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Architectural Strategies for Flood Mitigation in Urban Environments: A Study of Traditional Elements and Contemporary Resilience

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Unveiling the Interplay: Flood Impacts on Transportation, Vulnerable Communities - Data, and Methods

Seyedeh Negar Naghedi, Farzad Piadeh, Kouros Behzadian, Moein Hemmati

Introduction

- Human mobility is highly vulnerable against natural hazards
- Floods affect more people worldwide than any other hazards



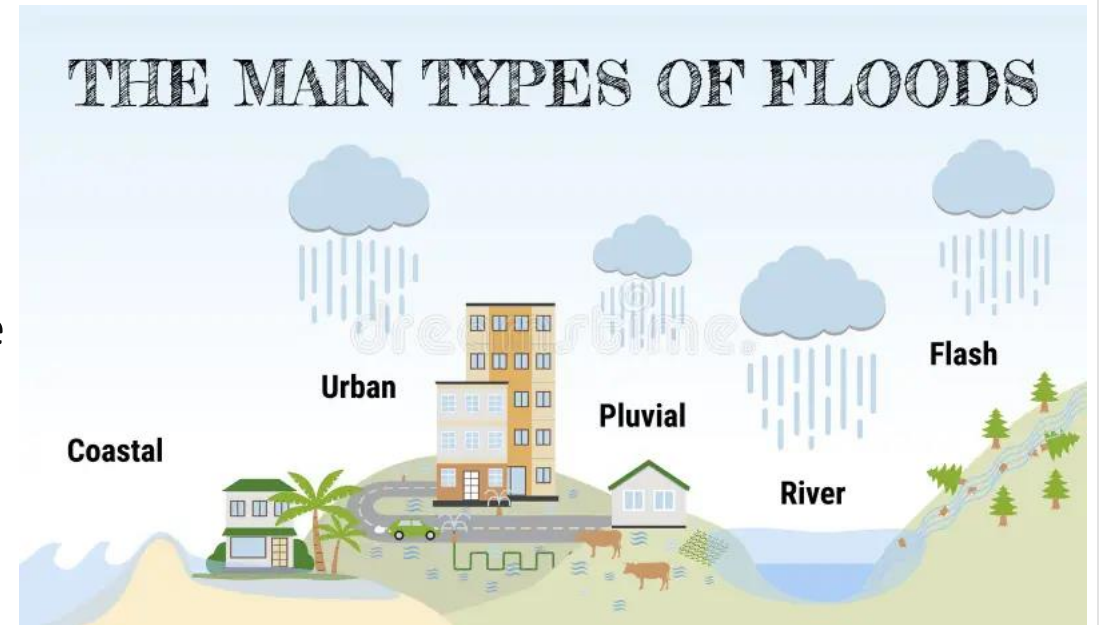
Overview of the study

- An extensive review: more than 4600 papers at the first step
- First round of review: decreasing the number to 413
- Final references: 139
- Considering both flooding and transportation together, data types and methods

Search within Article title	Search documents * transport OR road OR traffic
AND	
Search within Article title, Abstract, Keywords	Search documents flood OR extreme OR disaster OR rainfall
AND	
Search within Article title, Abstract, Keywords	Search documents impact
AND	
Search within Article title, Abstract, Keywords	Search documents pluvial OR runoff
AND NOT	
Search within Article title, Abstract, Keywords	Search documents sediment

Flooding sources

- Pluvial
- Riverine
- Flash flood/Storm surge
- Coastal
- Snow melt



Flooding Impacts on the transportation

1. Accessibility

- a. Road accessibility
- b. Infrastructure accessibility
- c. Emergency response access



2. Disruptions

- a. Traffic flow disruptions
- b. Public transit disruptions



Flooding Impacts on the transportation

3. Infrastructure damage

- a. Transportation infrastructure damage
- b. Road safety



4. Indirect / Sequential

- a. Economic costs and productivity losses
- b. Impacts on vulnerable populations
- c. Long-term resilience and adaptation



