ON THE POTENTIAL OF INTEGRATED MULTI-UTILITY ASSET MANAGEMENT IN URBAN WATER MANAGEMENT

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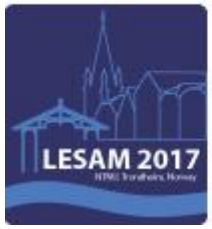

LESAM 2017

NTNU, Trondheim, Norway

Outline of the presentation

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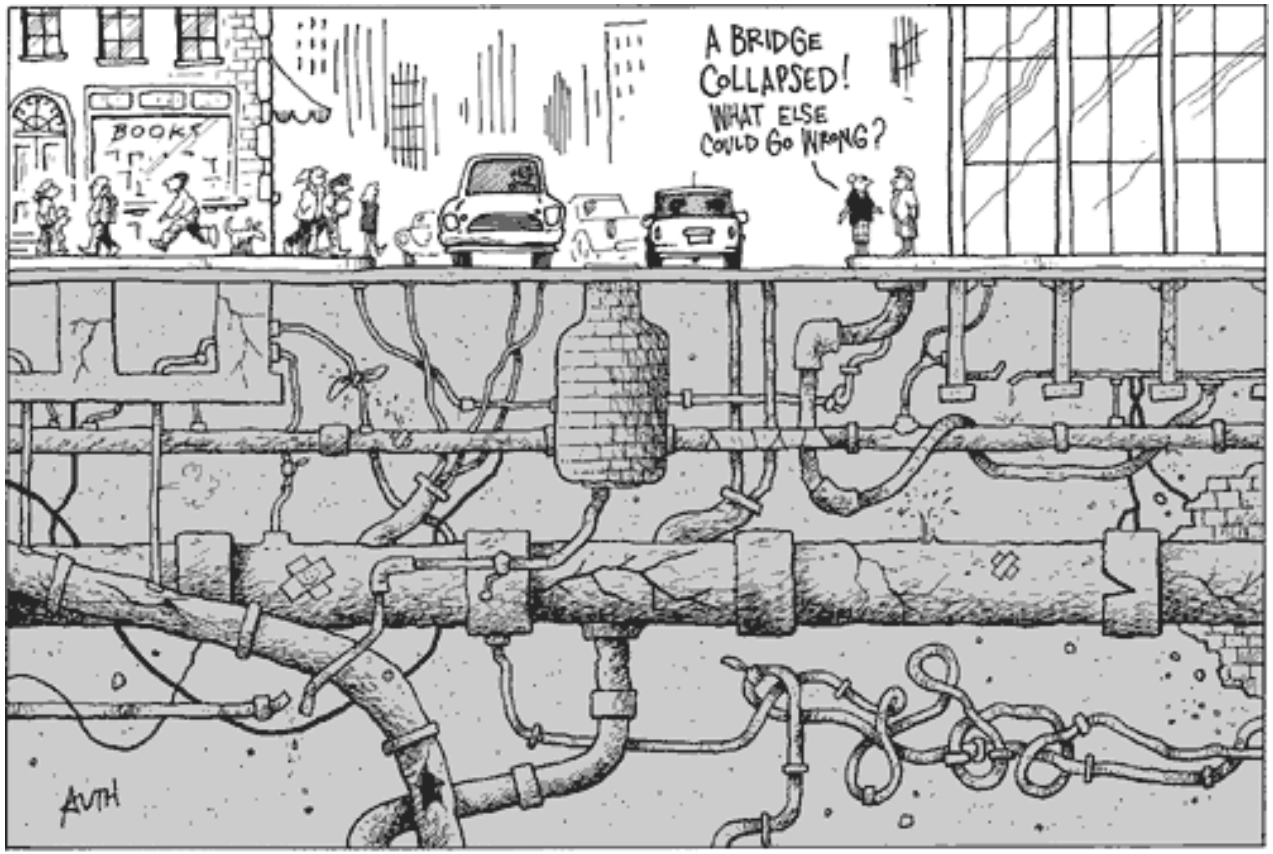
- Motivation



Outline of the presentation

- Motivation
- Integrated approach

Source: Margerison-McCann (2015)

Outline of the presentation

- Motivation
- Integrated approach
- Challenges and example application

Source: NewGrowth Consulting (2015)

