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“Spatial structure and symbolic ordering in post-Soviet capitals:

a comparative analysis of Yerevan and Tallinn”

by

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September 2022

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A Dissertation submitted in part fulfilment of the
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Space Syntax: Architecture and Cities

Bartlett School of Architecture
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Thank you to my dear friend and mentor Sona Balasanyan, for her endless encouragement and faith in me.

ABSTRACT

This thesis studies the urban structure and symbolic ordering of two post-Soviet cities: Yerevan, the capital of Armenia, and Tallinn, the capital of Estonia. Both cities have experienced major societal transformations in the 20th century. This research investigates the potential structural shifts that Yerevan and Tallinn have undergone. To capture this transformation and follow how the current structure of these cities relates to the pre-Soviet and Soviet spaces, three time periods have been analysed: pre-Soviet, Soviet and post-Soviet.

In order to understand the multilayer nature of cities, major public buildings and significant urban spaces (again of the three time periods) were analysed. This was done to learn not only about the quantitative aspect of the cities but also about the qualitative of the space. Therefore, how these principal elements are embedded into the urban structure was researched.

The analysis revealed, that although both cities were part of the Soviet Union and have been affected by the strictly centralized planning policies, Tallinn and Yerevan have few structural similarities; no specific structural pattern has been registered. Moreover, the research showed that the symbolic ordering of the city centers is yet again contrasting. The most integrated segments of Yerevan (in all time periods) hosted either square (pre-Soviet and post-Soviet) or cultural institutions (Soviet era), while the spatial ordering of Tallinn is led either by marketplaces or healthcare and educational institutions.

Such an outcome questions the validity of the “soviet” or “socialist” city, not in urbanistic, but spatial morphological terms. This study adds to the discussion of the structural analysis of cities of former-USSR member states and invites further research regarding spatial- morphological and symbolic aspects of post-soviet cities.

KEYWORDS:

Post-Soviet, Space Syntax, Spatial morphology, Symbolic Ordering, Yerevan, Tallinn

LIST OF TABLES AND FIGURES:

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INTRODUCTION

This thesis is an attempt at analysing the transformation of urban structure and the arrangement of symbolically significant attributes (public buildings and spaces) of two capital cities of the former USSR (Union of Soviet Socialist Republics or the Soviet Union) member states Yerevan (Armenia) and Tallinn (Estonia). It aims at studying the potential influence of swiftly changing political ideologies and respective planning practices on the urban fabric and symbolic ordering of the space, which in turn will allow understanding of the degree of responsiveness of urban structure to these societal shifts.

Considering that these cities have undergone numerous socio-economic and political changes in the 20th century, such as disintegration from an empire, formation of an independent state, becoming a Soviet republic, and again the formation of post-Soviet independence, it is vital to understand the degree the pre-soviet structure could afford the needs of the Soviet city and how modern capitalist society responds to the space that was developed according to the needs of Soviet political economy. The comparative analysis of the spatial morphology of two post-Soviet cities allows an understanding of the spatial meaning behind the term “post-Soviet” (often interchangeably used as post-socialist) and even a way to check the validity of the term post-Soviet or post-socialist city (not in terms of general urbanity, but spatial structure), in application to all former USSR cities.

The literature review revealed an abundance of research on the urban morphology of post-Soviet cities, however, there is a gap in the spatial-morphological analysis of these structures. This thesis tries to address this gap by creating and analysing spatial models of Tallinn and Yerevan in three different time periods: pre-Soviet, (late) Soviet (1979), and post-Soviet (2022). Since the evolution of the cities is under scrutiny, the analysis of the structure only would be insufficient to understand the complexity of the spatial mosaic of former USSR cities. The symbolic order of the significant public buildings/spaces and the way the network of these spaces is embedded into the overall urban structure will provide a sense of how functional and symbolic hotspots operated and eventually, created movement and encounter. The study of the spatial configuration of these cities in different time periods allows drawing conclusions on whether or not there is a pattern of spatial transformation inherent to any post-Soviet city, and to what degree current spatial characteristics relate to the (late) Soviet and pre-Soviet structures.

CHAPTER 1: POLITICAL REGIME AND CHANGES IN URBAN FORM

This chapter will focus on the highlights from the literature review which elaborate on the links between society, space, and policymaking.

1.1 State and space: how politics and decision-making influence urban fabric

Cities are in constant transformation in accordance with societal shifts that people inhabiting them are undergoing. These transformations are taking place under the influence of numerous processes, the most decisive of which are political processes and decision-making. In shaping the image and form of the city, nothing constitutes the idea of choices more than politics, in its broad sense (Rossi, 1984, p.162).

Planning practices and creating spatial order have always appeared as a way to execute power (Gordon, 2017). All cities are a representation of power in various degrees, but some physically manifest it. “They do so in the structure of the urban space and the full panoply of fittings that give it substance.” (Kostof, 1991, p. 271). For example, the ceremonial axis representing a politically important artery of cities existed for thousands of years, from the ancient world to modern-day cities like Brasilia or Canberra.

The direct involvement of political institutions, however, is especially notorious since the emergence of urban planning as a discipline itself. City planning has particularly developed after the collapse of the empires when many cities became capitals representing new nation-states and playing a significant role in nation-building processes.

Early plans for cities have not only engaged with the creation of an urban structure but often emphasized elements with symbolic connections to the nation-state, such as parliament houses, official residences, memorials, monuments, and cultural institutions. The creation of such symbolic representations (both on urban and architectural scale) has a tangible influence on the spatial texture and these representations have a specific influence on the production of space (Lefebvre, 1984, p.42).

Fast forward to our times, the cities constructed based on the “ideal plans” with the goal of creating a nation-state have eventually become a representation of a conflict between local needs and national objectives or as Kostof identified cities of “Traffic and Glory” (Kostof, 1973). As cities mature, their plans

became less focused on “glory” and more centered on solving the functional problems that are inseparable from the urbanization processes.

The way political institutions interact with urban form and respond to functional problems heavily depends on the type of political power, and regime. One way of dealing with such issues is exercising centralized power. An easy example of this could serve the emergence of “new towns” across the world. States that in an attempt to solve socio-economic, ecological, or simply demographic problems rely on creating new urban structures are evidently executing centralized power in relation to urban development. In more decentralized political systems local communities are encouraged to participate in public space projects and be part of the decision-making processes. While both of these approaches have their advantages and limitations, it is important to note, that the way power is executed not only depends on the political regime but also on the nature of the urban problem and general societal context.

1.2 Introduction to urban planning in USSR

It wouldn’t be an exaggeration to say that one of the major societal shifts of the 20th century that left an immense imprint on the urban form of settlements is the creation and, eventually, dissolution of the Soviet Union.

During the early Soviet period, in contrast to the democratization trends in Russian Empire in the early 20th century, every decision was made in a strictly centralized manner, according to the economic benefit and specifically for the development of the military-industrial complex (Kosenkova, p.20). In its early years, the priority of the Soviet Union was to adopt a territorial-administrative policy for an efficient government, to use all resources for the maximum industrialization of the country and to avoid sparse housing by constructing 3-5 stories apartment blocks to accommodate a bigger number of people (ibid, 108). Eventually, by the end of the 1930s, the idea of a garden city, so popular among Soviet planners and architects (however educated in imperial times) of the time was abandoned. At this point, urban planning became “a super-task of industrialization” (Meerovich, p. 180): the construction of a large number of towns around industrial complexes. In the time of the desperate need to accommodate people around

industries for the sake of increasing production, the concept of “socialist town” [rus: “sotsialisticheskiĭ gorod”] was introduced. It assumed communal living with no individual housing implied1 (ibid, p.191).

The general goal in Soviet urban planning was to find a single project, that can cover as large a territory as possible, be applicable to all systems of settlement with the purposeful leveling of differences between small and large structures or even urban and rural settlements (Kosenkova, p. 259). This was on the one hand cost-efficient, on the other easily interpreted as equitable in socialist terms. Such planning had the purpose of creating a “bigger society”, which implied not exactly the size of the community, but qualitative characteristics of people sharing the same values (ibid). These ideological interpretations of the built environment, as part of the Soviet nation-creating process, touched upon architectural scale as well. In 1930s, architectural harmony/unity as an ensemble was highlighted as a representation of social harmony.

The search for the ideal project seems to be over when the 1935 plan of Moscow [Appendix 1] was confirmed. “Imposing style, neoclassical and neo-baroque architecture, underscored the authority of power and exalted the new Stalinist governing class of proletariat origin” (Buttino, 2012, p. 11). The transformation of Moscow between the 1930s and 1950s served as the model for export to other socialist cities, specifically as a reference for a socialist capital city.

The era of “glory”, and nation-building was over after the death of Stalin [1953]. The housing crisis which became apparent in the late 50s altered the course of the planning. In the early 1960s USSR, extensive housing construction projects, this time purposefully providing individual housing, were initiated leading to the emergence of “mikrorayons” or “sleeping districts”. In the post-war USSR, a number of cities expanded: new suburbs appeared, already existing outskirts were reconstructed, and satellite towns were incorporated into cities. This created an issue of accessibility of services locally [a common problem shared by post-soviet cities). Such developments led to a need for better transportation infrastructure, which was essential in terms of complying with the production levels of the planned economy. According to 1960s master plans “…the location of urban activity should offer maximum convenience to the inhabitants at minimum cost with the lowest number of transports.” (French and Ian Hamilton, 1979). This is when the era of “traffic” in Soviet cities became perceptible.

[1] Although according to official doctrine individual housing was unacceptable, due to the lack of resources and need to accommodate people, the government would turn a blind eye to the self-constructed houses.

While it is logical that political economy, urban development and planning practices, and general ideological umbrella tried to create one way of living in the USSR, it is absolutely vital to consider the diversity of the cities that were part of the Soviet Union (and former socialist bloc). To try to accommodate this, the "national in form and socialist in content" idea was proposed and propagated as a motto for the development of the built environment in soviet republics. The former Soviet Union, a political entity that existed from 1922 to 1991, consisted of 15 republics: Armenia, Azerbaijan, Belarus, Estonia, Georgia, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Moldova, Russia, Tajikistan, Turkmenistan, Ukraine, Uzbekistan. These countries represent unique historical paths, diverse cultures, ethnicities, religions, etc. Historically, communication between some of these countries plausibly was even minimum prior to becoming part of the Russian Empire: the only crossroad that could connect these republics.

Even more than thirty years after the collapse of the Soviet Union, visitors can recognize a soviet/socialist city by the typical attributes such as abandoned or repurposed industrial buildings, pompous classicistic buildings with large arcades and columns representing the early Soviet period of nation-building, residential areas with standardized apartment blocks, panel buildings as a representation of later Soviet period and, of course, a large number of monuments, mosaics with socialist symbology that still remain standing in many post-Soviet cities.

However, what makes a city socialist is a question of not only practical but also academic interest. While some authors believe that the level of resilience of the soviet urban structure proposes constraints to the development of new social formations (Smith, 1996, p. 70), others believe that, in general, the phenomenon of urban transformation is a slow process and urban form eventually ends up bearing an imprint of not just one societal shift, but preceding ones as well.

1.3 Society and space

It has been discussed earlier that urban planning and certain symbolic ordering of principal public elements in the city can serve as a tool to embody nation-building. Although representing political will, this process is inherently social. Therefore, the pursuit of this discussion would be extremely abstract without establishing the link between society and space. Moreover, when analyzing the spatial morphology of a given city, we indirectly learn about society: social interactions and activities, movement patterns, and behavioral specifications.

While, at first glance, the relationship between space and society seems straightforward, societies occupy spaces, Hillier and Hanson in Social logic of Space (1984) argue that space does not solely represent society's material existence. On the one hand, space comes to accommodate the way society arranges people in relation to each other, on the other hand, it arranges space itself by building/ spatial attributes "… so that the physical milieu of that society also takes a definite pattern", in other words, creates a spatial order (Hillier and Hanson, 1984, p.26-27). For example, cultural differences can be traced when comparing spatial orders of different societies. This does not only mean that space mirrors lifestyle but also that the biggest societal shifts (such as urbanization, development of a state, industrialization, etc.) involve or cause a spatial change.

Later, in "Society as seen through the prism of space", Hillier and Netto highlight that despite the fact that the built environment is driven by economic and social processes, it is not as flexible in the forms it can take, as it may sound. Cities evolve considering the limitations of spatial laws governing both the emergence of spatial forms and the effect of these on co-presence (Hillier and Netto, 2001). Urban spaces do not just take their shape from society but respond to the social process and eventually affect society, even changing its deepest structures (ibid).

When it comes to the role of the main public buildings/major elements in cities, it is essential to address architectural and urban structures in the united system of correlated spaces (Karimi, 1998). These elements possess both functional and symbolic significance to the everyday life. Thinkers like Rossi, highlight that the analysis of urban structure without considering the major elements is incomplete in terms of understanding the evolution of cities (Rossi, 1982, p.59). Griffiths, when researching the symbolic ordering of British high streets, underlines how the evolution of the network of these buildings showcases the degree of continuity of the built environment, "it helps to bring the lives of the past, their actuality as agents of movement and encounter, into the framing of the present" (Griffiths, 2016, p.36) and the actual study of this evolution often instead of the expected contrast between past and present, shows "a surprising orientation of the *past towards the present* and, indeed, of the *present towards the past"* (ibid, p.37, highlights by Griffiths).

CHAPTER 2: INTRODUCTION TO CASE STUDIES: HISTORICAL PATH OF YEREVAN AND TALLINN

Yerevan and Tallinn have been selected as case studies for the research considering several parameters. Both Tallinn and Yerevan, have served as a spatial representation of the nation-building process three times during the 20th century. Once in 1917/1918 when independence was proclaimed after the collapse of the Russian Empire. The second time, as part of the process of building a soviet nation. The third time, after the dissolution of the USSR, when regained independence gave chance for the rebirth of the nation. After the collapse of the USSR, both Yerevan and Tallinn appeared in a historical void between communism and capitalism. In all three periods, Tallinn and Yerevan served as capitals for Estonia and Armenia respectively. These cities occupy rather comparable areas [Tallinn is 159,3 sq. km, Yerevan is 223 sq. km]. Last, but not least, the data necessary for the analysis was publicly available.

2.1 Historical development of Yerevan

Yerevan is the 12ve capital in the history of Armenia. It has served as the capital city of Armenia since 1918, the establishment of the Republic of Armenia. Such a high number of capitals in the history of Armenia is mostly related to the fact that the country has long been divided, different parts have been conquered by conflicting global and regional empires, leaving no choice but to change the capital in accordance with the socio-political situation. Currently, Yerevan has a population of slightly more than 1 million people (according to the population census, 2011) and is divided into 12 administrative units [Figure 10].

Pre-Soviet

Up until the beginning of the 20th century, Yerevan has been an overwhelmingly agricultural settlement with little political and economic involvement in the history of Armenia and the region in general. In the early 19th century, the settlement was populated by approximately 12000 residents [Hakobyan, 1957].

The settlement has grown spatially as well as in economic and demographic terms since the conquest of the city by the Russian Empire in 1827. The second half of the 19th century was a crucial period in the development of Yerevan: the first modern-type schools (including gender-mixed and only girls' schools) have been established, first pharmacies and industries (beer and brandy productions) have been established. Eventually, in 1877 Yerevan received the status of a town, and in 1979 a city administration

('Gorodskaia duma') has been created. By the end of the century, the population of the town has reached 29.000. [Hakobyan, 1957]

In the first quarter of the 20th century, Yerevan served as a place where Armenians escaping the Armenian Genocide in Ottoman Empire (1915-1923) found refuge. After WWI, under such conditions, Yerevan became the capital of the short-lived (2.5 years) Republic of Armenia. Despite being a small and just expanding city, it slowly transformed into a political, economic, and cultural center of the country and Armenian people in general.

Despite the short life of the Republic of Armenia (1918-1920) and a set of critical socio-economic and security-related problems, the authorities have initiated work toward the city planning perspective (Kosenkova, 2018, p. 567). Architects and planners have been invited to Armenia to develop a city that will serve as a capital of a newly born republic. The city planning process was symbolizing the rebirth of the national statehood and an attempt at representing the historical continuity of the culture [Balyan, 2020]. Most importantly, it aimed at creating a hub for the national consolidation of Armenian people, scattered all around the world as a result of the continuous massacres in the Ottoman Empire.

The mind behind the first master plan of Yerevan is Alexander Tamanyan, an Armenian neoclassical architect trained in Petrograd (St. Petersburg), Russian Empire, who arrived in Yerevan in 1919 and started to work on the development of a master plan, with an intention of creating 'the ideal city' (Balyan, 2020). This plan was heavily inspired by the ideological basis of a 'garden city. The idea of the garden city, in its classic terms defined and promoted by Ebenezer Howard, became very fashionable in the pre-revolutionary Russian Empire (Meerovich, 2018, p. 31).

Soviet

The plan for the development of Yerevan has been approved in already Soviet Armenia in April 1924. The ideology behind the plan intended to build a city that faces Mount Ararat (to the Southern direction of the city), a lost but important symbol to the Armenian people, as a representation of hope to return to the historical homeland. According to the initial plan symbolic axis stretching from People's House [currently Opera Theatre], a symbol of the cultural center, to Republic Square and House of Government, as a symbol of the political center, continues to the south. Moreover, symbolically significant buildings were planned to face the south/southwestern direction too.

The population of the city grew during the entire century: while Tamanyan's plan was initially designed for 150,000 inhabitants. However, the city expanded dramatically during Soviet rule. In the late 1950s, the population crossed 500,000, reaching 1 million in 1978. Like any other Soviet city, Yerevan hosted many industries. A transportation system and relevant infrastructures were developed that did not exist in pre-Soviet Armenia.

Post- Soviet

The start of the reclaimed independence of Armenia after the collapse of the Soviet Union was accompanied by harsh socio-economic circumstances. Armenia was going through the recovery process from the humanitarian crisis caused by the Spitak earthquake, which left the Northern part of the country in significant ruins, as well as the war with Azerbaijan, which left Armenia in an energy crisis caused by gas pipelines being cut by Azerbaijan. Alongside these major events, the economy too was going through severe hardship: currency crisis, devaluation, and high inflation. The economy was slowly transforming from a planned onto a market economy. This transformation was accompanied by the privatization process (1992 -2005) (IMF, 2001). The privatization process led to a considerable cut in public spaces. On top of these developments, an alarming level of corruption that existed in the country did not bypass the privatization/construction field (OECD, 2005), creating an unsystematically growing urban environment Legal measures to administer the situation came into force and realized their potential quite slowly.

Up until 2008, the mayor of Yerevan was a position appointed by the central government. Would be fair to say that the administration of the city was rather centralized and was not receptive to the local population's voices. Urban planning became predominantly centered in the central areas of Yerevan and was carried out in a haphazard manner leading to an overconstructed center and less developed suburbs.

