

# Monocentric or Polycentric?

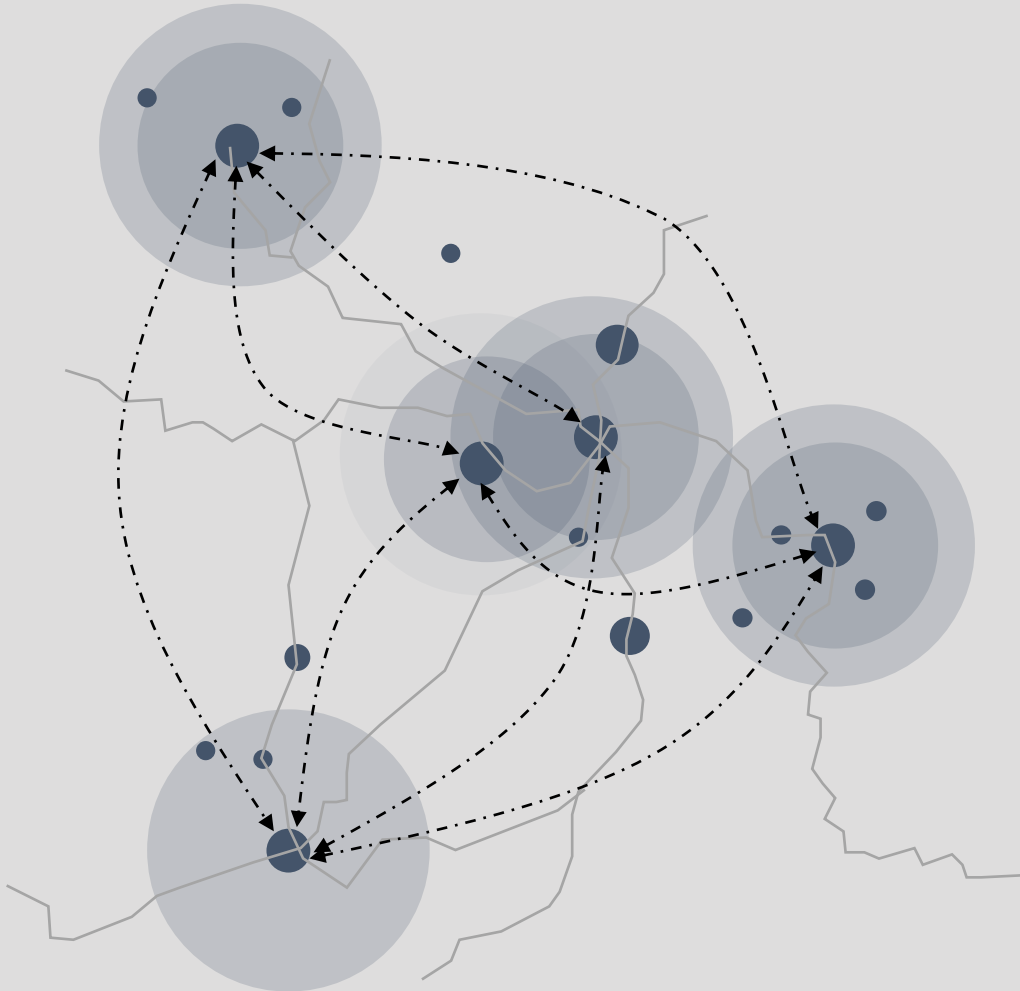
The Role of Public Transport Networks in Shaping Cities

**Ola Qasseer**

**András Munkácsy**

KTI Institute for Transport Sciences, Budapest, Hungary

# Presentation Outline



**1**

## **Introduction**

Background and literature  
Research motivation and novelty

**2**

## **Methodology**

Centrality metrics and classifications  
Semi-structured interviews

**3**

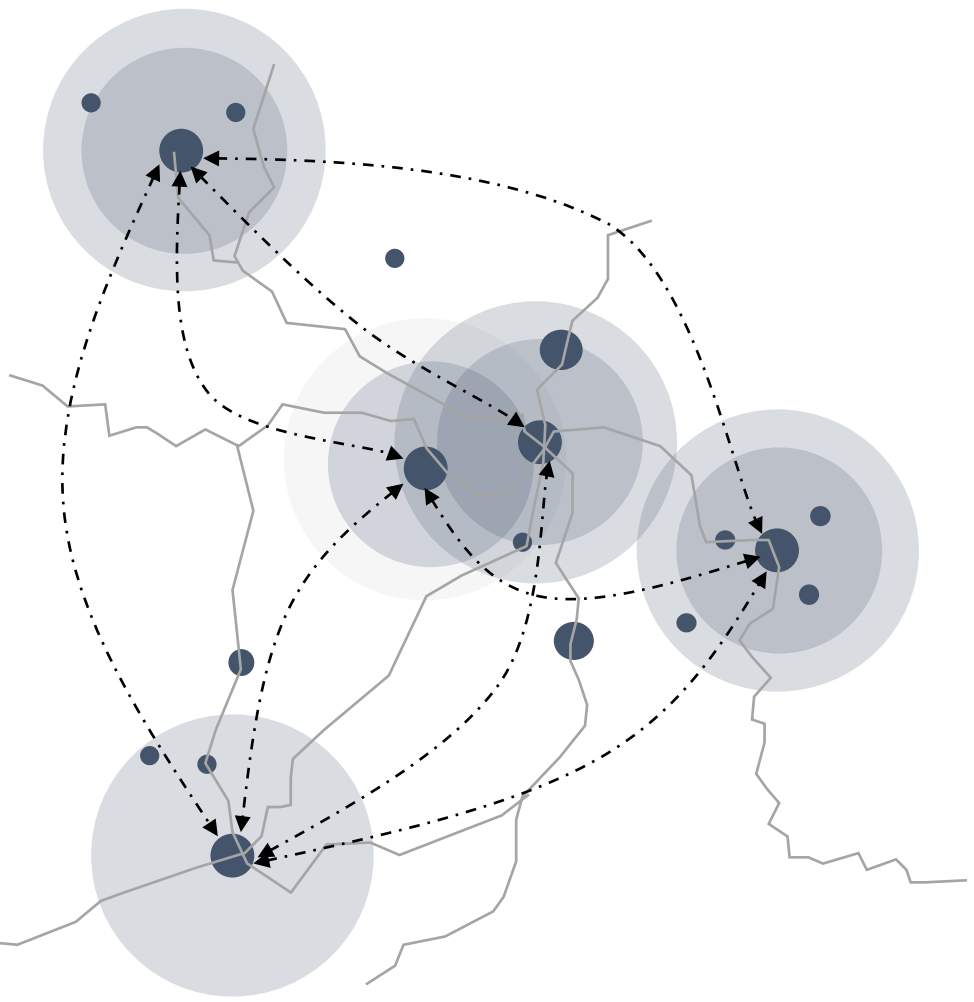
## **Results**

Centrality levels and patterns  
Experts' perspective

**4**

## **Conclusion**

# Introduction



**Transport networks**



**Urban spatial  
structure**

# Introduction

**Transport networks**



**Urban spatial  
structure**

Centralized

Decentralized

Clustered

Dispersed

Radial

# Introduction

**Transport networks**



**Urban spatial structure**

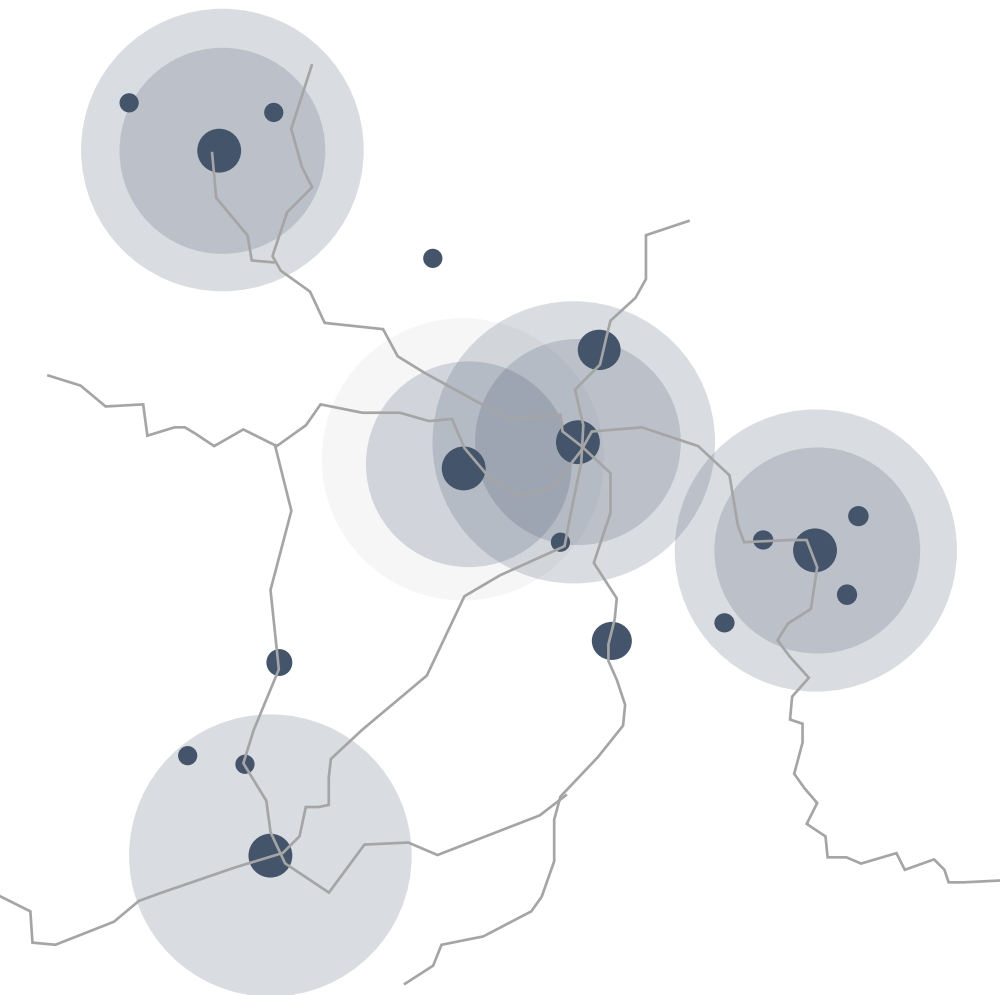
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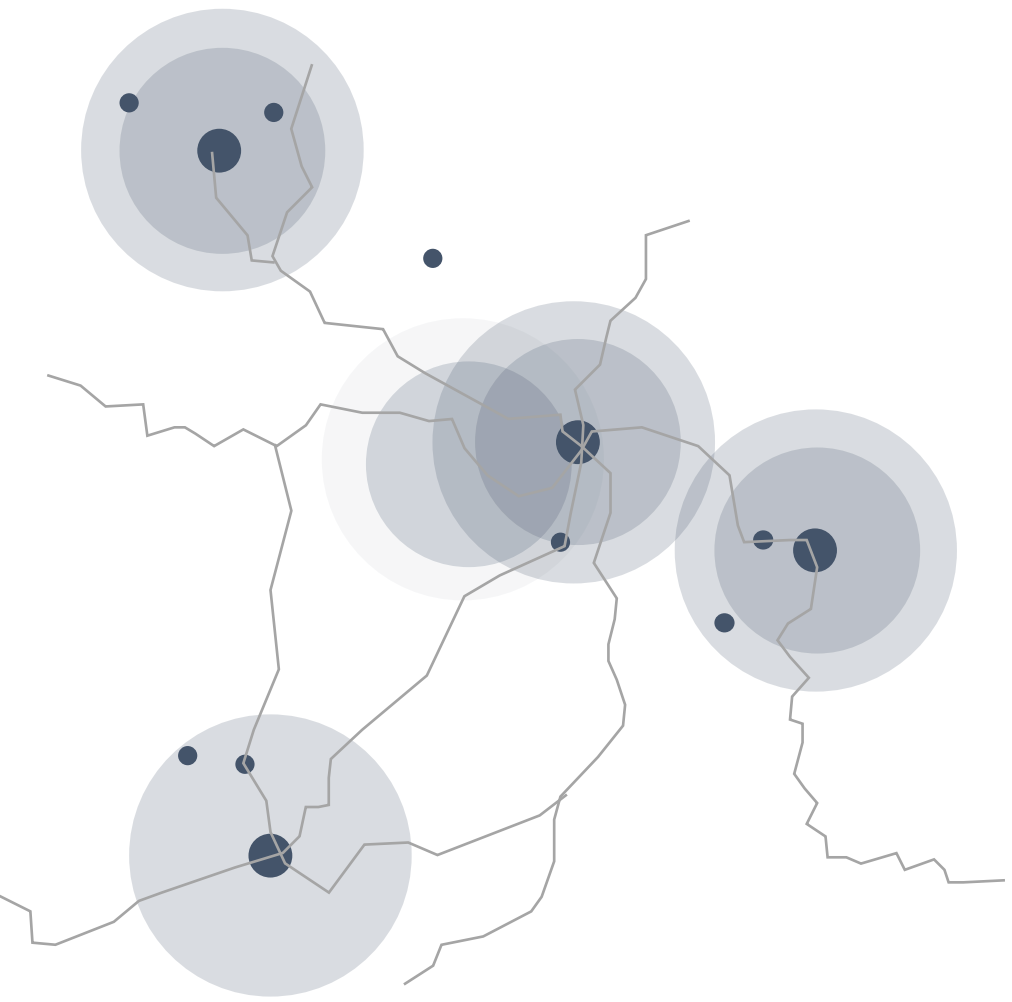
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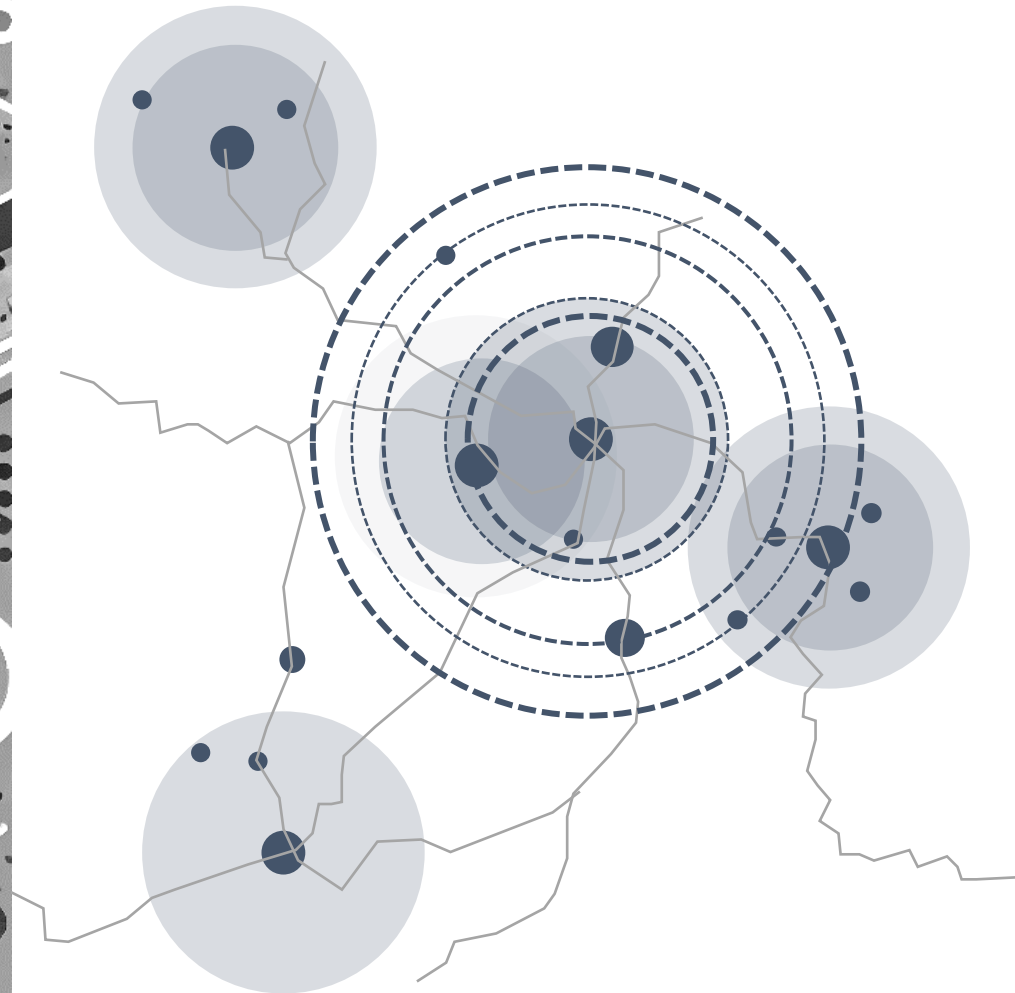
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# Introduction



