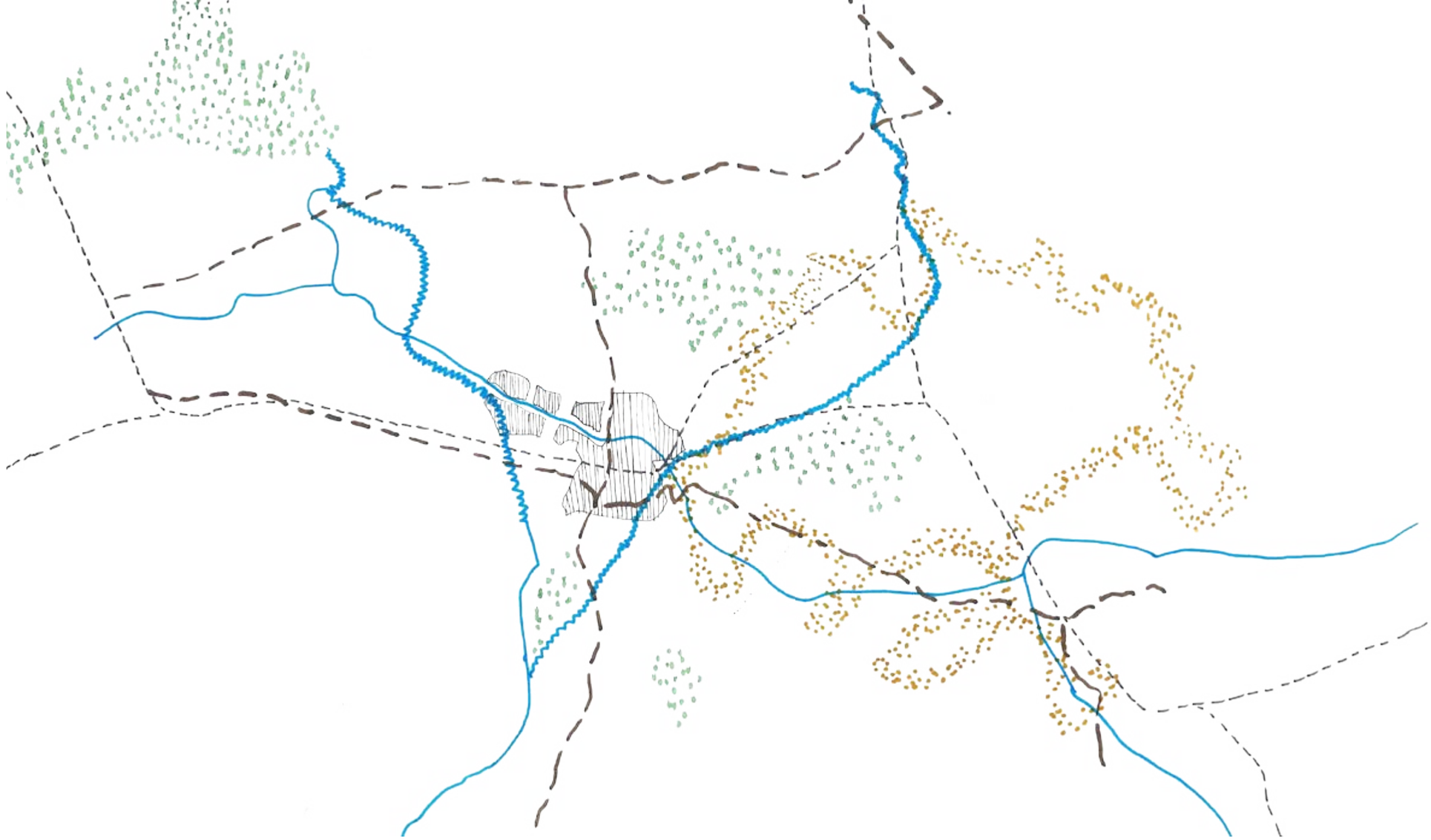


TILBURG

Movement in Time

Corridors as an adaptive framework

AR1U090

R&D Studio: Analysis and
Design of Urban Form

Karishma Asarpota

4619625

Project Abstract

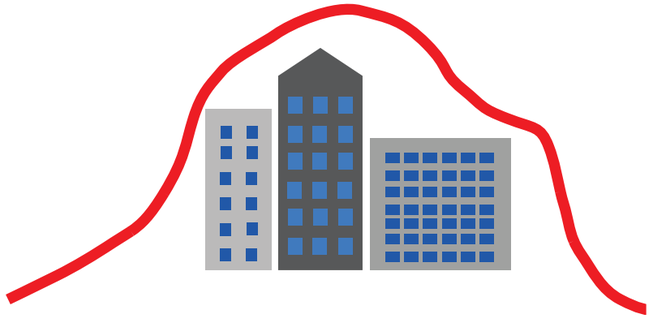
The intersection of effects of climate change, urbanism and communal action provides an opportunity for architects and planners to reinforce the complex system of cities by challenging current norms and empowering residents with tools to influence spatial form that they interact with.

'Our choices in Urbanism, will define not only the physical nature of our communities but will also prescribe out environmental footprint as well as frame our social opportunities and underwrite our economic future. Yet, architectural and urban design are often missing from the proposed remedies for climate change, job growth, and environmental stress; it is the invisible wedge in the pie chart of green solutions', said Peter Calthorpe in his book *Urbanism in the Age of Climate Change*.

Going forward solutions that demand a conservative use of current resources while pushing consumers to change their habits are needed for our civilization to sustain. Urbanism is a pivotal point in this journey as it represents both a conservation strategy as well as a lifestyle change. Through urban form analysis, the project explores designing for resilience and diversity in our cities so that we are better equipped to deal unforeseeable changes in the future. An interpretation of corridors as an adaptive framework in cities is explored within the context of Tilburg, Netherlands.

Climate Change and Tilburg

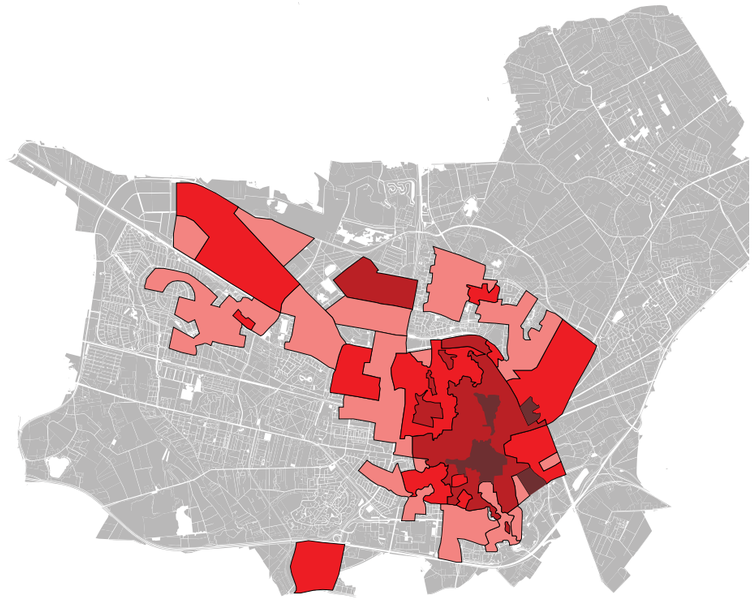
Climate change is one of the most pressing issues of our times. It impacts the air we breathe, food and water we consume and has challenged the building blocks our cities are made of. By 2050, cities are expected to be the home of about 66% of the world's population. UN reported that currently cities contribute to as much as 70% of global greenhouse gas emissions. Urban areas are a cause of fast rising temperature and associated greenhouse effects. But can they also be a solution to the same problem? How can we design urban frameworks that are adaptable, resilient and diverse?



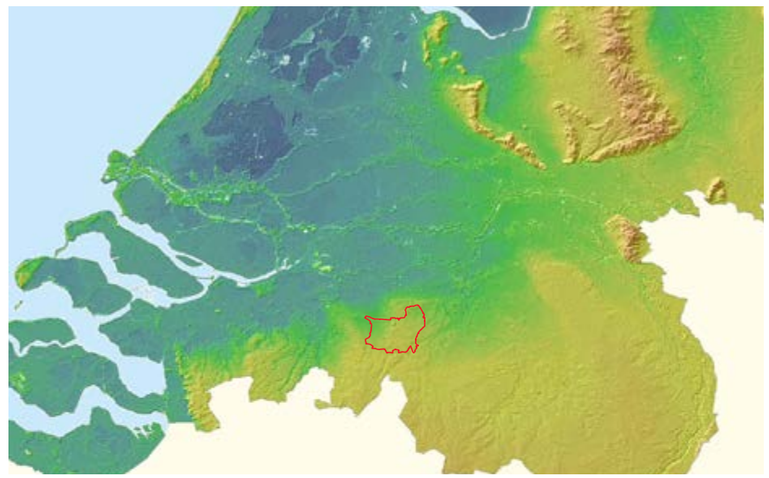
Urban Heat Island Effect

Increased Precipitation

Tilburg is a city in Brabant province of South Holland. Tilburg lies in the landmass of the country that is above sea level (about 60% of the Netherlands lies below sea level). While most of the country will have to deal with the consequences of sea level rise like flooding, Tilburg will be affected by warmer summers and wetter winters. The heat island affect and higher precipitation levels are immediate environmental concerns that the city needs to deal with. Denser areas in the city are most affected by heat island affect making public areas in the city center a cause for concern. The capacity of drainage and storage of water needs to be dealt with on the city level.



Urban Heat Island Map of Tilburg, 2011



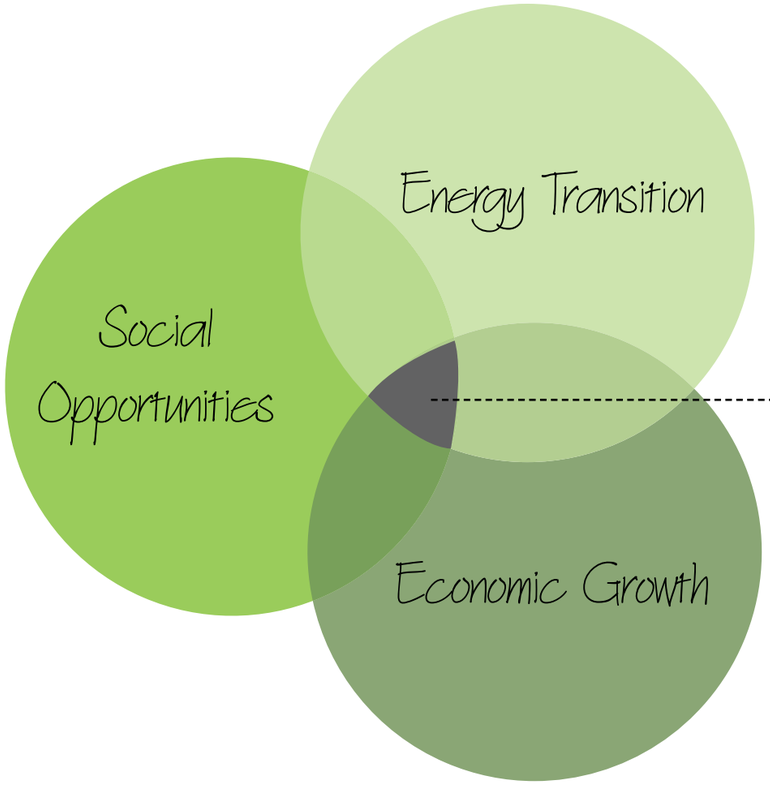
Tilburg above sea level

Urbanism as a green solution

'At this critical juncture – when energy, environmental, fiscal, and national security challenged are converging – we cannot afford another generation of unsustainable growth'. – Peter Calthorpe, Urbanism in the age of Climate Change.

Urbanism is at the intersection of green solutions to battle climate change. Energy transition, social opportunities and economic growth intersect in urban areas and can be addressed through designing an adaptable urban form. Urbanism can be used a tool to introduce a conservation mechanism in a city as well as impact a lifestyle change for its residents.

Sustainable design approaches that make systems more comprehensive are the solution to battle climate change going forward. At the crux of it, these design solutions emphasize the need of creating environments that can adapt to unforeseeable change. This approach can be migrated to the architectural landscape as well. The balance between the complexity of systems in urbanity and the self-organization of individual elements within the city framework affects the qualities of spatial form of the city contributes to its ability to adapt to change and be resilient to new developments such as economic crisis, energy transition, social upheaval and even climate change.



Solutions to battle climate change

Project Methodology

Literature Review

Climate Change and Tilburg
Regional Context
Urban Growth in Tilburg

Map Analysis

Landscape and Social Infrastructure
Economic Infrastructure
City Structure

Heirarchy & Typology of Corridors

Corridors as a diverse framework

Design guidelines to mitigate the effects of climate change along corridors in Tilburg

Contents

The matrix of maps for Tilburg has been created to be able to track the growth of the city in relevance to events of history. Being in constant dialogue, these layers have formed over time and metabolize to form the city of Tilburg.

	Regional Context	Urban Edge	Social Infrastructure and Landscape Pattern	Economic Infrastructure	City Structure
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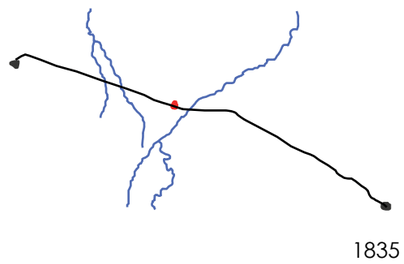
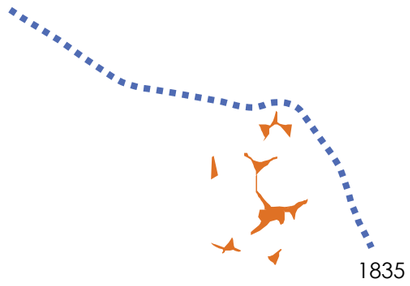
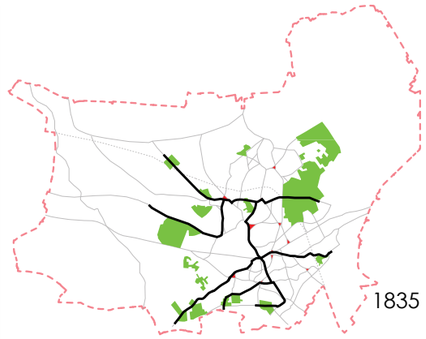
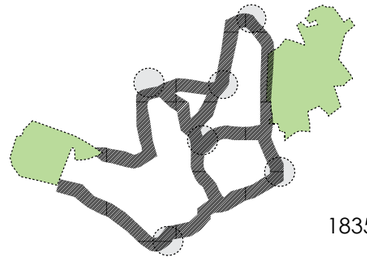
1835					
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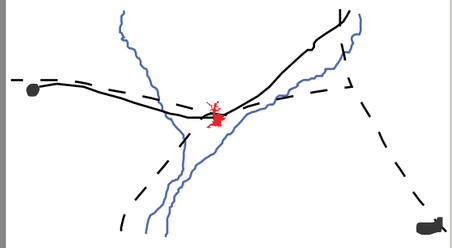
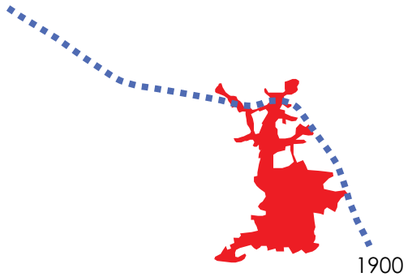
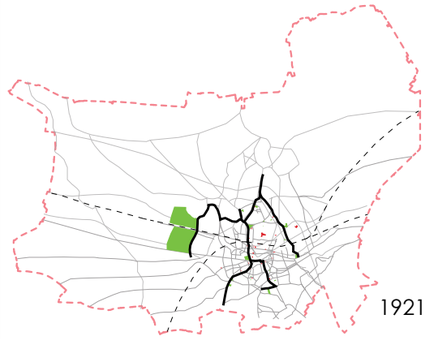
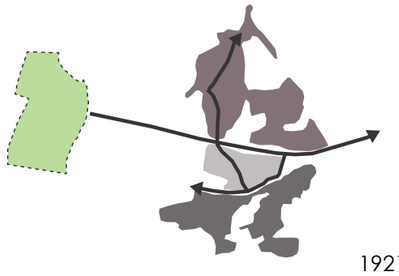
1880					
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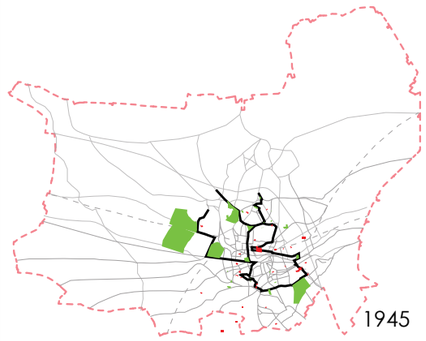
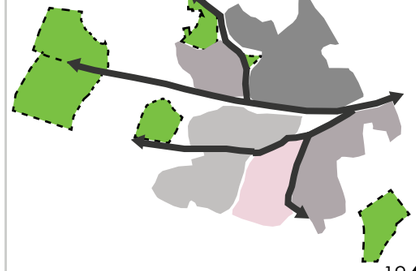
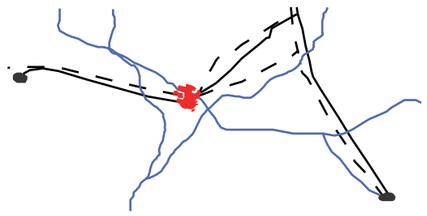
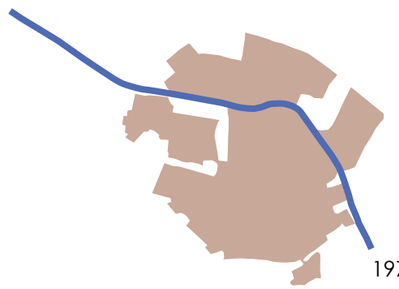
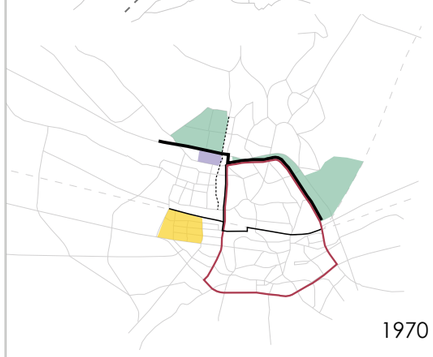
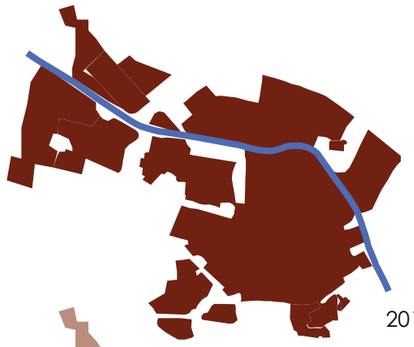
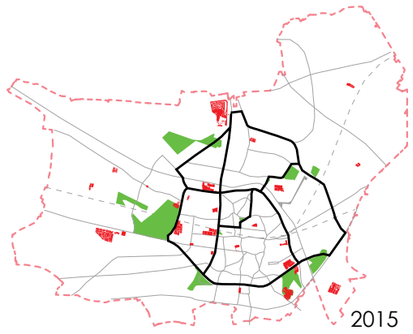
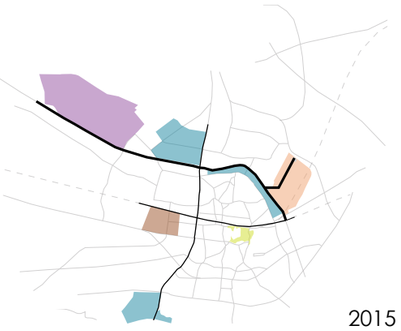
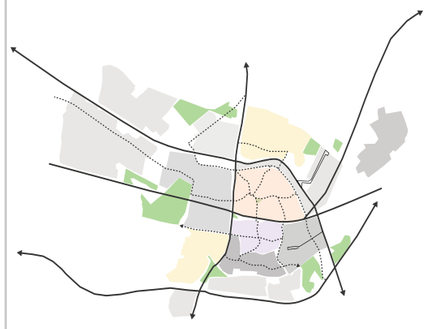
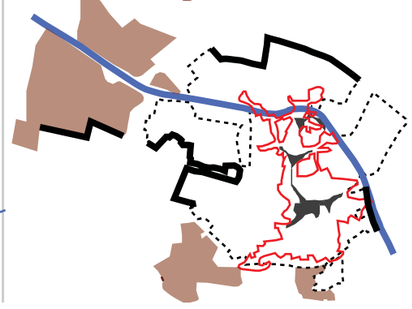
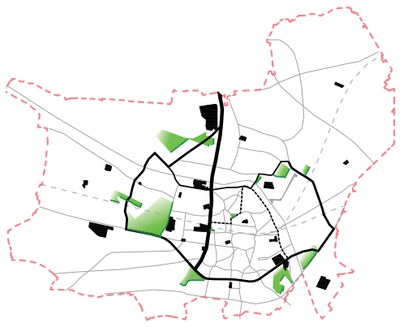
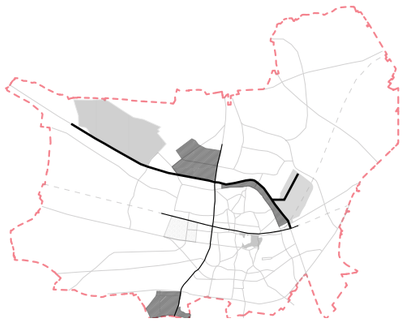
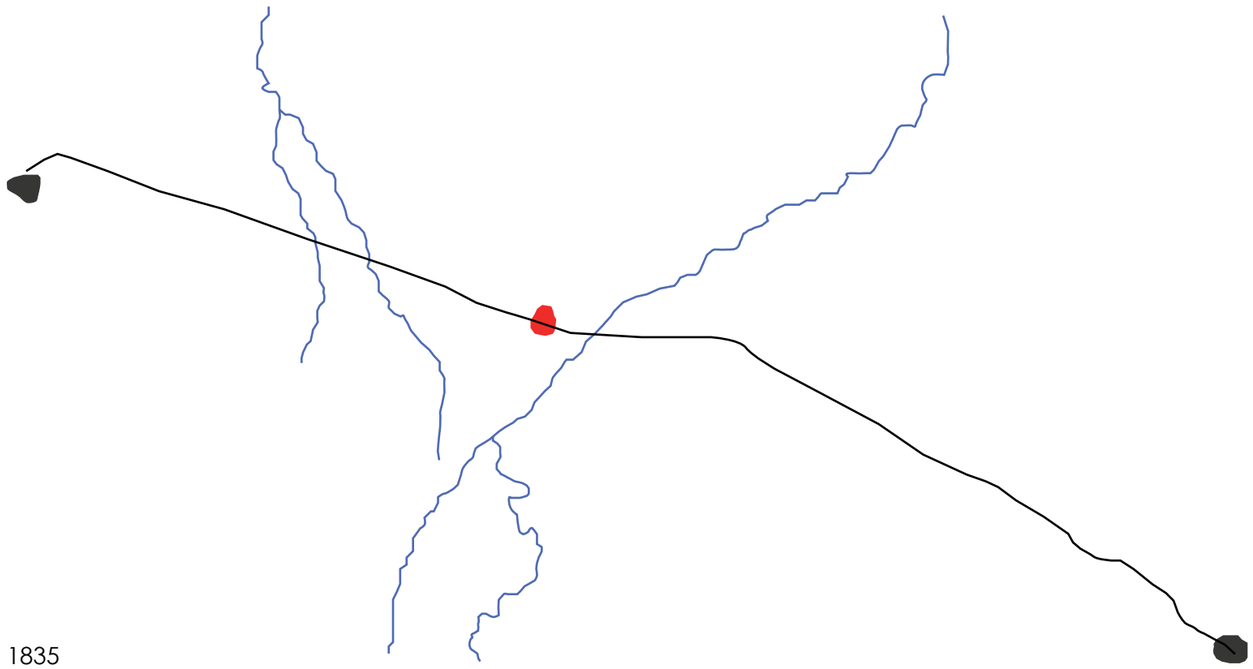
1945					
1950					
1970					
2015					
					