Methods Used in the literature

1. Spatial analysis
 - a. Static network analysis
 - b. Dynamic network analysis
 - c. GIS-based analysis
2. Decision Support System (DSS)
 - a. MCDM/MADM
 - b. Discussion
 - c. Decision tree framework
3. AI based
 - a. Machine learning (ML)
 - b. Deep learning (DL)
 - c. Datamining (DM)

Types of the data used

4. Location characteristics

- a. Demography
- b. Buildings
- c. Land use/ Land cover

5. Mobile based

- a. Mobile phone signals
- b. Smartphone apps

6. Text / Video content

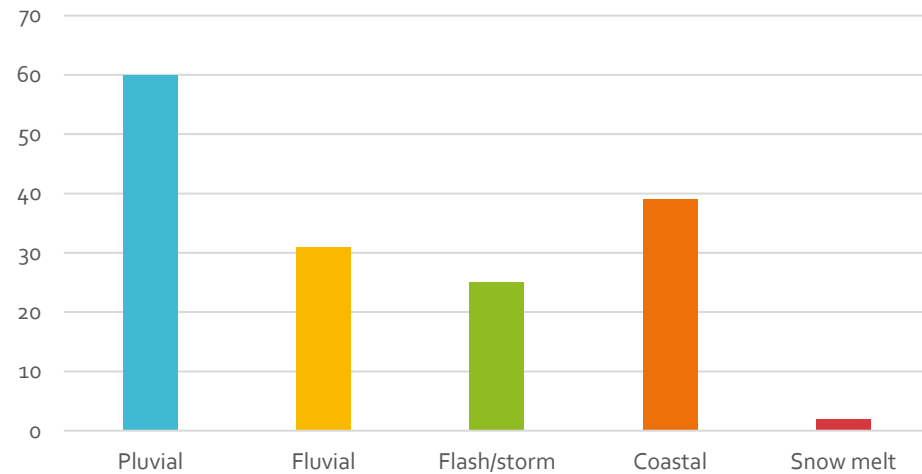


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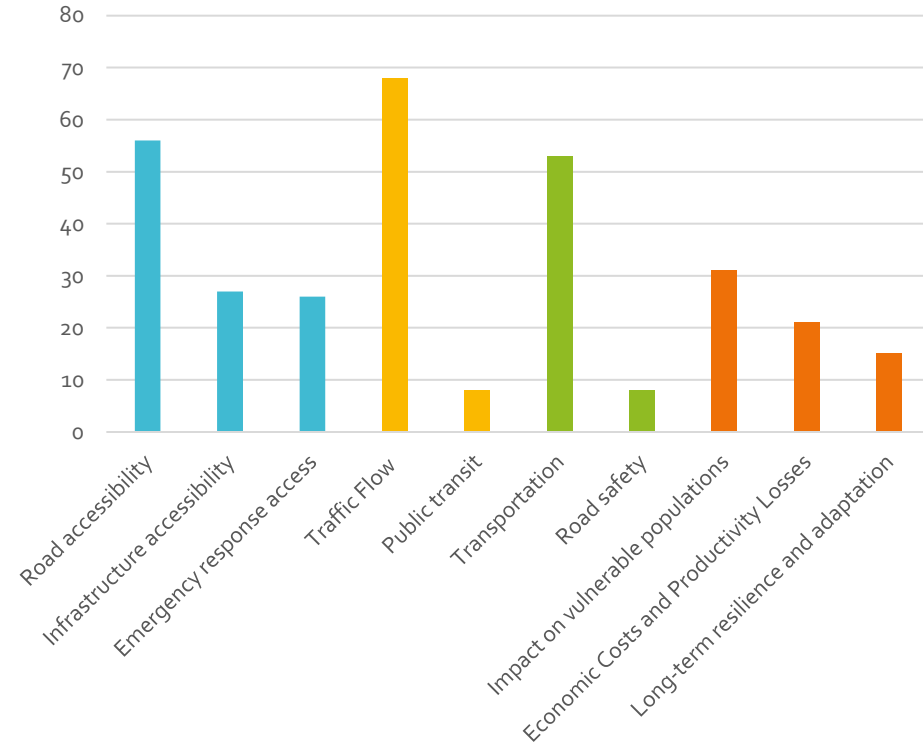