**Transport networks**



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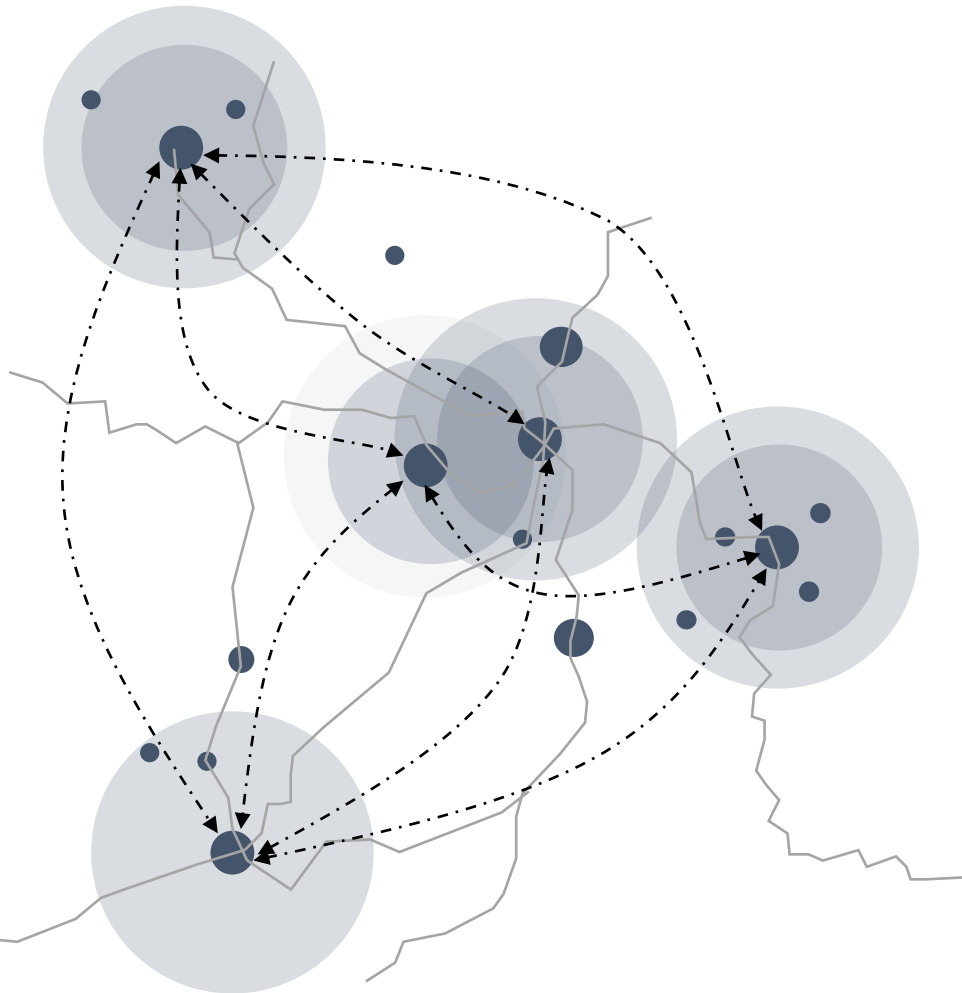
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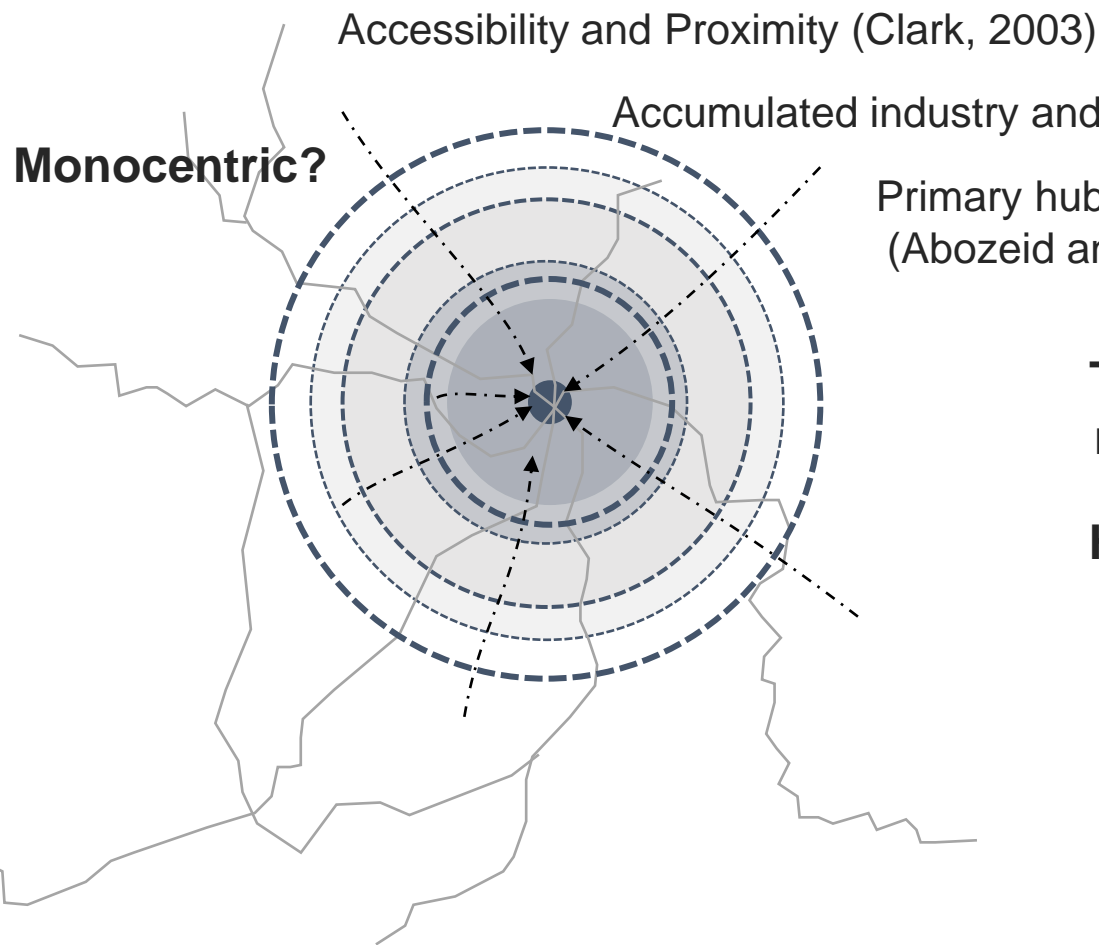
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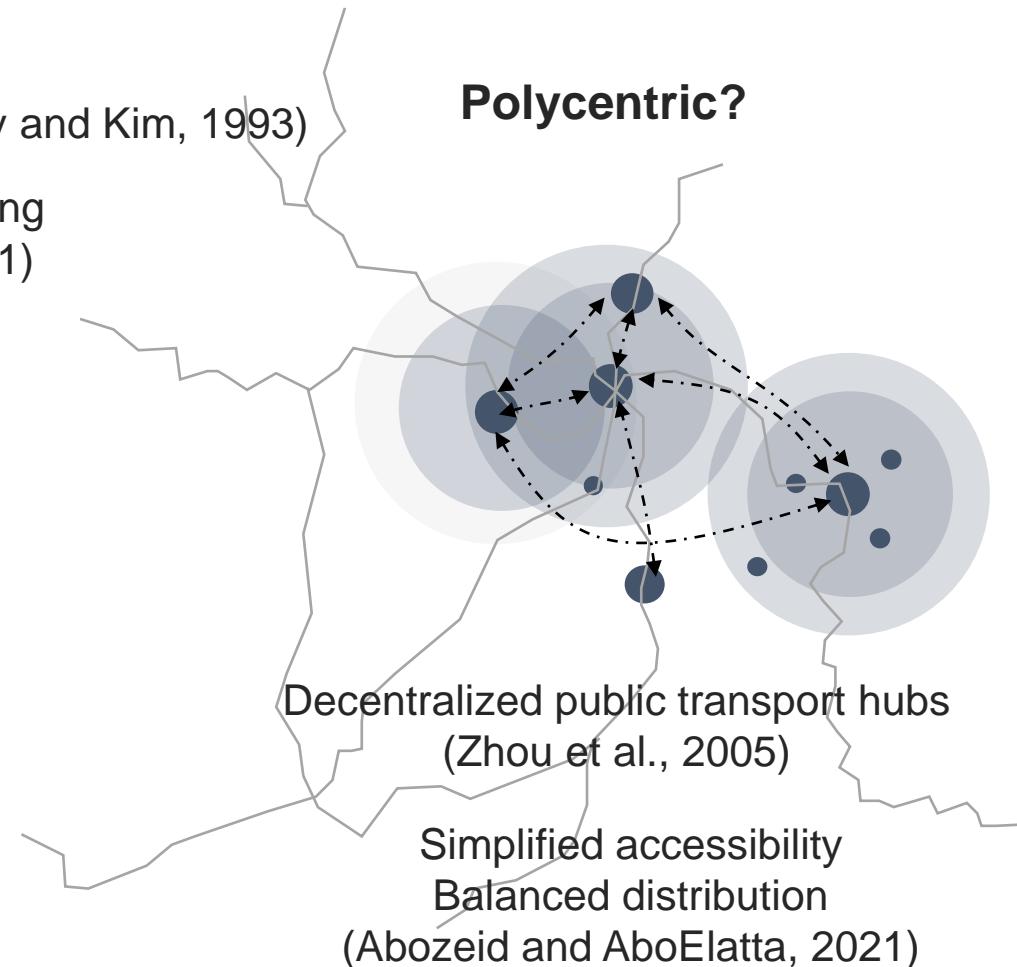
# Monocentric or Polycentric?