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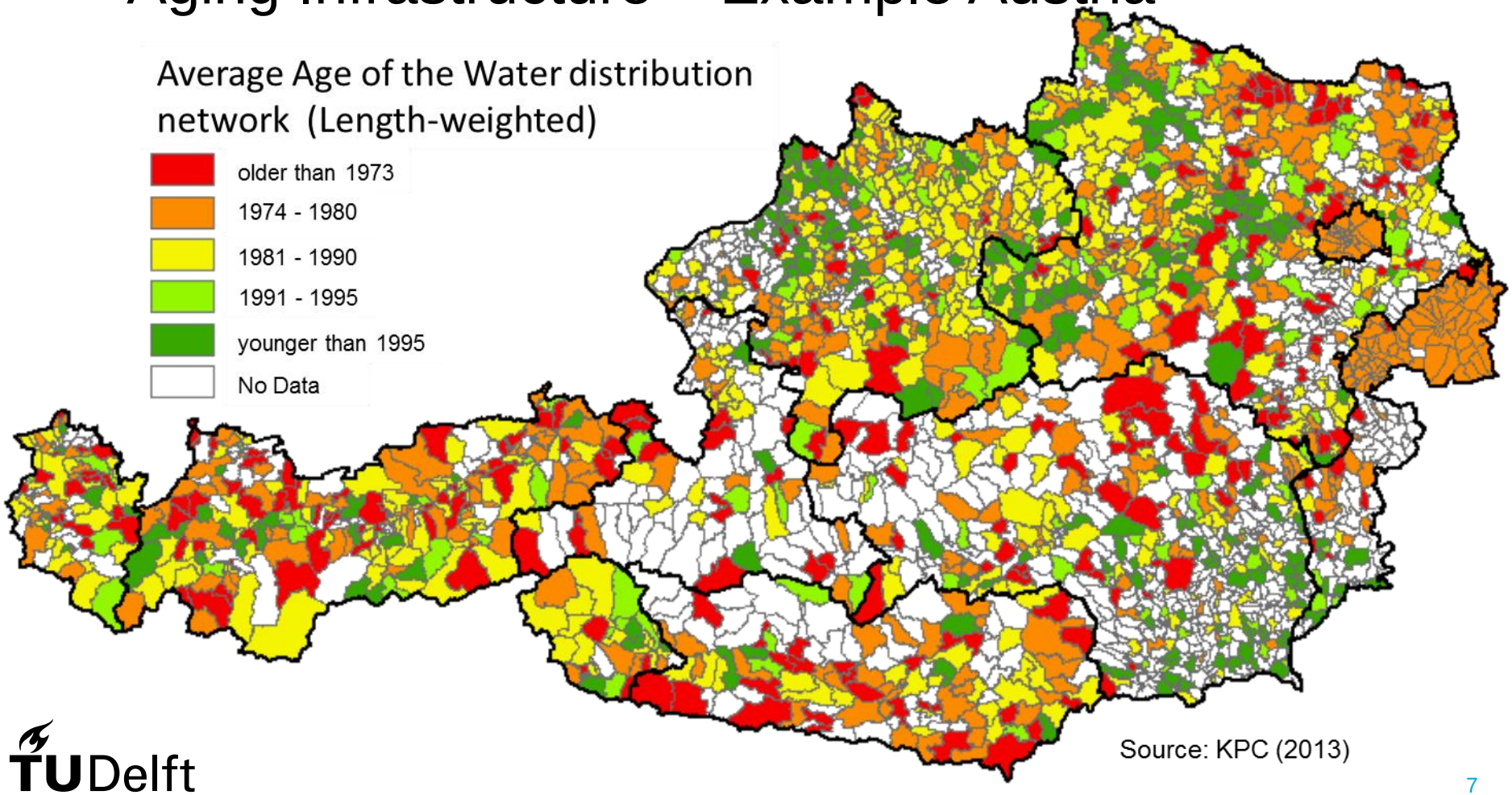
- Motivation
- Integrated approach
- Challenges and example application
- Conclusion

