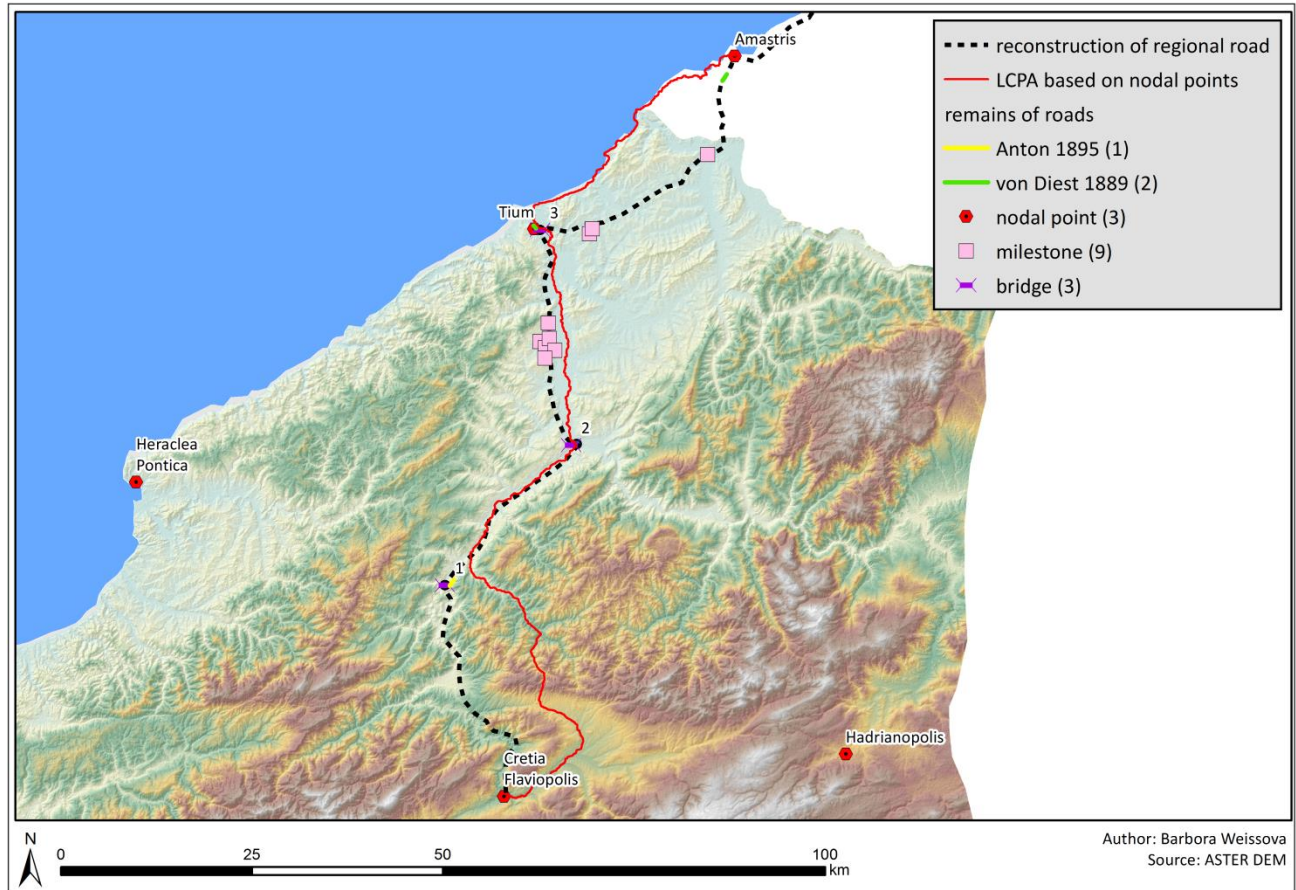


Figure 46: Reconstruction of the Regional Roads 'Cretia Flaviopolis - Tium - Amastris' (Addendum 1. 25.)

7. 4. Reconstruction of Road Systems during the Main Historical Periods

7. 4. 1. The Hellenistic Road System

Since there is a lack of information concerning the construction of the road system during the Hellenistic period, it is generally assumed that the roads were not paved (just as well as during all the preceding periods).⁶⁹¹ From the archaeological point of view, one does not expect any remains of pavements to be found in the terrain. Thus, there are no direct proofs of the existence of roads during the Hellenistic period.

The presented reconstruction assumes that the Greek *poleis* were interconnected *via* inland thoroughfares. Therefore, the resulting map Figure 47 depicts only the supra-regional and several main regional routes.

⁶⁹¹ French 1980, 704.

It is difficult to determine a status of each single road due to an insufficient amount of obtainable information. Most likely, the route that preceded the later supra-regional ‘Pilgrim’s road’ was the main artery already during the Hellenistic period.⁶⁹² The remaining roads were most probably regional ones, serving as an inter-connection between the main urban centres in the region.

During my research, I found only one route mentioned in the literary sources that led through Bithynia and can be connected with the Hellenistic period. Moreover, its existence even predates the Hellenistic era. The road follows the Black Sea coast from the Bosphorus as far as *Heraclea Pontica* and it is mentioned in Xenophon’s *Anabasis*:⁶⁹³

‘έφ’ ὄν ἔλθοιτε ἄν, εἰ τὸν Ἄλυν διαβαίητε. ἐγὼ μὲν οὖν οὐ χαλεπὴν ὑμῖν εἶναι νομίζω τὴν πορείαν ἀλλὰ παντάπασιν ἀδύνατον. ἂν δὲ πλέητε, ἔστιν ἐνθὲνδε μὲν εἰς Σινώπην παραπλεῦσαι, ἐκ Σινώπης δὲ εἰς Ἡράκλειαν: ἐξ Ἡρακλείας δὲ οὔτε πεζῆ οὔτε κατὰ θάλατταν ἀπορία: πολλὰ γὰρ καὶ πλοῖά ἐστιν ἐν Ἡρακλείᾳ.’

‘For my part, therefore, I believe that this journey is not merely difficult for you, but a thing of utter impossibility. If you go by sea, however, you can coast along from here to Sinope, and from Sinope to Heracleia; and from Heracleia on there is no difficulty either by land or by water, for there are ships in abundance at Heracleia.’⁶⁹⁴

⁶⁹² French 1997, 179 suggests that the development of the road system corresponds with the development documented on the other side of the Bosphorus; with the existence of *Via Egnatia*, which was used already by Xerxes in 480 BC.

⁶⁹³ Xen. Anab. 5, 6, 10.

⁶⁹⁴ Translation by Brownson 1922.

As shown by the text, the Greek colonies situated east of *Heraclea Pontica* were isolated islands located in the barbarian world. Therefore, the communication between them was maintained only by the sea (since land journey was too arduous and dangerous even for the Ten Thousand).⁶⁹⁵

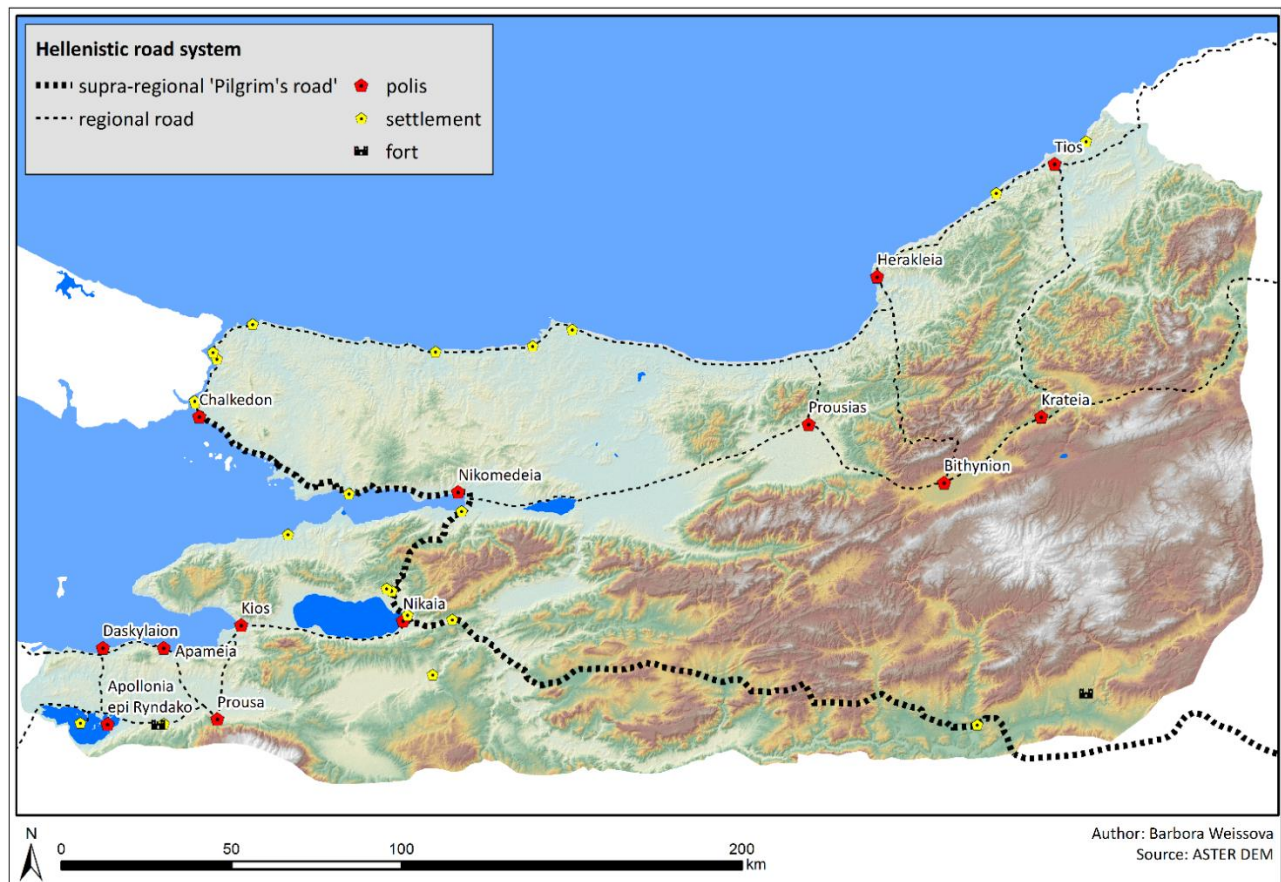


Figure 47: Reconstruction of the Supra-Regional and Regional Hellenistic Roads in the Macro-Region (Addendum 1. 26.)

The reconstruction of the main Hellenistic routes shows the possible picture of the thoroughfares leading through the territory before Romans started with the massive constructions. In other words, the presented network is a state of art on which Romans built the complex road system interconnecting the entire Empire.

The roads leading out of the macro region are based on interconnectivity with nodal points situated beyond the borders of the analysed area. Looking at the route along the Black Sea coast,

⁶⁹⁵ Jones 1998, 149.

despite Xenophon's *Anabasis*, I reconstructed its course heading further to the east of *Heraclea Pontica*. I assume the situation was more secure during the Bithynian Kingdom and thus changed in a favour of a denser road system during the Hellenistic period.

7. 4. 2. The Roman Road System

Since there is a widely-accepted assumption that the Roman road network depended upon its Persian and Hellenistic predecessors,⁶⁹⁶ one can postulate that the Roman road system started with the reorganization of the previously used roads.⁶⁹⁷ The fact itself, however, arouses one important question. How did the Romans approach the reorganisation of the Hellenistic road system? How fast did they manage to change the unpaved routes into an elaborate and, therefore, so admired Roman road system?

The Roman road system naturally develops with the official presence of Romans in the territory of Asia Minor, i.e. in 128–126 BC, after they created the province of Asia.⁶⁹⁸ Although there is recently published evidence of Republican milestones,⁶⁹⁹ none of the milestones directly mentions the paving of a road.⁷⁰⁰ Interestingly, the first inscription that can be interpreted as referring to the paving is found on the milestone on *Via Sebaste* dated not earlier than to the year 6 BC.⁷⁰¹ Based on this milestone, we may assume that for the first 120 years of Roman presence in Asia Minor, the roads were only tracks with no stable pavement. These routes most likely simply followed their Hellenistic predecessors, with local changes of courses where necessary.

Based on the observation published by D. H. French,⁷⁰² the unconditional paving of trans-regional roads was performed by the Flavian dynasty (attested by the texts *vias straverunt / stravit* during the reign of the Emperor Domitian) as a result of their policy. Vespasian namely established the *limes* near the *Euphrates* River and he needed the stable road system which would enable to

⁶⁹⁶ Hdt. 5, 52 describes the course of the 'Royal Road' which coincides with the Roman one and as such can be dated to the Persian Empire.

⁶⁹⁷ Talbert 1985, 159.

⁶⁹⁸ For circumstances concerning the rise of the province Asia, see Magie 1950, 3–33.

⁶⁹⁹ French 2012.

⁷⁰⁰ French 1980, 707 is in his first study on this topic not against the fact that each of the milestones means paving of the road. Later on, French (1997) reconsiders his interpretations and tends towards the later paving which seems more plausible considering the historical development of Asia Minor.

⁷⁰¹ French 1997, 182.

⁷⁰² French 1980, 711.

reach the borders as fast and as secure as possible. The developed Roman engineering facilitated to build a sustainable road system leading through the entire territory. The primary role of the roads was military and administrative (as demonstrated on the diagrams Figures 41 and 42 above). However, the easily passable roads also enabled an efficient trade and faster movement of the civilian population.

Looking at the map Figure 48 below, not only the density increased, but also the typological sub-division of the settlements features one more group in comparison with the preceding Hellenistic period. *Civitates* and forts could namely be supplemented with the road stations.

The resulting Roman road system encompasses all the routes that can be reconstructed based on the attainable data. It is certainly not the final version but based on a careful study of the materials, as accurate as possible. The *Tabula Peutingeriana*,⁷⁰³ dated to the 4th or 5th century AD but most probably based on the map from the 1st century AD,⁷⁰⁴ confirms the existence of most of the depicted roads. In particular, these are the 'Pilgrim's road',⁷⁰⁵ the 'Northern road',⁷⁰⁶ the road along the Black sea coast⁷⁰⁷ and the roads 'Pylae - Prusias ad Mare – Apamea – Dascyleion';⁷⁰⁸ 'Prainetos (Nicomedia's Gulf) – Nicaea';⁷⁰⁹ 'Nicaea – Dorylaion';⁷¹⁰ 'Nicomedia – Artane (Black Sea coast)';⁷¹¹ 'Apamea – Prusa ad Olympum – Miletopolis'.⁷¹²

Several roads are not depicted in the current reconstruction, though they must have existed, because the evidence is insufficient. It is the road leading from *Nicomedia* NE to the Black Sea coast and several roads connecting the forts, at the present reconstruction standing somewhat isolated in the terrain.

The presumption concerning the road leading from *Nicomedia* to the NE is based on the dense distribution of settlements in the territory as well as on the need of an interconnecting road

⁷⁰³ Tab. Peut. (Miller 1916; Talbert 2014).

⁷⁰⁴ Podossinov 2012, 203; Talbert 2014, 1. 7.

⁷⁰⁵ For the complete reconstruction of the 'Pilgrim's road', see Chapter 7. 4. 1.

⁷⁰⁶ For the complete reconstruction of the 'Northern road', see Chapter 7. 4. 2.

⁷⁰⁷ Miller 1916; Talbert 2014; Podossinov 2012, 204.

⁷⁰⁸ Tab. Peut. (Miller 1916, 694 f.).

⁷⁰⁹ Tab. Peut. (Miller 1916, 687).

⁷¹⁰ Tab. Peut. (Miller 1916, 687 f.).

⁷¹¹ Tab. Peut. (Miller 1916, 669 f.).

⁷¹² Tab. Peut. (Miller 1916, 712 f.).

between *Nicomedia* and the ports situated further east along the Black Sea coast. Since there is no real proof of its existence, i.e. not a bridge, a milestone, a remain of road pavement or a *civitas* to be interconnected based on the LCPA, I did not reconstruct the route.

The three isolated forts were most likely also connected with their surroundings. Likewise, they possibly guarded a road leading through the territory. However, since there is no other evidence for the existence of the communication, I did not include the reconstruction on the final map.

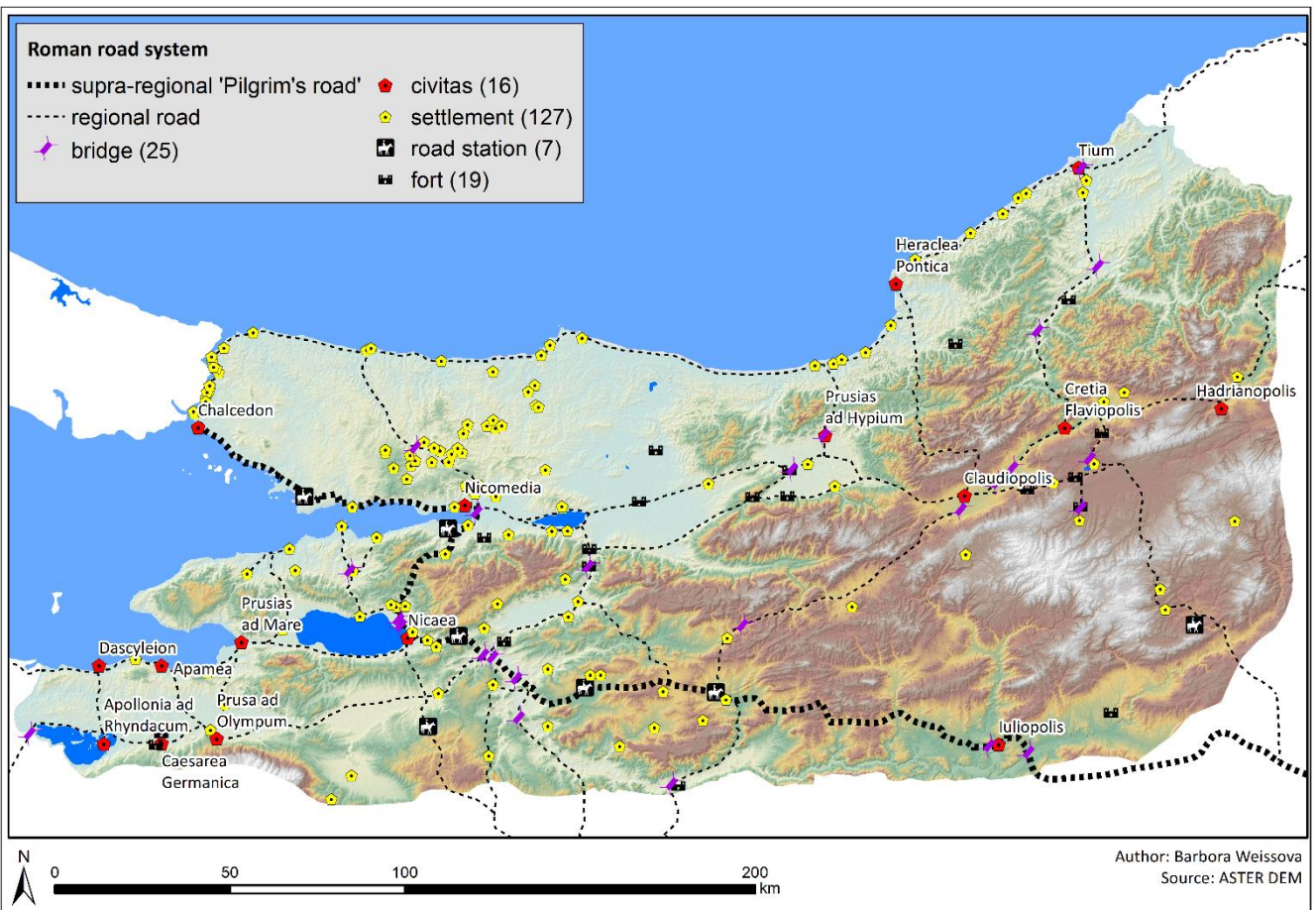


Figure 48: Reconstruction of the Supra-Regional and Regional Roman Roads in the Macro-Region (Addendum 1. 27.)

7. 4. 3. The Early Byzantine Road System

Comparing the results of the Roman road system discussed above (Figure 48) and the Early Byzantine roads depicted on Figure 49, there are only slight changes to be observed. One regional road is missing on the reconstruction dated to the Early Byzantine period and one bridge is added.

In particular, it is the 'NW – SE road' connecting the 'Pilgrim's road' with the road leading from the eastern shore of the Sapanca Lake to the south / SW. The reconstruction of the road is based on the records of the traveller M. Anton⁷¹³ who described remains of the Roman road pavements in several places along the proposed course. Since all the settlements along this road are dated to the Roman era, I did not reconstruct the thoroughfare for the Early Byzantine period. However, its existence is not excluded.

The surplus bridge is dated to the reign of the Emperor Justinian. Based on the written evidence, it is the first bridge built over the *Sangarius* River situated in the area. The 'Justinian Bridge' is described by Procopius⁷¹⁴ as built in a place where no bridge had ever been built and where *'the River Sangarius used to be crossed by skiffs lashed together'*.

The following map Figure 49 depicts the most probable reconstruction of the Early Byzantine road system during the 4th and 5th century AD. The bridges claimed to be built by Justinian I. are included on the map, since I assume that these were 'merely' reconstructions and not brand-new constructions as described by Procopius. I do not intent to challenge the priceless descriptions given by Procopius, I simply assume the need to cross the rivers by bridges was too urgent to wait until the end of the Early Byzantine era. Nonetheless, to keep the historical information, I depict the bridges in a different colour. The 6th century shift of the course of the 'Pilgrim's road' is documented in Chapter 7. 4. 1.

⁷¹³ Anton 1895, 111 f.

⁷¹⁴ Procop. aed. 5, 3, 8–11.

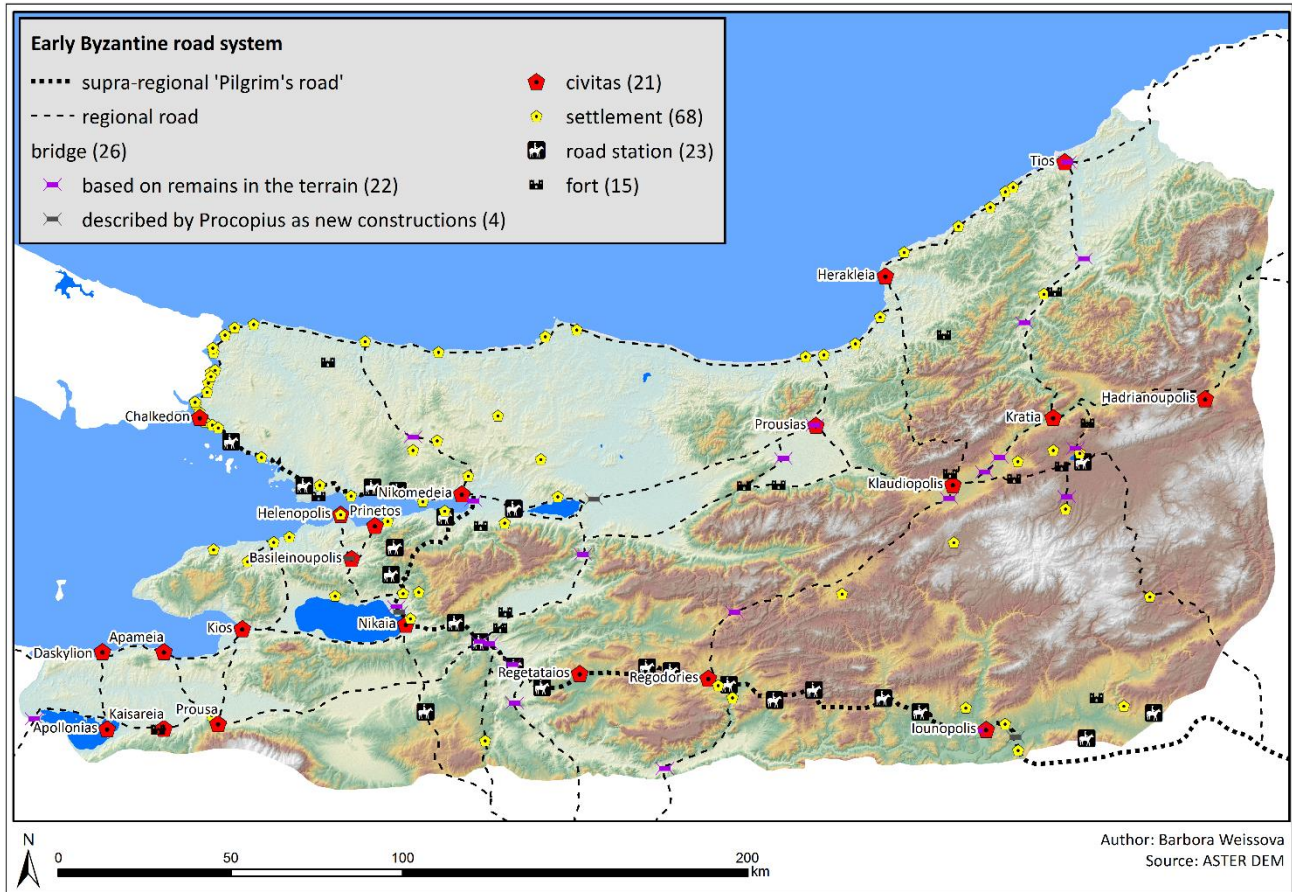


Figure 49: Reconstruction of the Supra-Regional and Regional Early Byzantine Roads in the Macro-Region (Addendum 1. 28.)

The typology of settlements depicted on the map equals the Roman ones; *civitates*, forts and road stations are supplemented by a further unspecified group, broadly identified as settlements. The group includes, again, mainly rural settlements and ports, but also urban settlements without the official status of a city.

The spatial distribution, similarly as during the preceding Roman period, embodies three isolated forts, suggesting the existence of communications leading along them and creating joints between the roads depicted on the reconstruction. Since I do not have any record confirming this assumption, I left the prediction open.

7. 4. 4. An Issue in the Spatio-Temporal Analysis of the Road System

Reconstructions of the Roman and Early Byzantine road systems depicted on the maps Figure 48 and 49 show slight changes when compared. The changes are based on the spatial distribution of settlements. *Prima facie*, one can observe that although the road system does not dramatically change during the first five centuries of our era, the distribution of settlements saw fundamental changes.

The density and clustering of road stations along the 'Pilgrim's road' is the most striking transformation. This can be interpreted in several ways. The obvious explanation is that the road gained in importance during the Early Byzantine period and thus needed to be equipped with an appropriate number of *mansia* and *municipia* along its course. Nonetheless, it is also necessary to keep in mind the character of the available evidence. The most consistent source of the road stations in the macro-region are the ancient *Itineraria*, i.e. *Tabula Peutingeriana*, *Itinerarium Antonini* and *Itinerarium Burdigalense*. All of them present the situation in the territory during the Early Byzantine period and, therefore, the considerably richer record might simply be ascribed to the existence of these written sources. I come back to this question once more in Chapter 7. 5. 1., when interpreting the situation in the light of public investments documented on milestones.

The survey conducted in the hinterland of *Nicaea* included also the road station *Ad Schinae*.⁷¹⁵ Only during surface observations of the ceramic scatter associated with the road station, we could find pottery dated to the Hellenistic and the Roman Imperial periods. Due to unfavourable conditions, we were not able to study the material in detail, but even the first observations in the terrain brought a considerably different picture, pointing to an earlier habitation. What was the function of the settlement during the Hellenistic and Roman periods? As a matter of fact, was it connected with its position next to the main road, similar as in the case of the documented road station? Can we predate the existence of the road station? Or is it merely a continuously inhabited area with different functions? The extent of the settlement, its true functions throughout the encountered periods and further interpretations require systematic archaeological works in the terrain.

⁷¹⁵ Tab. Peut. (Miller 1916, 657); Itin. Burdig. (Cuntz 1929, 92); French 1981, 29; Şahin 1981, 10; Şahin 1987, 145.

7. 5. Spatio-Temporal Analysis of Public Investments in Several Roads

The maps above represent reconstructions of the road systems during the broad time slices, each of them including several centuries. Looking at these reconstructions, one faces a crucial problem concerning the contemporaneity of the roads. Did the system ever work concurrently in the depicted way or, rather, were some of the roads already declining whilst others were just under construction, newly built or even not yet existing?

The epigraphic evidence preserved along the courses of several of the roads enables to answer the question, although it is chiefly restricted to the Roman and the beginning of the Early Byzantine periods. For the most part limited to milestones, it documents investments in the construction and upkeep of several roads, allowing for their precise chronology. There are 77 milestones and one inscription cut into the rock above a road known from the territory, out of which 59 are dated. Their chronology covers the first four centuries of our era. From the 5th century onwards, there is no epigraphic evidence documenting maintenance of the communications. However, as Procopius described the deeds of Justinian I., largely focused on new constructions and the upkeep of roads, the lacking evidence does not mean that there were no building activities. Most probably, the utilisation of milestones was simply out of fashion, as suggests D. G. Hogarth.⁷¹⁶

In spite of the rich evidence of milestones, all of them were found distributed solely along seven roads.⁷¹⁷ The evidence points to a considerably larger amount of paved roads⁷¹⁸ which naturally required investments. However, since there is a lack of any documents concerning their construction and upkeep, I do not include them in the analysis.

All the roads that can be connected with the public investments are presented separately within their spatio-temporal analyses. These include the supra-regional 'Pilgrim's road' and the regional roads as follows: the 'Northern road' (from *Nicomedia* to the east through *Claudiopolis*, *Cretia Flaviopolis* and *Hadrianopolis*), the roads connecting '*Cretia Flaviopolis* and *Tium*' as well as '*Tium* and *Amastris*' (out of the macro-region), the road leading along the southern shore of the

⁷¹⁶ Hogarth 1893, 75 f.

⁷¹⁷ French 2016, 41–49.

⁷¹⁸ See map Figure 2 in Chapter 2. 2. 2.

Ascania Lacus and connecting ‘*Nicaea* and *Prusias ad Mare*’, the road between ‘*Prusa ad Olympum* and *Apamea*’ and, lastly, the road between ‘*Prusa ad Olympum – Caesarea Germanica – Apollonia ad Rhyndacum*’.

The roads are presented in order based on the number of milestones documenting their existence, from the most numerous to the least. The numbers of milestones listed in the tables are after D. H. French.⁷¹⁹ Each section focused on the particular road encompasses detailed descriptions of the course of the road followed by basic information concerning the sources and a brief description in a tabular form. The spatio-temporal distribution of investments is depicted on schematic maps pointing out find-spots of milestones along the examined roads, accompanied with relevant bridges and *civitates*. The investments are further examined, analysed and interpreted in the framework of the entire macro-region.

7. 5. 1. The Supra-Regional ‘Pilgrim’s Road’

The Supra-Regional ‘Pilgrim’s Road’	
maps Figures 50 and 52, Addenda 1. 29. and 1.30.	
nodal points	<i>Constantinopolis – Chalcedon – Nicomedia – Nicaea – (Regetataios) – (Regodories) – Iuliopolis – further to the SE</i>
dated milestones	37 in total (French 2013, nos. 61. 62. 63a–g. 64. 65a–b. 68. 69. 72a–c. 73b. 75a. 76. 77. 80–83. 85. 86a–b. 87a–b. 88b–c. 89. 91–94)
milestones divided to emperor (quantity)	Trajan (2), Septimius Severus (2), Caracalla (4), Caracalla or Elagabalus (1), Elagabalus (2), Gordianus III (4), Phillipus Arabs (2), Aemilius Aemilianus (1), Gallienus (1), Tacitus (1), Diocletianus (8), Constantinus II (5), Julian (1), Valens (3)

Table 37: Overview of Capital Investments in the ‘Pilgrim’s Road’

Out of 55 milestones identified along the course of the road, 37 are dated (for an overview see Table 37). I performed the spatio-temporal analysis of the dated milestones, as it is presently the best assemblage of data that I have concerning the investments in one single road.

The analysis of the investments is enriched by eight bridges situated along the road. The determination of the chronology of the bridges is rather challenging. However, two of them (nos. 2 and 3 on the map Figure 50) most probably date to the period of the Emperor Hadrian.⁷²⁰

⁷¹⁹ French 2013.

⁷²⁰ IK Iznik, no. 1.

Assuming that the entire course of the road was passable during the reign of Hadrian, the possibility to safely cross all rivers should have been somehow guaranteed. Nevertheless, since there are no records about building activities, the rivers might also have been crossed by boats or temporary boat bridges. The solid constructions might have come later during the Roman period.

Inspecting investments in the 'Pilgrim's road', *prima facie* an appealing result appears. Although determining that the road was an important artery used to reach the *limes* established by Vespasian, there is not even one milestone dated to this period. Is it due to the missing evidence or were the investments performed later? Was it not earlier than during the reign of the Emperor Trajan, at the beginning of the 2nd century AD?

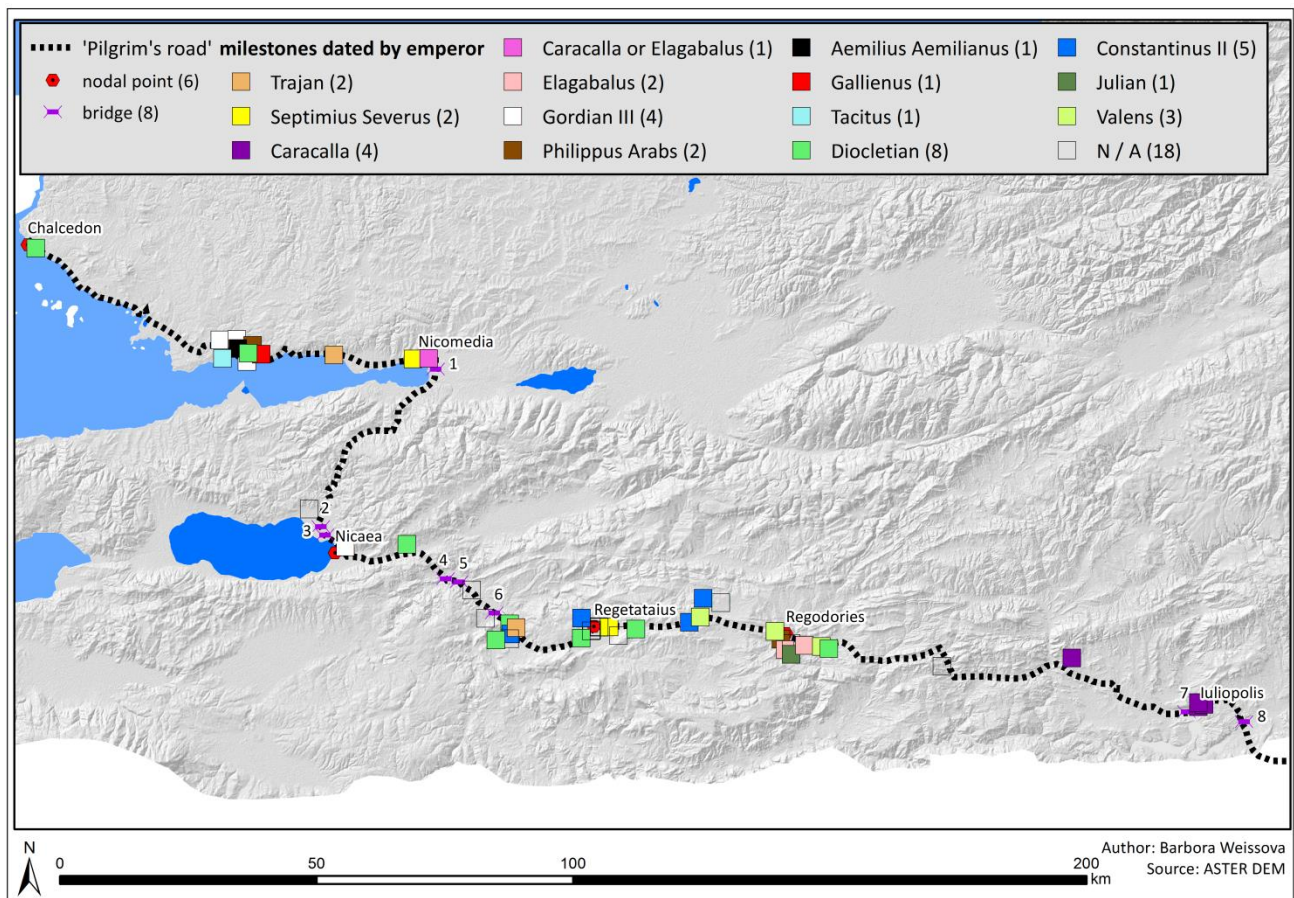


Figure 50: Spatial Distribution of Milestones Documenting the Investments in the 'Pilgrim's Road' (Addendum 1. 29.)

Based on the surviving evidence, the development seems as follows. Trajan invested in the road itself, constructing the sections between *Chalcedon* and *Nicomedia* as well as east of *Nicaea*. This work was followed by Hadrian who took care of the construction of at least two bridges

situated NW of *Nicaea*, making the road safer and easily passable. Thus, the first wave of investments in the supra-regional 'Pilgrim's road' road took place in the first half of the 2nd century AD.

Subsequent investments were conducted at the turn of the 2nd and 3rd century AD during the reign of the Emperor Septimius Severus. Based on the spatial distribution of the milestones, Septimius Severus chose for the investments the same segments as Trajan. The reign of Caracalla saw the reconstruction of the road around *Nicomedia* and massive building activities in the vicinity of *Iuliopolis*, situated east of the mountainous plateau. Is it possible, as appears from the preserved evidence, that the entire course of the road was constructed as late as during the beginning of the 3rd century AD? Or is it only missing evidence which would confirm the investments in its course east of the mountainous plateau?

At any rate, during the 3rd century AD, the road was well taken care of, with moderate but relatively continuous investments. The largest focus was put on the section between *Chalcedon* and *Nicomedia*. This might also relate to the heavier traffic on this section, as it not only connects the west with the SE via the 'Pilgrim's road' but also the west with the east via the 'Northern road'.

Massive investments in the entire course took place at the turn of the 3rd and 4th century AD during the reign of Diocletian, followed by Constantine II. during the 2nd quarter of the 4th century AD. These investments are usually interpreted in a direct connection with the rising importance of the road used for the pilgrimage. However, as pointed out by K. Belke,⁷²¹ pilgrims did not need paved roads and they often deliberately chose pilgrimage over land than along the busy road. This raises a general question: who were these constructions made for? In my opinion, although possibly also used by pilgrims, the economic importance of the road interconnecting *Constantinopolis* with Ancyra and further with the east was the decisive reason for the construction and upkeep. The reigns of the Emperors Diocletian and Constantine II. Should be rather seen as economically strong periods than as a heyday of the pilgrimage. The last investments documented on the milestones fall within the third quarter of the 4th century AD, performed during the reign of the Emperors Julianus and Valens.

⁷²¹ Belke 2010a, 46.

The milestones disappear by the end of the 4th century AD. Records documenting the maintenance during the fifth century are entirely missing. The following 6th century AD stands for massive investments during the reign of the Emperor Justinian I. These investments are examined in a separate section below and accompanied by a map Figure 52.

All the investments documented by milestones are depicted on the line graph Figure 51 below. The graph is based on an analogous system as used for the epigraphic evidence when dated to several centuries.⁷²² The difference lies in a more detailed chronology of the milestones, allowing for depicting the evidence in years and not only in centuries.

Looking at the visual depiction of investments documented on milestones, they correspond to the picture outlined by the distribution of the settlements. The clustering of road stations along the road which appears during the 4th century AD seems to be not only a consequence of the preserved evidence as postulated above. The massive investments documented by milestones dated to the 3rd and 4th century AD corroborate with the rise of investments in the road in general.

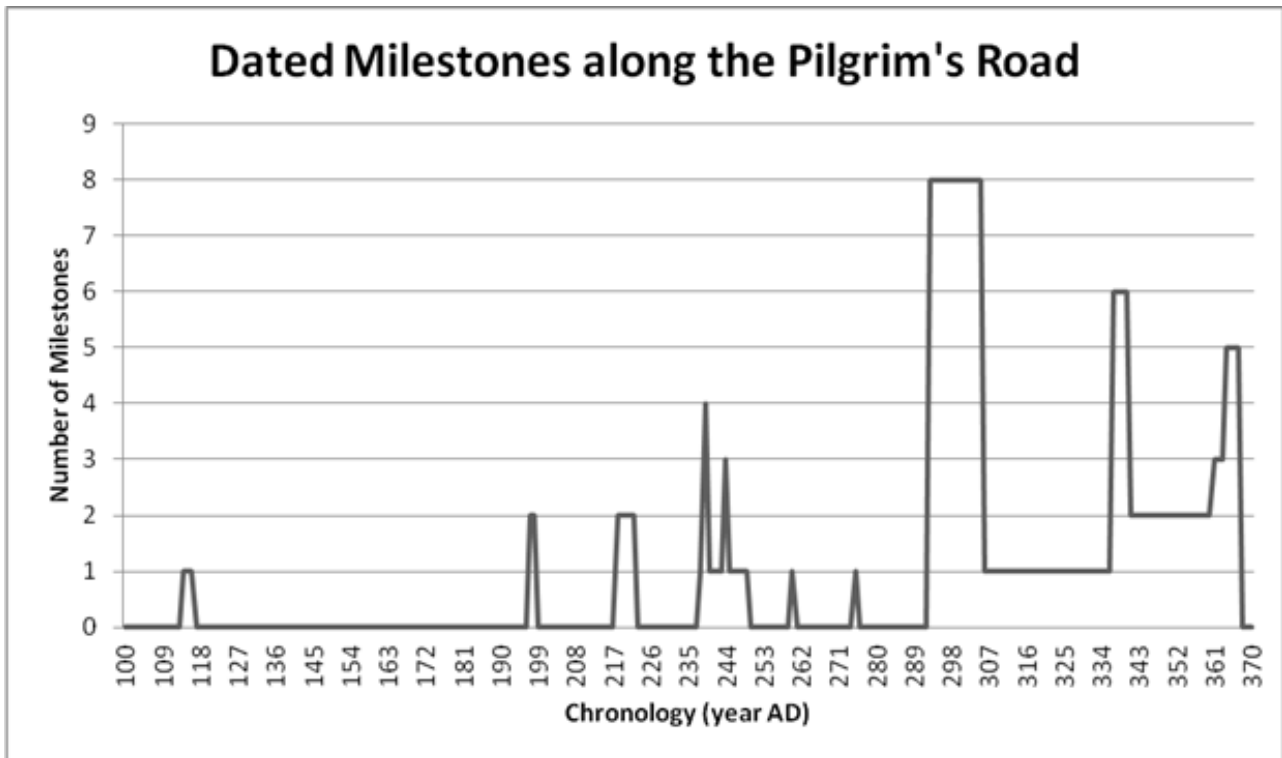


Figure 51: Temporal Analysis of Dated Milestones Situated along the 'Pilgrim's Road'

⁷²² For details, see Table 12 and the explanation above it.

Construction works during the reign of the Emperor Justinian I.

A vital change took place in the course of the 'Pilgrim's road' during the 6th century AD. The change was caused by the regulation of the official traffic by Justinian I. The emperor diverted the artery leading from *Constantinopolis* through *Nicomedia* towards *Nicaea* to an overseas road from *Constantinopolis* to *Helenopolis*, further through *Basileinoupolis* and then southwards, directly to *Nicaea*.⁷²³ This regulation had a negative impact on the role of *Nicomedia*, suddenly excluded from the position on the main artery. In contrast, the importance of *Helenopolis* rose, and thus also the road leading from *Helenopolis* towards *Nicaea* gained a completely new role. The regulation also involved the reduction of the number of road stations along most of the arteries. The reduction in all probability did not concern the discussed section of the 'Pilgrim's road' but had a negative impact, based on the following quotation, on the economic (and not only) situation in the Empire in general:⁷²⁴

ἔπειτα δὲ κατὰ μὲν τὴν ἐπὶ Πέρσας ὁδὸν φέρουσαν τὸν δρόμον ἐπὶ σχήματος τοῦ πρόσθεν ὄντος εἵασενεῖναι, ἐς δὲ τὴν λοιπὴν ξύμπασαν ἔω μέχρι ἐς Αἴγυπτον ἐν ἡμέρας ὁδῶν κατὰ σταθμὸν ἓνα κατεστήσατο μόνον, οὐχ ἵππων μέντοι, [11] ἀλλ' ὄνων ὀλίγων. τὰ μὲν ξυμβαίνοντα ἐν χώρᾳ ἐκάστη μόλις τε καὶ ὀψὲ τοῦ καιροῦ καὶ ὀπίσω τῶν πραγμάτων ἐσαγγελλόμενα ἐπικουρίας οὐδεμιᾶς τυγχάνειν εἰκὸς, οἱ δὲ τοὺς ἀγροὺς κεκτημένοι καρπῶν τῶν σφετέρων σεσηπότην τε καὶ εἰκῆ ἀνόνητοι ἐς ἀεὶ γίνονται.'

'And, in the second place, while on the route leading into Persia he did allow the previous arrangement to stand, yet for all the rest of the East as far as Egypt he allowed one station only for each day's journey, using not horses, however, but mules and only a few of them. [11] It is no wonder, consequently, that the things which take place in each country, being reported both with difficulty and too late to give opportunity for action and behind the course of events, cannot be dealt with at all, and the owners of

⁷²³ Procop. HA 30, 8.

⁷²⁴ Procop. HA 30, 10–11.