Results: Flood types and the impacts

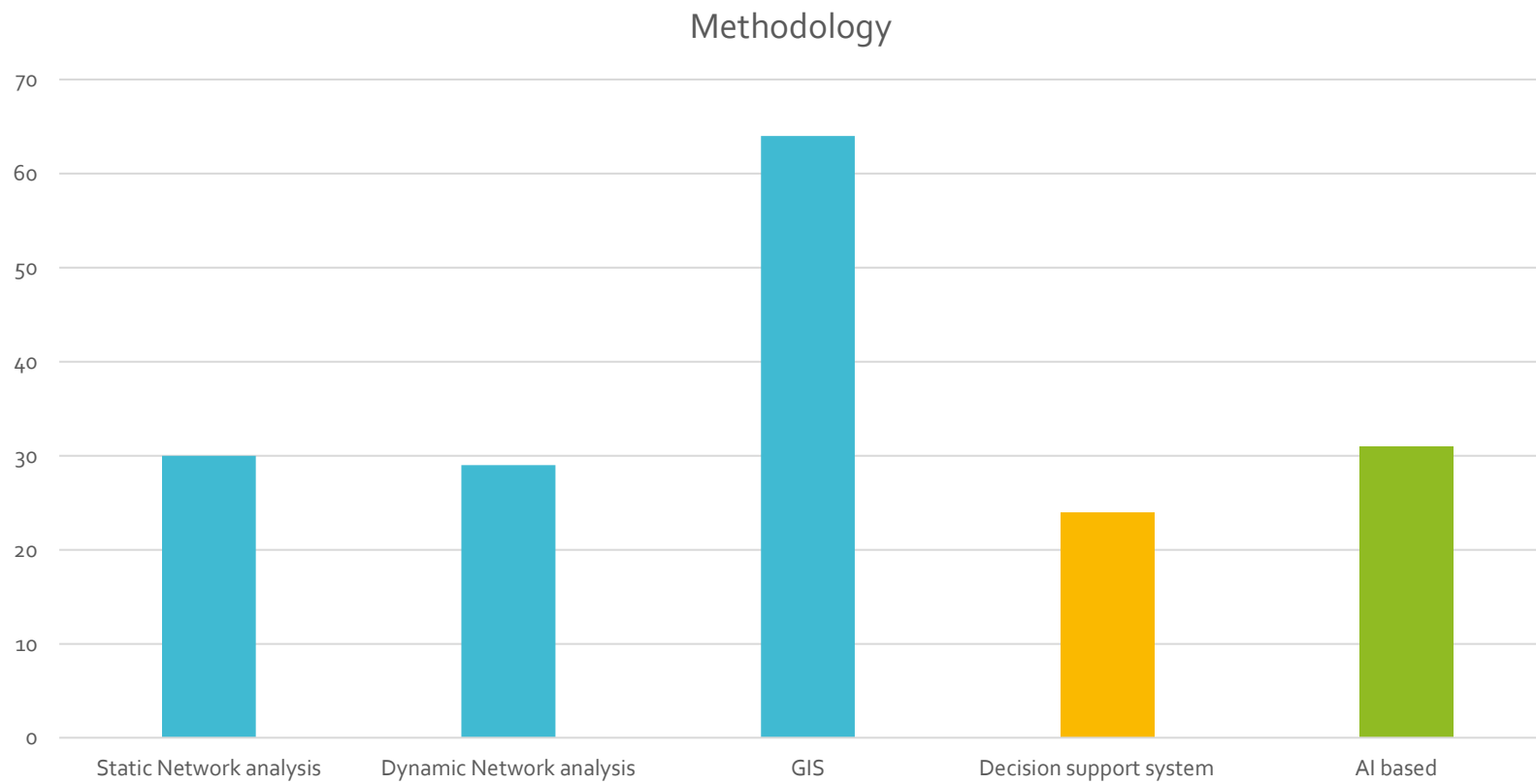
Types of flooding



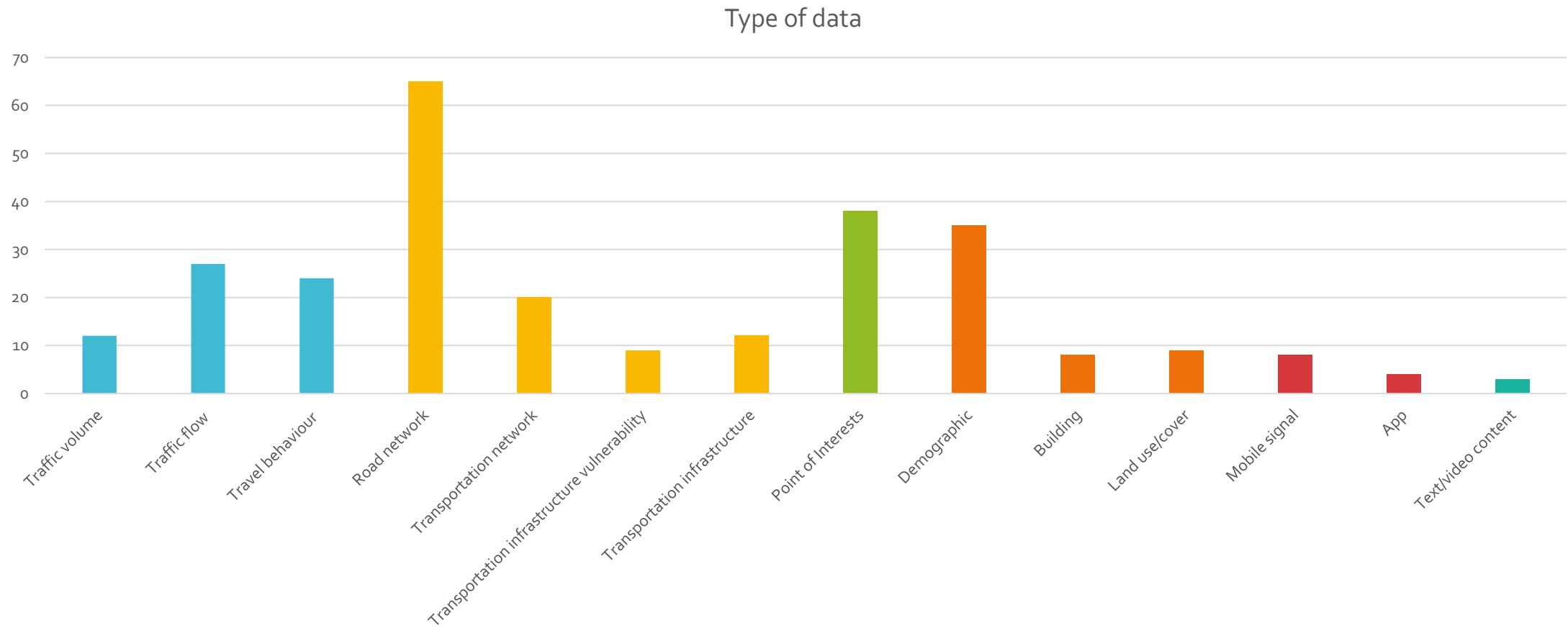
Type of the flood effect on the transportation



Results: Methods used



Results: Data type



Conclusion

- Most of the researches (%80) are in local scale
- AI based methods are used in fewer papers, however, it has a growing rate in the recent years
- Most of the flood types are Pluvial flooding, showing the impact of more probable floods on the transportation (less devastating)
- Mobile based data has a small share of the data types, though there is a high capacity for these type of data in AI based analysis



Thank you!