Motivation

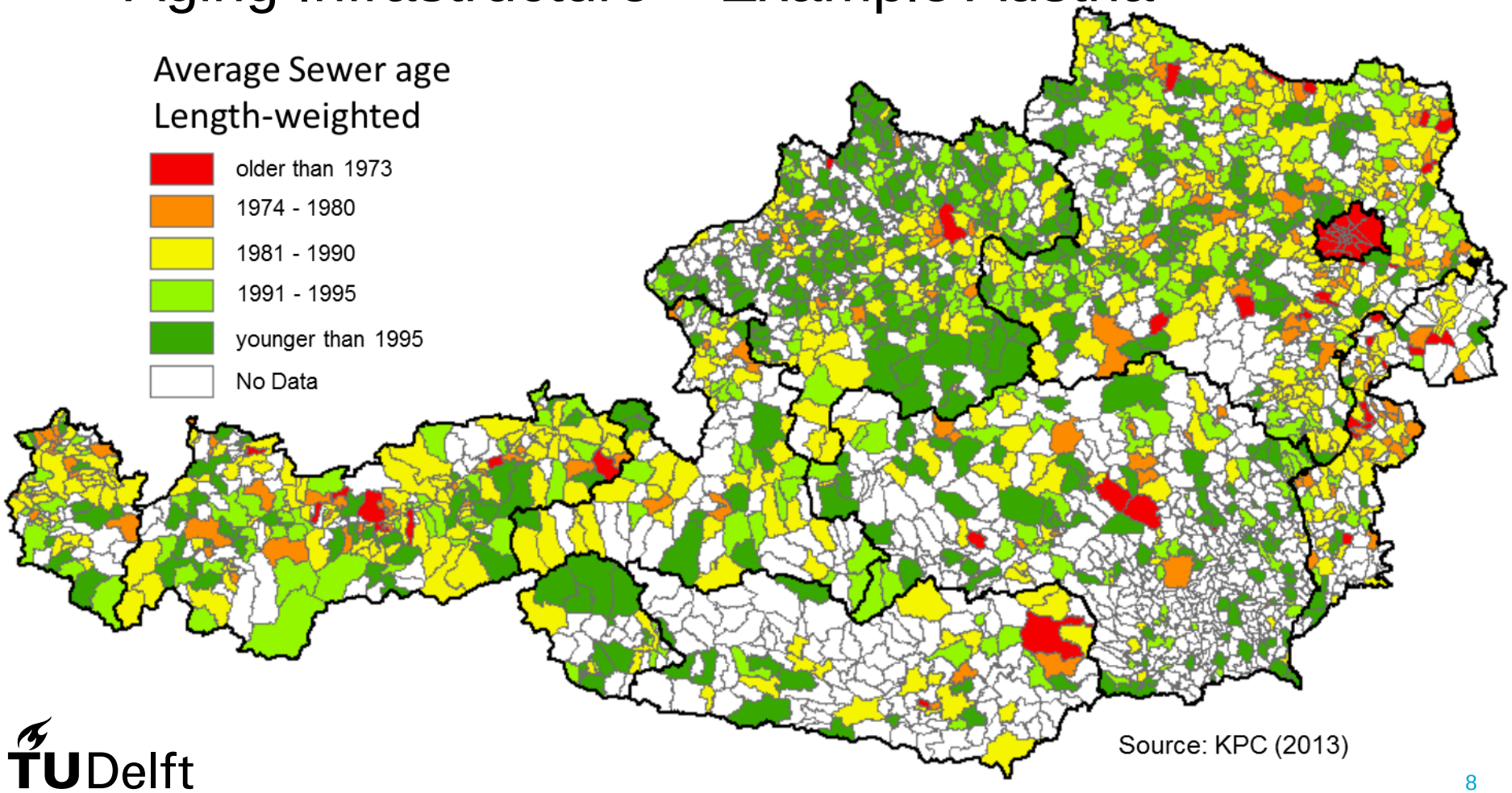
- Aging Infrastructure – Example Austria



Source: KPC (2013)