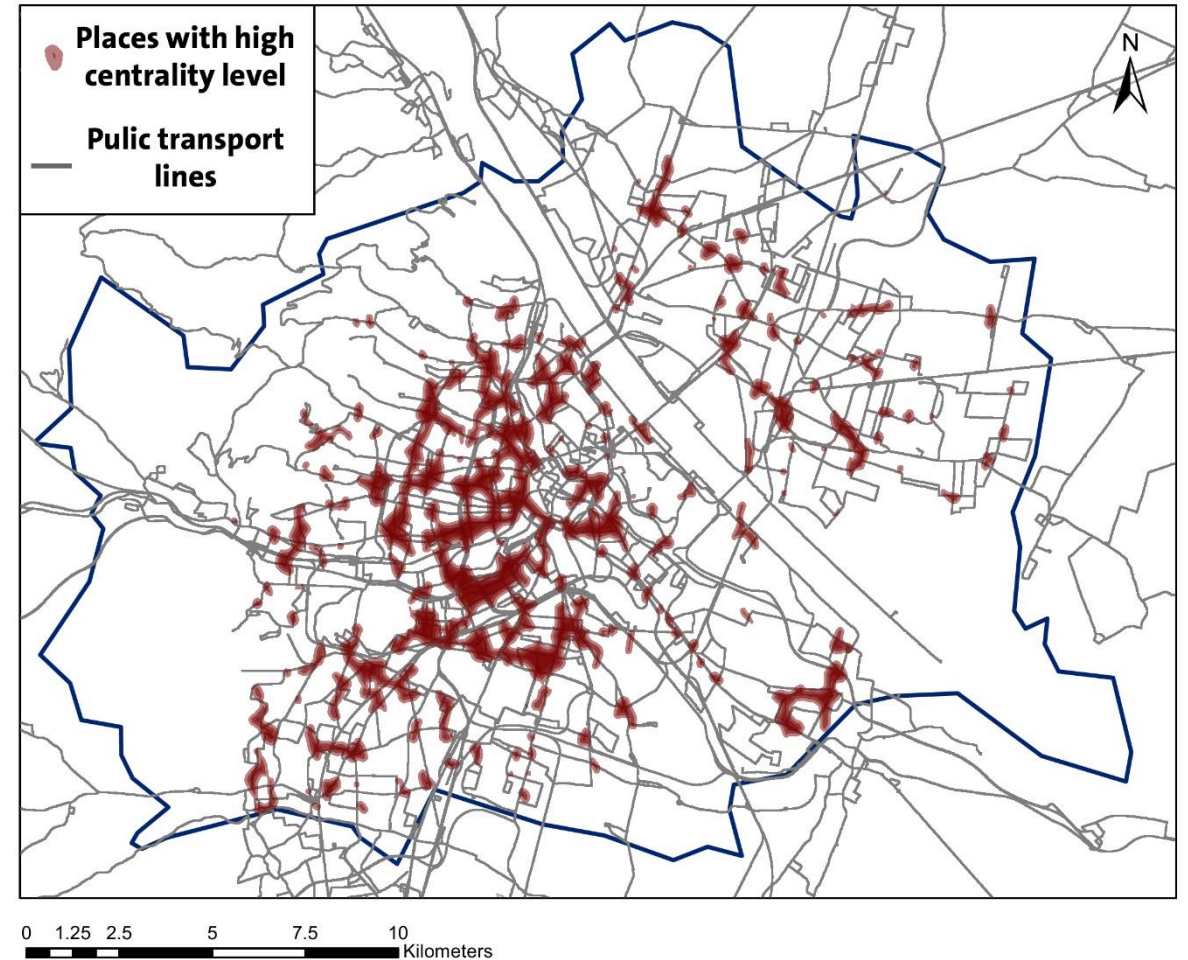
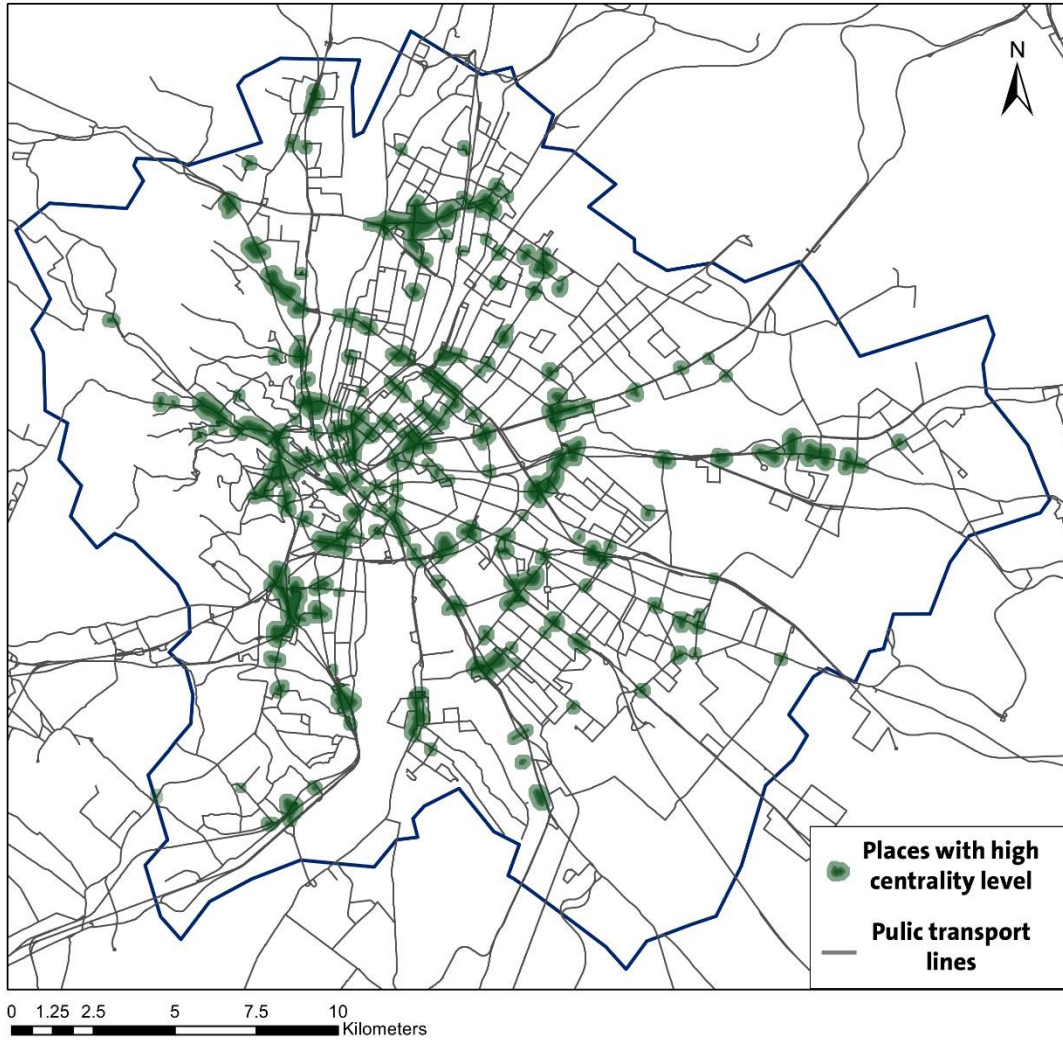
**Transport networks**

**Historical origin**

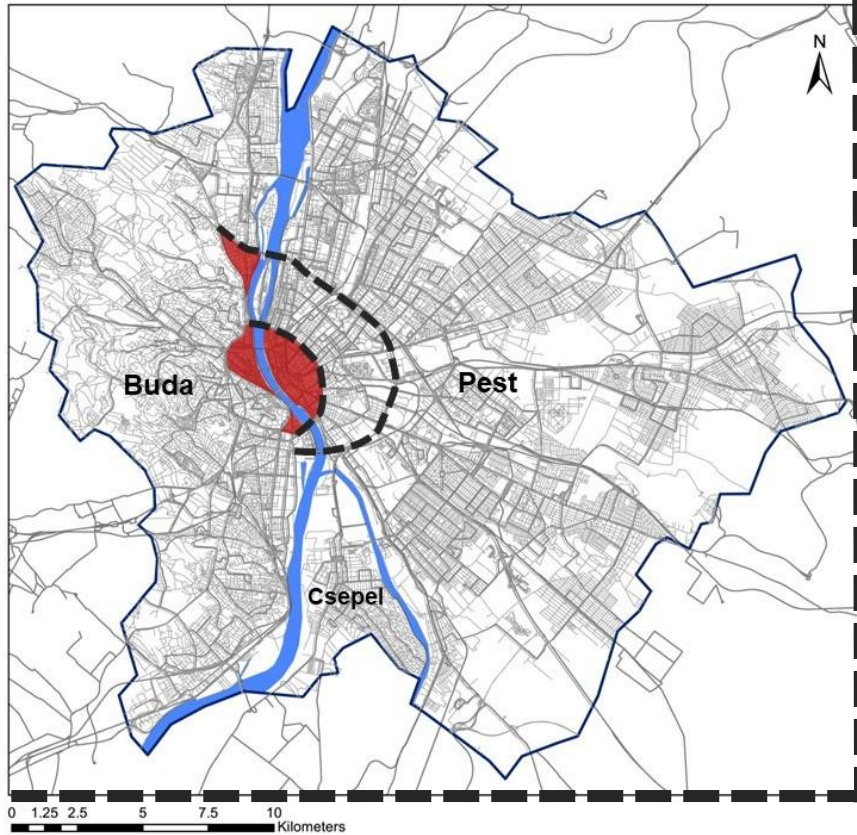
**City growth**



# Research Motivation - Previous research



# Research Motivation - Literature



## **Budapest:**

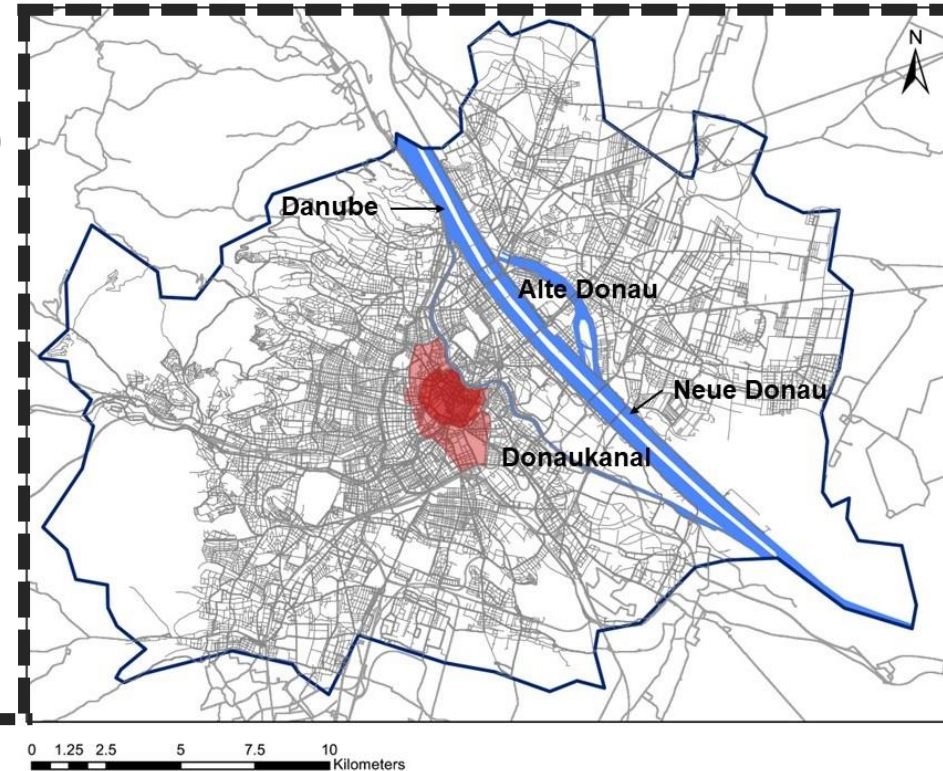
Monocentric, concentrated economic activities ( Erhart, 2008)