					

Regional Context

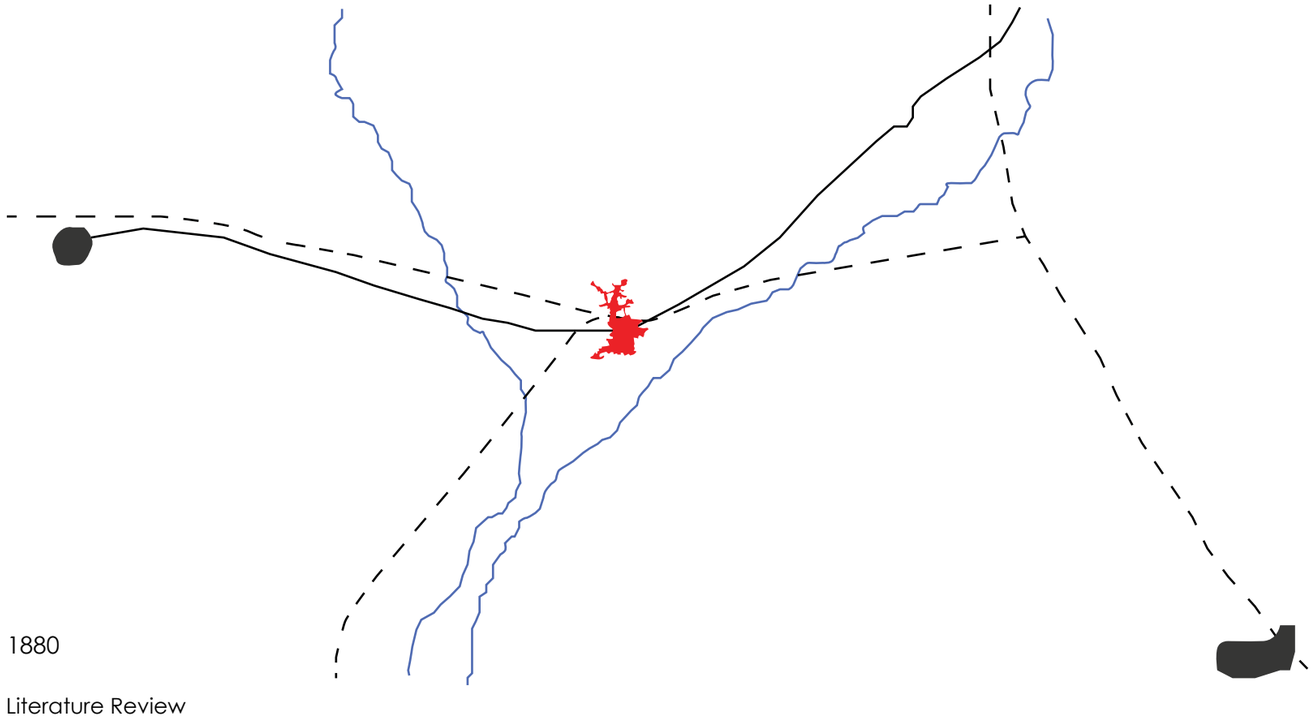
Position of Tilburg in the Benelux Region

Major Regional Connections through Tilburg

Regional Context



1835



1880

Tilburg was declared a city in 1809. In 2009, the municipality of Tilburg celebrated 200 years of being a city. Tilburg lies with the Zuid Zandriem or the Southern Sand belt of the Netherlands. Lacking fertility to grow crops, the sand beds had to be improved over time for cattle to feed. Since the area around Tilburg was entirely above sea level, its inhabitants did not have to deal with the sea like other lower parts of the country. Their challenge for survival lied in enriching the soil to support their livelihood.

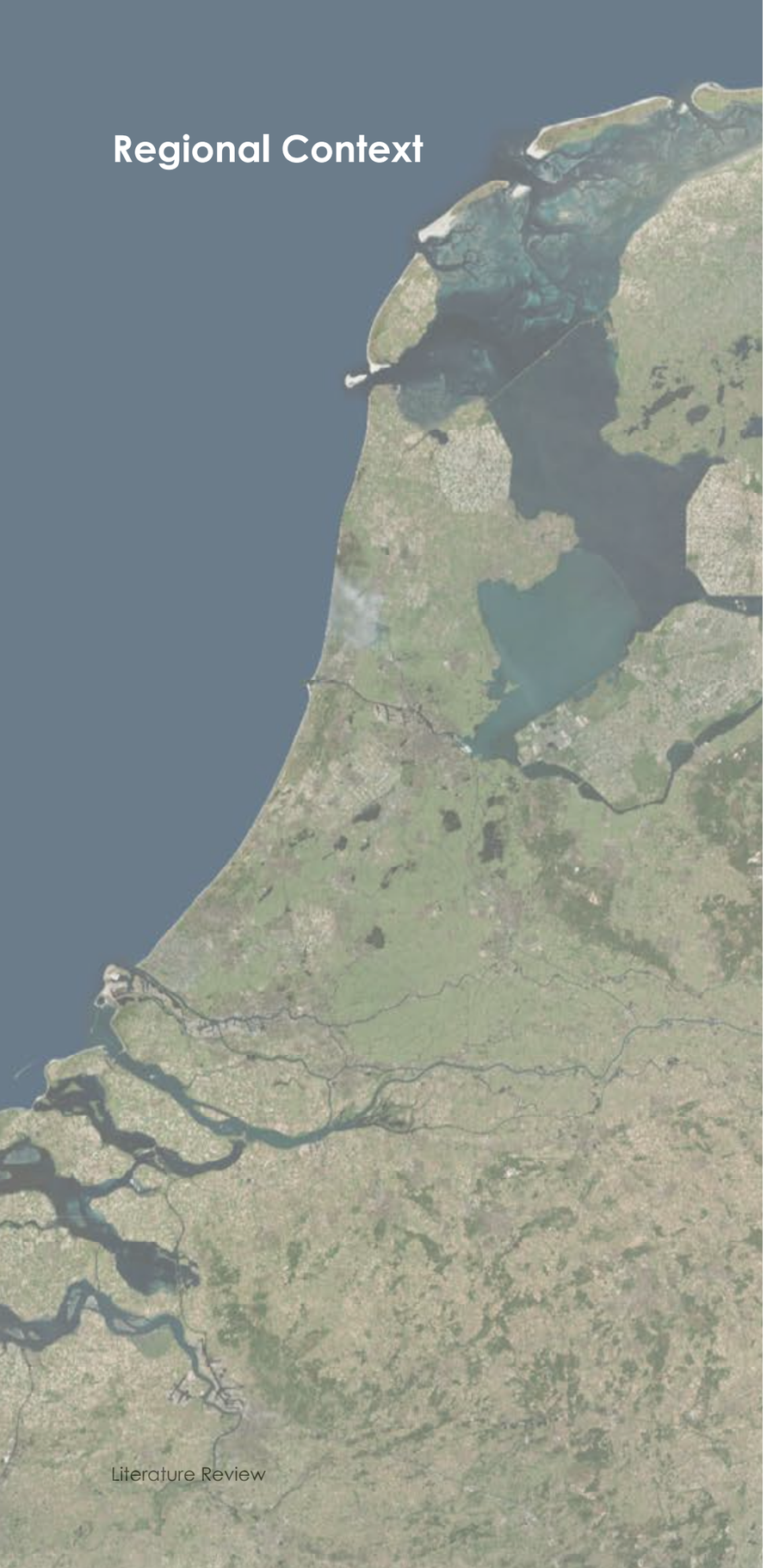
Historically two rivers (De Ley and Dongen) flow diagonally opposite to each other and narrow their paths south of Tilburg. Along with the National Park site toward the North of Tilburg they capture a triangular zone which urbanized over time to form Tilburg.

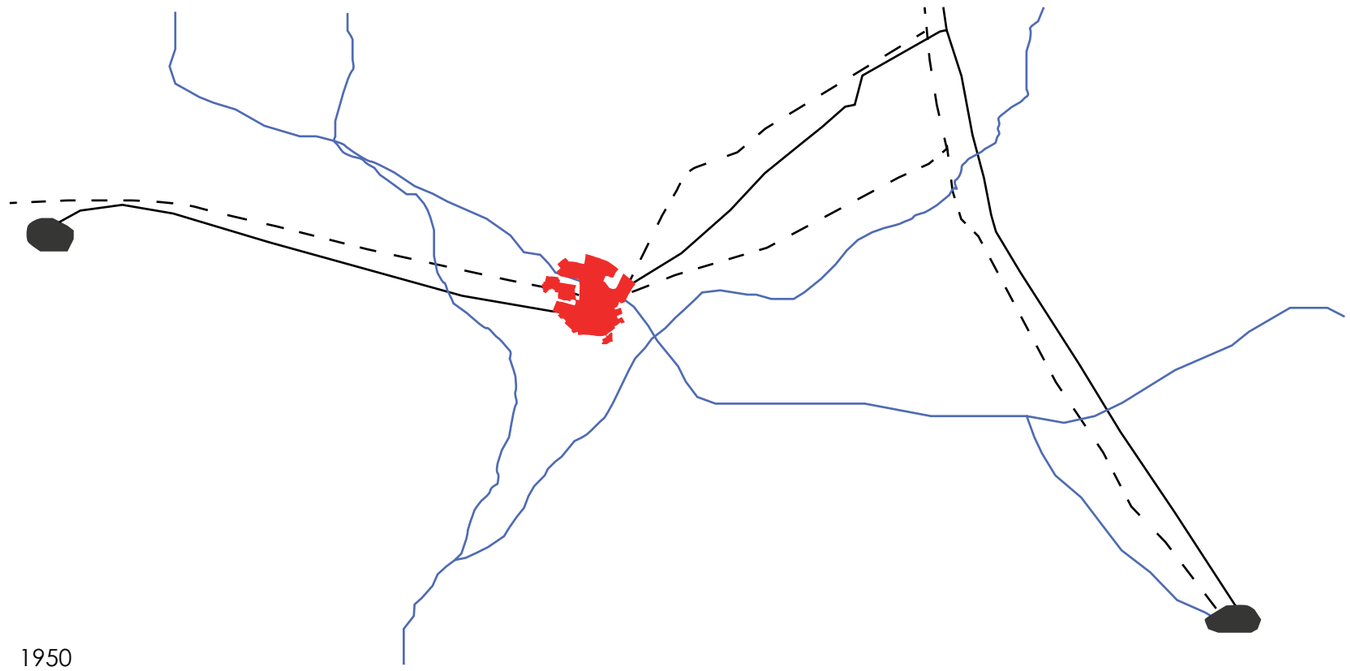
Toward the East another culturally significant area and Natura 2000 sites (protected ecological landscape) form a natural barrier for city growth. Thus the tendency to expand in the western direction strengthened.

Cultural and economic events in history have had a significant impact on the shaping of the urban landscape of Tilburg. In one sense, Tilburg can be considered to be a man-made city restricted in growth by the surrounding context of landscape.

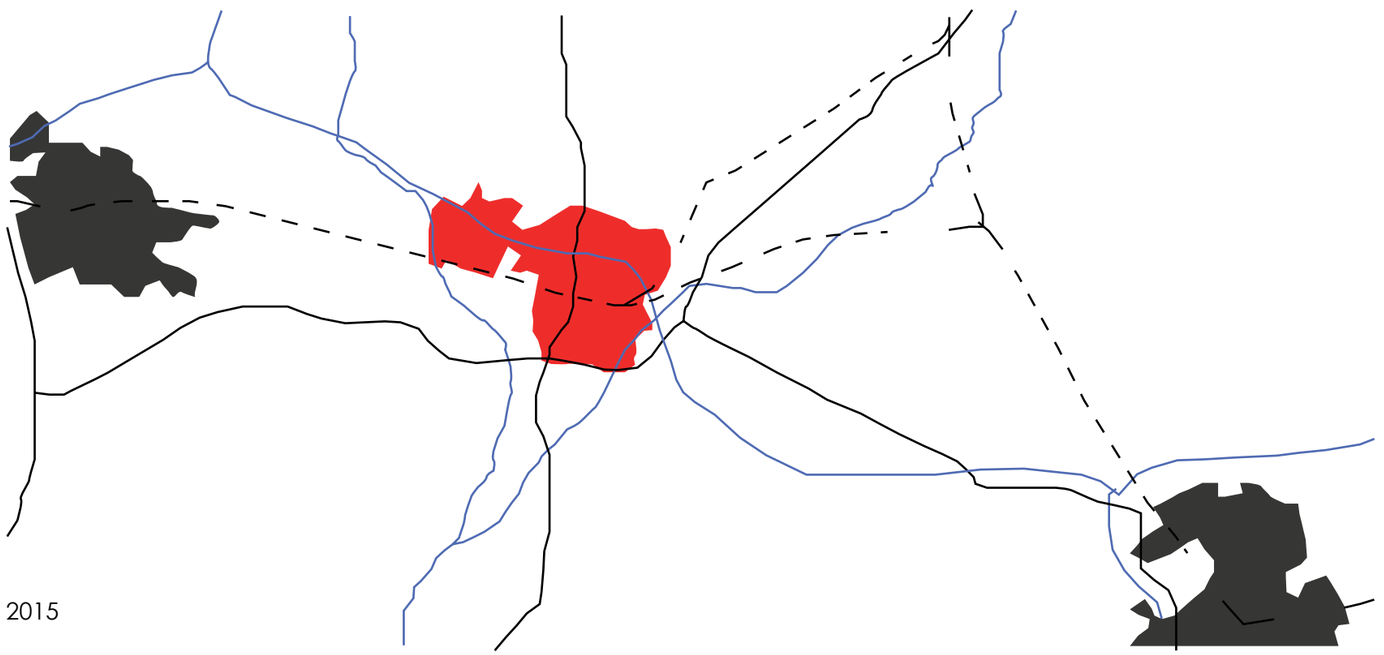
Currently, Tilburg is the second largest city in the province of Noord Brabant and the sixth largest city in the Netherlands. As Tilburg is centrally located among the Benelux countries (Netherlands, Belgium and Luxembourg), it enjoys the advantage of being well connected to neighboring cities and serves as a logistics hub in the region.

Regional Context





1950



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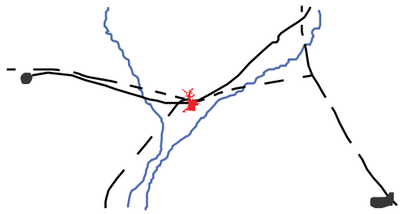

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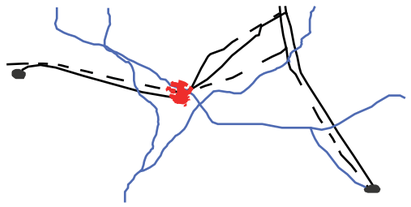

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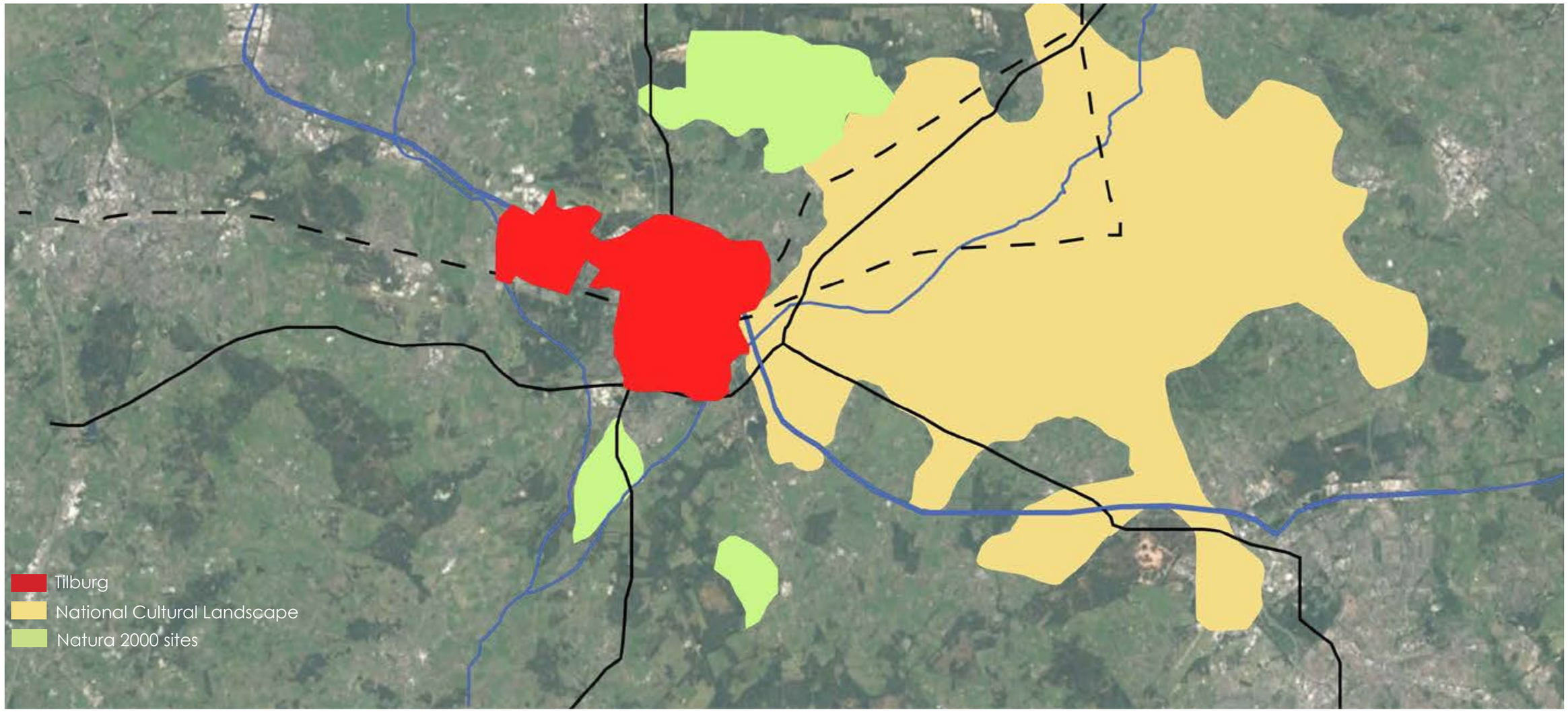