Motivation

- Aging Infrastructure – Example Austria

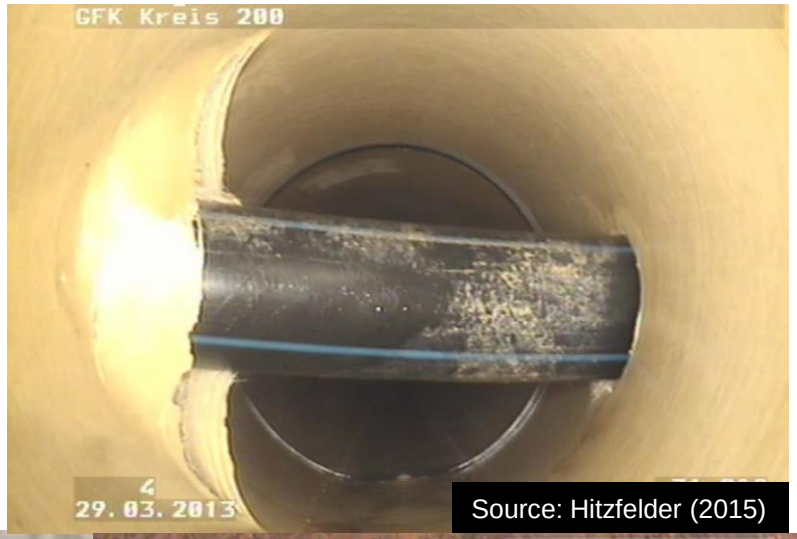


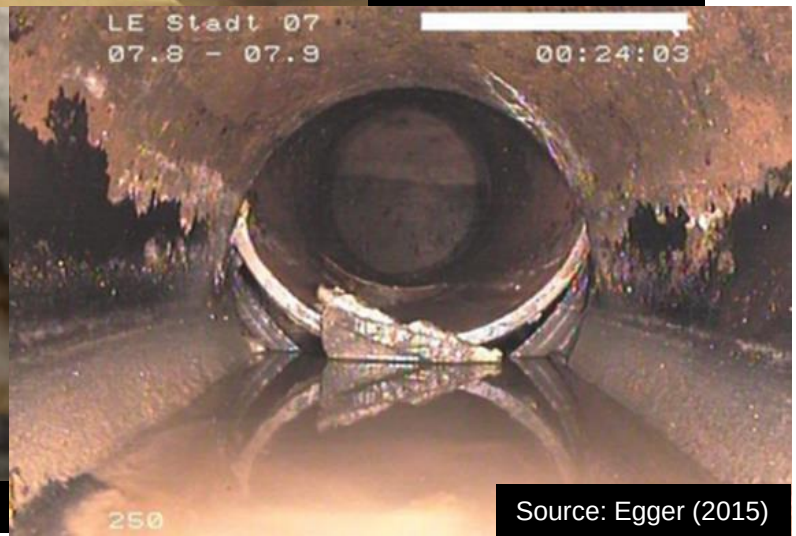
Motivation

- Rehabilitation Status Quo – Example Austria
  - Rehabilitation rates are low
    - Current rehabilitation rate for sewers in Austria 0.07% - life expectancy of 1500 years (Breindl 2013)
    - Average rehabilitation rate for water distribution systems in Austria 1.45% (Tscheikner-Gratl et.al. 2015)
  - Investments into water infrastructure are too low
    - In Austria 2016 - 736 Million € will be invested (KPC 2013)
    - 2 billion € should be invested (Cashman & Ashley 2008)

Motivation

- Missing public interest





Motivation

- Missing public interest


Source: FF Völs (2013)


Source: Bezirksblatt (2007)

Source: Standard (2015)


Source: ORF Tirol (2015)

