



# Identifying visitors' spatiotemporal profiles using smart card data

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***Efterfrågestyrning för minskad trängsel i stadstrafiken från resenärsgupper***  
***Demand management for reduced congestion in urban traffic from groups of travelers***

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# Outline



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- 
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# Background

Contributing to the local and national **economy** (Visit Stockholm, 2023):

- Revenues of SEK 57 billion
- 101,000 people employed in the tourism sector

Stockholm County is ranked as the **13th** most visited destination in Europe

**“Crowding and congestion”** are reported as the two most **problematic** aspects related to visitors



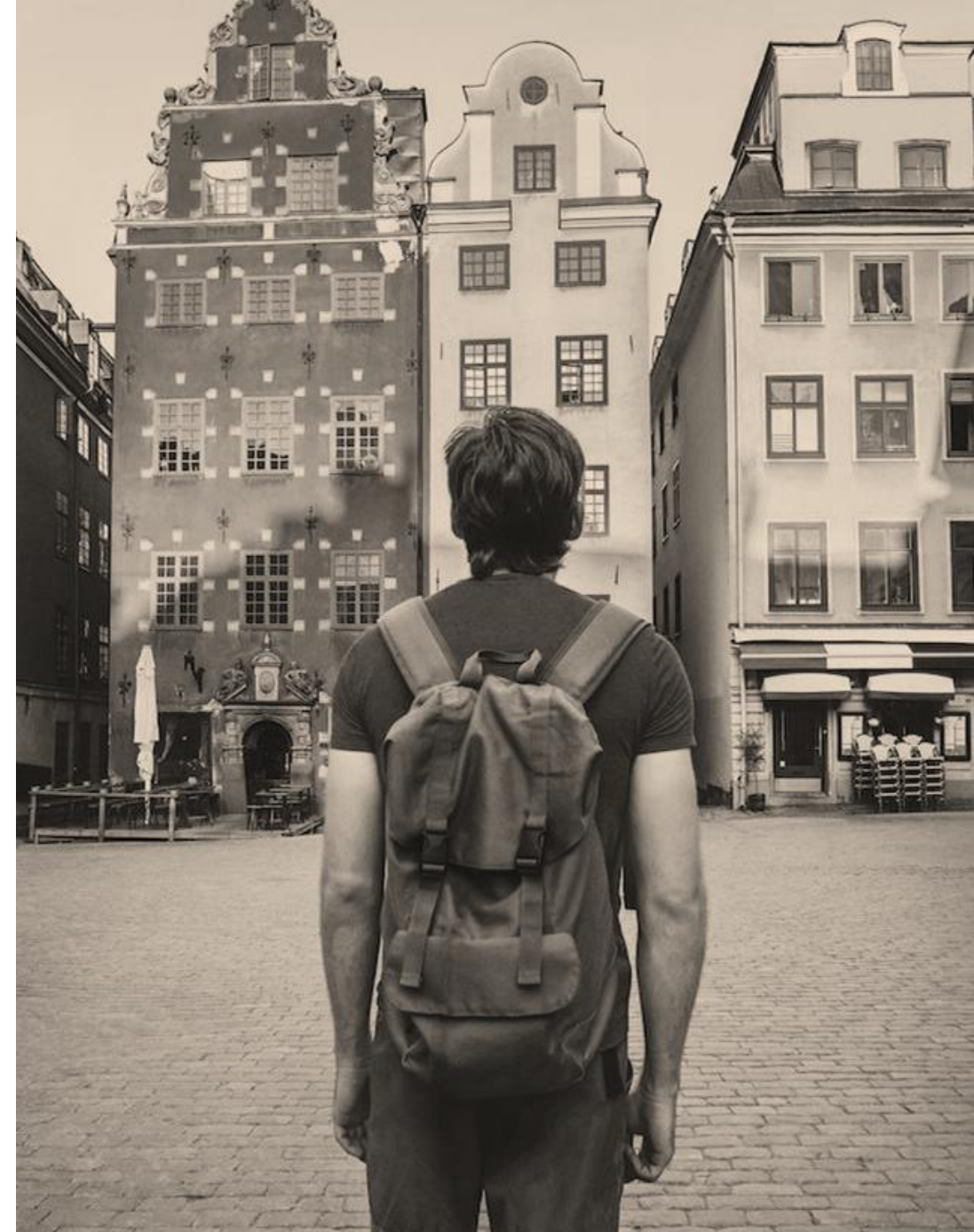
Swedes account for 2/3 of overnight stays