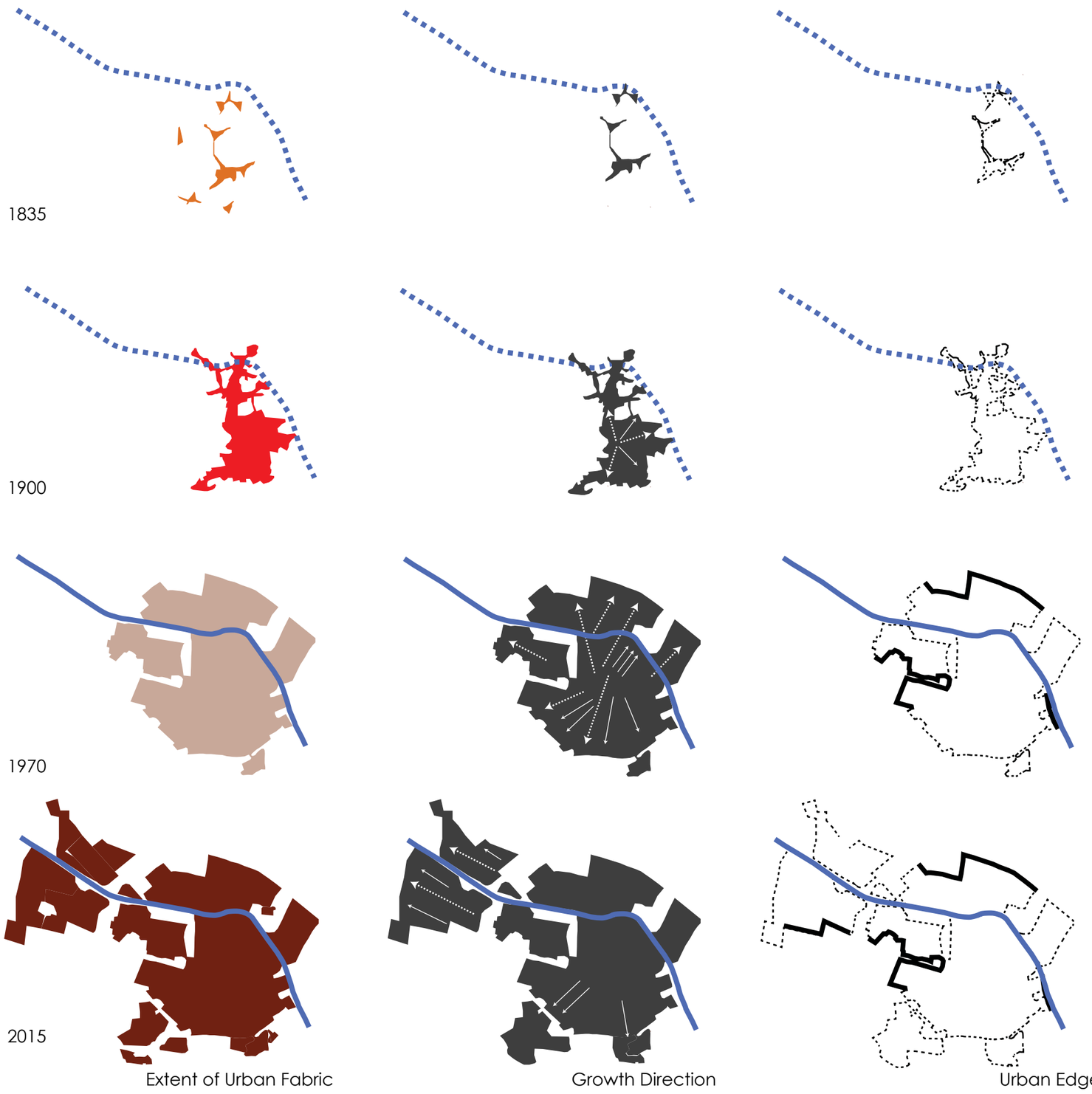
Urban Edge

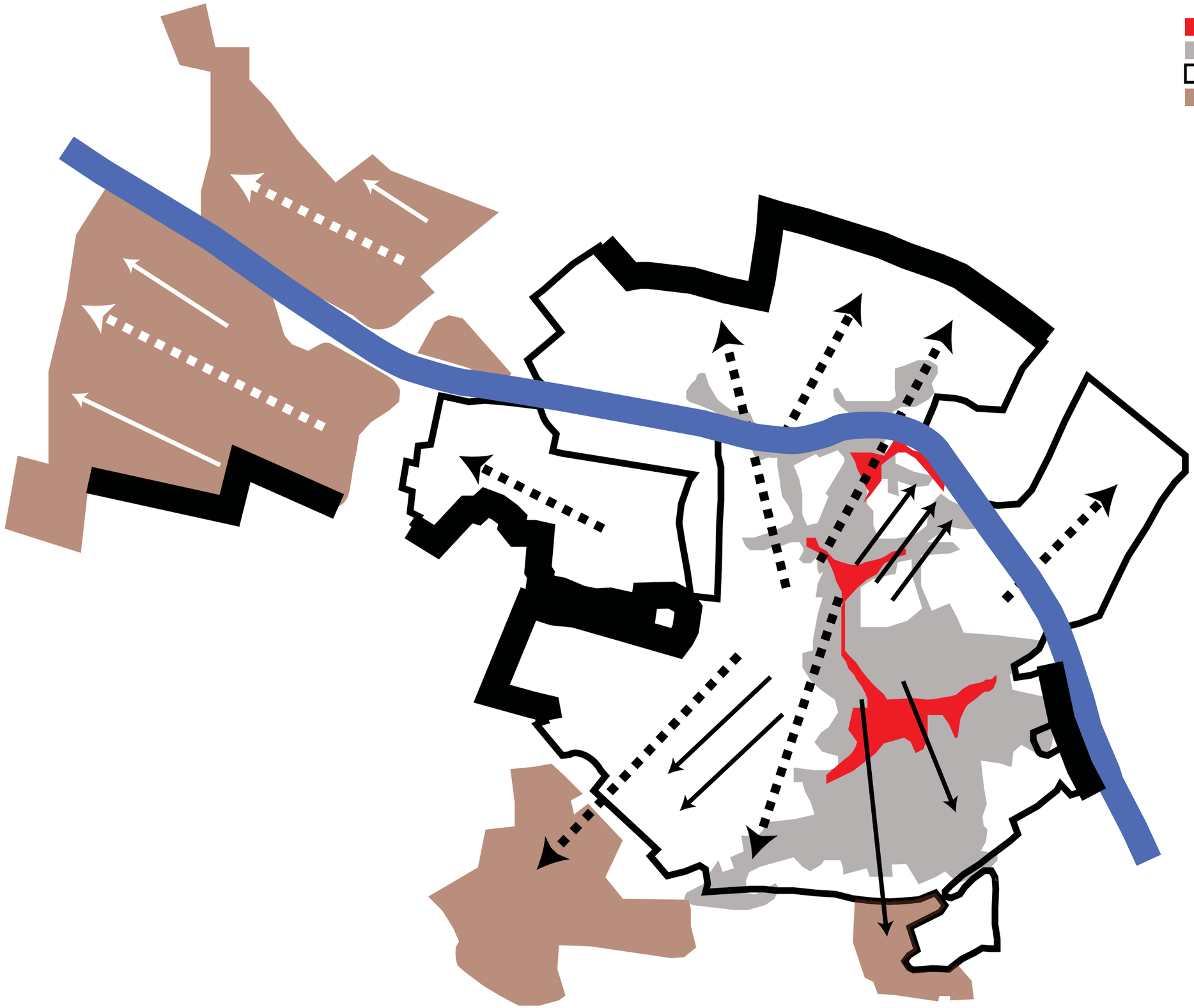
It is vital to understand the pattern and intensity of growth in Tilburg before analyzing patterns of urban form. To comprehend this, the urban edge of Tilburg from three time periods in the 19th century has been compared with the current condition.

Tilburg expanded relatively slowly until the early 20th century. After the introduction of a better infrastructure system and the predominance of the woolen industry in Tilburg, the city began to grow exponentially. The growth direction of Tilburg is restricted by the rivers surrounding it along the eastern and western side. The city grew outward in all directions from the historic city center until the middle of the 20th century. Between 1950 and 1970 the city expanded almost double in size dominantly in the north-western direction overcoming the natural water and landscape boundaries. After the 1970's the city has marginally expanded in the western and south-western directions.

Another observation that emerges through this comparative analysis is the prevailing dominant urban edges of the city. The urban fabric has been unable to penetrate through the strong urban edge in the northern direction. Shorter spans are also prevalent in the eastern and south western direction.

The matrix of diagrams on the right hand side show the movement within the extension of the urban fabric by highlighting the growth direction and dominant urban edges within the city.




1835
1900
1970
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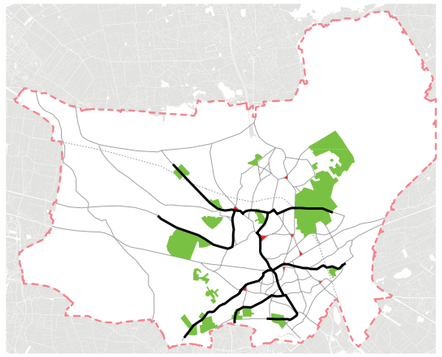
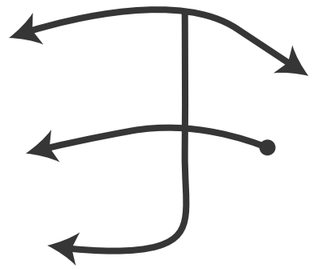
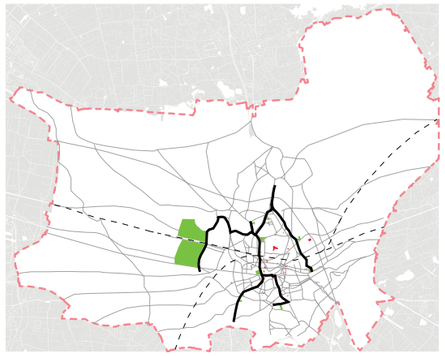
Landscape and Social Infrastructure Pattern

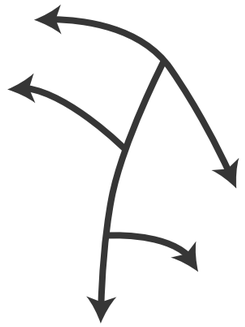
1835



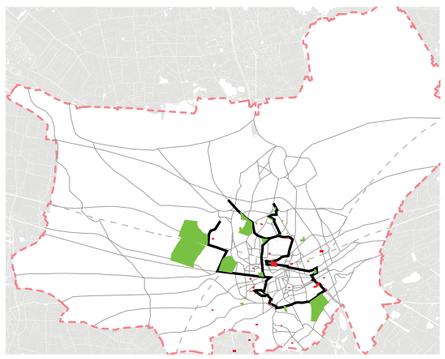


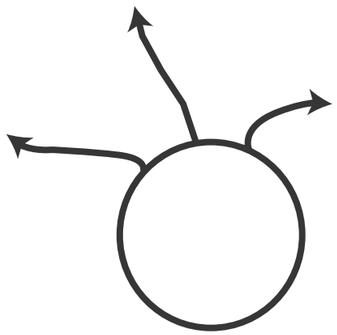
1921



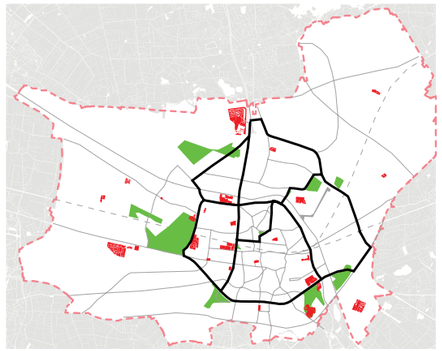


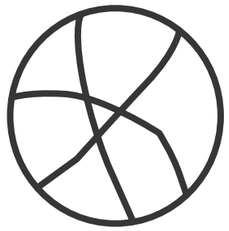
1945





2015





The map analysis of landscape and social infrastructure (public services such as schools, community centers, libraries, official government offices, post offices etc.) within Tilburg has been carried out over the years. The analysis aims to identify the dominant corridors that connect the elements of landscape and social infrastructure. This has then been synthesized into a series of drawings that show the hierarchy of corridors in present day.

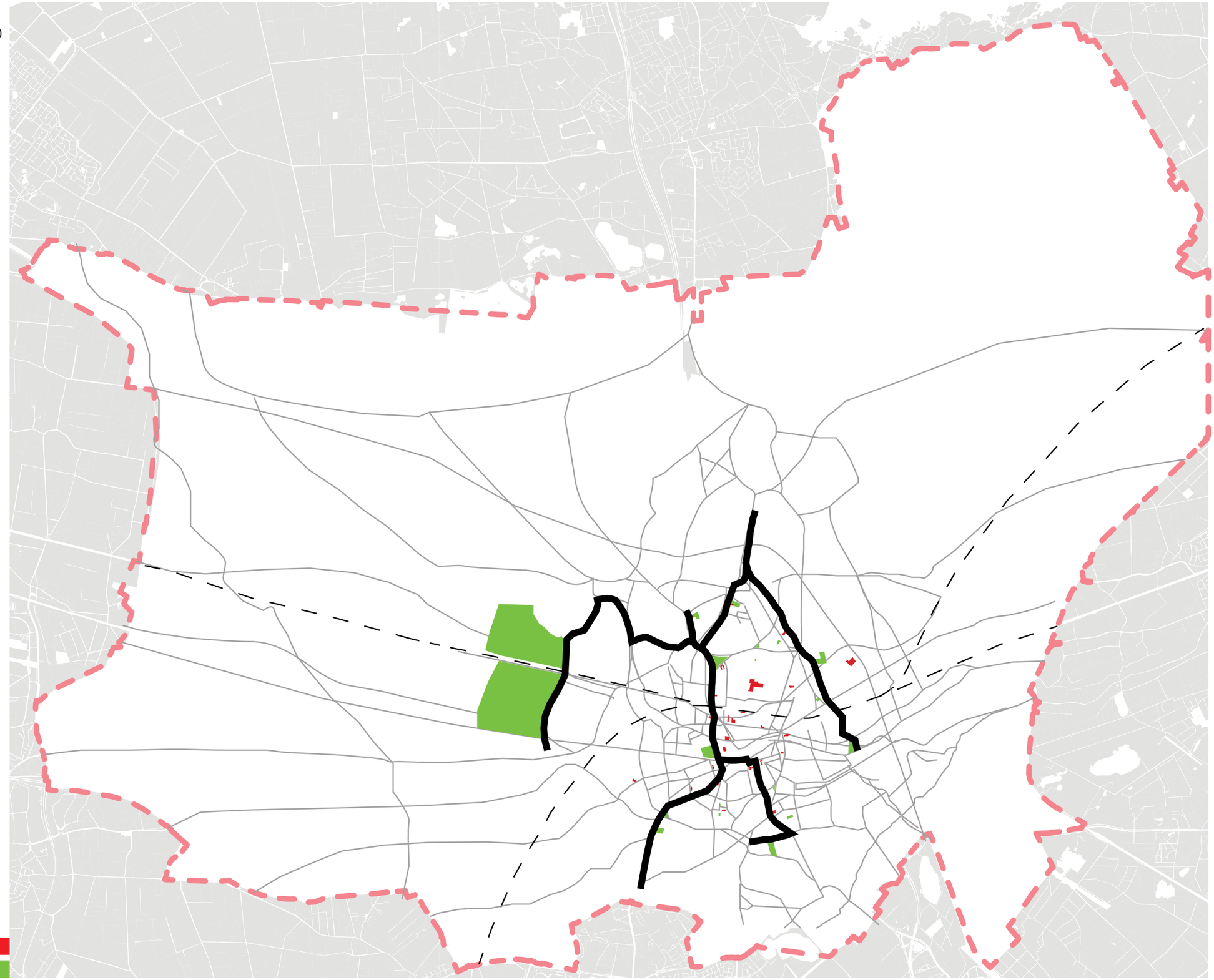
Social infrastructure is created with the intention of providing public services and propagating social interaction amongst people and between people and the city. This is an important layer that is emphasized while designing the city and assigning land use. Integrating public spaces and services among residential neighborhoods serving the population is synonymous with neighborhood design unit design almost everywhere. The layer of landscape or ‘green areas’ is analyzed within the same lens as it functions in a similar manner within the urban form.

Figure on the right shows the heirarchy of corridors connectd through urban form of Tilburg.

1835
Scale 1:50,000

Social Infrastructure
Landscape

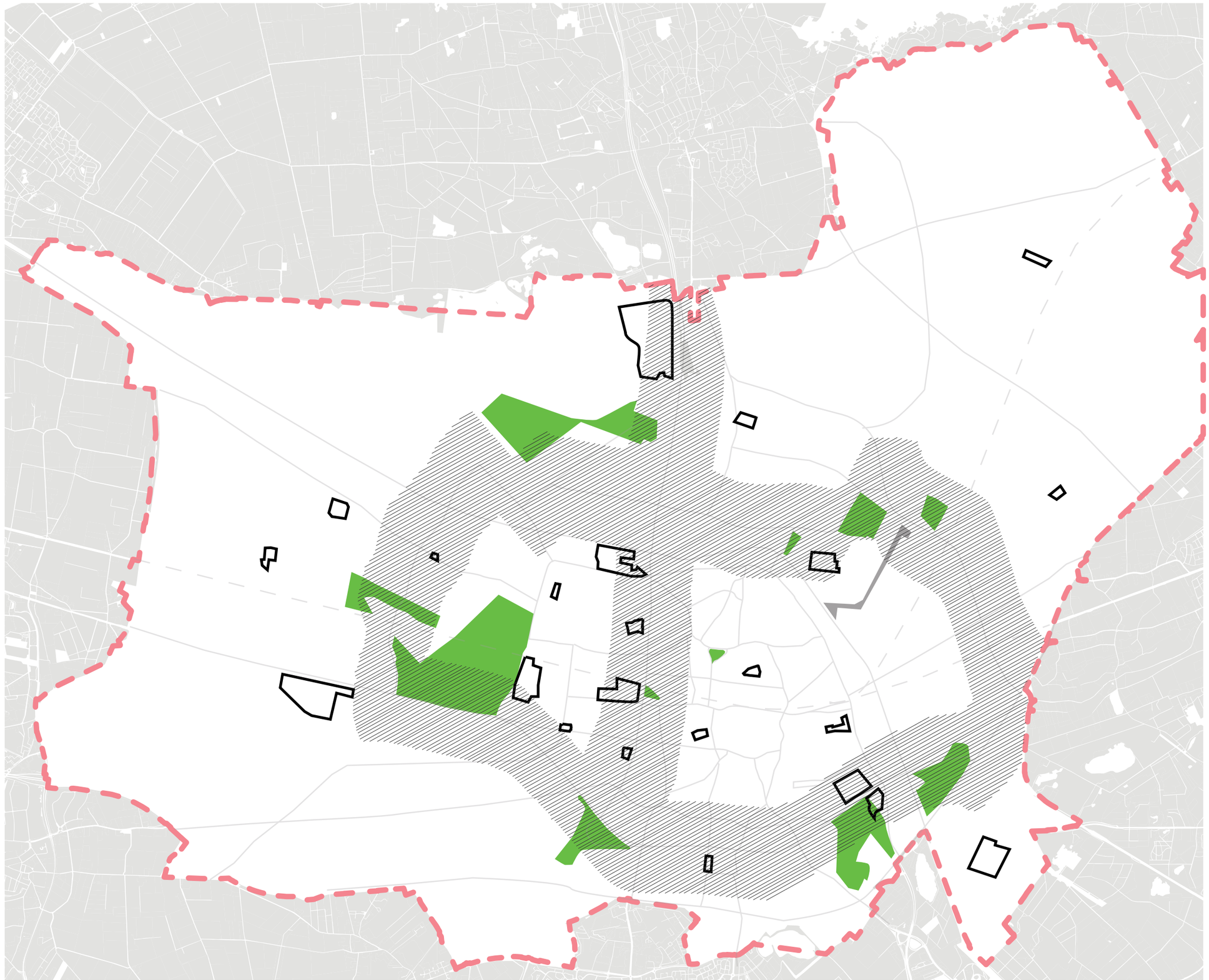
1921
Scale 1:50,000



Social Infrastructure
Landscape

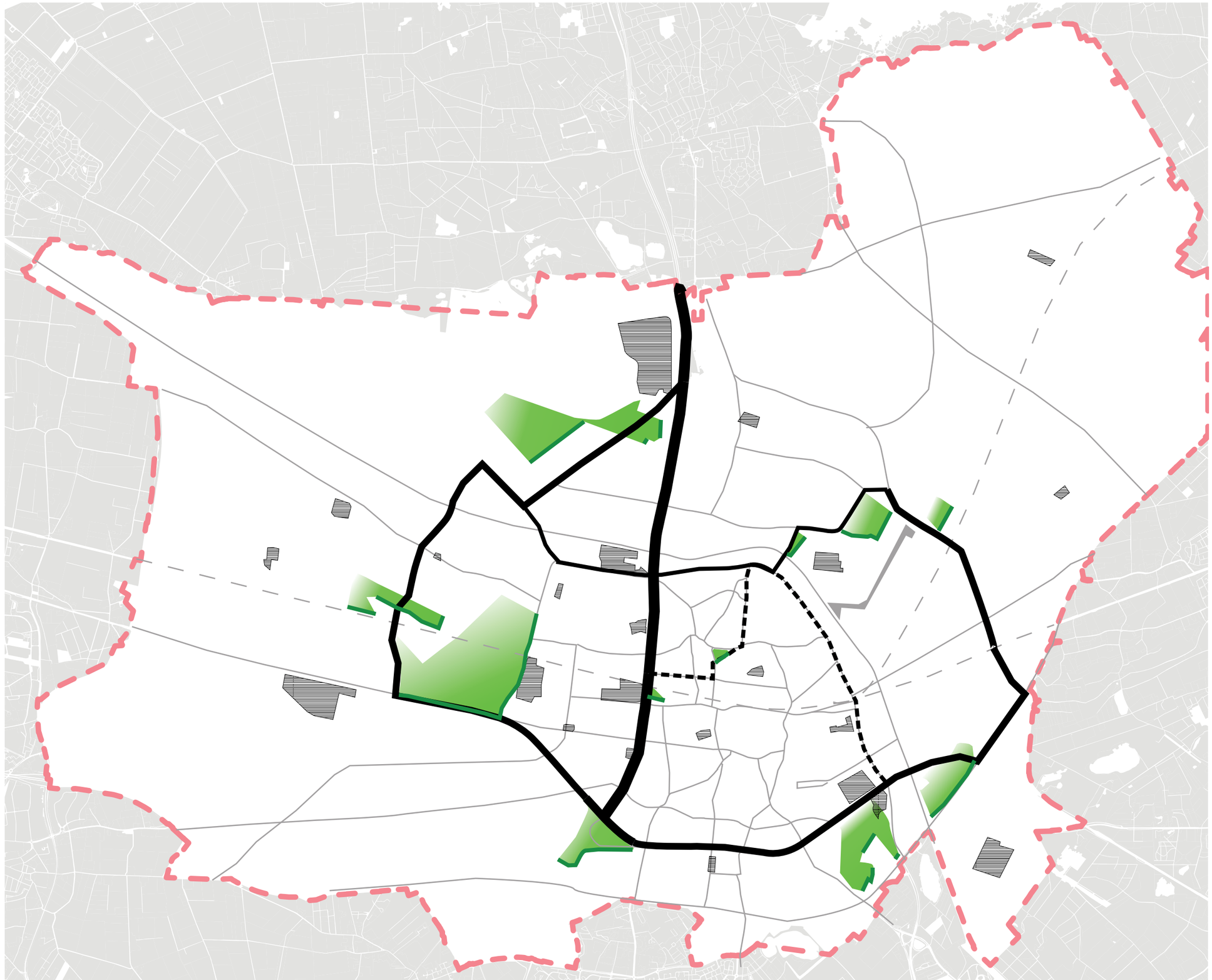
Corridor structure connecting landscape and social infrastructure