*the lands, with crops rotting on their hands and going to waste, continually lose all their profits.*⁷²⁵

The undertaken changes seem to be a sign of a considerable decline of the road system by the end of the Early Byzantine era.⁷²⁶ From this point of view, the massive building activities conducted during the reign of the Emperor Justinian I. can be seen as an evident and ostentatious fight against the general tendency.⁷²⁷

The modified course of the ‘Pilgrim’s road’ is depicted on the map Figure 52 below. The change required a number of constructions which are also documented by Procopius. Since the main road led from *Helenopolis*, its course towards *Nicaea* necessitated a completely new building activities, as described in detail by Procopius:⁷²⁸

‘Ταύτης δὲ ρεῖ τῆς πόλεως ἄγχιστα ποταμός, ὄνπερ ὁμώνυμος τῷ σχήματι Δράκοντα καλοῦσιν οἱ ἐπιχώριοι. [7] περιστρέφεται γὰρ ἐλισσόμενος ἐφ’ ἐκάτερα καὶ ἀπ’ ἐναντίας αὐτῷ ἀντιπεριάγων τὰς δίνας, σκολιῶ τε τῷ ῥοθίῳ, πῆ μὲν ἐν δεξιᾷ, πῆ δὲ ἐν ἀριστερᾷ προσιών· ὥστε ἀμέλει διαβαίνειν αὐτὸν πλεῖν ἢ εἰκοσάκις ἐπάνανγκές ἐστι τοῖς τῆδε ἰοῦσι. [8] πολλοῖς τε οὕτω διεφθάρθαι ξυνέβαινε τοῦ ποταμοῦ ἑξαπιναίως παρὰ τὰ ξυνειθισμένα πλημμύροντος. [9] πρὸς δὲ καὶ δάσος ἀμφιλαφές καὶ καλάμου τῆδε φυσομένου μέγα τι χρῆμα συμποδίζον αὐτοῦ τὴν ἐπὶ τὴν θάλασσαν ἐκβολὴν χαλεπώτερον αὐτὸν ἐσκευοῦντο εἶναι τοῖς ἐκείνη χωρίοις. [10] χρόνῳ γοῦν οὐ πολλῷ πρότερον, ὄμβρων οἱ ἐπιγενομένων πολλῶν, λιμνάζων τε καὶ κυρτούμενος καὶ σκεδαννύμενος ἐπὶ πλεῖστον τῆς γῆς, ἀνήκεστα κακὰ εἴργασται. [11] χωρία τε γὰρ παμπληθῆ καθεῖλε προρρίζους τε ἀμπέλους, ἔτι μέντοι ἐλαίας τε καὶ δένδρων ἄλλων παντοδαπῶν ἀνάριθμα πρέμνα, πρὸς δὲ καὶ τὰς οἰκίας αἱ πρὸ τοῦ περιβόλου τῆς πόλεως ἐτύγχανον οὔσαι, πάθεισι τε ἄλλοις ὑπερμεγέθει τοὺς ἐπιχωρίους ἐπέτριψεν. [12] οὐσπερ ἐποικτισιάμενος Ἰουστινιανὸς βασιλεὺς ἐπενόει τοιάδε. τὰ μὲν

⁷²⁵ Translation by Dewing 1935.

⁷²⁶ Detailed discussions on the development of the Byzantine road system by Avramea 2002, 57–90; Belke 2008, 295–308; Belke 2010a, 45–58; Belke 2010b, 57–59; Drakoulis 2013, 244 f.

⁷²⁷ The impacts of Justinian’s deeds on the regional development are outlined by Belke 2010b, 57–59.

⁷²⁸ Procop. aed. 5, 2, 6–13.

ἄλση περικαθήρας ποιεῖσθαι τῷ ποταμῷ ξυνεχώρησε τὰς ἐς τὴν θάλασσαν ἐκβολάς, ὡς μηκέτι αὐτῷ διασκεδάννυσθαι ἐπάνανγκες εἶη· τὰ δὲ ὄρη κατὰ μέσον ἀποτεμῶν ἃ δὴ ἀνέχει ἀμφὶ τὰ ἐκείνη χωρία, ἐν ταῖς πρότερον ἀποτόμοις καὶ κρημνώδεσι χώραις ὁδὸν ἀμαξιτὸν ἐξειργάσατο. [13] ταύτη τε τοῦ ποταμοῦ τὴν διάβασιν οὐκ ἀναγκαίαν ἐκ τοῦ ἐπὶ πλεῖστον τοῖς ἐνταῦθα οὔσι πεποίηκεν εἶναι. καὶ γεφύρας δύο ἐς ἄγαν εὐρείας τῷ ποταμῷ τούτῳ ἐντέθειται, καὶ ἀπ’ αὐτοῦ ἀκινδύνως αὐτὸν διαβαίνουσι τὸ λοιπὸν ἅπαντες.’

‘Close to this city flows a river which the natives call Dracon from the course which it follows. [7] For it twists about and winds from side to side, reversing its whirling course and advancing with crooked stream, now to the right and now to the left. Consequently, it is actually necessary for those visiting there to cross it more than twenty times. [8] Thus it has come about that many have lost their lives when the river has risen in sudden flood. [9] Furthermore, a dense wood and a great expanse of reeds which grew there used to obstruct its exit to the sea and made it more troublesome for the regions round about. [10] Indeed, not long ago, when it had been swollen by heavy rains, it backed up and rose in flood and spread far out over the land and caused irreparable damage. [11] For it ruined many districts, uprooted vines and even olive trees and countless other trees of all sorts, trunks and all, not sparing the houses which stood outside the circuit-wall of the city and inflicting other severe losses upon the inhabitants. [12] And feeling compassion for them, the Emperor Justinian devised the following plan. He cleared off the woods and cut all the reeds, thus allowing the river a free outlet to the sea, so that it might no longer be necessary for it to spread out. And he cut off in the middle the hills which rise there, and built a waggon-road in places which formerly were sheer and precipitous; [13] and in this way he made the crossing of the river for the most part unnecessary for those who dwelt there. Also he placed two very broad bridges over this river, and in consequence everyone now crosses it without danger.’⁷²⁹

⁷²⁹ Translation by Dewing 1935.

The Emperor Justinian I. not only changed the course of the 'Pilgrim's road', he also took care of adjusting the new route to sustain the diverted traffic. Out of the two bridges described by Procopius as built along the course of the *Dracon* River, I could point down the most probable allocation of one of them. Although there are no preserved remains that can be identified in the terrain and dated to the Early Byzantine period, there is a recently reconstructed Ottoman Bridge arching above the River *Dracon*. The so-called 'Sultan Bridge' is dated to the 16th century AD. Strikingly, the reconstruction based on the LCPA crosses the river at the same point where the 'Sultan Bridge' currently stands. Considering that the bridge is situated at the most suitable place for crossing the stream and that there must have been a bridge during the Roman and Early Byzantine times, I reconstruct it on the same place. The second bridge, however, I do not depict on the map. There are several probable places where it might have stood but they need to be inspected in the terrain.

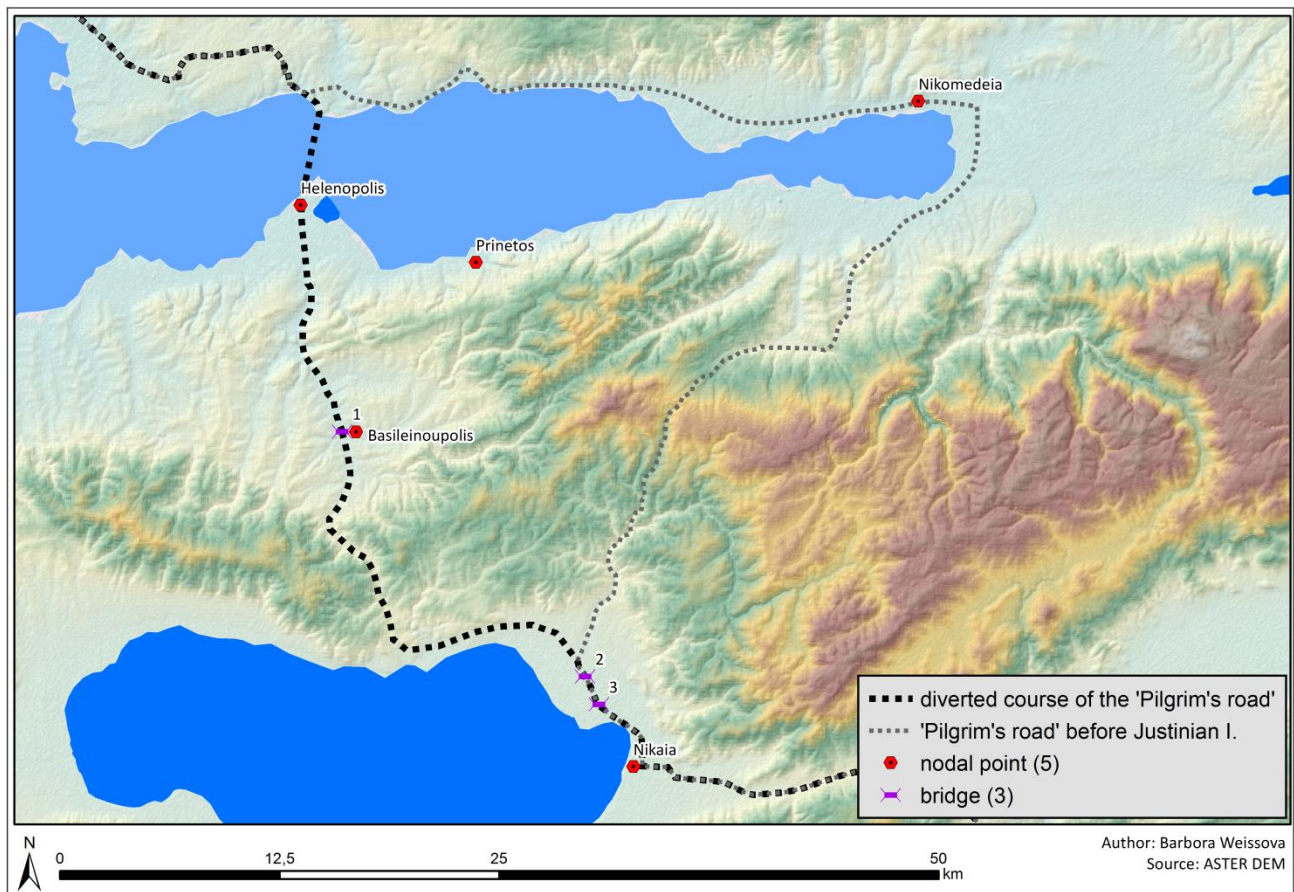


Figure 52: Diversion of the Main Traffic along the 'Pilgrim's Road' during the Reign of Justinian I. (Addendum 1. 30.)

The course of the 'Pilgrim's road' was improved with two more bridges by the time of Justinian I. The reconstruction of a destroyed bridge is described NW of *Nicaea*⁷³⁰ and, most probably, it concerns one of the bridges built by Trajan (see above). The second bridge is situated ten miles east of *Iuliopolis*,⁷³¹ crossing the River *Siberis*, and it is depicted on the map Figure 50 above as the easternmost bridge (no. 8).

Examining the spatial distribution of the deeds of Justinian I. along the course of the 'Pilgrim's road', I argue that he most likely maintained its entire course. His constructions appear all along the course and therefore, presumably, he interfered where it was necessary. It thus seems that during his reign the entire segment of the road leading through Bithynia became easily passable.

The character of the preserved data does not allow for following the public investments after the 6th century AD; my analysis terminates with the deeds of Justinian I. The later development of this road, as well as the roads during the Middle and the Late Byzantine periods in general, are outlined by K. Belke.⁷³² Essentially, K. Belke describes a fundamental change in the form of transport, from carriages and horses popular in the Roman and during the beginning of the Early Byzantine times, to simple walking and using donkeys for carrying the burden. This change is admittedly connected with the decline of the road system. The previously well-maintained roads could no longer be used by carriages, as they were falling apart and becoming dangerous for such a form of transport. Therefore, the means of transport changed to a simpler one, without a need of paved roads but enabling to use any pathway leading through the territory.

⁷³⁰ Procop. aed. 5, 3, 5–6.

⁷³¹ Procop. aed. 5, 4, 1.

⁷³² Belke 2010a, 45–58, and especially page 48 on the decay of the road system.

7. 5. 2. The Regional ‘Northern Road’

The Regional ‘Northern road’	
map Figure 53, Addendum 1. 31.	
nodal points	<i>Nicomedia – Prusias ad Hypium – Claudiopolis – Cretia Flaviopolis – Hadrianopolis</i>
dated milestones	8 in total (French 2013, nos. 33. 34. 35a–b. 36. 37. 65a–b; Şahin 1984a, 101–105)
milestones divided to emperor (quantity)	Trajan (1), Septimius Severus (1), Caracalla or Elagabalus (1), Elagabalus (1), Alexander Severus (1), Decius (1), Diocletian (1), Galerius (1)

Table 38: Capital Investments in the 'Northern Road'

The ‘Northern road’ is usually characterised as a military road,⁷³³ connecting Bithynia and Pontus. Based on W. M. Ramsay,⁷³⁴ the road gained in importance already during the Mithridatic wars, since the Romans established their military base in Bithynia and used the road for transferring the army.

The number of epigraphic evidence is considerably lower than in the case of the ‘Pilgrim’s road’ as it includes only eight milestones. All of them are dated and further used in the analysis. Each of them falls within the reign of a different emperor and, in this way, the assemblage represents an equal distribution of investments. The first evidence appears contemporaneously with the ‘Pilgrim’s road’, during the reign of Trajan at the beginning of the 2nd century AD. The subsequent investments are dated from the turn of the 2nd and 3rd century AD to the turn of the 3rd and 4th century AD. No later investments are documented on the preserved milestones.

The following building activity was conducted during the reign of Justinian I. It concerns the above-mentioned ‘Justinian’s bridge’, situated east of the Sapanca Lake. Except for this elaborate construction, there are no further proofs documenting the investments in the course of this road during the 6th century AD.

Comparing the chronology of the investments connected with the construction and upkeep of the ‘Pilgrim’s road’ and the ‘Northern road’, they roughly correspond. Both commence during the reign of Trajan and are maintained until the 4th century AD, with a following interference by Justinian I.

⁷³³ Doğanci 2012, 98.

⁷³⁴ Ramsay 1962, 46.

The map Figure 53 depicts the reconstructed route of the 'Northern road' as described above, supplemented with the main nodes, spatial distribution of milestones divided by their chronology, three bridges and three sections with remains of Roman pavement.

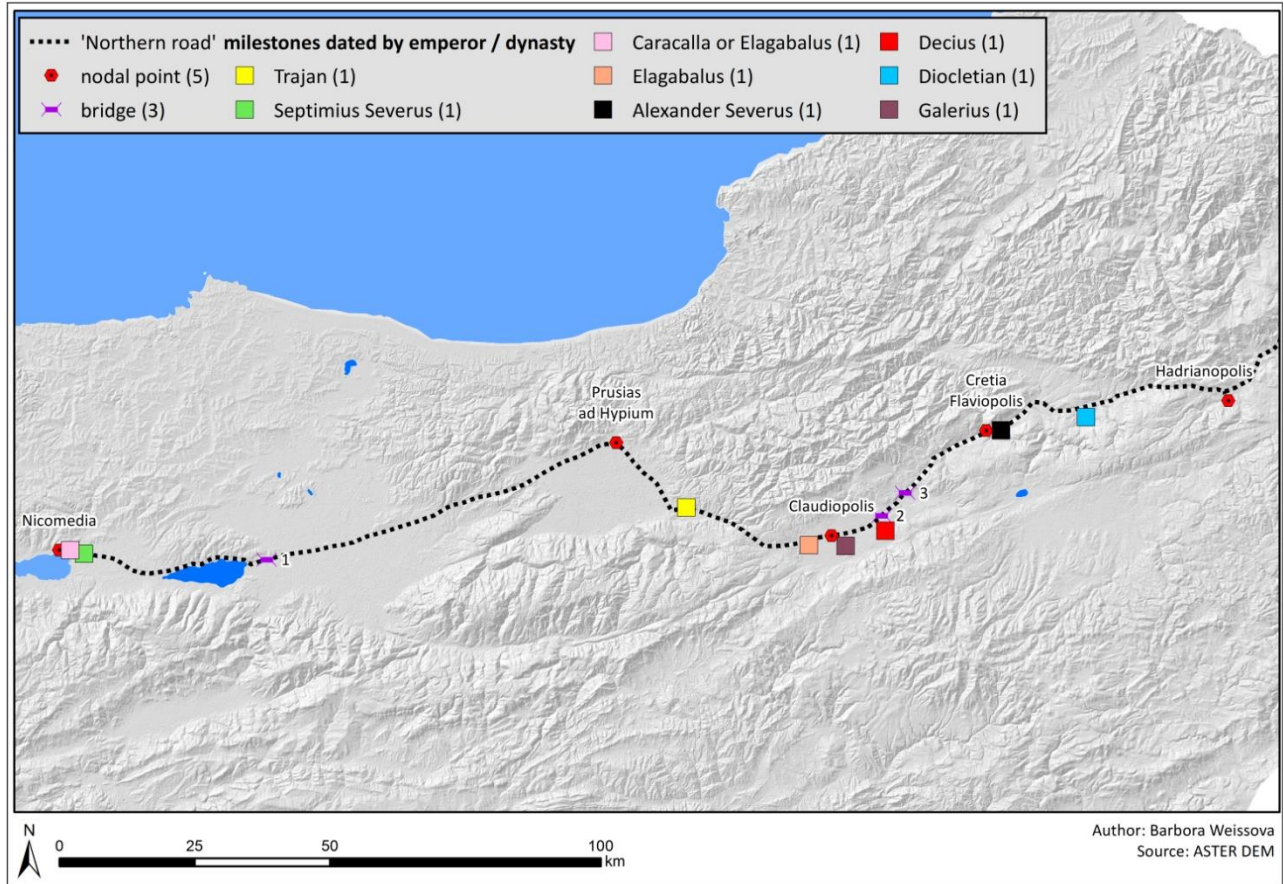


Figure 53: Spatial Distribution of Milestones Documenting the Investments in the Regional 'Northern Road' (Addendum 1. 31.)

The line graph Figure 54 below shows all the investments in the 'Northern road' documented by milestones. The graph encompasses an entire time span each of the milestones is possibly dated to.

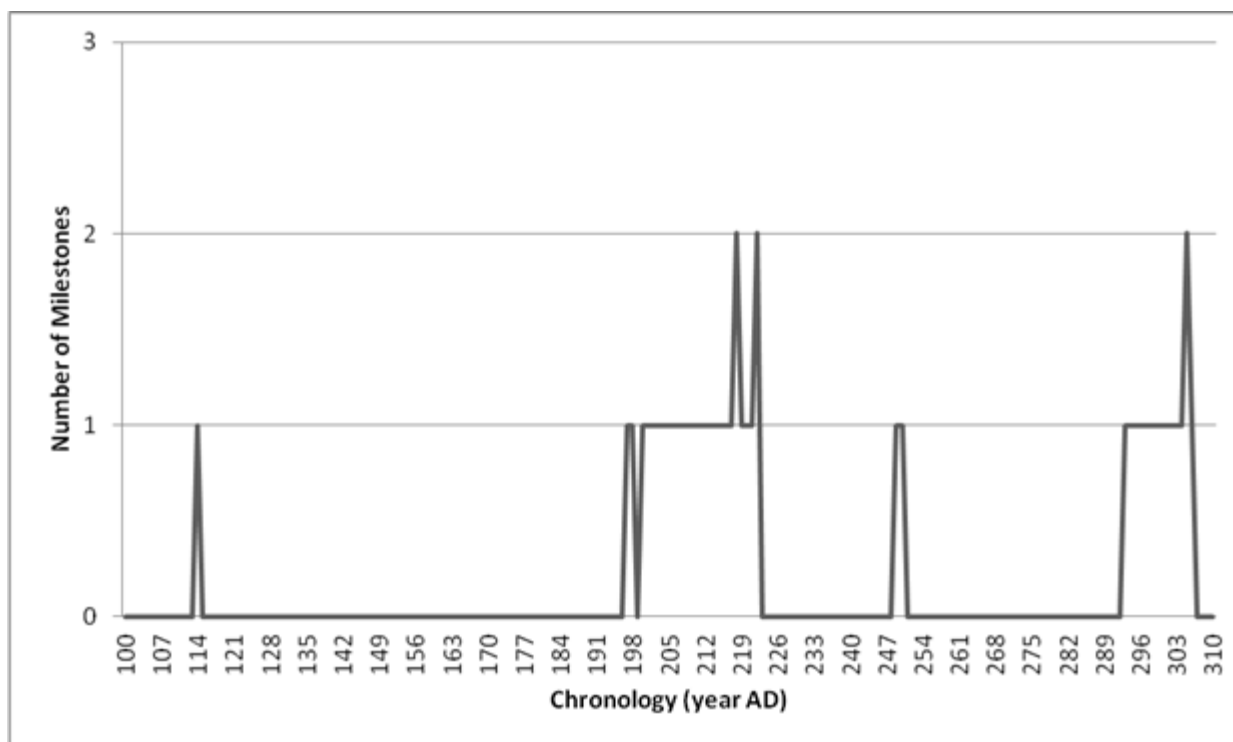


Figure 54: Temporal Analysis of Dated Milestones Situated along the 'Northern Road'

7. 5. 3. Regional Road 'Cretia Flaviopolis – Tium'

The Regional Road 'Cretia Flaviopolis – Tium'	
map Figure 55, Addendum 1. 32.	
nodal points	<i>Cretia Flaviopolis – Tium</i>
dated milestones	5 in total (French 2013, nos. 4a. 17a–d)
milestones divided to emperor (quantity)	Vespasian (1), Caracalla (1), Diocletian (1), Licinius (1), Severan – AD 306 (1)

Table 39: Capital Investments in the Road 'Cretia Flaviopolis – Tium'

All the milestones belonging to the regional road between *Cretia Flaviopolis* and *Tium* were found accumulated in the northernmost third of the road, just about 15 km south of the city *Tium*. Out of the six milestones in total, four can be dated with a precision to the reign of one emperor (see Table 39).

The first construction phase of the road is dated to the Flavian dynasty, in particular to the reign of the Emperor Vespasian. The following repairs are dated more than a century later, to the reign of Caracalla, between the years AD 213–217. The chronology of the remaining two milestones falls within the beginning of the 4th century AD; one to the reign of Diocletian and one

to the reign of Licinius. The fifth milestone is dated to the broad timespan of more than 100 years and it is excluded from the temporal analysis. On the map Figure 55 it is one of the milestones depicted as with no available chronology, as it does not date to the reign of one emperor and not even to only one dynasty.

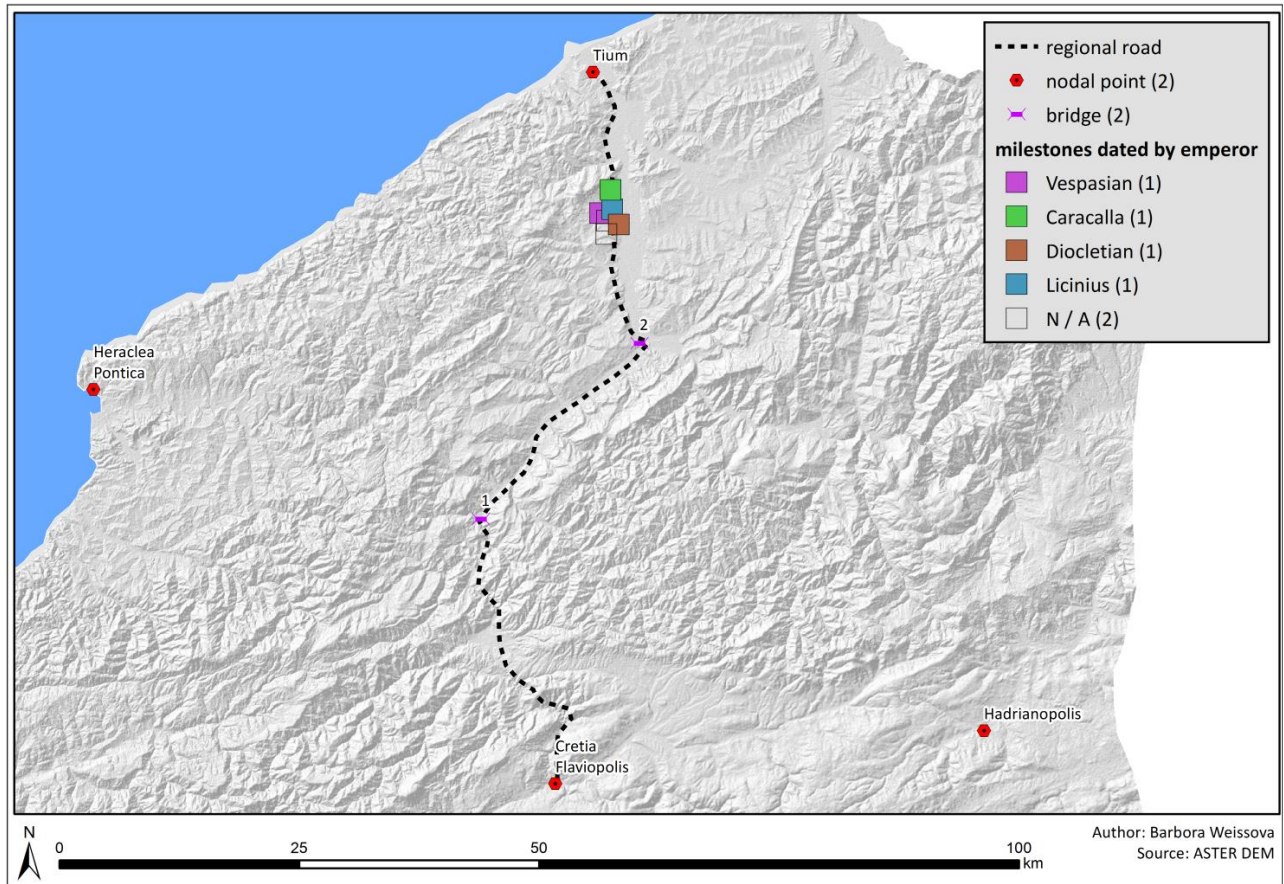


Figure 55: Spatial Distribution of Milestones Documenting the Investments in the Regional road 'Cretia Flaviopolis – Tium' (Addendum 1. 32.)

7. 5. 4. Regional Road 'Nicaea – Prusias ad Mare'

The Regional Road Along the Southern Shore of the <i>Ascania Lacus</i>	
map Figure 53, Addendum 1. 32.	
nodal points	<i>Nicaea – Prusias ad Mare</i>
dated milestones	3 in total (French 2013, nos. 25. 27–28)
dated rock inscription	1 in total (CIL III, no. 1.346; French 1980, 715)
evidence divided to emperor (quantity)	Nero (1), Hadrian (1), Trajan Decius (1), Trebonianus Gallus (1)

Table 40: Capital Investments in the Road 'Nicaea - Prusias ad Mare'

The first documented investments in the regional road connecting *Nicaea* with the Sea of Marmara and its port in *Prusias ad Mare* are dated to the reign of the Emperor Nero. The inscription was cut into the rock above the road near the place called Sarıkaya. The evidence survived thanks to C. Texier⁷³⁵ who copied the text of the inscription, currently entirely destroyed.⁷³⁶ The subsequent investments are documented on three milestones (see Table 40). The first one dates to the reign of the Emperor Hadrian, more accurately to the year AD 128. The remaining two are dated to the middle of the 2nd century AD.

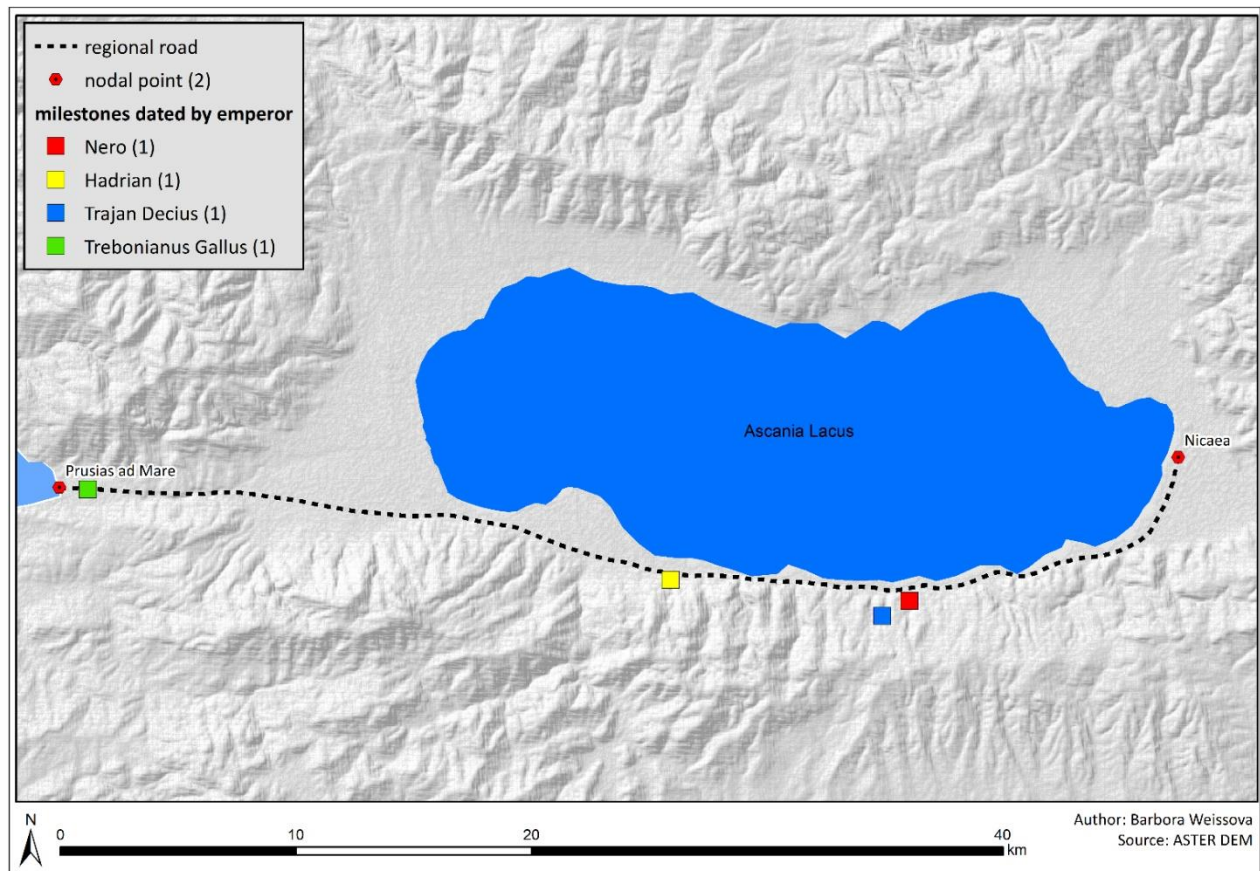


Figure 56: Spatial Distribution of Milestones Documenting the Investments in the Regional Road 'Nicaea – Prusias ad Mare' (Addendum 1. 33.)

⁷³⁵ Texier 1862, 108 f.; republished by Şahin 1979 as IK Iznik, no. 11.

⁷³⁶ The lack of any remaining evidence *in situ* was for the first time described by French 1980, 707.

7. 5. 5. The Regional Road 'Tium – Amastris'

The Regional Road 'Tium – Amastris'	
map Figure 57, Addendum 1. 34.	
nodal points	<i>Tium – Amastris</i>
dated milestones	3 in total (French 2013, nos. 5a–b. 6)
milestones divided to emperor (quantity)	Antoninus Pius (1), Septimius Severus (2)

Table 41: Capital Investments in the Road 'Tium - Amastris'

The investments in the road leading from *Tium* to *Amastris* are documented by three milestones (see Table 41). The first construction activity dates to the reign of the Emperor Antoninus Pius, in particular to the years AD 140 / 141. The other two are dated to the reign of the Emperor Septimius Severus, more accurately to the years AD 197 / 198. Examining the spatial distribution of the two latter milestones, it seems that the maintenance of the road concerned its entire course.

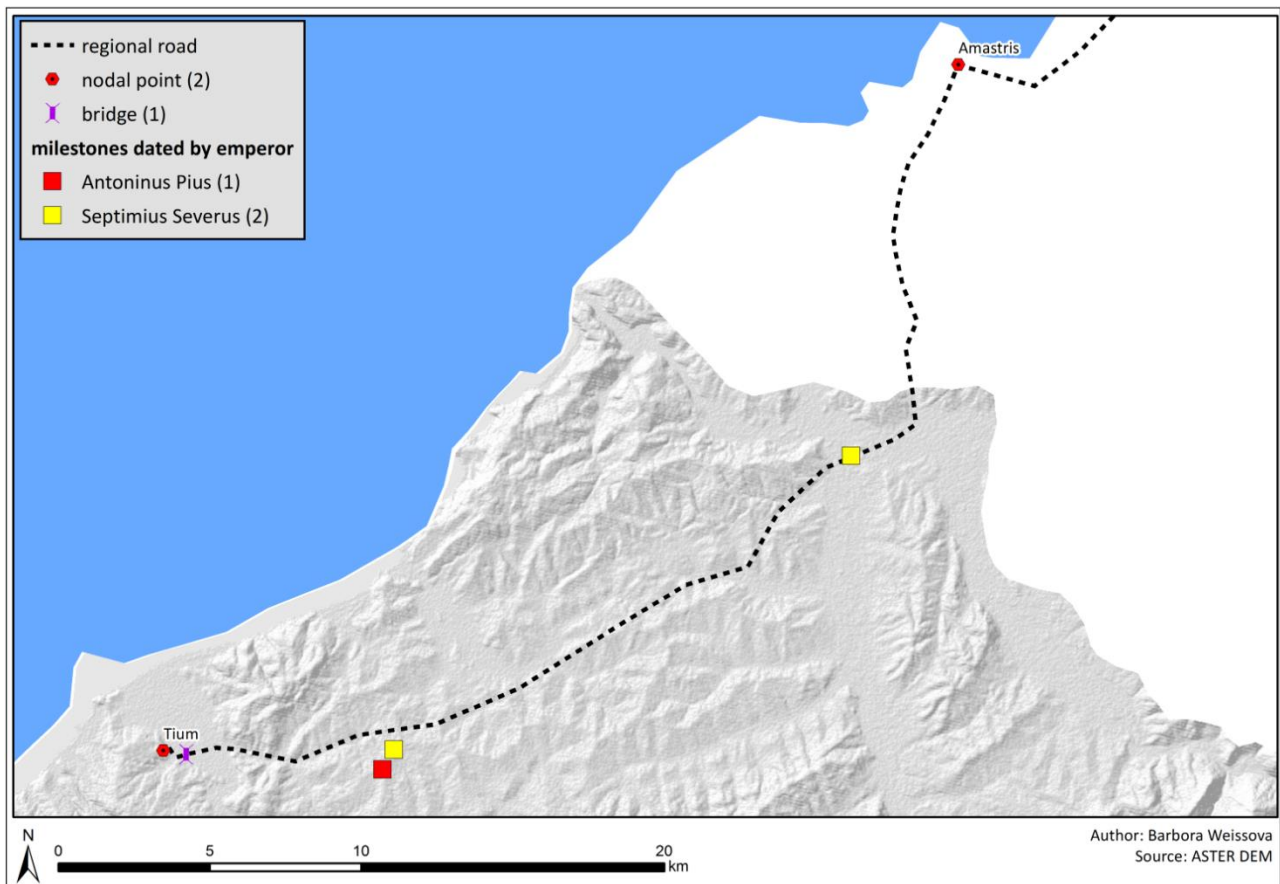


Figure 57: Spatial Distribution of Milestones Documenting the Investments in the Regional Road 'Tium - Amastris' (Addendum 1. 34.)

7. 5. 6. Regional Roads '*Prusa ad Olympum – Apamea / Caesarea Germanica*'

The Regional Roads ' <i>Prusa ad Olympum – Apamea</i> ' and ' <i>Prusa ad Olympum – Caesarea Germanica</i> '	
map Figure 58, Addendum 1. 35.	
nodal points	<i>Prusa ad Olympum – Apamea / Caesarea Germanica</i>
dated milestones	1 and 1 in total (French 2013, no. 01 and French 2013, no. 02)
milestones divided to emperor (quantity)	Vespasian (1), Septimius Severus (1)

Table 42: Capital Investments in the Roads radiating from '*Prusa ad Olympum*'

The last two roads I present together as both radiate from *Prusa ad Olympum* and each of them is dated by one milestone only. Moreover, when looking at the spatial distribution of the milestones, it is also possible that both of them belong to one road only. The *caput viae* on both of them does not help to answer the question since it is *Prusa ad Olympum*. With this issue in mind, I still interpret them as investments in two separate roads.

The road which might consider both of the milestones connects *Prusa ad Olympum* with *Caesarea Germanica*, a city situated inland. The other road leads to the north and connects *Prusa ad Olympum* with its port *Apamea*.

The road '*Prusa ad Olympum – Apamea*' is dated to the 1st century AD, in particular to the years AD 78 / 79. The milestone documenting construction works on the road '*Prusa ad Olympum – Caesarea Germanica*' dates to the reign of Septimius Severus, to the years AD 197 / 198 specifically.

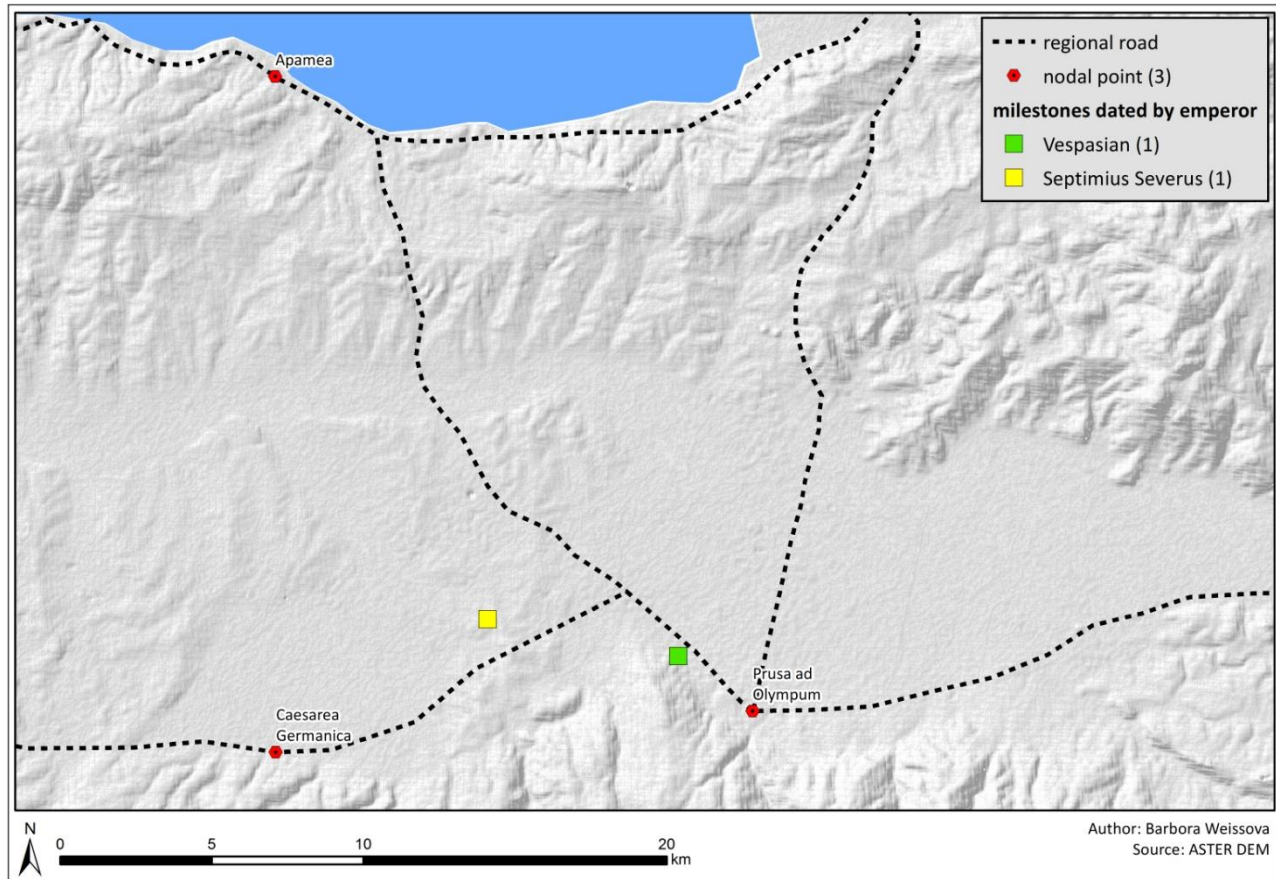


Figure 58: Spatial Distribution of Milestones Documenting the Investments in the Regional Roads 'Prusa ad Olympum – Apamea / Caesarea Germanica' (Addendum 1. 35.)

Observations on the milestone no. 23 (after French 2013)

I have to mention the circumstances which led me to exclude the milestone no. 23 from the present analysis. Although well dated (AD 235–238) and with preserved *caput viae* (*Nicaea*), the find-spot of this milestone is ambiguous. As such, it cannot admittedly relate to one single road. The milestone was brought to Yenişehir and the most accurate available allocation of its find-spot we have at our disposal is the vicinity of *Nicaea*.⁷³⁷ It might have been, therefore, connected with an upkeep of several roads. The possibilities include the 'Pilgrim's road', the road leading along the southern shore of the *Ascania Lacus*, or even the road leading from *Nicaea* to the south, towards *Dorylaion*. The latter is hitherto not dated by any epigraphic evidence. In the case that the milestone belongs to the 'Pilgrim's road', it does not dramatically change the described

⁷³⁷ Based on the information from a local, the milestone appeared around the year 1885 and its current allocation is unknown.

development of the investments. Within the road '*Nicaea – Prusias ad Mare*' it would mean that the road was maintained almost a century longer than what results from the present analysis. The last possibility, that the milestone belongs to the road '*Nicaea – Dorylaion*', is the most appealing one, as it would date construction of one more road. However, due to its ambiguity, I do not base an entire chronology of one road solely on its existence.

7. 6. Conclusion

This chapter presents sources and methodological approaches used for the reconstruction of road system in the macro-region. The reconstructions in the broad historical time-spans of the Hellenistic, Roman and Early Byzantine periods are briefly described, presented in the spatial environment and depicted on pertinent maps. Since I focus in the present work on the applicability of the GIS tools for reconstructions of roads and on the role of the road system in the light of the economic development, I further investigate only the segments of the roads which enable one of the aforementioned.

The LCPA was applied between 16 nodal points which resulted in 13 segments of roads. Out of these 13 segments, eight fit to the reconstructions based on the archaeological evidence and the final courses of roads required only minor changes. One section fits on 50 per cent to the archaeological evidence, i.e. the LCPA predicted half of the road entirely erroneously. The remaining four results of the LCPA do not fit at all to the archaeological data. Since the LCPA is based on the terrain, I looked for some common characteristics in the differences of elevations on the first place. However, the false results of the LCPA occur in the lowlands as well as in the mountainous areas. Therefore, the terrain constrains as a main reason of the occurring error had to be excluded. Studying all the possible characteristics in order to find a common feature of these four segments brought me to a final conclusion. The only uniting element is the considerably substantial difference between the lengths of the LCPA and the actual road. The results of the LCPA are in all the four cases considerably longer, in relation to their total length, than the roads reconstructed based on the archaeological evidence.⁷³⁸

⁷³⁸ The lengths are rounded to kilometres. The reconstructed segment *Nicaea – Iuliopolis* measures 190 km, the course based on the LCPA 265 km; the difference reaches 75 km. The reconstructed segment *Regodories – Iuliopolis* measures

This study demonstrates that the LCPA is for the most part applicable for the reconstructions of the road system. However, it is always necessary to examine the length of the reconstructed segment and compare it with the possible shortest way connecting the two nodal points. When the results considerably differ (more than one day of travel), it is highly possible the course of the road reconstructed by the LCPA is erroneous. The anisotropic LCPA seems to be applicable without errors only under the conditions that the easiest way calculated by the analysis is also the possibly shortest one.

The spatial distribution of the dated milestones allowed for following the investments in seven communications; one supra-regional and six regional roads. Spatio-temporal analyses of the investments brought striking results. Despite all expectations, the construction of a stable road system reaching the *limes* during the Flavian dynasty is not proved by the evidence of milestones. The building activities during the first century of our era are documented solely for regional roads joining *civitates* situated inland with their ports at the sea.

In particular, the earliest investment, hitherto localised in the macro-region and documented by a rock cut inscription, is dated to the reign of the Emperor Nero. This inscription concerns the road connecting *Nicaea* with *Prusias ad Mare*. The second one is the road between *Cretia Flaviopolis* and *Tium*. The construction is dated to the reign of Vespasian based on a milestone found along its course. The same chronology revealed the last road connecting *Prusa ad Olympum* with the port in *Apamea*.

Since the first investments in the road system focus solely on the roads enabling regional communications, I interpret them as an effort to secure fast and smooth connections of the *civitates* with the ports. In other words, to secure the trade and the economic development of the cities situated inland. This ascertainment implies that the Flavian dynasty did not build the supra-regional road leading to the *limes* at the *Euphrates* River, but took care of the stability of the regional economy. Only then, as follows from the subsequent public investments, the Roman Empire started with the construction and upkeep of the supra-regional communication.

91 km, the course based on the LCPA 152 km; the difference reaches 61 km. The reconstructed segment *Cretia Flaviopolis – Tium* measures 90 km, the course based on the LCPA 112 km; the difference reaches 22 km. The reconstructed segment *Nicaea – Prusias ad Mare* measures 51 km, the course based on the LCPA 64 km; the difference reaches 13 km. The reconstructed segment *Tium – Amastris* measures 41 km, the course based on the LCPA 47 km; the difference reaches 6 km.