Polycentric structure (Losonczy, Orbán and Benkő, 2022)

## **Vienna:**

Central compact form, polycentric among suburban areas (Helbich, 2011).

Monocentric compact form (Suarez-Rubio and Krenn, 2018)



# Research Novelty and Contribution

The role of **public transport networks** in shaping **urban spatial structure**

Do **Budapest** and **Vienna** exhibit **monocentric** or **polycentric** structures according to the **public transport layout**?



# Research Novelty and Contribution

The role of **public transport networks** in shaping **urban spatial structure**

Do **Budapest** and **Vienna** exhibit **monocentric** or **polycentric** structures according to the **public transport layout**?

Linking **transport planning** with **urban planning**

Contributing to **sustainable urban development**

2030 Agenda for Sustainable Development

11 SUSTAINABLE CITIES AND COMMUNITIES



Goals

11

**Make cities and human settlements inclusive, safe, resilient and sustainable**

# Methodology



- 1** Measuring centers' centrality in each case study
- 2** Calculating centrality levels for districts
- 3** Conducting semi-structured interviews

# Methodology

**1** Measuring centers' centrality in each case study

**2** Calculating centrality levels for district centers

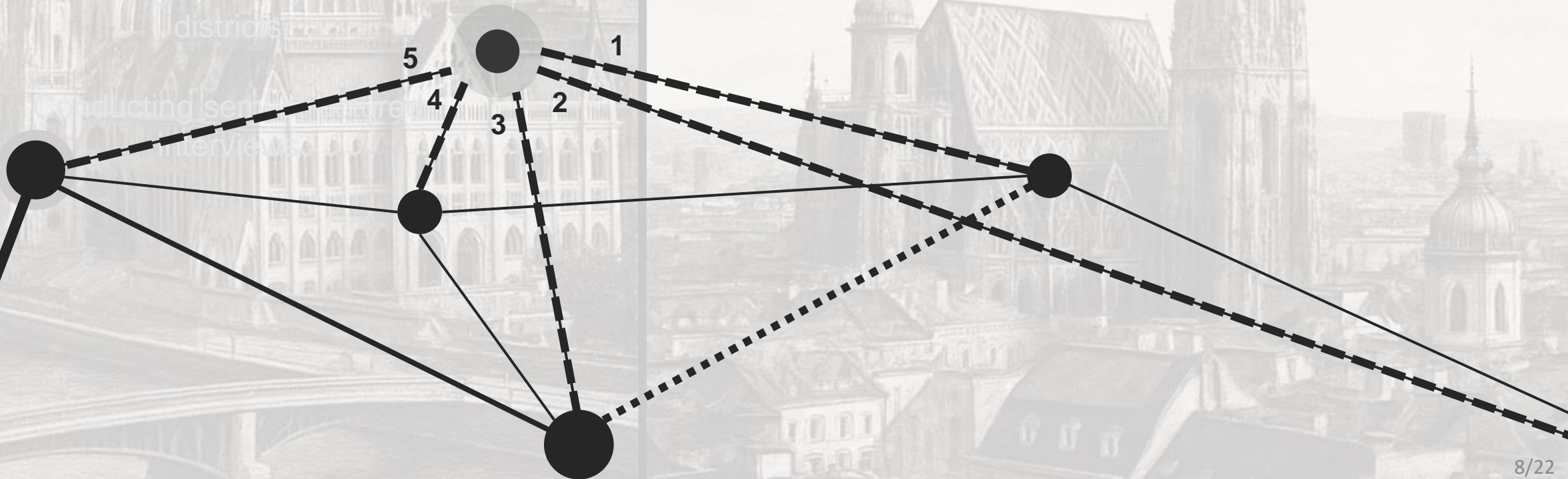
**3** Conducting semi-structured interviews

Degree Centrality

Closeness Centrality

Betweenness Centrality

Straightness Centrality



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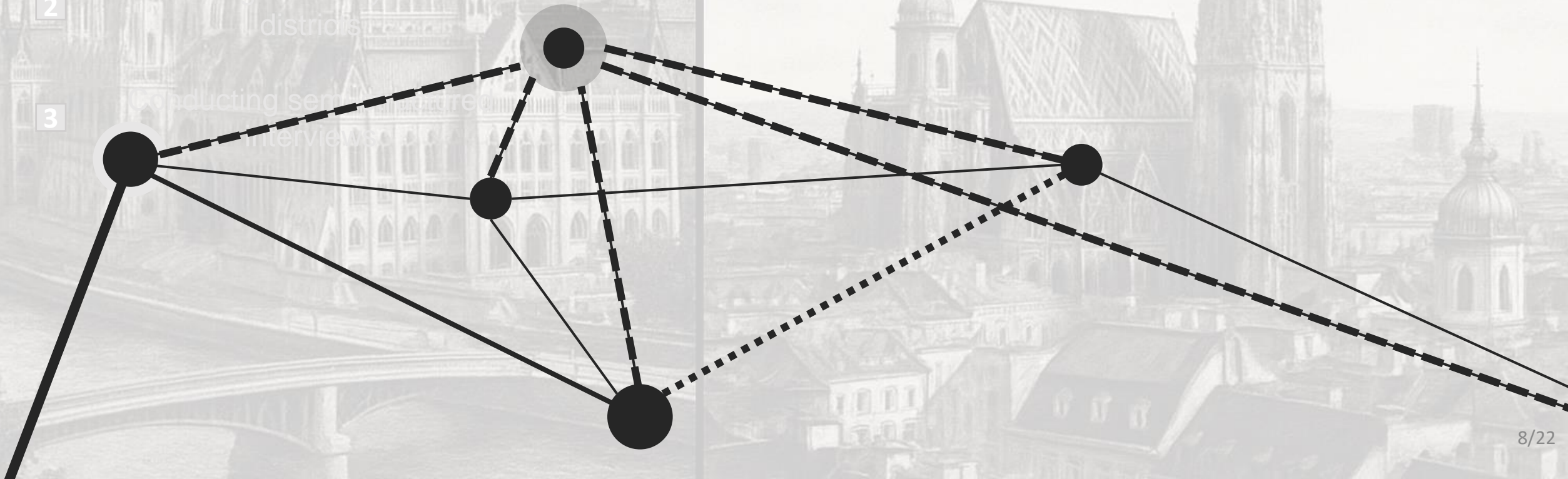
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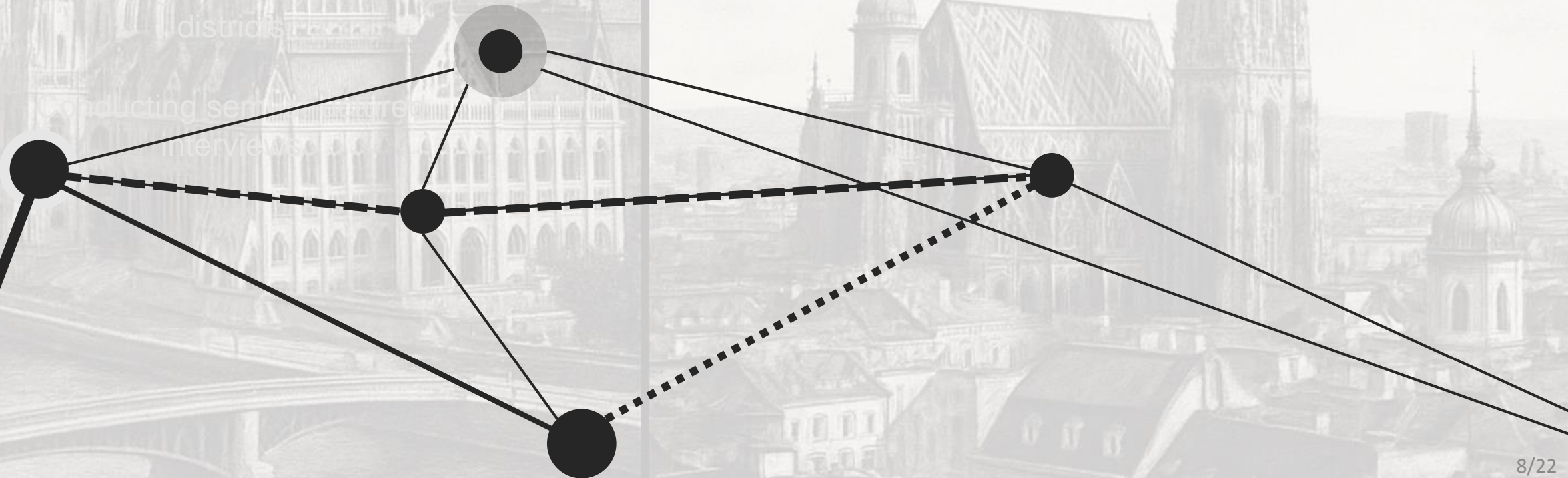
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Degree Centrality