2.2 Historical development of Tallinn

The establishment of Tallin is considered to be in 1219, under Danish rule. From the late 13thcentury, the city became part of the Hanseatic League, a trading organization of German towns/central and northern European towns, bridging European towns to Russia. In the late 14th century, Tallinn was a medium-sized European town with about 4000, population. Due to these developments, Tallinn has one of the most preserved old towns in Europe [Figure 11] not simply for standing medieval architecture, but for the organic street network. The old town has been fortified during the Middle Ages under German and Danish rule. Some of the fortifications were demolished to accommodate the infrastructural needs of an

industrial city in the mid to late 19th century. The city fell under Swedish rule in the late 16th century. The importance of the city in the trading infrastructure of Northern Europe fell and it became a rather provincial town. However, the population continued to grow and by the end of the 17th century, it reached about 10000 people.
Currently, the population of Tallinn is 426 thousand. The city is administratively divided into 8 districts [Figure 17].

Pre-Soviet

In 1710, the city was conquered by Russian Empire after its victory against Sweden in the Northern war. On top of war, plague and famine have also hit the city and the population has dropped to 3000 by 1718. During Tsarist rule, the Russian Orthodox Alexander Nevsky Cathedral [Appendix 2] came to replace the Martin Luther monument and was positioned on Toompea (the main hill in the old town). There was a long discussion in Estonian society to take this structure down, however, for both cultural and architectural reasons it has not been touched (Haas, 2006). Another addition to the city by Tsarist rule was the construction of Kadriorg Palace and the neighborhood [Appendix 3] by Tsar Peter.

In the mid to late 19th century, however, Tallinn rapidly turned into an industrial city. The introduction of the Baltic rail station was a breaking point in the development of the city. The rapid industrialization and construction boom in the late 19th century created a need for city planning. The first city plan was commissioned in 1894.

The second construction boom have taken place in 1908/1909 when an emphasis was put on developing the suburbs. In 1913, Finnish architect Eliel Saarinen won the competition for the master plan of Tallinn [Figure 13]. This far-fetched plan, named "Greater Tallinn", was trying to address the urban development problems of Tallinn by proposing a long-term developing plan for a city that will develop multiple centers and reach a population of 600 thousand people in 50 years (ibid). Because of WW1, the plan couldn't be realized however, has influenced further planning projects.

After the WW1 was over, in 1918, Estonia proclaimed its independence. Since then, Tallinn became the capital of the Republic of Estonia. By the 1930s, the industry generated nearly a third of Estonian national income. Industrial development remained a departing point for the new master plan (1938-39). The implementation of this plan, however, was also not interrupted by the war, this time WW2. However, it laid the ground for the development of Tallinn in the Soviet period.

Soviet

Unlike Armenia, which was one of the first to get Sovietised, Estonia became part of the Soviet Union only in 1940 and was occupied by Germany from 1941 to1944. Tallinn was in a way fortunate to avoid the early Soviet period when most of the critical changes to build environments were planned and implemented. These processes were coupled with demolitions of national (to republics and not the Soviet Union in general) heritage. However, since 1944, the multicultural environment of Tallinn has changed. The vast majority of the German, Swedish, and other European populations left the country. At the same time, in 1945-1950 about 240000 (net number) newcomers arrived in Estonia from various parts of the Soviet Union.

The first Soviet 25-year general plan (GENPLAN) for Tallinn was prepared and set for implementation in 1945. It created a ground for suburban industrial districts with their typical monolith neighborhoods of panel-built apartment buildings to appear. Most of these interventions happened in a post-Stalin era in the times of relative liberalization reforms introduced during Nikita Khrushchev's times, informally known as the Khrushchev Thaw.

Another general plan was introduced in the 1960s, which among other things, mainly expanded the scale of construction of residential areas around the city. Väike-Õismäe, one of the micro districts of Tallinn [Appendix 4], built in 1970s, due to its shape served as a subject of interest for specialists interested in Soviet urbanity.

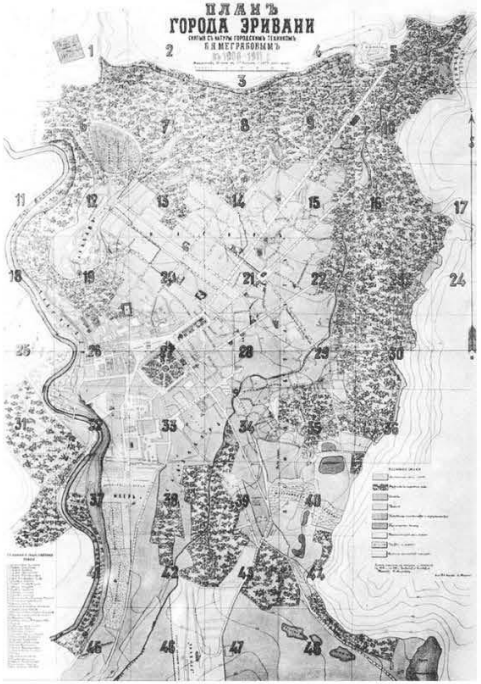
Post- Soviet

Although to a lesser degree than in Armenia, in Estonia, the collapse of the USSR was also accompanied by numerous socio-economic problems. In the process of creating a new economic and political system, a number of steps have been taken toward decentralization reforms (1), privatization processes (2), and land reform to establish the right of private ownership (3) and overall economic reforms to transition into the market economy (Jaakson, 1996). In 2004, Estonia became a member of the EU. This event played a significant role in many aspects, but what is central to this research, it allowed to development of efficient local governance which in turn fostered the urban development processes. Due to early acknowledgment of possible risks as well as relevant policymaking, and interventions, post-Soviet Tallinn, was not affected by a haphazard construction to a degree that Yerevan did.

HISTORICAL TIMELINE OF YEREVAN

[Figure 1] Panoramic view of Yerevan, 19th century

[Figure 2] Plan of seizure of Yerevan fortress by Russian forces, 1804

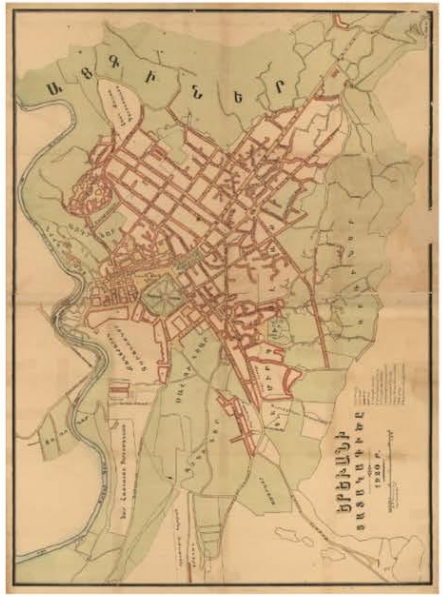


[Figure 3] Plan of Yerevan, Russian Empire, 1906-1911

18th century

19th century

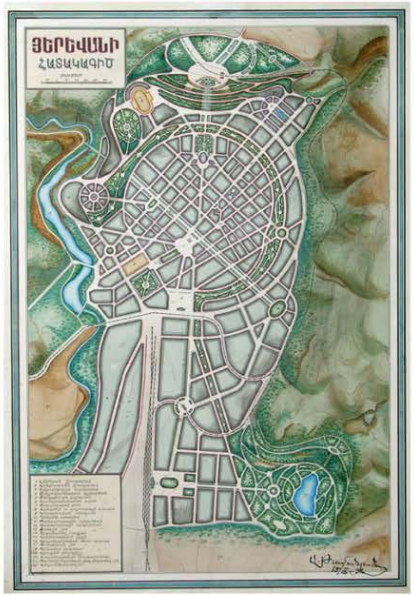
1906-1911



1920

[Figure 4]

1920 plan of Yerevan



1924-1932

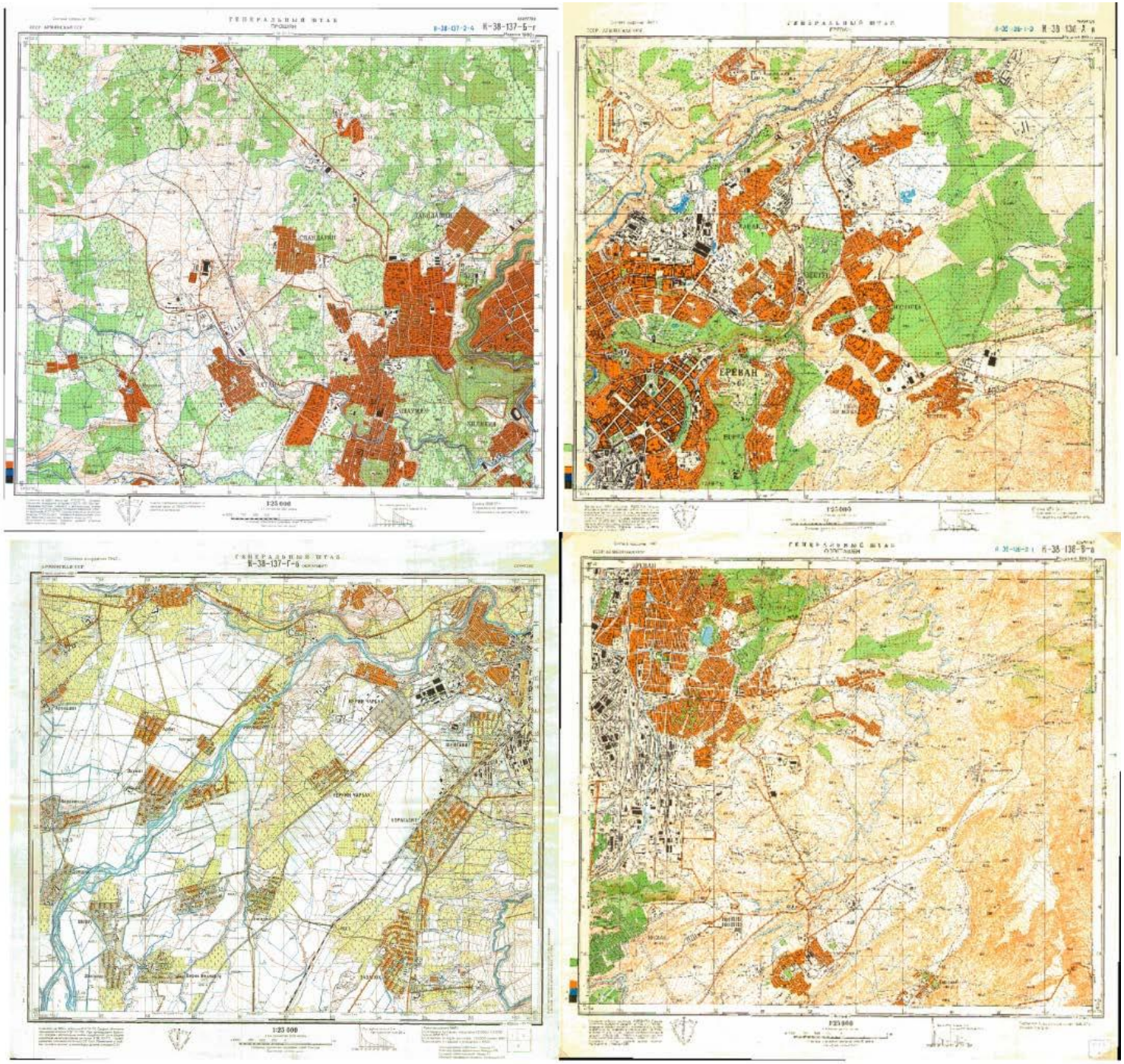
[Figure 5]

The first plan of Yerevan/ Tamanyan's master plan

1949

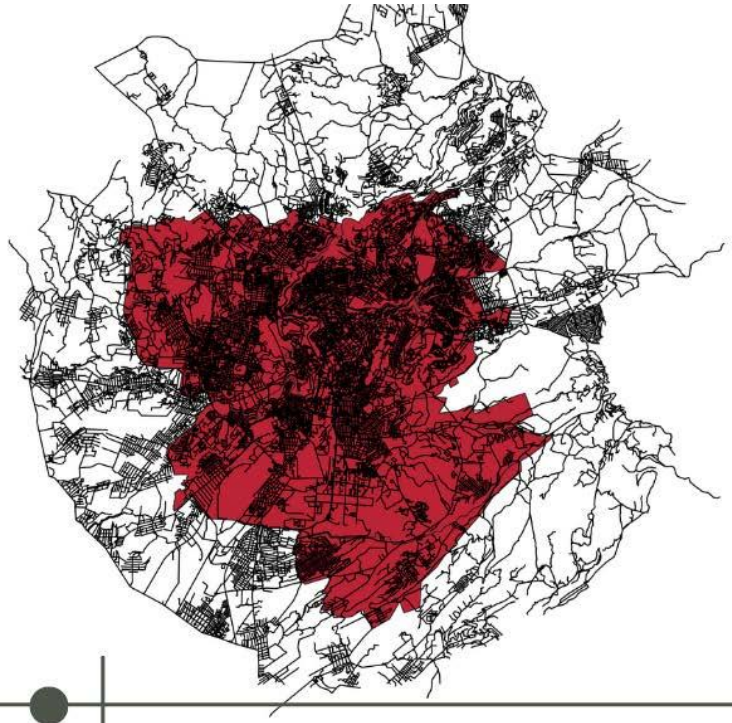
[Figure 6]

1949 master plan of Yerevan

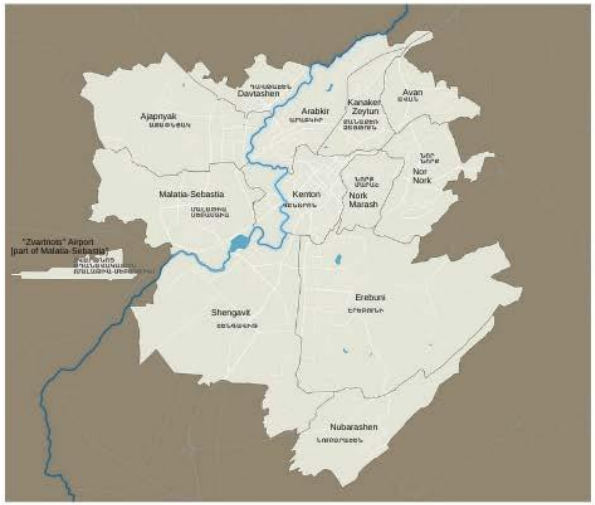


[Figure 7]
1979 Yerevan from Soviet map of the world

[Figure 8]
1979 Yerevan, administrative boundaries and spatial model



[Figure 9]
2022 Yerevan, administrative boundaries and spatial model

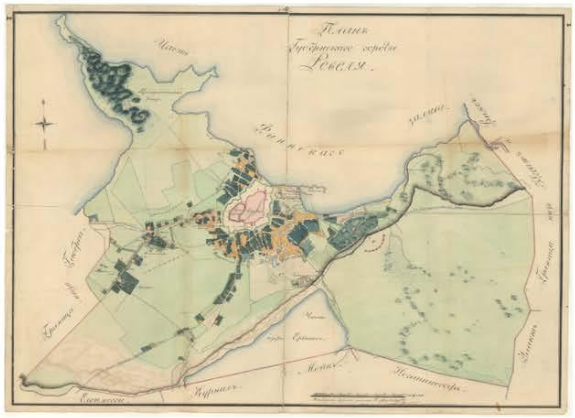


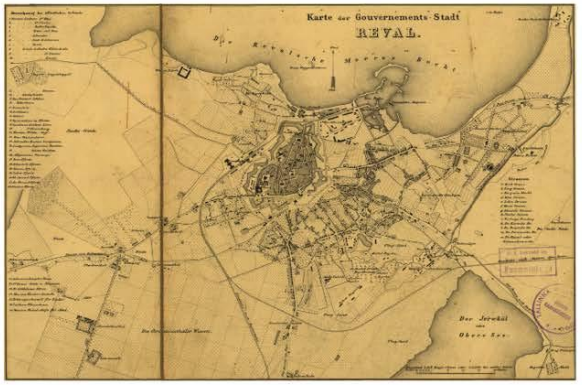
[Figure 10]
2022 Yerevan, administrative boundaries and districts

HISTORICAL TIMELINE OF TALLINN

Sketches of medieval city of Tallinn

[Figure 11]





Tallinn in the second half of 19th century

[Figure 12]

Visual excerpst from Saarinen's plan of Greater Tallinn (1912)

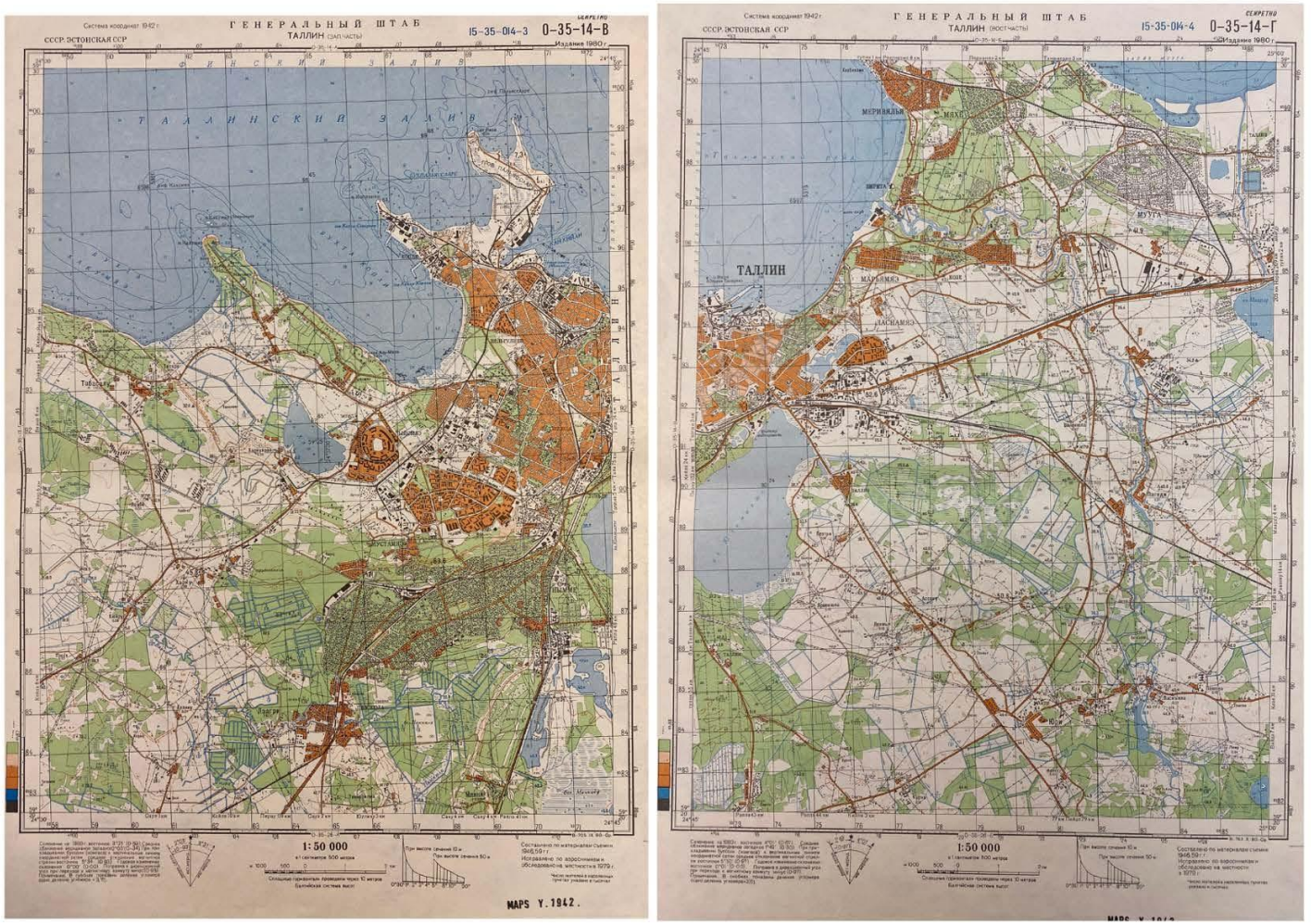
[Figure 13]