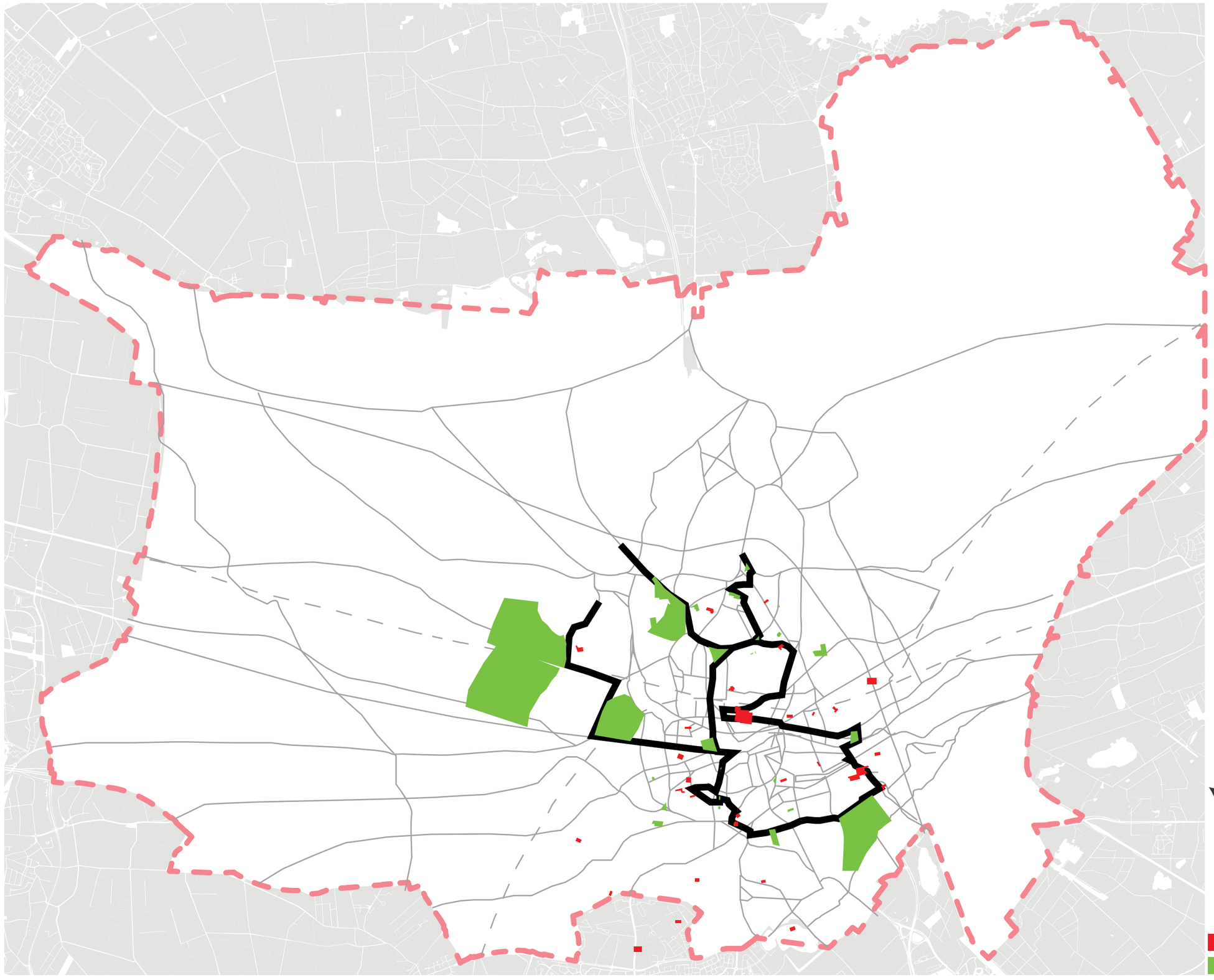
Scale 1:50,000



Heirarchy of road connection

Scale 1:50,000

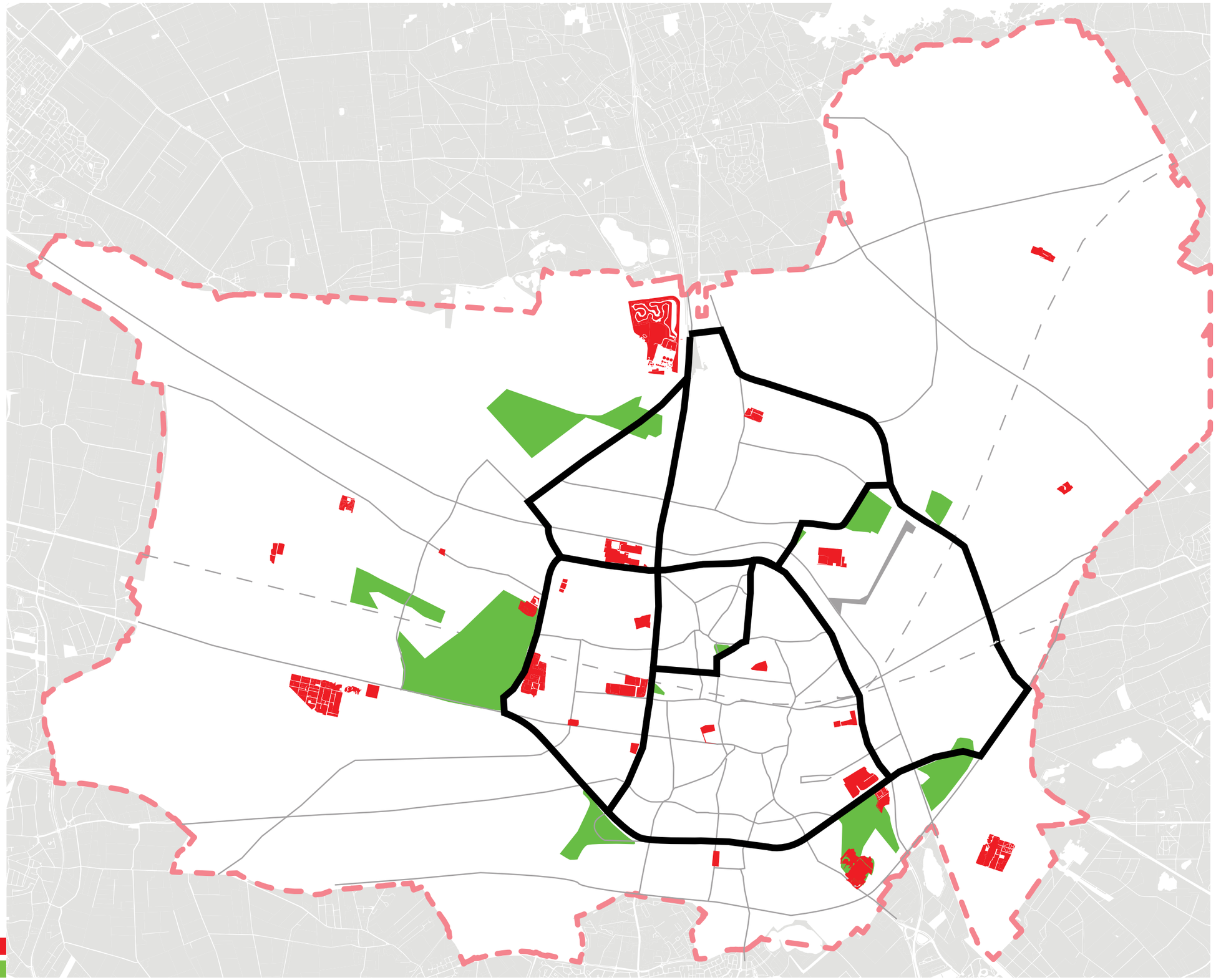




1945
Scale 1:50,000

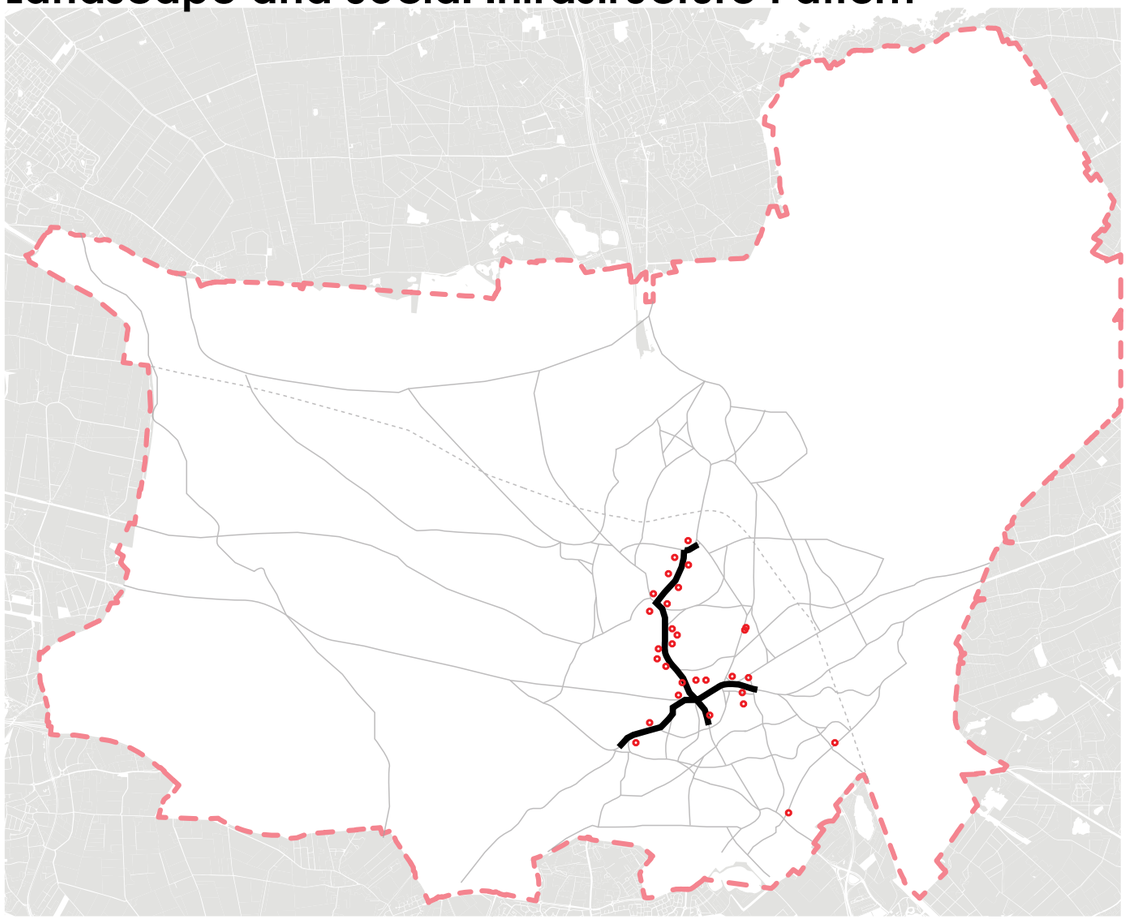
Social Infrastructure
Landscape

2015
Scale 1:50,000



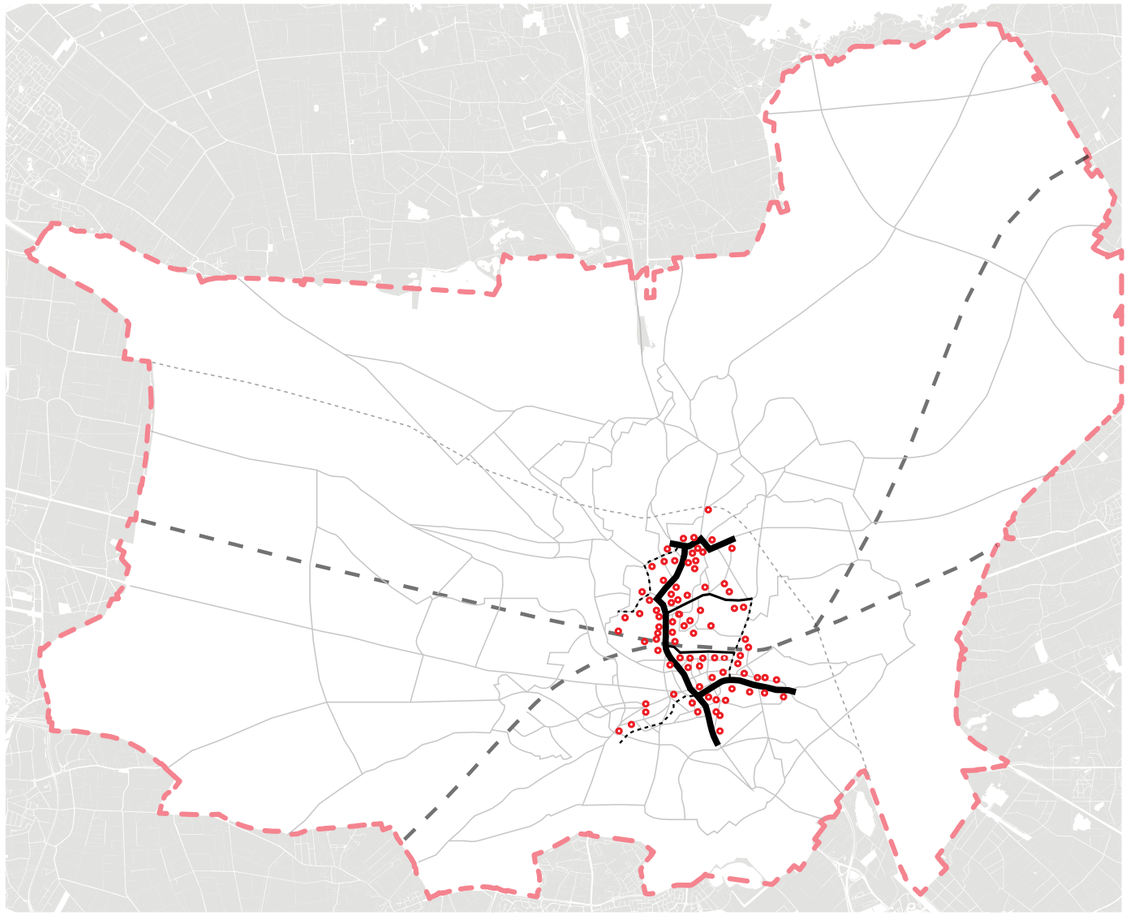
Social Infrastructure
Landscape

Landscape and Social Infrastructure Pattern



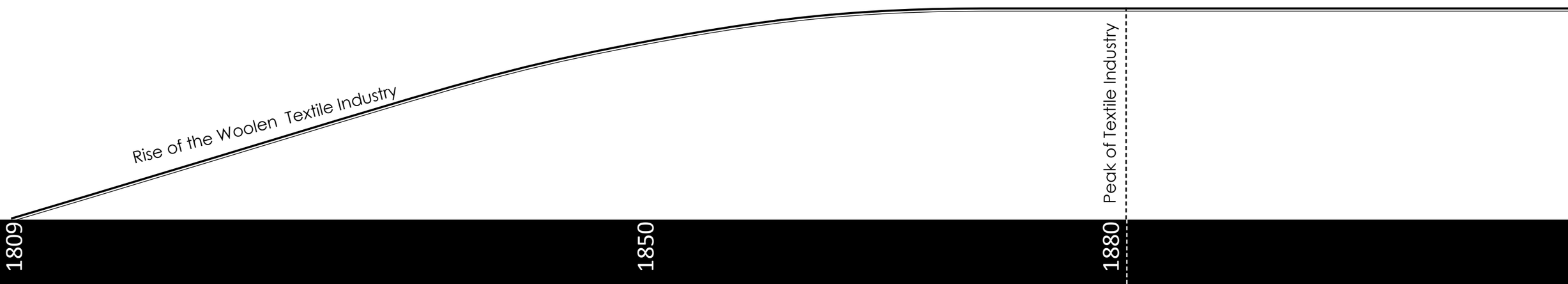
Growth of Woolen Industry

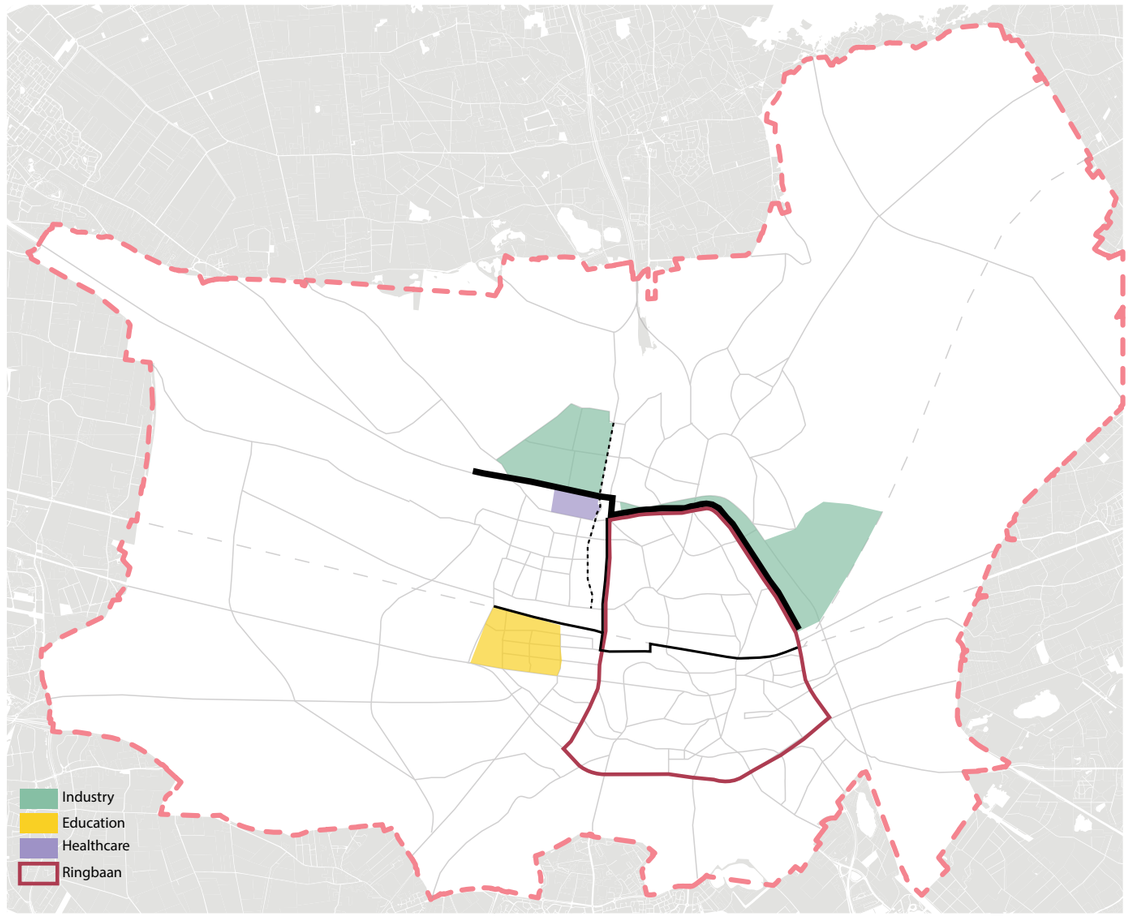
1835, Location of Woolen Industries



Wool Capital of the Netherlands

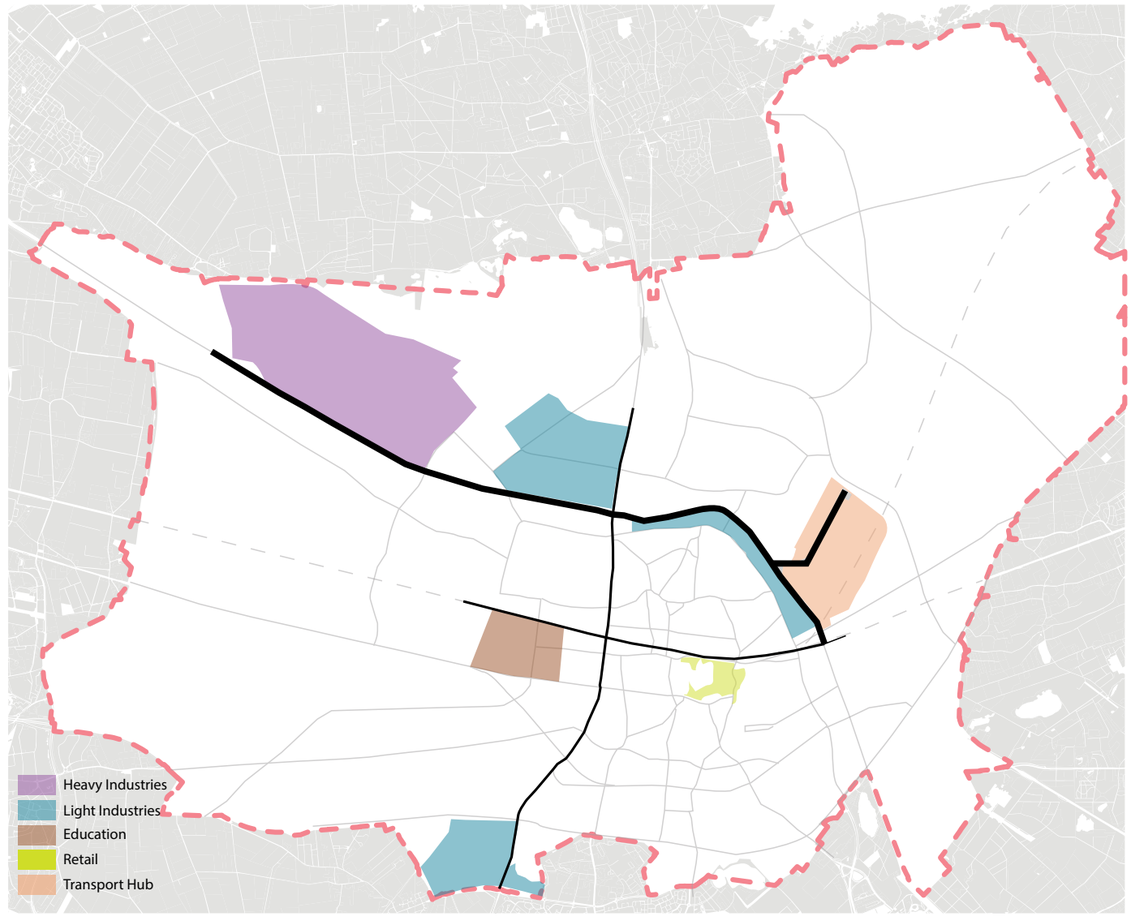
1880, Location of Woolen Industries





Transition Phase

1970, Location of IndustryTypes



'Tilburg Modern Industrial City'