Investments in the supra-regional 'Pilgrim's road', crossing Bithynia from the NW to the SE, as well as to the inter-regional 'Northern road', crossing Bithynia from the west to the east and connecting Bithynia and Pontus, are documented at the beginning of the 2nd century AD. Both of the roads were financed during the reign of the Emperor Trajan. The upkeep of the 'Pilgrim's road', based on the dated milestones, continued until the third quarter of the 4th century AD, the maintenance of the 'Northern road' terminated more than 60 years earlier, at the beginning of the 4th century AD. However, according to the literary sources, massive investments followed during the reign of Justinian I., *videlicet* between the years AD 527 and 565.

The dated regional road which is not documented until the year AD 140 is the only one situated along the Black Sea coast. It is a short segment which connects *Tium* and *Amastris*. The documented upkeep of the road is considerably brief, dated solely to the time span covering approximately 60 years. The first phase dates to the years AD 140 / 141 and the second to the very end of the 2nd century AD, to the years AD 197 / 198.

An examination of public investments in the road system in general yields the following results. The first investments in the regional roads predate the peak of the economic development in the area outlined by the analysis of the epigraphic evidence. I interpret their constructions as drivers of the following evolvement, basically enabling the heyday during the 2nd century AD. One can postulate that the first investments were aimed directly at the local economy, namely to sustain the trade and the supply of goods during the 1st century AD.

The investments in the 'Pilgrim's road' and in the 'Northern road' during the 2nd century AD fall within the peak of the economic development. The massive investments carried out at the turn of the 3rd and 4th century AD, however, do not correspond with the development outlined by the epigraphic evidence analysed in bulk. The numbers of the inscriptions identified in the macro-region for the most part already decline. This inconsistency in the results might be explained as follows. The regional economy, boosted during the second half of the 1st century and having its subsequent peak during the 2nd century AD, step-by-step declines during the 3rd century AD. The massive investments in the 'Pilgrim's road' and in the 'Northern road' evidently not fit to the regional development and they aim for the maintenance of these arteries crossing the macro-

region and connecting remote sites situated in the west and in the east of the analysed area. Thus, the later investments in the upkeep have only an imperceptible impact on the regional economy.

The suggested explanation interprets the illusive discrepancy as a proof that the region, well maintained during the second half of the 1st and especially within the 2nd century AD, declines and turns into a transitional territory during the late 3rd and the 4th century AD.

We miss any documents pointing to the maintenance of the roads during the 5th century AD. The 6th century reconstructions carried out by Justinian I. are the real outliers in the analysis. The epigraphic evidence did not play a decisive role anymore and the results are based on Procopius' records. This last massive upkeep is followed by the long-term decline of the entire road system.

In conclusion, public investments in the road system point to the heyday of the examined territory *per se* during the 1st and the 2nd century AD. The anticipation that the supra-regional road leading through the territory was the most important one and that the territory reached on importance due to the fact the road led through, is not proved by the recent study. In contrary, the region reached its peak before the massive investments in the 'Pilgrim's road'.

8. Micro-Regional Study of Economic Proxies in *Nicaea* and its Hinterland

The last chapter presents a complementary study to the economic development of the entire macro-region. The micro-regional focus includes *Nicaea*, one of the major cities situated in the macro-region, and its immediate hinterland. The study analyses the economic development of *Nicaea* and its hinterland and compares the results with the macro-region and with Asia Minor in its entirety, when possible. The analysed dataset is exceptional in terms of the whole study, since I had the possibility to verify, rectify and enrich the data gained from the ancient literary sources and current research during a survey I conducted in the terrain in 2015 (ISP15).

The first part outlines the status of *Nicaea* in the entire macro-region and examines the ways in which the detailed study of several economic aspects in one urban centre completes the current work.

The second part discusses the methodology applied during the work. I explain the methods used for collecting data in the field, with a special focus on their precise location and completeness. Further, I present the individual analyses, for the most part based on the approaches suggested by the OXREP. I use the analogous methodological approaches to be able to conduct comparative analyses not only with the macro-region but also with other regions and with entire Asia Minor. An inherent part of the methodology is an explanation of the GIS tools used during the analyses.

The third part focuses on the city of *Nicaea* itself, presenting datasets that can be quantified and compared with other cities of the Roman Empire. The crucial parameters are the extent of the city's area and resulting population estimates, evidence of diverse professions, capital investments and development of the road system.

In the fourth part, I examine results of the reconstruction of rural settlement patterns, divided into broad time spans of the Hellenistic, Roman and Early Byzantine periods.

The fifth section performs a functional analysis of the entire hinterland, including resources and evidence of their exploitation.

In the last part, I analyse imports from *Docimium*. This aspect of the trade with marble sarcophagi enables quantified temporal analysis, since the sarcophagi can be dated. They testify

not only the trade activities *per se*, but also fluctuations of their intensity during the 2nd and the 3rd century AD.

The chapter is completed with two addenda, showing results of the survey. Addendum 5 includes the surface concentrations discovered during the ISP15 and Addendum 6 presents quarries localised in the hinterland of *Nicaea*.

8. 1. How Do Studies of one City and its Hinterland Contribute to the Current Discussion?

As examined in detail in Chapter 6, urbanization is one of the fundamental economic proxies.⁷³⁹ General study of the entire macro-region and development of its urbanization is accomplished in the present chapter with a detailed study of developmental aspects in *Nicaea*.

Nicaea was a powerful city with a rich economic history, ever since fighting with *Nicomedia* for the leading position in the territory of Bithynia.⁷⁴⁰ Located in an extremely fertile flatland with rich resources of fresh water and naturally protected by forested mountains,⁷⁴¹ *Nicaea* offered ideal living conditions.

The first habitation on the eastern shore of the Iznik Lake, preceding the modern town of Iznik, is dated to the 4th century BC. It is connected with the Greek settlers who gave it the name *Helikoré*.⁷⁴² Yet, most likely, one cannot speak about an existence of a *polis*⁷⁴³ in the territory until 301 BC, when the settlement was re-established by Lysimachos under the name *Nicaea*.⁷⁴⁴ Apart from several destructions, re-foundations and re-naming,⁷⁴⁵ one can consider the place to be an important urban centre and transportation node from the Hellenistic period onwards.

The complex study of the economic development of *Nicaea* would be a sufficient topic *per se* for the entire thesis. However, it is not my aim to present each facet of the economic history of one city. Instead, I focus on aspects which enable a quantification and a succession of the temporal

⁷³⁹ Bowman – Wilson 2011, 1–14. For case studies on the urbanization in different regions, see Morley 2011, 143–160; Wilson 2011, 161–195; Hanson 2011, 229–275; Keay – Earl 2011, 226–316; Bowman 2011, 317–358.

⁷⁴⁰ Continuous fights between *Nicaea* and *Nicomedia* are documented by a number of ancient authors. For summaries, see Şahin 1987, 8–10. 31–34. 37–41 (IK Iznik nos. T11, T23, T26).

⁷⁴¹ Fernoux 2004, 236 f.

⁷⁴² Merkelbach 1987, 10; Şahin 1987, 1 (IK Iznik, no. T1).

⁷⁴³ Avram 2004, 976.

⁷⁴⁴ Strab. 12, 4, 7.

⁷⁴⁵ The history of the town based on historio-graphical sources and inscriptions is described in detail by Şahin 1987, 1–22.

development. The dataset creates a comparative sample for the macro-region and entire Asia Minor. The most appealing and for the territory also elucidating comparison offers the city of *Nicomedia*, since the detailed study of the urbanization promises to shed a new 'quantified light' on the rivalry between these two cities. The data hitherto published⁷⁴⁶ for the city of *Nicomedia* are, unfortunately, not as complex as one would wish for. The Doctoral study focused on the resources and economy of Roman *Nicomedia*⁷⁴⁷ opens a possibility of several comparative analyses, as performed below.

The first factor I examine in the study are changes in the extent of *Nicaea intra muros*. The extent further enables to roughly estimate the population living in the city. Since the population living inside the city walls is for the most part not engaged in the agricultural production, it must be fed from a surplus produced by the agricultural sector. In other words, the number of population not engaged in agricultural production directly relates to possibly higher value of *per capita* production in the territory of the city.⁷⁴⁸

The second analysed aspect is a single construction phase of the fortification walls. Historical records date the building of the entire Roman fortification of *Nicaea* in a relatively short time-span of ten years. The preserved size and the given period allow for a rough estimation of a number of workers needed to be engaged in the construction. The massive fortification *per se* and the surplus necessary to feed the workers point to an economic power of the city.

Another factor are the diverse professions documented in the city. The division of labour reflects an increased size of the market, therefore an increased trade, and it also means that the population could achieve greater *per capita* labour efficiency.⁷⁴⁹ Although it is evident in the city of such magnitude as *Nicaea*, direct proofs are few.

The institutions that enable economic growth including security, government, judicial system and supervised markets, require physical infrastructure in the form of public buildings.⁷⁵⁰ Therefore, I also examine the investments in the public buildings and in the construction and upkeep of the roads.

⁷⁴⁶ Foss 1996; Ross 2007; Güney 2012.

⁷⁴⁷ Güney 2012.

⁷⁴⁸ McCormick 2001, 30 f.; Wilson 2011, 161 f.

⁷⁴⁹ Bowman – Wilson 2009, 32.

⁷⁵⁰ Wilson 2011, 163–167.

An independent section focuses on the quantified spatio-temporal analysis of settlements distributed in the hinterland of *Nicaea*, as an existence of rural settlements represents one of the pre-conditions for an inception of a city.⁷⁵¹ In other words, without a sufficient size and density of the rural population able to produce a considerable amount of surplus, the city would not grow. Thus, the development of the density of rural settlements in the hinterland sheds light on the exploitation of the resources and potential *per capita* surplus produced in the immediate vicinity of the city.

The density of settlements in the micro-region is further compared with the densities presented for the macro-region. The main aim is to correlate the results from the macro-region since the micro-regional dataset is enriched by the terrain works of the ISP15.

The fifth subchapter examines the economic impact of the large concentration of marble quarries around *Nicaea* and imports⁷⁵² of marble sarcophagi from *Docimium*. The presence of *Docimium* marble is of an utmost value since it represents a quantifiable and datable dataset of imported artefacts, essentially contributing to the economic studies of the city.⁷⁵³

The functional analysis of the hinterland of *Nicaea* aims at elucidating the economic function of the territory. I study the spatial distribution of marble quarries in relation to wine / oil presses. Furthermore, I look at the spatial distribution of funerary monuments in order to explain their distribution throughout the hinterland.

8. 2. Methodology

8. 2. 1. Survey Methodology

The survey conducted in the field is specified as a 'selective'. The applied methodology was inspired by the survey carried out by S. F. Starr⁷⁵⁴ and described as a 'teahouse method'. In practice, we visited each modern village⁷⁵⁵ situated in the hinterland of *Nicaea* and talked to locals

⁷⁵¹ For more details, see Chapter 6. 1. 2.

⁷⁵² Greene 1986, 10.

⁷⁵³ For a complex study on the economics of the Roman stone trade, see Russell 2013.

⁷⁵⁴ Starr 1963, 162.

⁷⁵⁵ All together, these are 20 villages listed here from the north to the south: Tacir, Gürmüzlü, Ömerli, Orhaniye, İnikli, Elbeyli, Boyalıca, Çakırca, Hisardere, Karadin, Dereköy, Kaynarca, Çiçekli, Hocaköy, Çamdibi, Dırazali, Demirışık, Müşküle, Göllüce, Derbent.

in the teahouse, asking about possible remains of ancient human activities. As it appeared during the work, the most successful question was about 'old stones'. In contrast, questions concerning potsherds appeared to be useless, resulting in answers like 'everywhere around' or 'nowhere'.

During the visits of the villages, we also documented ancient *spolia* scattered throughout their main squares and built into houses. Out of 20 villages, only four did not include any *spolia*.⁷⁵⁶ As long as a village is situated more than 5 km away from *Nicaea* and as most of the documented architectural fragments are too massive, I decided to consider them as an indicator of ancient activity in the environs of the village. These *spolia* served as a good opening question during the 'teahouse method' survey, usually prompting one of the locals to take us to the place where he (or more often his ancestor) found the piece in question.

Information given by locals concerning origins of the fragments or of any other remains of 'ancient' human activities enabled me to enrich the archaeological map with hitherto unknown features. While the information about the number or extent of rural settlements in the hinterland is unknown, the survey results represent the first attempt to shed light on this kind of data and indicate rich archaeological potential of the hinterland. The relevant monuments are described below, divided into groups according to their geographic position and function.

One of the newly discovered scatters adjacent to a complex of ancient quarries (viz. Figure 64 below) was chosen for an exemplary intensive survey.⁷⁵⁷ The intensive total coverage survey was conducted with ten meters distance between walkers and accomplished with total pick up within the densest concentrations of pottery. Herewith I mean collecting all the material in a pre-defined area of 5x5 m and dividing it upon diverse criteria including functionality, chronology and typology. Such an exercise helps to enrich the dataset of fine ware which tends to faster fragmentation and it is often overlooked during the survey.

Since we were not able to take the finds from the field, all the data processing was conducted *in situ* and it is, therefore, preliminary and final at the same time.

⁷⁵⁶ Villages with no recorded *spolia* are Kaynarca, Karadin, Çiçekli and Müşküle.

⁷⁵⁷ On the survey methodology, see Banning 2002; the efficiency of intensive survey is thoroughly described by Alcock et al. 1994, 137–170.

8. 2. 2. Selection of Data and Analysis

The methodology applied during the data selection and analyses of the dataset available for *Nicaea* follows, for the most part, the approaches suggested and applied by the Oxford Roman Economy Project. I perform analyses analogous to the OXREP in order to be able to compare the presented results with their outcomes for the entire Asia Minor.

The extent of the city *intra muros*

The extent of the city *intra muros* can be determined for the Hellenistic and Roman / Early Byzantine periods separately. The extent of the Hellenistic city is based on ancient sources.⁷⁵⁸ The estimations concerning the extent in the Roman and in the Early Byzantine periods are based on the digitised plan of the fortification resulting from precise measurements taken in the field and kindly provided by A. Dalyancı-Berns.⁷⁵⁹

Estimation of population living *intra muros*

The area *intra muros* enables to calculate approximate population estimates for the Hellenistic and Roman / Early Byzantine periods. The estimates during the Hellenistic period are rather questionable. M. Aperghis⁷⁶⁰ presented the numbers of inhabitants in a broad range between 100 and 400 persons per hectare. Based on two case studies in *Plataiai* in Boiotia and in *Koresia* on Keos, M. H. Hansen⁷⁶¹ specified the estimates to the range between 160 and 200 plus inhabitants per hectare. In a later study, M. H. Hansen⁷⁶² lowered the estimates to a number of 150 inhabitants per hectare. In the present study, I find it reasonable to follow the lower assessment, as it equals the population estimates during the Roman period published by A. Wilson⁷⁶³ and allows for a direct comparison of the differences between the periods.

⁷⁵⁸ Strab. 12, 4, 7.

⁷⁵⁹ Dalyancı-Berns conducts a Doctoral thesis at the Technische Universität Berlin / Historische Bauforschung und Denkmalpflege focused on 'The Fortifications of Iznik / *Nicaea*: Documentation and building history of a late Roman-Byzantine large-scale construction'.

⁷⁶⁰ Aperghis 2001, 72 f.

⁷⁶¹ Hansen 1997, 27 f.

⁷⁶² Hansen 2006, 79.

⁷⁶³ Wilson 2011, 187 f.

Building activities connected with capital investments

Capital investments based on epigraphic evidence were already investigated in the Chapter 5. 5. 1. In the present chapter I enrich the epigraphic record with the data gained from literary sources and further interpret the outcomes in the context of the macro-region as well as of Asia Minor.⁷⁶⁴

Density of rural settlements per territory

The newly discovered rural settlements enabled to calculate an area per one rural settlement during the Hellenistic, Roman and Early Byzantine periods separately. The comparative analysis with results presented by J. W. Hanson⁷⁶⁵ estimating the territories for the entire Asia Minor is completed with the inter-regional sample enabled by the survey conducted in Paphlagonia.⁷⁶⁶

Functional analysis of the hinterland

The last section considers the spatial distribution of marble quarries and wine (oil?) presses identified during the survey. Furthermore, it includes the distribution of funerary monuments which are spread all over the analysed area. The main intention is to shed light on the organization of the hinterland of one of the most powerful cities in NW Asia Minor.

8. 2. 3. Applied GIS Analytical Tools

The analytical tools applied in this chapter include 'line of sight' and 'viewshed analysis'. Both of the analyses were conducted in ArcGIS with an aim to explain the spatial distribution of funerary monuments. For the most part, the funerary monuments are distributed in the foothills of the Samanlı and Katırlı Mountains, seemingly randomly surrounding the city of *Nicaea*. With the help of the GIS tools, I look for common characteristic explaining the layout of the graves.

⁷⁶⁴ Wilson 2011, 164.

⁷⁶⁵ Hanson 2011, 246–248.

⁷⁶⁶ Matthews – Glatz 2009.

Line of sight

The first applied tool is the line of sight⁷⁶⁷ which determines possible sight lines over a surface. The reason of this exercise is to explore the eventuality that funerary monuments follow a distribution pattern which enables them a direct view on the city.

I used a hillshade⁷⁶⁸ derived from the ASTER DEM (30 m precision) for modelling the elevations. The identified funerary monuments are used as observation points and the city of *Nicaea* as a target. In this way, I can determine the number of graves overlooking the city.

Viewshed analysis

A viewshed analysis is performed in order to identify places that can be seen from the funerary monuments as well as, reciprocally, places from which all the graves can be seen. A viewshed⁷⁶⁹ identifies the cells in an input raster that can be seen from one or more observation locations.⁷⁷⁰ Like in the case of the line of sight, I used hillshade derived from the ASTER DEM, thus with the elevation data per cell of 30x30 m. Each cell in the output raster receives a value that indicates a number of observer points that can be seen from each location. In other words, from how many graves can each of the cells be seen. In this way, I can determine the possible common view for all the funerary monuments, if there is any.

8. 3. Ways to Assess the Economic Development in *Nicaea*

8. 3. 1. Fortification Walls

The first fortification of *Nicaea* is mentioned by Strabo⁷⁷¹ who left an account about the Hellenistic walls reaching a perimeter of 16 *stadia* built around the town. The delimitation is still apparent in the ground plan of the city⁷⁷² and confirms the literary source. The reconstructed centuriation system apparently results from the Hellenistic fortification walls, since it follows its delimitations.

⁷⁶⁷ ArcToolbar: 3D Analyst -> Create Line of Sight (with z (the height of the observer point) of 1.7 m) -> Profile Graph.

⁷⁶⁸ ArcToolbox: -> Spatial Analyst Tools -> Surface -> Hillshade.

⁷⁶⁹ ArcToolbox: -> 3D Analyst Tools -> Visibility -> Viewshed.

⁷⁷⁰ Leusen 2002, Chapter 9–16.

⁷⁷¹ Strab. 12, 4, 7.

⁷⁷² Şahin 1987, 45 f. (IK Iznik, no. T29, especially note 3).

The centuriation system was reconstructed by G. Scardozzi⁷⁷³ and further elaborated by R. Brigand.⁷⁷⁴

During the Roman period, the city outgrew the fortification and the Hellenistic walls were destroyed and overbuilt. The defensive walls, naturally, underwent several reconstructions.⁷⁷⁵ The preservation state of the Roman fortification walls, rebuilt and supplemented during the Byzantine period, offers an outstanding opportunity to follow their course and form even today. It is extant almost along its entire length which reaches 5 km. The phase fundamental for the study is dated to the time after the invasion of Goths, to the year AD 258.⁷⁷⁶

The changes in the course of the fortification walls are outlined on the map Figure 59. Considering the alterations in the area of the city, we get the following results: the Hellenistic fortified city covered an area of around 504,100 sq. m or 50 ha (estimating the area of 16 *stadii* in perimeter to square with 710 m side). It subsequently grew until the second half of the third century AD, when it was fortified again, this time encompassing 1,369,436 sq. m or 137 ha. The new fortification covers a territory which is almost three times (2.7 times) the extent of the Hellenistic town. The fortified territory does not change anymore. Nevertheless, it is necessary to keep in mind that it does not inevitably mean that the city covered the entire fortified area in all the times. Most likely, it subsequently shrank during the Early Byzantine period,⁷⁷⁷ getting smaller within the extensive fortification walls.⁷⁷⁸ Although pertaining to a much later period, an evidence of such a situation was left by travellers who visited the city in the 19th century AD and described it as a small village inside the massive walls.⁷⁷⁹

⁷⁷³ Scardozzi 2012, 875–886.

⁷⁷⁴ TOPOI group A-6-6; Weissová et al. forthcoming in 2018.

⁷⁷⁵ Schneider – Karnapp 1938; Merkelbach 1987, 9.

⁷⁷⁶ Weiser 1983, 87.

⁷⁷⁷ See Chapter 6. 3. 3.

⁷⁷⁸ For the decline of towns during the Early Byzantine period in general, see Ward-Perkins 1996, 4–17. – For the western and central Anatolia, see Liebeschuetz 2001, 43–54.

⁷⁷⁹ For instance, see Pococke 1745, 123 who defines *Nicaea* as a village of not more than 300 houses; further Fellows 1839, 110; Ainsworth 1842, 46 f.; de Hell 1855, 296.

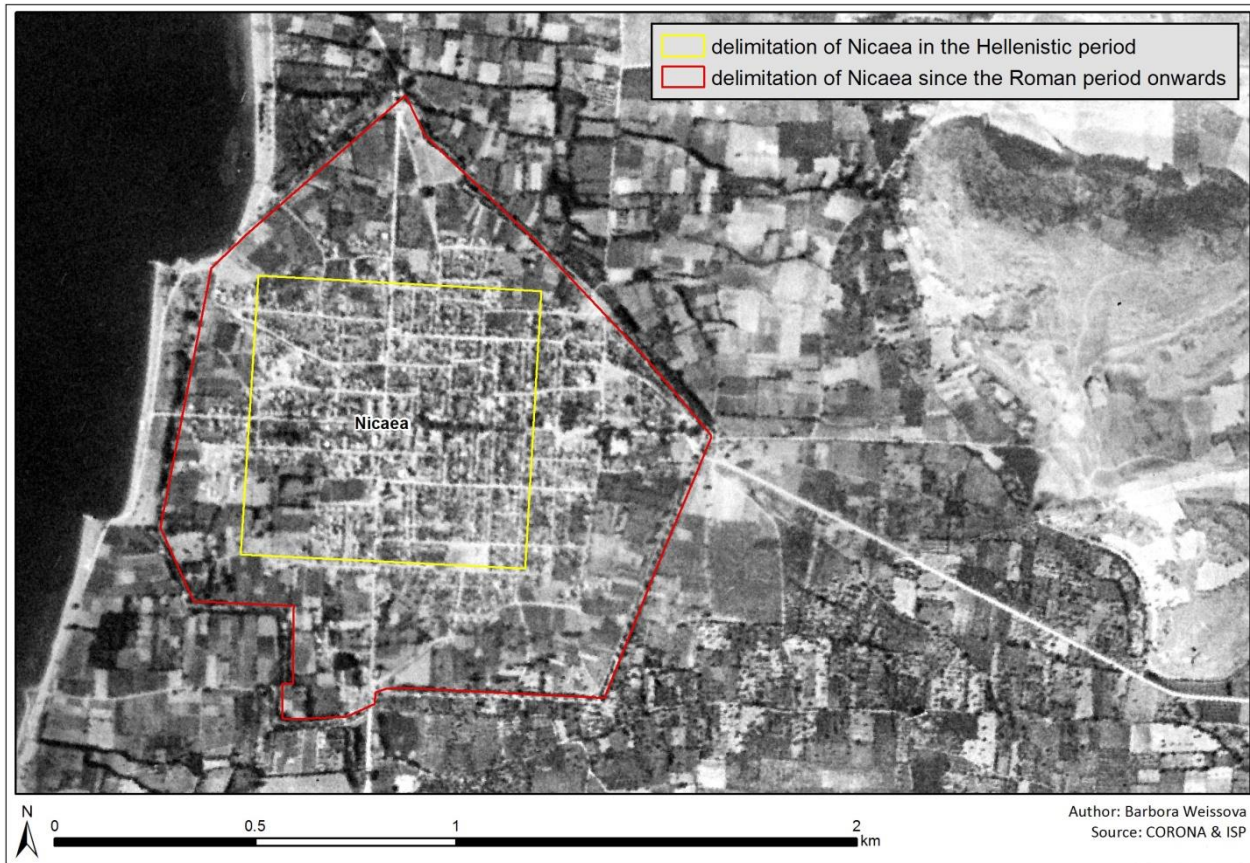


Figure 59: Delimitations of Nicaea in the Hellenistic and Roman / Early Byzantine Periods (Addendum 1. 36.)

The estimations for areas of fortified cities are rare in the macro-region. The extents of *Heraclea Pontica* during all the discussed periods, and *Nicomedia* and *Tium* during the Roman period, have been published, based on an archaeological research in the field.

In the present study, I discuss figures provided by J. W. Hanson, with a correction applied for *Nicaea*⁷⁸⁰ and accomplished with estimations by W. Hoepfner for the Hellenistic⁷⁸¹ and Early Byzantine⁷⁸² *Heraclea Pontica*. The sources and calculations leading to the estimations of the extent of *Nicomedia* during the Roman period were examined by H. Güney.⁷⁸³

Concerning the extent of *Nicaea*, J. W. Hanson proposes 159 ha but according to my calculations it equals 137 ha. At any rate, *Nicaea* belongs to the ten largest towns in the Roman

⁷⁸⁰ Hanson 2011, 254.

⁷⁸¹ Hoepfner 1966, 21.

⁷⁸² Hoepfner 1966, 36.

⁷⁸³ Güney 2012, 146–149.

period in Asia Minor.⁷⁸⁴ This might be partially caused by the fact that there is a lack of such estimations for a number of cities, but the figure is, anyway, largely conclusive.

The only comparative sample in the macro-region offers for the Hellenistic period the city of *Heraclea Pontica*. Unlike during the following Roman period, the difference between the extents of *Nicaea* and *Heraclea Pontica* is in principle negligible. The extent of *Heraclea Pontica* reaches 84 per cent of that of *Nicaea*.

The Roman period records an increase of the difference in the sizes of the cities *intra muros* since *Heraclea Pontica* reaches a mere 58 per cent of the territory of *Nicaea*. The comparative sample is enriched by the extent of *Nicomedia* and *Tium*.⁷⁸⁵ *Nicomedia* reaches in the Roman period a considerably larger extent *intra muros* than *Nicaea*. Taking the extent of *Nicaea* as a base, *Nicomedia* is almost 70 per cent larger in total. *Tium*, on the contrary, is located on an area that forms less than 12 per cent of the extent of *Nicaea* and mere seven per cent of *Nicomedia*.

Estimates of extents of the cities during the Early Byzantine period are rather problematic, as already mentioned above. The extents of *Nicaea*, *Nicomedia* and *Heraclea Pontica* follow the delimitations specified by the Roman fortifications. Only one city, *Hadrianopolis*, revealed a fortification dated to the Early Byzantine period. It is considerably smaller and merely roughly estimated. However, it is the only one which was newly built with the means and needs of the Early Byzantine city.

The Table 43 shows the development of the extents of the towns of *Nicaea*, *Nicomedia*, *Heraclea Pontica*, *Hadrianopolis* and *Tium* during the Hellenistic, Roman and Early Byzantine periods, as available in the published records.

The results demonstrate the exceptional extent of the territory of *Nicomedia*, followed by *Nicaea*, however, with a considerable gap. These estimations go along with results achieved during the analysis of urbanization in Chapter 6. 3. which interprets *Nicomedia* and *Nicaea* as the primate-cities reaching *hypercephalie*, with an economy largely based on impoverishing their hinterlands.

⁷⁸⁴ The ten largest cities in Asia Minor are, based on Hanson 2011, 254 and listed from the largest to the smallest: *Sardis* (356 ha), *Alexandria Troas / Antigoneia* (278 ha), *Ephesus* (224 ha), *Pergamum* (219 ha), *Halicarnassus* (174 ha), *Cyzicus* (168 ha), *Nicaea* (137 ha), *Clazomene* (117 ha), *Heraclea ad Latmum / Pleistarcheia* (99 ha), *Miletus* (97 ha).

⁷⁸⁵ Hanson 2011, 254 f.

The significant extent of *Heraclea Pontica* relates, most probably, to its primate position in the sea trade.

City	Extent in hectare		
	Hellenistic period	Roman period	Early Byzantine period
<i>Nicaea</i>	50	137	137 (or less ?)
<i>Nicomedia</i>	N/A	228 ⁷⁸⁶ – 232 ⁷⁸⁷	228 – 232 (or less ?)
<i>Heraclea Pontica</i>	42	78	78 (or less ?)
<i>Hadrianopolis</i>	N/A	N/A	20 – 40 ⁷⁸⁸
<i>Tium</i>	N/A	16	N/A

Table 43: Extents of cities in the Macro-Region in the Hellenistic, Roman and Early Byzantine Periods

Investments in the construction of the Roman city walls

The Roman fortification offers a unique opportunity to estimate the entire time span used for its construction. It falls within the years AD 258 and 268/69. The dates are bordered by the invasion of Goths who destroyed the fortifications and by the dedication of the new defensive walls to Caesar Claudius Gothicus.⁷⁸⁹ This relatively brief time span testifies to a great ability of *Nicaea* to organize and finance such immense construction works.⁷⁹⁰ The recent study of A. Dalyancı-Berns⁷⁹¹ offers an insight into the building techniques, presenting an approximate number of workers needed for such a construction. Based on detailed observations in the field, A. Dalyancı-Berns determined the amount of bricks used for the fortification. According to the formula presented by J. DeLaine⁷⁹² for quantifying the time and manpower needed for the brick production, A. Dalyancı-Berns calculates 301,938 working days required only for creating the sufficient amount of bricks. When counting with ten years of construction works and seven working days a week, one reaches a maximum of 3,652 working days. Thus, the resulting minimal requirement of workers is 83 men working every day on the brick production to enable the construction. Since this calculation does not consider any

⁷⁸⁶ The estimate based on Russell 1958, 149.

⁷⁸⁷ The estimate derives from the archaeological evidence published by Fıratlı 1971, 14 and further confirmed by Foss 1996, 29–31.

⁷⁸⁸ The fortification around *Hadrianopolis* was built only in the Early Byzantine period and its preservation state does not allow more precise estimates than between 20 and 40 ha (Ritter 2015, 121 f.).

⁷⁸⁹ Şahin 1979, 7–11 (IK Iznik, nos. 11. 12).

⁷⁹⁰ For details, see Daylançı-Berns 2017, 419.

⁷⁹¹ Dalyancı-Berns 2017, 422 f.

⁷⁹² DeLaine 1997, 120 f.

free days or fluctuation in workers' efficiency (caused by illnesses etc.), it is largely underestimated. I suggest the amount of 100 men only for the brick production as a minimum estimate. This number needs to be enlarged by workers quarrying and transporting stones, craftsmen processing the stones, workers building the actual fortification as well as supervisors organising the workflow. Since there are no actual numbers of the amount of marble used in the fortification,⁷⁹³ I can only roughly assess their figures. I suggest the number of some 300 men engaged in the construction of the fortification walls on an everyday basis in the time span of ten years. This rough assessment implies that *Nicaea* had to ensure accommodation, food and wages (for the workers who were not slaves) for 300 men who were working in a sector which did not produce any foodstuff. Thus, their alimentation had to be provided from surplus produced in the territory of *Nicaea*.

The construction of fortification walls *per se* is not anyhow outstanding performance during the studied period. However, the velocity, excellent implementation and an apparent rate of efficiency achieved during the construction of the fortification walls in *Nicaea* required a high level of organisation⁷⁹⁴ and it underlines the great economic power of *Nicaea* during the second half of the 3rd century AD.

8. 3. 2. Population

As pointed out by numerous studies⁷⁹⁵ and accurately expressed by McCormick, the population size plays a decisive role in the economic development of the ancient society:

*'The primordial element is population size, because in a pre-industrial society, the aggregate amount of wealth produced is directly connected with numbers of people working.'*⁷⁹⁶

⁷⁹³ DeLaine (1997, 121) elaborates also on numbers of men necessary for marble production: one cubic meter of worked marble requires one skilled quarryman and two assistants for four days of work and stonemason for 7.5 days of work.

⁷⁹⁴ Dalyancı-Berns 2017, 420.

⁷⁹⁵ For instance, see the study on demography by Scheidel 2013, 38–86.

⁷⁹⁶ McCormick 2001, 30.

Since the extent of the Hellenistic *Nicaea intra muros* equals 50 hectares, this leads us, based on the estimates discussed above, to a population estimate reaching 7,500 people. The population of Roman *Nicaea* was estimated by A. Wilson⁷⁹⁷ in a complex study focused on ‘City Sizes and Urbanization in the Roman Empire’. Since A. Wilson bases his calculation on the extent of *Nicaea* published by J. W. Hanson, I had to adjust the resulting number. Basing my estimate on the area of 137 ha, extrapolated with a conservative population density of 150 inhabitants / ha,⁷⁹⁸ the population of *Nicaea* reaches 20,550 inhabitants during the Roman Imperial period. The following Table 44 shows an overview of changes in the extent of *Nicaea* and resultant population estimates.

Chronology	Area (ha)	Inhabitants (in total)
Hellenistic	50	7,500
Roman	137	20,550
Early Byzantine	137 (or less ?)	20,550 (or less ?)

Table 44: Estimations of Inhabitants Living in *Nicaea* during the Hellenistic and Roman / Early Byzantine Periods

The following Table 45 presents all the values currently available for the cities in the macro-region during the Roman period. Beyond *Nicaea*, these are *Nicomedia*, *Heraclea Pontica* and *Tium*. The delimitations of the cities allow for calculating the population estimates, considering the maximum extents *intra muros*.

Territories <i>Intra Muros</i> and Population Estimates during the Roman Period		
City	Area (ha)	Inhabitants (150 / ha)
<i>Nicaea</i>	137	20,550
<i>Nicomedia</i>	228–232	34,200–34,500 ⁷⁹⁹
<i>Heraclea Pontica</i>	78	11,700
<i>Tium</i>	16	2,400

Table 45: Estimations of Sizes of Cities and Numbers of Inhabitants in the Macro-Region

⁷⁹⁷ Wilson 2011, 187.

⁷⁹⁸ On population estimates in the Roman city, see Wilson 2011, 170–172.

⁷⁹⁹ Güney 2012, 149 calculates the urban population based on the density suggested by Russell 1958, 64 which is 149 inhabitants per hectare. The resulting number of inhabitants is, therefore, slightly lower since it equals 34,000. In order to keep a consistent and comparable record, I use for each of the cities the estimates suggested by Wilson 2011, 170–172, i.e. 150 inhabitants per hectare.

8. 3. 3. Diverse Professions Documented in Epigraphic Evidence

The specialized professions are an integral part of the rise and sustainable maintenance / growth of any city.⁸⁰⁰ Looking at the remains of *Nicaea*, the massive fortification walls required a great deal of men taking part in its construction, as described in detail above. Moreover, the numerous quarries in the hinterland should function as manufacturing centres *per se*, involving not only workers quarrying stones but also specialists focused on the stone carving. The elaborate funerary monuments spread around the hinterland support the picture of a number of artists active in the territory.

Despite the rich indirect evidence, the preserved inscriptions found on funerary monuments document only two specialized industries. These are a greengrocer and a baker,⁸⁰¹ as listed in the Table 46 below.

Chronology	Type / Keyword	Interpretation	Corpus, No.
N/A	funerary / <i>lathanopoles</i>	greengrocer	IK Iznik, 197
N/A	funerary / <i>artopoles</i>	Baker	IK Iznik, 553

Table 46: Epigraphic Evidence Demonstrating Diverse Professions in *Nicaea*

Unlike in the towns situated directly at the sea, there is not a single ship-owner and merchant⁸⁰² documented in *Nicaea*. This might be caused by the lack of surviving evidence, but since *Nicaea* represents the most numerous and the best published assemblage of the entire macro-region,⁸⁰³ I suggest two reasons for this phenomenon. Either, the trade using the *Ascania Lacus* for reaching the western shore of the lake and, eventually the sea, was not as important as implied in Chapter 5, or, more likely, it was a domain of *Prusias ad Mare*.

⁸⁰⁰ Bowman – Wilson 2009, 32 f.; Erdkamp 2015, 20–22.

⁸⁰¹ Unfortunately, the inscription is not dated, since the importance of baker as a self-sustaining profession is a decisive factor for the city development. For instance, in Rome it is documented for the first time during the Third Macedonian War 171–168 BC (discussed by Stambaugh 1988, 143–145).

⁸⁰² *Nicomedia* revealed seven, *Prusias ad Mare* one and *Tios* two funerary inscriptions of ship-owner and merchant. All the three cities are situated directly at the sea. For details see Table 19 and accompanying description in the Chapter 5. 5. 4.

⁸⁰³ In comparison with the other cities which revealed epigraphic evidence documenting the division of labour, listed as place: total no./no. concerning labour division. *Nicaea* 687/2; *Nicomedia* 485/8; *Prusias ad Mare* 129/1; *Prusias ad Hypium* 175/1; *Tios* 28/2.

At any rate, *Nicaea* certainly had an increased division of labour already since the Hellenistic period, otherwise it would not become a fortified *polis*. During the Roman period, it certainly grew with the city itself, although it is not documented by the epigraphic evidence.

From the methodological point of view, this exercise shows that using the epigraphic evidence for demonstrating the division of labour is not always applicable and might be largely misleading when not compared with other evidence.

The evidence from *Nicomedia* (Table 47) shows a considerably larger number of inscriptions (eight in total) documenting the occupation of local inhabitants. However, the number still represents only an infinitesimal part of the expected professions when compared with the extent of *Nicomedia*. The represented occupations are a ship-owner and merchant (seven in total) and a wool merchant (one inscription only).

Chronology	Type / Keyword	Interpretation	Corpus, No.
2 nd century AD	funerary / <i>naukleros</i>	ship-owner and merchant	SEG 29, 1346
N/A	funerary / <i>naukleros</i>	ship-owner and merchant	SEG 32, 1256
N/A	funerary / <i>naukleros</i>	ship-owner and merchant	TAM IV, 1, 110
N/A	funerary / <i>naukleros</i>	ship-owner and merchant	SEG 32, 1257
N/A	funerary / <i>naukleros</i>	ship-owner and merchant	TAM IV, 1, 127
N/A	funerary / <i>naukleros</i>	ship-owner and merchant	TAM IV, 1, 195
N/A	funerary / <i>naukleros</i>	ship-owner and merchant	TAM IV, 1, 197
N/A	funerary / <i>erioples</i>	wool merchant	TAM IV, 1, 174

Table 47: Epigraphic Evidence Demonstrating Diverse Professions in *Nicomedia*

I list the inscriptions documenting different labours in *Nicaea* and in *Nicomedia* in order to demonstrate the applicability of this kind of analysis for these two samples. However, I do not perform any comparative analysis since the assemblages are apparently not predicative.

8. 3. 4. Capital Investments in *Nicaea*

The following overview (Table 48) presents capital investments directly connected with *Nicaea*, as documented by the epigraphic evidence and in the literary sources.

Chronology	Building Activity	Description	Corpus, No. / Source
29 BC	temple	Augustus built a temple for Roma and Caesar	Cassius Dio 51, 20, 6
AD 70 –72	monumental gate	the gate financed by the notable C. Cassius Chrestus	IK Iznik, 25. 26. 27. 28
AD 109–111	theatre	10 mil sesterces investment and not finished due to cracks in the construction	Plin. epist. 10, 48
AD 109–111	gymnasium	ill proportioned and built	Plin. epist. 10, 48
AD 123	repairs of public buildings	Hadrian stops in <i>Nicaea</i> after earthquake in AD 120 and decides to repair the town	IK Iznik, T13
AD 123	aqueduct, bridges	aqueduct and bridges for carriages / four-footed animals by Hadrian	IK Iznik, 1. 2
AD 123	aqueduct	built by the Emperor Hadrian	IK Iznik, 55
AD 180–192	temple	Commodus built temple of Apollon <i>extra muros</i>	IK Iznik, T14
AD 527–550	aqueduct	the previous one destroyed	Proc. aed. 5.3.1
AD 527–550	palace	the previous palace partially collapsed	Proc. aed. 5.3.3
AD 527–550	churches	missing in the city	Proc. aed. 5.3.2.
AD 527–550	monasteries (for women and men separately)	missing in the city	Proc. aed. 5.3.2.
AD 527–550	bath (at lodgings for veredarii)	the bath laid in ruins for a long time	Proc. aed. 5.3.4

Table 48: Capital Investments in Public Buildings in *Nicaea* Based on the Epigraphic Evidence and Literary Sources

According to the public investments documented for the city of *Nicaea*, one can observe two massive waves of constructions of public buildings. The first one in the beginning of the 2nd century AD, the second one in the 2nd quarter of the 6th century AD.

The first massive construction works are connected with the devastating earthquake in AD 123 and the necessity to repair the affected town. The direct connection with the economic development is in this case highly questionable. However, since there were available resources for the repairs, I argue it points to a considerably good economic situation in the Empire.

Interestingly, there is no preserved evidence for the 4th and 5th century AD; only during the first half of the 6th century AD, extensive investments are documented connected with the deeds of Justinian I. Basically, the entire city of *Nicaea* seems to have been rebuilt during his reign. This

implies that it was in a catastrophic state before, prompting Justinian I. to conduct massive construction works.

8. 3. 5. Reconstruction of the Road Network in the Light of Economic Development

The roads radiate from *Nicaea* towards all the four cardinal points, presumably following the same routes since the Hellenistic period:⁸⁰⁴ northwards, across the Samanlı Mountains to *Nicomedia*; westwards to *Prusias ad Mare* situated on the shores of the Marmara Sea; southwards towards the modern village Hayriye (considered to be the most probable allocation of *Otroia*);⁸⁰⁵ and, finally, eastwards to the rather extensive territory of *Nicaea*.

As the distribution of the cities has not undergone any dramatic changes in the macro-region since the Hellenistic period, one may expect the roads to follow the same courses as well.

The earliest epigraphic evidence mentioning a road-building activity in the analysed micro-region (as well as in the entire Bithynia) is connected with the reign of the emperor Nero (AD 57/58). An inscription cut into a rock beside the road⁸⁰⁶ leading from *Nicaea* to its seaport *Prusias ad Mare*, or even as far as *Apamea*,⁸⁰⁷ gives an account of the reparation / reconstruction conducted on its course.⁸⁰⁸

The road coming from the north and leading to the east is the 'Pilgrim's road'.⁸⁰⁹ Out of three milestones found along its course in the micro-region, two can be dated; the earlier one to the 1st quarter of the 3rd century (AD 218–221),⁸¹⁰ and the later one to the turn of the 3rd and 4th century (AD 293–305).⁸¹¹ The investments fall within the Late Imperial and Early Byzantine era, however, the chronology is in this case rather misleading. Considering the first investments

⁸⁰⁴ The changes in the courses do not exceed 1 km. For details on the road persistency in the area, see Weissová – Pavúk 2016, 11–21.

⁸⁰⁵ Şahin 1987, 134 f., nos. T60a–b.

⁸⁰⁶ More accurately, the inscription was located in the territory called Sarıkaya (Texier 1862, 108 f.), but it was destroyed ca. 40 years ago and thus it is no more to be found *in situ* (French 1980, 707).

⁸⁰⁷ Road leading as far as *Apamea Myrlea* was suggested by Texier 1862, 108; confirmed on *Tabula Peutingeriana* (Miller 1916, 694).

⁸⁰⁸ CIL III, no. 1346; the whole text published with commentaries by French 1980, 715.

⁸⁰⁹ French 1981, 13.

⁸¹⁰ Found 2.5 km SE of Iznik in the ancient cemetery, for details see French 2013, 121 f.

⁸¹¹ Found in the fields 1 km south of Karadin village, confirms the existence of the road station *Ad Schinae* supposed to be situated 13 km east of *Nicaea* (acc. to *Itinerarium Burdigalense*); for details concerning the milestone see French 2013, 122 f.

appearing along the entire section of the ‘Pilgrim’s road’, they date to the time of Trajan, followed by construction works during the reign of Septimius Severus. Since the milestones confirming Trajan’s as well as Septimius Severus’ constructions appear distributed along its entire course, I suppose that the road was paved and maintained since the time of the Middle Imperial period.

The precise route of the road is marked by two ancient bridges,⁸¹² Kuru Köprü⁸¹³ and Karasu Deresi Köprüsü,⁸¹⁴ which also enable to follow investments in their construction. Both are still to be found *in situ*, standing in the fields NW of *Nicaea*, with only 1.77 km distance between them, and currently not arching over any actual river. Since they were rebuilt several times, their first construction phase is not clearly identifiable. The first literary sources that can be linked with the area under discussion indicate problems with crossing the river. According to Strabo,⁸¹⁵ one had to wade through the river 24 times on the way between *Nicaea* and *Nicomedia*. Therefore, clearly, there was no bridge during the period between the 1st century BC and the 1st century AD. The likely construction of one of the bridges can be dated to the reign of the Emperor Trajan,⁸¹⁶ connected with reparations of the entire SE artery.⁸¹⁷ Procopius⁸¹⁸ describes the construction of a new bridge during the reign of Justinian I. in the place of an old and destroyed one. Procopius’ description of a monumental construction suggests an identification with the Karasu Deresi Köprüsü.

Chronology	Type of Inscription	Description	Corpus, No. / Source
AD 58 / 9	honorific	reparations of road along the southern shore of the Iznik Lake by the Emperor Nero	IK Iznik, 13
AD 123	honorific	bridges for carriages / four-footed animals by Hadrian	IK Iznik, 1. 2
AD 238 / 244	milestone	maintenance of the ‘Pilgrim’s road’	French 2013, 68
AD 249 / 250	milestone	maintenance of road ‘Nicaea – Prusias ad Mare’	French 2013, 27
AD 293 / 305	milestone	maintenance of the ‘Pilgrim’s road’	French 2013, 69

Table 49: The Investments in the Road System in the Micro-Region

⁸¹² For the photographic documentation, see Addendum 4. 3., nos. 2. 3.