1914, Plan of the existing structure of Provincial [Gubernia] City Reval

[Figure 14]

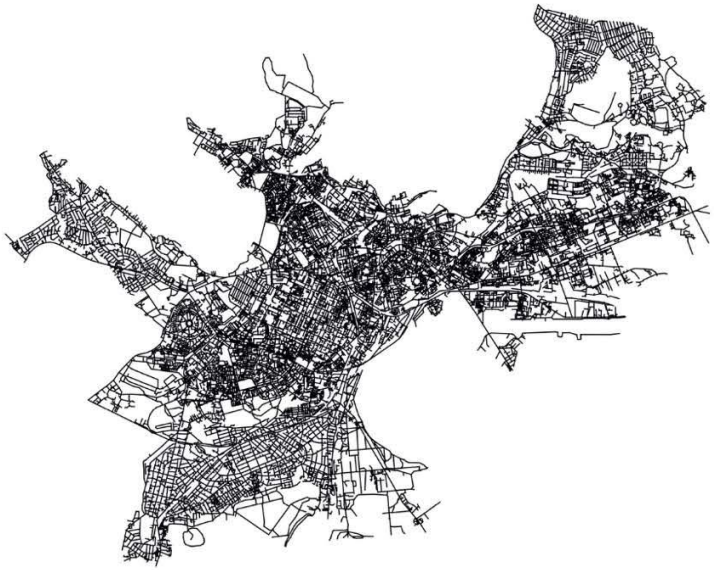
1939 master plan of Tallinn

[Figure 15]



1979 Tallinn from Soviet map of the world

[Figure 16]



2022 Talllin, adminitrative division of the city

[Figure 17]

2022 Tallinn, street network and adminitrative boundaries

[Figure 18]

CHAPTER 3: RESEARCH FRAMEWORK AND METHODOLOGY

3.1 Research framework and research questions

The aim of this thesis is to study the structural transformation of two post-Soviet capitals and understand the shifts in symbolic ordering through the dissolution of the USSR and the creation of an independent state. For this, two subgroups of research questions are formulated.

The *first group* relates to the structural aspect of cities, to spatial morphology:

> How have Yerevan and Tallinn structurally changed through the process of societal changes in three time periods: pre-Soviet, Soviet, and post-Soviet? Is there a pattern to the spatial transformation of a post-Soviet city? How do the current spatial characteristics of the city relate to the late Soviet and pre-Soviet periods?

The *second group* relates to symbolic ordering and its relationship to the structural characteristics of the cities:

> How have the most significant public buildings/ spaces been embedded into the structure of the city in three different time periods?

To look closely at the transformation of the city in its structure and symbolic ordering; to try to bridge the idea of the symbolic order and inhabited spaces, a theoretical framework that is capable of explaining what a city is, how it changes, how it relates to society and how it interacts with ideological backgrounds is needed. This requires an approach that both theorizes and provides a methodology to include both temporal and spatial processes of transformation by considering the impact of social interactions on the urban fabric.

For this reason, Space Syntax, a palette of theories and methods for spatial analysis, is used in the study. The mastermind behind it, Bill Hillier, has developed the approach to have a more profound understanding of how the 'material realm of physical space' relates to the 'abstract realm of the social space' [Hillier & Hanson, 1984].

Although connecting these important aspects of human existence: social and spatial, the structural analysis is at the core of the Space Syntax methodology. Space syntax examines the configurational features of urban [also architectural] form, and structure by assessing the relationship between

components of the overall system. Measures such as integration, for example, assess the distance from any segment/space of origin to all other segments in the system [Hillier and Hanson, 1984, p. 109]. Choice, on the other hand, measures the probability of the segment to be passed through considering all shortest routes of all segments to all other segments [Hillier et al, 1987, p 237]. Among many other techniques, these two specifically create a core to Space Syntax methodology and will be utilized in this study to analyze Yerevan and Tallinn.

3.2 Methodology and data sources

For the purposes of conducting the research, a cartographic redrawing method is used with the application of the diachronic modeling technique. Cartographic redrawing is a common method used to recreate the urban structure of cities from the past when studying urban morphology (also known as 'map regression', Kropf 2011). The redrawing has been done using available historical maps of adequate quality via 3.16 software.

Diachronic modeling is used to capture the morphological change and follow the evolving urban structure while having more room for comparison between historical time periods and avoiding fluctuation in integration and choice values. This is possible to achieve considering that with the creation of every new map we do not lose the information about the previous one (Serra, 2014). The changes made for each historical period are created within one system (basically creating one big database of existing or non-existing segments) which allows little or no deviation in the georeferenced outcome of each particular map. It makes the process more systematic and accurate.

The maps used in the analysis are described in Table 1.

YEREVAN	***TALLINN***
1906-1911, 1920 map of Pre-Soviet Yerevan [Figure 3 and 4]	Sketch of the medieval 'Old Town' of Tallinn [Figure 11]
1924, Alexander Tamanyan's plan for Yerevan [Figure 5]	1914, Plan of the existing structure of Provincial City Reval [Figure 14] [pedestrian model of the city center]
1949, master plan of Yerevan [Figure 6]	1939, master plan of Tallinn [Figure 15]

Soviet topographical Map of the World, photos taken 1956, corrected based on observations 1979, published 1980-1983 (1:25:000) [Figure 7] [city model and pedestrian model of the city center]	Soviet topographical Map of the World, photos taken 1956, corrected based on observations 1979, published 1980-1983 (1:100:000) [Figure 16] [city model and pedestrian model of the city center]
2022, OSM road centerline [city model and pedestrian model of the city center]	2022, Tallinn Municipality Road centerline [city model and pedestrian model of the city center]

Table 1: Maps used for creating spatial models of Tallinn and Yerevan.

First, segment maps of Tallinn and Yerevan, based on the most recent road center line databases, were created. Road center-line analysis has been introduced to Space Syntax in the early 2000s by Alasdair Turner and it helped with the analysis of large metropolitan cities: considering that the hand-drawn axial maps on a such scale not only take a long time to complete but also the final quality is highly dependent on the skills of the researcher. Relying on road centerline maps has significantly reduced such errors. Road center-line simplification techniques were used to create segment models suitable for angular segment analysis [Kolovou et al, 2017]. Historical models, however, are created only for the areas available on the maps that were used for cartographic redrawing. Therefore, it has to be taken into consideration that not all settlements constituting modern-day Tallinn and Yerevan are mapped for each historical period. However, it does not mean that those settlements did not exist before. The structural models for this research were mapped based on the area of what Tallinn or Yerevan would be in each period of time.
Second, 1979 segment maps of Yerevan and Tallinn were created (based on the Soviet Map of the World). The peculiar shape of the 1979 Yerevan model [Figure 35] is explained by the diachronic method of modeling. The areas that look rather detached in this model were kept having a more authentic comparison with the 2022 model, as well as to have some buffer area to avoid the *edge effect* [edge of a model can appear to be disproportionately segregated due to the fact that streets on the edge of the map are not connected onwards (Vaughan and Geddes, 2009)]. There was no need to make such decisions for Tallin's model, considering that 2022 road centerline data, provided by Tallinn's Municipality, was cut within the administrative boundaries of Tallinn. The maps of older periods were created in a similar manner following the method of diachronic modeling.

For the second part of the analysis, which looks at the relationship between the urban configuration of the city centers and locations of major elements, a number of pedestrian models have been created. A pedestrian scale model of Tallinn (1914, 1979, 2022) and Yerevan (1920, 1979, 2022). These models have been excerpted from the city scale maps created for the first exercise. The models have been cut based on the area in and around the old towns, approximately corresponding to the boundaries of current city centers. However, they are cut based on more natural limitations such as infrastructure or natural terrain and not administrative boundaries. The data on principal buildings have been collected and mapped based on the literature review. This process is discussed in better detail in Chapter 4.

All the models discussed above have been cleaned, segmented, verified, and analyzed using the Space Syntax toolkit and DepthmapX on QGIS 3.16 software. Although the diachronic modeling techniques introduced by the specialists at the University of Porto suggest using axial maps, we attempted to apply the same technique to the segment models.

A visualization entitled *"Streets' guide"* in the Appendix is prepared to ease the readers' navigation through Tallinn and Yerevan, whenever names of streets are mentioned.

CHAPTER 4: ANALYSIS OF URBAN TRANSFORMATION

In previous chapters, we have discussed the ideological, political, and historical processes that have affected the development of Tallinn and Yerevan. However, a quantification of the space is necessary to work with the spatial structure and understand it deeper. It provides a room for comparison of spatial structures through time and across the states.

The first part of this chapter will analyze the structural transformation of Tallinn and Yerevan. It will provide a comparative analysis and general statistical description of the models.

The second part will investigate the network of major elements of the city centers of Tallinn and Yerevan and try to unveil the symbolic ordering of significant buildings/spaces in relation to the local urban structure and social activities.

4.1 Description of urban transformation

To understand the structural transformation of Yerevan and Tallinn several segment models have been made. Through the techniques of Space Syntax these models have been analysed and the descriptive statistic of each model is presented in Table 2. It gives a general idea on the size and specificities such as mean and maximum connectivity, integration, and choice values. One of the advantages of Space Syntax research is its capability to analyze cities not only as a whole but also analyze global structure in relation to local structure. For this, two tests have been conducted. First, a correlation between connectivity and global integration measure [intelligibility] has been run [Pearson's correlation test]. The strength of the linear relationship between these two variables helps to understand if parts of the system can be read from the whole [Hillier and Hanson, 1984]. Table 2 shows that all these models show statistically significant results, therefore structures can be called intelligible[2]. Synergy, a correlation between local and global integration values, is a similar measure to intelligibility. It helps to understand how the local structure is embedded into the global structure [Hillier, 1996, p.91]. This test helped to validate "intelligibility" test results. Table 2 yet again shows that Pearson's correlation results for all models are statistically significant.

Analysis of pre-Soviet spatial structure of Tallinn and Yerevan

Modern-day Tallinn and Yerevan have been built based on the organic structures which preexisted the planning practices. While in Tallinn, the Old Town was preserved and the city center has developed around it (mostly to the south, southeast, and southwest), the current city center of Yerevan is developed based on the old structure of the late 19th-century town, transforming it according to the master plans adopted since 1924. So, if the term "old" must be defined, it would have different definitions for Tallinn and Yerevan. In Tallinn, it is part of the city center that is inherited from medieval times, meanwhile, in Yerevan, it is the representation of the "small center", which has been transformed over the last century and is rarely referred to as "Old Yerevan", instead people call it "city" or "center".

The models of the Old Towns of Yerevan and Tallinn are similar in size [Table 2]. The analysis of the Old Town structure in Tallinn shows, that Toompea *[consult Street Guide in Appendix for the location]*, a hill

[2] It has to be taken into consideration that intelligibility and synergy tests have been run based on the segment analysis values and not axial.

situated on the west side of the Old Town, which served as a home for ruling elites throughout centuries, is less integrated into the overall structure [Figure 19]. It appears as an island within the structure of the Old Town. Important to note, that the terrain supports neither closeness /integration/ nor betweenness /choice/ centrality values of Toompea, being located on a hill, its elevation creates more limitations to its accessibility. Additionally, until 1889, not only terrain and the urban structure, but also the feudal administrative division of the Toompea from the Lower town were synchronized (Pullat 1998, p. 123).

The most integrated segments of the medieval system are the beginning of the street stretching from the Town Square to the north [Pikk St.; 0,98 mean NAIN rN] and south [Kullaseppa and Harju St.; 1 mean NAIN rN]. Figure 20 represents the integration core of the settlement, by highlighting in red the 20% of the most integrated segments of the system. The Old Town has been surrounded by a green belt, which has been preserved up until today.

		size/number of segments	mean angular connectivity	mean connectivity	max connectivity	mean NAIN [radius N]	maximum NAIN [radius N]	mean NACH [radius N]	maximum NACH [radius N]	intelligibility	synergy
TALLINN	Old Town	514	2,5	3,6	7	0,82	1,05	0,85	1,33	.152**	.652**
	1939	3644	1,5	3,1	8	0,78	1,16	0,96	1,47	.161**	.652**
	1979	12850	2,1	3,4	8	0,7	1	0,8	1,5	.026**	.218**
	2022	33516	2,6	3,7	10	0,8	1,23	0,8	1,5	.184**	.547**
YEREVAN	1920	442	1,16	4,1	9	1	1,47	0,8	1,53	.119*	.519**
	1949	2017	3,16	4,6	9	0,86	1,16	0,9	1,48	.173*	.462**
	1979	18298	2,3	3,5	11	0,55	1	0,75	1,5	.145**	.177**
	2022	49011	2,2	3,3	11	0,54	0,82	0,7	1,4	.340**	.395**
Note: intelligibility and synregy values are calculated with segment model, not axial ** Correlation is significant at the 0.01 level (2-tailed) * Correlation is significant at the 0.05 level (2-tailed)											

Table 2: Descriptive statistics of spatial models of different time periods of Tallinn and Yerevan

Figure 19: Medieval structure of Tallinn, NAIN (radius N)

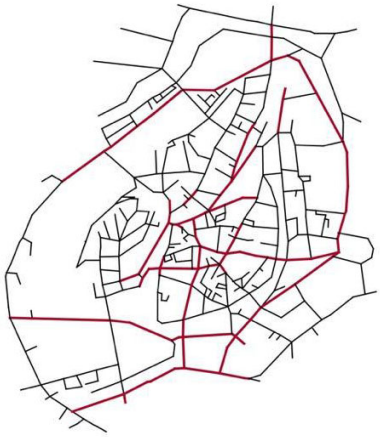


Figure 20: Medieval structure of Tallinn, integration core (20% of the most integrated segment) highlighted in red

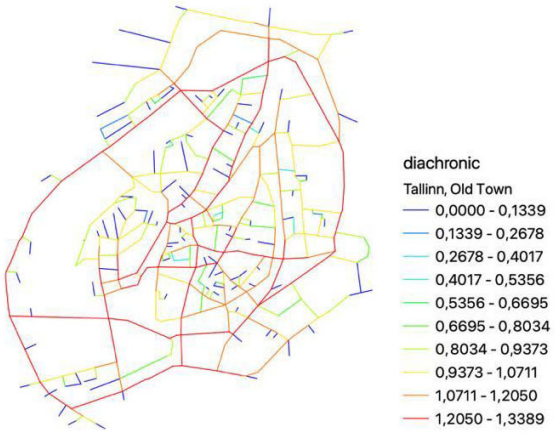


Figure 21: Medieval structure of Tallinn, NACH (radius N)

The growth of Tallin was rapid from the late 19th century until 1914. Tallinn swiftly turned into an industrial city with a growing population, reaching 156 thousand before WWI blew out. According to Pullat, in 1901, Tallinn's factories employed around 10000 workers [Pullat, 1998, p. 117]. 1917, with the dissolution of the Russian Empire and the disintegration of the Estonian economy from Russia, the number of major industrial entities dropped. However, the spaces occupied by them were rented to small and medium businesses of the time, which were growing both in their quantity and variety of activities covering spheres of metalwork, machinery, textile, food, and other industries [Pullat, 1972, p.153].

In the same time period, Yerevan was expanding as well. The maps dating 1906-1911 and 1920 [Figure 3-4] seem to represent the same road network, showing that the structure of Yerevan has not changed drastically in those years. Figure 22 shows the integration core of Yerevan as of 1920. While the end of the 19th century and the beginning of the 20th century was a period of growth for both Tallinn and Yerevan, the Armenian capital was smaller in both size and population (by 1920 having a population of about 50000 people [Korkotyan, 1932]).

Analysis shows *[Figure 23-24]* that the integration axis of the settlement was around Abovyan St. [1,46; mean NAIN rN] and Nalbandyan St [1,34; mean NAIN rN] *[consult Street Guide in Appendix for street locations]*, parallel streets stretching from the center of the settlement to the Northeast. This organic pattern of the road network laid the ground for the planning stage. The city plan proposed by Tamanyan [Figure 5] was built upon the existing structure of the city.

Unlike Yerevan, when the first planning attempt was eventually implemented to a certain degree in the early soviet era, the implementation of urban planning in Tallinn until the end of WW2 was unsuccessful. This means that up until the 1940s Tallinn developed in a rather unsystematic way [Pullat, 1972, p.355].

Figure 22: Pre-Soviet Yerevan, integration core (20% of the most integrated segment) highlighted in red

Figure 22: Pre-Soviet Yerevan, NAIN (radius N)

Figure 23: Pre-Soviet Yerevan, NACH (radius N)

Early planning attempts and interventions

Speaking of the planning practices of Yerevan, it is fair to say that Tamanyan's plan of 'the ideal city' was quite a radical proposal for the city. Despite the profound changes that Tamanyan proposed, the master plan doesn't seem to radically change the integration core [Figure 24] of the city. Abovyan street continues to have the highest integration values [Figure 25; 1,86, mean NAIN rN].

The 1924 plan, however, creates a new high integration axis, Teryan St. [1,85, mean NAIN rN], which later becomes an important street hosting significant pedestrian and vehicular movement *[Figure 25-26].* Another important axis created by Tamanyan's plan is Tigran Mets Ave. [1,73, mean NAIN rN], stretching from Republic Square to the south. Considering the ideological bases of the plan, as well as the spatial structure of the proposed master plan, we see that by creating North to South axial lines and diagonals crossing the circular belt, Tamanyan was aiming at creating a city that develops from North to South.