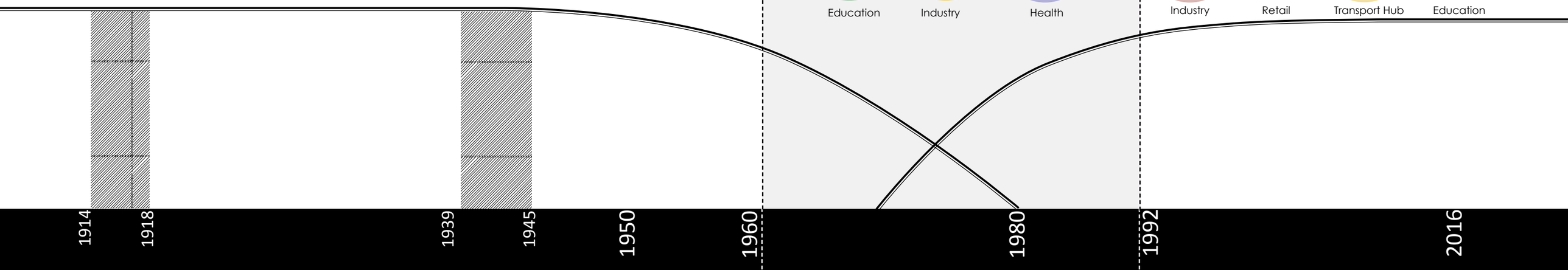
2015, Location of IndustryTypes

Tilburg as an 'Urban Node'

Adapted from Regional Strategic Plan

'Tilburg Modern Industrial City'

To combat unemployment (19% in 1992)
and promote economic development

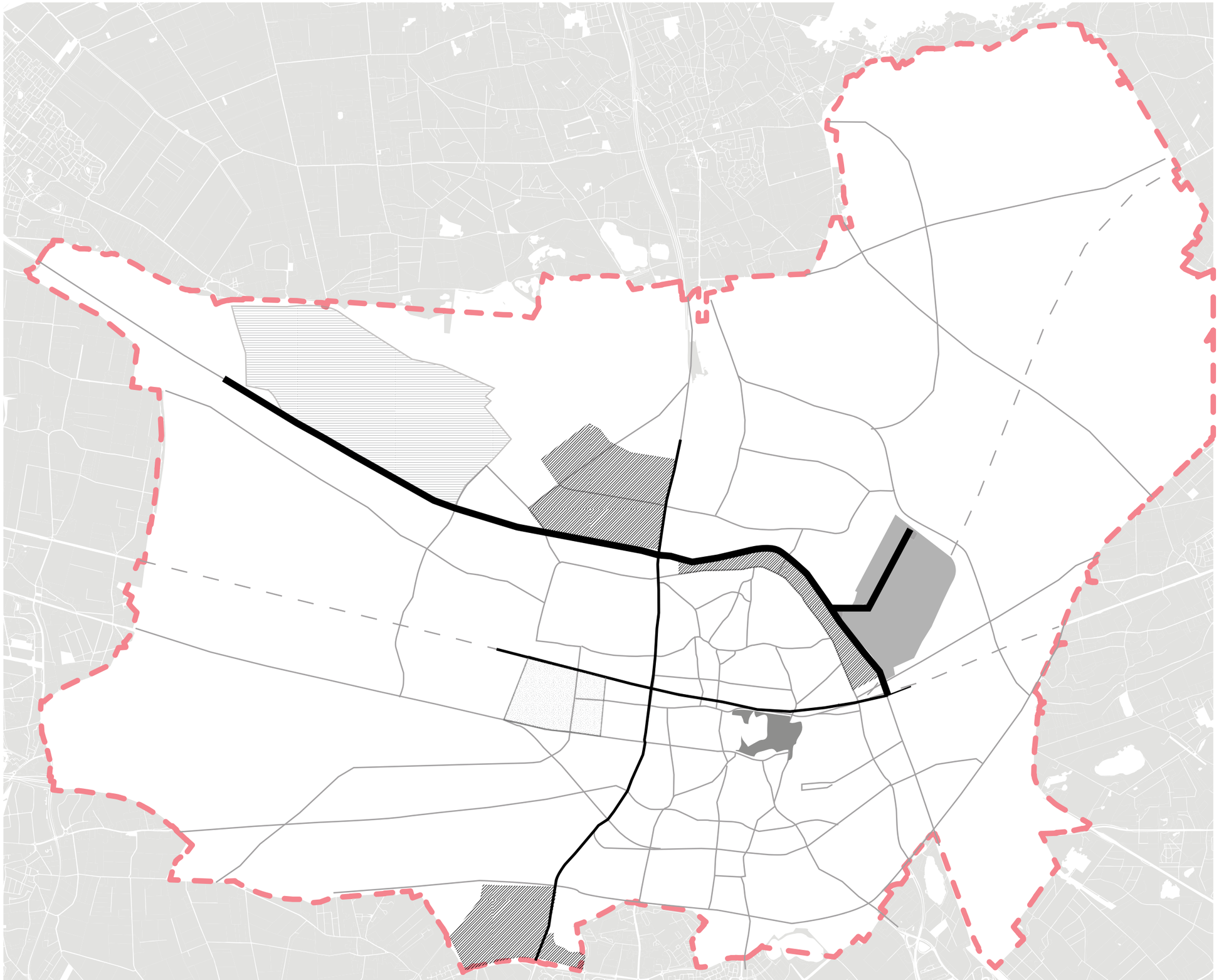


Historically, smaller settlements of villages were spread across the sand bed of Tilburg. The village centers were interconnected through a web-like network through the cattle fields. Over time, the woolen industry gained momentum in Tilburg. Leading the woolen textile industry in the country, Tilburg was nicknamed the 'Wool Capital of the Netherlands'. The people of Tilburg progressed even further by deciding to weave the wool from their cattle rather sell the raw product. The thriving industry was speculated to be at its peak in 1881 with approximately 145 wool mills. Even WWI and WWII did not slow down the woolen industry. However, with the industrial revolution, the prosperous woolen industry of Tilburg started on a steep decline in the 1960's. By the 1980's almost all of the woolen mills had closed down and new industries began to establish themselves. Varying industrial types grew and the woolen industry became limited to small scale home industries.

In the transition phase (1960's – 1992), representative from different economic sectors tried to influence the new image of the city. Tilburg had the options to recognized as an educational hub, transportation node or become a health city. In 1960, Cees Becht was the mayor of Tilburg. He attempted to implement an 8 year plan that projected Tilburg as an 'Education City'. However this notion failed to gain momentum and in 1988 Tilburg was recognized as an important 'Urban Node' in the regional context. Gerrit Brokx, who was the mayor at that time pushed the image of Tilburg in the strategic plan in national politics. The 'Fourth National Policy Document on Spatial Planning' released by the Dutch government aimed to create different 'nodes' in the Netherlands, each serving its own purpose. This would then create a diverse network of urban nodes within the country. In 1991, unemployment was at its highest in Tilburg at 19%. Therefore to combat this and drive economic growth forward the idea of 'Tilburg as a Modern Industrial City' was born.

Heirarchy of road connection in the context of industrial areas

Scale 1:50,000



City Structure

Peter Calthorpe in his book, Urbanism in the Age of Climate Change, has summarized the design principles of traditional and green urbanism into practical standards for development. He emphasizes the need of diverse 'place-types' that are a lexicon of diverse, mixed-use and communal places.

Spatially, there are five basic categories of such a place-based approach to community design: neighborhoods, centers, districts, preserves and corridors.

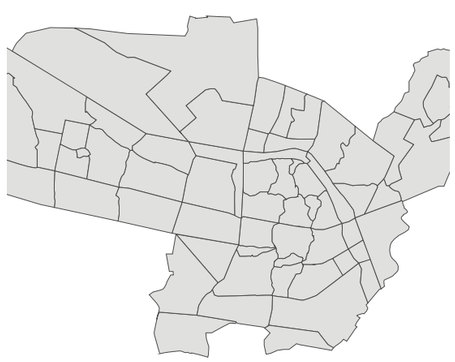
Neighborhoods are the basic building blocks of the community. Centers are the mixed-use destinations of the group of neighborhoods. Districts are special use areas typically dominated by a primary land-use such as a university or an airport. Preserves are the open space element in the region while corridors are the edges and connectors of the region's centers, neighborhoods and districts. 'Corridors are the skeletal structure of the regional form and its connections; they form the defining framework of its future', says Calthrope. Corridors can be of various types – waterways, highways, streets, ecological pathways, natural or man-made. They always constitute flow and can therefore direct the 'flow' of changes within the city.

The city structure of Tilburg has been analyzed using the same elements of design within the city form. The presence of neighborhoods, districts, centers, preserves and corridors have been summarized for each time period. The legibility of city structure in this manner leads to a comprehensive understanding of urban form and its relationship to the overall city structure.

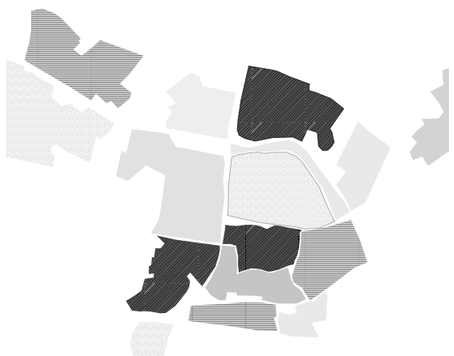
However it should be noted that the description of the individual elements described by Peter Calthorpe have a direct impact and application in American city planning. When migrated to the landscape of Netherlands in North Western Europe, the interpretation for districts differs. Peter Calthorpe describes it as special use areas dominated by a single land use. However, in the context of Tilburg this is not be applied in its explicit form. it has been interpreted as a group of neighborhoods whose boundary may be coincide with administrative boundaries of Geemente Tilburg.

Design Elements / 'Place Types' of City Form

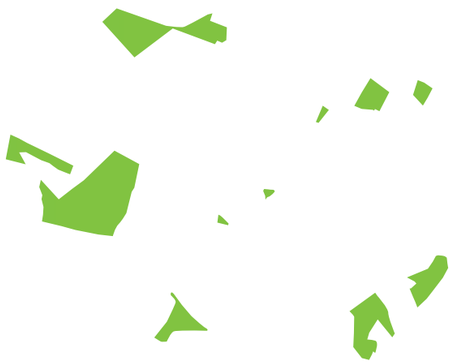
Peter Calthorpe, Urbanism in the Age of Climate Change