⁸¹³ Yalman 2000, 102.

⁸¹⁴ For a current state and a description of the bridge, see Ermiş 2009, 246–248.

⁸¹⁵ Strabo 13, 1, 10.

⁸¹⁶ Şahin 1987, 50.

⁸¹⁷ French 1980, 709.

⁸¹⁸ Procop. aed. 5, 3, 4–5.

The peak of the maintenance of the road network around *Nicaea* does not fall within the peak connected with public buildings (compare chronology in Tables 48 and 49). However, it is necessary to keep in mind one important fact. Based on the evidence found in the micro-region, the first phase of the ‘Pilgrim’s road’ dates to the reign of the Emperor Elagabalus. Examining the investments in the macro-region,⁸¹⁹ the first construction phase of the ‘Pilgrim’s road’ dates to the reign of the Emperor Trajan. Therefore, the ‘Pilgrim’s road’ predates the evidence from the micro-region by 100 years.

From the methodological point of view, when studying the investments in the road system, the complex reconstruction requires examining not only the studied section of the road but its entire length. The focus on one section might be largely misleading.

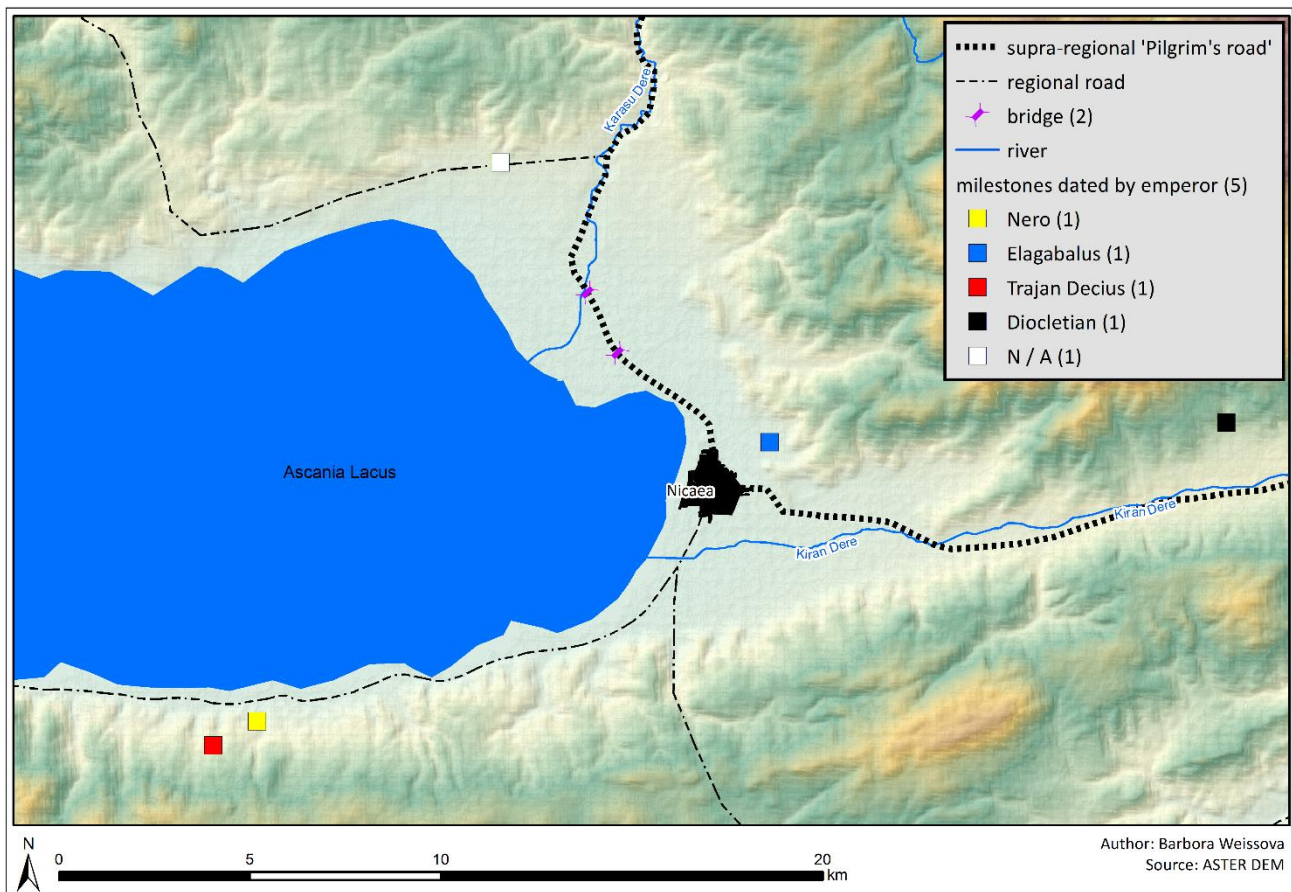


Figure 60: Reconstruction of the Road Network in the Micro-Region with Spatial Distribution of Milestones (Addendum 1. 37.)

⁸¹⁹ See Chapter 7. 5. 1.

The map Figure 60 above depicts the reconstruction of the road system based on the precise position of the two bridges situated in the field. Furthermore, it includes the milestones and the rock cut relief which enable following the chronology of the investments in the roads.

8. 4. Reconstruction of the Development of the Settlement Patterns in the Light of Economy

Nicaea has an outstanding position in the macro-region, since it represents the only ancient city with hinterland which is not built-up by the agglomeration of a modern city. Thus, it offers ideal conditions for exploration. I had the unique possibility to conduct a preliminary survey in the hinterland of *Nicaea* in order to establish the archaeological potential of the territory.⁸²⁰

The primary aim of the expedition was to rectify the geographical location of already known monuments⁸²¹ and create an accurate archaeological map of the area. The further goal was to survey selected areas in the hinterland of *Nicaea* and to complement the map with newly discovered evidence. Finally, yet importantly, the project also focused on documenting the state of preservation of the recorded monuments, assessing their rate of decay and pointing out landmarks requiring an immediate protection.

The survey yielded rectified positions of diverse monuments, opening a possibility of a spatial analysis of their distribution. However, since the hinterland was not surveyed by a systematic survey, the numbers of available monuments are with certainty underestimated.

The current dataset encompasses: 55 funerary monuments, predominantly spread in the foothills of surrounding mountains; ten quarries with remains of ancient quarrying techniques and six scatters of pottery and architectural ceramics identified as ancient rural settlements. Out of the six, two are supposedly connected with the adjacent quarries and can be interpreted as manufacturing centres for processing the quarried stones.

The following study analyses the spatial distribution of some of the collected features during the Hellenistic, Roman and Early Byzantine periods separately. In this way, it offers a rare

⁸²⁰ The Iznik Survey Project 2015, henceforth the ISP15, took place between the 21st of March and 9th of April 2015.

⁸²¹ Using a handheld GPS.

possibility to follow the development of the hinterland of one city situated in the analysed macro-region.

8. 4. 1. The Hellenistic period

The hinterland revealed four rural settlements. All the settlements feature more chronological phases and they were settled also during the Roman period.

The territory estimated per one rural settlement equals 40 sq. km. Although a distance from a road reaches in some cases 1 km, it is possible to state that the settlements are basically clustered along the main roads.

The following map Figure 61 shows the fortified area of *Nicaea* during the Hellenistic period, spatial distribution of the settlements and marble quarries identified during the ISP15. The general picture is completed with the reconstructed road system.

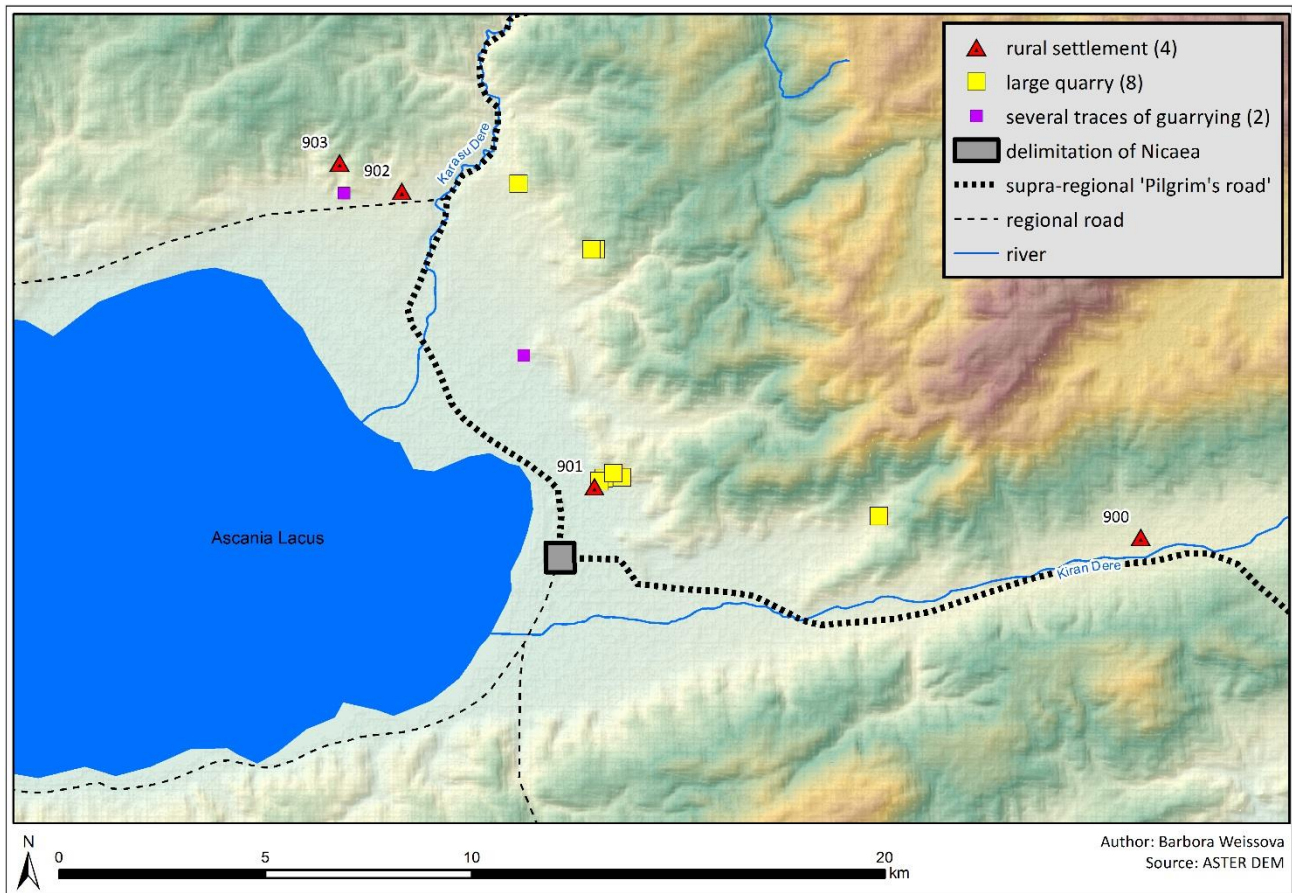


Figure 61: Reconstruction of the Hinterland of *Nicaea* during the Hellenistic Period (Addendum 1. 38.)

Examining the allocation of the four rural settlements, three of them are situated in the fertile lowland (nos. 900, 901, 902) and the remaining one (no. 903) in the foothills of the Samanlı Mountains. I suppose nos. 900 and 902 were connected with agricultural activities conducted in the lowland, no. 903 most likely with viniculture / olive oil production and / or pasture based on its elevated position. No. 901 is situated directly west of the complex of large quarries with remains of ancient quarrying techniques and it is, therefore, probably connected with the quarrying activities.

8. 4. 2. The Roman period

The town reaches 137 ha during the Roman period and the hinterland features five rural settlements with certainty. Three more settlements were suggested in the Barrington Atlas but not confirmed during the survey. Since the survey did not cover the entire area systematically and the error in geographic precision in the Barrington Atlas reaches 3 km, their existence, although not confirmed, was not excluded. The territory estimated per one rural settlement equals 32 sq. km counting with five and 23 sq. km counting with seven settlements. All the rural settlements are clustered along the main roads, with a maximum distance from the roads not exceeding 1 km.

Investigating the functionality of recorded rural settlements, no. 903 has an ideal position for viniculture / olive oil production. Three of the settlements (no. 902, *Ploketta*⁸²² and *Aureliane*⁸²³), situated in the lowland, were most likely connected with no further specified agricultural production. Based on the proximity of the large quarries, the settlements nos. 901 and 904 were probably focused on marble production. Lastly, no. 900 was identified with the road station *Ad Schinae*.⁸²⁴ Although the preserved record is dated no earlier than to the Early Byzantine period, I suppose, based on the confirmed existence of the road,⁸²⁵ that its function as a road station is highly probable already during the Roman period.

⁸²² Şahin 1981, 21.

⁸²³ Dörner 1941, 43.

⁸²⁴ *Mutatio Ad Schinae* is listed in *Tabula Peutingeriana* (Miller 1916, 657) and *Itinerarium Burdigalense* (Cuntz 1929, 92) mentioning the distance between *Nicaea* and *Ad Schinae* to be eight Roman miles, i.e. 13 km. The identification with the place confirmed by French 1981, 29 and Şahin 1981, 10; Şahin 1987, 145.

⁸²⁵ Weissová – Pavúk 2016, 11–21.

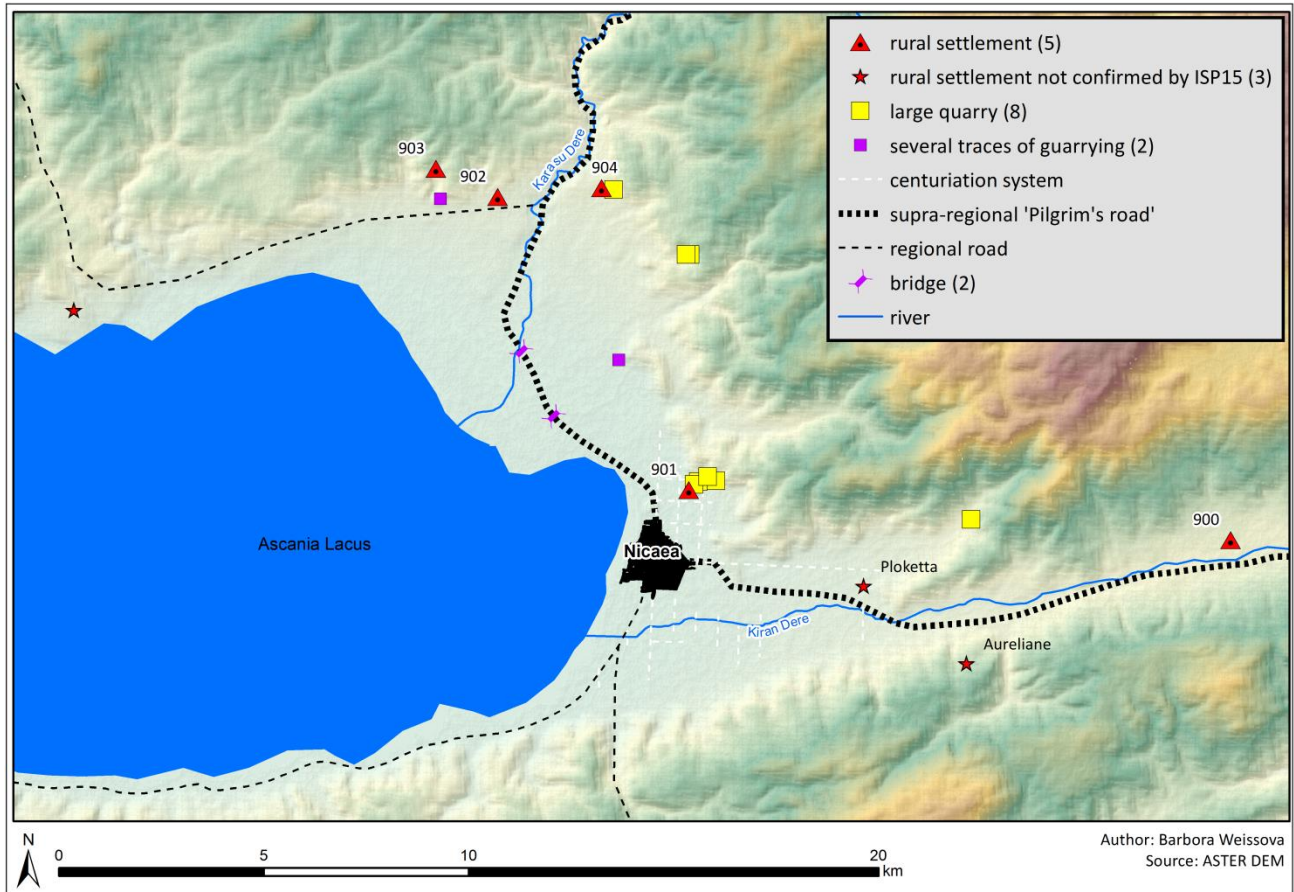


Figure 62: Reconstruction of the Hinterland of *Nicaea* during the Roman Period (Addendum 1. 39.)

The map Figure 62 above shows the fortified area of *Nicaea* during the Roman period, spatial distribution of settlements and marble quarries identified during the ISP15 and three settlements depicted in the Barrington Atlas but not located during the ISP15. The general picture of the hinterland is completed with the reconstructed road system and with the centuriation system as presented by G. Scardozi⁸²⁶ and completed by R. Brigand.⁸²⁷ As expressed by A. D. Rizakis, centuriation system is one, and sometimes most serious, of the consequences of Roman imperialism. Traces of the Roman centuriation system are still clearly identifiable on the satellite imagery.

⁸²⁶ Scardozi 2013, 875–886.

⁸²⁷ For the reconstruction by Brigand, see Weissová et al. forthcoming in 2018.

8. 4. 3. The Early Byzantine period

Based on the fortification walls, the extent of the town does not change in comparison with the Roman period. However, as discussed above within the extent estimates, this does not necessarily mean that the entire area of 137 ha situated *intra muros* was inhabited.

The number of rural settlements equals mere three in total situated in the direct hinterland of *Nicaea*. The resulting density is one settlement per 54 sq. km. As shown on the map, there are actually four settlements discovered dated to the Early Byzantine period. Yet, the settlement no. 906 is situated out of the analysed micro-region, in the Samanlı Mountains NE above the city. Its elevation reaches 700 meters above the sea level. I include it in the map as well as in the analysis of the micro-region as I suppose it was directly connected with the existence of *Nicaea*. However, since I visited the mountains only once, I do not include it into the area surveyed by the project. The settlement represents an outlier anticipating the shift of habitations to elevated positions during the Byzantine period.

The density of rural settlements dated to the Early Byzantine period is considerably lower than during the Roman period. The functionality of nos. 901 and 904 is probably analogous to the Roman era, focused on quarrying activities. No. 900 also keeps its status as the road station *Ad Schinae*. The function of the settlement no. 906 situated in the mountains is not entirely clear. Firstly, I interpreted it as a hiding place during invasions. However, considering the monumentality of the fortification of *Nicaea*, it is not a satisfactory explanation and it is necessary to look for an alternative function of this settlement. Another possible interpretation ensues from the records of several travellers in the 19th century. Based on their descriptions, the city of *Nicaea* was uninhabitable during summer, since it was strongly affected by malaria.⁸²⁸ All the authors agree on the point that the inhabitants of *Nicaea* who were able to move, simply left the city and lived in the mountains above it. From this point of view, it is possible to interpret the settlement no. 906 as one of the 'summer camps' of *Nicaeans*.

⁸²⁸ De Hell 1855, 296.

The map Figure 63 below shows the fortified area of *Nicaea* during the Early Byzantine period and spatial distribution of settlements and marble quarries identified during the ISP15 as well as the reconstructed road system.

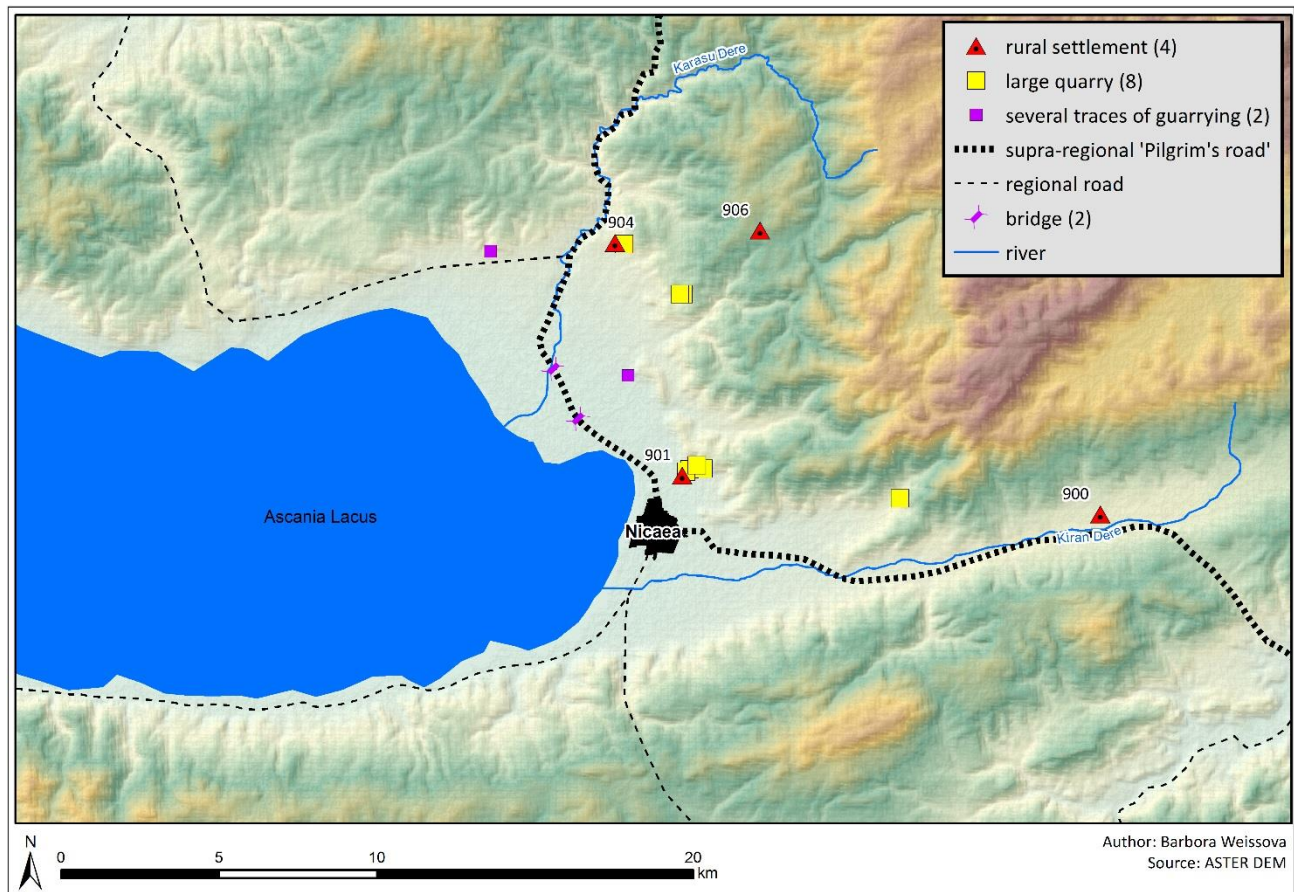


Figure 63: Reconstruction of the Hinterland of *Nicaea* during the Early Byzantine Period (Addendum 1. 40.)

8. 4. 4. Functional Analysis of the Scatter Identified as no. 901

The scatter identified as no. 901 serves as an exemplary study, since we managed to cover it with a systematic survey. The scatter is situated 1.6 km NE of *Nicaea* and its northern margin borders with a Roman cemetery.⁸²⁹ The detected *halo* of the scatter covers an area of about 40 ha, the nucleus spreads over 1.3 ha (Figure 64). The greater part of the nucleus consists of pottery and

⁸²⁹ The Funerary complex documented by the ISP15 is situated in Bayırdibi area and encompasses five rectangular and two simple graves, all disturbed by treasure hunters. Negative traces in the terrain indicate a considerably higher number of graves in the territory. These were, however, not *in situ* anymore.

architectural ceramics dated to the Roman period, several pieces of Hellenistic and Byzantine potsherds were also identified. The *halo* is predominated by architectural ceramics. Moreover, a dense concentration of architectural ceramics dated to the Ottoman period appear at its NW margin.

The eastern and the southern parts of the *halo* were covered with a dense layer of chipped marble suggesting the connection of the habitation with a stonemasonry, i.e. processing of marble was happening in the immediate vicinity of the quarries. Due to the proximity to *Nicaea*, the quarries are most likely to be interpreted as the main source of building stone used in the town.

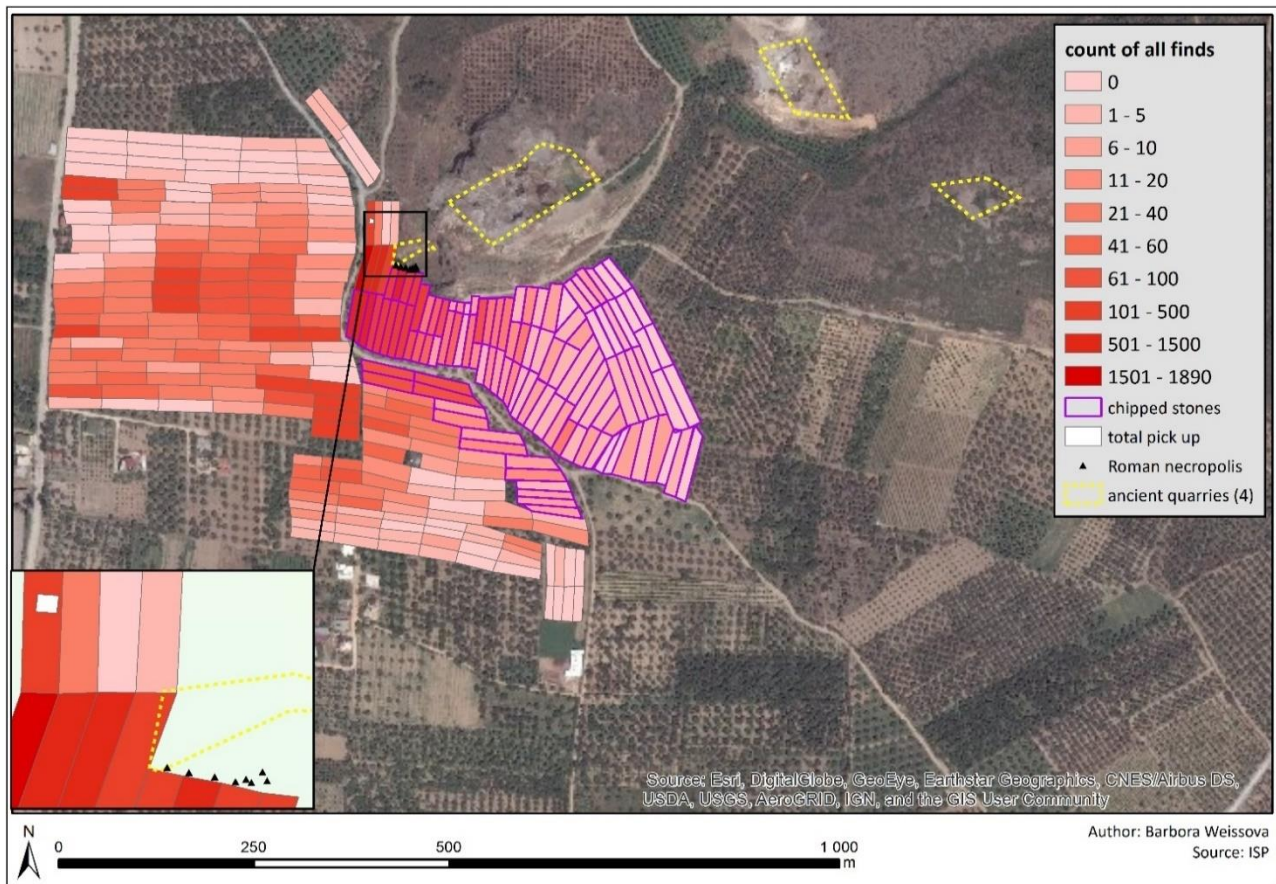


Figure 64: Map of Intensively Surveyed Scatter of Pottery Connected with Quarrying Activities (Addendum 1. 41.)

8. 4. 5. Density of Settlement Patterns from the Hellenistic till the Early Byzantine Period

Examining the developmental tendencies within the numbers of rural settlements situated in the hinterland of *Nicaea* between the Hellenistic and Early Byzantine periods, one can observe considerable fluctuations in their density. As shown in Table 50 below, the territories per rural

settlement change from 40 sq. km during the Hellenistic period, to 32 (23) sq. km during the Roman period and, again, to 54 sq. km in the Early Byzantine era. An analogous development featuring a decrease in the density of settlements during the Early Byzantine period was detected by surveys conducted in the mountainous areas of Paphlagonia⁸³⁰ and Pisidia.⁸³¹ However, this tendency is not uniform in the entire Asia Minor. Two valleys in the territory around *Sinop*, for instance, feature a boom of rural settlements in the Early Byzantine period,⁸³² followed by a sudden collapse of the settlements in the 8th century AD. This outstanding development has been hitherto detected only in the areas specialized on an olive oil production. O. Doonan⁸³³ connects the increase in the density of settlements with the establishment of *Constantinopolis* leading to a greater need of agricultural products and the decrease with the changes in the climate, disabling cultivation of olives in the territory. Regardless of the reason, the *Sinop* promontory features a local development connected with the regional economy, exceptional when characterising the situation in the entire Asia Minor.

The Early Byzantine period brings a shift in the spatial distribution of the settlements, since one of them is situated deep in the Samanlı Mountains. Such a position suggests a possible transformation from the agricultural to pastoral activities. This vague assumption is confirmed by the study of A. Izdebski⁸³⁴ who, based on the pollen analyses, defines a decline of cereal farming and arboriculture in the territory of the Marmara coast and increase of pastoral activities. Although situated out of the micro-region, I still include the settlement in the analysis, presenting the resulting numbers in the brackets.

Chronology	No. of rural settlements	Territory per settlement (sq. km) out of 161 sq. km in total
Hellenistic period	4	40
Roman period	5 (?)	32 (23?)

⁸³⁰ Matthews – Glatz 2009, 247 f. One more survey, the Cide Archaeological Project, was conducted in Paphlagonia in the area along the Black Sea coast and in the adjacent mountains (Düring – Glatz 2015a). The survey, however, did not reveal a sufficient amount of datable pottery. For details, see Bes 2015a, 260–293; Bes 2015b, 23–42.

⁸³¹ Vanhaverbeke 2003, 285–301.

⁸³² The area was surveyed by the Sinop Regional Archaeological Project (SRAP), or details concerning the boom during the Early Byzantine period, see Doonan 2015, 43–59.

⁸³³ Doonan 2015, 57 f.

⁸³⁴ Izdebski 2013b, 179–194.

Chronology	No. of rural settlements	Territory per settlement (sq. km) out of 161 sq. km in total
Early Byzantine period	3 (4)	54 (40?)

Table 50: Density of Rural Settlements in the Micro-Region during the Given Periods

8. 4. 6. Density of Settlements in the Micro- and Macro-Regions

A comparative analysis of the densities of settlements in the micro- and macro-regions demonstrates relative differences in the numbers of rural settlements during the discussed periods. The Table 51 shows the numbers of Roman settlements as a possible maximum representing 100 per cent of the assemblage, and the Hellenistic and Early Byzantine records in relation to the Roman one, equalling 80 (57) and 60 (43) per cent respectively.

Chronology	Macro-Region			Micro-Region		
	Total No.	Density (territory per settlement in sq. km)	Percentage of settlements (expressed proportionally to Roman as 100 %)	Total No.	Density (territory per settlement in sq. km)	Percentage of settlements (expressed proportionally to Roman as 100 %)
Hellenistic	23	1860	18%	4	40	80% (57%)
Roman	127	280	100%	5 (7)	32 (23)	100% (100%)
Byzantine	106	404	83%	3	54	60% (43%)

Table 51: Density of Settlements during the Given Periods in the Macro- and Micro-Region

The comparative analysis of results achieved in the hinterland of *Nicaea* and in the macro-region⁸³⁵ features vast differences. The most striking results concern the Hellenistic period, since the density of settlements in the micro-region exceeds 46 times the density in the macro-region. The Roman period features a nine (12) times denser habitation and the Early Byzantine period 7.5 times. The significant differences confirm the fact that the number of settlements in the macro-region is largely underestimated. However, since the position of settlements above the sea level proved to be a decisive factor for their density, the differences are partially caused by the fact that the micro-region is situated in the most favourable geographic conditions, with elevations not exceeding 500 meters above the sea level. The following Table 52 represents the studied areas

⁸³⁵ For detailed results, see 7. 4. 2.

divided into two elevation levels, 0 – 200 and 200 – 500 meters above the sea level. The estimates for the macro-region are already included in Chapter 6. 5. but, for a better overview when comparing the achieved results, I insert them also in the following Table 53.

Micro-Region	Area (sq. km)/ % of total	Settlements nos. / % of total (4)	Settlements nos. / % of total (5–7)	Settlements nos. / % of total (3)
Elevation (m a. s. l.)		Hellenistic	Roman	Early Byzantine
0 – 200	98.21 / 61%	2 / 50%	3 / 60% (43%)	2 / 67%
200 – 500	62.79 / 39%	2 / 50%	2(4) / 40% (57%)	1 / 33%

Table 52: Density of Settlements in the Micro-Region during the Given Periods Divided Based on their Altitudes

Macro-Region	Area (sq. km)/ % of total	Settlements nos. / % of total (23)	Settlements nos. / % of total (153)	Settlements nos. / % of total (106)
Elevation (m a. s. l.)		Hellenistic	Roman	Early Byzantine
0 – 200	10,266 / 24%	17 / 74%	81 / 54%	61 / 58%
200 – 500	8,555 / 20%	5 / 22%	37 / 24%	11 / 10%
500 – 1,000	12,405 / 29%	1 / 4%	25 / 16%	28 / 26%
1,000 – 2,000	10,695 / 25%	0	10 / 6%	6 / 6%
above 2,000	856 / 2%	0	0	0

Table 53: Density of Settlements in the Micro-Region during the Given Periods Divided Based on their Altitudes

The Tables 52 and 53 confirm the presumption that the density of settlements in the lowland is considerably higher than in mountainous areas, representing more than 50 per cent of the entire assemblage during each of the discussed periods. The assumed shift of settlements to the higher elevations during the Early Byzantine period suggested by the results achieved within the macro-region is confirmed by results in the micro-region. The density of settlements within the elevations between 0 – 500 meters above the sea level evidently decreases, but the survey encountered a settlement shifted to the mountains, reaching an elevation of 700 meters above the sea level. The settlement is not included in the table since it is located outside the micro-region.

The following Table 54 represents estimates of the density of settlements in the micro- and macro-regions divided by elevations to enhance the comparison of this altitudes' factor.

Elevation (m a. s. l.)	Density of Settlements (territory per settlement in sq. km) Macro-Region / Micro-Region		
	Hellenistic	Roman	Early Byzantine
0 – 200	603 / 49	127 / 33	168 / 49
200 – 500	1,711 / 31	231 / 31 (16)	778 / 63
500 – 1,000	3,101 / N/A	496 / N/A	443 / N/A
1,000 – 2,000	no settlements	1,070 / N/A	1,783 / N/A
above 2,000	no settlements	no settlements	no settlements

Table 54: Comparison of Settlements' Density in the Macro and Micro-Region Divided by the Given Periods and Altitudes

As follows from the comparative study, the elevation is a decisive factor for the density of settlements. The vast differences outlined by the comparison *en masse* were considerably lessened by this exercise.

The density of settlements during the Hellenistic period features following results. It is 12 times larger in the lowest elevations (0–200 m a. s. l.) in the micro- than in the macro-region. In the elevations between 200 and 500 meters above sea level, it reaches an incredible difference: the density in the micro-region is 55 times larger than in the macro-region. I suggest interpreting the resulting numbers as a fundamental lack of knowledge concerning the Hellenistic settlements in the macro-region.⁸³⁶

The macro-region features considerably better dataset of settlements dated to the Roman period than to the Hellenistic era.⁸³⁷ Examining each elevation range separately, the density of settlements situated in an altitude under 200 meters above the sea level is four times larger in the micro-region than in the macro-region. The elevations between 200 and 500 meters above the sea level feature seven times denser habitation pattern in the micro-region than in the macro-region. Considering the possibility of a higher amount of settlements when including features depicted in the Barrington Atlas but not localised during the survey, the estimates of an area per settlement are 14 times larger in the macro-region than in the micro-region. I rather see this number as exaggerated, caused by the impossibility to identify the settlements detected during the ISP15 with

⁸³⁶ As suggested for the macro-region in Chapter 6. 3. 1.

⁸³⁷ For the possible explanation of this phenomenon, see Chapter 6. 3. 2.

the record in the Barrington Atlas, caused by its inaccuracy. Similar to the Roman period, the Early Byzantine era features considerably smaller differences in the densities of settlements than the Hellenistic period. The lowlands demonstrate three times and the hilly areas 12 times denser habitation in the micro-region than in the macro-region.

The outlined comparative analysis demonstrates the deficiency of the records in the macro-region since the differences between the estimates are simply too large. For a better overview of the achieved results, I combined the first two elevation levels encompassing lowlands and hilly areas (0 – 200 and 200 – 500 meters above the sea level) into one estimate.

Elevation (m a. s. l.)	Density of Settlements (territory per settlement in sq. km) Macro-Region / Micro-Region		
	Hellenistic	Roman	Early Byzantine
0 – 500	856 / 40	160 / 32 (23)	262 / 54 (40 ?)

Table 55: Density of Settlements in the Macro- and Micro-Region in Altitudes 0 - 500 m a. s. l.

The final comparison presented in Table 55 features the following results. The density of the Hellenistic settlements is 21 times larger, the Roman settlements five (seven) times larger, and the Early Byzantine settlements five (or seven) times larger in the micro-region than in the macro-region. I take these results for the most realistic, showing the most likely estimates and pointing to the deficiency of the record in the macro-region within the elevations between 0 and 500 meters above the sea level. Based on these results, one might extrapolate the numbers and roughly establish the figures of settlements for the entire macro-region within the elevations 0 – 500 meters above the sea level. Yet, since the micro-region does not cover higher elevations, the study lacks estimates for the altitudes above 500 meters above the sea level. Moreover, the area of the micro-region covers less than one per cent of the macro-region in altitudes between 0 – 500 meters above the sea level and, therefore, I do not present the extrapolated numbers of the settlements. The extrapolation requires a larger area to be covered and to rectify the suggested estimates.

One more factor needs to be considered when analysing the micro-region; notably the position directly in the hinterland of one of the centres and the largest cities in the territory. The micro-region falls within the area directly surveyed by *Nicaea*, outlined by the ring buffer of 18 km

around the town.⁸³⁸ The high density of settlements is, therefore, connected not only with the elevation model but also with the direct vicinity of the city.⁸³⁹

8. 5. Local and Imported Marble

The marble quarries detected in the hinterland of *Nicaea* are all situated in the foothills of the Samanlı Mountains (Figure 67). The nearest complex of four ancient quarries is located 2.5 km NE of the city, the furthest some 13 km as the crow flies. The quarries *per se* create an important factor when examining the economic situation of *Nicaea*. As expressed by B. Russell,⁸⁴⁰ high concentrations of quarries are directly connected with an intensive urbanization of a territory and they represent an accessory to a local urban economy.

Despite an immediate vicinity of the marble quarries, *Nicaea* imported marble sarcophagi from *Docimium*.⁸⁴¹ In particular numbers, there are approximately 40 sarcophagi from *Docimium* identified in the region.⁸⁴²

An existence of such kind of material in the territory of *Nicaea* is extremely important when examining its economic situation.⁸⁴³ The marble quarried in *Docimium* was one of the most expensive marbles during antiquity,⁸⁴⁴ since it required considerably long transportation overland. Although it might have been transported to *Nicaea* partially down the *Sangarius* River,⁸⁴⁵ the marble was undoubtedly substantially costlier than the local stone. Therefore, I interpret the presence of the marble from *Docimium* as a proxy of a largely favourable economic situation in the city of *Nicaea*.

⁸³⁸ For details on urbanization estimates, see Chapter 6. 4. 1.

⁸³⁹ The areas encompassed in the direct vicinity of the city differ based on the discussed period. The Hellenistic period is represented by 22 sq. km, the Roman period by 26 sq. km and the Early Byzantine period by 34 sq. km. For a discussion on the estimates, see Chapter 6. 4. 1.

⁸⁴⁰ Russell 2013, 65.

⁸⁴¹ Wiegartz 1965; Waelkens 1982.

⁸⁴² The number is based on the personal information Altın kindly shared with me. The topic will be thoroughly discussed by Altın in his dissertation on *Die Nekropolen und Grabdenkmäler von Nikaia* (Ruhr University in Bochum, Germany). Hitherto is published a partial study by Özgan – Altın 2015, 485–504.

⁸⁴³ On the importance of the stone trade in the Roman economy, see Russell 2013; on the importance of imported marble for the quantification of the Roman trade, see Wilson 2009b, 218 f.

⁸⁴⁴ Edict of Diocletian fixing a maximum of prices throughout the Roman Empire 33, 1–18 (8 *Docimium*), as published by Lauffer 1971.

⁸⁴⁵ As suggested by Ward-Perkins as an alternative way to the one leading towards Miletus (Ward-Perkins 1980, 325–388; Ward-Perkins 1992, 61–105).

Concerning the chronology of the sarcophagi identified and published in the territory, they all fall within the 2nd and 3rd century AD, particularly from AD 115 to AD 250.⁸⁴⁶ The sarcophagi feature a growth in numbers in the 2nd half of the 2nd century AD, as demonstrated in the bar graph Figure 65 below.

The imported marble confirms presumptions concerning the economic situation in *Nicaea*. Although *Nicaea* had its own sources of marble situated directly in its hinterland, the economic situation of local population enabled to import the prestigious and costly marble from *Docimium*. The chronology of the assemblage falls within the peak of the 2nd century AD outlined for *Nicaea* based on the epigraphic evidence.⁸⁴⁷

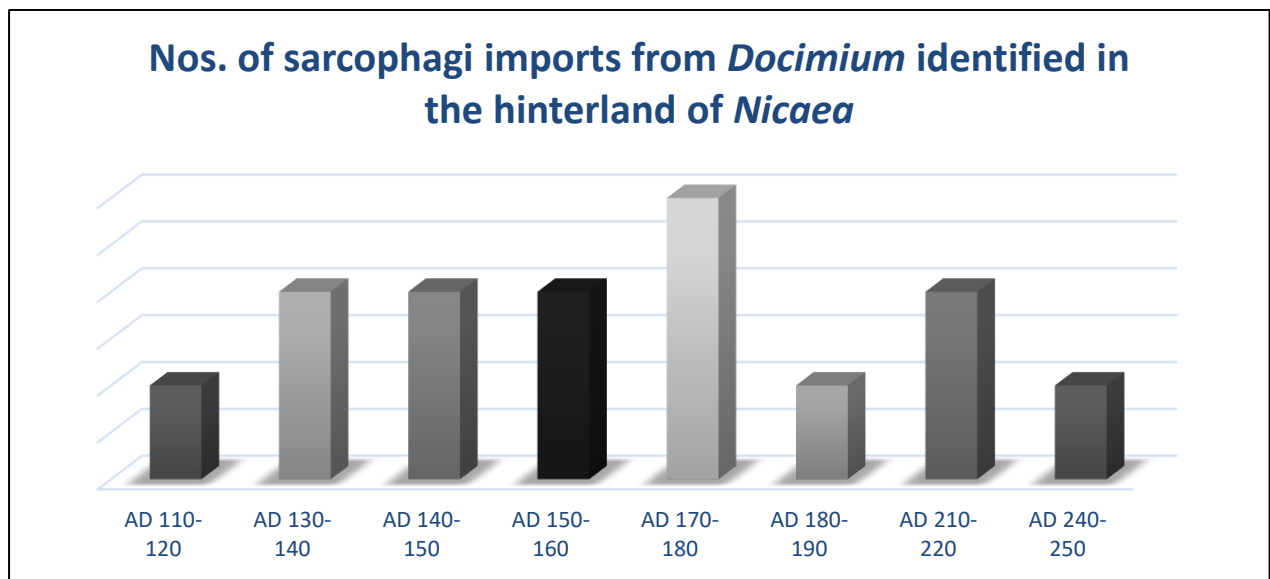


Figure 65: Bar Graph Showing the Temporal Distribution of Dated Sarcophagi from *Docimium* Identified in the Micro-Region

8. 6. Functional Analysis of the Hinterland of *Nicaea*

The function of the hinterland of *Nicaea* as an agricultural lowland with large quarries in the western slopes of the Samanlı Mountains is outlined in the previous chapter. In order to enrich this picture, I studied the historiographical sources and inscriptions concerning the hinterland of

⁸⁴⁶ Wiegartz 1965, 161 f.; Waelkens 1982, 19. 25. 34. 43. 46. 55. 67. 71. 79. 80. 85. 94. 99.

⁸⁴⁷ For details, see the line graph Figure 14 depicting the epigraphic evidence found in *Nicaea* and its territory in Chapter 5. 4. 1.

*Nicaea*⁸⁴⁸ in detail, looking for a possible connection with the actual archaeological remains. One of the generally accepted facts is that *Nicaea* was a centre of the production of wine.⁸⁴⁹ The presumption is based on the first name of the settlement,⁸⁵⁰ established by Greek settlers in the territory of the future urban centre *Nicaea*. Its name was *Helikoré*, which means 'rich in grapes.'⁸⁵¹

The ISP15 detected five large worked stones that can be interpreted as wine presses or oil presses (for two examples, see Figure 66 below). They were all found in a secondary context, five of them as *spolia* in the surveyed modern villages, one lying at the border of a field. Based on their dimensions, I assume they were not moved much further than several kilometres from their original find-spots.