Motivation

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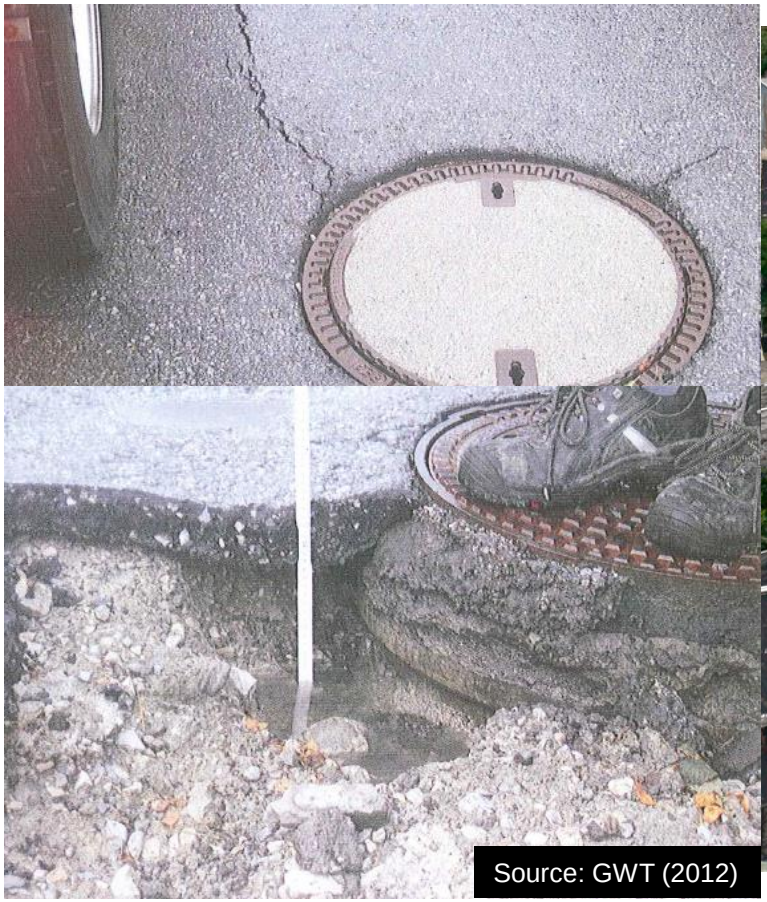
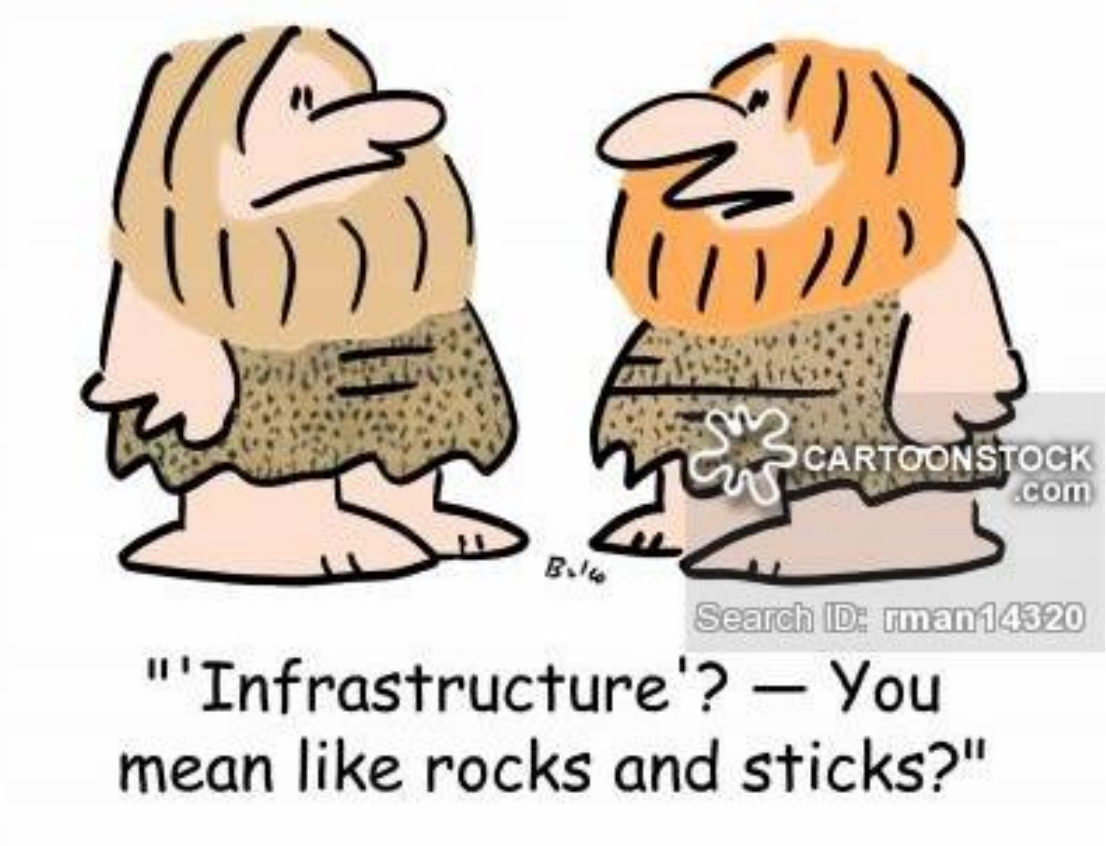


Source: GWT (2012)

Source: National Geographic (2010)