Closeness Centrality

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# Methodology

1

Measuring centers' centrality in each case study

2

Calculating centrality levels for districts

3

Conducting semi-structured interviews

Calculating average centrality levels

+

Comparing the calculations with the change in the borders of each city

# Methodology

1

Measuring centers' centrality in each case study

2

Calculating centrality levels for districts

3

Conducting semi-structured interviews

11 experts; 5 from **Budapest** and 6 from **Vienna**

Urban planners

Transport planners

Transport economists

Geographers

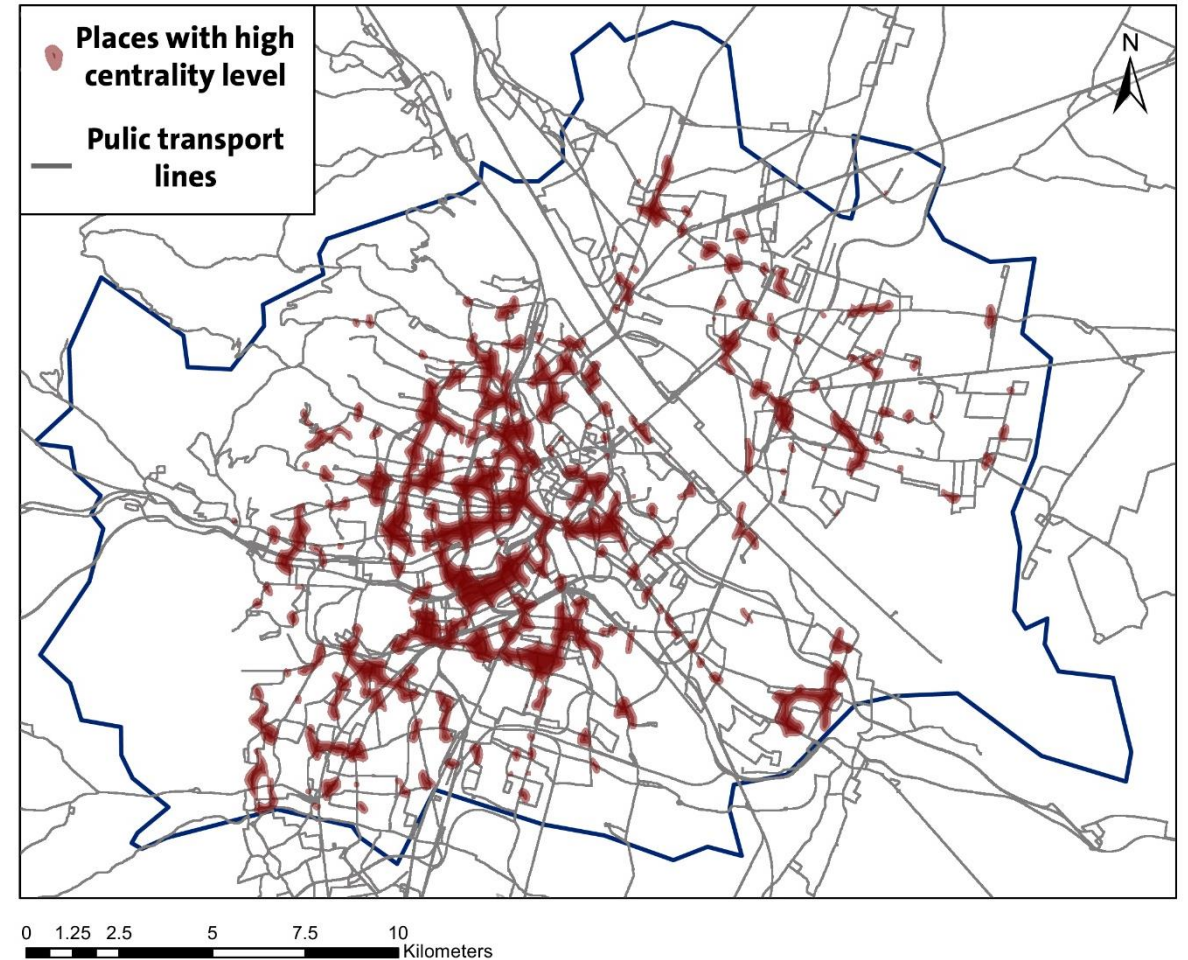
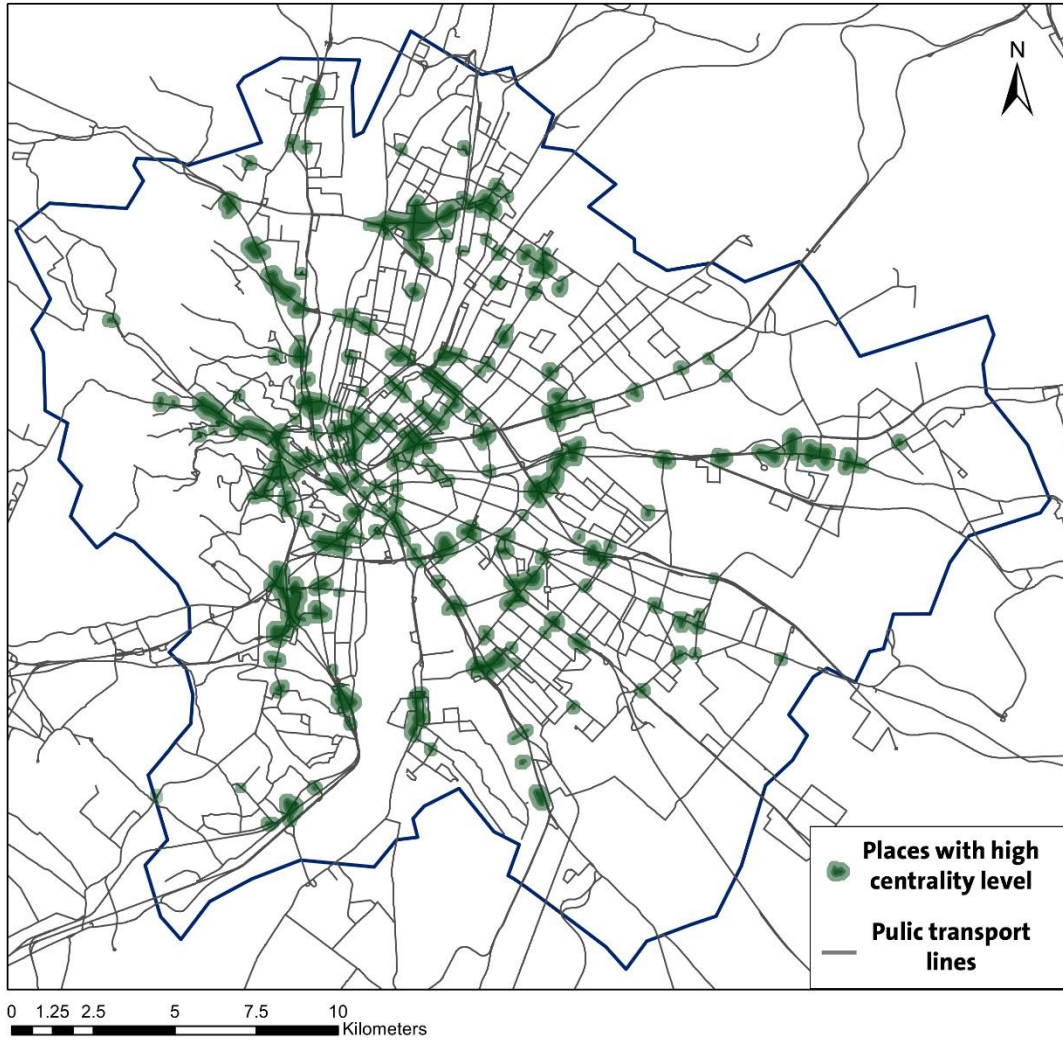
Spatial analysis experts

What is the center and where is it?

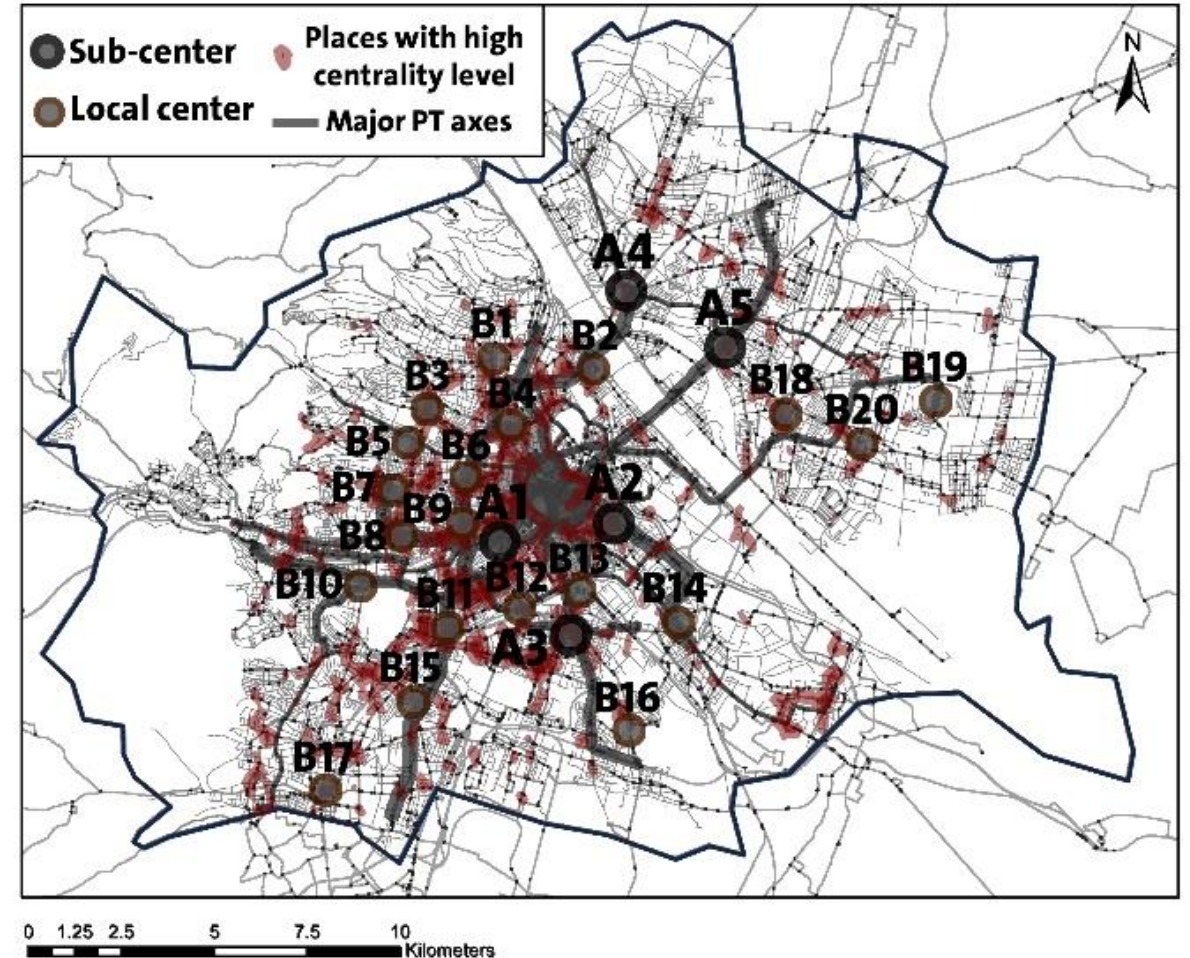
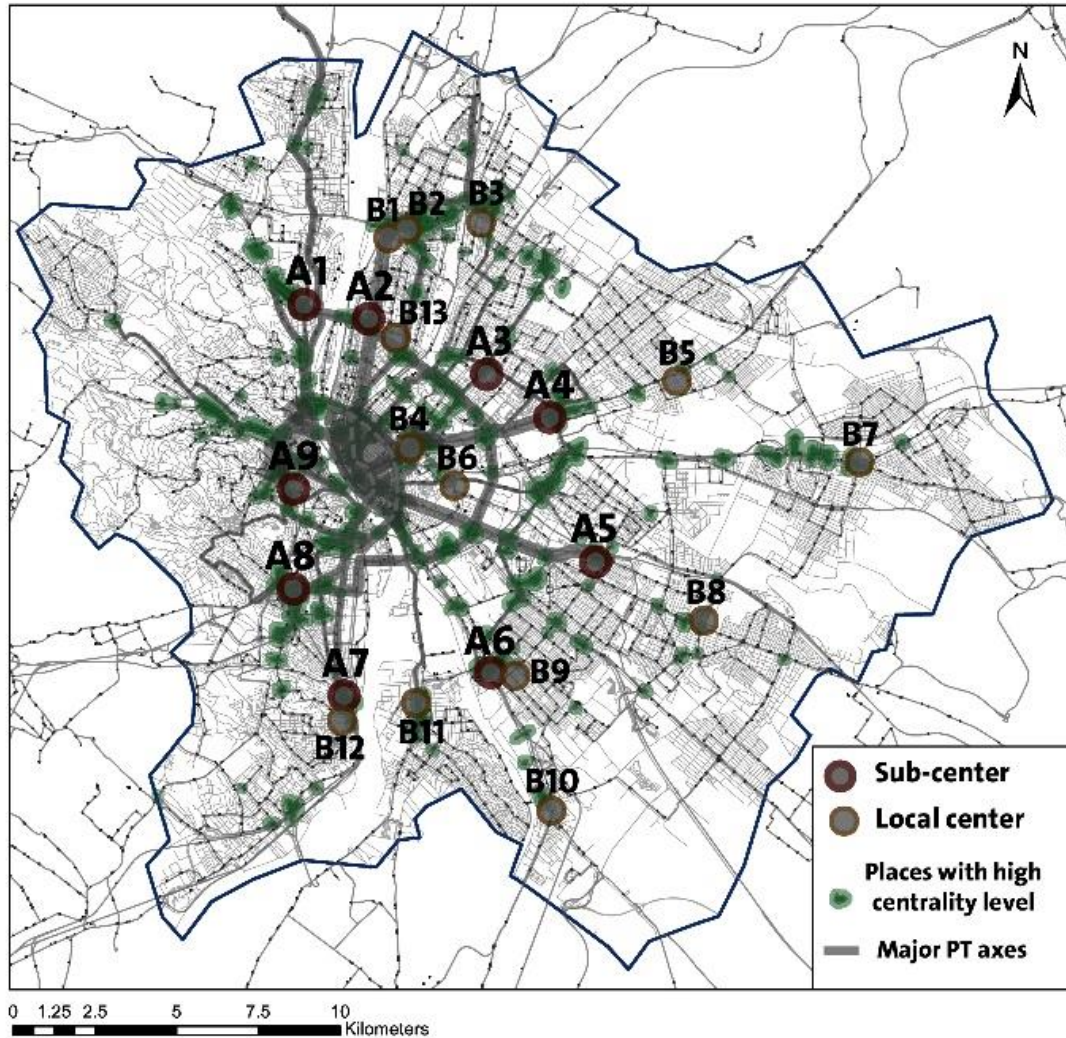
What is the role of public transport?