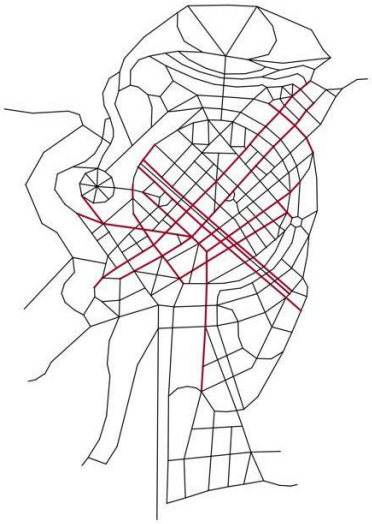


Figure 24: Tamanyan's plan of Yerevan, integration core (20% of the most integrated segment) highlighted in red

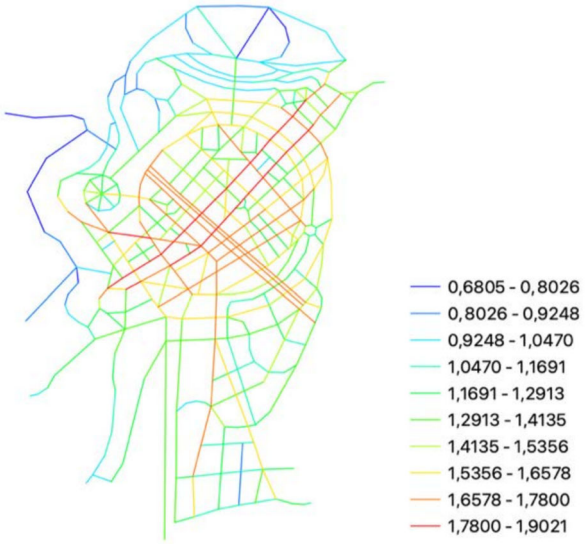


Figure 25: Tamanyan's plan of Yerevan, NAIN (radius N)

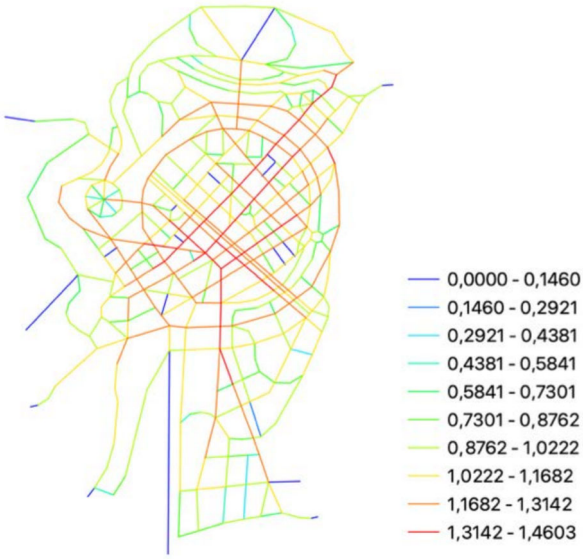


Figure 26: Tamanyan's plan of Yerevan, NACH (radius N)

However, evidently, everything laid outside of the circle itself seems to be rather segregated from the grid which is encompassed within this green belt. It can be assumed that the design of the belt itself creates such differences in integration and choice values of streets that fall into the circle and those that do not. This does not appear as a surprise, since Tamanyan's initial plan was designed as a small town for 150 thousand residents only [Balyan, 2020].

After Tamanyan's death (1936) and political changes both in Soviet Armenia (the assassination of Aghasi Khanjian, First Secretary of the Communist Party of Armenia), and in the Soviet Union in general (Stalin's social engineering policies, dekulakization, and overall years known as the Great Terror), the main ideology behind the city planning was altered: the plan was labeled as nationalistic, all the panoramic views towards the Mount Ararat have been blocked, the plan of the Northern Avenue has not been carried out, etc [Balyan, 2020]. At this point, Yerevan's population was growing quite rapidly reaching 200 thousand in 1939.

Planning practices in Tallinn took a different turn. Although Tallinn's planning practices during the Estonian independence (1917-1939) could not be implemented, the city kept growing. After a dramatic loss of population [due to migration and WW1] reaching 111 thousand in 1917, it grew to reach 143 thousand before the outbreak of WW2 [Pullat, 1972, p. 167]. Such growth had to be accommodated by the urban structure. The industrial area of the city was growing specifically in the direction of North-West and South, Southeast. The satellite town of Nõmme, to the southwest of Tallinn, was developing benefiting from cheaper prices for property and rather developed communication infrastructure. In the process of this growth, Tallinn slowly expanded its territory until the 1930s. By 1940, Tallinn covered a territory of 8,736.69 hectares and Old Town was only a small part of it. However, only 20.72% of the overall territory was actually taken by buildings and constructed road networks [Pullat, 1998].

During this era, the construction was booming alongside Parnu Rd, which ends up being the road with the most integrated segments in the 1914 pedestrian map [1,21; NAIN rN] and in the 1939 master plan [1,07; NAIN rN]. Construction of the area from the Southwest of the Old Town [approximately where the St. Charles church is] to the South-East, to the square occupied by the Russian Market [currently Viru Square], was very robust, leading to creating a city center around this road.

During Estonian independence, Narva Ave. (connecting the north-eastern part of the city center), Tartu Ave. (connecting the southeastern part of the city center) and Paldinski St. started to develop. The parts

of these roads neighboring the city center are heavily influenced by its character and are primarily hosting commercial, administrative, and bank buildings, while further away residential areas are located.

The 1914 map [Figure 14] representing the factual state of Tallinn gives an idea of what the structure of Tallinn was prior to WWI. However, the 1939 plan, gives a better idea of the status of the urban structure of Tallinn as well as the strategy for the development of the city prior to becoming part of the USSR. With the growth of Tallinn, the Old Town, although located in the heart of the city slowly became the most segregated area in the city center.

Figure 27 presents the model of the 1939 plan of Tallinn. Compared to 1914 map, the 1939 plan does not introduce drastic changes to the foreground network. The main road network that appears on the 1914 map is preserved.

The integration core of the 1939 plan covers the area from the South of Old Town to the South-West. Today, this area mostly falls into the administrative boundaries of the city center, Kesklinn, of Tallinn [Figure 17]. The eastern part of Tallinn as well as the North-West, which is traditionally considered the industrial areas of the city are not as integrated into the global structure of the city. The Northeastern part of the city, which is known for its extensive green areas and no significant industrial presence, is also not well-integrated into the global structure of the plan.

Figure 27: 1939 plan of Tallinn, NAIN radius N

Figure 28: 1939 plan of Tallinn, NACH radius N

Tallinn and Yerevan as Soviet cities

One of the major aims of urban development in USSR was to provide cheap transportation and infrastructure for the efficient movement of labor. Therefore, one of the first major interventions in both Tallinn and Yerevan was organizing a smooth movement of people by creating relevant infrastructure: streets got widened, highways were extended, and many roads were reconstructed.

The 1949 master plan [Figure 6] of Yerevan, authored by M. Grigoryan, N. Zargaryan, and G. Tamanyan, presents a much stricter grid than the previous plan suggested. This is practically the first Soviet plan for Yerevan [or at least the one we have information about]. It was recently restored, and for many years this plan was unknown even to the academic environment.

Considering the growth of the population (200k in 1939 and 510k in 1959), Yerevan has been planned not only to the North and Northwest, as Tamanyan suggested, but also significantly to the West bank of the Hrazdan river, as well as to the South. For the latter, Tigran Mets Ave., an axis suggested by Tamanyan's plan, has helped to create the integration axis stretching to the south. The integration core [Figure 29] has expanded out of the circular center, creating a potential for new local centers to develop. The growth of the city is yet again developed following a circular movement [Figure 30-31] as was done in the previous plan. Although still being part of the 20% of the most integrated segments of the city, the integration level of the city center in relation to other parts of the city dropped. The reason for this might be the circular structure of the city center, the level of strictness of the grid in the proposed plan, as well as topographic nuances of the area since all the newly proposed local centers are located on hills and/or have some other geographical obstacle /gorge, river/ in terms of connecting naturally to the city center.

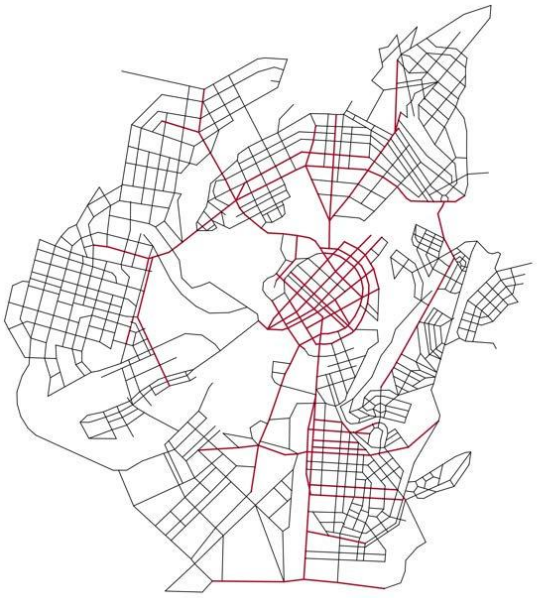


Figure 29: *1949, plan of Yerevan, integration core (20% of the most integrated segment) highlighted in red*

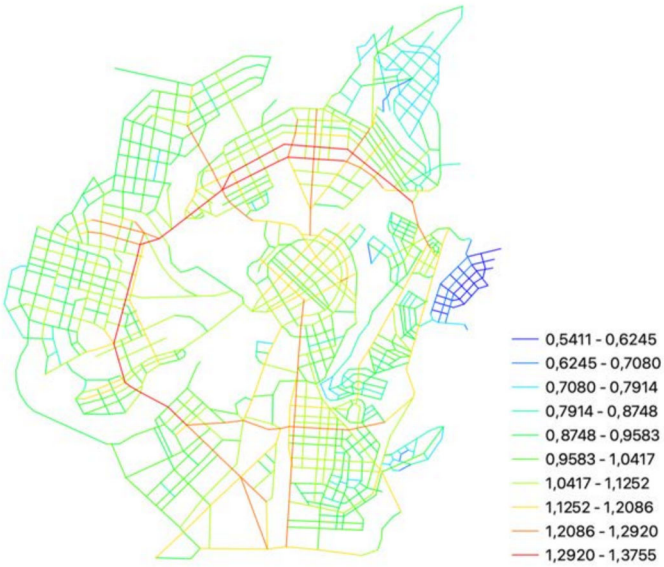


Figure 30: *1949 plan of Yerevan, NAIN (radius N)*

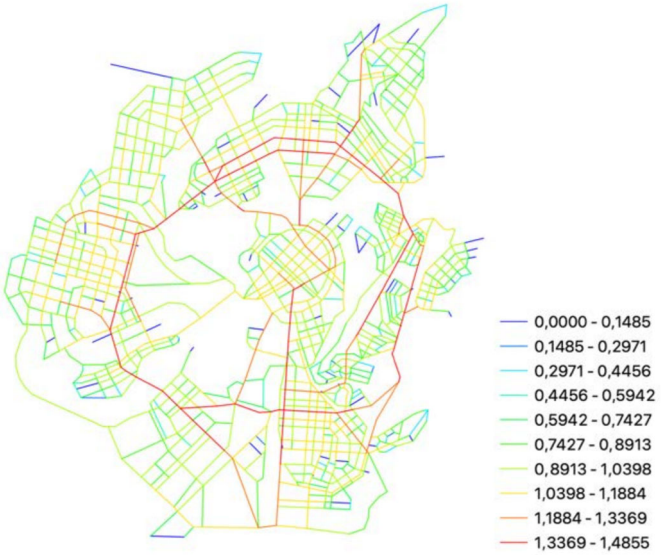


Figure 31: *1949 plan of Yerevan, NACH (radius N)*

The planning development as envisaged in the 1949 master plan had a major impact on how the city grew. Literature suggests that there was another master plan of Yerevan developed in 1960s, however not available for research.

The intervention of Soviet planning in Tallinn's history started post-WW2. In comparison to Tallinn's 1939 plan, the 1979 segment map [Figure 32, 35], derived from the Soviet topographical map of the world, shows that on a global scale, the Southeastern area of the city became more integrated. One of the reasons for this might be further construction of Tartu Ave., the addition of tunnels and an overground railway, and the operation of the Tallinn airport on the east shore of lake Ülemiste. On top of that, tunnels and overgrounds have been built alongside of Endla, Hejna, Tartu and Parnu mnt were contrcuted, to accommodate movement alongside the railways.

Lasnamäe district [Figure 17], currently the largest district both by area and population, was targeted by the Soviet government to become one of the "sleeping districts". In the late Soviet period, It became one of the "sleeping districts" of Tallinn (which is not fully visible in the 1979 map, since the construction was predominately carried out in the 1980s and wasn't completed). Regardless of the efforts, as Figure 34 shows, Lasnamäe could not develop into a local center. In comparison with other parts of the city the east

shows a higher level of segregation (both global integration and radius 3000 meters) with the mean integration value of segments in the east being lower than the mean integration values of all segments in the system.

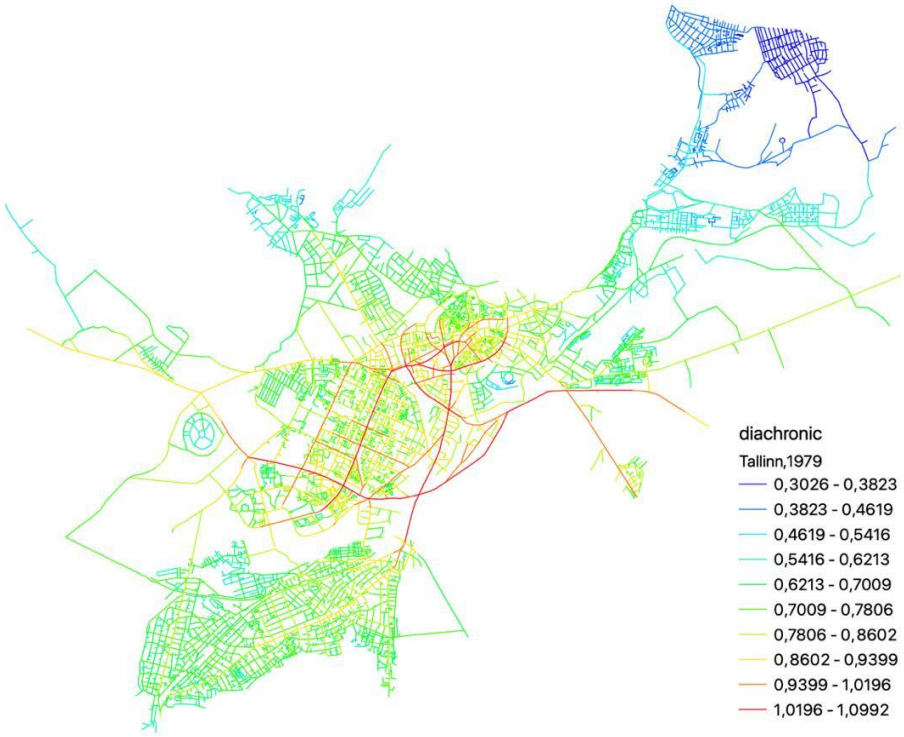


Figure 32: *1979 map of Tallinn, NAIN (radius N)*

On the other hand, the western part of the city, specifically the area of Mustamäe and Kristiine [Figure 17] become one of the best-integrated areas in the city. The construction of Mustamäe and Sõpruse streets was one of the major interventions in the urban fabric of the city in early Soviet period [Pullat, 1972, 355]. Evidently, these streets brought higher integration levels to the mentioned two districts [Figure 32] as well as created an alternative through movement to Nõmme district [Figure 33].

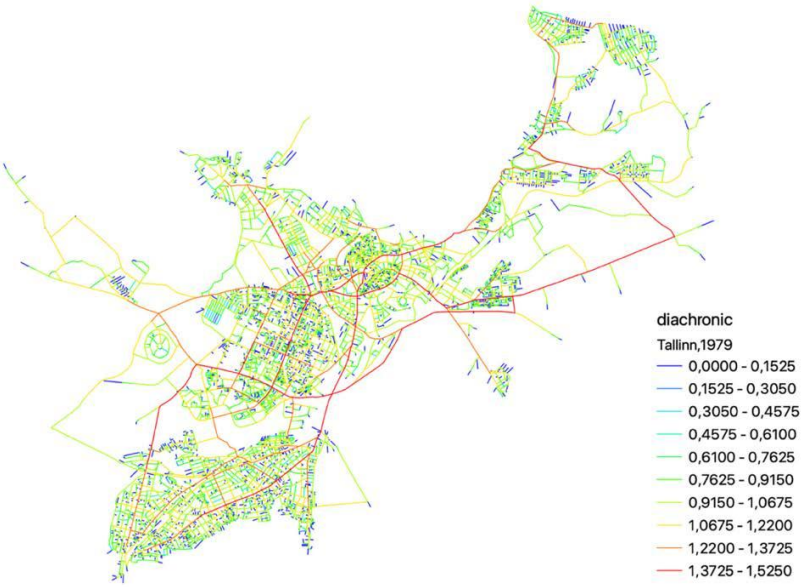


Figure 33: *1979 map of Tallinn, NAIN (radius N)*

Figure 34: *1979 map of Tallinn, NAIN (radius 3000 meters)*

Figure 33, depicting the betweenness centrality [choice] values, shows how despite relatively lower integration levels of the northwest, the Marx Road [current Sõle Str.], serves as an important route to the north of the city center, Põhja-Tallinn district [Figure 17].

Figure 35: *1979 map of Tallinn, integration core (20% of the most integrated segment) highlighted in red*

As just discussed above, during the Soviet era Tallinn went through transformations that affected the global structure of the city: expanded the integration core, created new through movements, and increased integration levels of districts [0,91; mean NAIN rN] to the west of Tallinn. The integration and choice analysis comes to support this conclusion. However, the enlargement and construction that Yerevan has undergone cover bigger areas and a variety of facilities.

Meanwhile, in 1979 Yerevan, Arabkir, a district to the North of the center [Figure 35], as proposed by the 1949 plan, becomes one of the well-integrated areas in Yerevan. Global integration analysis shows that encircled city center [0,78; mean NAIN rN] and Arabkir [0,77; mean NAIN rN] districts became the most

integrated areas in the city [Figure 36]. Baghramyan Ave. and Saralanji Str *(Soviet: Komeritmiut'yan highway)* play a significant role in connecting the city center to the northern part of the city, Myasnikyan Ave. connects to the North-East, Athens Str with Tsitsernakaberd highway with North-West, while Isakov to the South-West and Arshakuniats and Tigran Mets avenues to the south and south-east. on the other avenues connects to It can be seen on the map showcasing choice values [Figure 37].

Figure 35: *1979 map of Yerevan, integration core (10% of the most integrated segment) highlighted in red*

With these developments, local centers started to appear in Yerevan [Figure 38, NAIN radius 3000 meters]. One after another Erebuni, Ajapnyak, Shengavit, Malatia-Sebastia and other districts [Figure 10] were shaped. While one more than the other most of these areas hosted industrial units (mostly in the northeast and south), all these districts were and still are residential. Such expansion led to the population crossing the mark of 1 million. In Soviet standards, cities with at least 1 million population require the construction of underground transportation. Although having only one line and 10 stations, underground transportation services opened in 1981.

The most segregated part of the system remains the eastern areas situated on a hill with no direct infrastructure connecting it to the city center. To solve transportation issues that this segregation would cause, a ropeway was introduced in 1967 as part of public transportation to ensure residents mobility from the city center to Nork [Figure 10].