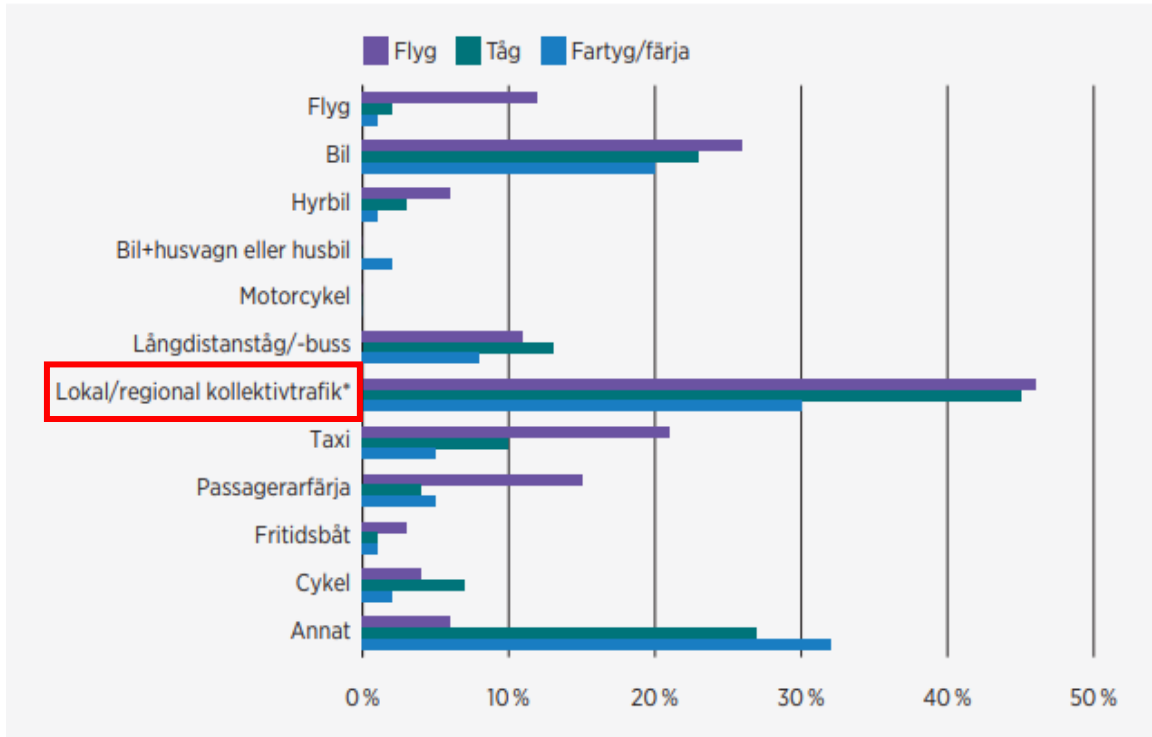
2.7 nights is the average overnight stay



*“ Been here before / wish to return ”*



# Mobility of visitors



Source: Swedish Agency for Economic and Regional Growth (Facts about Swedish Tourism (2020))

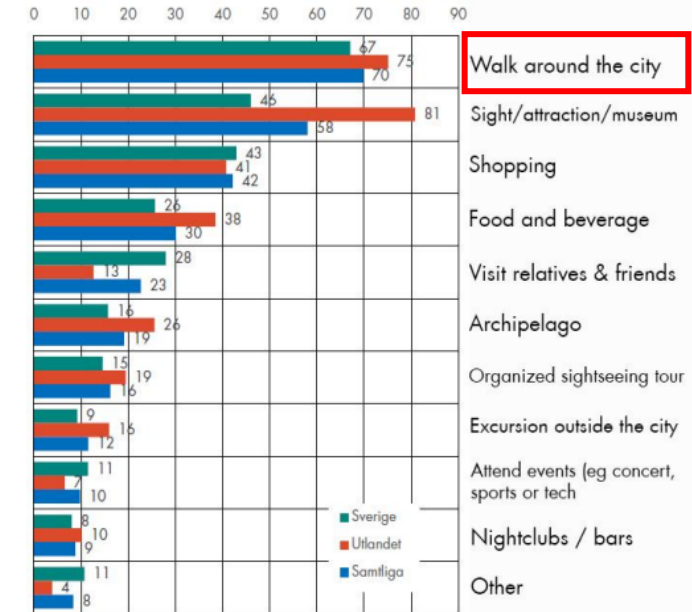


Chart 4: "Activities during the stay". The visitor's experience of Stockholm. Visit Stockholm 2022

- **Public transport** is the most common means of transport for visitors in Sweden (for visitors arriving by air/train)
- Almost **50%** of the visitors by air or train **use public transport** during their visit
- Active transportation (**walking**) is an important component of visitors' mobility

# Identifying visitors using smart card data

It is **not** trivial (Lin et al., 2023)



Visitor



Resident

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## Criteria for identifying visitors