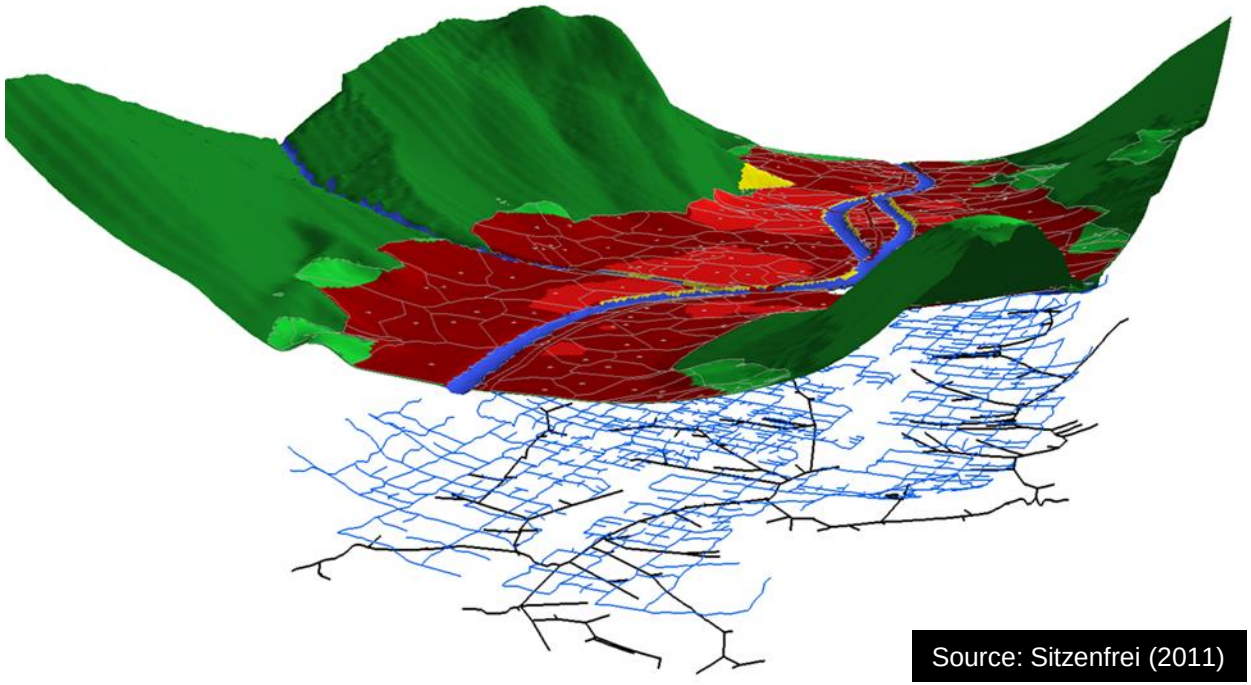
Integrated approach

Integrated approach



Integrated approach

- Pipe networks
  - Sewer / Drainage
  - Water supply
  - Gas



Source: Sitzenfrei (2011)

Integrated approach

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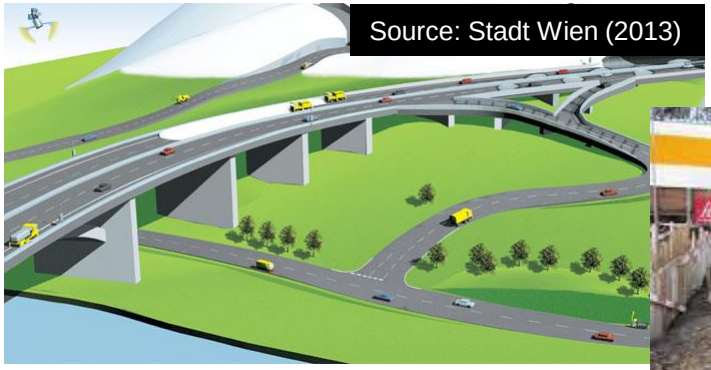


- Other networks
  - Traffic facilities (roads, railways)
  - Electrical grids
  - Telecommunication grids
  - District heating

Integrated approach

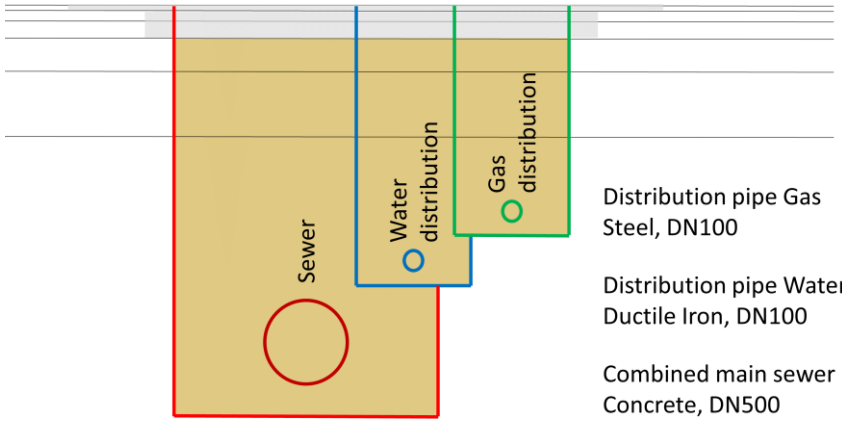
- Pipe networks
  - Sewer / Drainage
  - Water supply
  - Gas
- Other networks
  - Traffic facilities (roads, railways)
  - Electrical grids
  - Telecommunication grids
  - District heating