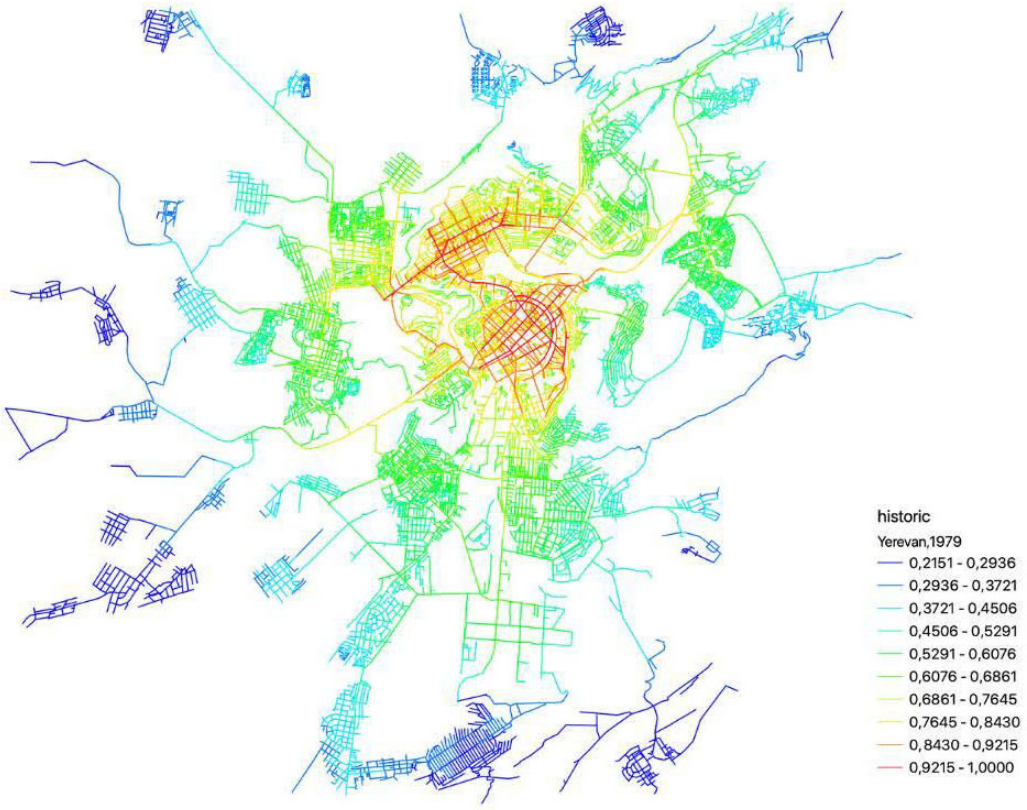


Figure 36: *1979 map of Yerevan, NAIN (radius N)*

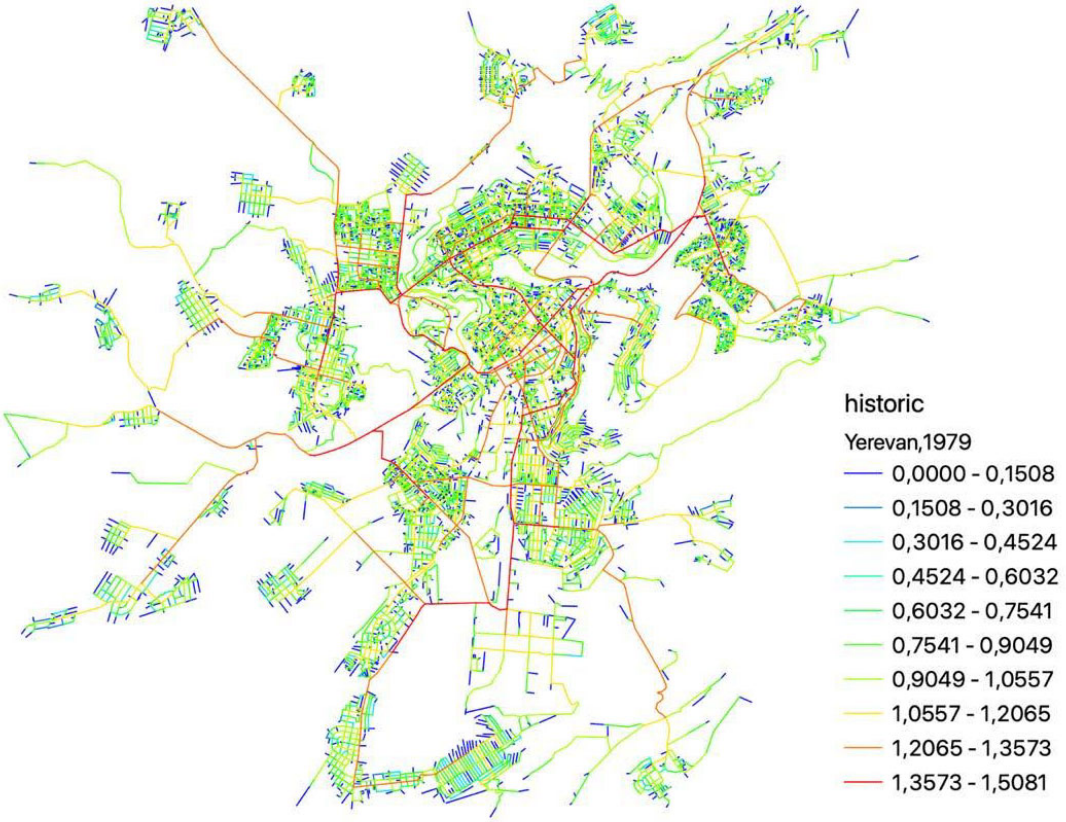


Figure 37: *1979 map of Yerevan, NACH (radius N)*

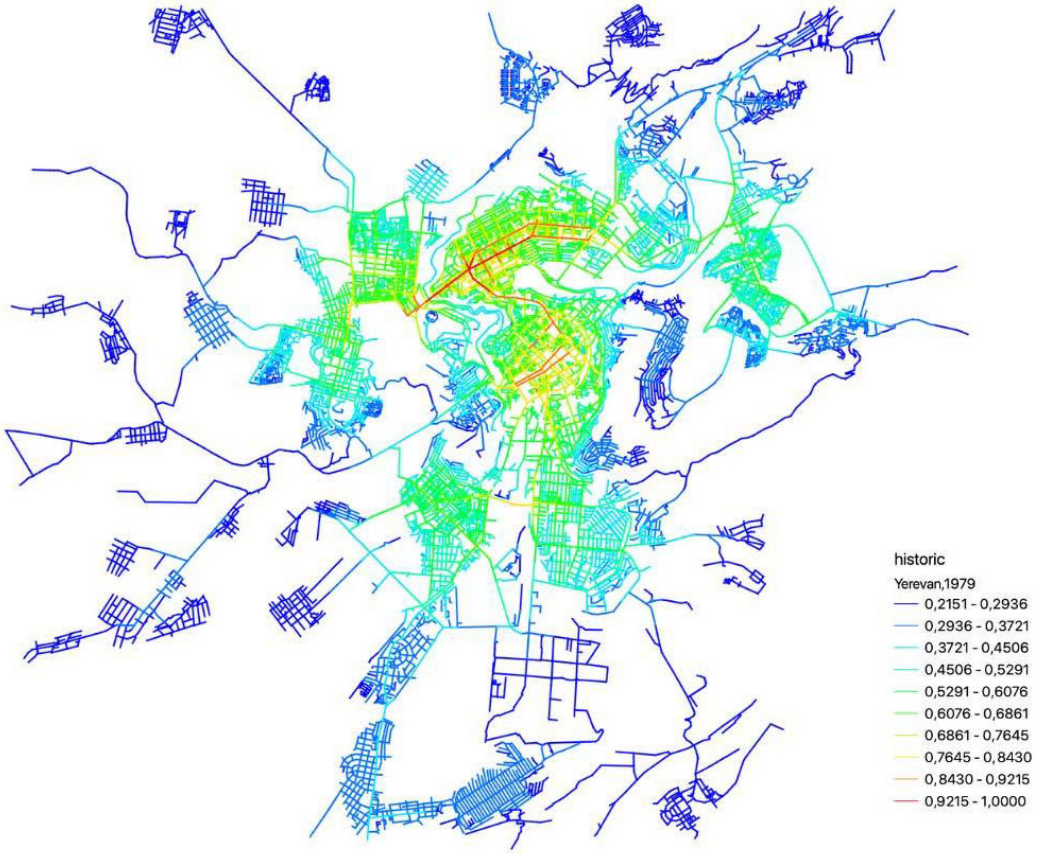


Figure 38: *1979 map of Tallinn, NAIN (radius 3000 meters)*

Modern-day Tallinn and Yerevan: how do they relate to the older spatial structures?

Today, Yerevan has not expanded much further than the 1979 Yerevan. The eastern direction still stays the least integrated one. Moreover, the services of the ropeway connecting the city center to Nork has been stopped in 2004. The enlargement of the city and the development of its integration core [Figure 39] to the west make the segregation levels even more noticeable. The integration core maps depict that the highways and streets in the east and southeastern direction do not only fall into the top 20% or 10% but also 5% of the most integrated segments in the city [Image and Annexes]. This shift has taken place due to the construction of important arteries, such as Sebastia St. (constructed in 1980s) and Monte Melkonyan Avenue (opened in 2014).

Figure 39: *2022 Yerevan, an integration core (10% of the most integrated segment) highlighted in red*

While the integration core has shifted to the west of the city, global integration analysis shows [Figure 40] that Arabkir distict and city center still remain the most integrated areas of the city. Komitas Ave., Kievyan St., Halabyan St, and Tigran Mets continue to play an important role, however, segments comprising Isakov Ave., Melkonian Ave., Bagratuniants Ave. gain higher integration values and together form the foreground network of the city. Despite the construction of new streets, highways, bridges and tunnels, one of the major problems that stays unresolved in Yerevan is the public transportation due to the lack of systematic regulation policies.

Noteworthy that, both in 1979 and 2022 models, the integration core of the old town (Abovyan St. and Nalbandyan St.) stay within the integration core both globally and locally.

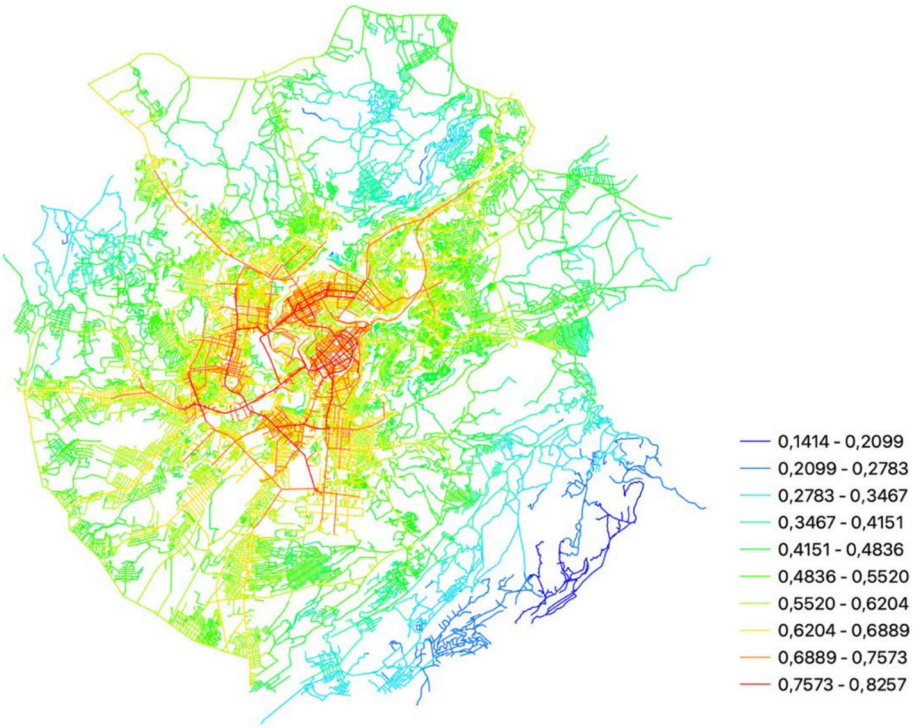


Figure 40: *2022 Yerevan, NAIN (radius N)*

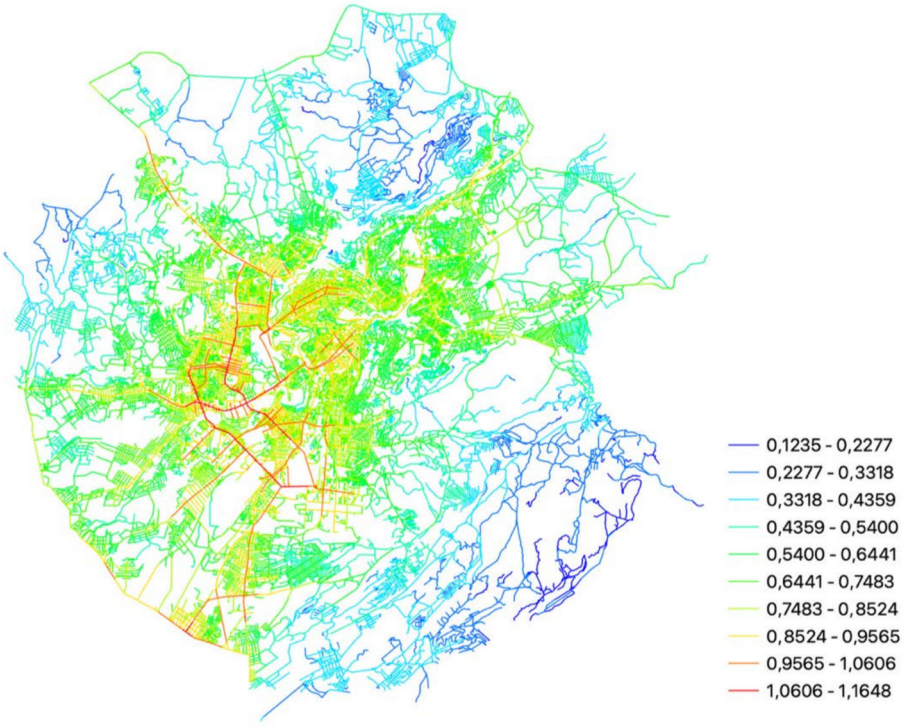


Figure 41: *2022 Yerevan, NAIN (radius 10000 meters)*

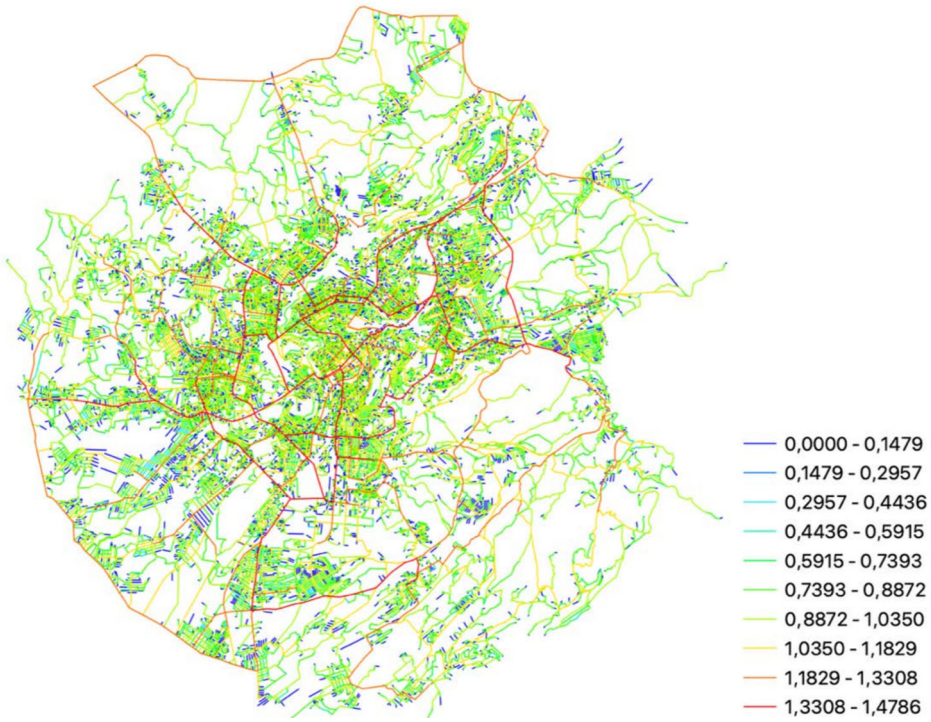


Figure 42: *2022 Yerevan, NAIN (radius 10000 meters)*

Similar to Yerevan, the territory of Tallinn did not expand. Also similar to Yerevan, the integration core of Tallinn does not expand proportionately around the city center but moves in one direction only [Figure 43 and 43.1]. It can be assumed that in both, Yerevan and Tallinn, the former industrial areas of cities are not well integrated. On contrary, streets with lower than mean integration value segments often possess high choice value [Figure 44]. It may be concluded, that due to Soviet policies aiming to have efficient movement of employees but at the same time expanding cities on the one hand through residential "sleeping districts" (that in most cases do not have local purpose or intention to have local services) and on the other hand via industrial complexes, led to the creation of low integration, but high choice value streets/part of cities. However, it will need further analysis and comparison with more cities to confirm this proposition.

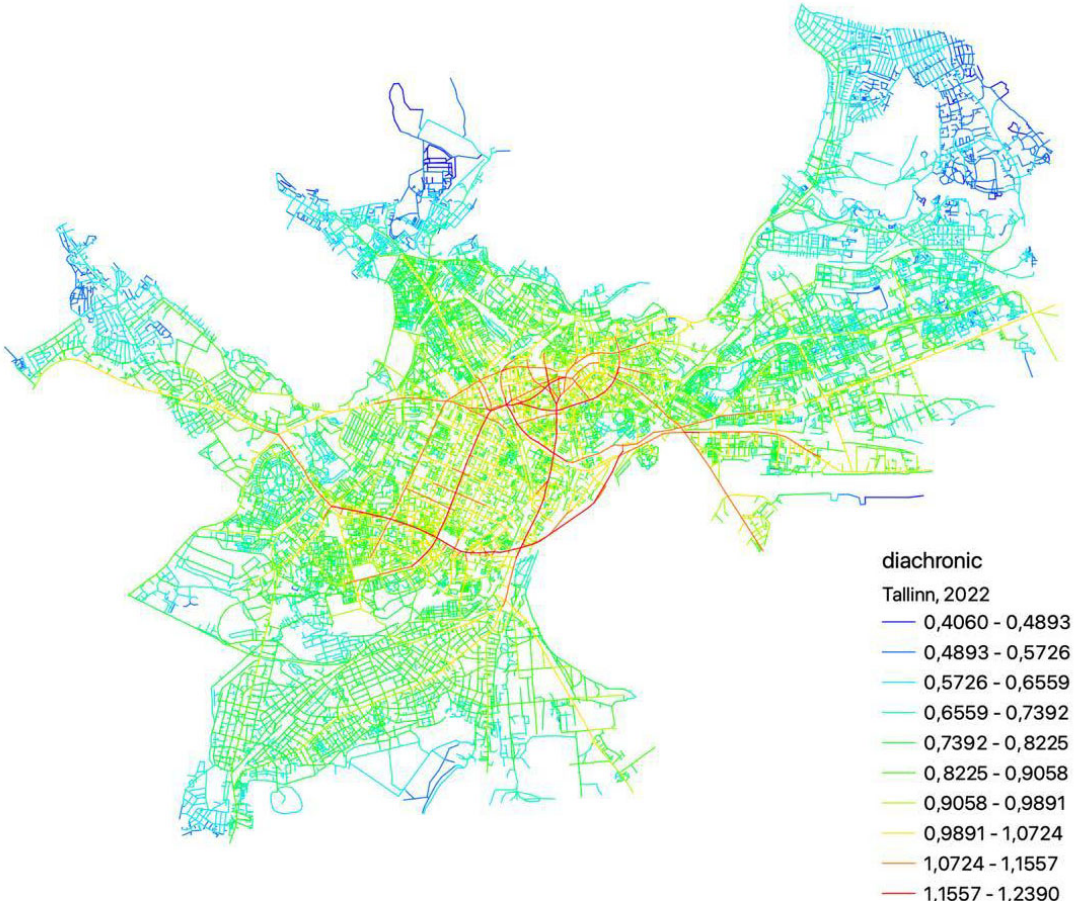


Figure 43: *2022 Tallinn, NAIN (radius N)*

Figure 43.1: *2022 Tallin, an integration core (10% of the most integrated segment) highlighted in red*

Figure 44: *2022 Yerevan, NACH (radius N)*

4.2 Symbolic ordering of the major public buildings and urban spaces in the city centres of Tallinn and Yerevan

The adoption of this method is inspired by Dr. Kayvan Karimi's work on continuity and change in Iranian and English cities. Karimi defines these significant public buildings and urban spaces as major or principal "elements" (Karimi, 1998, p.157). The phrase will be borrowed and used further in this analysis.