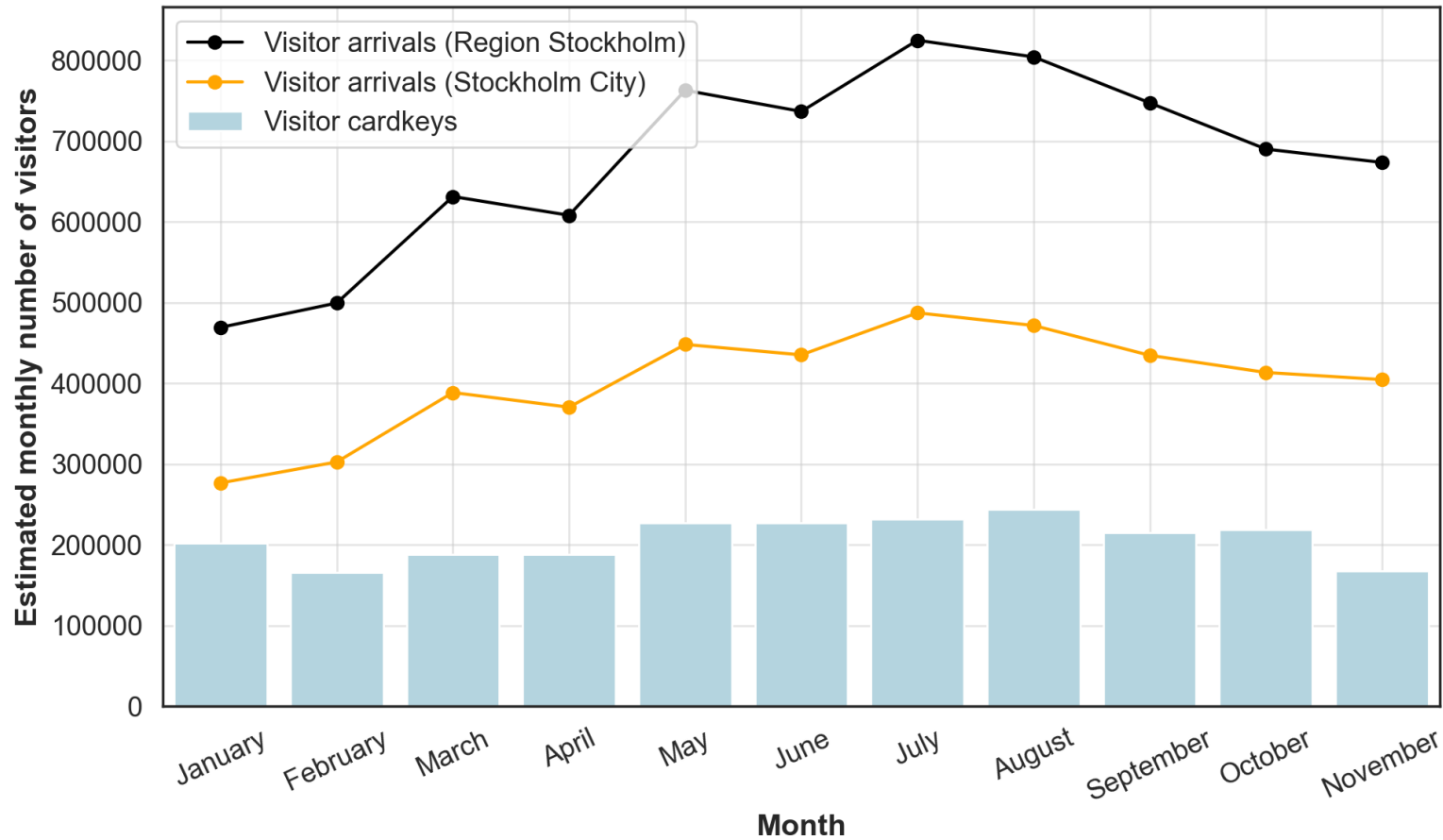
Appear once (1-time visitors)  
Active for less than 7 successive days (week)



They use the visitor fare product (1, 3, 7-day ticket)

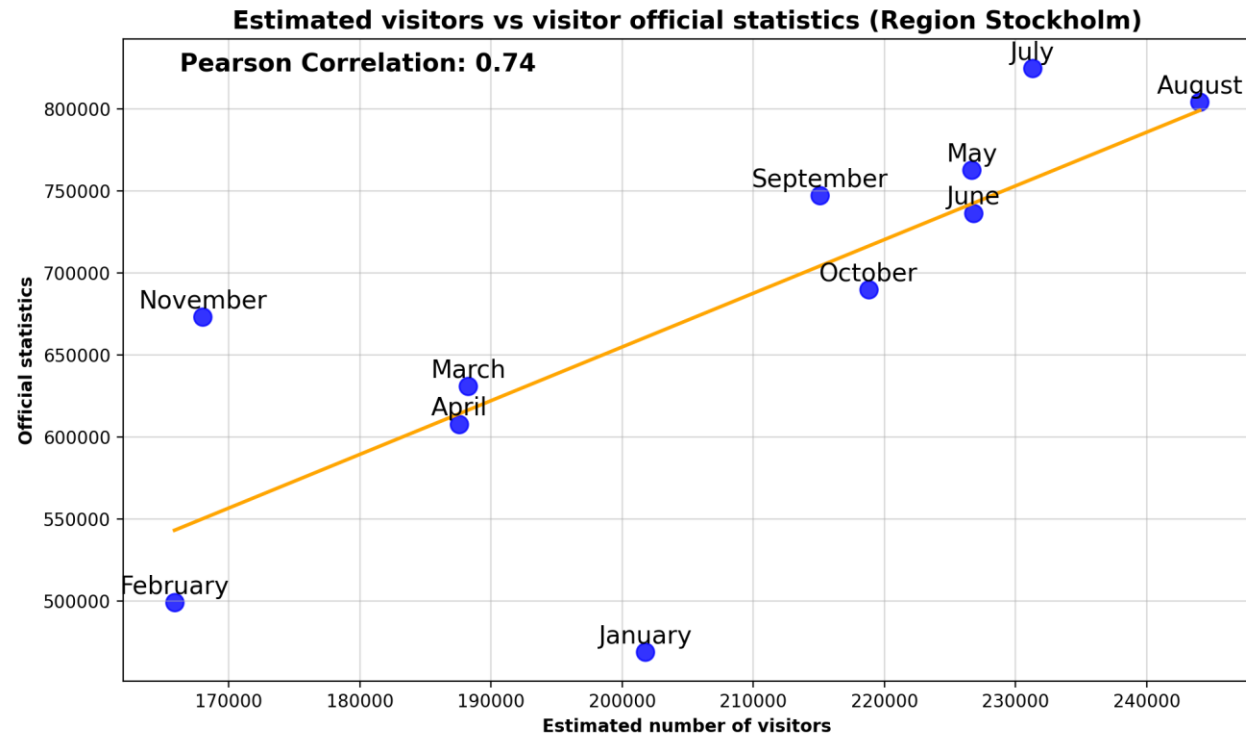
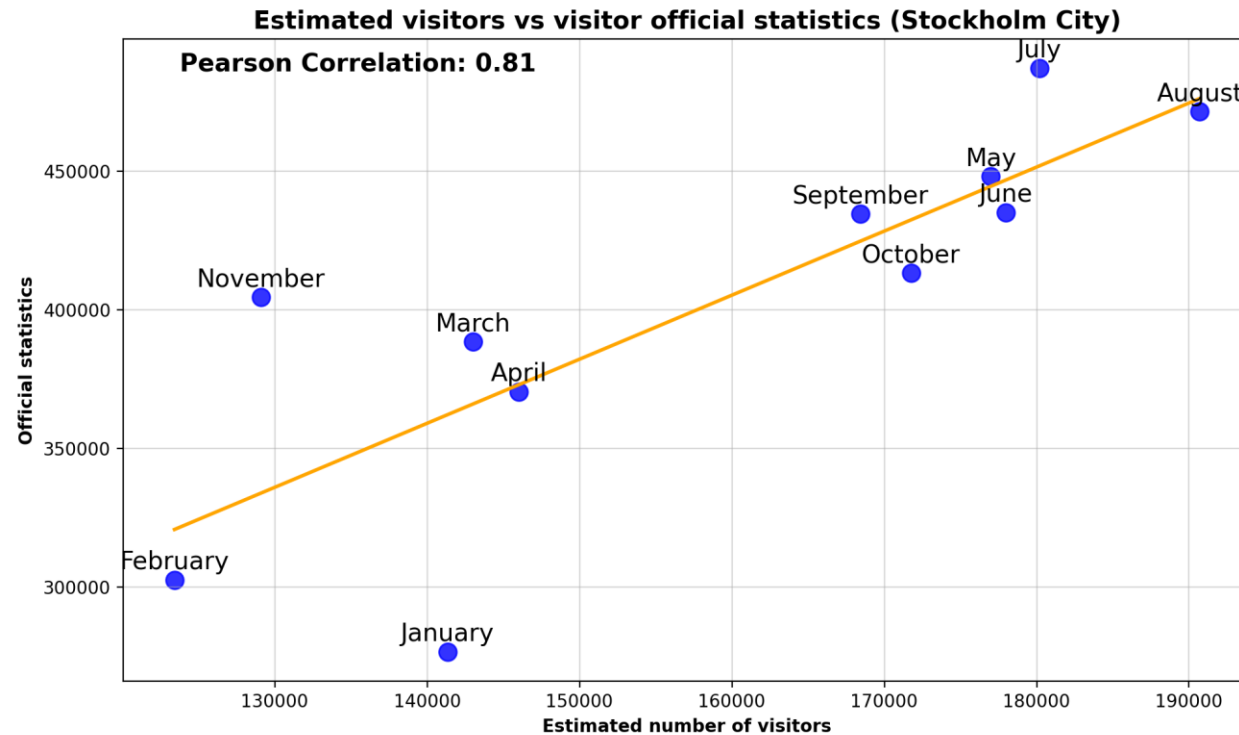