Figure 66: Wine / Oil Presses from Hacaköy (left) and Dirazali (right) (photos by author)

As shown on the distribution map below (Figure 67), the presses create two linear distribution patterns; one in the northern and one in the southern part of the territory. Quarries, on the contrary, spread in the eastern slopes of the mountains. One may presume that the slopes of the Katırlı Mountains facing towards the north and the slopes of the Samanlı Mountains facing towards the south were used for the cultivation of wine / olives and their processing, whilst the

⁸⁴⁸ Şahin 1987, 1–22.

⁸⁴⁹ Viticulture during the Roman and Early Byzantine periods in Bithynia is discussed by Anagnostakis – Boulay 2016, 25–49. Palynological data also confirm the favourable climatic situation in the macro-region during the discussed periods, allowing for the prosperous viticulture. For details, see Haldon et al. 2014, 113–161.

⁸⁵⁰ Most probably *non-polis* as stated by Avram 2004, 976.

⁸⁵¹ Merkelbach 1985, 1–3; Merkelbach 1987, 10; Şahin 1987, 1.

western slopes of the Samanlı Mountains for quarrying. Such a layout is very logical as the bedrock of the Samanlı Mountains offers marbles of different qualities, whilst the Katırlı Mountains are of a volcanic origin.⁸⁵²

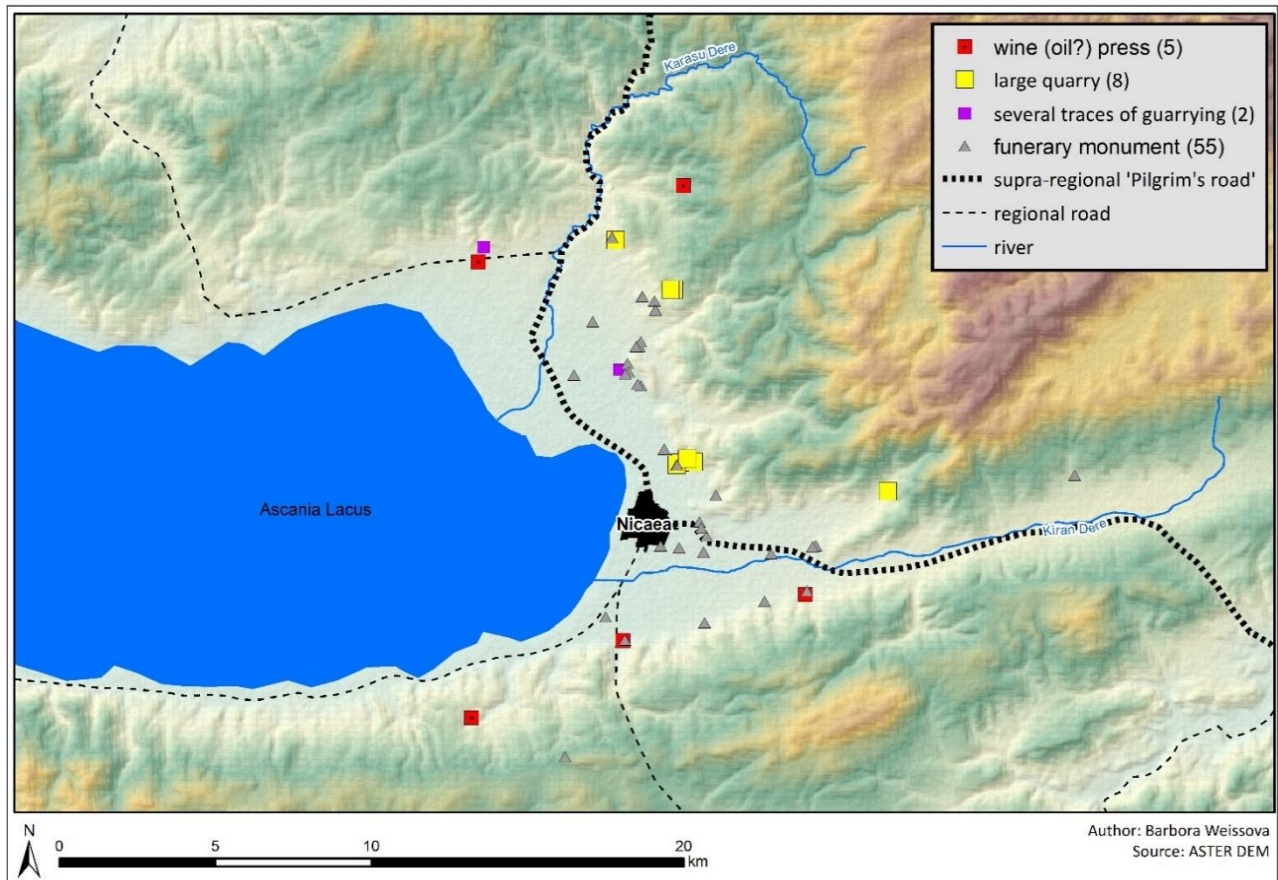


Figure 67: Functional Analysis of the Hinterland of *Nicaea* (Addendum 1. 42.)

8. 7. Spatial Analysis of the Funerary Monuments

The last discussed evidence are 55 funerary monuments distributed in the hinterland of *Nicaea*. The diversity of identified monuments speaks for different social statuses of population in this area. During the ISP15, I could spatially localise 11 *hypogea*,⁸⁵³ ten rectangular brick graves, ten simple brick graves, seven sarcophagi, four flat tombs,⁸⁵⁴ three *stelae*, three vaulted grave

⁸⁵² For the detailed description of geological settings, see Chapter 3. 2. 3.

⁸⁵³ Fıratlı 1974, 919–932; Yalman 2000, 121–125. 129; Ermiş 2009, 190–237; Ermiş 2011, 121–139.

⁸⁵⁴ Yalman 2000, 96–99. This type of graves is called χαμοσόριον, translation as ‘flat grave’ based on The Online Liddell-Scott-Jones Greek-English Lexicon:

URL <http://stephanus.tlg.uci.edu/lsg/#eid=116310&context=lsj&action=from-search>.

chambers with *dromos*,⁸⁵⁵ one grave chamber in the form of a sarcophagus,⁸⁵⁶ one rock cut grave monument,⁸⁵⁷ one grave monument with three *stelae*, one obelisk⁸⁵⁸ and one *ostothek*. Two more monuments connected with funerary activities are also included in the group. This is a massive reef rising above *Nicaea* and decorated with rock cut busts⁸⁵⁹ and one rock cut sanctuary.⁸⁶⁰

Although the chronology of the assemblage covers the Hellenistic, Roman and the Early Byzantine era, the spatial distribution of the funerary monuments shows a distinct pattern. It seems that the ancient roads radiating from the town were not accompanied by rows of sarcophagi.⁸⁶¹ The presumption based on observations in the field was confirmed by the recent geophysical research at the Southern Gate⁸⁶² which did not confirm any funerary architecture under the ground. Despite their character, the monuments are for the most part (89 per cent) situated in the foothills of the Samanlı and Katırlı Mountains. The remaining 11 per cent are *stelae* or sarcophagi found in the fields, creating a group of less monumental graves situated near the city walls and / or along the road.⁸⁶³

Why is there a lack of well-built sarcophagi along the roads? Looking at the hinterland of *Nicaea* and at the extent of the town itself, I suggest interpreting the phenomenon as a tendency of the inhabitants to keep as much fertile land around *Nicaea* as possible, available solely for agricultural activities. Therefore, the graves were shifted beyond the fertile fields, to the foothills of the mountains.

⁸⁵⁵ Yalman 1994, 171–188.

⁸⁵⁶ Pococke 1745, 122 f. pl. 60, I; de Laborde 1838, 38 pls. 15. 33; Texier 1882, 109; Schneider 1943, 7 f. Taf. 3; Rodenwaldt 1943, 5–7 Abb. 2. 3; Kleiner 1957, 8 Taf. 5, 2. 3, Berns 2003, 238 f. Taf. 21, 1. 2.

⁸⁵⁷ Yalman 2000, 96–99.

⁸⁵⁸ Pococke 1745, 123 pl. 61; Texier 1882, 109 f.; Schneider 1943, 7 Taf. 1. 2; Şahin 1979, no. 85; Berns 2003, 159. 162.

⁸⁵⁹ Şahin 1979, pl. 4. 5, no. 38.

⁸⁶⁰ Yalman 2000, 93 f.

⁸⁶¹ This phenomenon is described in general by Berns 2003, 130. 132. In particular, it can be observed along the road leading from *Heraclea Pontica* to *Prusias ad Hypium* (Hoepfner 1966, Plan 2); along the road leading to the west from *Kyaneai* (Kupke 1998, 6) or in *Assos* along the road coming from the north and leading to the Western gate. *Assos* is a good example, since during the Roman times the new road was built right next to the Hellenistic road in order to create new space for Roman graves (Berns 2003, 53 f.).

⁸⁶² Conducted by the Institute of Geophysics of the Christian Albrechts University Kiel.

⁸⁶³ An analogous phenomenon of the spatial distribution of funerary monuments can be observed around *Sagalassos* (Köse 2005, 17–24).

Another factor is the role of the scenic view of the graves,⁸⁶⁴ as the most imposing graves are often situated right under the mountains, overlooking the hinterland of *Nicaea* and, presumably, also a property of the deceased.⁸⁶⁵

I performed the lines of sight for all the 55 funerary monuments and this exercise proved that 36 per cent of the monuments directly overlooked the town of *Nicaea*, revealing lines of sights similar to the one used here as an example (Figure 68 below). Reading the graph, the black point stands for the viewpoint and the green point for the distant point. For the view point which represents a funerary monument I consider the height of the viewer equals 1.7 m. The distant point is *Nicaea*. The dashed line between the two points is the line of sight, i.e. a line from an observer's eye to a distant point. The red and green curve represents the terrain between the observer and the distant point. The green sections show all the places the observer's eye can see, the red sections, on the contrary, cannot be seen from the given viewpoint.

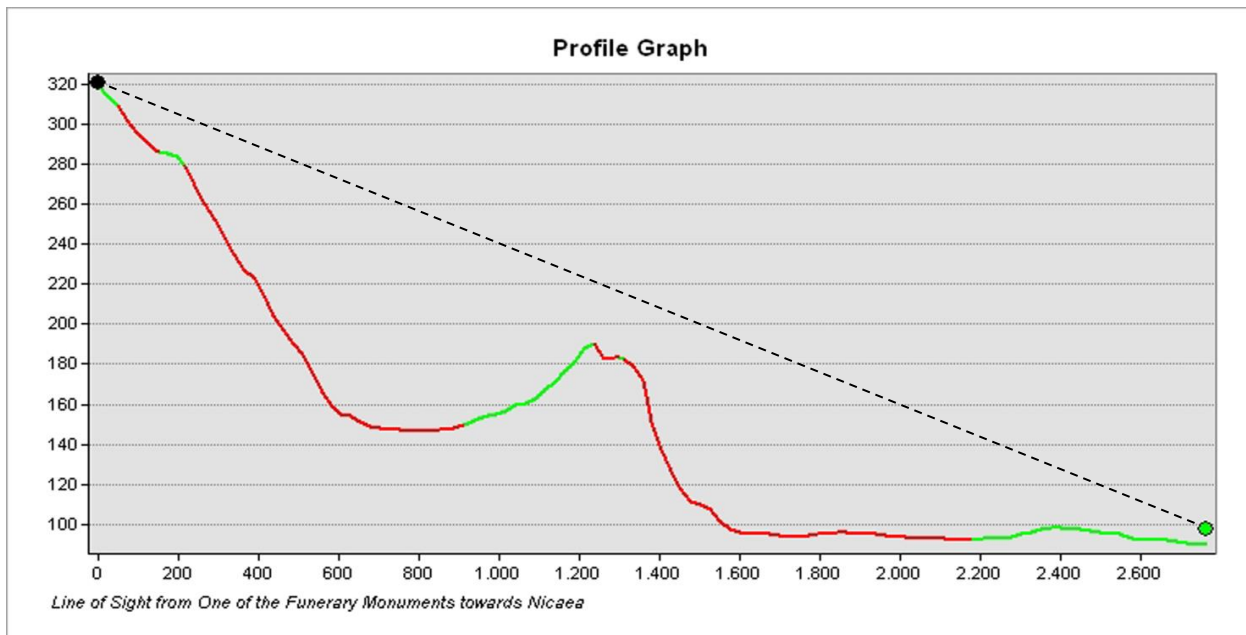


Figure 68: Line of Sight similar to 36 per cent of Funerary Monuments towards *Nicaea*

⁸⁶⁴ The types of funerary buildings situated on well visible and outstanding spots in the landscape or directly along the roads are described by Berns (2003, 20 f.) as 'memorial buildings'. The monuments are characterised by a monumental architecture and / or rich decorations. As such, these monuments possess of a lasting public representation of the wealth and status of the deceased which is to be observed from afar. On funerary monuments in Asia Minor in general and their potential to provide the opportunity for public advertisement and social display, see Cormack 1997, 141–145.

⁸⁶⁵ Geppert 1998, 87 performs a similar study on the distribution of graves in the hinterland of *Kyaneai*, pointing to a group of 69 stand-alone graves. The results are not unambiguous, since the spatial distribution either features too dense clustering around one piece of land or there are too many dwellings surrounding one grave.

Since *Nicaea* is visible only from a mere 36 per cent of the monuments, this criterium does not seem to be decisive. I decided to perform a different kind of analysis with an aim to determine a common characteristic for the major part of the graves. The following text encompasses descriptions of two diverse viewshed analyses performed in the hinterland of *Nicaea*.

The first viewshed analysis considers all the funerary monuments as points of view and determines the viewshed from each of them. The resulting map Figure 69 divides the territory into colour schemes based on the number of funerary monuments which can see a particular point, and which can be seen from the particular point. Each square of the raster, *videlicet* each 30x30 m, represents one point and it is examined separately, shows the visibility within the assemblage.

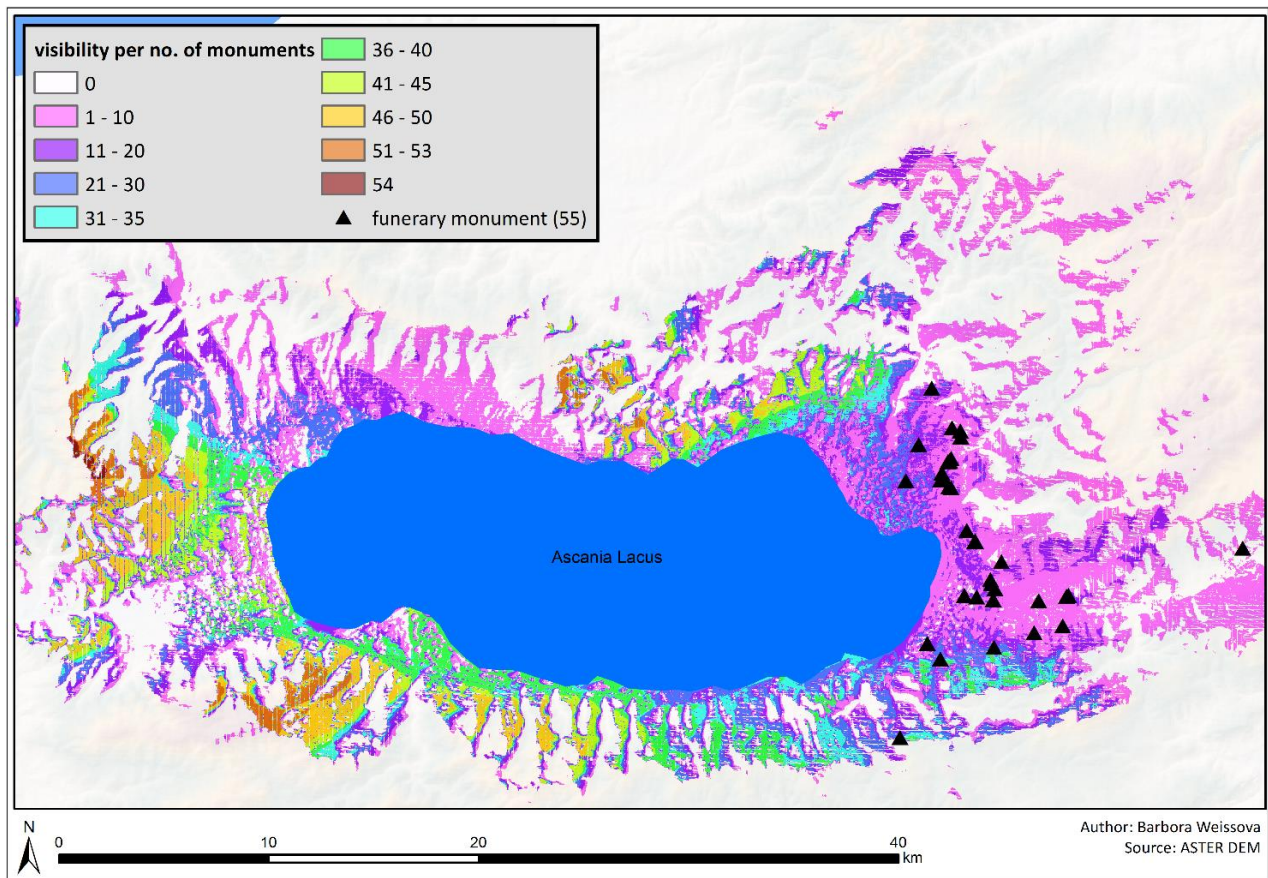


Figure 69: Results of the Viewshed Analysis from all the Funerary Monuments (55) (Addendum 1. 43.)

This exercise demonstrates that the view to the far distance, towards the *Ascania Lacus*, as far as the western horizon allows, seems to be the most important. It is the common view for all the funerary monuments but one. Is the location of monuments caused by the need of a nice and

unobstructed view during the funerary festivities? Or is it connected with the importance of the lake in the life of the inhabitants of *Nicaea*? Or is it possibly representing the direction towards the Marmara Sea, a trading route connecting *Nicaea* with the sea?

Depending on the architecture of the funerary monuments, memorial buildings could be probably seen from the road *Prusias ad Mare – Nicaea*. However, for the most part, their size was too modest to be seen from further distances, not to mention the vegetation which stood in observer's view.

The second viewshed analysis considers the importance of the supra-regional 'Pilgrim's road' and calculates with its route as with an initial line of sight. It counts the viewshed along its entire length. All the places visible at some point from the 'Pilgrim's road' are depicted on the map Figure 70, differentiated by the red colour of the terrain. This exercise shows an outstanding pattern. All the graves but one could be seen from the 'Pilgrim's road'. The remaining grave is visible from the regional road '*Nicaea – Prusias ad Mare*'. The clustering of the funerary monuments in the sight of view of passers-by points out to the utmost importance of this aspect, characterizing spatial allocations of funerary monuments in the hinterland of *Nicaea*. Nevertheless, as in the first analysis, this criterion certainly does not apply to all of them. The visibility is directly dependent on the individual size of each of the grave monuments and on the vegetation possibly standing in the view; only the monumental ones were observable from the road.

The map Figure 70 features one more aspect to be pointed out. Based on the hitherto collected data, the ridges which are highlighted as visible from the road represent allocations most suitable for the monumental funerary architecture. They create a map of potential necropolises, requiring further verification in the field.

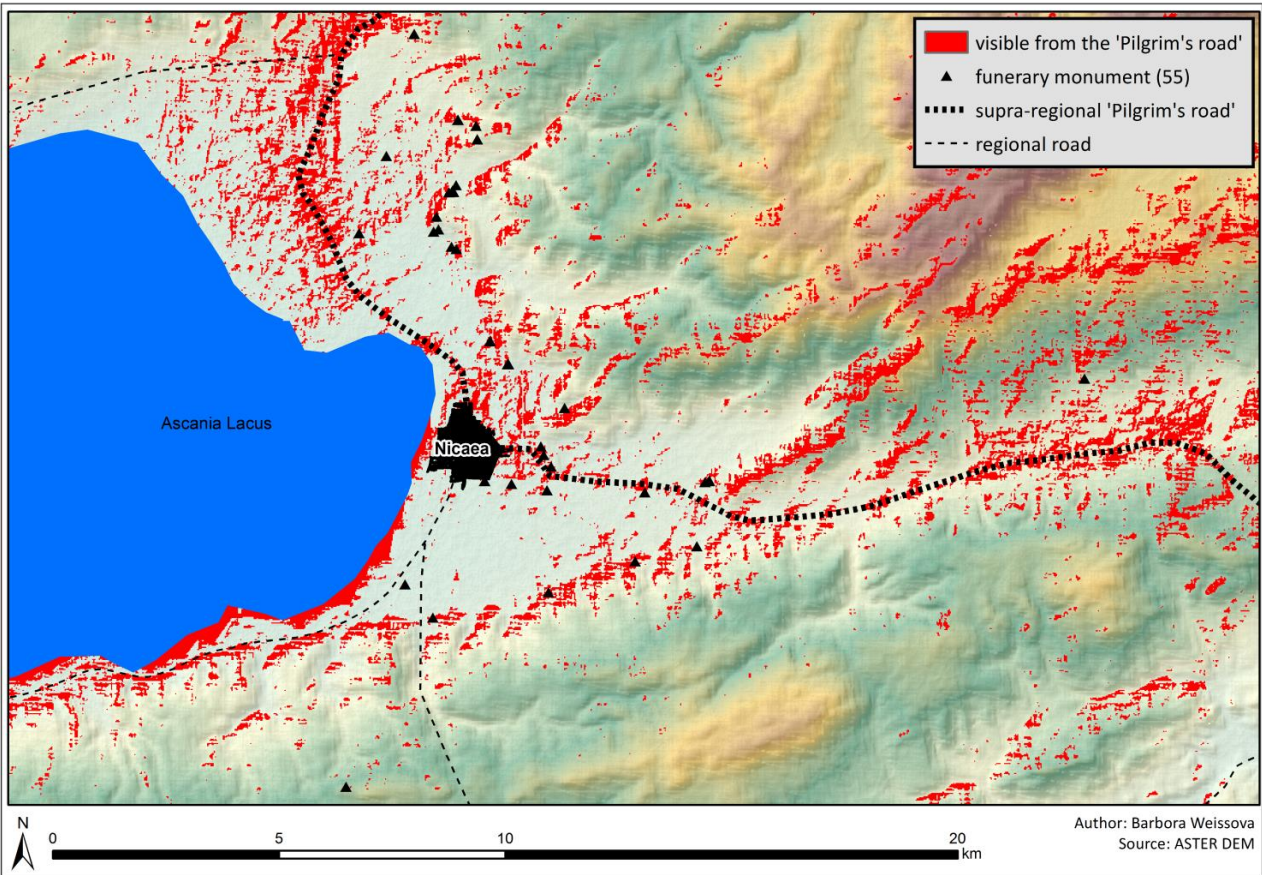


Figure 70: Results of the Viewshed Analysis from the 'Pilgrim's Road' (Addendum 1. 44.)

8. 8. Conclusion

The micro-regional study analyses the economic development of *Nicaea* and its hinterland and further accomplishes the study with comparative analyses on a multi-scalar basis. Quantifiable data collected in the territory allow for an examination of the economic situation in the city of *Nicaea* and in its immediate hinterland, further compared to the development in the rival city of *Nicomedia*, other cities situated in the macro-region and, finally, cities in Asia Minor.

The extent and resultant population estimates confirm the position of *Nicaea* as the primate-city in the territory. However, *Nicomedia* proved to be considerably larger, consequently with more inhabitants *intra muros*. This fact suggests that *Nicomedia* was also economically stronger during the Roman period. The development of the cities during the Early Byzantine period suggests a change in the tendency. Considering the economic impact of the ecumenic council

organised in *Nicaea* in AD 325,⁸⁶⁶ frequent destructive earthquakes striking in *Nicomedia* during the 4th and 5th century AD⁸⁶⁷ and, finally, the diversification of the traffic in the 6th century AD avoiding the way through *Nicomedia*,⁸⁶⁸ I argue that *Nicaea* became economically stronger than *Nicomedia* during the Early Byzantine era.

When compared to the sizes of *Heraclea Pontica* and *Tium* during the Roman period, the extent of *Nicaea intra muros* encompasses almost twice that of the city of *Heraclea Pontica* and eight times that of the city of *Tium*. In the entire Asia Minor, *Nicaea* belongs to the ten largest civitates.

The diverse professions are confirmed by mere two inscriptions. The analysis of the division of labour based on the epigraphic evidence is not applicable in the present assemblage.

Capital investments create a separate economic proxy discussed in the territory of *Nicaea* and its hinterland. The investments in public buildings based on the epigraphic evidence⁸⁶⁹ are enhanced with literary sources. In particular, five inscriptions are supplemented with eight remarks about different building activities by ancient authors. The assemblage features the same peak as the evidences from the entire macro-region and from Asia Minor, falling in the 2nd century AD. The upkeep and the maintenance of the road system are proved by five inscriptions with a definable peak during the 3rd century AD.

The reconstruction of settlement patterns during the Hellenistic, Roman and Early Byzantine periods is based on the Barrington Atlas and completed with the results of the ISP15. The enriched numbers of settlements for each given period enable to estimate densities of rural settlements, further compared with estimates for the macro-region, region of Paphlagonia and, finally, for Asia Minor. The comparative analyses demonstrate that the survey, although not a total coverage of the hinterland, brought striking results especially concerning the Hellenistic settlements. Among others, the results point out to largely underestimated densities of the Hellenistic settlements in the entire macro-region.

Based on the ranges of altitudes available in the micro-region (between 0 and

⁸⁶⁶ Kaçar 2005, 305–318.

⁸⁶⁷ For a brief description of the earthquakes, see Table 5.

⁸⁶⁸ The diverted road and economic consequences are discussed in detail in Chapter 7. 5. 1.

⁸⁶⁹ For details, see Chapter 5. 5. 1.

500 m a. s. l.), I point out varying densities of the settlements during the analysed timespans, further compared with the macro-region. The density of Hellenistic settlements is 21 times larger, Roman and Early Byzantine settlements feature both at least five times larger density in the micro-region than in the macro-region.

Functional analysis of the hinterland follows the spatial distribution of marble quarries and wine / oil presses identified during the field survey and shows the division of the territory into three main functional zones. The first zone is created by the western slopes of the Samanlı Mountains, rich in marble deposits and hence exploited in eight large marble quarries during antiquity. The remaining two zones, spread in the foothills of the mountains, create the northern and southern border of the micro-region. The zones are characterised by the distribution of wine / oil presses which point out to their function connected with viniculture / olive oil production.

The analysis of the hinterland is further accomplished by studying the spatial distribution of the funerary monuments. The survey pointed out to an interesting characteristic of the distribution of the graves in the hinterland of *Nicaea*. Most of the graves, regardless of their character and chronology, are distributed in the foothills of the mountains. With the help of GIS tools, I examined the possibility that the scenic view was the decisive factor for their allocation. The line of sight showed that the city of *Nicaea* can be seen from mere 36 per cent of the graves. The viewshed analysis performed from all the funerary monuments showed that they kept the view of the western shore of the *Ascania Lacus*. The viewshed analysis calculated from the entire length of the 'Pilgrim's road' showed that the vast majority of the graves could be at some point seen from the road. However, for the final interpretation of the visibility it is necessary to consider the size of each of the monuments as well as the possible vegetation standing in the view. Although the results of the viewshed analysis need to be re-evaluated, best *in situ*, I find the function in general applicable and meaningful when searching for a possible common view of a large number of features.

The last section introduces one of the factors of the trade. It studies the imports of sarcophagi from *Docimium*. The imports confirm an essentially good economic situation of the city and its inhabitants. Although *Nicaea* had its own rich sources of marble, located directly in its hinterland, the economic situation of the local population enabled to import the prestigious and

costly marble from *Docimium*. Quantified temporal analysis of the sarcophagi completes the picture of the economic development of *Nicaea*. The chronology of the sarcophagi falls within the 2nd and 3rd century AD, in particular to the time span from AD 115 to AD 250, with a peak in the 2nd half of the 2nd century AD. This development fits well to the growth of the entire epigraphic evidence from *Nicaea*, reaching its peak during the 2nd century AD, with only a moderate decline during the 3rd century AD. As the dated assemblage of marbles imported from *Docimium* and found in *Nicaea* / its hinterland falls within the peak outlined by the quantified spatial analysis of the entire epigraphic evidence, it also rectifies the accuracy of the applied analysis *per se*.

The micro-regional study proved its applicability and significance for the entire macro-region, since it validated results of the study. Based on various kinds of the available data, the micro-regional study achieved analogous results concerning the peaks of the evidence as the macro-regional analysis. Moreover, it offered more details of the causes, as in the case of the capital investments in public buildings and in the road system. The combination of two scales examined in a considerable detail was of a vital importance for this study.

9. Conclusion

The primary goal of the present thesis is an investigation of the economic development of NW Asia Minor in the Hellenistic, Roman and Early Byzantine periods. During the initial steps of the work, I focused on identifying and collecting the datasets suitable for an assessment of the economic situation, using quantified spatial and temporal analyses. I studied the literary sources and archaeological evidence, looking for quantifiable proxies enabling to follow the expected changes in the territory. Besides the quantifiability, evidently, the main criteria included the availability of the spatial and chronological information, in both cases as precise as possible. This initial step of searching for the suitable data and their subsequent digitizing represented rather an arduous task, since there were no similar studies hitherto performed in the territory. Thanks to several online databases focused on digitising of archaeological data in bulk, I could get the first impression concerning the available proxies.

After more than two years of a careful study of the materials, I decided for one proxy as a basis of the quantified spatial and temporal analyses. The most numerous, the most widespread, and dated throughout the entire analysed time span, is the epigraphic evidence. Since I am not an epigraphist, I mainly focused on an analysis of the evidence in bulk, following fluctuations in the numbers *en masse* and in their spatial contexts. However, some of the topics discussed on the inscriptions directly relate to the economic performance. To fully explore the potential of the collected data, I analysed these inscriptions separately. The topics which I present as proxies demonstrating the economic situation in NW Asia Minor include capital investments, evidence of trade, demonstrations of food and / or land divisions, divisions of labour and evidence confirming the existence of rural settlements.

An inherent part of the analysed epigraphic evidence are milestones, the direct witnesses of the investments in constructions and maintenances of the Roman road system. The numerous collection of the milestones prompted the second topic analysed during my work, the development and upkeep of the road system. Although the milestones were in use only during the Roman period, the system of communications can be reconstructed and further analysed with the help from the literary sources.

The last topic which I considered to be suitable for a detailed examination in the present thesis, are densities of settlements, with a special focus on the urbanization. Although the status of the cities is based on the literary sources and it is, therefore, largely questionable, I explore their distribution models and interpret them with respect to the economic situation. The literary sources are numerous and unambiguous when describing the statuses of the cities and since there are no researches in the territory which would intervene in the picture, I follow their definitions.

When I defined the most numerous proxies suitable for the quantified spatial and temporal analyses, I focused on the methodological questions and issues. Reading through the countless studies interpreting the ancient economy, it is not an easy task to decide which methods and models are the most suitable and meaningful for assessing and explaining the economic development in the targeted area. The history of the economic studies is rather long and full of twists. Within its course, many approaches were suggested, used, and later on disproved as insufficient. Finally, I did not argue for any of the economic models in particular. The scarcity of the available datasets made me consider the methodologies which examine the external manifestations of the economic activities to be the most suitable. In the present work, I focused on demonstrating the fluctuations in numbers of these external manifestations and interpreting them as the expressions of the changes in the economic situation itself. At this point, it is necessary to point out the initial problem connected with this approach. It is the definition of the manifestations *per se*. Each of the datasets I analyse in order to demonstrate the economic development is standardly used in economic studies, but each of them is also criticised as misleading and deceptive. In order to present all the main contradictory points, the analytical chapters encompass a methodological part, discussing the diverse approaches and criticisms connected with the utilisation of the particular manifestation. I hope that hereby I managed to demonstrate the reasons why I found the specific proxy suitable and meaningful for the present work.

One of the aims of the work was to perform clear and transferable analyses, accompanied with explanations describing the methodology. Presenting the applied methodologies step by step, I avoid the often criticised 'black box', i.e. the insufficiently explained analytical approaches

'somehow' leading to results. This approach enables not only an instant definition of possible mistakes, but it also provides an easy reapplication in different environments, in case the methodologies prove their correctness and applicability.

What are the approaches used in the present thesis? The main procedures applied throughout the entire work are the quantified spatial and temporal analyses. In particular, the quantifiable data are divided based on their chronology and presented in the spatial environment. This methodology enabled me to demonstrate the fluctuations in numbers and examine the spatial distribution in given periods. As the main tool for the presentation of the collected data I used the maps which I created in ESRI ArcGIS. The analysis proved to be a powerful tool especially when examining the numbers of epigraphic evidence (see Addendum 1. 14.) and when demonstrating their chronology (see Addendum 1. 15.).

The spatial aspect of the data allowed me to use several tools such as the Voronoi diagram / Thiessen polygons, ring buffers, the least cost path analysis, the line of sight and the viewshed analysis, lately frequently applied in archaeological studies. The applicability and correctness of these tools is often brought into question. In order to contribute to this debate, I compare results of the analyses with the available historical and archaeological data.

I use the Voronoi diagram / Thiessen polygons for determining the territory of a city, the ring buffers for determining the territory under a direct control of a city, the least cost path analysis for calculating the most feasible routes of the roads, the line of sight for demonstrating the view between two features and, finally, the viewshed analysis for visualising the common view of a number of features. In the following summary, I present the results achieved in the methodological part of the study.

The tool Voronoi diagram / Thiessen polygons was used for dividing the territory between the cities. The analysis was performed in three instances; for the cities dated to the Hellenistic, to the Roman and, finally, to the Early Byzantine periods. The comparison of the results with historiographical data proved the applicability of the tool solely in the territories with an equal distribution of settlements. The issue lies in the fact that the Voronoi diagram / Thiessen polygons naturally create as even a division of the territory as possible based on the distribution of given points. Since

the reality is often heteroclitic and some of the cities govern considerably larger territories than the others, this type of the terrain analysis creates misleading results. Specifically, it represents the small territories naturally larger and the large territories again smaller. The equalisation of the division of the territory may lead to the misinterpretation of the economic situation, since the equally divided area is generally interpreted as an equal and universally favourable condition for each of the cities. However, the Voronoi diagram / Thiessen polygons offer an appropriate tool for visualising and examining the possibly most favourable divisions of analysed territories. These divisions, however, need to be further combined with historiographical sources and natural delimitations to be adjusted accordingly.

The multiple ring buffers which I used for determining the possible territories directly governed by a city proved a better applicability when analysing archaeological records than the aforementioned Voronoi diagram / Thiessen polygons. Naturally, the ring buffers have not the ability to count the territory which was in reality under a direct control of one city. However, they enable to determine the territories which have an utmost potential to be under the control. Since the ring buffers allow to create identical circles around each analysed city which, in this case, equal a one day's walking distance of the city, they outline areas which could be and most probably also were under the control. When performed for the cities dated to the Hellenistic, Roman and Early Byzantine periods separately, the ring buffers enable to determine the differences in the areas under a direct control and the remote areas, more than one day of walk far from any city. I find these disparities to be a suitable tool for estimating the development of the urbanization. Nevertheless, the comparable urbanization estimates feature one issue necessary to be kept in mind when interpreting the data. Above a certain density of cities, the ring buffers do not show any differences in the estimates even though the density of cities grows, since the rings simply overlap. The particular, the density depends on the radii of the applied ring buffers. Since the ring buffers calculate the crow-fly distances and do not take into account the terrain model, the multiple ring buffers offer a range of the minimum and the maximum distance reachable in a day. In the present study, I use the estimates between 18.5 and 37 km. As follows from the given radii, when a new city emerged within the distance of 37 km from an already existing city, its territory did not fully appear in the analysis. The closer to the existing city, the smaller was the newly

embraced area (compare the Table 24 and the maps Addenda 1. 17, 1. 19 and 1. 21). From this point of view, there is a border of an applicability of this tool, differing based on the given radii, which needs to be kept in mind when interpreting the results.

The least cost path analysis (the LCPA) is a complex analytical tool consisting of several independent steps which allows for calculating the cheapest road between two given points. For the present study, I used the anisotropic LCPA, counting the routes solely with a relation to the elevation model. All the other data including riverbeds succumbed to fundamental changes and the current data do not provide sufficient constrains for modelling of the ancient roads. The archaeological data which I used for the verification of the results of the LCPA include rectified positions of ancient bridges, spatial distribution of milestones and, although only scarcely available, the spatially rectified information concerning the original pavements of the roads. These kinds of data were available in a sufficient amount between 16 nodal points, resulting in 13 segments of the roads allowing for the verification of the functionality of the LCPA. The LCPA proved an infallible applicability in more than 60 per cent of the analysed datasets. However, the remaining calculations were completely wrong. The erroneous sample featured a common problem. The results of the LCPA counted the less arduous path which was in these cases considerably longer than the shortest path. Since the archaeological remains I used for the comparative analysis are all dated to the Roman period and the Roman road system is well known for its efficiency, the Roman roads, apparently, took the shortest paths. Although more strenuous, the length played the decisive role in this scenario. The anisotropic LCPA proved its applicability for the reconstruction of the Roman road system without errors only under the condition that the calculated route was not fundamentally longer than the shortest possible way (for instance, see the reconstructions of particular segments of the 'Pilgrim's road' in Addendum 1. 22.).

The line of sight and the viewshed analysis represent the last two analytical tools I attested for the applicability in the archaeological record. These tools seemed to me, on the first sight, a perfect addition to any archaeological study examining the intervisibility between two or more points. However, both of the analyses feature the same fundamental problem. The line of sight as well as the viewshed analysis count the obstructions in the view based on the relief of the terrain. In reality, it is highly probable there were also other obstructions which are not further assessed

during the analysis. For instance, the height of the possible vegetation, the common visibility in the area (for instance hindered by frequent fogs) and the greatness of the analysed objects need to be always considered when interpreting the data. Examining the results of the viewshed analysis performed for all the 55 graves situated in the hinterland of *Nicaea*, their common view are the mountains situated at the western shore of the *Ascania Lacus* (the Iznik Lake). However, the observations in the field and consultations with locals proved that the western shore of the lake is for the most part of the year in the fog or in the clouds, not visible at all. Therefore, the common view needs to be interpreted as a view on the lake itself and not on the mountains situated at its western shore (for visual depiction of the results see Addendum 1. 43.). On top of that, a possibility of the obstructed view caused by the lush vegetation needs to be considered. Therefore, the results of the line of sight and viewshed analysis cannot be presented without further descriptions and explanations of these obstructions. Although not a flawless tool, I still find the analyses relating to the intervisibility to be a tool with a great potential, only the interpretations of the data require a bit of circumspection.

What are the actual results of the applied analyses? What peaks and falls features the economic situation in the territory? In the following text, I summarize the economic fluctuations defined by each of the analysed proxies, linking them to the pertinent addenda where applicable. On the first place, however, I shortly present the delimitations of the macro- and micro-regions.

The macro-region was defined with an aim to encompass the entire area of Bithynia, taking into account its transformations during the Hellenistic, Roman and Early Byzantine periods. Since the territorial extension admittedly changed several times, I decided to encompass as large an area as once conceivably belonged to the territory of the ancient Bithynia. This approach in reality means that the macro-regional borders are rather larger than the extent of Bithynia during any of the discussed periods. I outlined the borders by including all the cities mentioned as once being a part of the territory. Moreover, the resulting delimitations follow natural borders represented by major rivers and significant ridges of mountains. The central political powers ruling over the territory during the discussed periods include the Bithynian Kingdom, the Roman province of Bithynia (or the western part of the double province Bithynia et Pontus) and the two Byzantine

provinces *Ponticaea* and *Honoriadis* (*Honoriadis* not in its entirety, since it stretches further to the west). The territory of the macro-region stretches over an area including approximately 43,000 sq. km. The western border is formed by the Ulubat Lake (*Apolloniatis Lacus*) the Mustafakemalpaşa River (*Rhyndacus*), the Marmara Sea (*Propontis*) and the Bosphorus (*Bosphorus*). The northern border follows the Black Sea coast (*Pontus Euxinus*). The eastern boundary follows the Bartın River for approximately 50 km and then it continues to the south as far as the Sakarya River (*Sangarius*). The southern border follows the River Sakarya and the Uludağ Mountains (*Olympus*).

The micro-region is situated in the western part of the macro-region and it covers approximately 161 sq. km. The analysed territory includes the city *Nicaea* and its immediate hinterland. The northern and the NE borders of the micro-region are formed by the Samanlı Mountains. The eastern border cuts the narrow valley between the mountains about 18.5 km east of the city (the distance equals to the minimum territory embraced by one city based on the ring buffer as described above). The southern border is created by the Katırlı Mountains and the western border by the Iznik Lake.

The epigraphic evidence revealed 2,878 inscriptions and the assemblage could be divided by find-spots and identified with 18 urban settlements. The quantified analysis of inscriptions available for each centre showed following results (with no. of inscriptions in brackets): *Nicaea* (761), *Nicomedia* (502), *Prusa ad Olympum* (344), *Claudiopolis* (252), *Chalcedon* (200), *Prusias ad Hypium* (179), *Hadrianopolis* (154), *Prusias ad Mare* (136), *Apamea* (114), *Heraclea Pontica* (107), *Tium* (35), *Dascyleion* (18), *Apollonia ad Rhyndacum* (12), *Cretia Flaviopolis* (12), *Strobilos* (10), *Pylae* (9), *Iuliopolis* (7) and *Caesarea Germanica* (5).

The results of the quantified spatial analysis point out to the utmost importance of *Nicaea*, followed by the city of *Nicomedia*. However, the evidence from *Nicomedia* is more than 30 per cent smaller than the records from *Nicaea*. Regarding the numbers of the epigraphic evidence as a proxy of the economic status, *Nicaea* seems to be the strongest city in the macro-region. However, considering the historic records of destructive earthquakes, *Nicomedia* suffered considerably more than *Nicaea* during the 4th century AD. Therefore, it is also necessary to reflect

on the possibility that a large amount of the epigraphic evidence could simply be destroyed and buried during the earthquakes.

The spatial and temporal analysis points out the peaks of the evidence in each of the centres. The urban centres featuring a sufficient number of inscriptions to reconstruct developmental curves are 12 and include *Apamea*, *Chalcedon*, *Claudiopolis*, *Heraclea Pontica*, *Hadrianopolis*, *Nicaea*, *Nicomedia*, *Prusias ad Hypium*, *Prusias ad Mare*, *Prusa ad Olympum*, *Strobilos* and *Tium*.

Out of the 12 analysed assemblages, nine of them have peaks oscillating between the 2nd and 3rd century AD. These are *Claudiopolis*, *Heraclea Pontica*, *Hadrianopolis*, *Nicaea*, *Nicomedia*, *Prusias ad Hypium*, *Prusias ad Mare*, *Prusa ad Olympum*, and *Tium*. The last three urban centres, *Chalcedon*, *Apamea* and *Strobilos*, represent outliers in the analysed evidence. The urban settlements were influenced by diverse external local factors that, noticeably, did not have a strong impact on the situation in the entire macro-region, but solely on the conditions in the territories of these cities. For instance, *Chalcedon* flourished relatively continuously during the analysed time spans due to its favourable position controlling the trade route towards the Black Sea.

The developmental curve of the epigraphic evidence analysed in bulk revealed following results; a moderate increase during the time span between the 4th and the 1st century BC is followed by a dramatic increase during the 1st century AD. The peak of the evidence falls within the 2nd century AD, the decrease is apparent in the 3rd and 4th centuries AD. The evidence stagnates at very low estimates during the 5th and the 6th centuries AD.

The quantified temporal analysis of the inscriptions mentioning topics related to the economy revealed its peak during the 3rd century AD, followed by a slight decrease of the evidence during the 4th century AD. The decline then came during the 5th century AD.

The comparative analysis of the results following from the assessment of the epigraphic evidence *en masse* and from the selective interpretation of inscriptions connected with economic topics revealed a shift of almost an entire century. The shift was, for the most part, caused by the chronology of milestones. The milestones create 50 per cent of the assemblage and feature the peak of evidence during the 2nd half of the 3rd and at the beginning of the 4th century AD. Since the

maintenance and upkeep of the roads is not unambiguously connected with the regional economy but can be also aimed at the extra regional economy, I decided to exclude them from the analysis. Without the milestones, the outcomes confirm the economic peak of the macro-region during the 2nd and within the first half of the 3rd century AD.

The building activities create one of the most relevant proxies when examining the economic performance and, fortunately, also the most significant group of all the economic topics available for the macro-region. Their chronology narrowed down the peak to 25 years, to the 2nd quarter of the 2nd century AD. It is tempting to interpret this significant and relatively short-term peak as a heyday encountered in the macro-region. However, it comes with one decisive fact. The peak of the investments directly follows one of the devastating earthquakes, possibly simply prompting the obvious cumulation of the building activities. Therefore, I tend to interpret the peak of the epigraphic evidence rather *en masse* and place it during the entire 2nd and at the beginning of the 3rd century AD.

The milestones were analysed separately in the context of the reconstructed road system. Spatial distribution of the dated milestones enabled following investments in seven roads in total. These include the supra-regional 'Pilgrim's road' and six regional roads. Spatio-temporal analyses of the investments brought striking results. Above all expectations, the construction of a stable road system reaching as far as the *limes* on the *Euphrates* River, generally anticipated during the Flavian dynasty, is not proved by the milestones. The building activities dated to the 1st century AD relate to the regional roads connecting the cities situated inland with their ports located at the sea. In other words, the first investments in the road system focus merely on the roads enabling regional communications. Therefore, I interpret them as communications securing the fast and smooth connection in the macro-region, ensuring the economic development of cities situated inland. This ascertainment implies that the Flavian dynasty did not build the supra-regional road leading to the *limes* at the *Euphrates* River in the first place but took care of the stability of the regional economy. Only then, as follows from the sequential public investments, the Roman Empire started with the constructions and upkeep of the supra-regional communications.