Since there is no database of past or present public buildings of Yerevan and Tallinn (at least according to our research), a database of the major elements, their function, and transformation of the function throughout the observed three time periods have been created. The database of public buildings has been comprised based on the review of the literature on the history of Yerevan and Tallinn. This does not mean that all public elements of the referred time period have been mapped, but rather what was accessible

through the literature available in English, Russian, and Armenian languages. Following this step, a smaller number of elements carrying a rather significant role has been shortlisted, mapped, and used for the analysis. Major elements have been divided into five main groups: *places of worship, cultural institutions* (museums, theatres, cinemas, and music halls), *government buildings, marketplaces/bazaars* (in contemporary maps large shopping centers), *healthcare institutions (major hospitals/clinics), educational institutions (only higher education institutions were included),* and *large squares.*

First, the major elements relevant to the pre-Soviet period were mapped. Second, the transformation of the type (as in activity hosted) of the identified pre-Soviet elements was observed and new major elements relevant to the Soviet period were added. Third, the transformation of the buildings identified in the pre-Soviet and Soviet eras is observed in the post-Soviet model. Additionally, new major elements with significant public value (as of today) have been added to the database. It is noteworthy that the area of the study for this exercise is based on the area that is covered in the pre-Soviet maps of Yerevan and Tallinn. Considering the already discussed urban growth in the 20th century, the areas investigated for the Soviet and post-Soviet periods have been slightly enlarged (however, still remaining close to the size of Pre-Soviet maps) to cover only the central areas of modern-day Yerevan and Tallinn. For this, 6 pedestrian maps have been modeled: three for each city, each representing one time period observed in this work.

Figure 45 represents the integration core (20%) of the pre-Soviet map of Yerevan and major elements of the 1906-1920 period. It shows that the major elements located the closest to the most integrated segments of the existing road network are the Main Square [1.4 NAIN], educational institutions [1.4, mean NAIN], the House of the Government [1.28, NAIN], and places of worship [1.17, total mean NAIN; 1, mean NAIN for mosques; 1.2, mean NAIN for churches][3]. Astafyan Street (currently Abovyan), the longest line stretching from the Main Square to the North-East direction, is comprised of the most integrated segments of the system. The average normalized integration value of the segment is 1,46, compared to the mean integration value of the overall system is 1. The major elements located the closest to the most integrated segment of the system are St. Paul and Peter's church (Appendix 5), an all-girls Gayane gymnasium located in the courtyard of the church, as well as a Russian Orthodox Church located across the same street.

[3] Note that the number of places of worship is bigger than the number of other mentioned categories, which causes the mean value to be slightly lower than those of other categories. Singularly taken, churches alongside Astafyan St. are practically located on the most integrated segments.

Figure 45: Pre-Soviet Yerevan, major elements and integration core overlaid. Note, that the overall structure covers an area of about 7 sq. km and is a rather walkable territory with a rather plain terrain

The main marketplace, however, does not seem to be located in the most integrated part of the city: the normalized integration value is 0.9, slightly lower than the mean NAIN.

It is important to note here, that before the declaration of the First Republic of Armenia (1918) and in the circumstances of being part of different empires, the Armenian Apostolic Church played the role of organizing the community life for Armenians. The Muslim population of Yerevan had a similar experience too. Therefore, most of the educational and cultural institutions/activities have been running adjacent

institutions to churches. Therefore, schools are closely located to churches and integrated segments of the town. The literature on the pre-Soviet history of Yerevan did not identify locations of cultural activities. It is described that cultural life was closely tied with religious institutions. Theatrical performances or music evenings have been taking place adjacent to religious institutions and/or schools. For example, according to Yervand Shahaziz's "Old Yerevan", a cinema named "Godless" *[Arm: "Anastrvats']* existed in The Illuminator church before its' destruction in the early Soviet period [Shahaziz, 2003, p.266]. Another example is the stage at the all-girls Gayane gymnasium being used to host theatrical troupes.

As for the administrative buildings, only the House of the Government (the residency of the 1918-1920 government of the Republic of Armenia, Appendix 6) has been included in the analysis of the pre-Soviet period. Yerevan Fortress, which served as a seat for Ottoman and Persian rulers, was dysfunctional at this point, making space for the residential area for new coming refugees escaping the Armenian Genocide in Ottoman Turkey as well as for one of the first industries in Yerevan: the factory producing brandy and wine.

Considering the atheist agenda of the Soviet government, all religious institutions have been closed. In the 1920s-30s, when the large-scale urban planning and construction has been launched, a large number of religious institutions have been demolished across the territory of the USSR. Analysis of Yerevan shows, that those places of worship located close to the most integrated segments and those with higher choice value (on both pre-Soviet and Soviet models), have been either torn down or the immediate surrounding was fenced by buildings to block any visibility of these landmarks. At the same time, those not located close to the segments with high integration and choice values have not been destroyed. Figure 46, representing the integration core of the pre-Soviet Yerevan with highlighted sites of places of worship, shows the sites located the closest to the integration core (marked with a yellow center) has undergone demolition or visibility blocking intervention. For example, the "Moscow" cinema with the small square came to replace St. Paul and Peter's church and Gayane gymnasium, a theatre after Stanislavsky was built on the site of the Russian Orthodox church. The Opera theatre was built on the site of the small Getseman temple. The Shahumyan square (to the South-west of the Main Square) was built after the demolition of St. Nikolay Orthodox church. Others, like St. Katoghike church (Figure 47) and the Blue Mosque (Appendix 8) have been "hidden" behind the apartment block buildings on respectively Abovyan St. and Mashtots. Ave.

Figure 46: Pre-Soviet Yerevan and places of worship (1906-1920)

	Yerevan		
Mean NAIN value per group (radius N)	Pre-Soviet (1920)	Soviet (1979)	Post-Soviet (2022)
Places of worship	1.1715	1.04	1.113
Cultural institutions	N/A	1.227	1.187
Governmental buildings	1.28	1.157	1.1386
Marketplaces	0.997	1.125	1.131
Healthcare	N/A	1.175	1.178
Educational institutions	1.409	1.154	1.1387
Squares	1.418	1.202	1.207

Table 3: Descriptive statistics on integration levels of major elements in Yerevan

Despite the fact that the category of “places of worship”, as a network of institutions, shows a rather low mean integration value, some churches are still among the elements with the highest integration values. Looking at the most integrated elements of Yerevan through the prism of time, it becomes clear that the only structure that maintained its position in the three most integrated elements of each time period is the St. Katoghike church (Figure 48-50).

NAIN value per closest segment(s) (radius N)	Pre-Soviet (1906-1920)	Soviet (1979)	Post-Soviet (2022)
St. Paul and Peter’s (Armenian Apostolic church), all-girls Gayane gymnasium and Russian Orthodox church (no name available)	1.47		
The House of Government	1.41		
St. Katoghike church	1.38	1.30	1.23
Opera House		1.31	
Puppet Theatre		1.27	
Freedom Square and Opera House		1.21	1, 19
Republic Square and History Museum		1.22	1,2

Table 4: The most integrated major elements in Yerevan in three different time periods

St. Katoghike is an interesting case. While it was not demolished during Soviet rule, the visibility of the church was completely blocked (Figure 48). However, after the regained independence, in the process of rediscovering national identity, not only the buildings around this church were torn down (Figure 49), but also a newly designed and built St. Anna church, was constructed right next to the St. Katoghike (Figure 50) to emphasize the Christian identity of Armenian people.

Figure 48: St. Katoghike during Soviet rule.

Figure 49: St. Katoghike during early days of Republic of Armena (until 2015)

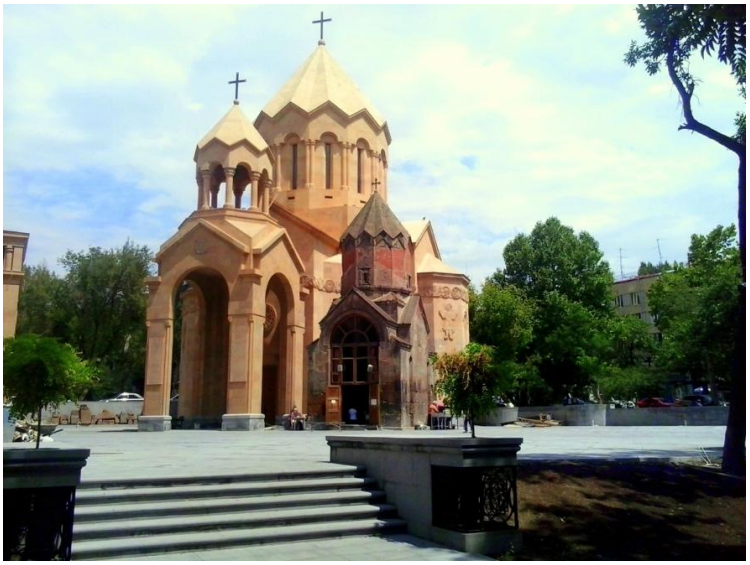


Figure 50: St. Katoghike and St. Anna (on the background) in modern-day Yerevan

Despite cultural institutions being the most integrated spaces [1.227; mean NAIN rN] in the Soviet era, squares consistently show one of the highest integration levels [Figure 51]. Symbolic ordering of modern day Yerevan have not changed drastically, square and cultural institutions are the most integrated spaces in central Yerevan [Figure 52].

Unlike Yerevan, which despite socio-economic and cultural development in the late 19th and early 20th century remained a small provincial city, Tallinn, by the end of the 19th century, was already shaped into an industrialized center with a 58810 (as of 1897) population, which almost tripled by the start of WW1 *[Pullat, 1972, p.41]*. However, following the end of WW1, the dissolution of the Russian Empire, and the declaration of Estonian independence, the population of Tallinn dropped to 111,291. *[ibid, p.167].* Baltic railways built in the 1870s played a major role in the economic and social development of Tallinn. Levels of industrialization continued to grow also during and after WWI.

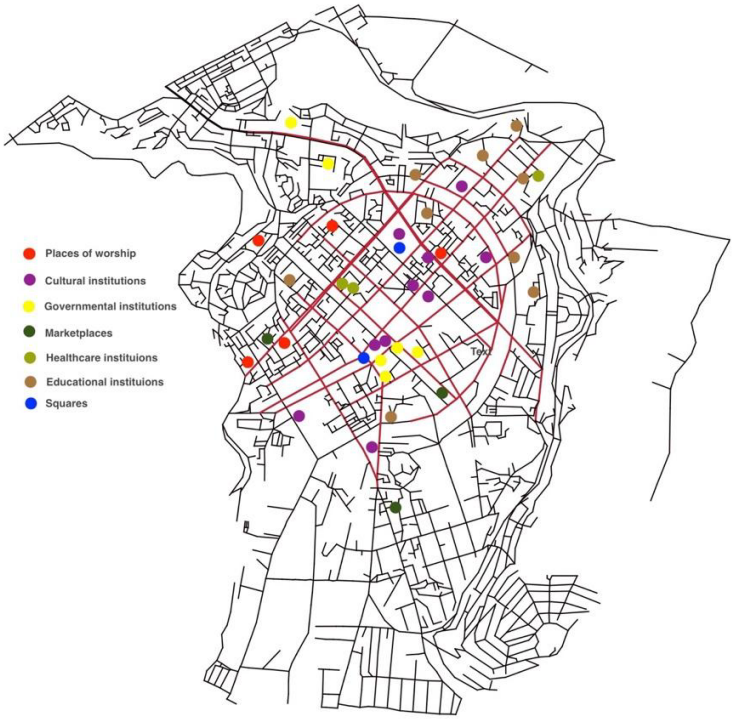


Figure 51: City center of Soviet Yerevan: major elements, and integration core overlaid

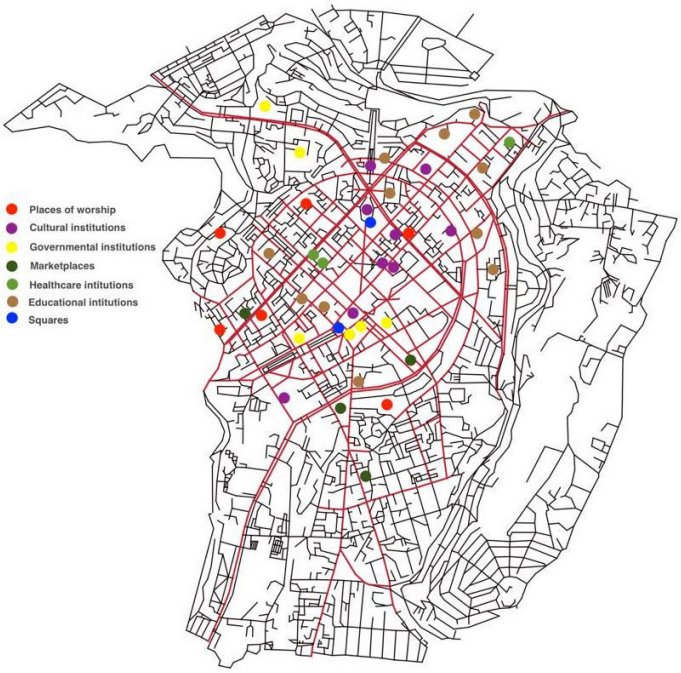


Figure 52: City center of Post-Soviet Yerevan: major elements, and integration core overlaid.

The pre-Soviet map of Tallinn was redrawn from the 1914 map comprised while being a part of the Russian Empire titled "Plan of the existing structure of Provincial [Gubernia] City Reval[4] in 1914 [Figure 14]. The major elements of the pre-Soviet time period have been comprised considering the time period between the start of WWI and the end of WW2.

The most integrated elements of the Pre-Soviet structure [Figure 53] is the main marketplace [1.17, NAIN radius N], educational institutions [1.08, mean NAIN radius N], and cultural institutions [1.07, mean NAIN radius N].

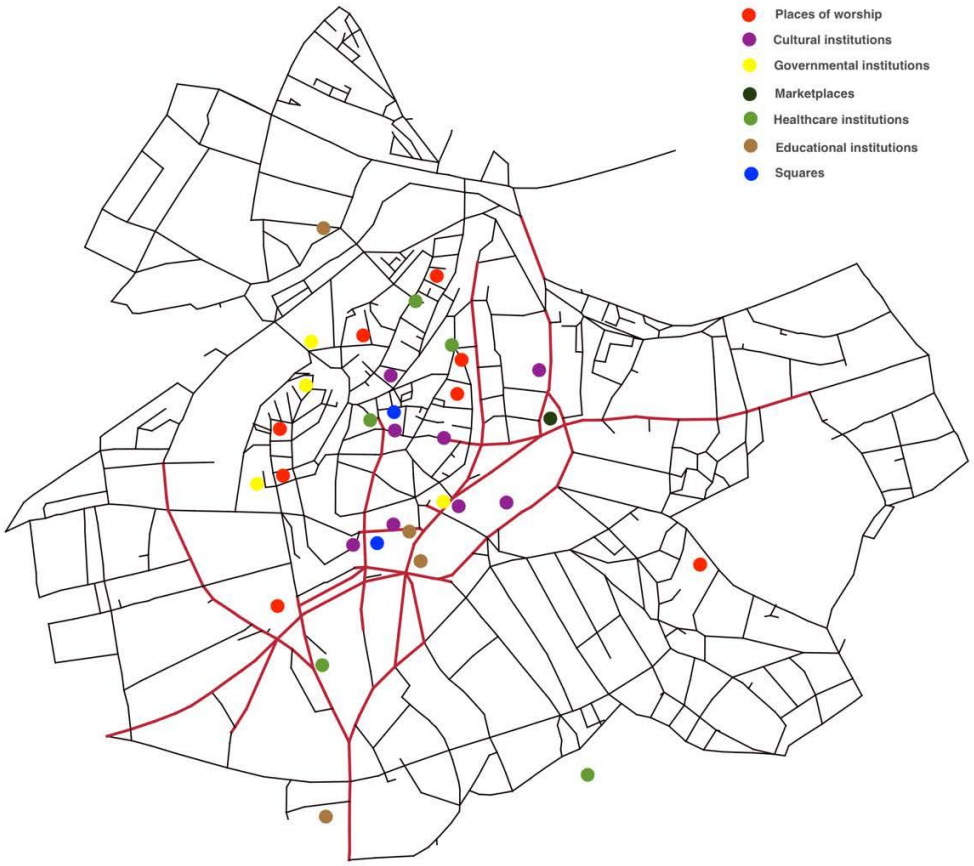


Figure 53: City center of Pre-Soviet Tallinn: major elements, and integration core overlaid.

[4] Reval or Revel [this being mostly used in Russian language sources] is the historic name of Tallinn.

The most integrated element of the pre-Soviet structure is the old market /also known as the Russian market located on Viru Square. It was located in the heart of the city where the old town practically connected to, at the time newly developing city center, which eventually became the city center of Tallinn today. The market existed until 1939 when Estonia first became part of Soviet Union, the main market has been moved further to the east. While the location didn't lose its high integration levels, during soviet times it served as a square known in different time periods as Viru Square, Stalin square or Center Square, but was renamed back to Viru Square after gaining independence. However, in the early 2000s, this square, which also connects major roads like Narva and Parnu roads, has been transformed into a plaza with shopping and office spaces. Other most integrated elements of the city are the oldest building of Tallinn University, which is known as Tallinn English College, as well as the Estonian Drama Theatre.