# Visitors in numbers (2023)



- Region Stockholm has low visiting seasonality ([Eurostat, 2024](#))
- **July** and **August** are the top 2 months in terms of visitor arrivals

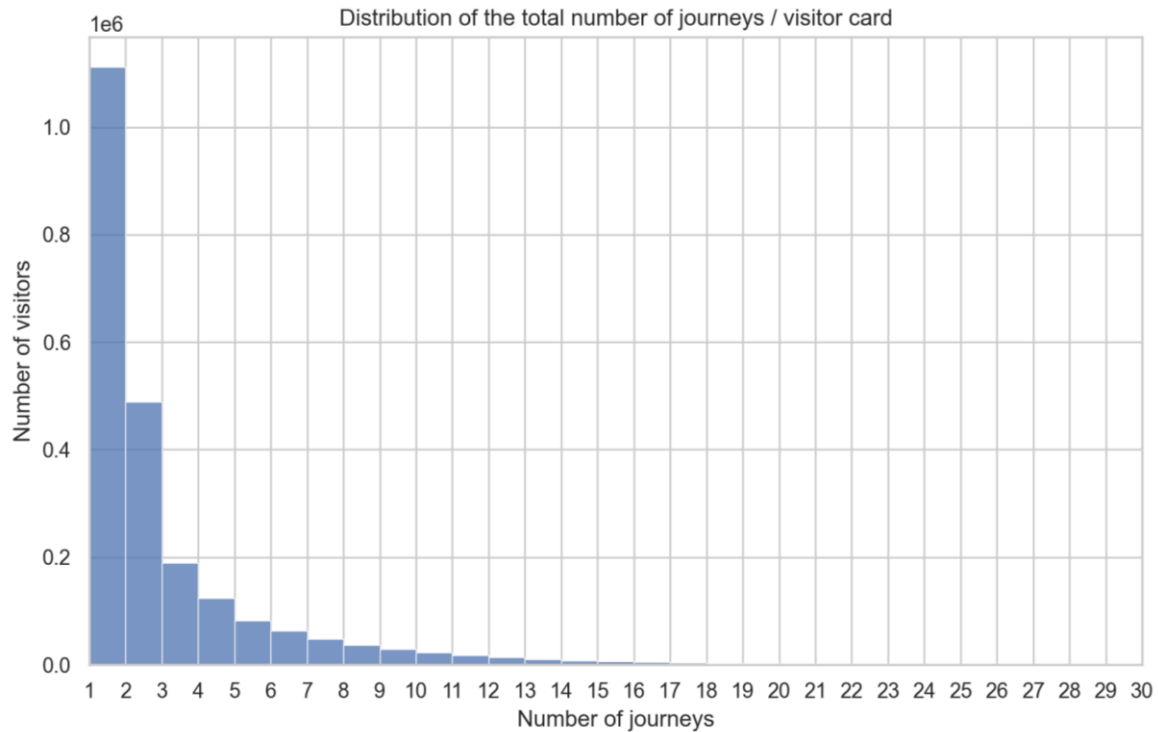
# Visitors in numbers (2023) (estimations vs official statistics)