Similarities

- Essential infrastructure
- Similar layout
- Aging
- Need to be adapted

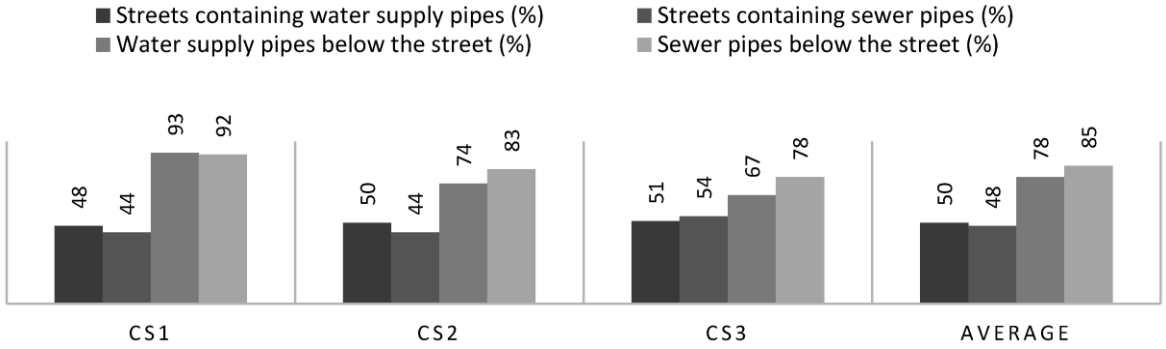
Integrated approach

- Idea:
  - Street sections as container for multiple infrastructure
  - Savings by coordinated rehabilitation



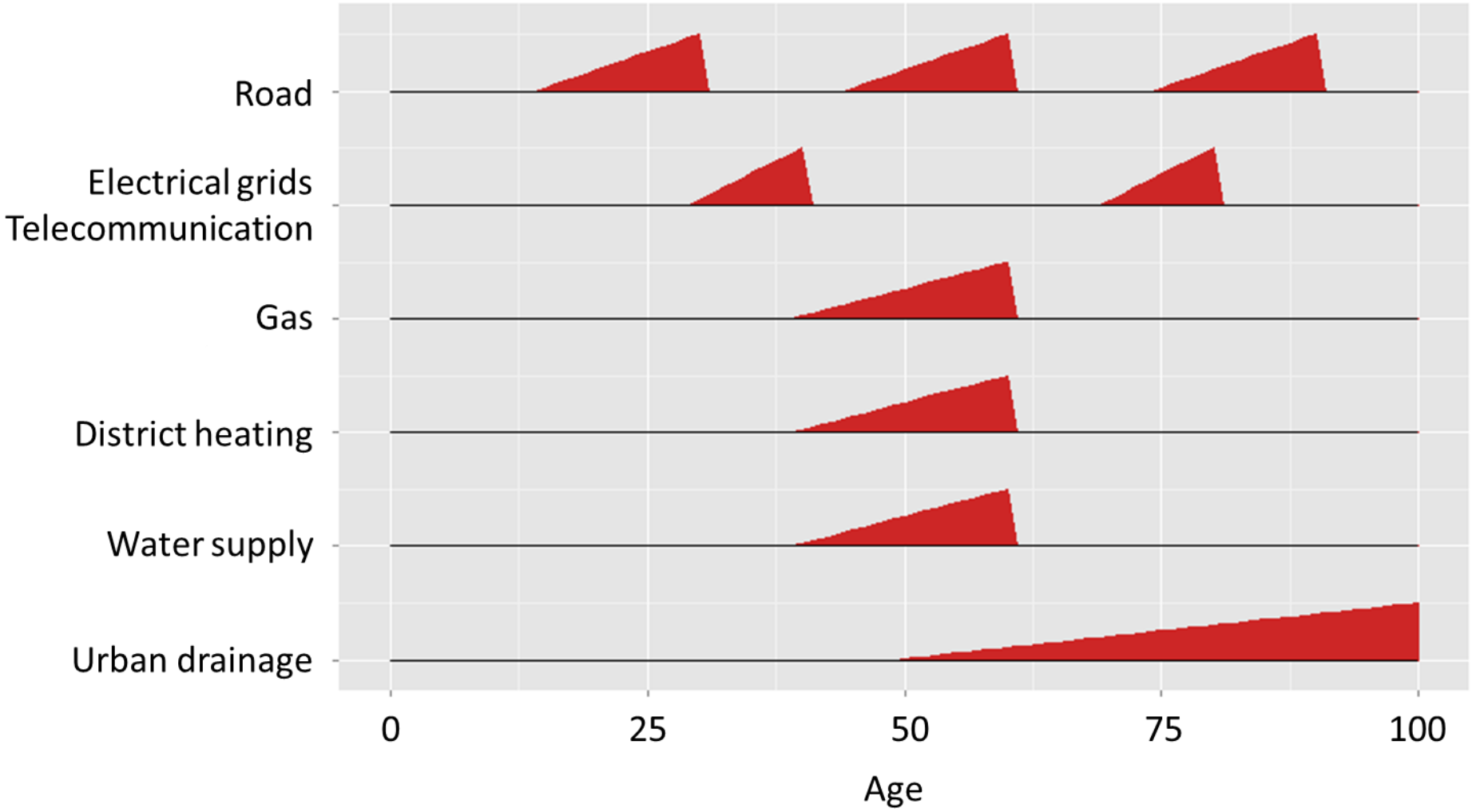
Tscheikner-Gratl (2016)