During the Soviet rule, the main market has been moved to a new place located alongside Tartu Road. The integration level of elements categorized as marketplaces [1; mean NAIN radius N], although staying above the mean integration value of the overall system [0.92; mean NAIN radius N], has dropped in relation to the maximum integration value [1.39; mean NAIN radius N].

Although during the years of Estonian independence a few medical institutions existed, such as the Tallinn hospital in Tõnismäe and various specialized clinics across Old Town and beyond, they were not located close to the most integrated segments of the system. However, the construction of the large complex of Central Hospital of Tallinn near Liivalaia Road turned it into one of the most integrated major elements of the Soviet [1.38; mean NAIN radius N] and Post-Soviet models [1.3; mean NAIN radius N], this is when the maximum integration value is 1.39 in Soviet and 1.36 in post-Soviet models. Healthcare institutions, in general, have the highest mean integration level both in Soviet [1.29; mean NAIN radius N] and post-Soviet models [1.28; mean NAIN radius N].

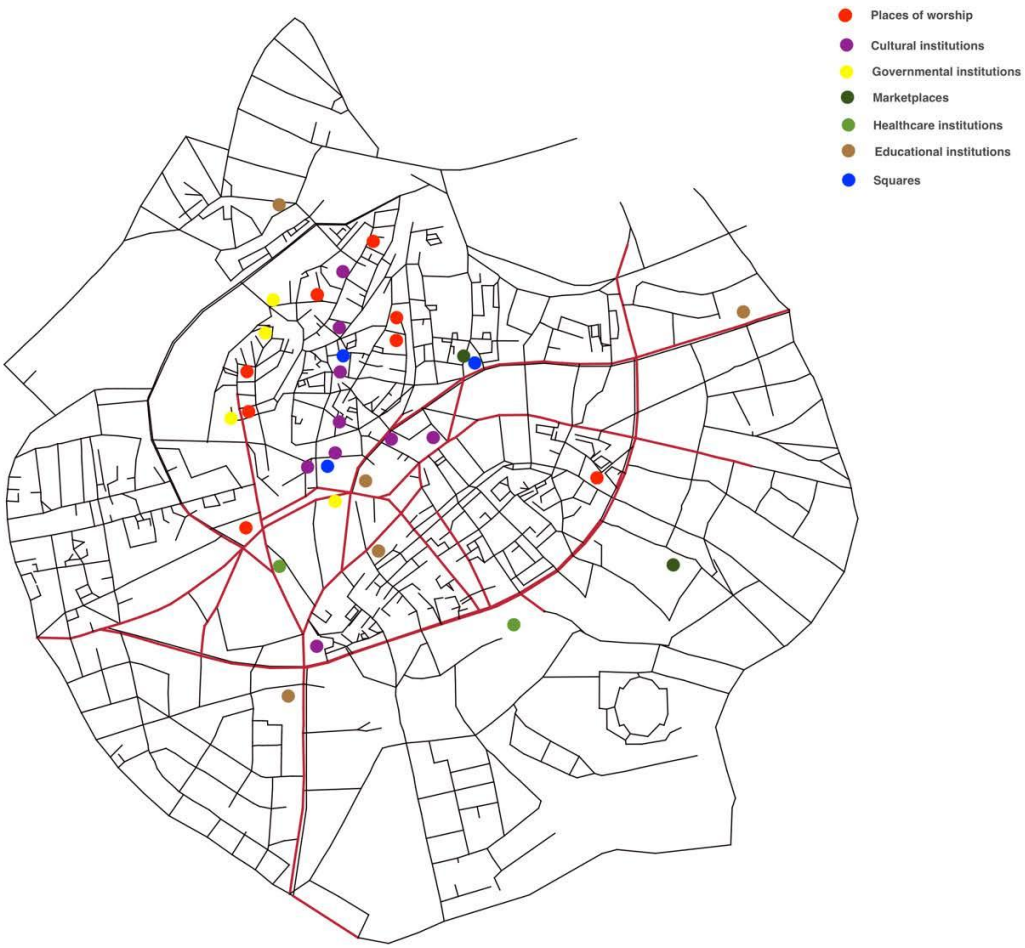


Figure 54: City center of Soviet Tallinn: major elements, and integration core overlaid.

Following hospitals, educational [1.07] and cultural institutions [1.06] as well as squares [1.05] appear as the most integrated elements of the Soviet-time structure. Kosmos Cinema [1.37], Estonian Drama Theatre [1.21], and Freedom Square [1.2] are among the elements located in the most integrated segments. [Despite the fact that there were only 4 higher education institutions in Soviet Tallinn, all the institutions have been placed along well-integrated roads and junctions.

In the post-Soviet system, main healthcare institutions continued to have the highest integration level [1.28; mean NAIN]. With the shift in the economy after the collapse of the USSR, the marketplaces/shopping centers, however, gained a much more significant role in the structure of the city center of Tallinn. The contemporary city center which geographically is located to the south and south-east of the old town hosts numerous malls, shopping centers, and plazas that incorporate shopping areas

in them [1.12; mean NAIN]. The shopping center on Parnu Rd. which is hosted in the building of the Mutual Loan Society designed by Saarinen [1912] is one of the most integrated elements of the system [1.25; mean NAIN]. By contrast to Yerevan, where all large shopping malls are located outside of the immediate city center, in Tallin, shopping malls and are densely located in the city center too.

Educational institutions continue to be located close to the high integration segments [1,09; mean NAIN]. Kosmos Cinema continues to be one of the elements with high integration value [1.34; mean NAIN]. Moreover, the only government building that is located on the segments with high integration value is the City Government of Tallinn. Traditionally most of governmental, and administrative buildings, as well as those hosting diplomatic missions, are located in the Old Town. Later with the expansion of the city, although being part of the city center, it slowly lost the global integration and choice values that it once possessed.

	Tallinn		
Radius N, mean NAIN values per group	Pre-Soviet (1914)	Soviet (1979-1983)	Post-Soviet (2022)
Places of worship	0.9234	0.9747	1.0004
Cultural institutions	1.0760	1.0265	1.0391
Governmental buildings	0.9937	0.9864	0.9881
Marketplaces	1.1689	1.0216	1.1298
Healthcare	0.9792	1.2981	1.2855
Educational institutions	1.0805	1.0795	1.093
Squares	1.0661	1.0596	1.0607

Table 5: Descriptive statistics on integration levels of major elements in Tallinn

By contrast to Yerevan, where all large shopping malls are located outside of the immediate city center, in Tallin a marketplaces

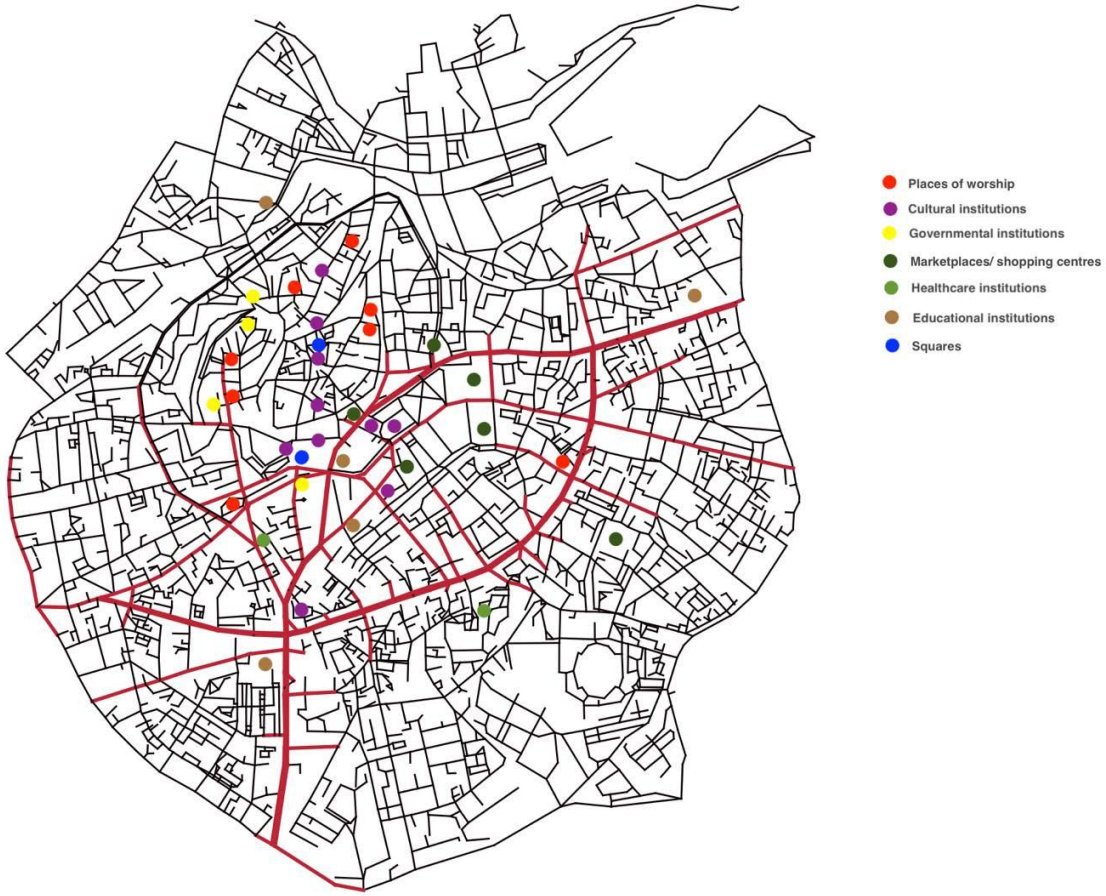


Figure 55: City center of Post-Soviet Tallinn: major elements, and integration core overlaid.

DISCUSSION AND CONCLUSIONS

Tallinn and Yerevan are two unique spaces with distinct, but also shared history. Undoubtedly, both cities have expanded to afford the political and economic processes of the 20th century. Both transformed to become a capital city of a new nation-state. With the Sovietisation, Yerevan and Tallinn grew their industrial potential which left its imprint on the spatial morphology. The analysis shows, that potentially soviet industrial areas and potentially “mikrorayons”, while possessing high choice values, tend to become a rather segregated space.

However, a more detailed analysis shows that although these cities might share the soviet decision-making influence on their urban structure, they are different both in structural and symbolic aspects.

It turns out that spatial laws do not provide such flexibility to a single, even though very centralized power like USSR, to level cities across the union to a predefined standard. After the comparison of late-Soviet data, it becomes apparent, that in terms of both urban structure and symbolic order, Tallinn and Yerevan presented different pictures. Yerevan undoubtedly is more influenced by Soviet planning practices. A reason for that might be the lack of developed pre-Soviet urban structure and/or being part of the Soviet Union from the most deterministic period (the 1920s and 1930s) onwards and for the whole period of existence of the Soviet Union. And despite this, Yerevan has preserved the most integrated part of the city centre, which has not significantly changed since the pre-Soviet times. While not denying the shifts that soviet planning caused in the structure of cities in former USSR-member states, this research cannot conclude that there is a specific spatial pattern that these two cities share.

The way these cities currently relate to the pre-Soviet and Soviet structures is different: Yerevan has been predominantly shaped during Soviet Union, while Tallinn's main foreground network of streets, as well as the Old Town are preserved from pre-Soviet and medieval times respectively.

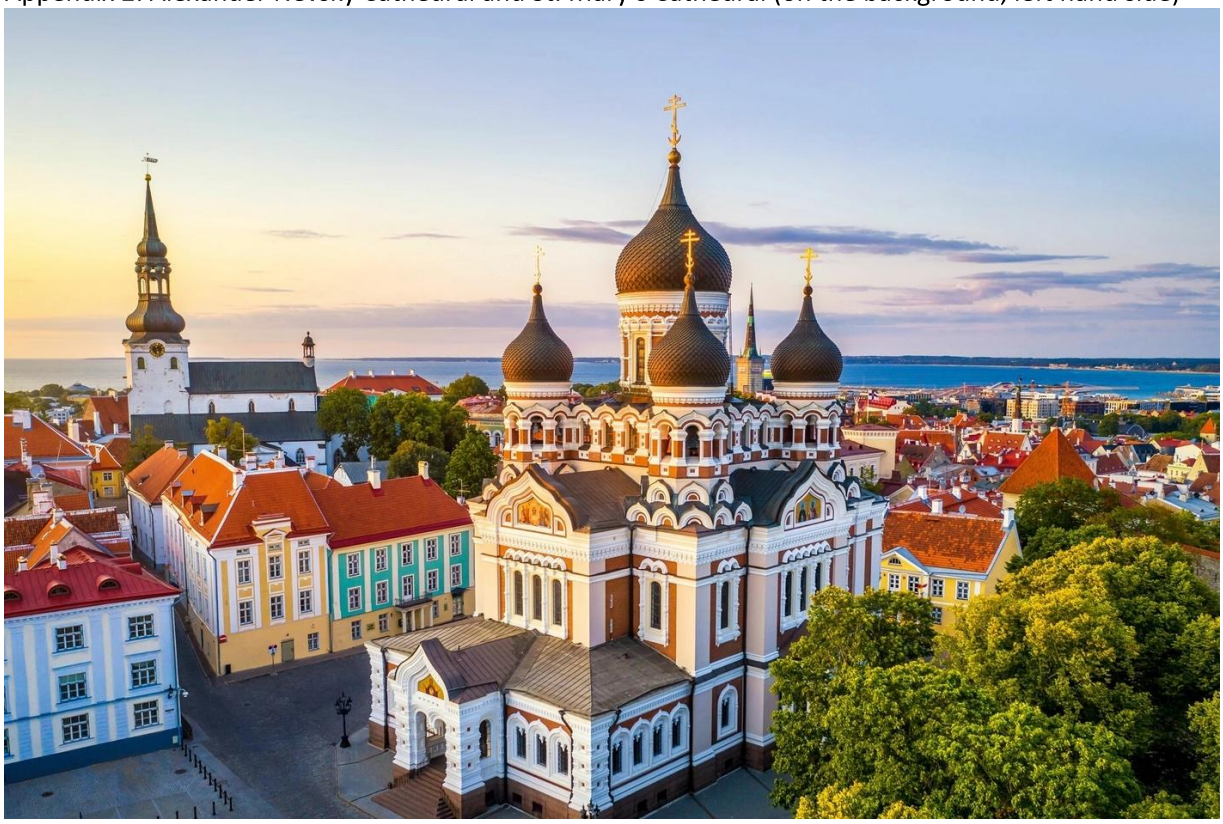
Symbolic ordering of Tallinn and Yerevan through these three time periods, show different meanings too. Squares and cultural institutions were the most integrated elements in Yerevan in all time periods, while marketplaces/shopping centers, as well as social services such as healthcare and education occupy the most significant spaces in Tallinn (marketplaces lost their value only during Soviet era)

Following the discussion of the results a question arises. Is the label of Post-Socialist or Post-Soviet city valid as a description for urban areas of former USSR states? The simple answer is no, at least in spatial morphological terms. These cities might share similar urbanistic issues regarding the organization of housing, vacant/ segregated industrial areas, problems with the accessibility of local services, or simply the similar aesthetic of architecture. However, the structural analysis of Yerevan and Tallinn suggests that in terms of spatial morphology, these cities are not exactly similar. The research shows that the overlooked structure and symbolic order of the pre-Soviet Tallinn and Yerevan had a bigger potential in explaining the current structure than it was anticipated. In this sense, to understand the structure and symbolic ordering of any city, researching spatial morphology in its continuity is essential.

APPENDICES

Appendix 1: The 1935 general reconstruction plan of Moscow

Appendix 2: Alexander Nevsky Cathedral and St. Mary's Cathedral (on the background, left hand side)



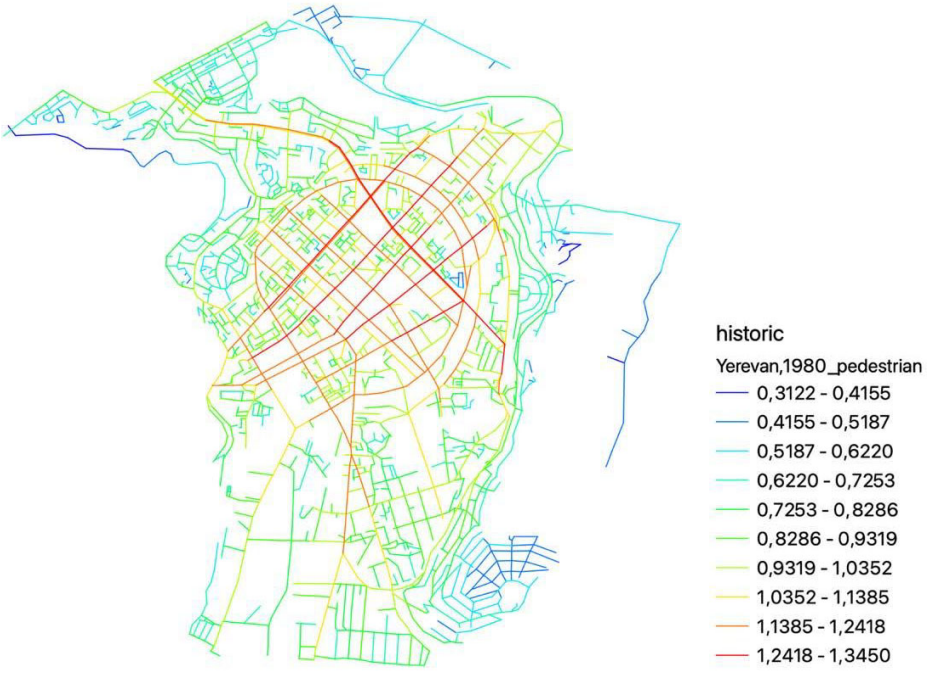
Appendix 3: Kadriorg Palace, west façade

Appendix 4: Mikrodistrict of Väike-Õismäe built in 1970s in Tallinn.