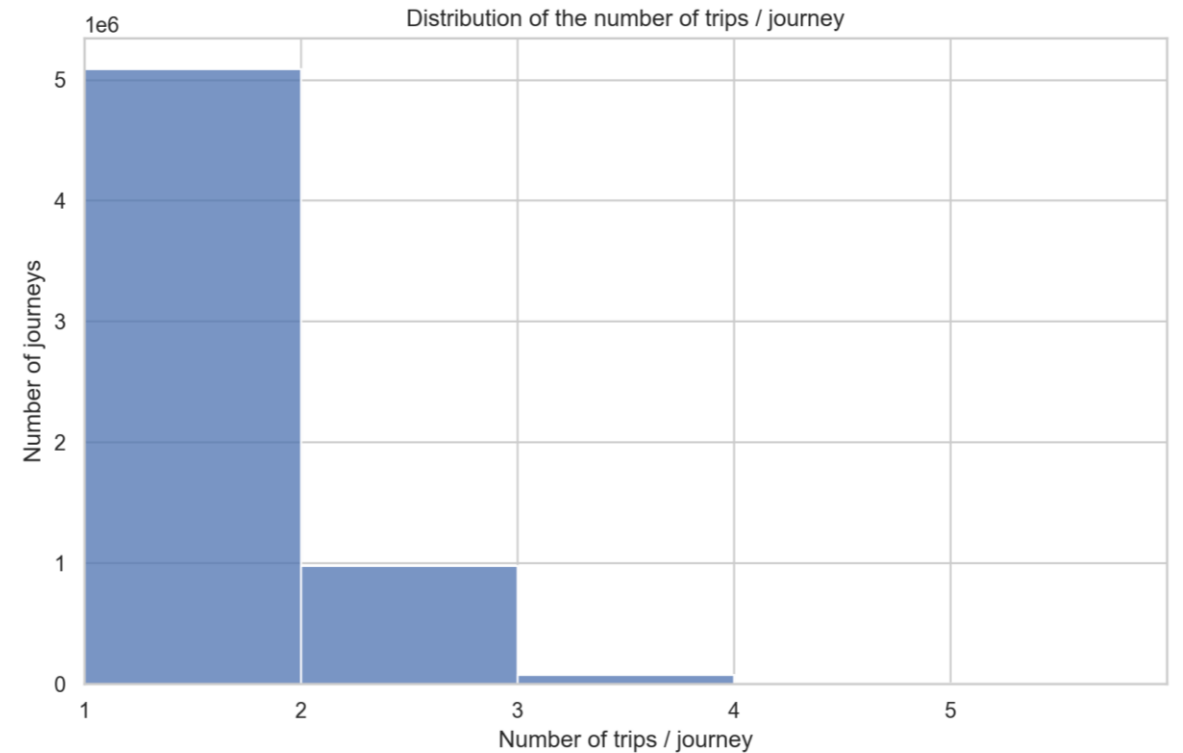
In both cases, correlation results show a **strong positive relationship**