Does a center attract transport networks, or do networks create the center?

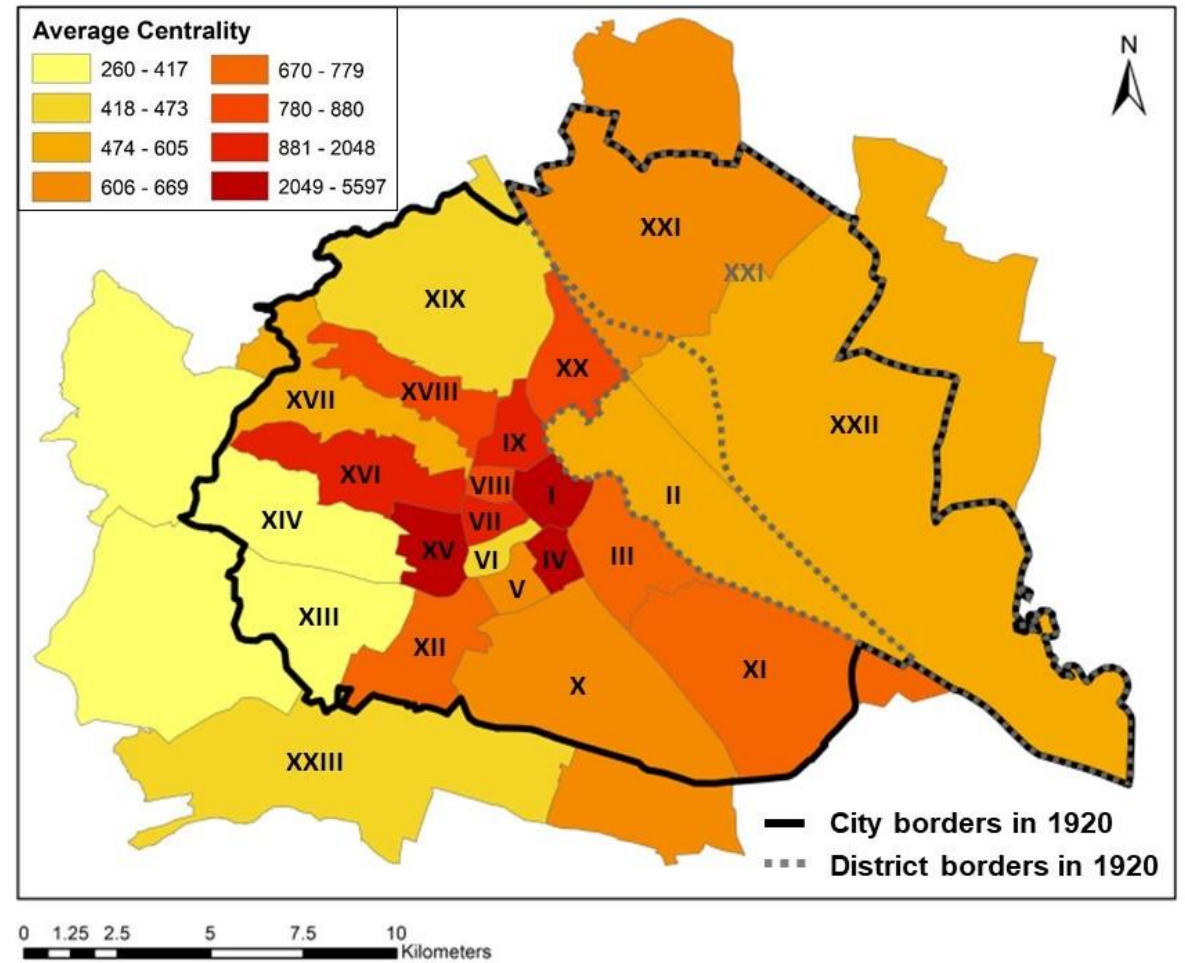
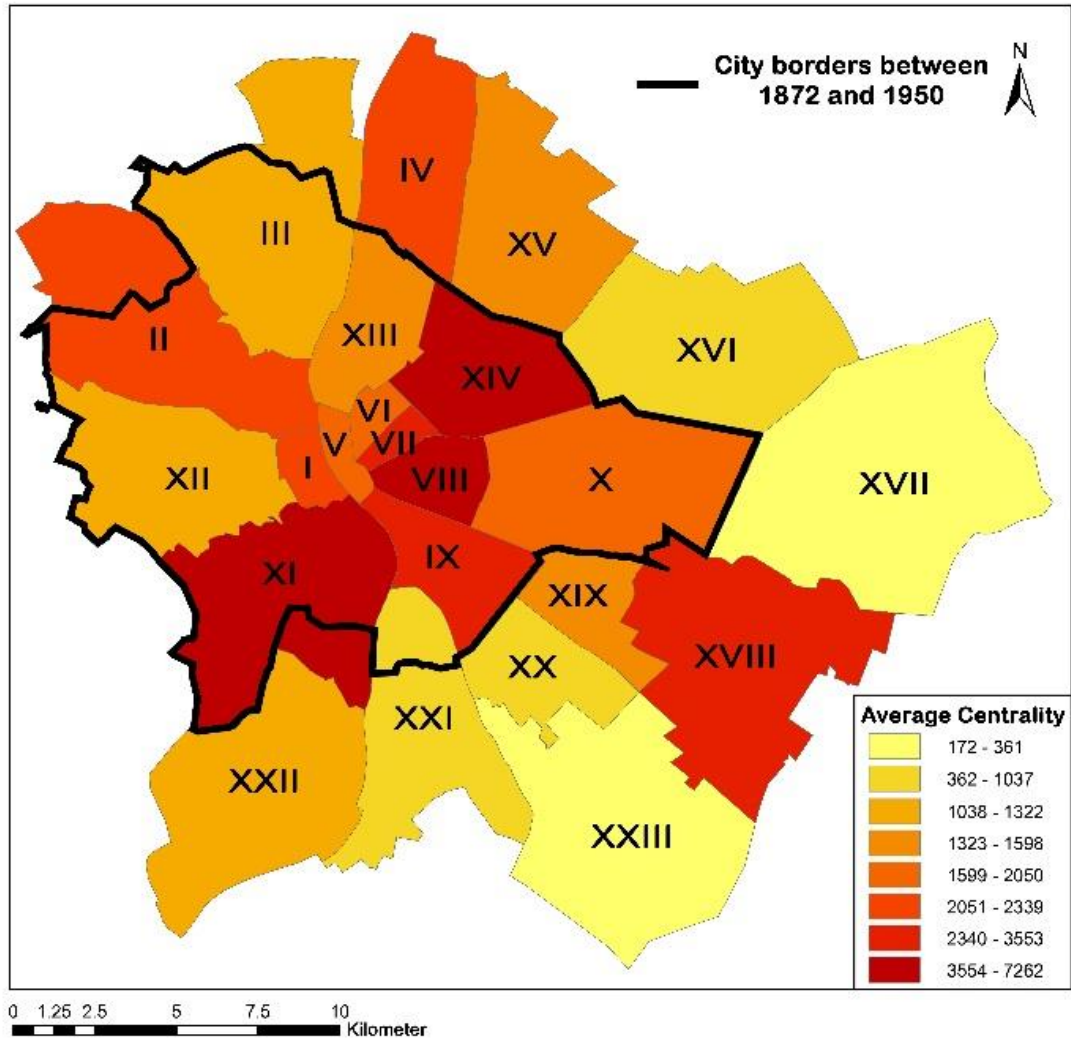
# Centrality Levels and Centers Classification



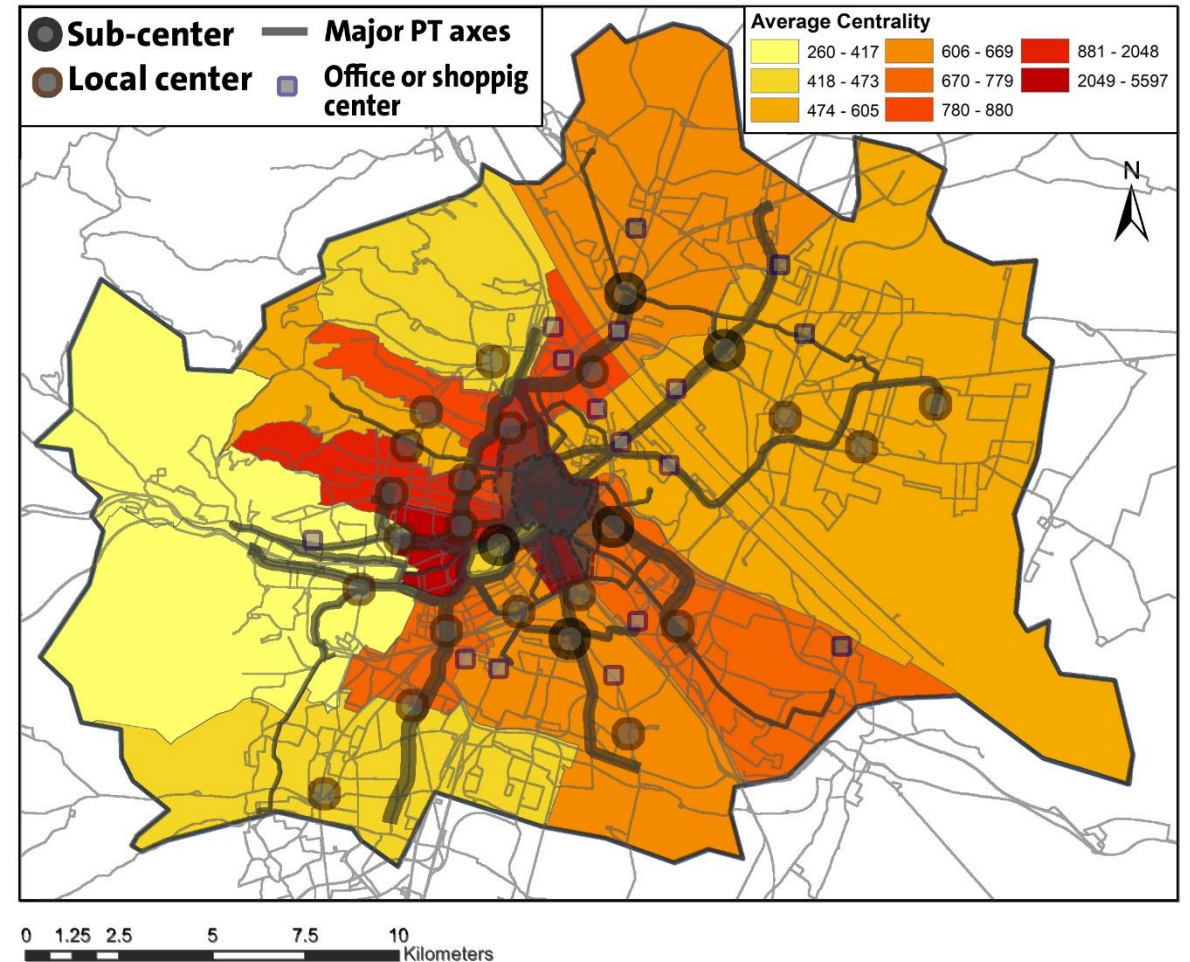
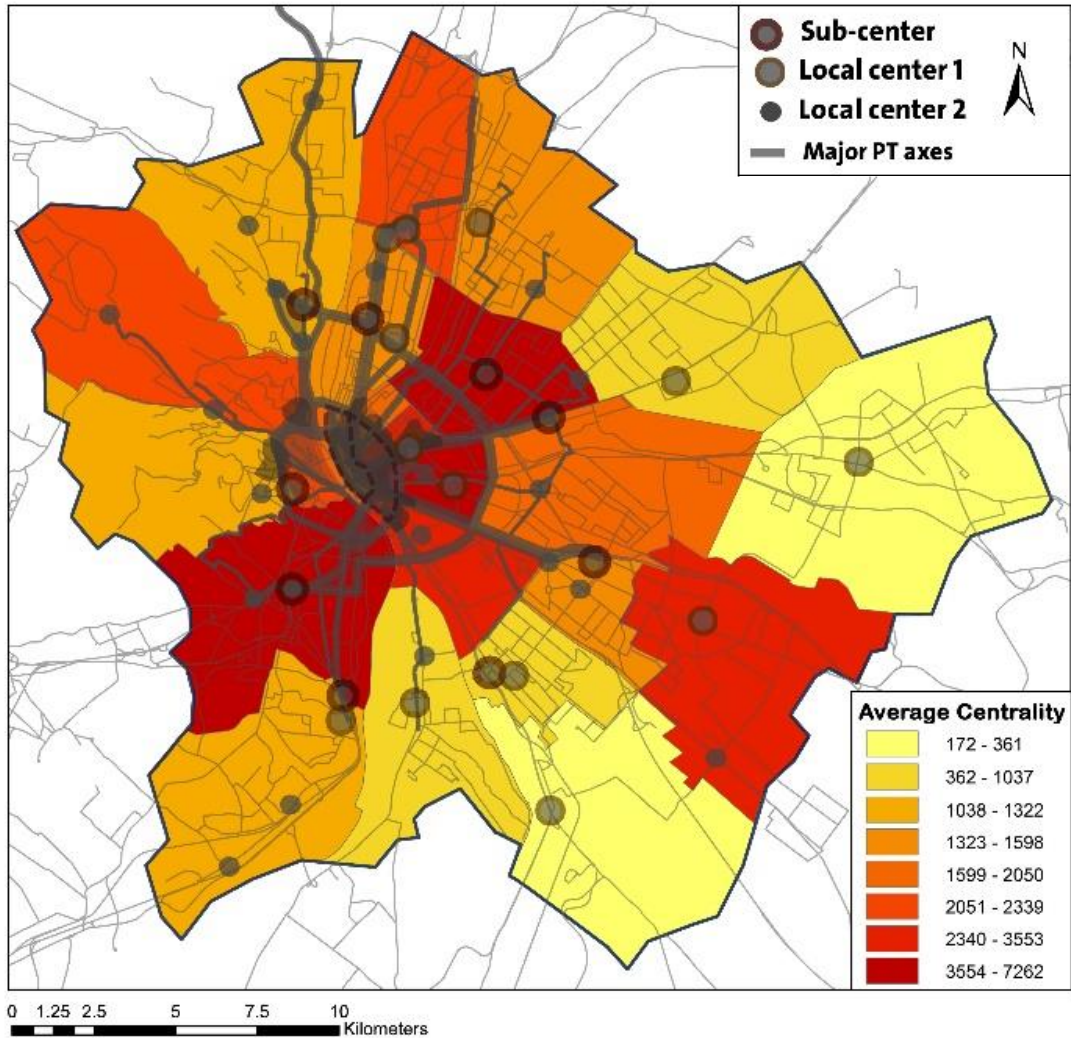
# Centrality Levels and Centers Classification