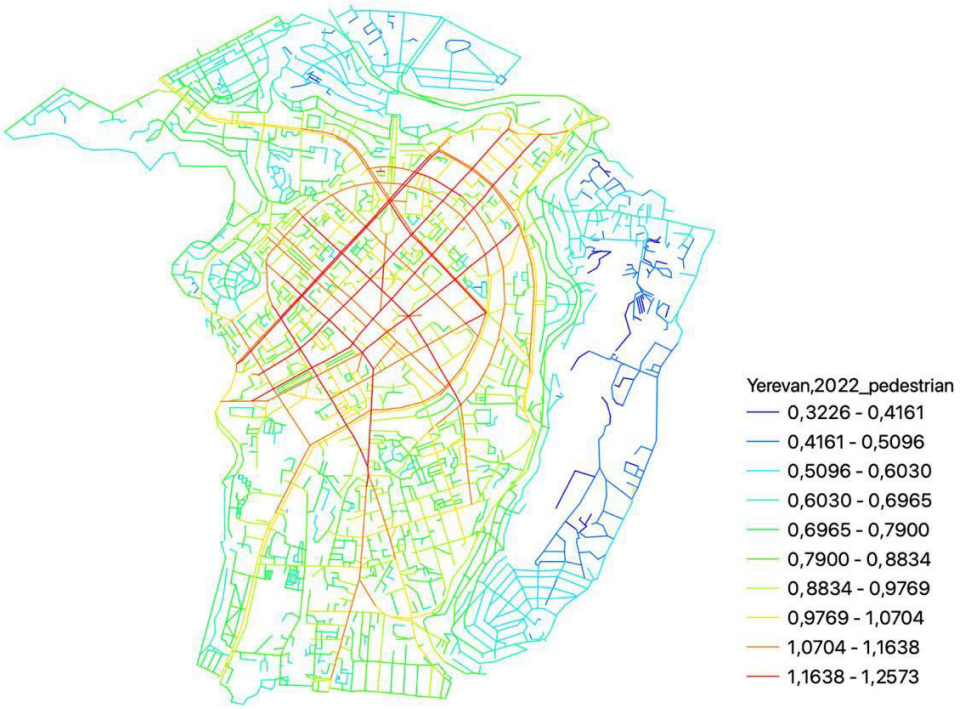
Appendix 5: St. Paul and Peter Cathedral in Yerevan.

Appendix 6: The House of Government of the First Republic of Armenia.

Appendix 7: The pedestrian model of the city center of 1979 Yerevan, NAIN (radius N)



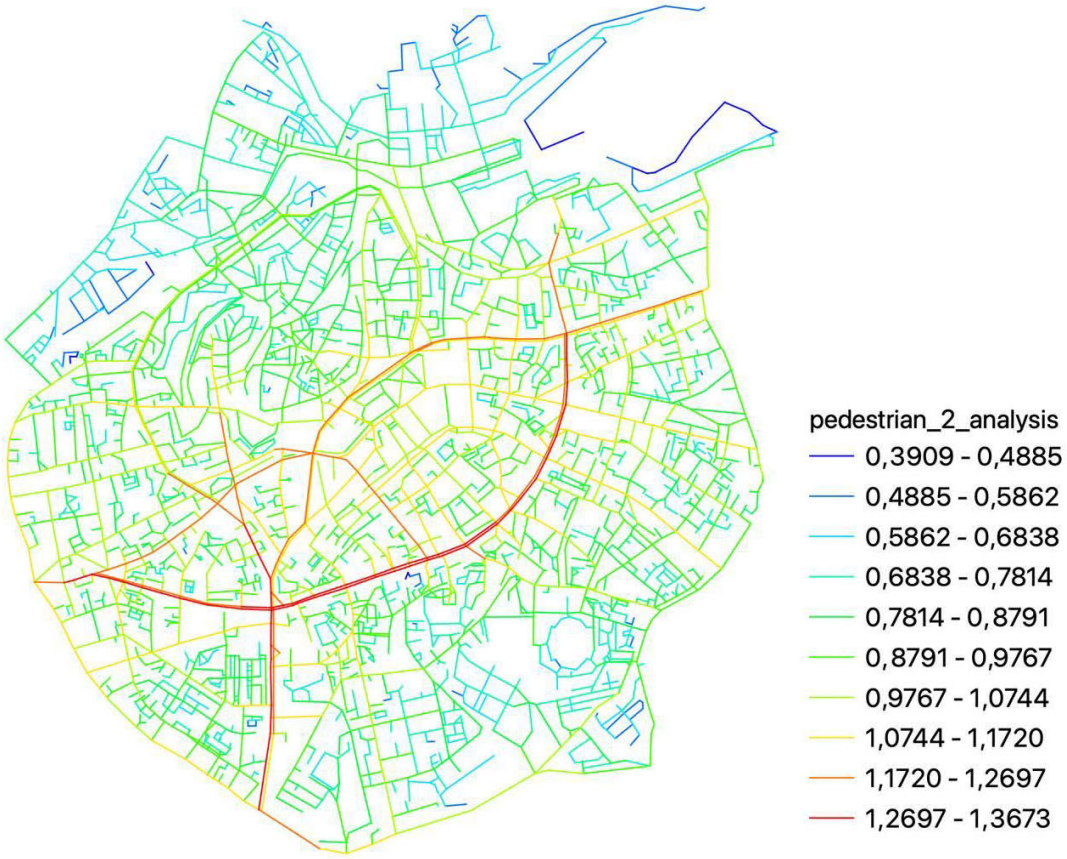
Appendix 8: The pedestrian model of the city center of 2022 Yerevan, NAIN (radius N)

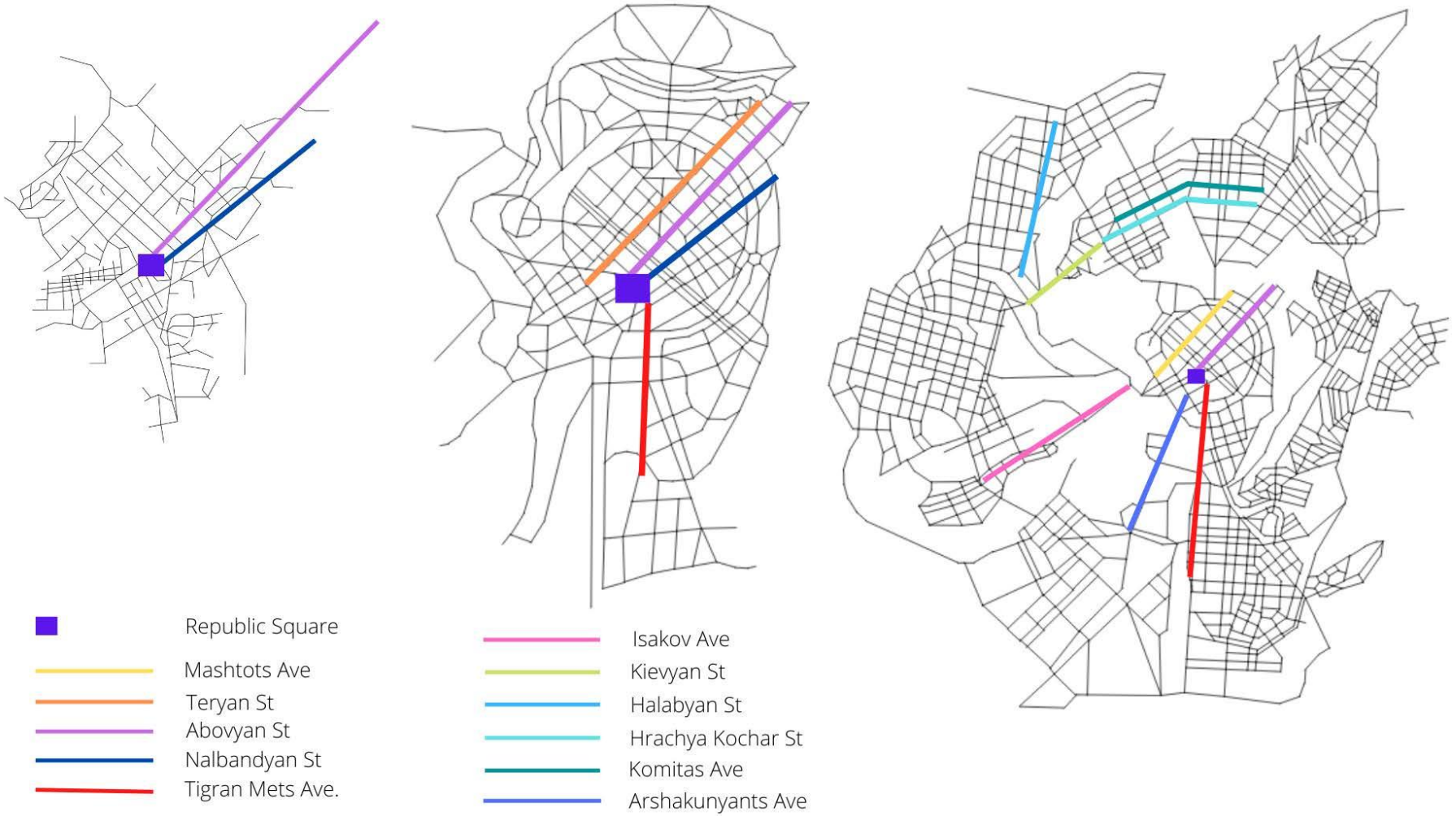


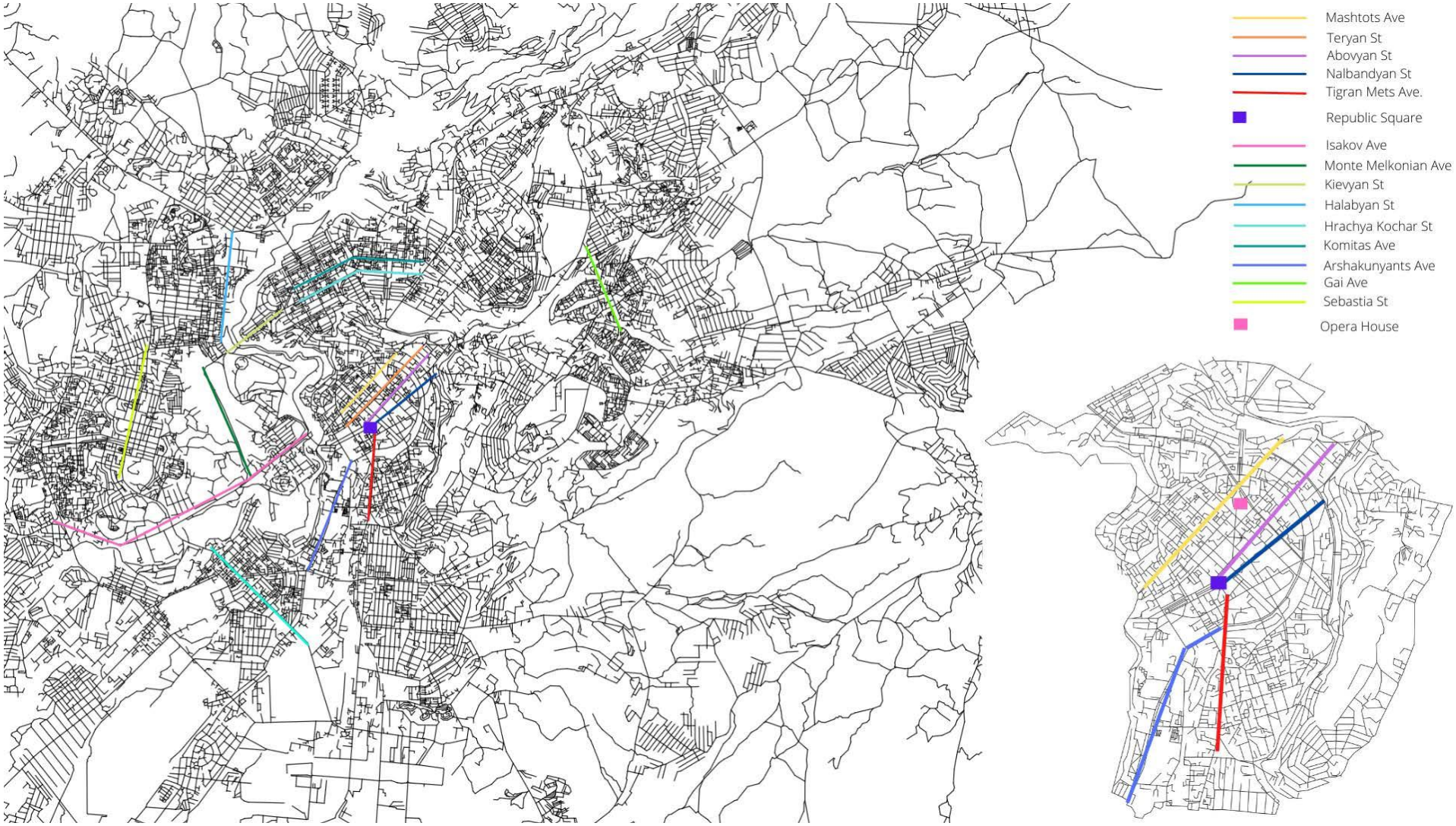
Appendix 9: The pedestrian model of the city center of 1914 Tallinn, NAIN (radius N)

Appendix 10: The pedestrian model of the city center of 1979 Tallinn, NAIN (radius N)

Appendix 11: The pedestrian model of the city center of 2022 Tallinn, NAIN (radius N)




Republic Square
Mashtots Ave
Teryan St
Abovyan St
Nalbandyan St
Tigran Mets Ave.
Isakov Ave
Kievyan St
Halabyan St
Hrachya Kochar St
Komitas Ave
Arshakunyants Ave


Mashtots Ave
Teryan St
Abovyan St
Nalbandyan St
Tigran Mets Ave.
Republic Square
Isakov Ave
Monte Melkonian Ave
Kievyan St
Halabyan St
Hrachya Kochar St
Komitas Ave
Arshakunyants Ave
Gai Ave
Sebastia St
Opera House

Street Guide for Tallinn (Part 1)

Street Guide for Tallinn (Part 2)

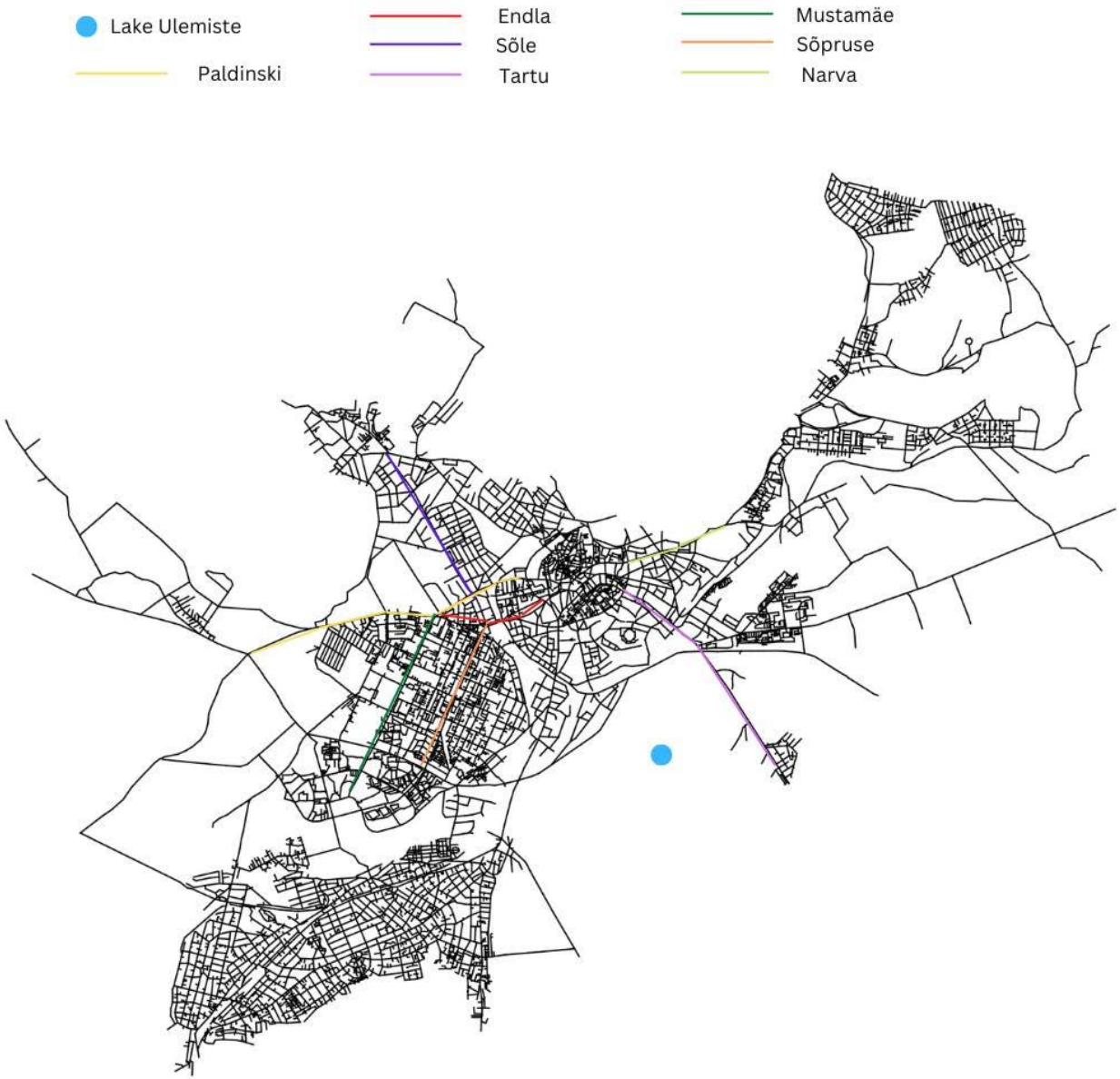


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Figure 1. Panoramic view of Yerevan in the 19th century (Dzoragyuigh neighborhood) from wikipedia [author unknown]

Figure 2. Hakobyan, T. (1959). Erevani patmut'yunĕ (1801-1879). Erevan, Erevani hamalsarani hratarakch'ut'yun

Figures 3, 4, 5, 6. Historical Maps of Yerevan, provided by Museum of History of Yerevan via email

Figure 7. Excerpt of Yerevan from Soviet Maps of the World provided by Cadastre Committee of the Republic of Armenia via email

Figure 10. Yerevan administrative map designed by 517design, own work. Available at: https://commons.wikimedia.org/w/index.php?curid=87738492

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Figures 12, 14, 15. Histrical maps of Tallinn from open source Kaardid, online database of maps. Available at: https://www.ra.ee/kaardid/index.php/en

Figure 16. Soviet topographical Map of the World, photos taken 1956, corrected based on observations 1979, published 1980-1983 (1:100:000). Available at British Library archives

Figure 17. Administrative districts of Tallinn by Municipality of Tallinn. Available at: https://www.tallinn.ee/en/tallinn-city-districts-map

Figures 48-50. St. Katighike Church from Wikipedia [author unknown]

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Appendix 1: Sasha Trubetskoy (2019) [Twitter]. Available at: https://twitter.com/sasha_trub/status/1159980177197342721/photo/1 (Accessed 12 September 2022)

Appendix 2: Alexander Nevsky Cathedral in Tallinn by National Geographic . Available at: https://www.nationalgeographic.co.uk/travel/2021/12/how-to-spend-a-weekend-in-tallinn-estonia

Appendix 3: West Façade of Kadriorg Palace, by A.Savin, Own work. Available at: https://commons.wikimedia.org/w/index.php?curid=121388991

Appendix 4: Mikrodistrict of Väike-Õismäe built in 1970s in Tallinn from Wikipedia. Available at: https://en.wikipedia.org/wiki/Urban_planning_in_communist_countries

Appendix 5: Saint Peter and Paul Cathedral from Wikipedia. Available at: https://commons.wikimedia.org/wiki/File:Saint_Peter_and_Paul_Church,_Yerevan.jpg

Appendix 6: First Government Building [author unknown, Published before 1920, Public domain, via Wikimedia Commons]