# Preliminary results – activity-based attributes

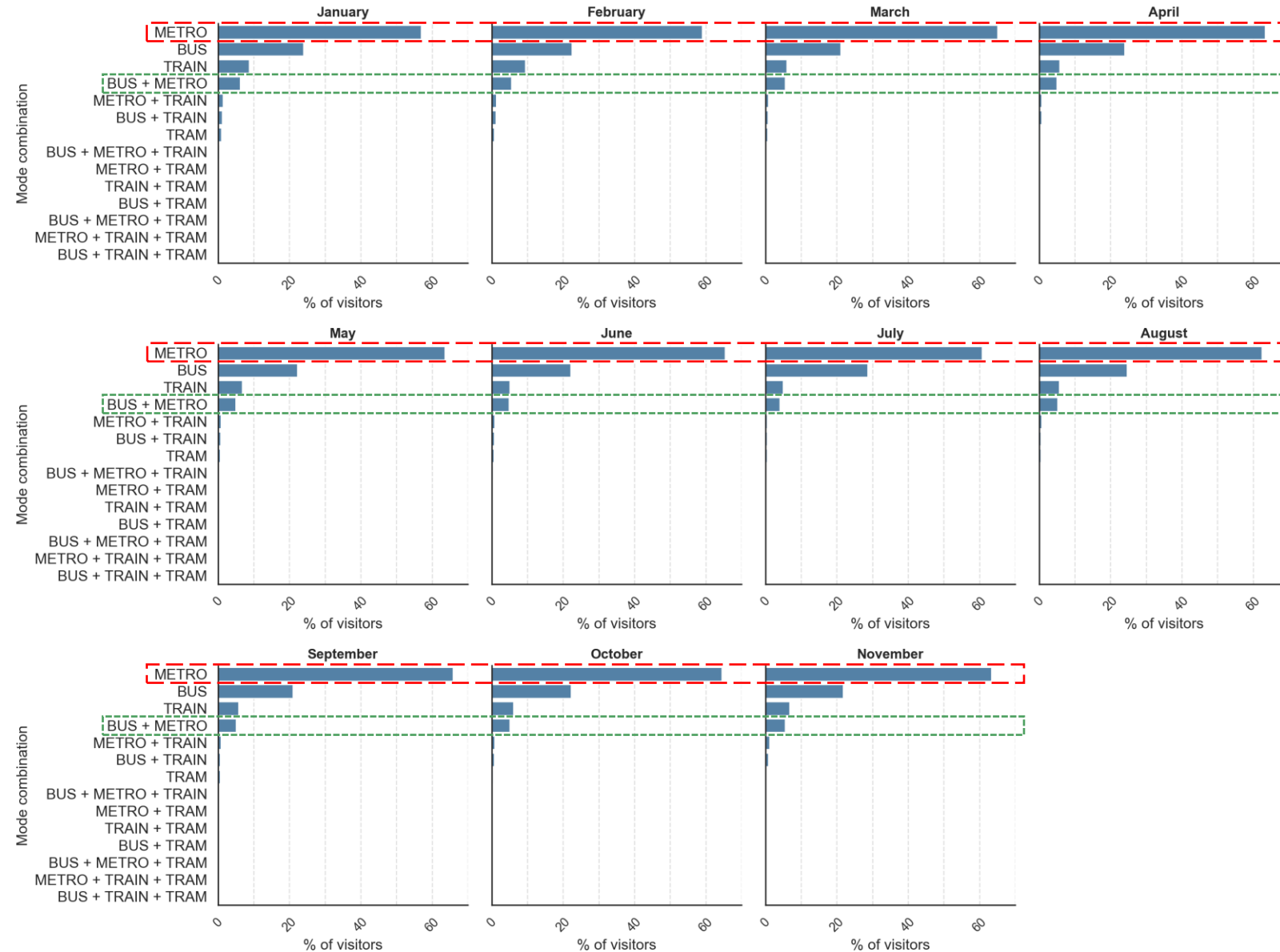


**49%** of identified visitors have a single PT journey



**70%** of visitors' journeys are transferless

# Preliminary results – activity-based attributes



**Metro** is the most popular PT mode throughout the year (**63%** of identified visitors)

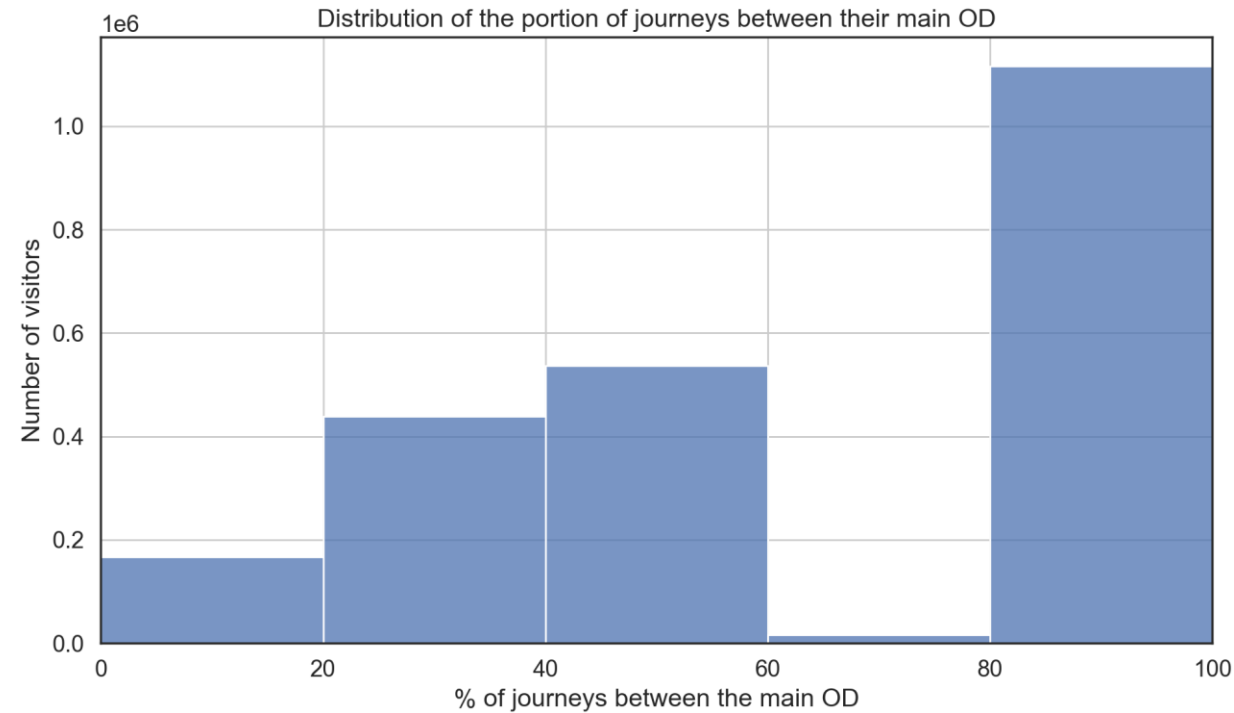