# Districts' Centrality Levels



# Districts' Centrality Levels



# Experts' Perspectives

11 Semi-structured Interviews – June – 1<sup>st</sup> Week of September/ 2024

## Interviewees

Spatial planning and regional development

Geography

Transport planning

Economics and business management

Urban planning

Landscape architecture

## Main Aspects

Centers and sub-centers definitions

The role of public transport networks in formulating the urban structure

Center attracts or networks generate?

Budapest main center – Vienna main center

Budapest sub-centers – Vienna sub-centers

Examples of local centers/ connections

Historical effect

Danube effect

Budapest structure – Vienna structure

SUMPs and Urban Development Plans

# Experts' Perspectives

11 Semi-structured Interviews – June – 1<sup>st</sup> Week of September/ 2024

## Hierarchy

land uses

commercial activities

## level of intersections and accessibility

network density

historical or urban  
development

demographic density

concentration of amenities

## Main Aspects

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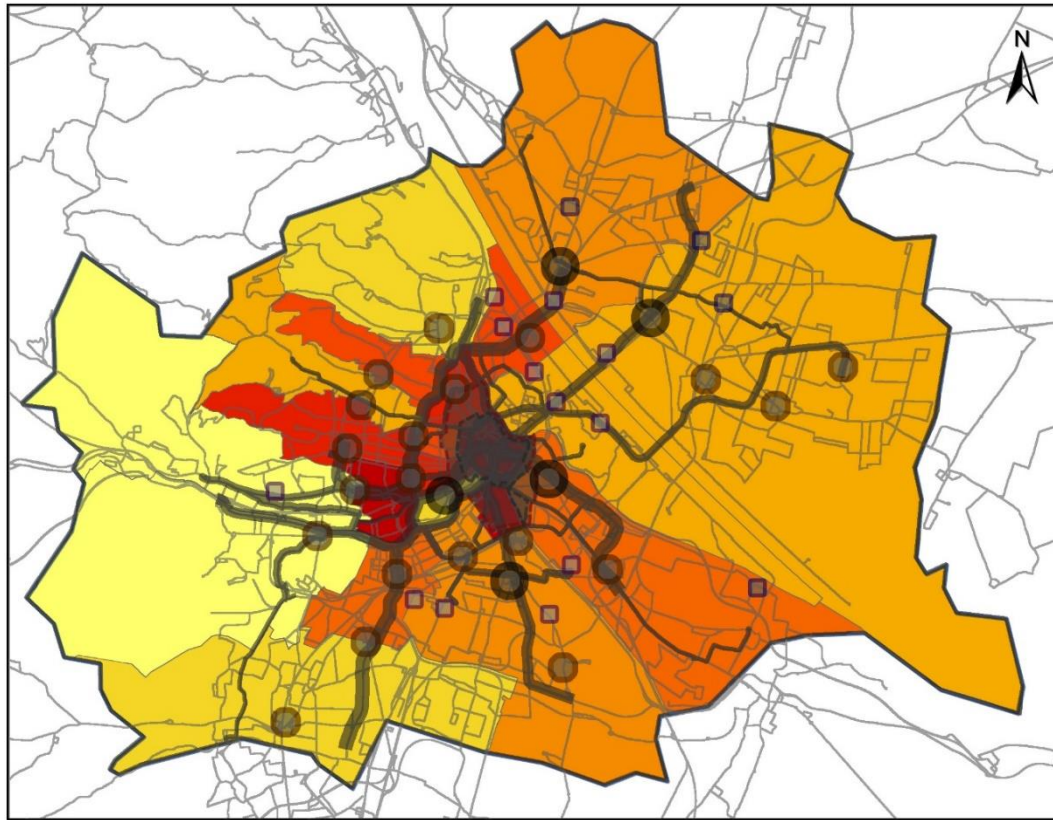


## Main Aspects

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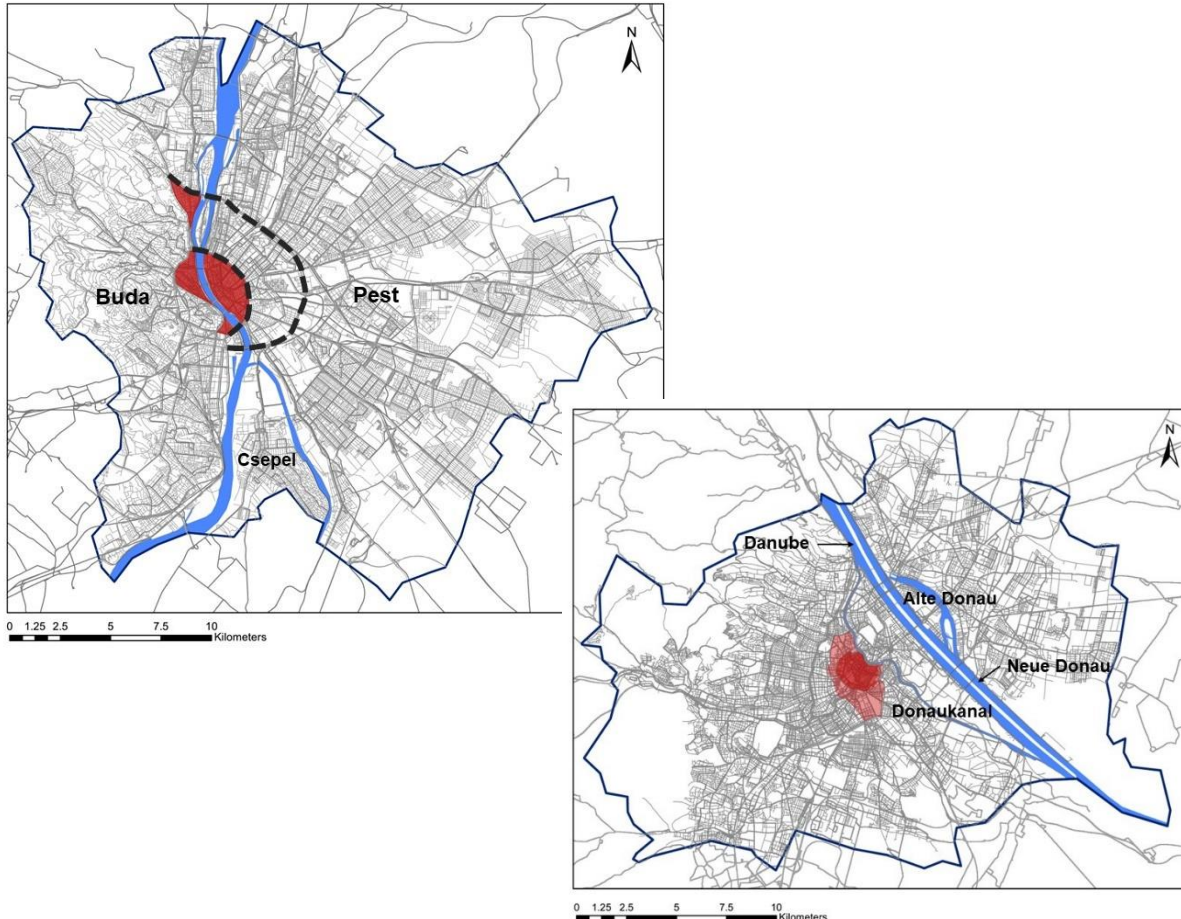
0 1.25 2.5 5 7.5 10 Kilometers