The first investments in the supra-regional 'Pilgrim's road', crossing Bithynia from the NW to the SE, as well as investments in the regional 'Northern road', crossing Bithynia from the west to the east and connecting Bithynia and Pontus, are documented at the beginning of the 2nd century AD. Both roads were financed during the reign of the Emperor Trajan. The upkeep of the 'Pilgrim's road', as documented on the dated milestones, continued until the third quarter of the 4th century AD. The maintenance of the 'Northern road' terminated more than 60 years earlier, by the beginning of the 4th century AD. However, according to the literary sources, massive investments followed during the reign of Justinian I., *videlicet* between the years AD 527 and 565.

The first investments in the regional roads predate the peak of the economic development in the area outlined by the epigraphic evidence. I assume that it follows a natural way of the development, since the roads were the first investment in the region and functioned as the 'drivers of growth'. Their existence enabled a faster economic development of the entire territory, including the centres situated inland. This point of view interprets the first investments as directly aimed at the regional economy. The roads were built to sustain the trade and supply of goods. This development took place during the 2nd half of the 1st century AD. The investments in the 'Pilgrim's road' and the 'Northern road', conducted during the 2nd century AD, fall within the peak of the economic development.

The massive investments carried out at the turn of the 3rd and the 4th century AD do not correspond with the development outlined by the epigraphic evidence. The numbers of inscriptions identified in the macro-region for the most part already decline. This inconsistency of the results might be explained as follows. The regional economy, booming during the second half of the 1st century and having its subsequent peak during the 2nd century AD, step-by-step declines during the first half of the 3rd century AD. The investments focused on the 'Pilgrim's' and the 'Northern' roads, evidently discordant with the outlined regional development, aim for the maintenance of these arteries crossing the NW Asia Minor and connecting remote sites situated in the west and in the east, out of the analysed macro-region. Thus, the later investments in the upkeep of the road system are not aimed at the development of the regional economy and, most likely, do not have as strong an impact as might be assumed in the first place.

The anticipation that the supra-regional road leading through the territory was the most important one and that the territory gained in importance because the road led through, is not proved by the recent study. On the contrary, the regional economy features a massive development before one can confirm the investments in the 'Pilgrim's road' *per se*.

The functional analysis based on the distribution of road stations confirmed the transformation of the territory into a transitional one during the Early Byzantine period. The number of road stations increased from a mere seven during the Roman period to 23 in total in the Early Byzantine era. Although some of the Early Byzantine road stations were possibly in use already during the Roman period (as demonstrated the results achieved during the field survey which predated the road station *Ad Schinae* to the Roman period), the difference is still remarkable.

The last quantifiable dataset I analysed in this study are the settlements. I examined the fluctuations in the densities and types of the settlements, looking for possible patterns in their distribution.

A temporal analysis of urbanization features a subsequent growth during the analysed periods, reaching the densest coverage during the Early Byzantine era. The changes between the studied periods are relatively even since there is a lack of clearly observable and sudden growth of the urbanization during one of them. In particular numbers, the extensive urbanized area, *videlicet* within a maximum radius of 37 km around each centre, grows from 34 sq. km during the Hellenistic period to 41 sq. km in the Roman period and reaches 46 sq. km in the Early Byzantine era.

The most striking results brought the spatial and temporal analyses of the urbanization as they clearly outlined one important fact. The urbanization models defined in the macro-region enabled to see the development of the territory as undoubtedly uneven. Some cities and their territories featured the central place distribution, some the primate-city distribution in its positive form, some reached the negative outcome known as *hypercephalie*. These completely diverse models of the regional economies were simply coexisting one next to the other. In particular, the territory encompasses densely urbanized areas with cities situated a 'half day way' from each other on the one side and extensive areas with one large metropolis several days from any other

city on the other side. The decisive factor seems to be the terrain model, *videlicet* the accessibility and fertility of the area, combined with the favourable allocation along the main roads and with a maximum estimate of one day travel from the sea.

The central place distribution of cities with presumably similar and in general favourable economic situation was detected in lowland areas, with good living conditions and uniform access to resources, including the proximity of the sea. In particular, such a cluster of cities was detected in the SW of the macro-region. It encompasses the cities of *Apamea*, *Dascyleion*, *Apollonia ad Rhyndacum*, *Caesarea Germanica* and *Prusa ad Olypium*.

The primate-city distribution in its positive form in relation to the economic development was encountered in a more difficult terrain, but in the evenly and moderately difficult terrain. In this case, it refers to the mountainous and hilly areas with similar fluctuations in altitudes and with evenly difficult access to resources. These cities are distributed 'one to two days' way' from each other. The larger distances in this distribution model can be explained by the difficulty of the terrain and by less fertile hinterlands. Therefore, each of the cities needed to embrace a larger area to sustain the consumption of its inhabitants. The primate-city distribution model was detected in the NE part of the macro-region and it includes the cities *Claudiopolis*, *Cretia Flaviopolis*, *Hadrianopolis*, *Heraclea Pontica*, *Prusias ad Hypium* and *Tium*.

The negative outcome of the primate-city distribution model, *hypercephalie*, appeared in territories which are easy to be embraced, territorially as well as politically. This in reality means the territory encompasses well maintained supra-regional or regional road which enables a fast and efficient travelling throughout the region. The negative primate-city distribution model was detected in *Nicaea* and *Nicomedia*.

The results of the spatial and temporal analyses of the epigraphic evidence and the urbanization models revealed an appealing interplay of the datasets. The most numerous assemblages representing outliers in the epigraphic evidence belong to the primate-city distribution models featuring *hypercephalie*. Again, the cities with modest numbers of inscriptions belong to the central place distribution. The study of urbanization and density of settlements implies that the analysis of the economic situation in the macro-region *en bloc* is generally correct but does not correspond with the reality of particular cities. The necessity to consider

characteristics diversifying the centres needs to be pointed out. These mainly include the terrain model and the accessibility of the resources in combination with available types of roads leading through the region.

In addition to urbanization, I focused on the reconstruction of the density of the settlements. The state of research enabled to divide the settlements into three broad groups including road stations, forts and not further specified group of other settlements. The results of the spatial and temporal analyses of the density of settlements were further compared with the results achieved in Paphlagonia, pointing to the possible insufficiencies of the analysed dataset.

During the second year of my work, I had a great opportunity to explore the hinterland of *Nicaea* (modern Iznik), one of the largest and strongest cities in the region during the investigated time spans. The expedition was conducted in March and April 2015 and it enabled to rectify the economic proxies described above and define several more detailed representatives of the regional economy. The rectification concerned the density of rural settlements and courses of the roads, supplemented with several bridges. Newly defined economic proxies included extent of the city and resulting population estimates *intra muros*, allowing for a comparative analysis with other cities in Asia Minor. The hinterland of *Nicaea* revealed several economic proxies which I analysed solely in relation to this one city, with intention to demonstrate the strength of the regional economy.

The micro-regional study confirmed the economic development of the territory outlined for the macro-region. *Nicaea* proved its importance and economic strength since it belonged to the ten largest cities in Asia Minor. However, the outcomes also pointed to the larger extent of *Nicomedia*, resulting in considerably higher estimates of inhabitants. In general, these estimates suggest a stronger economic position of *Nicomedia* in the territory. The data collected during the ISP15 enabled me to prove a high concentration of marble quarries in the hinterland of *Nicaea*, an important accessory to the local urban economy.

What testify the results of the present work about the rivalry between *Nicaea* and *Nicomedia*? Which of the cities was the stronger and more important one in the regional

economy? Based on the careful evaluation of all the collected datasets and results of the analyses, I argue that *Nicomedia* was a stronger centre during the Roman period, convincingly demonstrated by its extent, 70 per cent larger than that of *Nicaea*. However, the Early Byzantine period brought several significant changes including the impact of number of strong earthquakes and diversification of the supra-regional road, all of them in favour to *Nicaea*. On top of that, the ecumenical council organised in *Nicaea* in AD 325 had also its positive impact on the economic situation in the city. Therefore, I argue that the city of *Nicaea* became economically stronger than *Nicomedia* during the Early Byzantine era.

Finally, I would like to point out to the main contributions of the present work. The study shows the potential and limits of the application of several analytical tools in an archaeological context. It explains their functions, demonstrates strong and weak points and suggests ways how to utilise the tools in order to achieve the most convincing results.

Concerning the economic development in NW Asia Minor, the study proves its peak in the 2nd and during the beginning of the 3rd century AD.

An inherent part of the work are the graphic depictions of the results. Detailed maps show reconstructions of the settlements and road systems in NW Asia Minor during the Hellenistic, Roman and Early Byzantine periods.

The work argues for the multi-scalar approach to be the most suitable, especially when analysing a territory with deficient datasets. The combination of results from the macro- and micro-region, further supplemented with the supra- and inter-regional comparisons, proved its utmost relevance during the evaluation of the results.

Last but not least, the micro-regional study of the hinterland of *Nicaea* identified rural settlements, marble quarries and funerary monuments, hitherto not known in the territory.

10. Bibliography

10. 1. Ancient Sources

- Amm.** J. C. Rolfe (ed.), *Ammianus Marcellinus* (London 1935)
- Apoll. Rhod.** W. Preston (ed.), *The Argonautics of Apollonius Rhodius* (London 1822)
- App. Mithr.** H. White (ed.), *The Roman History of Appian of Alexandria I* (London 1899)
- Arr. an.** E. I. Robson (ed.), *Arrian. Anabasis of Alexander I/II* (London 1929; Repr. London 1967)
- Arr. per p. E.** R. Hercher (ed.), *Arriani Nicomediensis Scripta Minora* (Leipzig 1885)
- Cass. Dio** E. Cary – H. B. Foster (eds.), *Dio Cassius. Roman History V–IX. Books 46–80* (Cambridge 1917)
- Diod.** F. R. Walton (ed.), *Diodorus Siculus. Library of History XII. Fragments of Books 33–40* (Cambridge 1967)
- Dion Chrys.** H. von Arnim (ed.), *Dionis Prusaensis quem vocant Chrysostomum quae exstant omnia* (Berlin 1893)
- Eus.** J. Karst (ed.), *Eusebius Werke V. Die Chronik* (Leipzig 1911)
- Hdt.** A. D. Godley (ed.), *Herodotus III. Books 5–7* (London 1922)
- Hierocles, Syn.** G. Parthey (ed.), *Hieroclis. Synecdemus et notitiae episcopatum* (Amsterdam 1967)
- Ioh. Mal.** E. Jeffreys – M. Jeffreys – R. Scout (ed.), *The Chronicle of John Malalas* (Melbourne 1986)
- Itin. Anton.** O. Cuntz (ed.), *Itineraria Romana I. Itinerarium Antonini Augusti et Burdigalense* (Leipzig 1929) 1–85
- Itin. Burdig.** O. Cuntz (ed.), *Itineraria Romana I. Itinerarium Antonini Augusti et Burdigalense* (Leipzig 1929) 86–102
- John of Nikiu** R. H. Charles (ed.), *The Chronicle of John (c. 690 A. D.) Coptic Bishop of Nikiu. Being a History of Egypt before and during the Arab Conquest* (Amsterdam 1981)
- Liv.** E. T. Sage (ed.), *Livy XI. Books 38/39* (Cambridge 1936)

Memnon	F. Jacoby (ed.), <i>Fragmente der griechischen Historiker III</i> (Nr. 434) Memnon von Heraklea (Leiden 1954/55)
Paus.	W. H. S. Jones – H. A. Ormerod (eds.), <i>Pausanias. Description of Greece II. Books 5–7</i> (Laconia, Messenia, Elis 1) (Cambridge 1926)
Plin. epist.	W. Williams (ed.), <i>Pliny the Younger. Correspondence with Trajan from Bithynia</i> (Epistoles X) (Warminster 1990)
Plin. nat. hist.	H. Rackham (ed.), <i>Pliny's Natural History II. Libri 3–7</i> (Cambridge 1942, Repr. Cambridge 1961)
Plut. Alcibiades	B. Perrin (ed.), <i>Plutarch's Lives IV. Alcibiades and Coriolanus. Lysander and Sulla</i> (Cambridge 1916; Repr. Cambridge 1965) 1–116
Plut. Sulla	B. Perrin (ed.), <i>Plutarch's Lives IV. Alcibiades and Coriolanus. Lysander and Sulla</i> (Cambridge 1916; Repr. Cambridge 1965) 323–443
Procop. HA	H. B. Dewing (ed.), <i>Procopius. Anecdota or Secret History</i> (London 1935)
Procop. aed.	H. B. Dewing (ed.), <i>Procopius. On Buildings. General Index</i> (Cambridge 1940; Rev. Repr. Cambridge 1954)
Pseudo-Skyl.	G. Shipley (ed.), <i>Pseudo-Skylax's Periplus. The Circumnavigation of the Inhabited World</i> (Exeter 2011)
Strab.	H. L. Jones (ed.), <i>The Geography of Strabo</i> (Cambridge 1961)
Tab. Peut.	K. Miller (ed.), <i>Itineraria Romana. Römische Reisewege an der Hand der Tabula Peutingeriana</i> (Stuttgart 1916)
Thuc.	T. Hobbes (ed.), <i>History of the Peloponnesian War. The History of the Grecian War written by Thucydides</i> (London 1843)
Xen. an.	C. L. Brownson (ed.), <i>Xenophon. Anabasis</i> (London 1921/1922)
Xen. hell.	C. L. Brownson (ed.), <i>Xenophon. Hellenica</i> (London 1918)

10. 2. Secondary Literature

- Adak et al. 2008** M. Adak – N. E. Akyürek Şahin – M. Y. Güneş, Neue Inschriften im Museum von Bolu (Bithynion/Klaudiupolis), *Gephyra* 5, 2008, 73–120
- Ainsworth 1842** W. F. Ainsworth, *Travels and Researches in Asia Minor, Mesopotamia, Chaldea, and Armenia* (London 1842)
- Alcock et al. 1994** S. E. Alcock – J. F. Cherry – J. L. Davis, Intensive Survey, Agricultural Practice and the Classical Landscape of Greece, in: I. Morris (ed.), *Classical Greece. Ancient Histories and Modern Archaeologies* (Cambridge 1994) 137–170
- Alcock 2013** S. E. Alcock, The Eastern Mediterranean, in: W. Scheidel – I. Morris – R. P. Saller (ed.), *The Cambridge Economic History of the Greco-Roman World* (Cambridge 2013) 671–697
- Alpar – Yaltırak 2002** B. Alpar – C. Yaltırak, Characteristic Features of the North Anatolian Fault in the Eastern Marmara Region and Its Tectonic Evolution, *Marine Geology* 190, 2002, 329–350
- Altın (forthcoming)** A. A. Altın, *Die Nekropolen und Grabdenkmäler von Nikaia* (Ph.D. diss. Ruhr-Universität Bochum, forthcoming)
- Altın et al. 2015** A. A. Altın – C. Berns – M. Şahin, Survey in Nikaia / Iznik (Türkei) und Umgebung 2014, in: C. Berns – M. Müller-Kissing – T. Stöllner (eds.), *Jahresbericht des Instituts für Archäologische Wissenschaften der Ruhr Universität Bochum für das Akademische Jahr 2013–2014* (Bochum 2015) 64–66
- Ameling 1985** W. Ameling, *Die Inschriften von Prusias ad Hypium*, IK 27 (Bonn 1985)
- Anagnostakis – Boulay 2016** I. Anagnostakis – T. Boulay, Les grands vignobles bithyniens aux époques romaine et protobyzantine, in: F. Lerouxel – A.-V. Pont (eds.), *Propriétaires et citoyens dans l’Orient romain*, *Scripta Antiqua* 84 (Bordeaux 2016) 25–49

- Anderson – Robinson 2012** W. Anderson – A. Robinson, Marginal or Mainstream? The Character of Settlement in Late Roman Paphlagonia, in: G. R. Tsetschladze (ed.), *The Black Sea, Paphlagonia, Pontus and Phrygia in Antiquity. Aspects of Archaeology and Ancient History*, BARIntSer 2432 (Oxford 2012) 13–27
- Andreau 2002** J. Andreau, Twenty Years after Moses I. Finley's *The Ancient Economy*, in: W. Scheidel – S. von Reden (eds.), *The Ancient Economy* (Edinburgh 2002) 33–49
- Anton 1895** M. Anton, Reise von Premierleutnant M. Anton, in: W. von Diest – M. Anton (ed.), *Neue Forschungen im nordwestlichen Kleinasien*, Petermanns Geographische Mitteilungen Erg. 116 (Gotha 1895) 41–115
- Aperghis 2001** M. Aperghis, Population – Production – Taxation – Coinage: A Model for the Seleukid Economy, in: Z. H. Archibald – J. Davies – V. Gabrielsen – G. J. Oliver (eds.), *Hellenistic Economies* (London 2001) 69–102
- Archibald et al. 2001** Z. H. Archibald – J. Davies – V. Gabrielsen – G. J. Oliver (eds.), *Hellenistic Economies* (London 2001)
- Archibald et al. 2011** Z. H. Archibald – J. K. Davies – V. Gabrielsen, *The Economies of Hellenistic Societies, Third to First Centuries BC* (Oxford 2011)
- Asgari – Firatlı 1978** N. Asgari – N. Firatlı, *Die Nekropole von Kalchedon, Studien zu Religion und Kultur Kleinasiens 1* (Leiden 1978)
- Atasoy 2012** S. Atasoy, New Exploration of the Southern Black Sea Coast. Filyos – Tios, in: G. R. Tsetschladze (ed.), *The Black Sea, Paphlagonia, Pontus and Phrygia in Antiquity. Aspects of Archaeology and Ancient History*, BARIntSer 2432 (Oxford 2012) 29–33
- Atasoy et al. 2013** S. Atasoy – Ş. Yildirim – A. Baran – Y. S. Yildirim – E. Karaca, Filyos-Tios 2011 Yili Kazısı, *KST* 34, fasc. 3, 2013, 297–312

- Avram 2004** A. Avram, The Propontic Coast of Asia Minor, in: M. H. Hansen – T. H. Nielsen (eds.), *An Inventory of Archaic and Classical Poleis* (Oxford 2004) 976–999
- Avram et al. 2004** A. Avram – J. Hind – G. Tsetskhladze, The Black Sea Area, in: M. H. Hansen – T. H. Nielsen (eds.), *An Inventory of Archaic and Classical Poleis* (Oxford 2004) 924–973
- Avramea 2002** A. Avramea, Land and Sea Communications, Fourth-Fifteenth Centuries, in: A. E. Laiou (ed.), *The Economic History of Byzantium. From the Seventh through the Fifteenth Century*, *Dumbarton Oaks Studies* 39 (Dumbarton Oaks 2002) 57–90
- Aybek – Öz 2004** S. Aybek – A. K. Öz, Preliminary Report of the Archaeological Survey at Apollonia ad Rhyndacum in Mysia, *Anadolu/Anatolia* 27, 2004, 1–25
- Aybek – Öz 2009** S. Aybek – A. K. Öz, Ulubat Gölü Çevresi Yüzey Araştırması, 2007, *AST* 26, fasc. 2, 2009, 327–342
- Aybek – Öz 2010** S. Aybek – A. K. Öz, Ulubat Gölü Çevresi 2008 Yılı Yüzey Araştırmaları, *AST* 27, fasc. 2, 2010, 313–328
- Bagnall 2009** R. Bagnall, Response to Elio Lo Cascio, in: A. Bowman – A. Wilson (eds.), *Quantifying the Roman Economy. Methods and Problems*, *Oxford Studies on the Roman Economy* 1 (Oxford 2009) 107–112
- Bahadır – Özdemir 2011** M. Bahadır – M. A. Özdemir, Climate Trend Analysis of the Level Changes of Iznik Lake in Turkey, *Journal of Biology and Life Sciences* 2, fasc. 3, 2011, 4–13
- Banning 2002** E. B. Banning, *Archaeological Survey, Manuals in Archaeological Method, Theory and Technique* (New York 2002)
- Barka 1997** A. Barka, Neotectonics of the Marmara Region, in: C. Schindler – M. Pfister (eds.), *Active Tectonics of the Northwestern*

- Anatolia – The MARMARA Poly-Project. A Multidisciplinary Approach by Space-Geodesy, Geology, Hydrology, Geothermics and Seismology (Zürich 1997) 55–87
- Barow 2013** H. Barow, Roads and Bridges of the Roman Empire (Stuttgart 2013)
- Barth 1860** H. Barth, Dr. H. Barth's Reise von Trapezunt durch die nördliche Hälfte Klein-Asiens nach Scutari, Petermanns Geographische Mitteilungen Ergh. 3 (Gotha 1860)
- Becker-Bertau 1986** F. Becker-Bertau, Die Inschriften von Klaudiu Polis, IK 31 (Bonn 1986)
- Bekker-Nielsen 1989** T. Bekker-Nielsen, The Geography of Power. Studies in the Urbanization of Roman North-West Europe, BARIntSer 477 (Oxford 1989)
- Bekker-Nielsen 2008** T. Bekker-Nielsen, Urban Life and Local Politics in Roman Bithynia. The Small World of Dion Chrysostomos, Black Sea Studies 7 (Aarhus 2008)
- Bekker-Nielsen 2015** T. Bekker-Nielsen – R. M. Czichon, Ancient Roads and Bridge of the Vezirköprü District, in: K. Winther-Jacobsen – L. Summerer (eds.), Landscape Dynamics and Settlement Patterns in Northern Anatolia during the Roman and Byzantine Period, Geographica Historica 32 (Stuttgart 2015) 295–305
- Belke 1984** K. Belke, Galatien und Lykaonien, TIB 4 = DenkschrWien 172 (Wien 1984)
- Belke 1996** K. Belke, Paphlagonien und Honorias, TIB 9 = DenkschrWien 249 (Wien 1996)
- Belke 2008** K. Belke, Communications, Roads and Bridges, in: E. Jeffreys – J. Haldon – R. Cormack (eds.), Oxford Handbook of Byzantine Studies (Oxford 2008) 295–308

- Belke 2010a** K. Belke, Verkehrsmittel und Reise- bzw. Transportgeschwindigkeit zu Lande im Byzantinischen Reich, in: E. Kislinger – J. Koder – A. Külzer (eds.), *Handelsgüter und Verkehrswege. Aspekte der Warenversorgung im östlichen Mittelmeerraum (4. – 15. Jahrhundert)*. Akten des Internationalen Symposions Wien 19. – 22. Oktober 2005, *DenkschrWien 388 = Veröffentlichungen zur Byzanzforschung 18* (Wien 2010) 45–58
- Belke 2010b** K. Belke, Development of Towns in Northwestern Asia Minor during Late Antiquity, *Acta Byzantina Fennica 3*, 2010, 46–66
- Belke 2013** K. Belke, Bithynien. Historische und geographische Beobachtungen zu einer Provinz in byzantinischer Zeit, in: E. Winter – K. Zimmermann (eds.), *Neue Funde und Forschungen in Bithynien*, *AMS 69* (Bonn 2013) 83–109
- Bell – Lock 2000** T. Bell – G. Lock, Topographic and Cultural Influences on Walking the Ridgeway in Later Prehistoric Times, in: G. Lock (ed.), *Beyond the Map. Archaeology and Spatial Technologies*, *NATO Science Series A 321* (Amsterdam 2000) 85–100
- Berns 2003** C. Berns, Untersuchungen zu den Grabbauten der frühen Kaiserzeit in Kleinasien, *AMS 51* (Bonn 2003)
- Bes 2015a** P. Bes, The Cide-Şenpazar Region in the Roman Period, in: B. S. Düring – C. Glatz (eds.), *Kinetic Landscapes. The Cide Archaeological Project: Surveying the Turkish Western Black Sea Region* (Warsaw 2015) 260–293
- Bes 2015b** P. Bes, Roman-Period Finds from the Cide Region, in: K. Winther-Jacobsen – L. Summerer (eds.), *Landscape Dynamics and Settlement Patterns in Northern Anatolia during the Roman and Byzantine Period*, *Geographica Historica 32* (Stuttgart 2015) 23–42

- Bikoulis 2012** P. Bikoulis, Revisiting Prehistoric Sites in Göksu Valley. A GIS and Social Network Approach, *AnSt* 62, 2012, 35–59
- Bintliff – Howard 2004** J. Bintliff – P. Howard, A Radical Rethink on Approaches to Surface Survey and the Rural Landscape of Central Greece in Roman Times, in: F. Kolb (ed.), *Chora und Polis, Schriften des Historischen Kollegs. Kolloquien 54* (München 2004) 43–78
- Bittel et al. 1939** K. Bittel – F. K. Dörner – A. M. Schneider, Archäologische Funde aus der Türkei 1934-1938, *AA* 54, 1939, 94–207
- Blanton 2000** R. E. Blanton, Hellenistic, Roman and Byzantine Settlement Patterns of the Coast Lands of Western Rough Cilicia, *BarIntSer* 879 (Oxford 2000)
- Bodel 2001** J. Bodel, Epigraphy and the Ancient Historian, in: J. Bodel (ed.), *Epigraphic Evidence* (London 2001) 1–56
- Bodel 2015** J. Bodel, Inscriptions and Literacy, in: C. Bruun – J. Edmondson (eds.), *The Oxford Book of Roman Epigraphy* (New York 2015) 745–763
- Bowman 2011** A. Bowman, Ptolemaic and Roman Egypt: Population and Settlement, in: A. Bowman – A. Wilson (eds.), *Settlement, Urbanization, and Population, Oxford Studies on the Roman Economy 2* (Oxford 2011) 317–358
- Bowman – Wilson 2009** A. Bowman – A. Wilson, Quantifying the Roman Economy. Integration, Growth, Decline?, in: A. Bowman – A. Wilson (eds.), *Quantifying the Roman Economy. Methods and Problems, Oxford Studies on the Roman Economy 1* (Oxford 2009) 3–84
- Bowman – Wilson 2011** A. Bowman – A. Wilson, Introduction, in: A. Bowman – A. Wilson (eds.), *Settlement, Urbanization, and Population, Oxford Studies on the Roman Economy 2* (Oxford 2011) 1–14

- Bowman – Wilson 2013** A. Bowman – A. Wilson (eds.), *The Roman Agricultural Economy. Organization, Investment, and Production* (Oxford 2013)
- Bracke 1993** H. Bracke, *Pisidia in Hellenistic Times (334–25B.C.)*, in: M. Waelkens (ed.), *First General Report on the Survey (1986 – 1989) and Excavations (1990 – 1991), Sagalassos 1 = Acta Archaeologica Lovaniensia Monographiae 5* (Leuven 1993) 15–35
- Brandt – Kolb 2005** H. Brandt – F. Kolb, *Lycia et Pamphylia. Eine römische Provinz im Südwesten Kleinasien*²(Mainz 2005)
- Bulba 2011** M. Bulba, *Die Keramikfunde des Görükle-Grabes in Bursa*, *Mediterranean Journal of Humanities* 1, fasc. 1, 2011, 53–61
- Bulut 2013** H. Bulut, *West Slope Ware from Daskyleion*, *IstMitt* 63, 2013, 75–127
- Bury 1958** J. B. Bury, *History of the later Roman Empire from the Death of Theodosius I. to the Death of Justinian (A.D. 395 to A.D. 565)* (New York 1958)
- Carter et al. 2004** J. C. Carter – S. M. Thompson – J. Trelogan, *Dividing the Chora*, in: F. Kolb (ed.), *Chora und Polis, Schriften des Historischen Kollegs. Kolloquien 54* (München 2004) 127–145
- Chaput 1936** E. Chaput, *Voyages d'Études géologiques et géomorphogéniques en Turquie* (Paris 1936)
- Chevallier 1976** R. Chevallier, *Roman Roads* (London 1976)
- Christaller 1968** W. Christaller, *Die zentralen Orte in Süddeutschland. Eine ökonomisch-geographische Untersuchung über die Gesetzmäßigkeit der Verbreitung und Entwicklung der Siedlungen mit städtischen Funktionen* (Jena 1933, Repr. Darmstadt 1968)

- Cohen 1995** G. M. Cohen, *The Hellenistic Settlements in Europe, the Islands, and Asia Minor* (Oxford 1995)
- Cormack 1997** S. Cormack, *Funerary Monuments and Mortuary Practice in Roman Asia Minor*, in: S. E. Alcock (ed.), *The Early Roman Empire in the East*, Oxbow Monograph 95 (Oxford 1997) 137–156
- Corsten 1985** T. Corsten, *Die Inschriften von Kios*, IK 29 (Bonn 1985)
- Corsten 1987** T. Corsten, *Die Inschriften von Apameia (Bithynien) und Pylai*, IK 32 (Bonn 1987)
- Corsten 1988** T. Corsten, *Daskyleion am Meer. Ein Corpusculum der Inschriften und Nachrichten über die Stadt*, *EpigrAnat* 12, 1988, 53–77
- Corsten 1990a** T. Corsten, *Nachtrag zu "Daskyleion am Meer"* (*EpigrAnat* 12, 1988, 53–77), *EpigrAnat* 15, 1990, 43–138
- Corsten 1990b** T. Corsten, *Caesarea Germanice*, *EpigrAnat* 15, 1990, 19–42
- Corsten 1991a** T. Corsten, *Neue Denkmäler aus Bithynien*, *EpigrAnat* 17, 1991, 79–102
- Corsten 1991b** T. Corsten, *Die Inschriften von Prusa ad Olympum I*, IK 39 (Bonn 1991)
- Corsten 1993** T. Corsten, *Die Inschriften von Prusa ad Olympum II*, IK 40 (Bonn 1993)
- Cramer 1832** J. A. Cramer, *A Geographical and Historical Description of Asia Minor I* (Oxford 1832)
- Cuntz 1929** O. Cuntz, *Itineraria Romana I. Itinerarium Antonini Augusti et Burdigalense* (Leipzig 1929)
- Dalyancı-Berns 2017** A. Dalyancı-Berns, *Die Stadtbefestigung von Nikaia (Izник). Bautechnische Beobachtungen zur Rekonstruktion des Bauablaufs*, in: D. Kurapkat – U. Wulf-Rheidt (eds.), *Werkspuren. Materialverarbeitung und handwerkliches*

- Wissen im antiken Bauwesen. Internationales Kolloquium in Berlin vom 13.–16. Mai 2015, Diskussionen zur Archäologischen Bauforschung 12 (Regensburg 2017) 417–426
- Dalyancı-Berns forthcoming** A. Dalyancı-Berns, The Fortifications of Iznik / Nicaea: Documentation and Building History of a Late Roman-Byzantine Large Scale Construction (Ph.D. diss. Technische Universität Berlin, forthcoming)
- de Blois – Rich 2002** L. de Blois – J. Rich (eds.), The Transformation of Economic Life under the Roman Empire. Proceedings of the Second Workshop of the International Network Impact of Empire (Roman Empire, c. 200 B.C. – A.D. 476). Nottingham July 4-7, 2001 (Amsterdam 2002)
- Degryse – Waelkens 2008** P. Degryse – M. Waelkens (eds.), Geo- and Bio-Archaeology at Sagalassos and in Its Territory, Sagalassos 6 (Leuven 2008)
- de Hell 1855** H. de Hell, Voyage en Turquie et en Perse I 2 (Paris 1855)
- de Laborde 1838** L. de Laborde, Voyage de l'Asie Mineure (Paris 1838)
- DeLaine 1997** J. DeLaine, The Baths of Caracalla. A Study in the Design, Construction, and Economics of Large-Scale Building Projects in Imperial Rome, JRA Suppl. 25 (Portsmouth 1997)
- Dewdney 1971** J. C. Dewdney, Turkey (London 1971)
- Díaz 1997** P. G. Díaz, Nicea. Ciudad y territorio en la Bitinia romana (Huelva 1997)
- Dignas 2002** B. Dignas, Economy of the Sacred in Hellenistic and Roman Asia Minor (Oxford 2002)
- Dilke 1985** O. A. W. Dilke, Greek and Roman Maps (London 1985)
- Dörner 1941** F. K. Dörner, Inschriften und Denkmäler in Bithynien, IstForsch 14 (Berlin 1941)
- Dörner 1952** F. K. Dörner, Bericht über eine Reise in Bithynien, DenkschrWien 75, 1 (Wien 1952)

- Doğanci 2007** K. Doğanci, Roma Principatus Dönemi (M.Ö. 27-M.S. 284) Bithynia Eyaleti Valileri (Prosopografik Bir Inceleme) (Ph.D. diss. Ankara Üniversitesi 2007)
- Doğanci 2012** K. Doğanci, Antik Dönemde Bithynia'dan Geçen Ticari ve Askeri Yollar, in: T. Yiğit – M. A. Kaya – A. Sina (eds.), Ömer Çapar'a Armağan (Ankara 2012) 93–104
- Doğanci 2013** K. Doğanci, The Oldest People of Bithynia. Tribes of Thracian Origin, in: K. Mutafova – N. Hristova – St. Dermendzhieva – A. Petrova – T. Ivanova – D. Buşă – Z. D. Abaci (eds.), The Balkans. Languages, History, Cultures 3. Third International Conference, 14 – 15 October 2011 (Veliko Tarnovo 2013) 45–51
- Doonan 2004** O. P. Doonan, Sinop Landscapes. Exploring Connection in a Black Sea Hinterland (Philadelphia 2004)
- Doonan 2015** O. Doonan, Settlement and Economic Intensification in the Late Roman/Early Byzantine Hinterland of Sinop, in: K. Winther-Jacobsen – L. Summerer (eds.), Landscape Dynamics and Settlement Patterns in Northern Anatolia during the Roman and Byzantine Period, *Geographica Historica* 32 (Stuttgart 2015) 43–59
- Drakoulis 2011** D. P. Drakoulis, Συμβολή στη μελέτη της Επαρχίας Βιθυνίας κατά την πρώιμη Βυζαντινή Περίοδο, in: Th. Korres – P. Katsoni – I. Leontiades – A. Gkoutzioukostas (eds.), *Philotimia. Studies in Honour of Alkmene Stavridou-Zafraka* (Thessaloniki 2011) 147–172
- Drakoulis 2012** D. P. Drakoulis, Regional Transformation and the Settlement Network of the Coastal Pontic Provinces in the Early Byzantine Period, in: G. R. Tsetschladze (ed.), *The Black Sea, Paphlagonia,*

- Pontus and Phrygia in Antiquity. Aspects of Archaeology and Ancient History, BARIntSer 2432 (Oxford 2012) 79–96
- Drakoulis 2013** D. P. Drakoulis, European and Asiatic Settlements of the Bosphorus Hinterland in the Early Byzantine Period, in: G. R. Tsetschladze – S. Atasoy – A. Avram – Sh. Dönmez – J. Hargrave (eds.), The Bosphorus: Gateway between the Ancient West and East (1st Millenium BC – 5th Century AD). Proceedings of the 4th International Congress of Black Sea Antiquities Istanbul 14th–18th September 2009, BARIntSer 2517 (Oxford 2013) 237–247
- Drexhage 2007** H.-W. Drexhage, Wirtschaftspolitik und Wirtschaft in der römischen Provinz Asia in der Zeit von Augustus bis zum Regierungsantritt Diokletians, AMS 59 (Bonn 2007)
- Düring – Glatz 2015a** B. S. Düring – C. Glatz (eds.), Kinetic Landscapes. The Cide Archaeological Project: Surveying the Turkish Western Black Sea Region (Warsaw 2015)
- Düring – Glatz 2015b** B. S. Düring – C. Glatz, Remote Landscapes in Flux. The Cide and Şenpazar Region, in: B. S. Düring – C. Glatz (eds.), Kinetic Landscapes. The Cide Archaeological Project: Surveying the Turkish Western Black Sea Region (Warsaw 2015) 9–35
- Duncan-Jones 1974** R. Duncan-Jones, The Economy of the Roman Empire. Quantitative Studies (Cambridge 1974)
- Duncan-Jones 1990** R. Duncan-Jones, Structure and Scale in the Roman Economy (Cambridge 1990)
- Duncan-Jones 1994** R. Duncan-Jones, Money and Government in the Roman Empire (Cambridge 1994)
- Elliott 2015** T. Elliott, Epigraphy and Digital Resources, in: C. Bruun – J. Edmondson (eds.), The Oxford Book of Roman Epigraphy (New York 2015) 78–85

- Erdkamp 2002** P. P. M. Erdkamp, 'A Starving Mob Has no Respect'. Urban Markets and Food Riots in the Roman World, 100 B.C. – 400 A.D., in: L. de Blois – J. Rich (eds.), *The Transformation of Economic Life under the Roman Empire. Proceedings of the Second Workshop of the International Network Impact of Empire (Roman Empire, c. 200 B.C. – A.D. 476)*. Nottingham Jy 4-7, 2001 (Amsterdam 2002) 93–115
- Erdkamp 2014** P. Erdkamp, Urbanism, in: W. Scheidel (ed.), *The Cambridge Companion to the Roman Economy*³(Cambridge 2014) 241–265
- Erdkamp 2015** P. Erdkamp, Agriculture, Division of Labour and the Paths to Economic Growth, in: P. Erdkamp – K. Verboven – A. Zuiderhoek (eds.), *Ownership and Exploitation of Land and Natural Resources in the Roman World, Oxford Studies of the Roman Economy 9* (Oxford 2015) 18–39
- Erdkamp – Verboven 2015** P. Erdkamp – K. Verboven (eds.), *Structure and Performance in the Roman Economy. Models, Methods and Case Studies, Collection Latomus 350* (Brussel 2015)
- Erdkamp et al. 2015** P. Erdkamp – K. Verboven – A. Zuiderhoek (eds.), *Ownership and Exploitation of Land and Natural Resources in the Roman World, Oxford Studies of the Roman Economy 9* (Oxford 2015)
- Ermiş 2009** Ü. M. Ermiş, *İznik ve Çevresi Bizans Devri Mimari Faaliyetinin Değerlendirilmesi* (Ph.D. diss. İstanbul Üniversitesi 2009)
- Ermiş 2011** Ü. M. Ermiş, Son Yıllarda Ortaya Çıkarılan Mezar Odaları Işığında İznik Nekropollerini, *TüBA-Ar 14*, 2011, 121–139
- Errington 2008** R. M. Errington, *A History of the Hellenistic World 323–30 BC* (Malden 2008)
- Feinman 2008** *Encyclopedia of Archaeology II* (2008) 1114–1120 s.v. Economic Archaeology (G. M. Feinman)

- Fellows 1839** C. Fellows, *A Journal Written during an Excursion in Asia Minor* (London 1839)
- Fernoux 2004** H. L. Fernoux, *Notables et élites de cités de Bithynie aux époques hellénistique et romaine (III^e siècle av. J.-C. – III^e siècle ap. J.-C.)*, Collection de la Maison de l’Orient et de la Méditerranée 31 = Série épigraphique et historique 5 (Lyon 2004)
- Finley 1973** M. I. Finley, *The Ancient Economy* (London 1973)
- Fıratlı 1953** N. Fıratlı, *Bithynia Arařtırmalarına Birkaç İlave*, *Belleten* 17, 1953, 15-25
- Fıratlı 1960** N. Fıratlı, *Adapazarı-Tersiye Köyü Tümölüsü*, *İstanbul Arkeoloji Müzeleri Yıllığı* 9, 1960, 22–25
- Fıratlı 1965** N. Fıratlı, *Two Galatian Tumuli in the Vicinity of Bolu*, *AJA* 69, 1965, 365–367
- Fıratlı 1971** N. Fıratlı, *İzmit Şehri ve Eski Eserleri Rehberi* (Istanbul 1971)
- Fıratlı 1974** N. Fıratlı, *An Early Byzantine Hypogeum Discovered in Iznik*, in: E. Akurgal – U. B. Alkım (eds.), *Mansel’e Armağan / Mélanges Mansel* 2, *Türk Tarih Kurumu Yayınları* 7, fasc. 60b (Ankara 1974) 919–932
- Foss 1996** C. Foss, *Survey of Medieval Castles of Anatolia II. Nicomedia*, *BIAA Monograph* 21 (London 1996)
- Foss 2000a** *BAtlas 2. Map-by-Map Directory* (2000) 785–795 s. v. *Map 52 Byzantium* (C. Foss),
<http://press.princeton.edu/B_ATLAS/BATL052_.pdf>
(26.03.2017)
- Foss 2000b** *BAtlas 2. Map-by-Map Directory* (2000) 796–802 s. v. *Map 53 Bosphorus* (C. Foss),
<http://press.princeton.edu/B_ATLAS/BATL053_.pdf>
(26.03.2017)

- Foss 2000c** BATlas 2. Map-by-Map Directory (2000) 1217–1225 s. v. Map 86 Paphlagonia (C. Foss),
<http://press.princeton.edu/B_ATLAS/BATL086_.pdf>
(26.03.2017)
- French 1967** D. H. French, Prehistoric Sites in Northwest Anatolia: I. The Iznik Area, *AnSt* 17, 1967, 49–100
- French 1974** D. H. French, A Study of Roman Roads in Anatolia. Principles and Methods, *AnSt* 24, 1974, 143–149
- French 1980** D. H. French, The Roman Road-System of Asia Minor, *ANRW* 2. Principat 7, 2 (Berlin 1980) 698–729
- French 1981** D. H. French, Roman Roads and Milestones of Asia Minor I. The Pilgrim's Road, *BARIntSer* 105 = BIAA Monograph 3 (Oxford 1981)
- French 1984** D. H. French, The Location of Cretia Flaviopolis in Bithynia, *EpigrAnat* 3, 1984, 49–58
- French 1991** D. H. French, Dated Inscriptions at Amasia, *ADerg* 1, 1991, 65–70
- French 1997** D. H. French, Pre- and Early-Roman Roads of Asia Minor. The Earliest Roman, Paved Roads in Asia Minor, *ADerg* 5, 1997, 179–187
- French 2012** D. H. French, Roman Roads and Milestones of Asia Minor III. Milestones 1. Republican, BIAA Electronic Monograph 1 (2012)
<<http://biaa.ac.uk/ckeditor/filemanager/userfiles/rrmam%20vol.%203%20milestones.pdf>> (26.03.2017)
- French 2013** D. H. French, Roman Roads and Milestones of Asia Minor III. Milestones 4. Pontus et Bithynia (with Northern Galatia), BIAA Electronic Monograph 4 (2013)
<http://biaa.ac.uk/ckeditor/filemanager/userfiles/electronic_publications/P_et_B_final.pdf> (26.03.2017)

- French 2016** D. H. French, Roman Roads and Milestones of Asia Minor III. Milestones 9. An Album of Maps, BIAA Electronic Monograph 9 (2016)
<<http://biaa.ac.uk/uploads/album-1.viii.16.pdf>> (4.10.2016)
- Gatzke 2013** A. F. Gatzke, Language and Identity in Roman Anatolia: A Study in the Use and Role of Latin in Asia Minor (Ph.D. diss. Pennsylvania State University 2013)
- Geppert 1998** K. Geppert, Gräber und Grabtypen 1993/94, in: F. Kolb (ed.), Feldforschungen auf dem Gebiet von Kyaneai (Yavu-Bergland). Ergebnisse der Kampagnen von 1993/94, AMS 29 = Lykische Studien 4 (Bonn 1998) 87–90
- Giardina 2013** A. Giardina, The Transition to Late Antiquity, in: W. Scheidel – I. Morris – R. P. Saller (ed.), The Cambridge Economic History of the Greco-Roman World (Cambridge 2013) 743–768
- Goltz 1896** C. Goltz, Anatolische Ausflüge (Berlin 1896)
- Gonzales 1997** A. Gonzales, Les limites d'un territoire en Bithynie romaine, *DialHistAnc* 23, 1997, 248–262
- Greene 1986** K. Greene, The Archaeology of the Roman Economy (London 1986)
- Gregory 2003** I. N. Gregory, A Place in History. A Guide to Using GIS in Historical Research (Oxford 2003)
- Gren 1941** E. Gren, Kleinasien und der Ostbalkan in der wirtschaftlichen Entwicklung der Römischen Kaiserzeit, Uppsala Universitets Årsskrift 9 (Uppsala 1941)
- Grünbart 2013** M. Grünbart, Das Byzantinische Bithynien als Hinterland von Konstantinopel, in: E. Winter – K. Zimmermann (eds.), Neue Funde und Forschungen in Bithynien, AMS 69 (Bonn 2013) 111–130

- Güney 2012** H. Güney, *The Resources and Economy of Roman Nicomedia* (Ph.D. diss. University of Exeter 2012)
- Haggett 1966** P. Haggett, *Locational Analysis in Human Geography* (London 1965; Repr. London 1966)
- Haggett et al. 1977** P. Haggett – A. D. Cliff – A. Frey, *Locational Analysis in Human Geography*² (London 1977)
- Haldon et al. 2014** J. Haldon – N. Roberts – A. Izdebski – D. Fleitmann – M. McCormick – M. Cassis – O. Doonan – W. Eastwood – H. Elton – S. Ladstätter – S. Manning – J. Newhard – K. Nicoll – I. Telelis – E. Xoplaki, *The Climate and Environment of Byzantine Anatolia: Integrating Science, History, and Archaeology*, *Journal of Interdisciplinary History* 45, fasc. 2, 2014, 113–161
- Hamilton 1984** W. J. Hamilton, *Researches in Asia Minor, Pontus, and Armenia I/II* (London 1842; Repr. London 1984)
- Hansen 1997** M. H. Hansen, *The Polis as an Urban Centre. The Literary and Epigraphical Evidence*, in: M. H. Hansen (ed.), *The Polis as an Urban Centre and as a Political Community. Symposium August, 29-31 1996, Acts of the Copenhagen Polis Centre 4 = Historisk-filosofiske Meddelelser 75* (Copenhagen 1997) 9–86
- Hansen 2006** M. H. Hansen, *Polis. An Introduction to the Ancient Greek City-State* (Oxford 2006)
- Hanson 2011** J. W. Hanson, *The Urban System of Roman Asia Minor and Wider Urban Connectivity*, in: A. Bowman – A. Wilson (eds.), *Settlement, Urbanization, and Population, Oxford Studies on the Roman Economy 2* (Oxford 2011) 229–275
- Harl 1996** K. W. Harl, *Coinage in the Roman Economy, 300 B.C. to A.D. 700* (Baltimore 1996)
- Harris 1993** W. V. Harris, *Between Archaic and Modern: Some Current Problems in the History of the Roman Economy*, in:

W. V. Harris (ed.), *The Inscribed Economy. Production and Distribution in the Roman Empire in the Light of Instrumentum Domesticum. The Proceedings of a Conference Held at the American Academy in Rome on 10-11 January, 1992*, *JRA Suppl.* 6 (Ann Arbor 1993) 11–29

Herzog 2013

I. Herzog, *Least-Cost Networks*, in: G. Earl – T. Sly – A. Chrysanthi – P. Murrieta-Flores – C. Papadopoulos – I. Romanowska – D. Weatley (eds.), *Archaeology in the Digital Era. Papers from the 40th Annual Conference of Computer Applications and Quantitative Methods in Archaeology (CAA)*, Southampton, 26–29 March 2012 (Amsterdam 2013) 237–248

Herzog – Poluschny 2011

I. Herzog – A. Poluschny, *Tilt. Slope-Dependent Least Cost Path Calculations Revisited*, in: E. Jerem – F. Redő – V. Szeverényi (eds.), *On the Road to Reconstructing the Past. Computer Applications and Quantitative Methods in Archaeology (CAA). Proceedings of the 36th CAA Conference, Budapest, 2–6 April 2008* (Budapest 2011) 236–242

Hild 1977

F. Hild, *Das byzantinische Straßensystem in Kappadokien*, *DenkschrWien* 131 = *Veröffentlichungen der Kommission für die TIB 2* (Wien 1977)

Hild 2014

F. Hild, *Meilensteine, Straßen und das Verkehrsnetz der Provinz Karia*, *DenkschrWien* 464 = *Veröffentlichungen zur Byzanzforschung* 33 (Wien 2014)

Hillier 2014

B. Hillier, *Spatial Analysis and Cultural Information: The Need for Theory as well as Method in Space Syntax Analysis*, in: E. Paliou – U. Lieberwirth – S. Polla (eds.), *Spatial Analysis and Social Spaces. Interdisciplinary Approaches to the Interpretation of Prehistoric and Historic Built Environments*,

- Topoi. Berlin Studies of the Ancient World 18 (Berlin 2014) 19–47
- Hitchner 2012** R. B. Hitchner, Roads, Integration, Connectivity, and Economic Performance in the Roman Empire, in: S. E. Alcock – J. Bodel – R. J. A. Talbert (eds.), Highways, Byways, and Road Systems in the Pre-Modern World, The Ancient History: Comparative Histories 5 (Chichester 2012) 222–234
- Hoepfner 1966** W. Hoepfner, Heraclea Pontike – Ereğli. Eine baugeschichtliche Untersuchung, in: F. K. Dörner (ed.), Forschungen an der Nordküste Kleinasiens, TAM Ergh. 2, 1 = DenkschrWien 89 (Wien 1966)
- Hoepfner 1972** W. Hoepfner, Topographische Forschungen, in: F. K. Dörner (ed.), Herakleia Pontike. Forschungen zur Geschichte und Topographie, Forschungen an der Nordküste Kleinasiens 1 = TAM Ergh. 5 = DenkschrWien 106 (Wien 1972) 40–46
- Hogarth 1893** D. G. Hogarth, The Military Road from Caesarea to Melitene on the Euphrates, in: D. G. Hogarth – J. A. R. Munro (eds.), Modern and Ancient Roads in Eastern Asia Minor, Royal Geographical Society Suppl. 3 (London 1893) 38–78
- Hooglund 1996** E. Hooglund, The Society and its Environment, in: H. C. Metz (ed.), Turkey a Country Study (Washington DC 1996) 71–145
- Hütteroth 1982** W.-D. Hütteroth, Türkei, Wissenschaftliche Länderkunden 21 (Darmstadt 1982)
- Hütteroth – Höhfeld 2002** W.-D. Hütteroth – V. Höhfeld, Türkei. Geographie, Geschichte, Wirtschaft, Politik (Darmstadt 2002)
- İplikçioğlu 2004** B. İplikçioğlu, Ländliche Siedlungen und das Territorium von Termessos (Pisidien), in: F. Kolb (ed.), Chora und Polis, Schriften des Historischen Kollegs. Kolloquien 54 (München 2004) 103–125

- Izdebski 2012** A. Izdebski, The Changing Landscapes of Byzantine Northern Anatolia, *ABulg* 16, fasc. 1, 2012, 47–66
- Izdebski 2013a** A. Izdebski, The Economic Expansion of the Anatolian Countryside in Late Antiquity. The Coast Versus Inland Regions, *Late Antique Archaeology* 10, fasc. 1, 2013, 343–376
- Izdebski 2013b** A. Izdebski, Asia Minor from Late Antiquity into the Early Middle Ages, *The Journal of Juristic Papyrology Suppl.* 18 (Warsaw 2013)
- Janouchová forthcoming 2018** P. Janouchová, The Epigraphic Evidence from Kazanlak and Yambol, c. 500 BC – AD 300, in: S. A. Ross – A. Sobotkova – J. Tzvetkova – G. Nekhrizov – S. Connor (eds.), *Tundzha Regional Archaeological Project, Surface Survey, Palaeoecology and Related Studies (2009–2011). Final Report* (Oxford, forthcoming in 2018) 385–404
- Jefferson 1939** M. Jefferson, The Law of the Primate City, *Geographical Review* 29, fasc. 2, 1939, 226–232
- Johnson 1970** E. A. J. Johnson, *The Organization of Space in Developing Countries* (Cambridge 1970)
- Jongman 2013** W. M. Jongman, The Early Roman Empire: Consumption, in: W. Scheidel – I. Morris – R. P. Saller (ed.), *The Cambridge Economic History of the Greco-Roman World* (Cambridge 2013) 592–618
- Jones 1974** A. H. M. Jones, *The Roman Economy. Studies in Ancient Economic and Administrative History* (Oxford 1974)
- Jones 1998** A. H. M. Jones, *Cities of the Eastern Roman Provinces* (Oxford 1937; Special Edition 1998)
- Jonnes 1994** L. Jonnes (ed.), *The Inscriptions of Heraclea Pontica. With a Prosopographia Heracleotica by Walter Ameling*, *IK* 47 (Bonn 1994)

- Kaçar 2005** T. Kaçar, Church Councils and Their Impact on the Economy of the Cities in Asia Minor, in: S. Mitchell – C. Katsari (eds.), Patterns in the Economy of Roman Asia Minor (Swansea 2005) 305–318
- Kaplanoğlu 1997** R. Kaplanoğlu, Bithynia. Charles Texier'in „Küçük Asya“ (Istanbul 1997)
- Kay 2014** P. Kay, Rome's Economic Revolution, Oxford Studies on the Roman 7 (Oxford 2014)
- Keay – Earl 2011** S. Keay – G. Earl, Towns and Territories in Roman Baetica, in: A. Bowman – A. Wilson (eds.), Settlement, Urbanization, and Population, Oxford Studies on the Roman Economy 2 (Oxford 2011) 276–316
- Kesim 2009** G. A. Kesim, Roma Dönemi Kent Yerleşmeleri ve Prusias ad Hypium (Kieros, Üskübü, Konuralp), Ormancik Dergisi, Düzce Üniversitesi Yayinlari, 5, fasc. 1, 2009, 4–24
- Kiepert 1844** H. Kiepert, Karte von Klein-Asien. 1 Karte auf 6 Blatt. scale 1:1,000,000 (Berlin 1844)
- Kiepert 1884** H. Kiepert, Nouvelle carte générale des provinces asiatiques de l'Empire Ottoman (sans l'Arabie). 1 Karte auf 6 Blatt. scale 1:1,500,000 (Berlin 1884)
- Kiepert 1890–1892** H. Kiepert, Spezialkarte vom westlichen Kleinasien. 16 Karten. scale 1:250000 (Berlin 1890–1892)
- Kleiner 1957** G. Kleiner, Hellenistische Sarkophage in Kleinasien, IstMitt 7, 1957, 1–10
- Köse 2005** V. Köse, Nekropolen und Grabdenkmäler von Sagalassos in Pisidien in Hellenistischer und Römischer Zeit, Studies in Eastern Mediterranean Archaeology 7 (Turnhout 2005)

- Kolb 2004** F. Kolb, Einführung, in: F. Kolb (ed.), Chora und Polis, Schriften des Historischen Kollegs. Kolloquien 54 (München 2004) pp. IX–XV
- Kolb 2006** Brill's New Pauly (1st online Publication 2006) s. v. Agora (F. Kolb), <http://dx.doi.org/10.1163/1574-9347_bnp_e108390> (11.09.2016)
- Kolb – Thomsen 2004** F. Kolb – A. Thomsen, Forschungen zu Zentralorten und Chora auf dem Gebiet von Kyaneai (Zentrallykien): Methoden, Ergebnisse, Probleme, in: F. Kolb (ed.), Chora und Polis, Schriften des Historischen Kollegs. Kolloquien 54 (München 2004) 1–42
- Kupke 1998** B. Kupke, Archäologische Forschungen in Kyaneai 1993/94, in: F. Kolb (ed.), Feldforschungen auf dem Gebiet von Kyaneai (Yavu-Bergland). Ergebnisse der Kampagnen 1993/94, AMS 29 = Lykische Studien 4 (Bonn 1998) 5–23
- Lafli – Christof 2012** E. Lafli – E. Christof, Hadrianopolis I. Inschriften aus Paphlagonia, BARIntSer 2366 (Oxford 2012)
- Lafli – Zäh 2008** E. Lafli – A. Zäh, Archäologische Forschungen im byzantinischen Hadrianoúpolis in Paphlagonien, Byzantinische Zeitschrift 101, 2008, 681–713
- Laiou 2002** A. E. Laiou, Exchange and Trade, Seventh-Twelfth Centuries, in: A. E. Laiou (ed.), The Economic History of Byzantium. From the Seventh through the Fifteenth Century, Dumbarton Oaks Studies 39 (Dumbarton Oaks 2002) 697–769
- Lang 2003a** G. Lang, Klassische antike Staetten Anatoliens I. Abonuteichos-Laranda (Norderstedt 2003)
- Lang 2003b** G. Lang, Klassische antike Staetten Anatoliens II. Larisa-Zeleia (Norderstedt 2003)

- Lauffer 1971** S. Lauffer, Diokletians Preisedikt, Texte und Kommentare 5 (Berlin 1971)
- Leake 1824** W. M. Leake, Journal of a Tour in Asia Minor with Comparative Remarks on the Ancient and Modern Geography of that Country (London 1824)
- Leusen 2002** P. M. V. Leusen, Pattern to Process. Methodological Investigations into Formation and Interpretation of Spatial Patterns in Archaeological Landscapes (Ph.D. diss. Rijksuniversiteit Groningen 2002)
- Levick 2004** B. Levick, The Roman Economy. Trade in Asia Minor and the Niche Market, GaR 51, fasc. 2, 2004, 180–198
- Liebeschuetz 2001** J. H. W. G. Liebeschuetz, Decline and Fall of the Roman City (Oxford 2001)
- Lloris 2015a** F. B. Lloris, Latin Epigraphy: The Main Types of Inscriptions, in: C. Bruun – J. Edmondson (eds.), The Oxford Book of Roman Epigraphy (New York 2015) 89–110
- Lloris 2015b** F. B. Lloris, The „Epigraphic Habit“ in the Roman World, in: C. Bruun – J. Edmondson (eds.), The Oxford Book of Roman Epigraphy (New York 2015) 131–148
- Lo Cascio 2009** E. Lo Cascio, Urbanization as a Proxy of Demographic and Economic Growth, in: A. Bowman – A. Wilson (eds.), Quantifying the Roman Economy. Methods and Problems, Oxford Studies on the Roman Economy 1 (Oxford 2009) 87–106
- Löhberg 2006a** B. Löhberg, Das „Itinirarium Provinciarum Antonini Augusti“. Ein kaiserzeitliches Straßenverzeichnis des Römischen Reiches. Textband (Berlin 2006)

- Löhberg 2006b** B. Löhberg, Das „Itinirarium Provinciarum Antonini Augusti“. Ein kaiserzeitliches Straßenverzeichnis des Römischen Reiches. Kartenband (Berlin 2006)
- Lösch 1954** A. Lösch, Die räumliche Ordnung der Wirtschaft. Eine Untersuchung über Standort, Wirtschaftsgebiete und internationalen Handel (Jena 1940)
- Long 1854** Dictionary of Greek and Roman Geography I (1854) 404–406 s. v. Bithynia (G. Long)
- Lucas 1712** P. Lucas, Voyage dans la Grèce, l'Asie Mineure, la Macédoine et l'Afrique I (Paris 1712)
- MacMullen 1982** R. MacMullen, The Epigraphic Habit in the Roman Empire, *AJPh* 103, 1982, 233–246
- MacMullen 1986** R. MacMullen, Frequency of Inscriptions in Roman Lydia, *ZPE* 65, 1986, 237–238
- Madsen 2009** J. M. Madsen, Eager to be Roman. Greek Response to Roman Rule in Pontus and Bithynia (London 2009)
- Madzharov 2009** M. Madzharov, Roman Roads in Bulgaria. Contribution to the Development of Roman Road System in the Provinces of Moesia and Thrace (Veliko Tarnovo 2009)
- Magie 1950** D. Magie, Roman Rule in Asia Minor to the End of the Third Century After Christ II. Notes (Princeton 1950)
- Mango – Dagron 1995** C. Mango – G. Dagron (eds.), Constantinople and Its Hinterland. Papers from the Twenty-Seventh Spring Symposium of Byzantine Studies, Oxford, April 1993 (Cambridge 1995)
- Mansel 1974** M. Mansel, Gemlik Tümülüs Mezari, *Belleten* 150, 1974, 181–189
- Marek 1993** C. Marek, Stadt, Ära und Territorium in Pontus-Bithynia und Nord-Galatia. Katalog der Inschriften von

- Kaisareia/Hadrianopolis, *IstForsch* 39 (Tübingen 1993) 187–210, Anhang 6
- Marek 2003** C. Marek, Pontus et Bithynia. Die Römischen Provinzen im Norden Kleinasiens (Mainz 2003)
- Marek 2013** C. Marek, Intellektuelle in Bithynien und ihre Feindschaften, in: E. Winter – K. Zimmermann (eds.), *Neue Funde und Forschungen in Bithynien*, *AMS* 69 (Bonn 2013) 33–46
- Marsh et al. 2009** B. Marsh – N. Roberts – V. Toprak – R. Matthews – W. Eastwood – J. Carolan – A. Arcasoy – M. L. Süzen, Context of Human Interaction: Geology, Geography, Geomorphology and Environment, in: R. Matthews – C. Glatz (eds.), *At Empires Edge: Project Paphlagonia. Regional Survey in North-Central Turkey*, *BIAA Monograph* 44 (London 2009) 27–73
- Marzano 2011** A. Marzano, Rank-Size Analysis and the Roman Cities of the Iberian Peninsula and Britain: Some Considerations, in: A. Bowman – A. Wilson (eds.), *Settlement, Urbanization, and Population*, *Oxford Studies on the Roman Economy* 2 (Oxford 2011) 196–228
- Matthews 2007** R. Matthews, An Arena for Cultural Contact. Paphlagonia (North-Central Turkey) Through Prehistory, *AnSt* 57, 2007, 25–34
- Matthews – Glatz 2009** R. Matthews – C. Glatz (eds.), *At Empires Edge: Project Paphlagonia. Regional Survey in North-Central Turkey*, *BIAA Monograph* 44 (London 2009)
- Mattingly 2006** D. Mattingly, The Imperial Economy, in: D. S. Potter (ed.), *A Companion to the Roman Empire* (Malden 2006) 283–311
- McCormick 2001** M. McCormick, *Origins of the European Economy. Communications and Commerce, A.D. 300–900* (Cambridge 2001)

- McLean 2002** B. H. McLean, *An Introduction to Greek Epigraphy of the Hellenistic and Roman Periods from Alexander the Great down to the Reign of Constantine (323 B.C. – A.D. 337)* (Ann Arbor 2002)
- Mellink 1956** M. J. Mellink, *Archaeology in Asia Minor*, AJA 60, 1956, 369–384
- Mellink 1959** M. J. Mellink, *Archaeology in Asia Minor*, AJA 63, 1959, 73–85
- Mellink 1960** M. J. Mellink, *Archaeology in Asia Minor*, AJA 64, 1960, 57–69
- Mellink 1964** M. J. Mellink, *Archaeology in Asia Minor*, AJA 68, 1964, 149–166
- Mellink 1967** M. J. Mellink, *Archaeology in Asia Minor*, AJA 71, 1967, 155–174
- Mellink 1968** M. J. Mellink, *Archaeology in Asia Minor*, AJA 72, 1968, 125–147
- Mellink 1973** M. J. Mellink, *Archaeology in Asia Minor*, AJA 77, 1973, 169–193
- Mellink 1974** M. J. Mellink, *Archaeology in Asia Minor*, AJA 78, 1974, 105–130
- Mellink 1976** M. J. Mellink, *Archaeology in Asia Minor*, AJA 80, 1976, 261–289
- Mellink 1979** M. J. Mellink, *Archaeology in Asia Minor*, AJA 83, 1979, 331–352
- Mellink 1980** M. J. Mellink, *Archaeology in Asia Minor*, AJA 84, 1980, 501–518
- Mellink 1982** M. J. Mellink, *Archaeology in Asia Minor*, AJA 86, 1982, 557–576
- Mellink 1987** M. J. Mellink, *Archaeology in Anatolia*, AJA 91, 1987, 1–30
- Mellink 1990** M. J. Mellink, *Archaeology in Anatolia*, AJA 94, 1990, 125–151
- Mellink 1991** M. J. Mellink, *Archaeology in Anatolia*, AJA 95, 1991, 123–153

- Mellink 1993** M. J. Mellink, *Archaeology in Anatolia*, AJA 97, 1993, 105–133
- Mendel 1900** G. Mendel, *Inscriptions de Bithynie*, BCH 24, 1900, 361–426
- Meriçboyu – Atasoy 1969** Y. Meriçboyu – S. Atasoy, *İzmit Kanlıbag Tümülüsü*, İstanbul Arkeoloji Müzeleri Yıllığı 15/16, 1969, 67–95
- Merkelbach 1985** R. Merkelbach, *Nikaia die Rankenreiche (ΕΛΙΚΩΦΗ)*. Ein übersehenes Fragment aus Arrians *Bithyniaka*, EpigrAnat 5, 1985, 1–3
- Merkelbach 1987** R. Merkelbach, *Nikaia in der Römischen Kaiserzeit* (Opladen 1987)
- Merkelbach – Stauber 2001** R. Merkelbach – J. Stauber, *Steinepigramme aus dem griechischen Osten II. Die Nordküste Kleinasiens (Marmarameer und Pontos)* (München 2001)
- Merkelbach et al. 1980** R. Merkelbach – F. K. Dörner – S. Şahin, *Die Inschriften von Kalchedon*, IK 20 (Bonn 1980)
- Meyer 1973** E. Meyer, *Einführung in die Lateinische Epigraphik* (Darmstadt 1973)
- Meyer 1990** E. A. Meyer, *Explaining the Epigraphic Habit in the Roman Empire: The Evidence of Epitaphs*, JRS 80, 1990, 74–96
- Meyer 2013** E. A. Meyer, *Inscriptions as Honors and the Athenian Epigraphic Habit*, Historia 62, 2013, 453–505
- Michels 2014** C. Michels, *Die Kleinkönigreiche Bithynien, Pontos und Kappadokien*, in: K. Ehling – G. Weber (eds.), *Hellenistische Königreiche* (Darmstadt 2014) 135–140
- Millar 1981** F. Millar, *The Roman Empire and Its Neighbours* (New York 1981)
- Miller 1916** K. Miller, *Itineraria Romana. Römische Reisewege an der Hand der Tabula Peutingeriana* (Stuttgart 1916)
- Miller 1995** S. G. Miller, *Architecture as Evidence for the Identity of the Early Polis*, in: M. H. Hansen (ed.), *Sources for the Ancient*

- Greek City-State. Symposium August, 24-27 1994. Acts of the Copenhagen Polis Centre 2, *Historisk-filosofiske Meddelelser* 72 (Copenhagen 1995) 201–244
- Mitchell 1995a** S. Mitchell, *Anatolia. Land, Men, and Gods in Asia Minor I. The Celts in Anatolia and the Impact of Roman Rule* (Oxford 1995)
- Mitchell 1995b** S. Mitchell, *Anatolia. Land, Men, and Gods in Asia Minor II. The Rise of the Church* (Oxford 1995)
- Mitchell 1998/1999** S. Mitchell, *Archaeology in Asia Minor 1990–98*, *ARepLond* 45, 1998/1999, 125–192
- Mitchell et al. 2005** St. Mitchell – C. Katsari – D. Braund (eds.), *Patterns in the Economy of Roman Asia Minor* (Swansea 2005)
- Morley 2011** N. Morley, *Cities and Economic Development in the Roman Empire*, in: A. Bowman – A. Wilson (eds.), *Settlement, Urbanization, and Population*, *Oxford Studies on the Roman Economy* 2 (Oxford 2011) 143–160
- Morrisson – Sodini 2002** C. Morrisson – J.-P. Sodini, *The Sixth Century Economy*, in: A. E. Laiou (ed.), *The Economic History of Byzantium. From the Seventh through the Fifteenth Century*, *Dumbarton Oaks Studies* 39 (Dumbarton Oaks 2002) 171–220
- Mueller et al. 1997** S. Mueller – H. G. Kahle – A. Barka, *Plate Tectonic Situation in the Anatolian-Aegean Region*, in: C. Schindler – M. Pfister (eds.), *Active Tectonics of Northwestern Anatolia – The MARMARA Poly-Project. A Multidisciplinary Approach by Space-Geodesy, Geology, Hydrology, Geothermics and Seismology* (Zürich 1997) 13–28
- Naumann 1893** E. Naumann, *Vom Goldenen Horn zu den Quellen des Euphrat. Reisebriefe, Tagebuchblätter und Studien über die Asiatische Türkei und die Anatolische Bahn* (München 1893)

- Newhard et al. 2008** J. M. L. Newhard – N. Levine – A. Rutherford, Least-Cost Pathway Analysis and Inter-Regional Interaction in the Göksu Valley, Turkey, *AnSt* 58, 2008, 87–102
- Niewöhner et al. 2010** P. Niewöhner – W. Rabbel – H. Stümpel – R. Pašteka – Ş. Barış, Eine neu entdeckte byzantinische Kirche in Iznik/Nikaia, *IstMitt* 60, 2010, 475–490
- Niewöhner et al. 2011** P. Niewöhner – H. Stümpel – Ş. Barış – R. Pašteka – W. Rabbel, A Newly Discovered Byzantine Church in Iznik/Nicaea, in: M. Şahin – I. H. Mert (eds.), *The Proceeding of International Workshop: Localisation of the 1st Council Palace in Nicaea. 22-23 Mayıs/May 2010 Iznik (Bursa 2011)* 105–127
- Özgan – Altın 2015** R. Özgan – A. A. Altın, Iznik / Nikaia'dan İkinci Bir Sütunlu Lahit (Res. 2–10), in: C. Şimşek – B. Duman – E. Konakçı (eds.), *Mustafa Büyükkolancı'ya Armağan. Essays in Honour of Mustafa Büyükkolancı (Istanbul 2015)* 485–504
- Öztürk 2013** B. Öztürk, The History of Tieion/Tios (Eastern Bithynia) in the Light of Inscriptions, in: M. Manoledakis (ed.), *Exploring the Hospitable Sea. Proceedings of the International Workshop on the Black Sea Antiquity held in Thessaloniki, 21–23 September 2012, BARIntSer 498 (Oxford 2013)* 147–164
- Okay 2008** A. I. Okay, Geology of Turkey: A Synopsis, in: Ü. Yalçın (ed.), *Anatolian Metal 4, Anschnitt Beih. 21 = Veröffentlichungen aus dem Deutschen Bergbau-Museum Bochum 157 (Bochum 2008)* 19–42
- Olshausen 2012** *DNP Suppl. III (2012)* 182–183 s. v. Die Entwicklung der Römischen Provinzen in Kleinasien (2. Jh. v. Chr. bis 5. Jh. n. Chr.) (E. Olshausen)
- Ortaç 2011** M. Ortaç, Bolu İli Yüzey Araştırması 2009, *AST* 28, fasc. 1, 2011, 329–348

- Ortaç 2012** M. Ortaç, Bolu ili Yüzey Araştırması 2010: Merkez ve Mudurnu İlçeleri İle Köyleri, *AST 29*, fasc. 1, 2012, 129–154
- Paliou et al. 2014** E. Paliou – U. Lieberwirth – S. Polla (eds.), *Spatial Analysis and Social Spaces. Interdisciplinary Approaches to the Interpretation of Prehistoric and Historic Built Environment*, *Topoi. Berlin Studies of the Ancient World 18* (Berlin 2014)
- Pekáry 1968** T. Pekáry, *Untersuchungen zu den Römischen Reichsstrassen, Antiquitas. Abhandlungen zur alten Geschichte 17* (Bonn 1968)
- Perrot 1872** G. Perrot, *Exploration archéologique de la Galatie et la Bithynie, d'une partie de la Mysie, de la Phrygie, de la Cappadoce et du Pont I* (Paris 1872)
- Petzl 2012** G. Petzl, *Greek Epigraphy and the Greek Language*, in: J. Davies – J. Wilkes (eds.), *Epigraphy and the Historical Sciences, Proceedings of the British Academy 177* (Oxford 2012) 47–60
- Philippson 1939** A. Philippson, *Das Byzantinische Reich als geographische Erscheinung* (Leiden 1939)
- Pleket 2003** H. W. Pleket, *Economy and Urbanization. Was there an Impact of Empire in Asia Minor?*, in: E. Schwertheim – E. Winter (ed.), *Stadt und Stadtentwicklung in Kleinasien, AMS 50* (Bonn 2003) 85–95
- Pococke 1745** R. Pococke, *A Description of the East, and some other Countries II 2. Observations on the Islands of the Archipelago, Asia Minor, Thrace, Greece, and some other Parts of Europe* (London 1745)
- Podossinov 2012** A. V. Podossinov, *Bithynia, Paphlagonia and Pontus on the Tabula Peutingeriana*, in: G. R. Tsetschladze (ed.), *The Black Sea, Paphlagonia, Pontus and Phrygia in Antiquity. Aspects of Archaeology and Ancient History, BARIntSer 2432* (Oxford 2012) 203–206

- Polla – Verhagen 2014** S. Polla – P. Verhagen (eds.), *Computational Approaches to the Study of Movement in Archaeology. Theory, Practice and Interpretation of Factors and Effects of Long Term Landscape Formation and Transformation*, Topoi. Berlin Studies of the Ancient World 23 (Berlin 2014)
- Polla et al. 2013** S. Polla – G. Graßhoff – E. Rinner, *Explanatory Models in Archaeology. Are Least Cost Paths the Way to Go?*, in: F. Contreras – M. Farjas – F. J. Melero (eds.), *Fusion of Cultures. Proceedings of the 38th Annual Conference on Computer Applications and Quantitative Methods in Archaeology*, Granada, Spain, April 2010, BarIntSer 2494 (Oxford 2013) 299–302
- Powell 2003** O. Powell, *Galen. On the Properties of Foodstuffs* (Cambridge 2003)
- Price 2011** S. Price, *Estimating Ancient Greek Populations. The Evidence of Field Survey*, in: A. Bowman – A. Wilson (eds.), *Settlement, Urbanisation, and Population, Oxford Studies on the Roman Economy 2* (Oxford 2011) 17–35
- Ramsay 1962** W. M. Ramsay, *The Historical Geography of Asia Minor*, Royal Geographical Society Suppl. 4 (London 1890; Repr. Amsterdam 1962)
- Reger 2013** G. Reger, *Hellenistic Greece and Western Asia Minor*, in: W. Scheidel – I. Morris – R. P. Saller (ed.), *The Cambridge Economic History of the Greco-Roman World* (Cambridge 2013) 460–483
- Rennell 1831** J. Rennell, *A Treatise on the Comparative Geography of Western Asia II* (London 1831)
- Ritter 2015** M. Ritter, *The End of Late Antiquity in Paphlagonia. Disurbanisation from a Comparative Perspective*, in: K.

- Winther-Jacobsen – L. Summerer (eds.), *Landscape Dynamics and Settlement Patterns in Northern Anatolia during the Roman and Byzantine Period*, *Geographica Historica* 32 (Stuttgart 2015) 119–133
- Rizakis 1997** A. D. Rizakis, *Roman Colonies in the Province of Achaia. Territories, Land and Population*, in: S. E. Alcock (ed.), *The Early Roman Empire in the East*, *Oxbow Monograph* 95 (Oxford 1997) 15–36
- Robert 1970** L. Robert, *Études anatoliennes. Recherches sur les inscriptions grecques de l'Asie Mineure*, *Études orientales* 5 (Amsterdam 1970) 224–300
- Robert 1977** L. Robert, *Documents d'Asie Mineure*, *BCH* 101, 1977, 43–132
- Rodenwaldt 1943** G. Rodenwaldt, *Sarkophagprobleme*, *RM* 58, 1943, 1–26
- Ross 2007** A. Ç. Ross, *Ancient İzmit. Nicomedia* (Istanbul 2007)
- Rostovtzeff 1926** M. Rostovtzeff, *The Social and Economic History of the Roman Empire* (Oxford 1926)
- Rostovtzeff 1936** M. I. Rostovtzeff, *The Hellenistic World and Its Economic Development*, *The American Historical Review* 41, 1936, 231–252
- Rostovtzeff 1998** M. Rostovtzeff, *The Social and Economic History of the Hellenistic World I–III* (Oxford 1941, Repr. Oxford 1998)
- Ruffing 2009** K. Ruffing, *Interdependente, spezialisierte dörfliche Ökonomien und ihre Ausrichtung an überregionalen Märkten in der römischen Kaiserzeit*, in: T. Mattern – A. Vött (eds.), *Mensch und Umwelt im Spiegel der Zeit. Aspekte geoarchäologischer Forschungen im östlichen Mittelmeergebiet*, *Philippika. Marburger altertumskundliche Abhandlungen* 1 (Wiesbaden 2009) 127–145
- Ruge 1937** *RE* I 17, 2 (1937) 2302 s. v. Oka (W. Ruge)

- Russell 2013** B. Russell, The Economics of the Roman Stone Trade, Oxford Studies on the Roman Economy 6 (Oxford 2013)
- Russell 1958** J. C. Russell, Late Ancient and Medieval Population, Transactions of the American Philosophical Society 48, 1958, 1-152
- Şahin 2012** M. Şahin, 2010 Yılı Bursa İli Yüzey Araştırması Harmancık – Mudanya, AST 29, fasc. 1, 2012, 11–26
- Şahin 2014a** M. Şahin, İznik Gölü’nde Gizli Tarih, Bursa’da Zaman 9, 2014, 2–5
- Şahin 2014b** M. Şahin, Mudanya Tümüsülü, Prusa Şehrengiz. Türkiye’nin En İyi Yerel Tarih ve Kültür Dergisi 50/51, 2014, 14–17
- Şahin 2016a** M. Şahin, İznik Gölü Bazilika Kazısı Sikke Örnekleri, Bursa’da Zaman 19, 2016, 48–49
- Şahin 2016b** M. Şahin, İznik Gölü Bazilikası’nın Köle Tasvirli Sikkeleri, Bursa’da Zaman 20, 2016, 76–79
- Şahin 2017** M. Şahin İznik Gölü Mezarları, Bursa’da Zaman 21, 2017, 78–81
- Şahin et al. 2008** M. Şahin – D. Yavaş – R. Okçu – D. Şahin, İznik Yüzey Araştırması 2006, AST 25, fasc. 1, 2008, 11–26
- Şahin et al. 2014** M. Şahin – E. Tok – Ş. Kiliç, Deprem Kurbanı Aziz Neophytos: İznik Gölü’ndeki Batık Kilise, Deniz Magazin 39, 2014, 42–45
- Şahin 1974** S. Şahin, Neufunde von antiken Inschriften in Nikomedeia (Izmit) und in der Umgebung der Stadt (Ph.D. diss. Westfälische Wilhelms-Universität Münster 1974)
- Şahin 1975** S. Şahin, Neue Inschriften von der bithynischen Halbinsel, ZPE 18, 1975, 27–48
- Şahin 1978** S. Şahin, Bithynische Studien, IK 7 (Bonn 1978)
- Şahin 1979** S. Şahin, Katalog der antiken Inschriften des Museums von Iznik (Nikaia) I, IK 9 (Bonn 1979)

- Şahin 1981** S. Şahin, Katalog der antiken Inschriften des Museums von Iznik (Nikaia) II 1, IK 10, 1 (Bonn 1981)
- Şahin 1982** S. Şahin, Katalog der antiken Inschriften des Museums von Iznik (Nikaia) II 2, IK 10, 2 (Bonn 1982)
- Şahin 1984a** S. Şahin, Zwei Meilensteine aus der Gegend von Claudiopolis – Krateia, *EpigrAnat* 3, 1984, 101–104
- Şahin 1984b** S. Şahin, TAM IV Nr. 57 und 160 stammen nicht aus „Bey-Köy“ bei Nikomedia, sondern aus Umurbey bei Nikaia, *EpigrAnat* 3, 1984, 105–107
- Şahin 1986a** S. Şahin, Katalog der bithynischen Inschriften im Museum von Istanbul, *EpigrAnat* 8, 1986, 109–128
- Şahin 1986b** S. Şahin, Studien über die Probleme der historischen Geographie des Nordwestlichen Kleinasien 1. Strabon XII 3, 7 p. 543. Der Fluss Gallos, die Stadt Modr<en>e in Phrygia Epiktetos und die Schiffbarkeit des Sangarios, *EpigrAnat* 7, 1986, 125–152
- Şahin 1986c** S. Şahin, Studien über die Probleme der historischen Geographie des Nordwestlichen Kleinasien 2. Malagina / Melagina am Sangarios, *EpigrAnat* 7, 1986, 153–167
- Şahin 1987** S. Şahin, Katalog der antiken Inschriften des Museums von Iznik (Nikaia) II 3, IK 10, 3 (Bonn 1987)
- Şahin 1999** S. Şahin, Wasserbauten Justinians am unteren Sangarius in Bithynien, in: *Atti dell 'XI Congresso Internazionale di Epigrafia Greca e Latina. Roma, 18–24 settembre 1997* 2 (Rom 1999) 643–658
- Şahin 2004** S. Şahin, Hellenistik ve Roma Çağlarında Iznik / Nikaia, *Tarih Boyunca Iznik* (Istanbul 2004) 3–22
- Salermi 2005** G. Salmeri, Central Power Intervention and the Economy of the Provinces in the Roman Empire. The Case of Pontus and

- Bithynia, in: S. Mitchell – C. Katsari (eds.), *Patterns in the Economy of Roman Asia Minor* (Swansea 2005) 187–206
- Saller 2002** R. Saller, *Framing the Debate over Growth in the Ancient Economy*, in: W. Scheidel – S. von Reden (eds.), *The Ancient Economy* (Edinburgh 2002) 251–269
- Scardozi 2013** G. Scardozi, *Ancient Land Divisions in the Territories of Hierapolis in Phrygia and Nicaea (Turkey). The Contribution of Multitemporal Satellite Images to the Discovery and Study*, in: R. Lasaponara – N. Masini – M. Biscione (eds.), *33rd EARSeL Symposium. Towards Horizon 2020: Earth Observation and Social Perspectives. 3–6 June 2013 Matera, Italy (s. l. 2013)* 875–886
- Scheidel 2009** W. Scheidel, *In Search for Roman Economic Growth*, *JRA* 22, 2009, 46–70
- Scheidel 2013** W. Scheidel, *Demography*, in: W. Scheidel – I. Morris – R. P. Saller (ed.), *The Cambridge Economic History of the Greco-Roman World* (Cambridge 2013) 38–86
- Scheidel 2014** W. Scheidel (ed.), *The Cambridge Companion to the Roman Economy* ³(Cambridge 2014)
- Scheidel – von Reden 2002** W. Scheidel – S. von Reden (eds.), *The Ancient Economy* (Edinburgh 2002)
- Scheidel et al. 2013** W. Scheidel – I. Morris – R. P. Saller (ed.), *The Cambridge Economic History of the Greco-Roman World* (Cambridge 2013)
- Schneider – Karnapp 1938** A. M. Schneider – W. Karnapp, *Die Stadtmauer von Iznik (Nicaea)*, *IstForsch* 9 (Berlin 1938)
- Schneider 1943** A. M. Schneider, *Die Römischen und Byzantinischen Denkmäler von Iznik-Nicaea*, *IstForsch* 16 (Berlin 1943)
- Schneiderwirth 1882** H. Schneiderwirth, *Das Pontische Heraclea* (Düsseldorf 1882)

- Schuler 2015** C. Schuler, Local Elites in the Greek East, in: C. Bruun – J. Edmondson (eds.), *The Oxford Book of Roman Epigraphy* (New York 2015) 250–273
- Schwertheim – Şahin 1977** E. Schwertheim – S. Şahin, Neue Inschriften aus Nikomedeia und Umgebung, *ZPE* 24, 1977, 259–264
- Şerifoğlu – Bakan 2015** T. E. Şerifoğlu – C. Bakan, The Cide-Şenpazar Region during Hellenistic Period (325/300 - 1BC), in: B. S. Düring – C. Glatz (eds.), *Kinetic Landscapes. The Cide Archaeological Project: Surveying the Turkish Western Black Sea Region* (Warsaw 2015) 246–259
- Sharankov 2011** N. Sharankov, Language and Society in Roman Thrace, in: I. P. Haynes (ed.), *Early Roman Thrace. New Evidence from Bulgaria*, *JRA Suppl.* 82 (Portsmouth 2011) 135–155
- Smith 2004** M. E. Smith, The Archaeology of the Ancient State Economies, *Annual Review of Anthropology* 33, 2004, 73–102
- Stambaugh 1988** J. E. Stambaugh, The Ancient Roman City, *Ancient Society and History* 35 (Baltimore 1988)
- Starr 1962** S. F. Starr, *The Ancient Roads of Asia Minor: Expedition 1961* (Ph.D. diss. Yale University, New Haven 1962)
- Starr 1963** S. F. Starr, Mapping Ancient Roads in Anatolia, *Archaeology* 16, fasc. 3, 1963, 162–169
- Strobel 2011** Brill's New Pauly (1st online Publication 2006; 201) s. v. Bityhnia (K. Strobel), <http://dx.doi.org/10.116/1574-9347_bnp_e217910> (26.03.2017)
- Talbert 1985** R. J. A. Talbert, *Atlas of Classical History* (London 1985)
- Talbert 2000** R. J. A. Talbert (ed.), *Barrington Atlas of the Greek and Roman World* (Princeton 2000)
- Talbert 2014** R. J. A. Talbert, *Rome's World. The Peutinger Map Reconsidered* (New York 2014)

- Talbert et al. 2017** R. J. A. Talbert – B. Turner – J. A. Becker – R. Horne – R. Twele – G. Moss (eds.), *Asia Minor in the 2nd Century C.E.* scale 1:750000 (2017), <<http://awmc.unc.edu/wordpress/blog/2017/02/22/wall-map-now-available-asia-minor-in-the-second-century-c-e/>> (12.03.2017)
- Texier 1862** C. Texier, *Asia Mineure. Description géographique, historique et archéologique des provinces et des villes de la Chersonnèse d'Asie* (Paris 1862)
- Tschihatscheff 1867** P. A. Tschihatscheff, *Reisen in Kleinasien und Armenien 1847–1863* (Gotha 1867)
- Tschihatscheff 1887** P. A. Tschihatscheff, *Klein-Asien* (Berlin 1887)
- Tsetschladze 2006** G. R. Tsetschladze, *Revisiting Ancient Greek Colonisation*, in: G. R. Tsetschladze (ed.), *Greek Colonisation. An Account of Greek Colonies and Other Settlements Overseas 1*, *Mnemosyne Suppl.* 193, 1 (Leiden 2006) pp. xxiii–lxxxiii
- Tülek 2009** F. Tülek, *Bitinya-Paflagonya Bölgeleri Mozaik Külliyyat 2007 Çalışması*, *AST* 29, fasc. 1, 2009, 141–146
- Turgut – Aksoy 1996** M. Turgut – T. Aksoy, 'Kocaeli İli Üçtepeliler Köyü Büyük Tümülüs Kurtarma Kazısı, Müze Kurtarma Kazıları Sonuçları 6, 1996, 399–414
- Ülgen et al. 2012** U. B. Ülgen – S. O. Franz – D. Biltekin – M. N. Çagatay – P. A. Roeser – L. Doner – J. Thein, *Climatic and Environmental Evolution of Lake Iznik (NW Turkey) Over the Last ~ 4700 Years*, *Quaternary International* 274, 2012, 88–101
- Ustaömer et al. 2005** P. A. Ustaömer – R. Mundil – P. R. Renne, *U/Pb and Pb/Pb Zircon Ages for Arc-Related Intrusions of the Bolu Massif (W Pontides, NW Turkey): Evidence for Late Precambrian (Cadomian) Age*, *Terra Nova* 17, 2005, 215–223

- Vanhaverbeke 2003** H. Vanhaverbeke, The Evolution of the Settlement Patterns, in: H. Vanhaverbeke – M. Waelkens (eds.), The Evolution of the Settlement Pattern from Prehistoric until Recent Times, Studies in Eastern Mediterranean Archaeology 5 (Turnhout 2003) 149–326
- Vanhaverbeke – Waelkens 2003** H. Vanhaverbeke – M. Waelkens (eds.), The Evolution of the Settlement Pattern from Prehistoric until Recent Times, Studies in Eastern Mediterranean Archaeology 5 (Turnhout 2003)
- Verhagen 2013** P. Verhagen, On the Road to Nowhere? Least Cost Paths, Accessibility and the Predictive Modelling Perspective, in: F. Contreras – M. Farjas – F. J. Melero (eds.), Fusion of Cultures. Proceedings of the 38th Annual Conference on Computer Applications and Quantitative Methods in Archaeology, Granada, Spain, April 2010, BarIntSer 2494 (Oxford 2013) 383–389
- Verhagen et al. 2014** P. Verhagen – S. Polla – I. Frommer, Finding Byzantine Junctions with Steiner Trees, in: S. Polla – P. Verhagen (eds.), Computational Approaches to the Study of Movement in Archaeology. Theory, Practice and Interpretation of Factors and Effects of Long Term Landscape Formation and Transformation, Topoi. Berlin Studies of the Ancient World 23 (Berlin 2014) 73–98
- von Diest 1889** W. von Diest, Von Pergamon über den Dindymos zum Pontus, Petermanns Geographische Mitteilungen Ergh. 94 (Gotha 1889)
- von Diest 1895** W. von Diest, Reise von Major W. v. Diest, in: W. von Diest – M. Anton (eds.), Neue Forschungen im nordwestlichen

- Kleinasien, Petermanns Geographische Mitteilungen Ergh. 116 (Gotha 1895) 1–40
- von Diest 1898** W. von Diest, Von Tilsit nach Angora. Forschungsreise zweier preußischen Staboffiziere im Frühjahr 1896, Petermanns Geographische Mitteilungen Ergh. 125 (Gotha 1898)
- Waelkens 1982** M. Waelkens, Dokimeion. Die Werkstatt der repräsentativen, kleinasiatischen Sarkophage. Chronologie und Typologie ihrer Produktion, AF 11 (Berlin 1982)
- Waelkens 1993** M. Waelkens (ed.), First General Report on the Survey (1986 – 1989) and Excavations (1990 – 1991), Sagalassos 1 = Acta Archaeologica Lovaniensia Monographiae 5 (Leuven 1993)
- Waelkens – Loots 2000** M. Waelkens – L. Loots (eds.), Report on the Survey and Excavation Campaigns of 1996 and 1997, Sagalassos 5 = Acta Archaeologica Lovaniensia Monographiae 11A/B (Leuven 2000)
- Waelkens – Poblome 1993** M. Waelkens – J. Poblome (eds.), Report on the Third Excavation Campaign of 1992, Sagalassos 2 = Acta Archaeologica Lovaniensia Monographiae 6 (Leuven 1993)
- Waelkens – Poblome 1995** M. Waelkens – J. Poblome (eds.), Report on the Fourth Excavation Campaign of 1993, Sagalassos 3 = Acta Archaeologica Lovaniensia Monographiae 7 (Leuven 1995)
- Waelkens – Poblome 1997** M. Waelkens – J. Poblome, Report on the Survey and Excavation Campaigns of 1994 and 1995, Sagalassos 4 = Acta Archaeologica Lovaniensia Monographiae 9 (Leuven 1997)
- Waelkens et al. 2000** M. Waelkens – E. Paulissen – H. Vanhaverbeke – G. Reyniers – J. Poblome – R. Degeest – W. Viane – J. Deckers – B. de Cupere – W. van Neer – H. A. Ekinici – M. O. Erbay, The 1996 and 1997 Surveys in the Territory of Sagalassos, in: M. Waelkens – L. Loots (eds.), Report on the Survey and Excavation Campaigns