**Bus and metro** is the most popular mode combination (**5.3%** of identified visitors)

# Preliminary results – spatial-based attributes

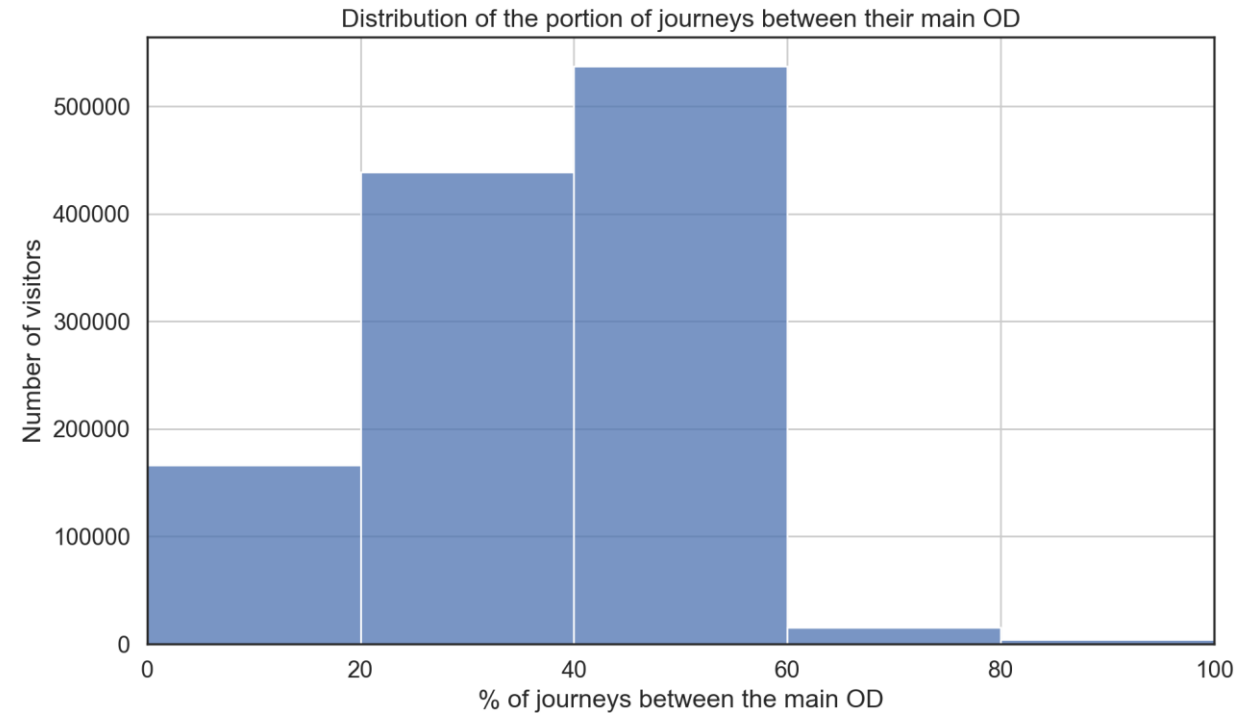


## All visitors



Most visitors travel within their main OD  
But...**49%** of visitors have a single PT journey

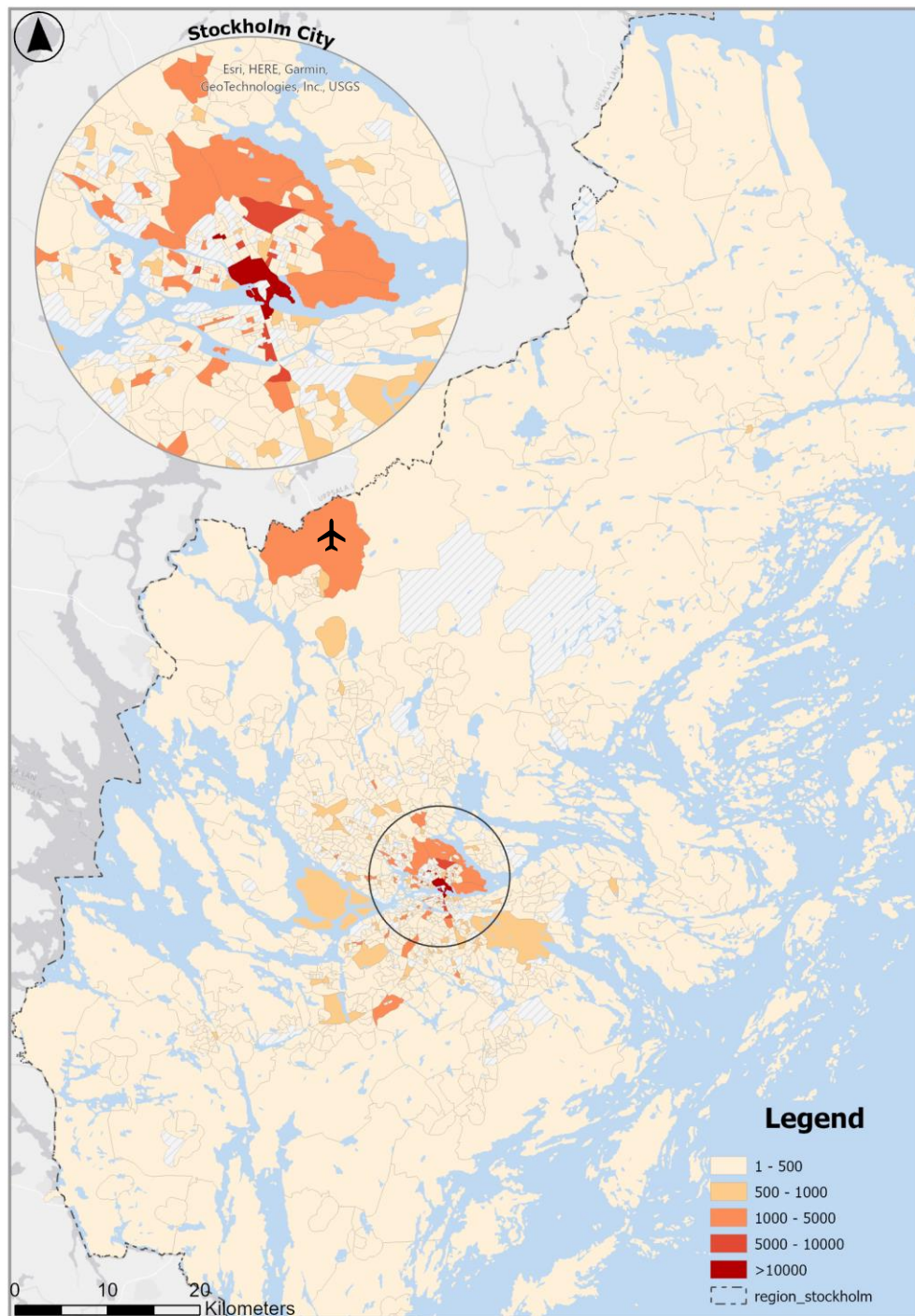
## Visitors with more than 1 PT journeys