## Main Aspects

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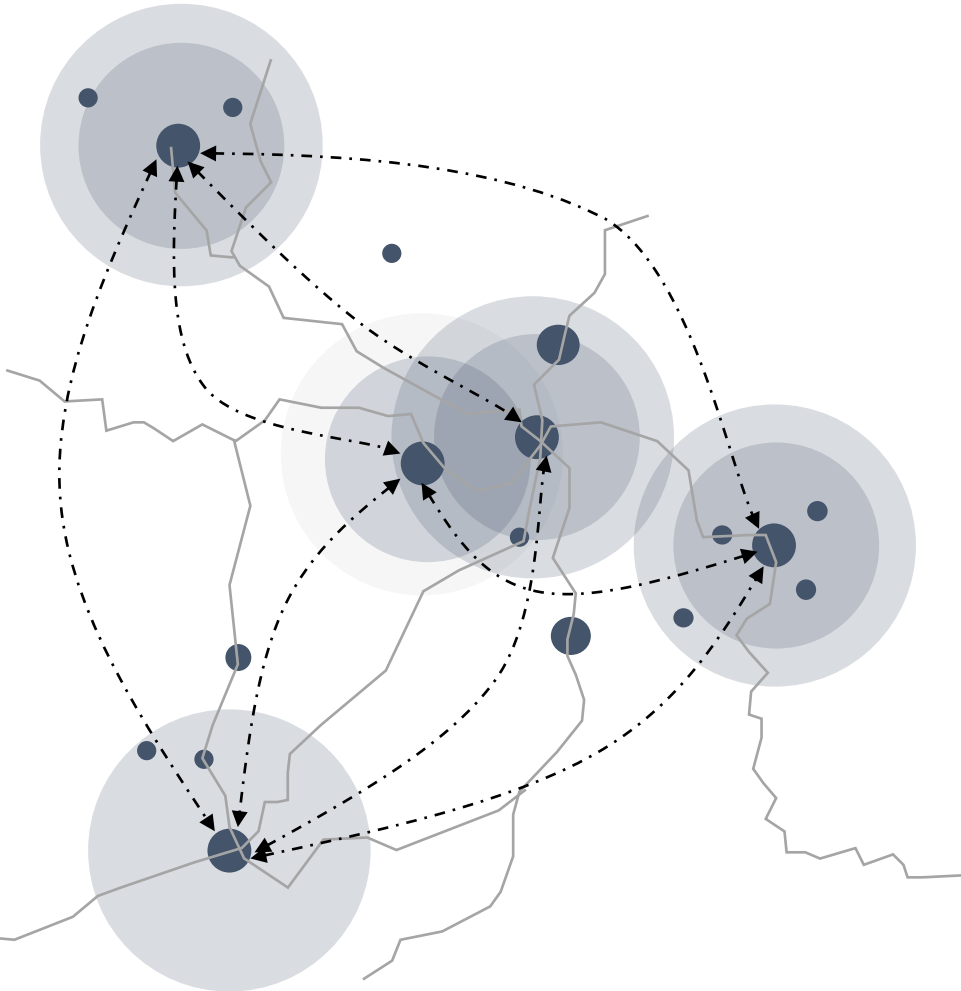


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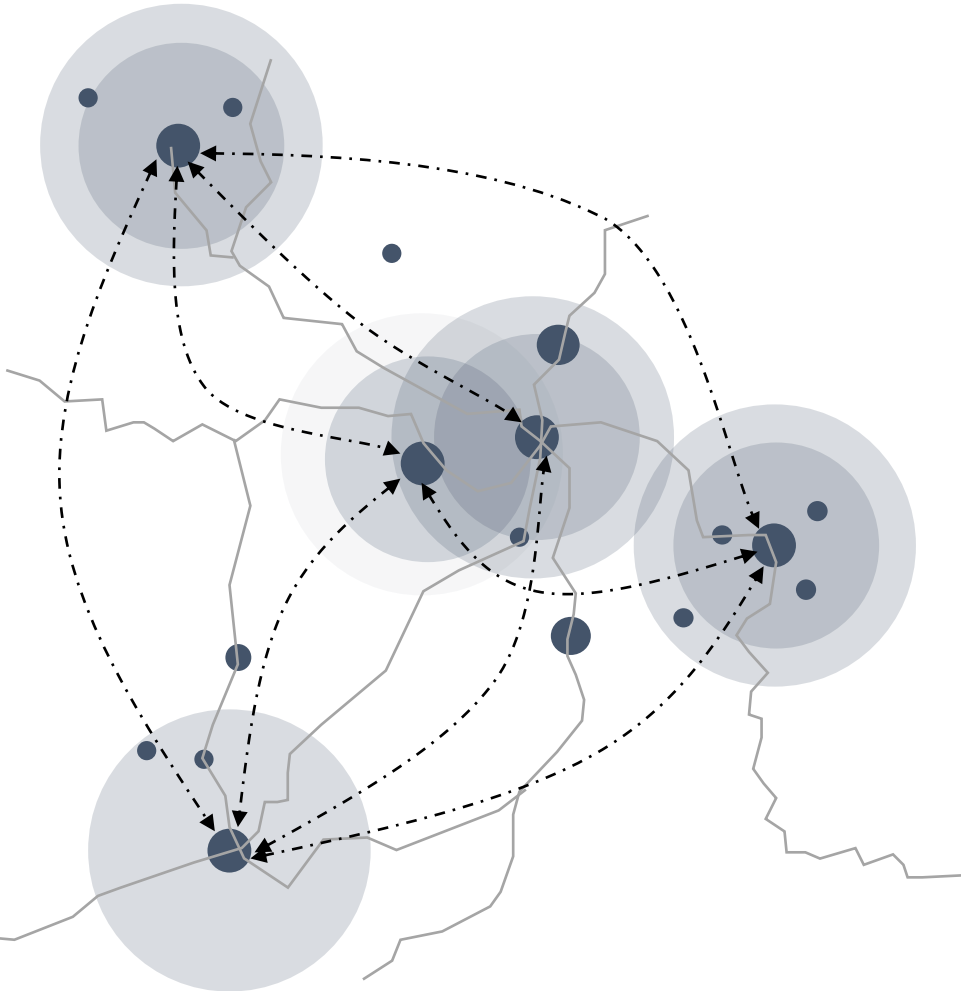
# Conclusion

- 1 The role of public transport and the functionality of urban spaces
- 2 The complexity of describing and defining the spatial organization
- 3 The issue of **hierarchy**, **polycentricity**, and different structural **dynamics**
- 4 Bridging quantitative centrality metrics with real-world planning and policy frameworks.
- 5 The importance of **integration** between **land-use** and **transport planning**

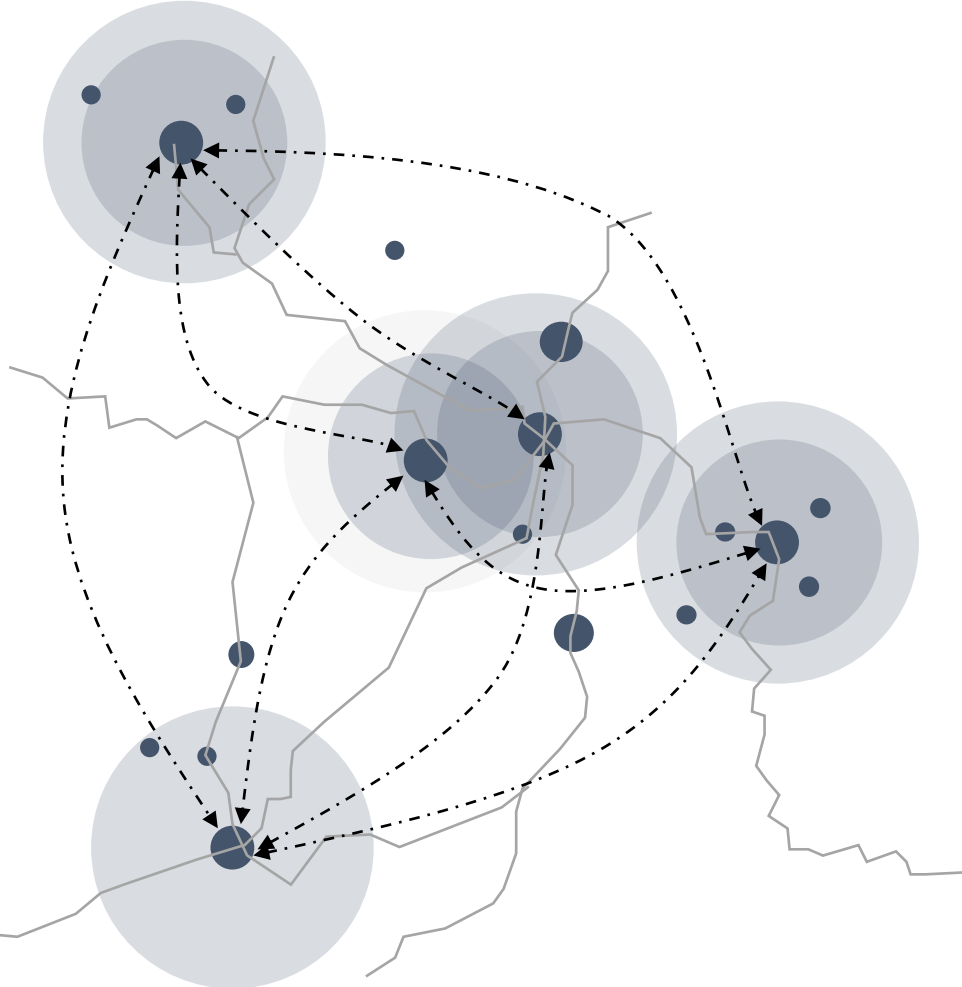


# Conclusion

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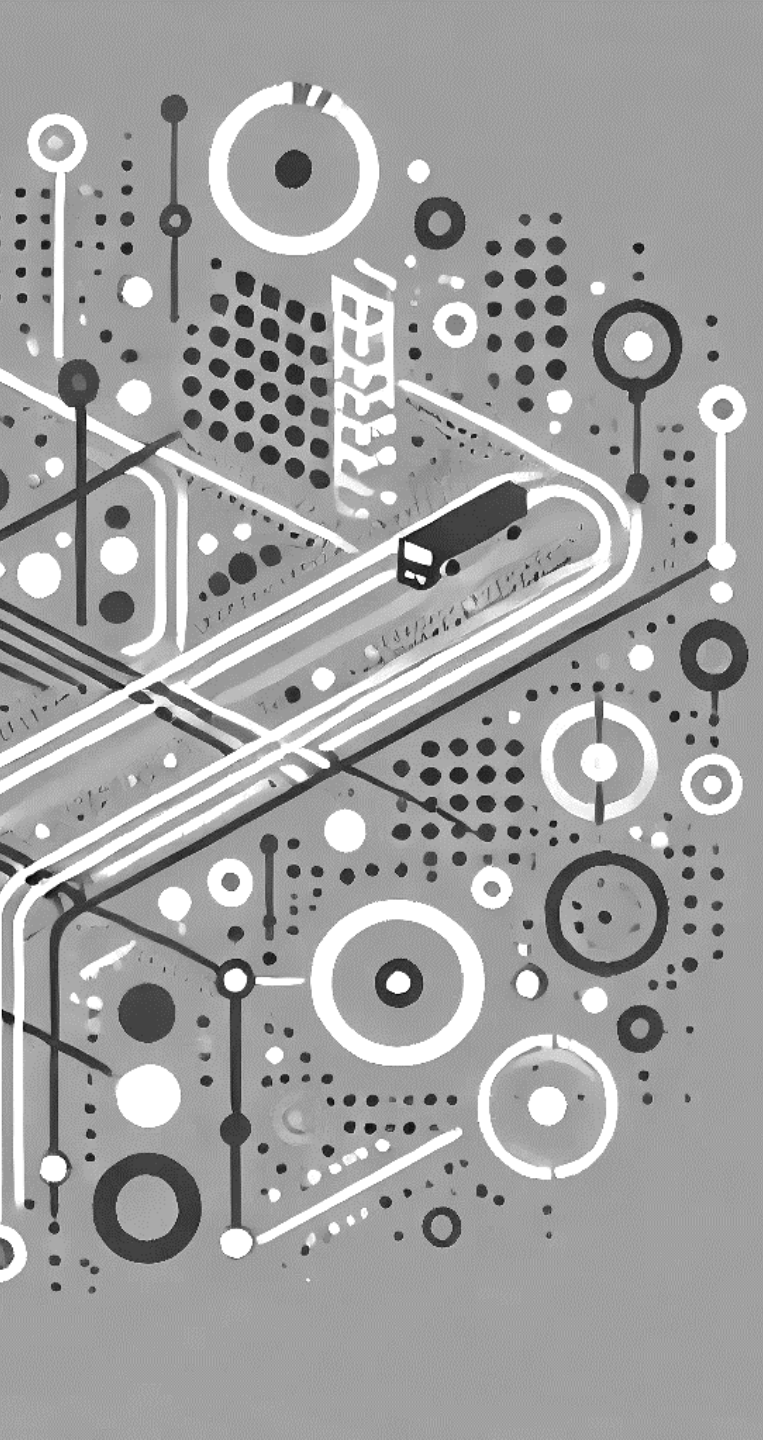


# Conclusion – What's next?

- 
- 1 The role of public transport and the functionality of urban spaces
  - 2 The complexity of describing and defining the spatial organization
  - 3 The issue of **hierarchy, polycentricity,** and different structural **dynamics**
  - 4 Bridging quantitative centrality metrics with real-world planning and policy frameworks.
  - 5 The importance of **integration** between **land-use** and **transport planning**

Developing practical criteria for classifying urban centers by their public-transport centrality.

These guidelines will help planners craft more connected, equitable, and resilient city networks.



**Thanks for your attention!**  
Looking forward to your questions and comments 😊

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