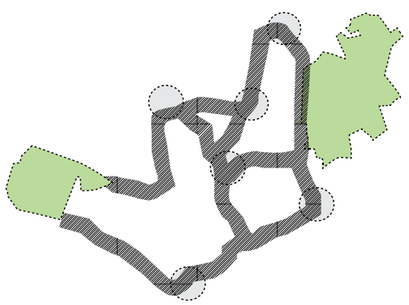
Neighborhood



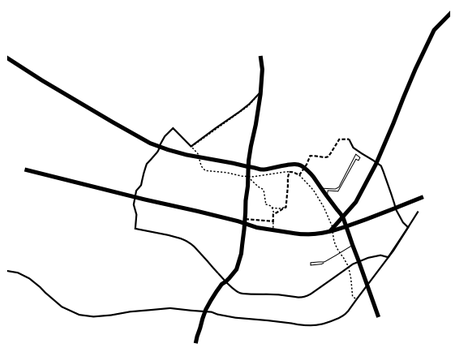
District



Preserves



Centers



Corridors

1835

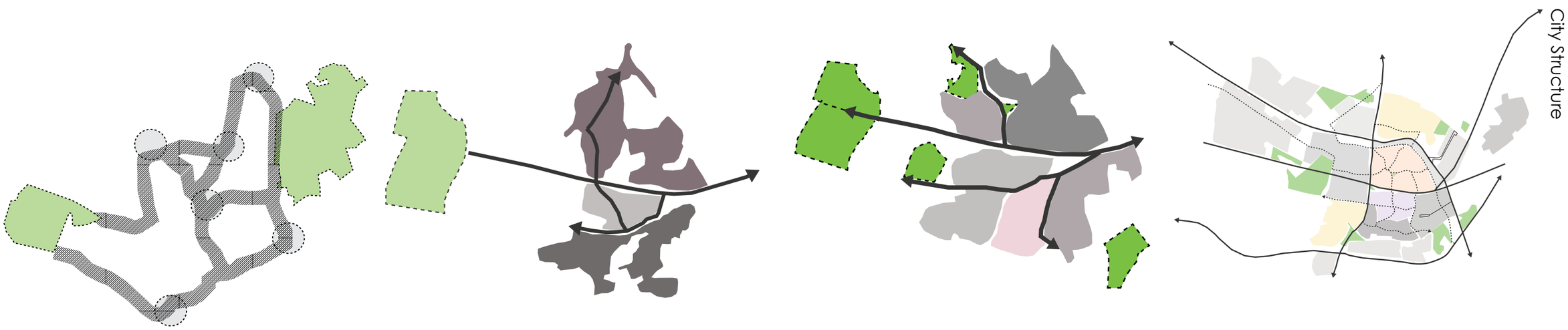
1921

1945

2015

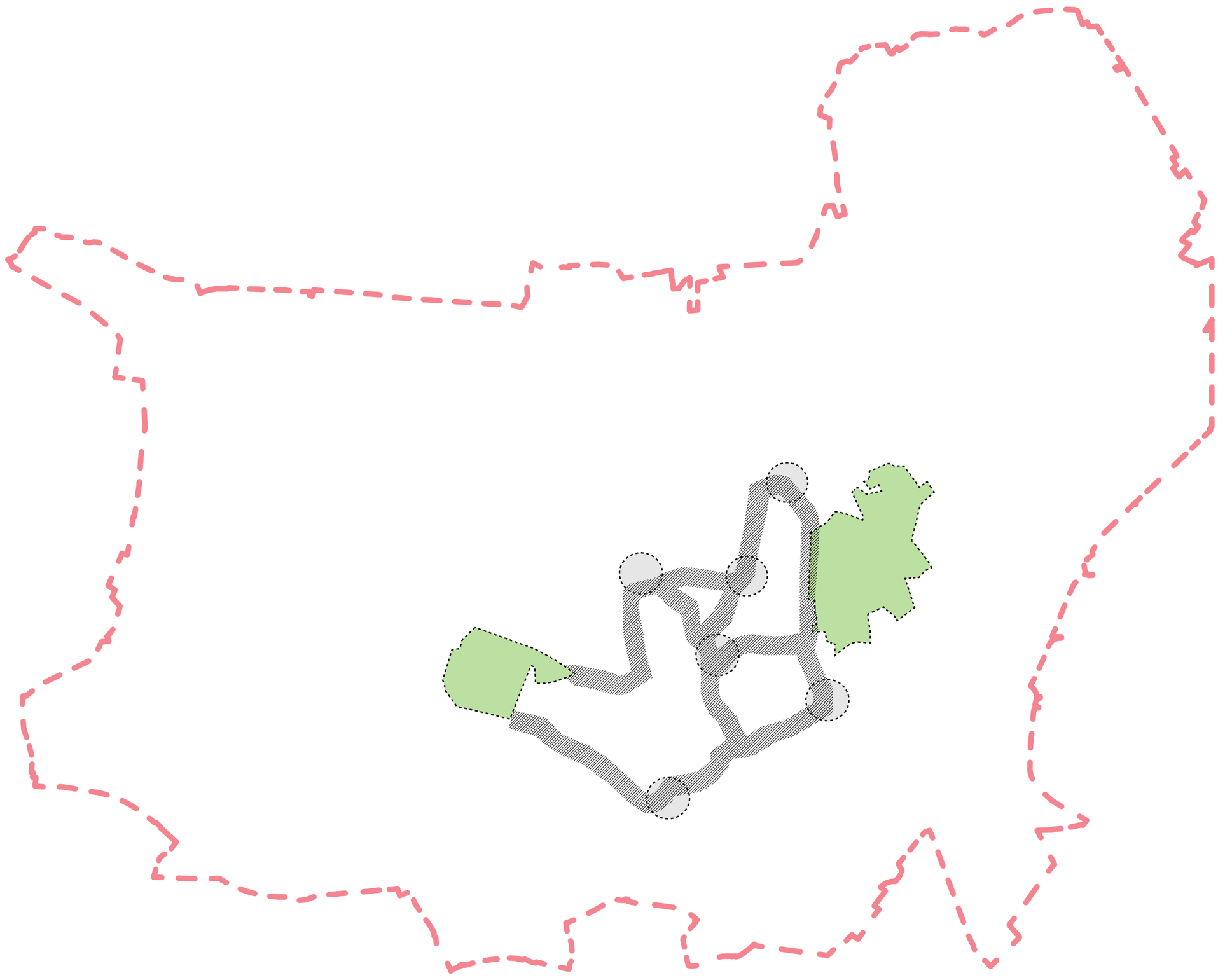
Urban Fabric and Connection

City Structure



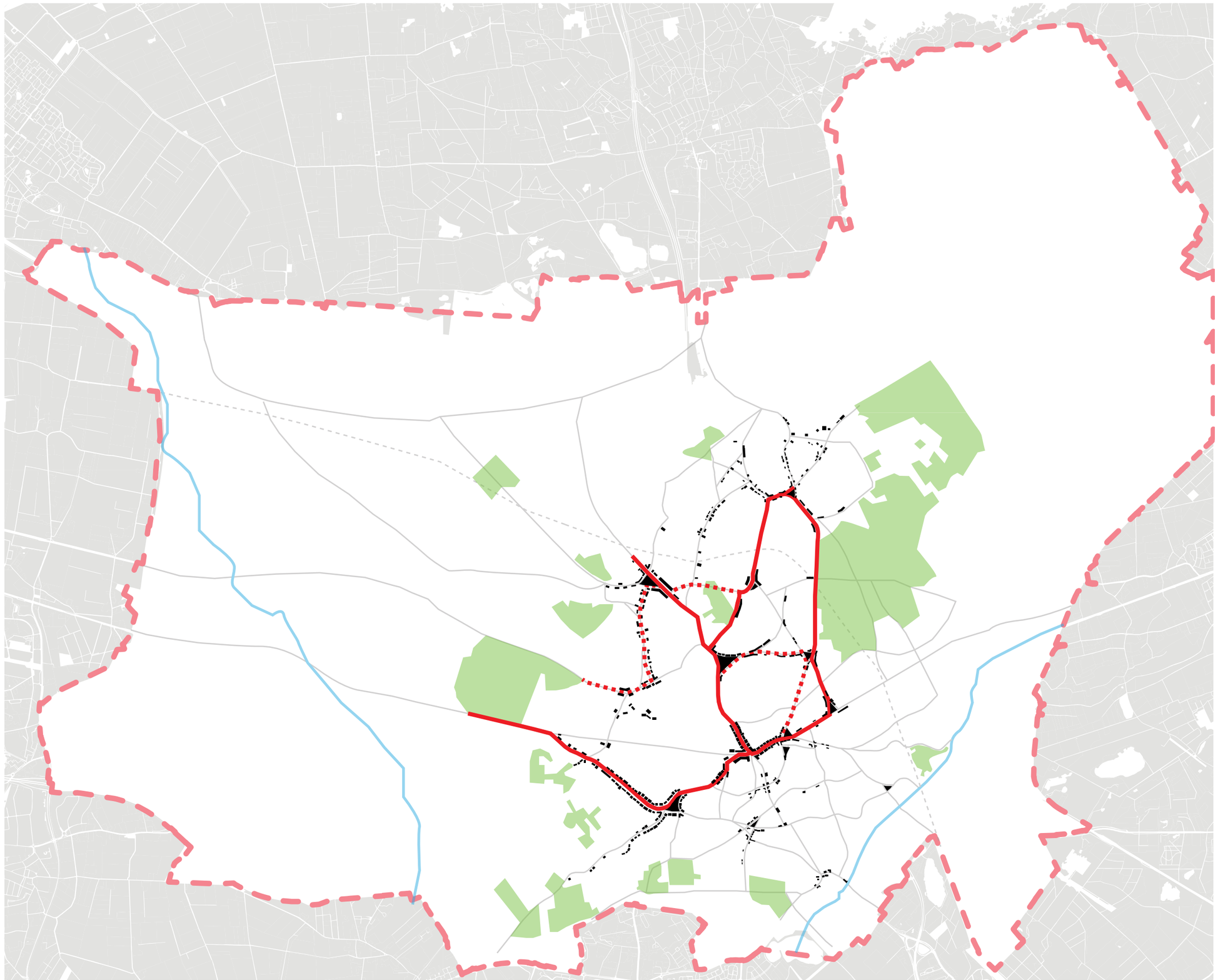
1835
City Structure

Scale 1:50,000



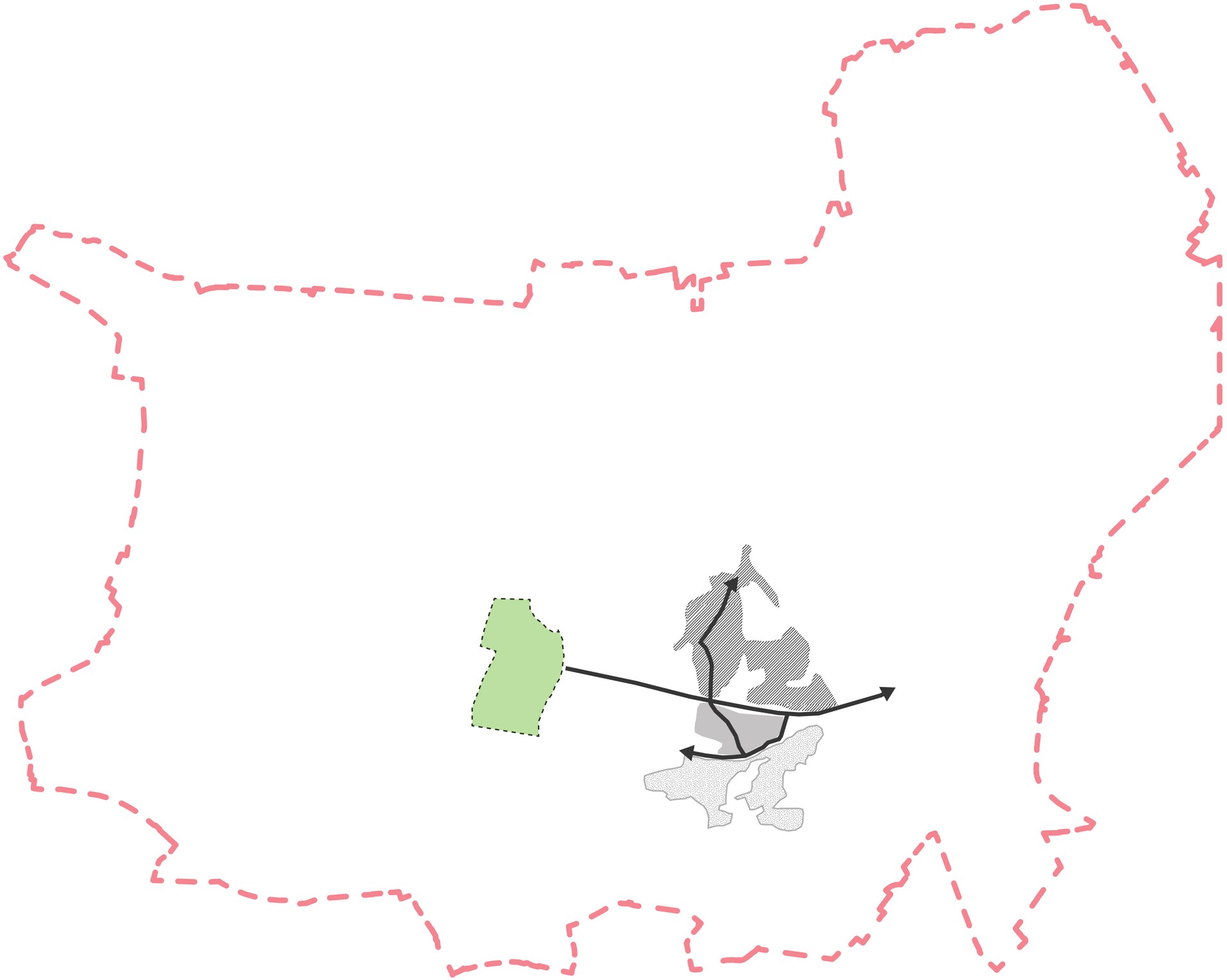
1835
Place types

Scale 1:50,000



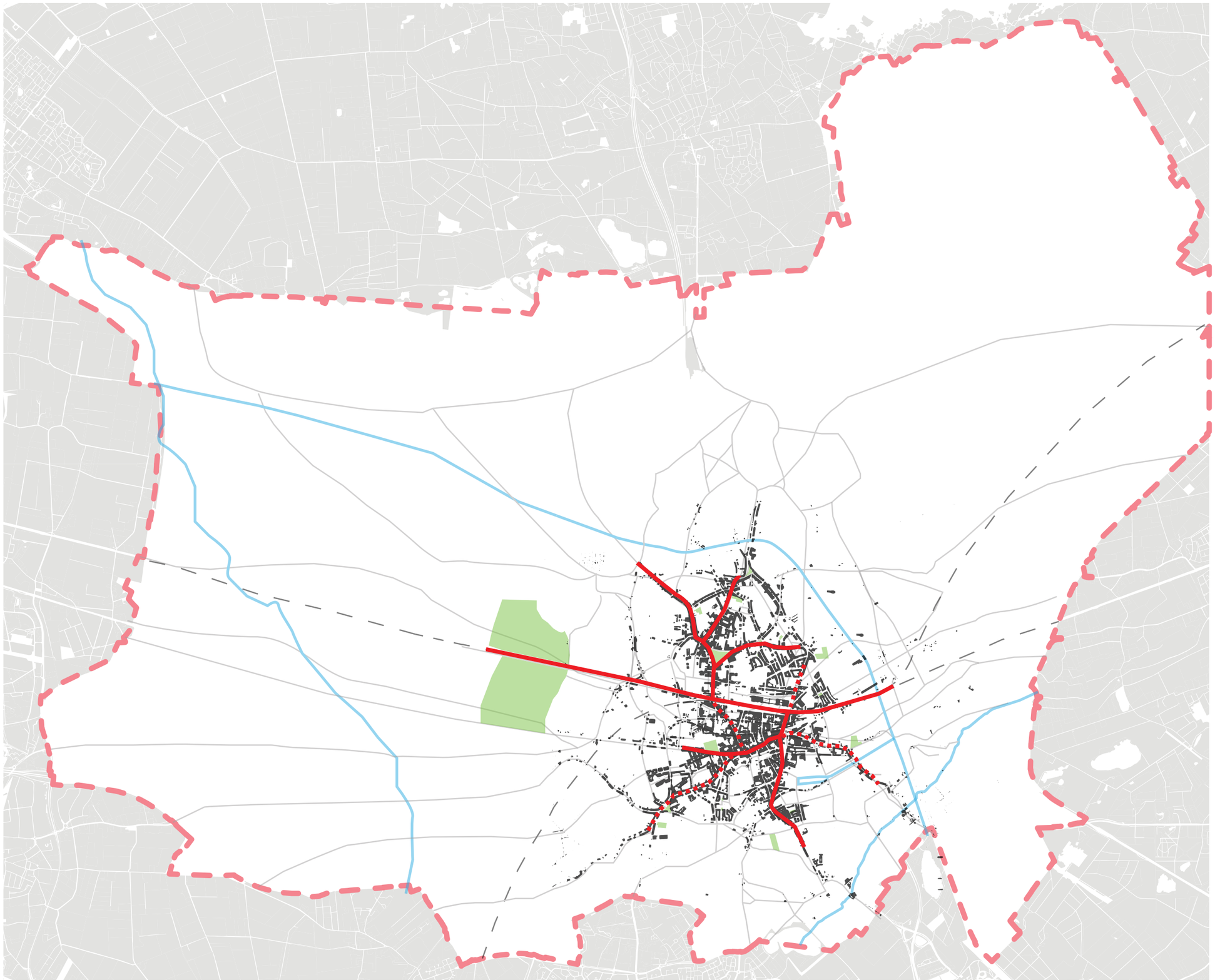
1921
City Structure

Scale 1:50,000



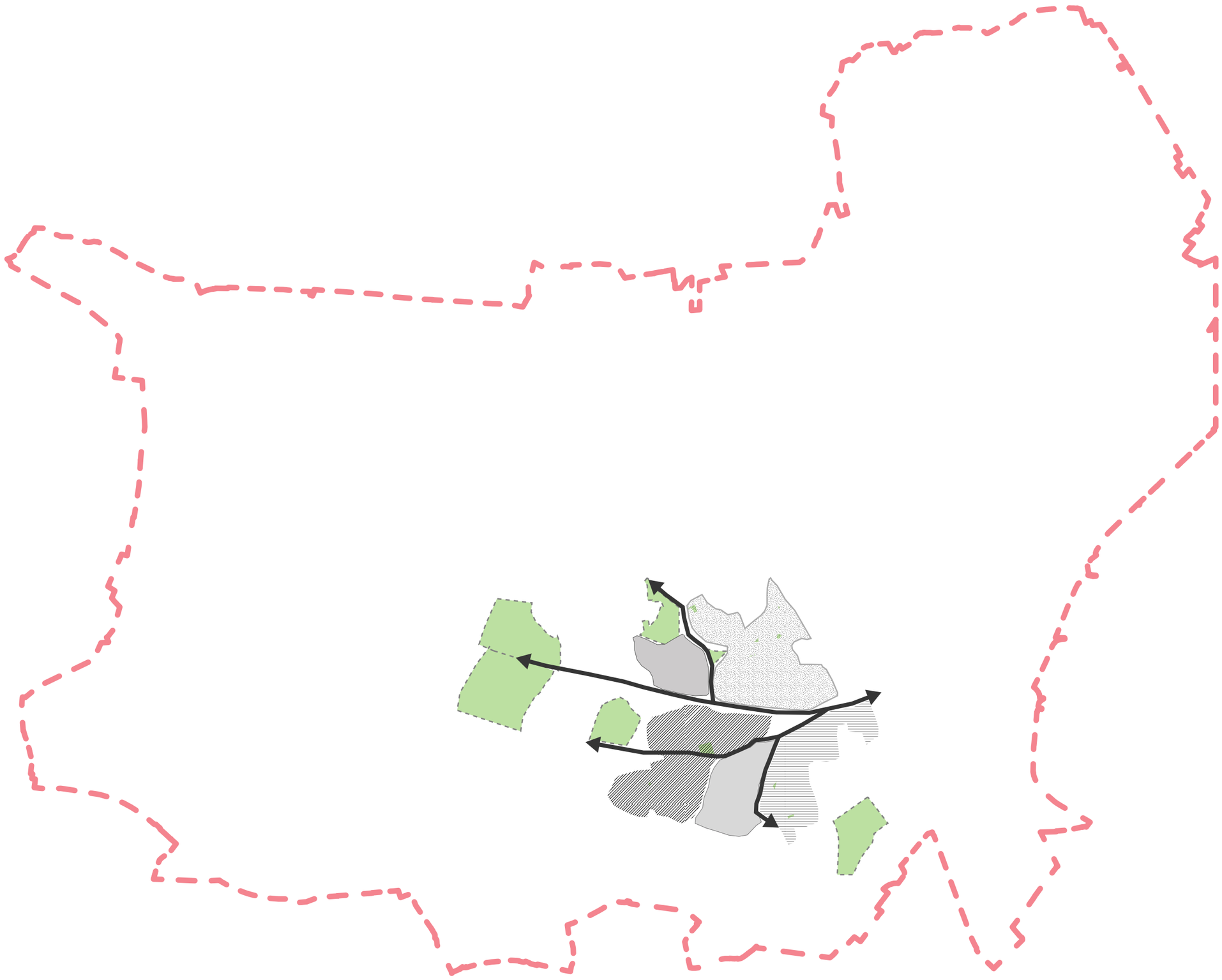
1921
Place types

Scale 1:50,000



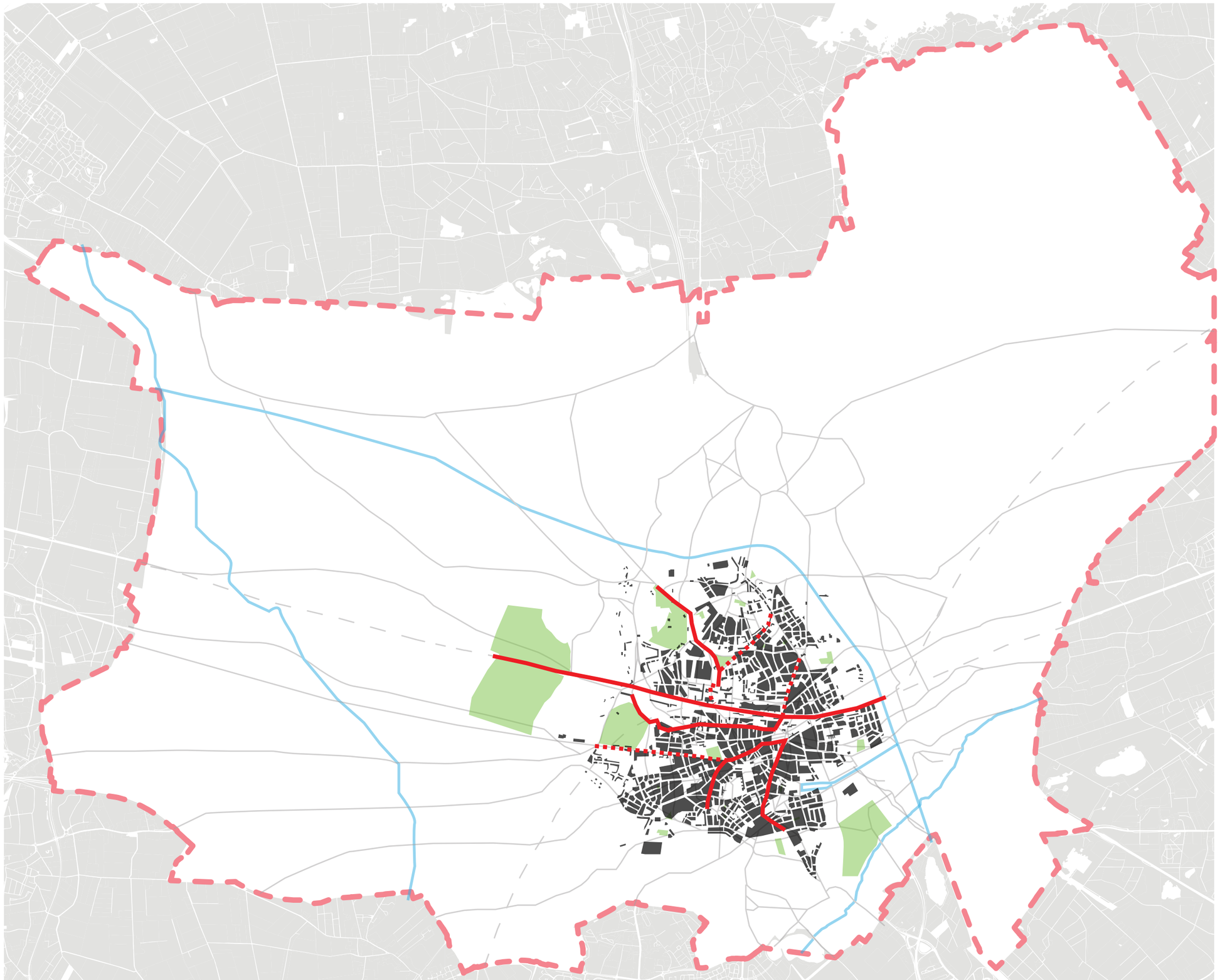
1945
City Structure

Scale 1:50,000



1945
Place types

Scale 1:50,000

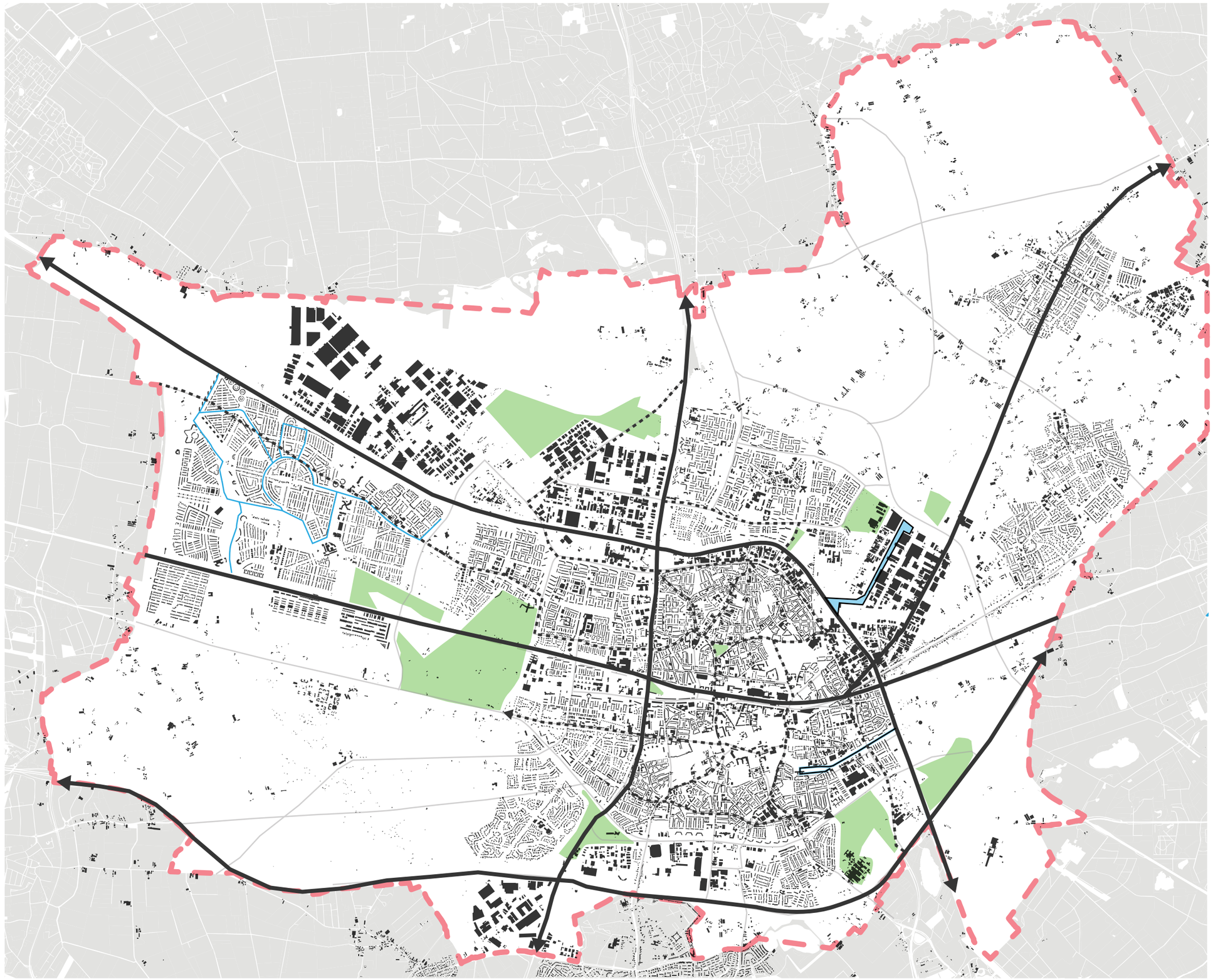


2015
City Structure

Scale 1:50,000

2015
Place types

Scale 1:50,000



Heirarchy of Corridors, Tilburg
Scale 1:50,000

1981 - 2016

Population rise and city expansion
'Tilburg Modern Industrial City'
Tilburg University advances