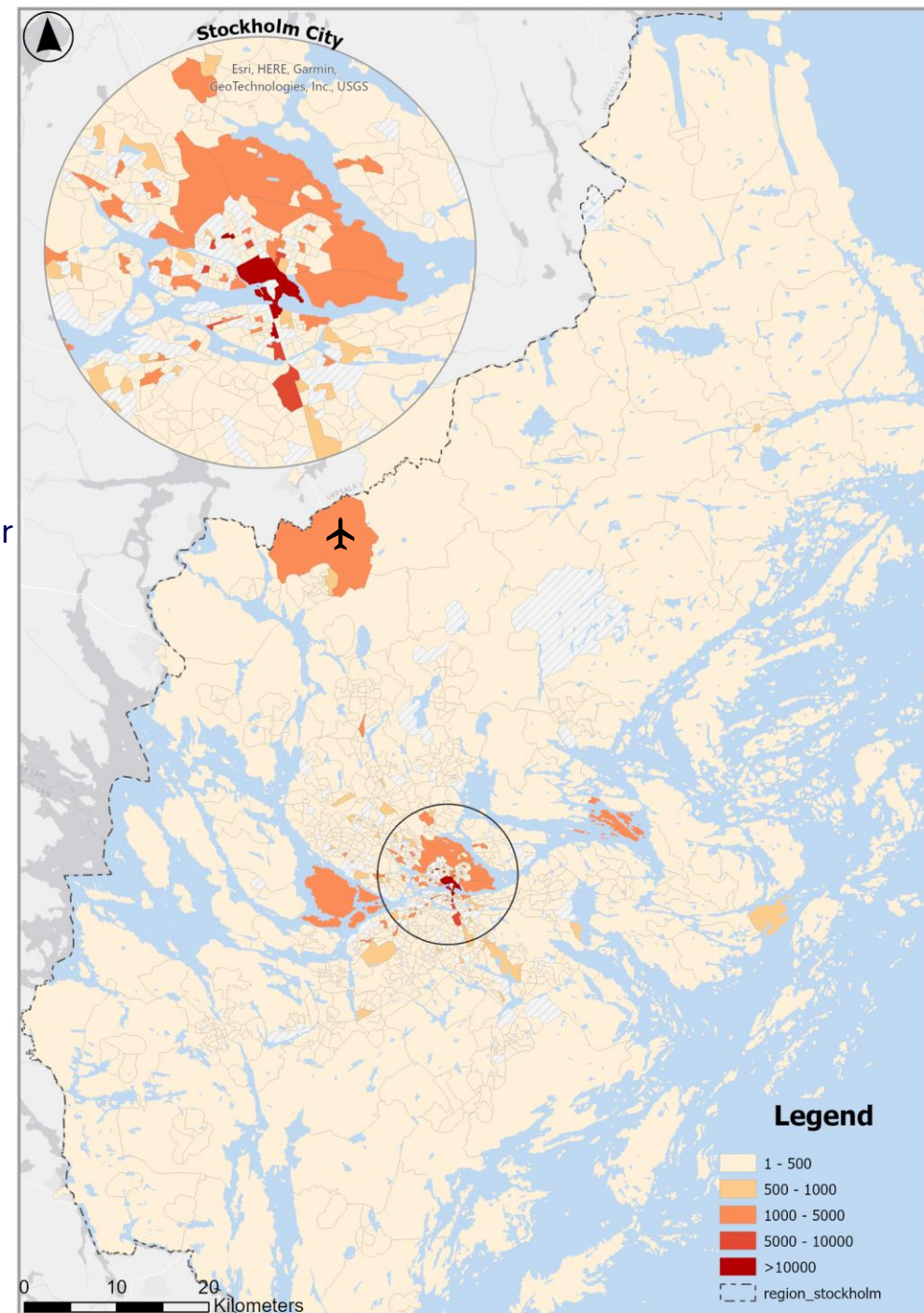
**54%** of visitors travel within their main OD for up to 40% of the time

More **explorative** visitor profiles pop up!

Geographical  
spread of visitor  
journeys  
(January)



Geographical  
spread of visitor  
journeys  
(July)



# Discussion and next steps (visitors)



Identify visitors' profiles using a **clustering** technique (e.g., k-means, DBSCAN)



Account for various attributes:

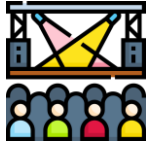
- Activity-based
- Spatial-based



**Improve knowledge** of how different groups of visitors contribute to public transportation crowding



## Part II: Special events



Sporting events, festivals, concerts in multi-use venues (e.g., arenas)



Contribution to the Swedish GDP (SEK 25 Billion in 2023)



High number of ticket sales, especially after the pandemic (24M tickets for 75,000 events in 2022)

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Understand the **network-wide** public transport **crowding** and traffic **congestion** impact



Propose relevant **demand management strategies**, reducing crowding and congestion



# References



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# Thank you for your attention!

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