- of 1996 and 1997, Sagalassos 5 = Acta Archaeologica Lovaniensia Monographiae 11A/B (Leuven 2000) 17–216
- Waelkens et al. 2003** M. Waelkens – E. Paulissen – H. Vanhaverbeke, Topographical Units within the Territory of Sagalassos, in: H. Vanhaverbeke – M. Waelkens (eds.), The Evolution of the Settlement Pattern from Prehistoric until Recent Times, Studies in Eastern Mediterranean Archaeology 5 (Turnhout 2003) 60–87
- Ward-Perkins 1980** J. B. Ward-Perkins, The Marble Trade and Its Organisation. Evidence from Nicomedia, MemAmAc 36, 1980, 325–388
- Ward-Perkins 1992** J. B. Ward-Perkins, Nicomedia and the Marble Trade (BSR 48 (1980), in: H. Dodge – B. Ward-Perkins (eds.), Marble in Antiquity. Collected Papers of J. B. Ward-Perkins, Archaeological Monographs of the British School at Rome 6 (London 1992) 61–105
- Ward-Perkins 1996** J. B. Ward-Perkins, Urban Continuity? in: N. Christie – S. T. Loseby (eds.), Towns in Transition. Urban Evolution in Late Antiquity and the Early Middle Ages (Hants 1996) 4–17
- Welwei 2006** Brill's New Pauly (1st online Publication 2006) s. v. Polis (K. W. Welwei), <http://dx.doi.org/10.1163/1574-9347_bnp_e1000430> (11.09.2016)
- Weiser 1983** W. Weiser, Katalog der Bithynischen Münzen der Sammlung des Instituts für Altertumskunde der Universität I. Nikaia. Mit einer Untersuchung der Prägesysteme und Gegenstempel, Papyrologica Coloniensia 11 (Opladen 1983)
- Weissová – Pavúk 2016** B. Weissová – P. Pavúk, On Persistency of the Main Communication Routes from Prehistory until Today, TüBA-Ar 19, 2016, 11–21

- Weissová et al. forthcoming 2018** B. Weissová – R. Brigand – S. Polla, The Economic Landscape of the Hellenistic, Roman and Late Antique Bithynia. Iznik Intensive Survey Project, eTOPOI, forthcoming 2018
- Whitby 1985** M. Whitby, Justinian's Bridge over the Sangarius and the Date of Procopius' *de Aedificiis*, *JHS* 105, 1985, 129–148
- White – Surface-Evans 2012** D. White – S. Surface-Evans (eds.), Least Cost Analysis of Social Landscapes. Archaeological Case Studies (Salt Lake City 2012)
- Wiegartz 1965** H. Wiegartz, Kleinasiatische Säulensarkophage. Untersuchungen zum Sarkophagtypus und zu den figürlichen Darstellungen, *IstForsch* 26 (Berlin 1965)
- Wilson 2009a** A. Wilson, Indicators for Roman Economic Growth. A Response to Walter Scheidel, *JRA* 22, 2009, 71–82
- Wilson 2009b** A. Wilson, Approaches to Quantifying Roman Trade, in: A. Bowman – A. Wilson (eds.), *Quantifying the Roman Economy. Methods and Problems*, *Oxford Studies on the Roman Economy* 1 (Oxford 2009) 213–249
- Wilson 2011** A. Wilson, City Sizes and Urbanization in the Roman Empire, in: A. Bowman – A. Wilson (eds.), *Settlement, Urbanization, and Population*, *Oxford Studies on the Roman Economy* 2 (Oxford 2011) 161–195
- Winfield 1977** D. Winfield, The Northern Routes Across Anatolia, *AnSt* 27, 1977, 151–166
- Winter 1996** E. Winter, Staatliche Baupolitik und Baufürsorge in den römischen Provinzen des kaiserzeitlichen Kleinasien, *AMS* 20 (Bonn 1996)
- Woolf 1997a** G. Woolf, Beyond Romans and Natives, *World Archaeology* 28, 1997, 339–350

- Woolf 1997b** G. Woolf, The Roman Urbanization of the East, in: S. E. Alcock (ed.), The Early Roman Empire in the East, Oxbow Monograph 95 (Oxford 1997) 1–14
- Yalman 1981** B. Yalman, İznik Tiyatro Kazısı 1980, KST 3, 1981, 31–34
- Yalman 1983** B. Yalman, İznik Tiyatro Kazısı, KST 5, 1983, 215–220
- Yalman 1984** B. Yalman, İznik Tiyatro Kazısı 1983, KST 6, 1984, 459–467
- Yalman 1985** B. Yalman, İznik Tiyatro Kazısı, KST 7, 1985, 579–595
- Yalman 1986** B. Yalman, İznik Tiyatro Kazısı 1985, KST 8, 1986, 233–257
- Yalman 1987** B. Yalman, İznik Tiyatro Kazısı 1986, KST 9, fasc. 2, 1987, 299–328
- Yalman 1988** B. Yalman, İznik Tiyatro Kazısı 1987, KST 10, fasc. 2, 1988, 339–382
- Yalman 1990** B. Yalman, İznik Tiyatro Kazısı 1988, KST 11, fasc. 2, 1990, 301–324
- Yalman 1991** B. Yalman, İznik Tiyatro Kazısı 1989, KST 12, fasc. 2, 1991, 379–404
- Yalman 1992** B. Yalman, İznik Tiyatro Kazısı 1990, KST 13, fasc. 2, 1992, 377–402
- Yalman 1993a** B. Yalman, İznik Tiyatro Kazısı 1991, KST 14, fasc. 2, 1993, 181–203
- Yalman 1993b** B. Yalman, İznik ve Çevresinde Belirlenen Eski Eser Tahribatları ve Öneri Koruma Tedbirleri, Ankara Üniversitesi Dil Tarih Coğrafya Fakültesi Dergisi 36, fasc. 1/2, 1993, 461–479
- Yalman 1994** B. Yalman, İznik Dörttepeliler Tümülüsü Mezar Odaları ve İznik Müzesi'ne Gelen Önemli Eserler, XI. Türk Tarih Kongresinden Ayrı Basım (Ankara 1994) 425–435
- Yalman 1996** B. Yalman, 1994 İznik Roma Tiyatrosu Kazısı, KST 17, fasc. 2, 1996, 337–360
- Yalman 2000** B. Yalman, Nikaia – İznik (İstanbul 2000)

- Yalman 2003** B. Yalman, 2001 İznik Tiyatro Kazısı, KST 24, fasc. 1, 2003, 127–138
- Yalman 2004** B. Yalman, 2002 Yılı İznik Tiyatro Kazısı, KST 25, fasc. 2, 2004, 391–402
- Yaltırak 2002** C. Yaltırak, Tectonic Evolution of the Marmara Sea and Its Surroundings, *Marine Geology* 190, 2002, 493–529
- Yaltırak et al. 2012** C. Yaltırak – E. B. İşler – A. E. Aksu – R. N. Hiscott, Evolution of the Bababurnu Basin and Shelf of the Biga Peninsula: Western Extension of the Middle Strand of the North Anatolian Fault Zone, Northeast Aegean Sea, Turkey, *Journal of Asian Earth Sciences* 57, 2012, 103–119
- Yılmaz 1997** Y. Yılmaz, Geology of Western Anatolia, in: C. Schindler – M. Pfister (eds.), *Active Tectonics of Northwestern Anatolia – The MARMARA Poly-Project. A Multidisciplinary Approach by Space-Geodesy, Geology, Hydrology, Geothermics and Seismology (Zürich 1997)* 31–54
- Zeyrek – Asal 2005** T. H. Zeyrek – R. Asal, İzmit (Nikomedeia) Seka-Fabrikası Buluntuları 2003 Yılı Çalışmaları Ön Raporu, *AST* 22, fasc. 1, 2005, 1–9
- Zeyrek – Baran-Çelik 2005** T. H. Zeyrek – G. Baran-Çelik, Prusias ad Hypium (Kieros). Anadolu'nun Kuzeybatısında Antik Bir Kent (Konuralp/Üskübü) (Istanbul 2005)
- Zuiderhoek 2015** A. Zuiderhoek, Introduction: Land and Natural Resources in the Roman World in Historiographical and Theoretical Perspective, in: P. Erdkamp – K. Verboven – A. Zuiderhoek (eds.), *Ownership and Exploitation of Land and Natural Resources in the Roman World, Oxford Studies of the Roman Economy* 9 (Oxford 2015) 1–17

10. 3. Index to Sources of the Greek and Latin Inscriptions

Since all the Greek and Latin databases, I use in the present work follow the citation system based on listing the name of the corpora / journal and the number of the inscription within, I follow the same system in order to keep the compatibility with the main sources. This system is used in the text when discussing particular inscriptions as well as in the Addendum 2.

- AA 48** A. Müfid Mansel, *Erwerbungsbericht des Antikenmuseums zu Istanbul seit 1914*, AA 48, 1933, 115–140
- AE 1888** R. Cagnat, *Périodique*, AE 1888, 1889, 11–19
- AE 1889** R. Cagnat, *Périodique*, AE 1889, 1890, 59–74
- AE 1900** R. Cagnat – M. Besnier, *Périodique*, AE 1900, 1901, 40–68
- AE 1902** R. Cagnat – M. Besnier, *Périodique*, AE 1902, 1903, 38–65
- AE 1947** A. Merlin, *Publications relatives a l’antiquité Romaine*, AE 1947, 1948, 66–76
- AE 1948** A. Merlin, *Périodique*, AE 1948, 1949, 8–72
- AE 1977** A. Chastagnol – J. Gagé – M. Leglay – H.-G. Pflaum (eds.), *Asie Mineure*, AE 1977, 1981, 218–238
- AE 1983** A. Chastagnol – J. Gagé – M. Leglay (eds.), *Asie Mineure*, AE 1983, 1985, 256–264
- AE 1984** A. Chastagnol – M. Leglay – P. Le Roux (eds.), *Asie Mineure*, AE 1984, 1987, 241–260
- AE 1986** A. Chastagnol – M. Leglay – P. Le Roux (eds.), *Asie Mineure*, AE 1986, 1989, 228–246
- AE 1989** A. Chastagnol – A. Laronde – M. Leglay – P. Le Roux (eds.), *Asie Mineure*, AE 1989, 1992, 210–243
- AE 1991** F. Bérard – A. Bresson – M. Corbier – G. Di Vita-Évrard – M. Dondin-Payre – J.-L. Ferrary – S. Follet – J. Gascoü – A. Laronde – J.-M. Lassère – P. Le Roux – O. Masson – M. Sartre – M. Sève (eds.), *Asie Mineure*, AE 1991, 1994, 398–434

- AE 1992** F. Bérard – A. Bresson – M. Corbier – G. Di Vita-Évrard – M. Dondin-Payre – J.-L. Ferrary – S. Follet – J. Gascoü – A. Laronde – J.-M. Lassère – P. Le Roux – O. Masson – B. Puech – M. Sartre – M. Sève (eds.), *Asie Mineure*, AE 1992, 1995, 433–471
- AE 1993** F. Bérard – A. Bresson – M. Corbier – S. Dardaine – G. Di Vita-Évrard – X. Dupuis – S. Follet – R. Frei-Stolba – J. Gascoü – A. Laronde – J.-M. Lassère – P. Le Roux – O. Masson – M.-Y. Perrin – B. Puech – M. Sartre – M. Sève (eds.), *Asie Mineure*, AE 1993, 1996, 422–469
- AE 1994** F. Bérard – A. Bresson – M. Corbier – S. Dardaine – G. Di Vita-Évrard – X. Dupuis – S. Follet – R. Frei-Stolba – J. Gascoü – A. Laronde – J.-M. Lassère – P. Le Roux – M.-Y. Perrin – B. Puech – M. Sartre – M. Sève (eds.), *Asie Mineure*, AE 1994, 1997, 493–546
- AE 1997** F. Bérard – A. Bresson – M. Corbier – S. Dardaine – G. Di Vita-Évrard – X. Dupuis – S. Follet – R. Frei-Stolba – J. Gascoü – A. Laronde – J.-M. Lassère – P. Le Roux – M.-Y. Perrin – C. Prêtre - B. Puech – M. Sartre – M. Sève (eds.), *Asie Mineure*, AE 1997, 2000, 479–535
- AE 1998** F. Bérard – A. Bérenger-Badel – A. Bresson – M. Corbier – S. Dardaine – G. Di Vita-Évrard – X. Dupuis – S. Follet – P.-L. Gatier – R. Frei-Stolba – J. Gascoü – A. Laronde – J.-M. Lassère – P. Le Roux – M.-Y. Perrin – C. Prêtre - B. Puech – M. Sève (eds.), *Asie Mineure*, AE 1998, 2001, 493–560
- AE 1999** F. Bérard – A. Bérenger-Badel – A. Bresson – M. Corbier – S. Dardaine – X. Dupuis – S. Follet – R. Frei-Stolba – J. Gascoü – P.-L. Gatier – A. Laronde – J.-M. Lassère – P. Le Roux – M.-Y. Perrin – C. Prêtre - B. Puech – M. Sève (eds.), *Asie Mineure*, AE 1999, 2002, 532–608
- AE 2000** F. Bérard – A. Bérenger-Badel – A. Bresson – J.-B. Cayla – M. Corbier – S. Dardaine – M. Ducos – X. Dupuis – S. Follet – R. Frei-Stolba – J. Gascoü – P.-L. Gatier – A. Laronde – J.-M. Lassère – P. Le Roux – M.-Y. Perrin – É. Perrin-Saminadayar – B. Puech – O. Salomies – M. Sève (eds.), *Asie Mineure*, AE 2000, 2003, 516–586

- AE 2001** A. Bérenger-Badel – A. Bresson – J.-B. Cayla – M. Corbier – S. Dardaine – M. Ducos – X. Dupuis – S. Follet – R. Frei-Stolba – J. Gascoü – P.-L. Gatier – C. Hamdoune – A. Laronde – P. Le Roux – N. Mathieu – M.-Y. Perrin – É. Perrin-Saminadayar – B. Puech – O. Salomies – C. Schmidt Heidenreich – M. Sève (eds.), *Asie Mineure*, AE 2001, 2004, 610–658
- AE 2002** P. Arnaud – A. Bérenger-Badel – A. Bresson – J.-B. Cayla – M. Corbier – S. Dardaine – M. Ducos – X. Dupuis – S. Follet – R. Frei-Stolba – J. Gascoü – P.-L. Gatier – C. Hamdoune – A. Laronde – P. Le Roux – N. Mathieu – M.-Y. Perrin – É. Perrin-Saminadayar – B. Puech – O. Salomies – C. Schmidt Heidenreich – M. Sève (eds.), *Asie Mineure*, AE 2002, 2005, 499–566
- AE 2003** P. Arnaud – A. Bérenger – J.-B. Cayla – M. Corbier – S. Dardaine – M. Ducos – S. Follet – R. Frei-Stolba – J. Gascoü – P.-L. Gatier – C. Hamdoune – A. Laronde – P. Le Roux – N. Mathieu – M.-Y. Perrin – É. Perrin-Saminadayar – B. Puech – O. Salomies – C. Schmidt Heidenreich – M. Sève (eds.), *Asie Mineure*, AE 2003, 2006, 557–621
- AE 2005** A. Bérenger – M. Corbier – S. Dardaine – M. Ducos – P. Faure – S. Follet – R. Frei-Stolba – J. Gascoü – P.-L. Gatier – F. Gayet – C. Hamdoune – A. Laronde – P. Le Roux – N. Mathieu – M.-Y. Perrin – É. Perrin-Saminadayar – B. Puech – O. Salomies – C. Schmidt Heidenreich – M. Sève (eds.), *Asie Mineure*, AE 2005, 2008, 485–544
- AE 2006** A. Bérenger – J.-B. Cayla – M. Corbier – S. Dardaine – M. Ducos – P. Faure – S. Follet – R. Frei-Stolba – J. Gascoü – P.-L. Gatier – F. Gayet – C. Hamdoune – A. Laronde – P. Le Roux – N. Mathieu – M.-Y. Perrin – É. Perrin-Saminadayar – B. Puech – O. Salomies – C. Schmidt Heidenreich – M. Sève (eds.), *Asie Mineure*, AE 2006, 2009, 530–621
- AE 2007** A. Bérenger – J.-B. Cayla – M. Corbier – S. Dardaine – M. Ducos – P. Faure – S. Follet – R. Frei-Stolba – J. Gascoü – P.-L. Gatier – F. Gayet – C. Hamdoune – A. Laronde – P. Le Roux – N. Mathieu – M.-Y. Perrin – É. Perrin-Saminadayar –

- B. Puech – O. Salomies – C. Schmidt Heidenreich – M. Sève – J.-Y. Strasser (eds.), *Asie Mineure*, AE 2007, 2010, 505–633
- AEMÖ 17** W. Kubitschek, *Inedita*, AEMÖ 17, 1894, 158–164
- AM 33** T. Wiegand, *Inschriften aus der Levante*, AM 33, 1908, 145–160
- AnthGr II 7** H. Stadtmüller (ed.), *Anthologia Graeca epigrammatum Palatina cum Planudea II. Palatinae 7* (Leipzig 1899)
- BCH 13** G. Doublet, *Inscriptions de Paphlagonie*, BCH 13, 1889, 293–319
- BCH 17** T. Homolle, *Nouvelles et correspondance*, BCH 17, 1893, 624–641
- BCH 24** G. Mendel, *Inscriptions de Bithynie*, BCH 24, 1900, 361–426
- BCH 25** G. Mendel, *Inscriptions de Bithynie*, BCH 25, 1901, 5–92
- BCH 27** G. Mendel, *Inscriptions de Bithynie et de Paphlagonie*, BCH 27, 1903, 314–333
- BE 1963** J. Robert – L. Robert, *Bulletin épigraphique, Revue des Études Grecques* 76, 359/360, 1963, 121–192
- CIG** J. Kirchner (ed.), *CIG II². Inscriptiones Atticae Euclidis anno posteriores III 1/2²* (Berlin 1935–1940)
- CIL III** T. Mommsen (ed.), *CIL III. Inscriptiones Asiae, provinciarum Europae Graecarum, Illyrici Latinae* (Berlin 1873)
- CIRB** V. Struve (ed.), *Corpus Inscriptionum Regni Bosporani* (Moscow 1965)
- DenkschrWien 75,1** F. K. Dörner, *Bericht über eine Reise in Bithynien*, DenkschrWien 75,1 (Vienna 1952)
- EpigrAnat 1** S. Şahin – M. A. Işin – M.K. Can, *Acht Meilensteine aus Libyssa*, EpigrAnat 1, 1983, 41–55
- EpigrAnat 3** S. Şahin, TAM IV Nr. 57 und 160 stammen nicht aus „Bey-Köy“ bei Nikomedia, sondern aus Umurbey bei Nikaia, EpigrAnat 3, 1984, 105–107
- EpigrAnat 4** M. P. Speidel, *Catafractarii clibanarii and the Rise of the Later Roman Mailed Cavalry. A Gravestone from Claudiopolis in Bithynia*, EpigrAnat 4, 1984, 151–156

EpigrAnat 5	S. Şahin – S. Öğüt-Polat, Katalog der bithynischen Inschriften im Archäologischen Museum von İstanbul, EpigrAnat 5, 1985, 97–124
EpigrAnat 12	T. Corsten, Daskyleion am Meer. Ein Corpusculum der Inschriften und Nachrichten über die Stadt, EpigrAnat 12, 1988, 53–77
EpigrAnat 15	T. Corsten, Caesarea Germanice, EpigrAnat 15, 1990, 19–42. – T. Corsten, Nachtrag zu “Daskyleion am Meer” (EpigrAnat 12, 1988, 53–77), EpigrAnat 15, 1990, 43–138
EtAnat	L. Robert, Études anatoliennes. Recherches sur les inscriptions grecques de l'Asie Mineure (Paris 1937)
GVI	W. Peek, Griechische Vers-Inschriften I. Grab-Epigramme (Berlin 1955)
HIP	E. Laflı – E. Christof, Hadrianopolis I. Inschriften aus Paphlagonia, BARIntSer 2366 (Oxford 2012)
IGR III	R. Cagnat, IGR III (Paris 1906)
IK Apameia (Bith.) u. Pylai	T. Corsten, Die Inschriften von Apameia (Bithynien) und Pylai, IK 32 (Bonn 1987)
IK Hercalea Pontica	L. Jonnes, The Inscriptions of Heraclea Pontica. With a Prosopographia Heracleotica by Walter Ameling, IK 47 (Bonn 1994)
IK Kalchedon	R. Merkelbach – F. K. Dörner – S. Şahin, Die Inschriften von Kalchedon, IK 20 (Bonn 1980)
IK Kios	T. Corsten, Die Inschriften von Kios, IK 29 (Bonn 1985)
IK Klaudiu Polis	F. Becker-Bertau, Die Inschriften von Klaudiu Polis, IK 31 (Bonn 1986)
IK Iznik	S. Şahin, Katalog der antiken Inschriften des Museums von Iznik (Nikaia) I/II, IK 9. 10, 1/2 (Bonn 1979. 1981/82)
IK Prusa ad Olympum	T. Corsten, Die Inschriften von Prusa ad Olympum I/II, IK 39/40 (Bonn 1991–93)
IK Prusias ad Hypium	W. Ameling, Die Inschriften von Prusias ad Hypium, IK 27 (Bonn 1985)
ILS	H. Dessau, ILS II 2 (Berlin 1906). – H. Dessau, ILS III (Berlin 1914–16)

- IstForsch 14** F. K. Dörner, *Inschriften und Denkmäler aus Bithynien*, IstForsch 14 (Berlin 1941)
- IstForsch 39** C. Marek, *Stadt, Ära und Territorium in Pontus-Bithynia und Nord-Galatia. Katalog der Inschriften von Kaisarea/Hadrianopolis*, IstForsch 39 (Tübingen 1993) 187–210, Anhang 6
- JHS 17** J. A. R. Munro, *Inscriptions from Mysia*, JHS 17, 1897, 268–293
- ÖJh 28** E. Kalinka, *Aus Bithynien und Umgebung*, ÖJh 28, Beibl. 91, 1933, Beibl. 45–111
- Pfuhl – Möbius** E. Pfuhl – H. Möbius, *Die ostgriechischen Grabreliefs* (Mainz 1977–79)
- REA 42** L. Robert, *Inscriptions de Bithynie copiées par George Radet*, REA 42, 1940, 302–322
- SbBerlin 2** G. Hirschfeld, *Inschriften aus dem Norden Kleinasiens besonders aus Bithynien und Paphlagonien*, SbBerlin 2, 1888, 863–892
- SEG** J. E. Hondius (ed.), SEG 4 (Leiden 1929/30). – A. G. Woodhead (ed.), SEG 14 (Leiden 1957). – H. W. Pleket – R. S. Stroud (eds.), SEG 26–41 (Amsterdam 1979–94). – H. W. Pleket – R. S. Stroud – J. H. M. Strubbe (eds.), SEG 42–44 (Amsterdam 1995–97). – H. W. Pleket – R. S. Stroud – A. Chaniotis – J. H. M. Strubbe (eds.), SEG 45–49 (Amsterdam 1998–2002). – A. Chaniotis – R. S. Stroud – J. H. M. Strubbe (eds.), SEG 50 (Amsterdam 2003). – A. Chaniotis – T. Corsten – R. S. Stroud – R. A. Tybout (eds.), SEG 51–58 (Leiden 2005–12). – A. Chaniotis – T. Corsten – N. Papazarkadas – R. A. Tybout (eds.), SEG 59–61 (Leiden 2013–15)
- TAM IV, 1** F. K. Dörner (ed.), TAM IV. *Tituli Bithyniae linguis Graeca et Latina conscripti*
1. *Paeninsula Bithynica praeter Chalcedonem. Nicomedia et ager Nicomedensis cum septentrionali meridianoque litore sinus Astaceni et cum lacu Sumonensi* (Vienna 1978)
- TravMem 10** D. Feissel, *De Chalcédoine à Nicomédie. Quelques inscriptions négligées*, TravMem 10, 1987, 405–436

10. 4. Online Sources

All the Uniform Resource Locators (the URLs) were checked and correct on the 26th of March 2017. Since the locators change rapidly, it is feasible that some of the listed URLs are incorrect. If the URL appears to be incorrect, the site can be found by typing its name in a search engine.

10. 4. 1. Literature

The Online Liddell-Scott-Jones Greek-English Lexicon (LSJ)

Digitized version of the standard lexicographical resource for the Classical Greek, the Liddell-Scott-Jones, published by the University of California as a part of the Thesaurus Linguae Graecae project directed by Maria Pantelia. In the present work, I use the translation of ‘χαμοσόριον’ (flat tomb).

<<http://stephanus.tlg.uci.edu/lsg/#eid=116310&context=lsg&action=from-search>>

10. 4. 2. Databases

The Ancient World Mapping Center (AWMC)

The AWMC is based at the University of North Carolina at Chapel Hill. The AWMC continues the work of the Classical Atlas Project / Barrington Atlas of the Greek and Roman World and cooperates with the Pleiades Project. For the detailed description of the AWMC, see:

<<http://awmc.unc.edu/wordpress/about/>>

The AWMC offers for download, among others, SHAPEFILES of ancient features published in the Barrington Atlas of the Greek and Roman World.

<http://awmc.unc.edu/awmc/map_data/>

Corpus Inscriptionum Latinarum (CIL)

The database of Latin inscriptions is published by the Berlin-Brandenburgische Akademie der Wissenschaften. The contact person is M. G. Schmidt.

<<http://cil.bbaw.de/>>

Konkordanzprogramm zur griechischen und lateinischen Epigraphik (ConcEyst)

The program is created by the Katholische Universität Eichstätt Ingolstadt under the supervision of Jürgen Malitz. The project offers a software ProPhil which enables to download and peruse the inscriptions offline. The database is connected with the databases EDH and EAGLE.

<<http://www.ku.de/ggf/geschichte/altegesch/forschung/conceyst/>>

The Digital Atlas of Roman and Medieval Civilizations (DARMC)

The DARMC is published by the Harvard University and the general editor is M. McCormick. The project offers a number of databases of the ancient world in WMS (Web Map Server) and REST (Representational State Transfer) formats. The DARMC data can be directly visualized in ESRI ArcGIS or other geographic information systems.

<<http://darmc.harvard.edu/>>

The diverse datasets offered by DARMC for download are in EXCEL and CSV formats:

<<http://darmc.harvard.edu/data-availability>>

Epigraphische Datenbank Heidelberg (EDH)

The database of Latin and bilingual (Greek/Latin) inscriptions of the Roman Empire is published by the Heidelberger Akademie der Wissenschaften. The inscriptions are available for download in a CSV format.

< <http://edh-www.adw.uni-heidelberg.de/home/>>

The Europeana Network of Ancient Greek and Latin Epigraphy (EAGLE)

The EAGLE is a massive epigraphic database, coordinated by Silvia Orlandi and Raffaella Santucci from the University of Rome in Sapienza. The data are available for download in a CSV format.

<<http://www.eagle-network.eu/resources/search-inscriptions/>>

Nomisma

The numismatic database Nomisma offers stable digital representations of numismatic concepts according to the principles of Linked Open Data and provides information concerning the existence of mints and their production. The database has been created by a wide community of scholars and institutions. The data are available for download in a CSV format.

<<http://www.nomisma.org/>>

Oxford Roman Economy Project (OXREP)

The research project on the Roman Economy is based in the Faculty of Classics at the University of Oxford and lead by A. Bowman and A. Wilson. The project provides several databases connected with the Roman Economy for download in an EXCEL format.

<<http://www.romaneconomy.ox.ac.uk/>>

The Packard Humanities Institute (PHI)

The PHI is a searchable Greek inscriptions database published by the Packard Humanities Institute with centres at the Cornell University and Ohio State University.

<<http://epigraphy.packhum.org/>>

Pleiades

Pleiades is an open license database of the historical geographic information about the ancient world in digital form. Pleiades has an extensive coverage for the Greek and Roman world and it expands further into the Ancient Near Eastern, Byzantine, Celtic and Early Medieval geography. Senior editors of the project are R. Bagnall and R. Talbert. Pleiades is a joint project of AWMC (University of North Carolina), the Stoa Consortium for Electronic Publications in Humanities (initiated and edited between 1997 and 2008 by R. Scaife, Professor of Classics at the University of Kentucky, now only the blog is active, jointly maintained by a consortium of scholars in Classics and Digital Humanities) and the Institute for the Study of the Ancient World (New York University). The list of contributors is available online at

<<http://pleiades.stoa.org/credits>>

The database offers daily updated versions of its content for download in JSON, CSV, KML and RDF formats.

<<http://pleiades.stoa.org/>>

Project Paphlagonia

The multi-period and large-scale regional survey project offers an interactive database and much of the raw data collected during the survey freely accessible for download in an EXCEL format on the web pages of the University College of London (UCL):

<<http://www.ucl.ac.uk/paphlagonia/>>

10. 4. 3. Software and Technical Data

Geographic Resources Analysis Support System (GRASS)

GRASS is an open source geographic information system software suite used for geospatial data management and analysis, image processing, graphics and maps production, spatial modelling, and visualization. The GRASS used in the present work was developed by the GRASS Development Team, 2017. Geographic Resources Analysis Support System (GRASS) Software, Version 7.2. Open Source Geospatial Foundation.

<<http://grass.osgeo.org>>

The regularly updated software is available for download at:

<<https://grass.osgeo.org/download/>>

The Shuttle Radar Topography Mission (SRTM)

Originally created by NASA, the SRTMs have a resolution of 90 m. The data are available for download in ArcInfo ASCII and GeoTiff formats.

<<http://www.cgiar-csi.org/data/srtm-90m-digitalelevation-database-v4-1#download>>

The Advance Spaceborne Thermal Emission and Reflection Radiometer (ASTER)

The ASTER Global Digital Elevation Model Version 2 was released by the Ministry of Economy, Trade, and Industry (METI) of Japan and the United States National Aeronautics and Space Administration (NASA) in October 17, 2011. The data have a resolution of 30 m and are available for download in a GEOTIFF format.

<<http://asterweb.jpl.nasa.gov/gdem.asp>>

The United States Geological Survey (USGS)

The USGS was established in 1879 and it is the sole science agency for the Department of the Interior of the United States. Among others, the USGS offers world geological maps and maps of faults for download in a SHAPEFILE format.

<<http://energy.usgs.gov/OilGas/AssessmentsData/WorldPetroleumAssessment/WorldGeologicMaps.aspx>>

10. 4. 4. Institutions

The British Museum

The British Museum offers some of its collections in online research catalogues. The objects are described in detail and the photographic documentation is available for download in a JPEG format. The silver hoard from a local tomb in Bursa was published in one of these catalogues:

<https://www.britishmuseum.org/research/collection_online/search.aspx?searchText=Bursa,+tomb>

Berlin Graduate School of Ancient Studies (BergSAS)

The BergSAS is home to five doctoral programs located at the Freie Universität Berlin and the Humboldt-Universität zu Berlin. The present thesis was written as a part of the BergSAS.

<<http://www.berliner-antikekolleg.org/-/programm-laa?redirect=%2Fbergsas%2Fprograms>>

Deutsches Archäologisches Institut (DAI)

The Deutsches Archäologisches Institut is the main German organisation conducting and facilitating research in the archaeological sciences and classical studies. Currently, the DAI is active in more than 350 projects worldwide. The DAI also provides lists of the abbreviations which are used in the present thesis:

<<http://www.dainst.org/publikationen/publizieren-beim-dai/richtlinien>>

TOPOI Excellence Cluster in Berlin

The Excellence Cluster TOPOI is a product of the cooperation with the four major institutions in Berlin involved in research into antiquity: the Berlin-Brandenburg Academy of Sciences and Humanities, the German Archaeological Institute, the Max Planck Institute for the History of Science and the Stiftung Preußischer Kulturbesitz. Central to its mission are the concepts of space and knowledge. For details, see:

<<https://www.topoi.org/>>

The present work has been written as a part of the TOPOI research group A-6:

<<https://www.topoi.org/group/a-6/projects/>>

11. Curriculum Vitae

Name and Surname: **Barbora Weissová**

EDUCATION

2013 – 2017 Ph. D. studies in Classical Archaeology, Freie Universität in Berlin

thesis: Regional Economy, Settlement Patterns and the Road System in Bithynia (4th Century BC - 6th Century AD) Spatial and Quantitative Analysis

2009 – accepted for PhD. studies of Classical Archaeology at the Charles University in Prague

thesis: GIS Analysis of Spatial Relations of Burial Mounds and Flat Settlements in Thrace

M.A. in Classical Archaeology, Charles University in Prague (September 2009)

thesis: 'Antique Versus Classical' in the 20's of the 20th Century in Czechoslovakia

B.A. in Classical Archaeology, Charles University in Prague (June 2007)

thesis: Corinthian order and its reflections in Prague post-medieval architecture

STABLE MEMBERSHIPS IN FIELD PROJECTS AND OWN PROJECTS

2015 – survey in the hinterland of Iznik (NW Turkey)

Position: project management, organization of work, leadership in the field - GPS and PDA records, post-processing of data based on GIS analysis – predictions of roads (LCPA mainly), water sources and overall reconstruction of the ancient landscape around the ancient metropolis with a focus on its economic significance

Since 2014 – stable member of urban survey at the site of Miletos, Humei Tepe (Turkey) under the guidance of Christof Berns (Ruhr University in Bochum)

Position: leadership in the field, GIS analyst focused on the functional analyses of the spatial distribution of finds *intra muros*

2014 – 2016 – co-leadership of the excavations undertaken in Stroyno, Bulgaria (Roman vicus) (<http://ukar.ff.cuni.cz/node/892>)

Position: GIS analyst focused on the interconnectivity of the site with the immediate vicinity as well as following long distance trade (reconstruction of roads), management and logistics of the project, leadership in the field

2010 – establishment of the BUM Project (Burial Mounds in Thrace Project), systematic survey of burial mounds in three modern regions of Bulgaria

Position: Project management, leadership, GIS and PDA supervisor, logistics

Since 2009 – stable member of TRAP (www.tundzha.org) – systematic survey in two modern regions of Bulgaria

Position: team leader, GIS and PDA supervisor, archaeological illustration, logistics

CONFERENCES AND GUEST LECTURES CONNECTED WITH PH. D.

2016 (1.-2.12.) – paper *An Applicability of Thiessen Polygons / a Voronoi Diagram and Multiple Ring Buffers for Spatio-Temporal Analysis of Urbanization, Case Study in NW Asia Minor*, conference 5th Perspectives of Classical Archaeology (Prague, Czech Republic)

2016 (9.4.) – paper *Pilot GIS Project in the Hinterland of Nicaea, Bithynia, Asia Minor*, conference Mapping the Past: G.I.S. Approaches to Ancient History (Ancient World Mapping Centre, University of North Carolina-Chapel Hill, United States of America)

2015 (2.-4.10.) - paper *Results of the Pilot Project Identifying Archaeological Monuments in the Hinterland of Nicaea*, symposium Iznik/Nicaea on its Way to Become UNESCO World Heritage Site (Iznik, Turkey)

2015 (28.-30.5.) - paper *Reconstruction of Ancient Road System in Bithynia with Micro-Regional Focus on Nicaea and its Hinterland (nowadays Iznik, Turkey) - How LCPA fits to the real archaeological data?* and poster (with P. Tušlová) *LCPA Applied on Prediction of Ancient Road System Connecting Yambol District (Bulgaria) with the Mediterranean*, conference Computer Applications & Quantitative Methods in Archaeology (Cieszyn, Poland)

2014 (6.2.) paper *Spatial Analysis of Settlement Patterns in Bithynia*, Forschungskolloquium der Graduiertengruppe Landscape Archaeology and Architecture der Berlin Graduate School of Ancient Studies (Berlin, Germany)

OTHER CONFERENCES AND GUEST LECTURES

2015 (10.-11.12.) - organisation of a conference section *Results of Stroyno Archaeological Project*, conference 4th Perspectives of Classical Archaeology (Prague, Czech Republic)
paper *Rural Settlement Yurta in Broader Context & CRM on the Site*

2015 (12.-14.11.) - paper (with P. Janouchová) *The Use of Writing in Funerary Context in Classical and Hellenistic Thrace* and poster (with P. Tušlová) *Reconstruction of the Ancient Landscape in the Hinterland of the Roman Rural Settlement of Yurta, Province of Thrace (SE Bulgaria)*, 19th Symposium on Mediterranean Archaeology (Kemer/Antalya, Turkey)

2015 (5.-8.12.) - poster (with S. Polla, B. Gruber, A. Springer, P. Tušlová – S. Bakardzhiev) *The Content of Roman and Late Antique Amphorae as Economic Proxy. A Case Study on the Analysis of the Organic Residues in Amphorae of the Black Sea Hinterland (Yambol Region, SE Bulgaria)*, conference Roman Amphorae Contents (Cadiz, Spain)

2014 (27.-30.9.) – poster *Potential of Relational Database in Archaeological Record. Case Study in Yambol Region*, 4th Balkan Symposium on Archaeometry (Nesebar, Bulgaria)

2014 (6.-10.4.) poster *Spatial Distribution of Late Roman Amphorae 2 within Bulgaria*, 5th Late Roman Coarse Ware Congress (Alexandria, Egypt)

2013 (16.-17.12.) – poster (with P. Janouchová) *Speaking Burials. Characteristics of Inscribed Objects in Burial Mounds in Selected Areas of Thrace*, conference 2nd Perspectives of Classical Archaeology (Prague, Czech Republic)

2013 (20.-21.9.) – poster (with P. Tušlová) *New Greek Amphorae Stamps from Emporion Pistiros'* 5th International Congress on Black Sea Antiquities (Belgrade, Serbia)

2012 (11.12.) – paper *Verification of Burial Mounds in Thrace* and poster *Transport Amphorae in the Context of Burial Mounds in Thrace*, conference 1st Perspectives of Classical Archaeology (Prague, Czech Republic)

2012 (7.3.) – guest lecture *Preliminary Results of the Verification of the Mounds in Regions Stara Zagora, Pazardzhik and Yambol* (National museum in Prague, Czech Republic)

2012 (1.-3.3.) – paper *Spatial Analysis of Burial Mounds in Bulgaria, connections with Mediterranean*, Symposium on Mediterranean Archaeology (Florence, Italy)

2012 (14.-15.2.) – paper *Preliminary Analysis of the Burial Mounds in Region of Kazanluk, Yambol and Pazardzhik*, conference *Burials under the Mounds* (Plzeň, Czech Republic)

2011 (5.12.) – guest lecture *Spatial Analysis of Burial Mounds* (New Bulgarian University, Sofia, Bulgaria)

2011 (18.-20.5) – poster *Utilization of Information Technologies for the Spatial Analysis of Burial Mounds*, 10th conference *Computer Support in Archaeology* (Dalešice, Czech Republic)

2011 (7.-10.4.) – poster (with P. Tušlová) *Roman Pottery from 27 Metropolit Panaret Street, Plovdiv, Bulgaria*, 4th International Late Roman Coarse Ware Congress (Thessaloniki, Greece)

2010 (15.2.) – guest lecture (with P. Tušlová and S. Kučová) *Transport Amphorae from Pistiros* (National Museum in Prague, Czech Republic)

2009 (14.-18.9.) – poster (with P. Tušlová and S. Kučová) *Greek Trade Amphorae in The Emporion Pistiros, Bulgaria*, 4th International Congress on Black Sea Antiquities (Istanbul, Turkey)

LIST OF PUBLICATIONS CONNECTED WITH PH. D.

Weissová – Pavúk 2016

B. Weissová – P. Pavúk, On Persistency of the Communication Routes from Prehistory until Today, TÜBA-AR 19, 2016, 11–21

FORTHCOMING

Weissová et al. forthcoming 2018

B. Weissová – R. Brigand – S. Polla, The Economic Landscape of the Hellenistic, Roman and Late Antique Bithynia. Iznik Intensive Survey Project, eTOPOI

LIST OF OTHER PUBLICATIONS

Weissová 2016

B. Weissová, Quantification of Burial Mounds in Yambol District, Ancient Thrace, AncWestEast 15, 2016, 115–129

Tušlová et al. 2016

P. Tušlová – B. Weissová – S. Bakardzhiev – V. Čiřáková – R. Frecer – P. Janouchová, The Stroyno Archaeological Project, Report on the Season 2015, Studia Hercynia 19, fasc. 1, 2016, 243–261

Tušlová et al. 2014

P. Tušlová – B. Weissová – S. Bakardzhiev, Stroyno Excavation Project, Introduction to the Site of Yurta-Stroyno and Report of the 2014 Season, Studia Hercynia 18, 2014, 16–24

Weissová 2013

B. Weissová, Archaeological Survey in the Environs of Pistiros. Status Quo and Future Possibilities, Studia Hercynia 17, fasc. 1, 2013, 68–73

Bouzek et al. 2013

J. Bouzek – L. Domaradzka – M. Domaradzki – V. Taneva – B. Weissová, Fortification and urban planning of the emporion Pistiros (Adžijska Vodenica) reconsidered, Studia Hercynia 17, fasc. 1, 2013, 12–19

Musil et al. 2013

J. Musil – J. Bouzek – B. Weissová – A. Matys – M. Matys, Pistiros 2012: Report of the Czech Mission, Studia Hercynia 17, fasc. 1, 2013, 8–11

Weissová 2013

B. Weissová, Preliminary report of the Verification of Burial Mounds in the Regions of Stara Zagora, Yambol and Pazardzhik, in: L. Bombardieri – A. D'Agostino – G. Guarducci – V. Orsi – S. Valentini (eds.), SOMA 2012. Identity and Connectivity. Proceedings of the 16th Symposium on

Mediterranean Archaeology, Florence, Italy, 1–3 March 2012, British Archaeological Reports International series 2581, 2 (London 2013) 1047–1052

Weissová 2013

B. Weissová, Verifikace mohylníků v Bulharsku, metody a předběžné výsledky z regionů Stará Zagora, Jambol a Pazardžik, Archeologie západních Čech 5, 2013, 136–148

Tušlová – Weissová 2013

P. Tušlová – B. Weissová, Late Roman Coarse Ware and Amphorae from 27 Metropolit Panaret Street, Plovdiv, Bulgaria, in: N. Poulou-Papadimitriou – E. Nodarou – V. Kilikoglou (eds.), LRCW 4. Late Roman Coarse Wares, Cooking Wares and Amphorae in the Mediterranean. Archaeology and Archaeometry. The Mediterranean: a Market without Frontiers, British Archaeological Reports International series 2616, 1 (London 2013) 433–439

Tušlová – Weissová 2013

P. Tušlová – B. Weissová, New Finds and Observations on Transport Amphorae from Pistiros, in: J. Bouzek – L. Domaradzka – A. Gotzev – Z. H. Archibald (eds.), Pistiros V. Excavations and Studies (Prague 2013) 161–166

Bouzek et al. 2013

J. Bouzek – J. Musil – B. Weissová – P. Tušlová – S. Kučová – M. Mačková – P. Mašková – A. Matys – M. Matys – M. Trefný, Square B 11 (in 2007 season), in: J. Bouzek – L. Domaradzka – A. Gotzev – Z. H. Archibald (eds.), Pistiros V. Excavations and Studies (Prague 2013) 57–63

Weissová – Tušlová 2012

B. Weissová – P. Tušlová, Pistiros report 2011, part II, Studia Hercynia 16, fasc. 2, 2012, 8–11

Tušlová – Weissová 2011

P. Tušlová – B. Weissová, Roman Terracotta Lamps from 27 Metropolit Panaret Street, Plovdiv, Bulgaria, Studia Hercynia 15, fasc. 2, 2011, 18–26

Tušlová et al. 2010

P. Tušlová – S. Kučová – B. Weissová, Greek and Black Sea Transport Amphorae in Emporion Pistiros; Quantified Analyses of Material Excavated until 2009, in: J. Bouzek – L. Domaradzka – Z. H. Archibald (eds.), Pistiros IV. Excavation and Studies (Prague 2010) 205–220

Sobotková et al. 2010

A. Sobotková – S. Ross – G. Nehrizov – B. Weissová, Tundzha Regional Archaeological Project; Kazanluk Survey and Investigations; Report from spring 2009-2010, Studia Hercynia 14, fasc. 2, 2010, 56–66

Tušlová – Weissová forthcoming in 2018

P. Tušlová – B. Weissová, Excavations at the Roman site of Stroyno-Yurta (2014-2015): An interim report, in: S. A. Ross – A. Sobotkova – J. Tzvetkova – G. Nekhrizov – S. Connor (eds.), Tundzha Regional Archaeological Project, Surface Survey, Palaeoecology and Related Studies (2009–2011). Final Report (Oxford, forthcoming in 2018) 191–199

Tušlová – Weissová forthcoming in 2018

P. Tušlová – B. Weissová, Greek and Black Sea Provenience Transport Amphorae Found During the Field Survey, Yambol Region, Bulgaria, in: S. A. Ross – A. Sobotkova – J. Tzvetkova – G. Nekhrizov – S. Connor (eds.), Tundzha Regional Archaeological Project, Surface Survey, Palaeoecology and Related Studies (2009–2011). Final Report (Oxford, forthcoming in 2018) 211–216

Janouchová – Weissová forthcoming in 2018

P. Janouchová – B. Weissová, The Use of Writing in Funerary Context in Classical and Hellenistic Thrace, Proceedings from (SOMA) Symposium on Mediterranean Archaeology, Antalya, forthcoming in 2018, 59–74

Tušlová et al. forthcoming in 2018

P. Tušlová – B. Weissová – S. Bakardzhiev, Yurta-Stroyno Archaeological Project. Preliminary Report to the Final Season of 2016, *Studia Hercynia* 21, fasc. 2, forthcoming in 2018

Polla et al. forthcoming

S. Polla – A. Springer – B. Gruber – P. Tušlová – B. Weissová, Inland Trade and Consumption in Context. A Case Study on the Organic Residue Analysis of Transport Amphorae from the Balkan Peninsula (Yambol District, South-eastern Bulgaria), proceedings from RACIIC 2015 held in Cadiz