1921 - 1980

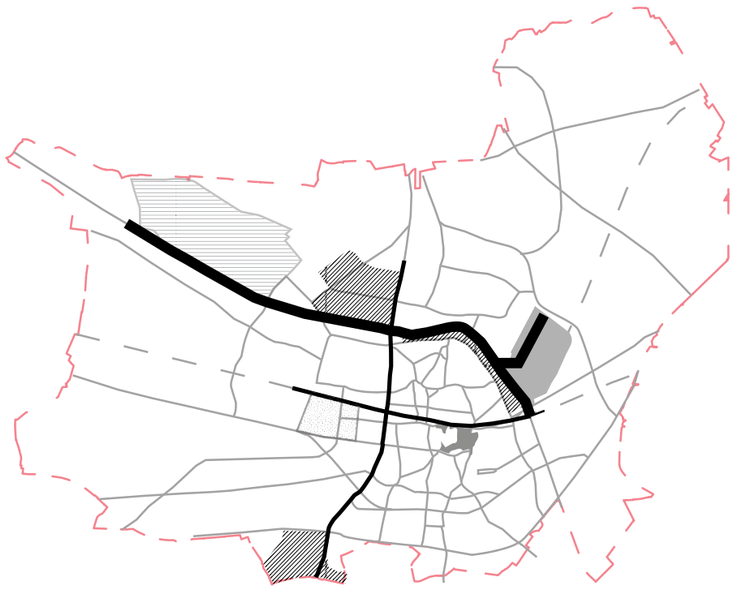
Industrial and Economic transition
Ringbaan
Canal through Tilburg

1809 - 1920

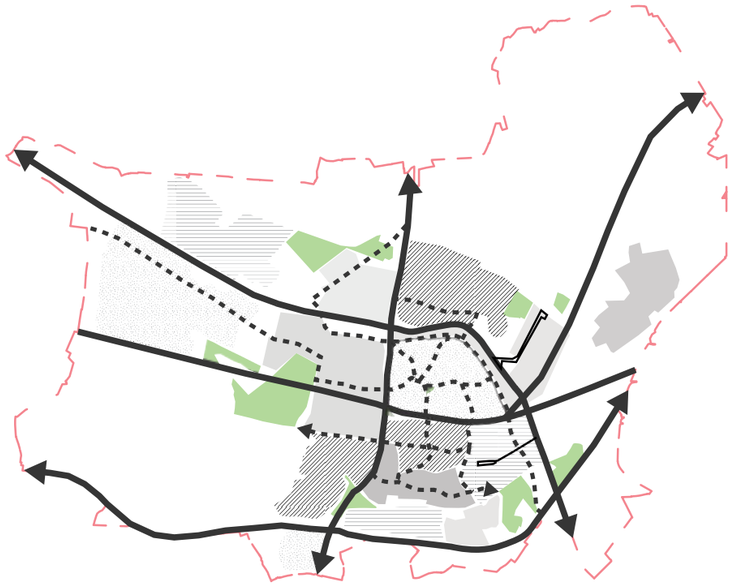
Rise of the woolen industry
Introduction of the railway

Scale 1:50,000

Social Infrastructure and Landscape Pattern



Economic Infrastructure



City Structure

Movement in Time

1809 Gemeente TILBURG

1850 Railway through Tilburg

1880 Peak of Woolen Industry

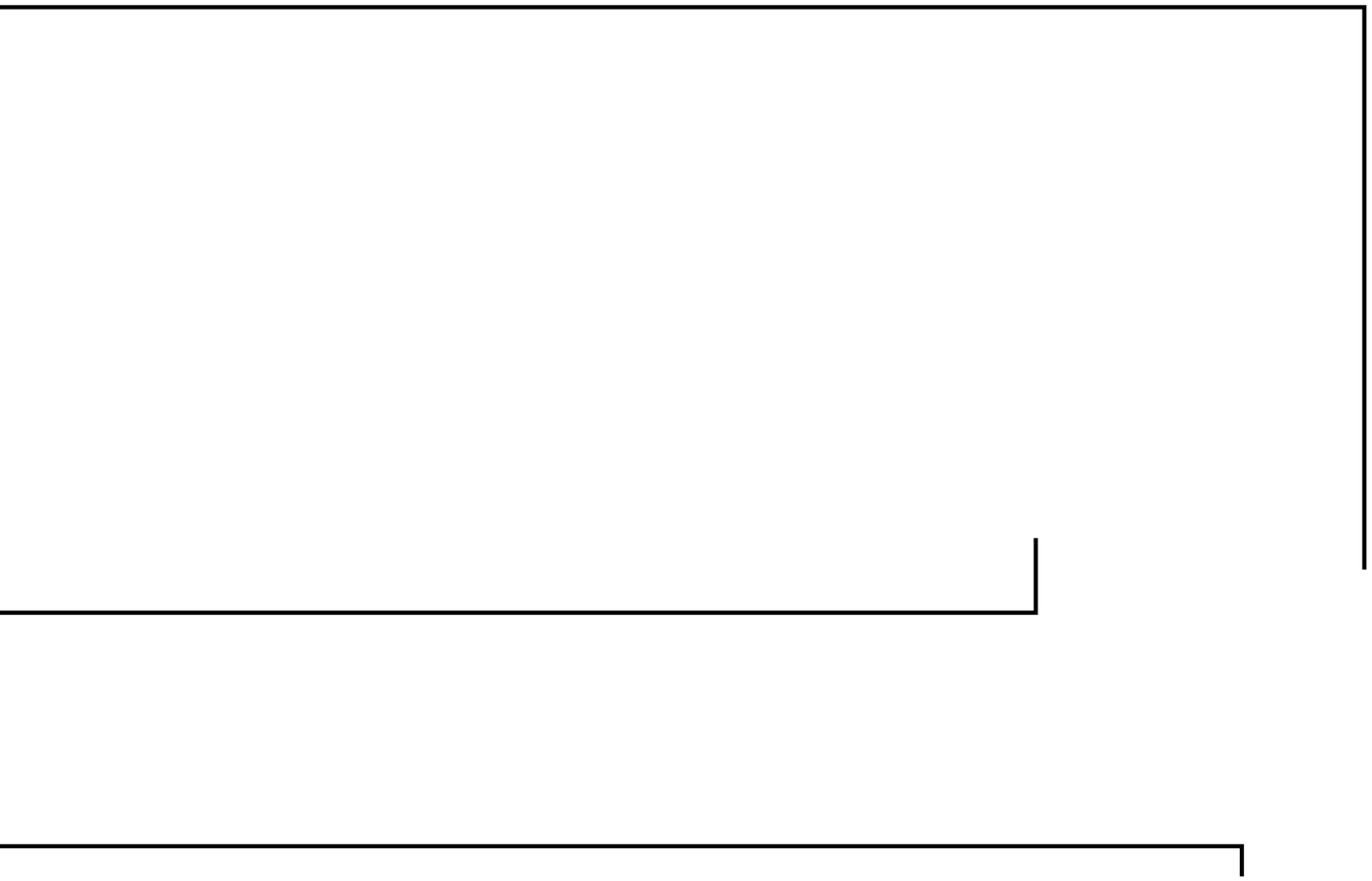
1914
1918
1921 Canal through Tilburg

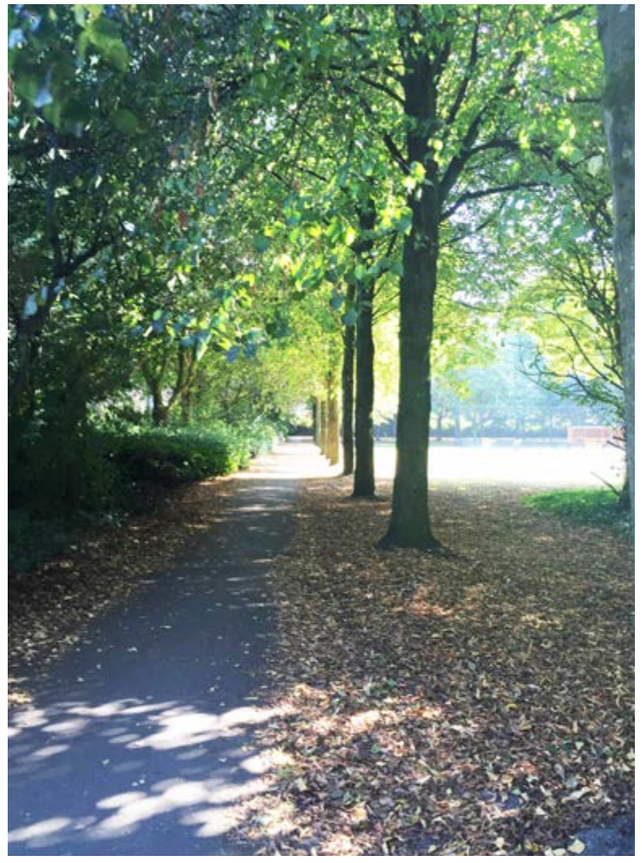
1939
1945
1950 Removal of Southern Railway Connection

1970 Ringbaan network was completed

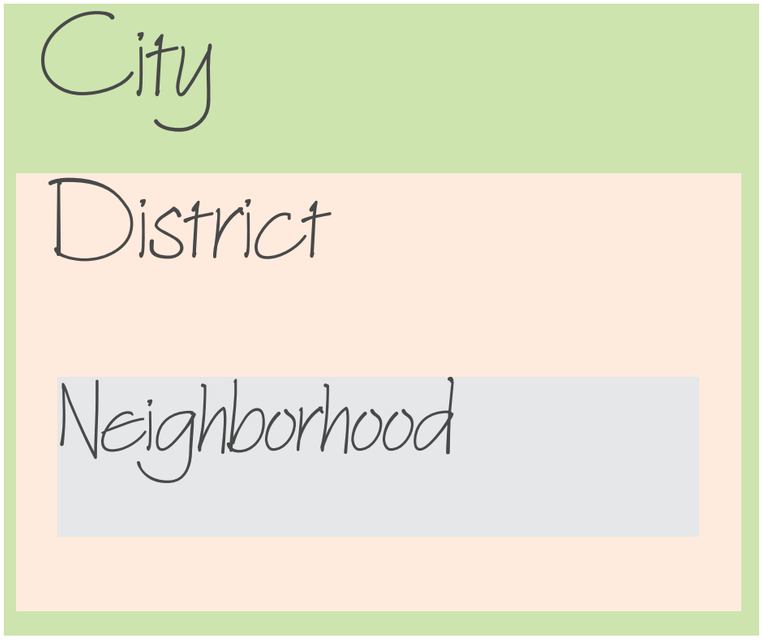
1980 Diversification of Economic Activities leading to growth and expansion of the city

2016 Industrial Economy and Logistics Hub





Corridor Framework

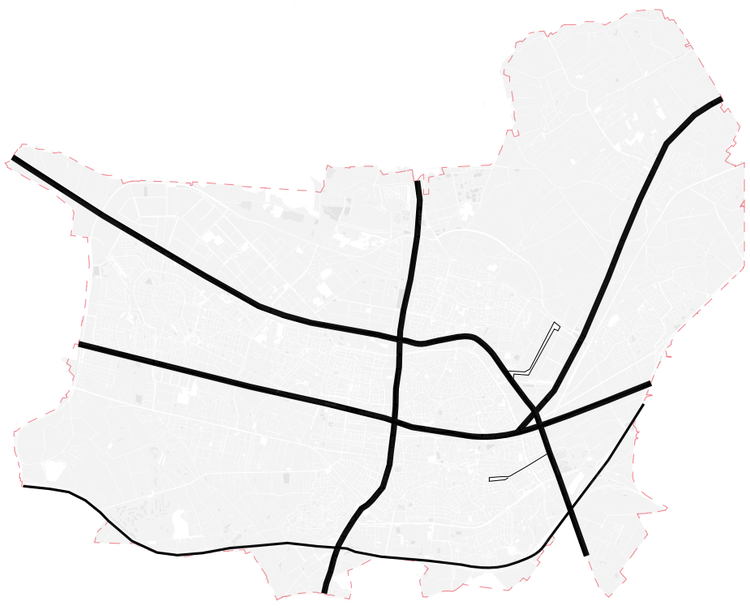


Heirarchy of Corridors, Tilburg

Corridors in cities can be classified based upon their structure. This refers to the geometry, orientation, physical arrangement or elements determining the functions of the building, district or city.

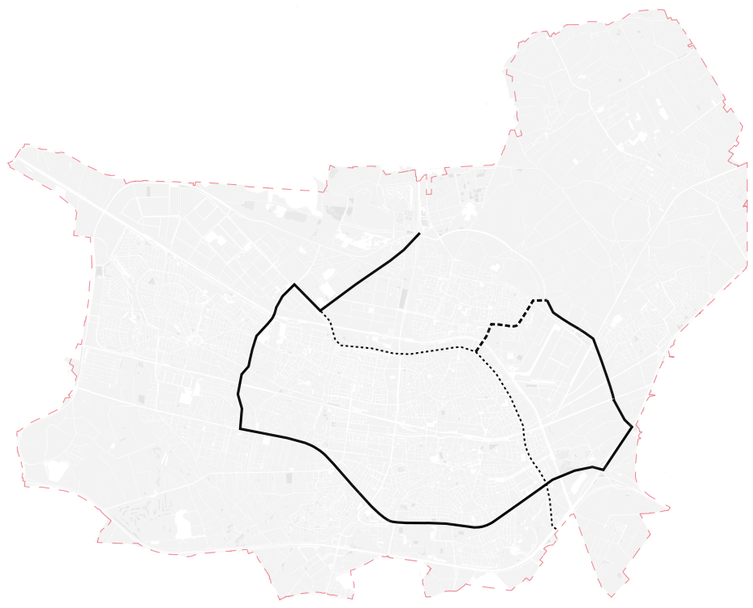
At a city level corridors deal with the transport networks and management and services and good provision. At the district level, it contextualizes energy and water infrastructure and management and transport infrastructure. At neighborhood level, it relates public space with private space.
This notion applied to Tilburg as well. The map analysis of varying urban forms over time has led to determining corridors at the three levels.

Corridor Typology



Level 1 **Regional Connectors**

Connects Tilburg with neighboring cities and the surrounding hinterland. Forming the major spine of regional transport and infrastructure these connectors are vital to economic activity.



Level 2 **District Connections**

Connecting districts that are characterized by different land uses within the city limits. It forms the major internal city spine.

Level 3 **Neighborhoods Connections**

Inner streets connecting public and private space within neighborhoods. They connect to district roads which in turn link the regional connections in the city.

Classification of corridors

Corridors as a diverse framework

Theories over time demonstrating the varying role of corridors

Corridors in cities are a channel that is representative of transition. Be it between regions, uses, terrains or within the same neighborhood or district. Spatially, its primary quality is to enhance connections. The intention of this section is to highlight the varying role of corridors as demonstrated by theories over time. Corridors can be summarized as having three major roles – it is a 'place type' in the city form; it forms a regional skeletal structure; and can be used as a tool for integration and diversity.

'Corridors are the skeletal structure of the regional form and its connections; they form the defining framework of its future', says Calthrope. Corridors can be of various types – waterways, highways, streets, ecological pathways, natural or man-made. They always constitute flow and can therefore direct the 'flow' of changes within the city.

Richerd Sennet emphasizes the system of passages or corridors as an essential element of an open city. The experience of moving from one place to another within a city is one of the daily exchanges that inhabitants have with their urban environment. The experience of passage from place to place is how people know the city.

The idea of the living city as described by Jan Gehl in his book Life between Buildings augments this notion. He describes living cities as ones in which people can interact with one another and stimulate rich experiences. His work highlights the need to create spatial frameworks where social events can evolve spontaneously. Jane Jacobs describes the streets of successful city neighborhoods to have three main qualities. First, there must be a clear demarcation between what is public space and what is private space. It should be clearly identifiable. Second, there must be 'eyes' on the street. Spatially this translates into having residences balconies and verandahs facing the street and store windows and openings onto the same street. They should turn their backs or blank sides on it and leave the street 'blind'. And thirdly, the sidewalks must have users on it fairly continuously. People attract more people and a street should support activities to ensure that people pass through the day.

The ubiquitous principle of designing cities to be diverse and mutually supportive provides the tools needed to create a spatial framework that is adaptable.

'Place Type'

Corridors as a design element and 'place type' of city form

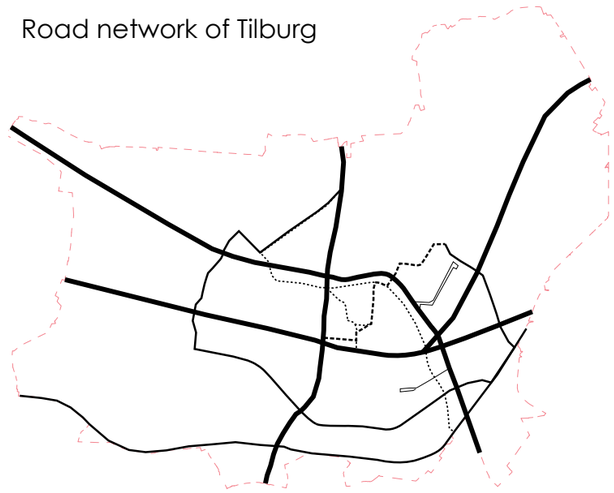
Regional Skeletal Structure

Corridors functioning as a skeletal structure within the city structure

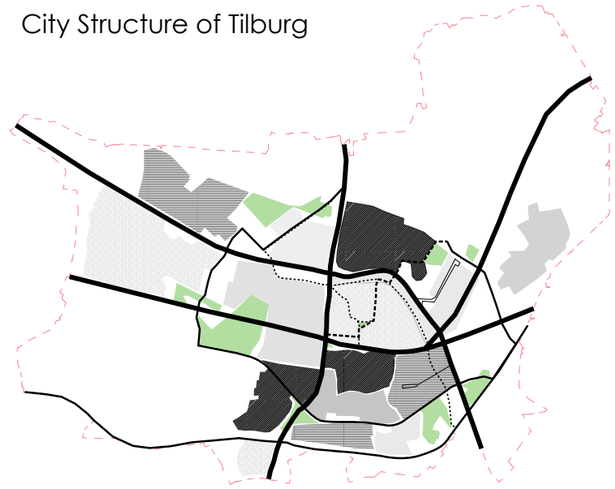
Tool for Integration and Diversity

Corridors as a tool to integrate varying land uses and functions

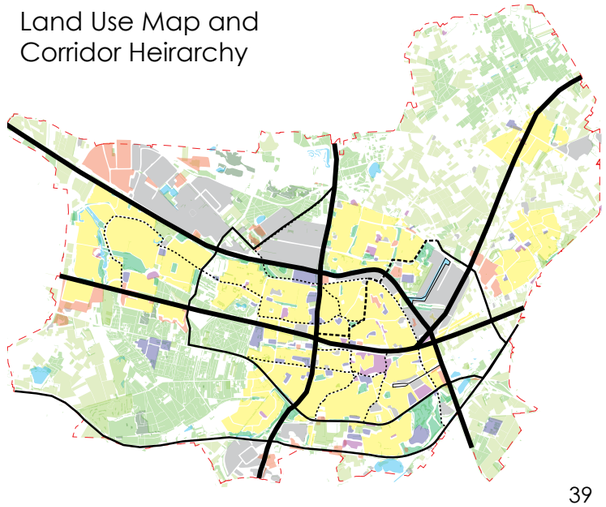
Road network of Tilburg

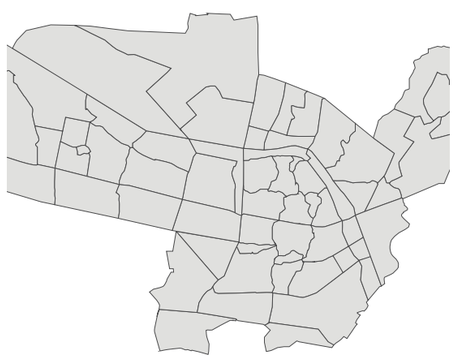


City Structure of Tilburg

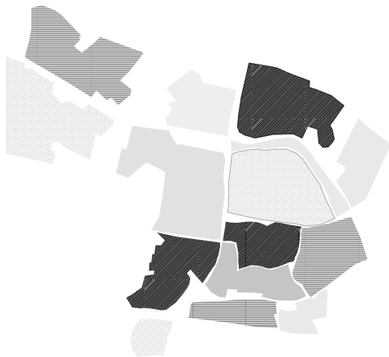


Land Use Map and Corridor Heirarchy

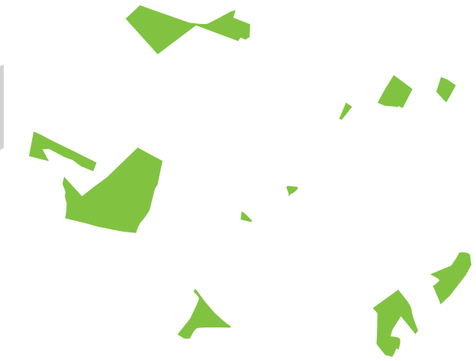




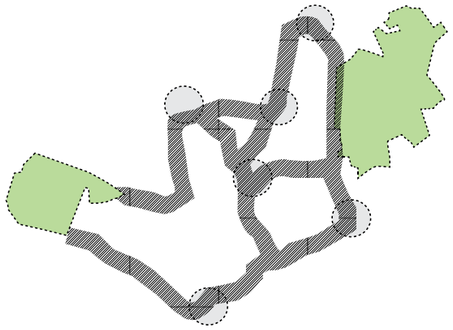
Neighborhood



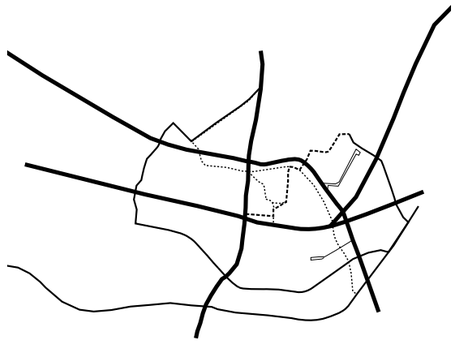
District



Preserves



Centers

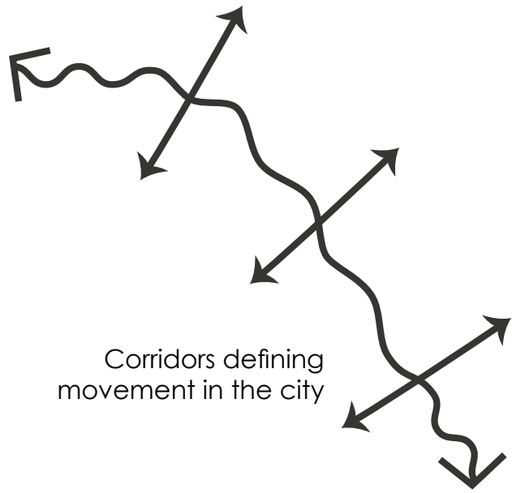


Corridors

'Place Types' of City Form

Concept of place types as design elements of the city, Tilburg.

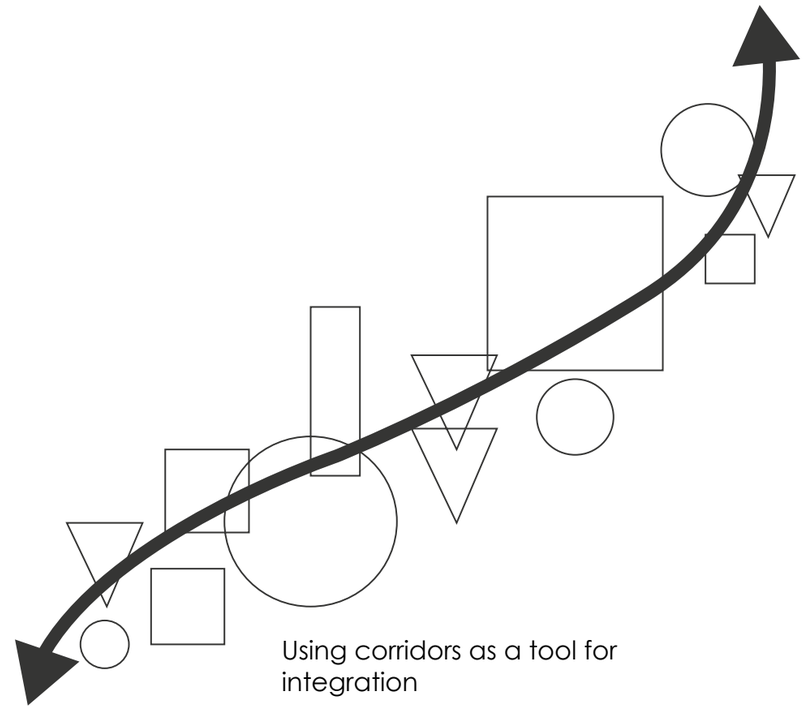
Peter Calthorpe, Urbanism in the Age of Climate Change



Corridors defining movement in the city

Corridors are used to move between spaces in the city. It is the primary way in which 'users' experience the city.

Richard Sennet, The Open City



Using corridors as a tool for integration

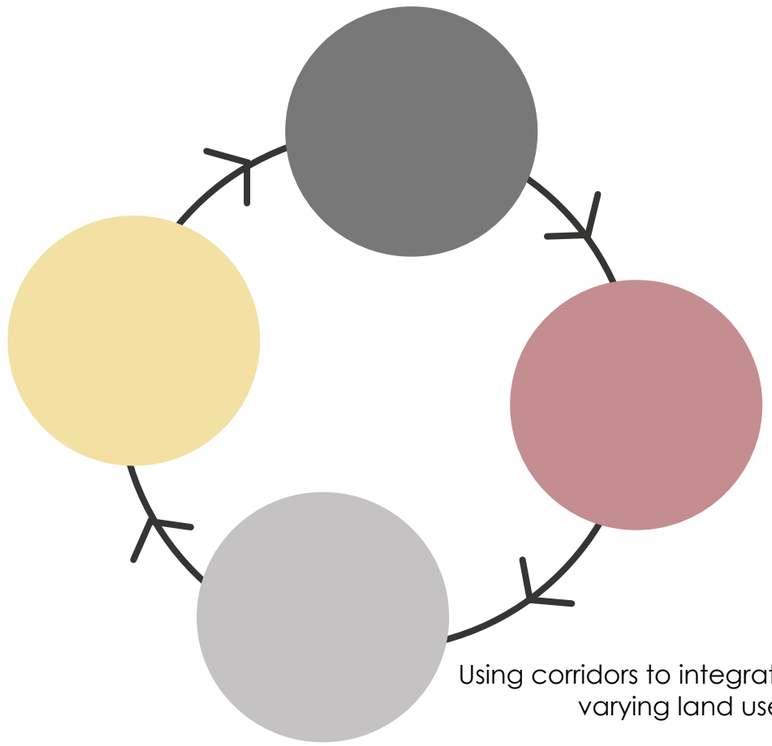
Corridors as a diverse framework

Corridors can provide a tool for integration of varrying activities and functions.

Jan Gehl, Life Between Buildings

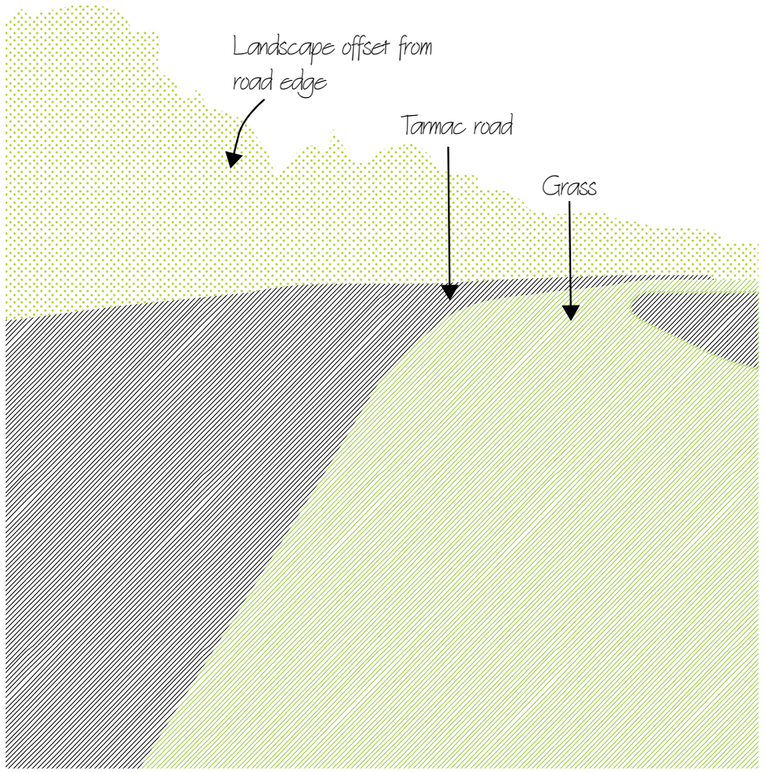
Diversity of land use and their integration is the basis for successful design in cities.

Jane Jacobs, The Death and Life of Great American Cities

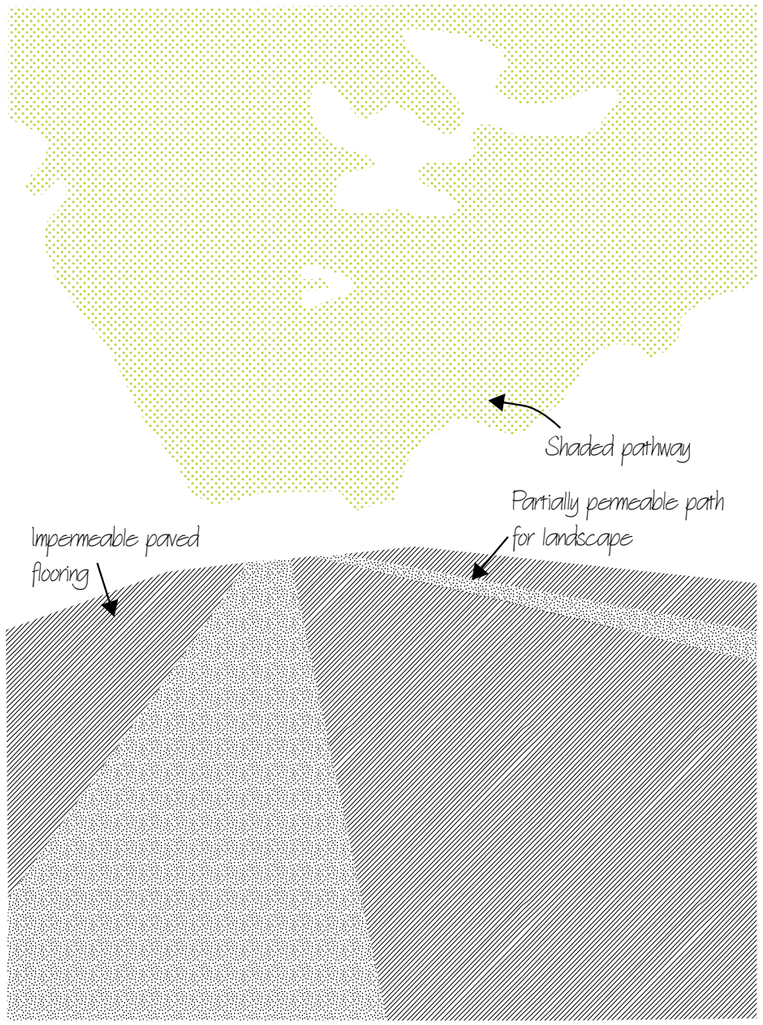


Using corridors to integrate varying land uses

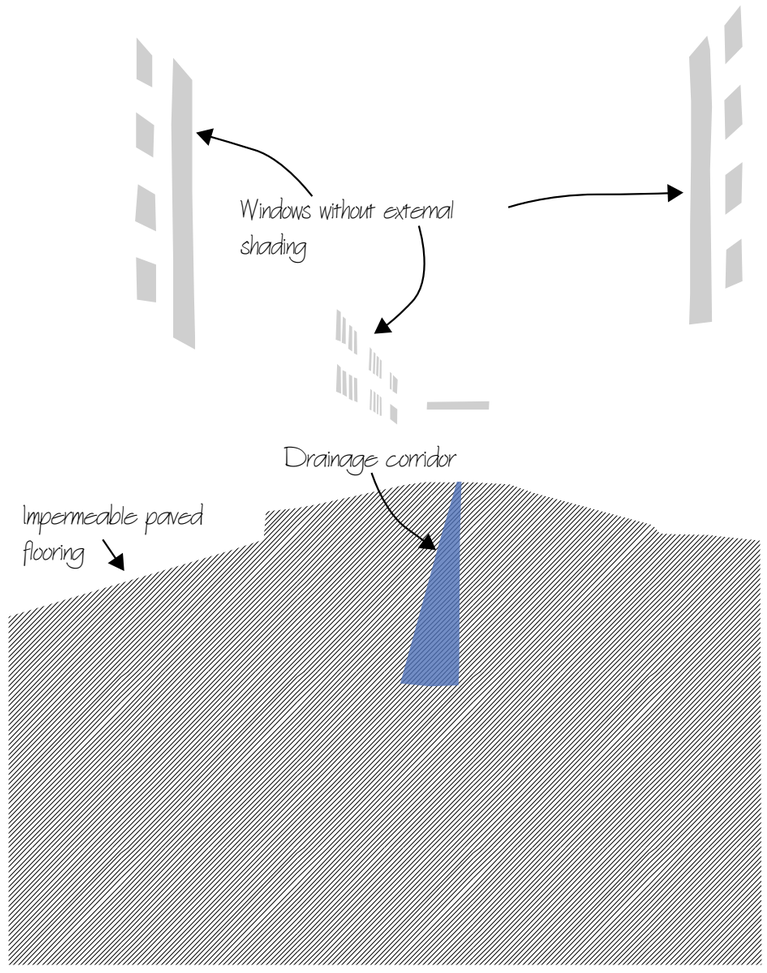
Current Situation Analysis



Level 1 **Regional Connectors**

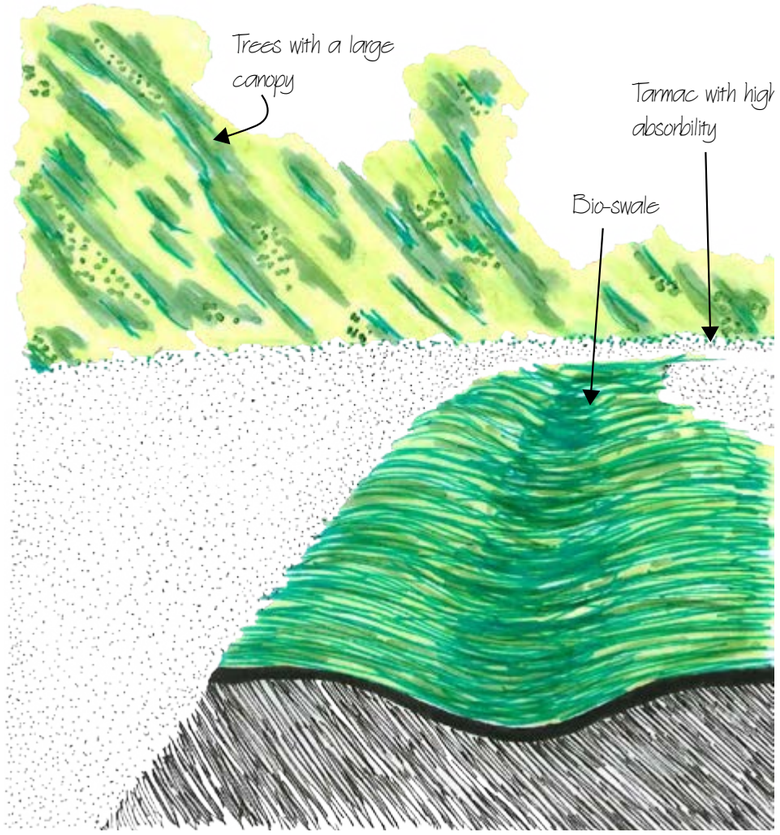


Level 2 **District Connections**

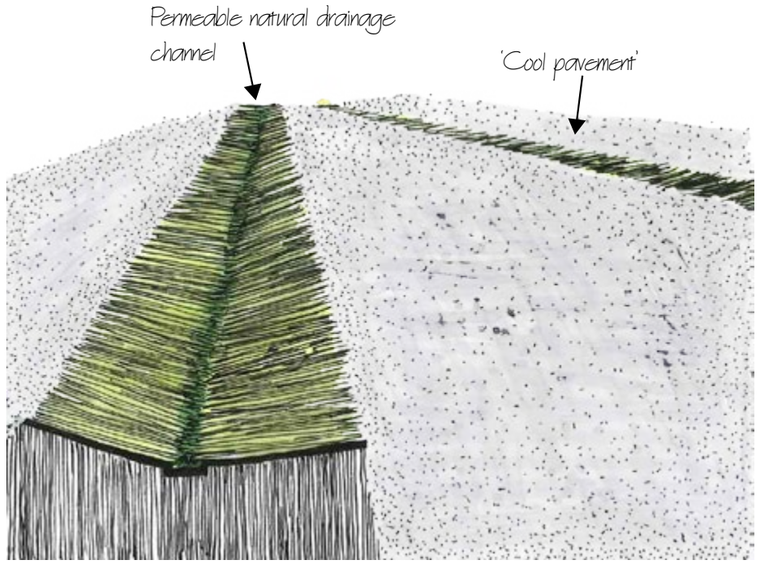


Level 3 **Neighborhoods Connections**

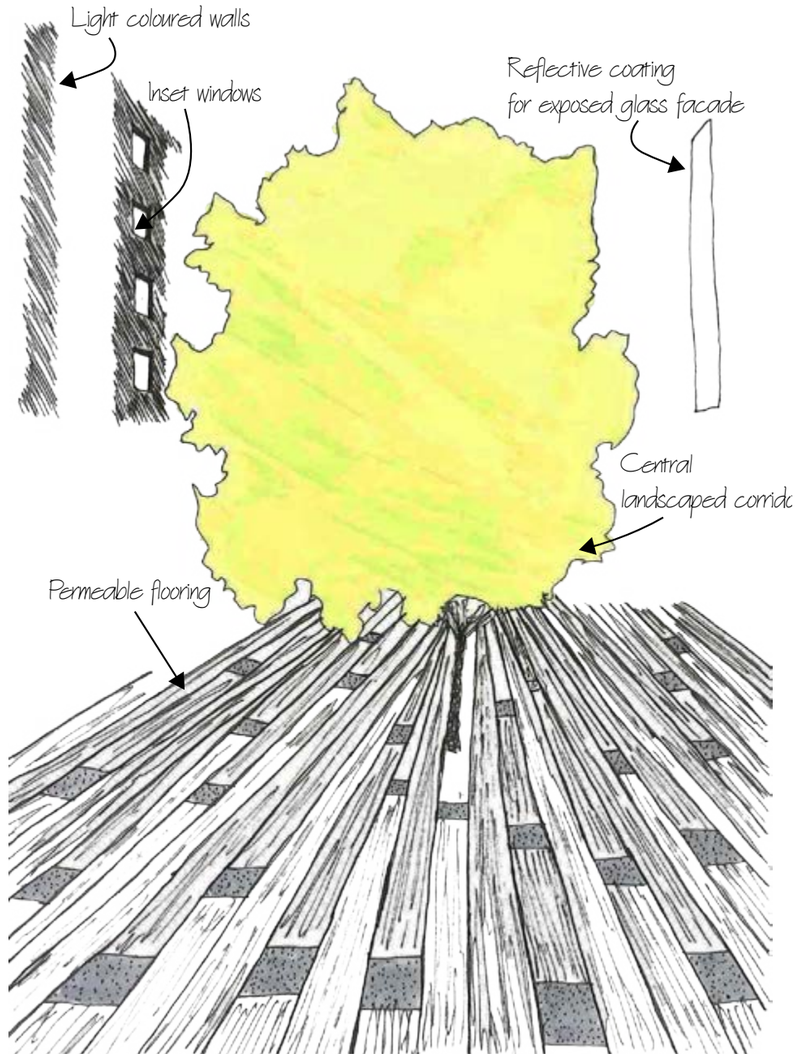
Design Suggestions



Level 1 **Regional Connectors**



Level 2 **District Connections**



Level 3 **Neighborhoods Connections**

Designing a framework for adaptation

Mitigating the effects of climate change / Design strategies as per classification of corridor typology

City

- Transport Network Management
- Services and Goods Provision

- Increase capacity to store excess water
- Introduce Retention Ponds
- Attention to transportation infrastructure

District

- Energy and Water Infrastructure and Management
- Transport Infrastructure

- Increase drainage capacity
- Create more water buffers
- Plant trees with larger canopies

Neighborhood

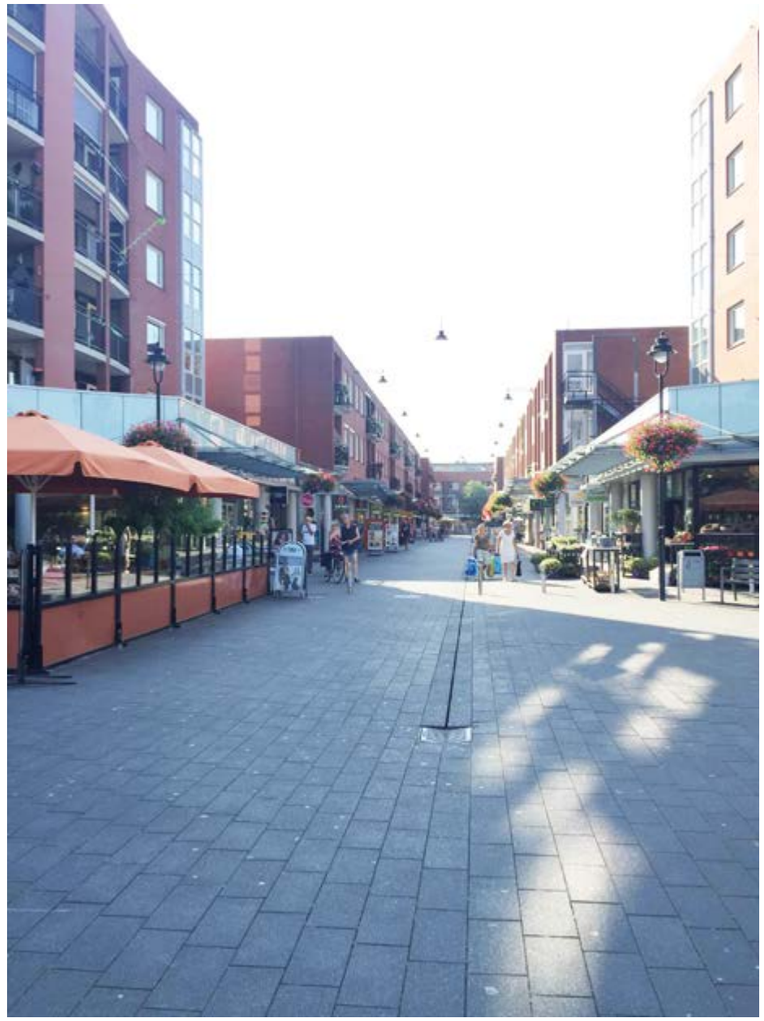
- Link private and public
- Everyday interaction with the city

- Increase amount of permeable surfaces
- Install more shading devices especially in public spaces
- Improve opportunities for interaction by designing more intimate public spaces

Current Corridor Visuals

Level 1 **Regional Connectors**

Level 2 **District Connections**



Level 3 **Neighborhoods Connections**

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Thank You!