Mair et.al. (2017)



Integrated approach

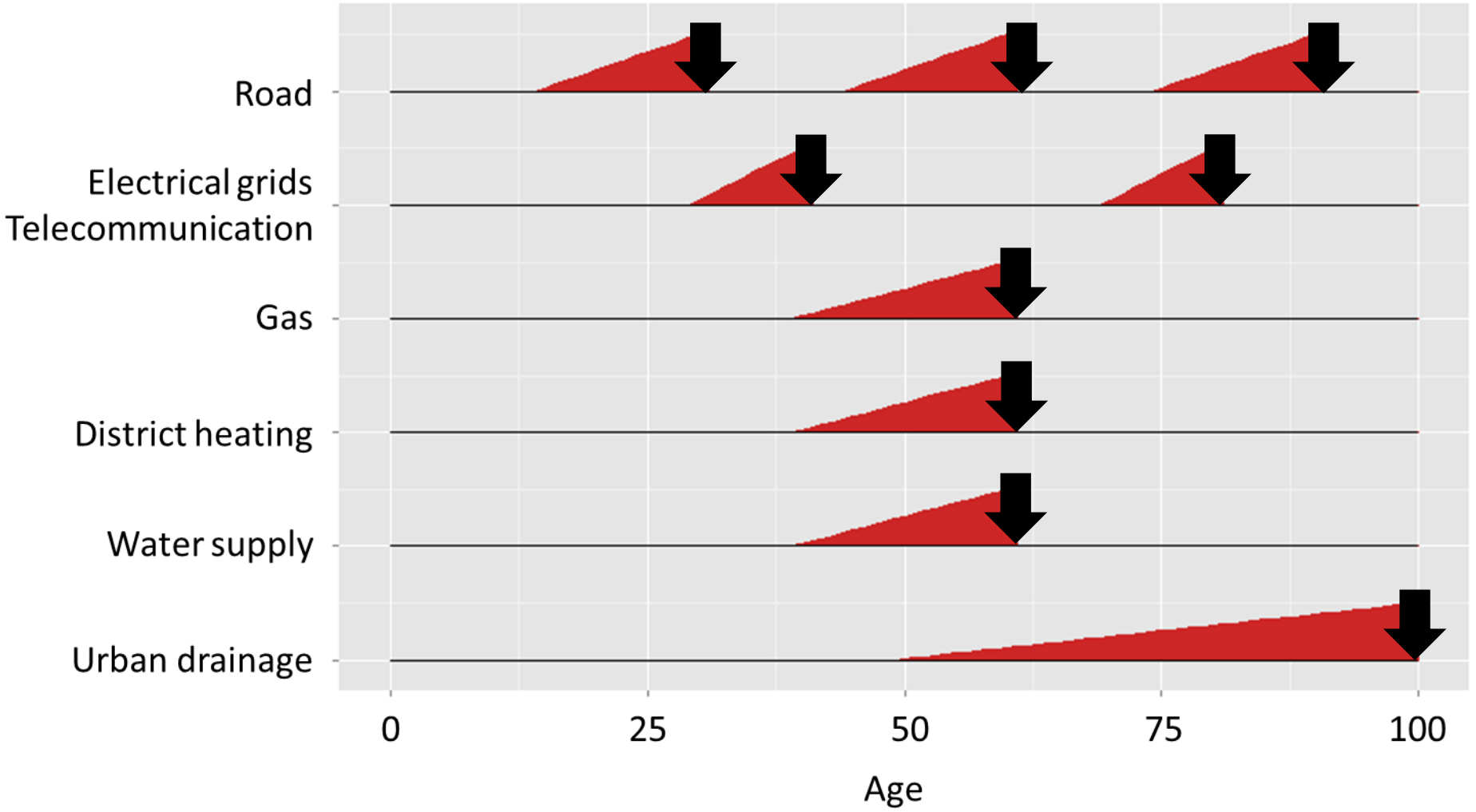
Tscheikner-Gratl (2016)



Life expectancies range from LAWA (2012)

Integrated approach

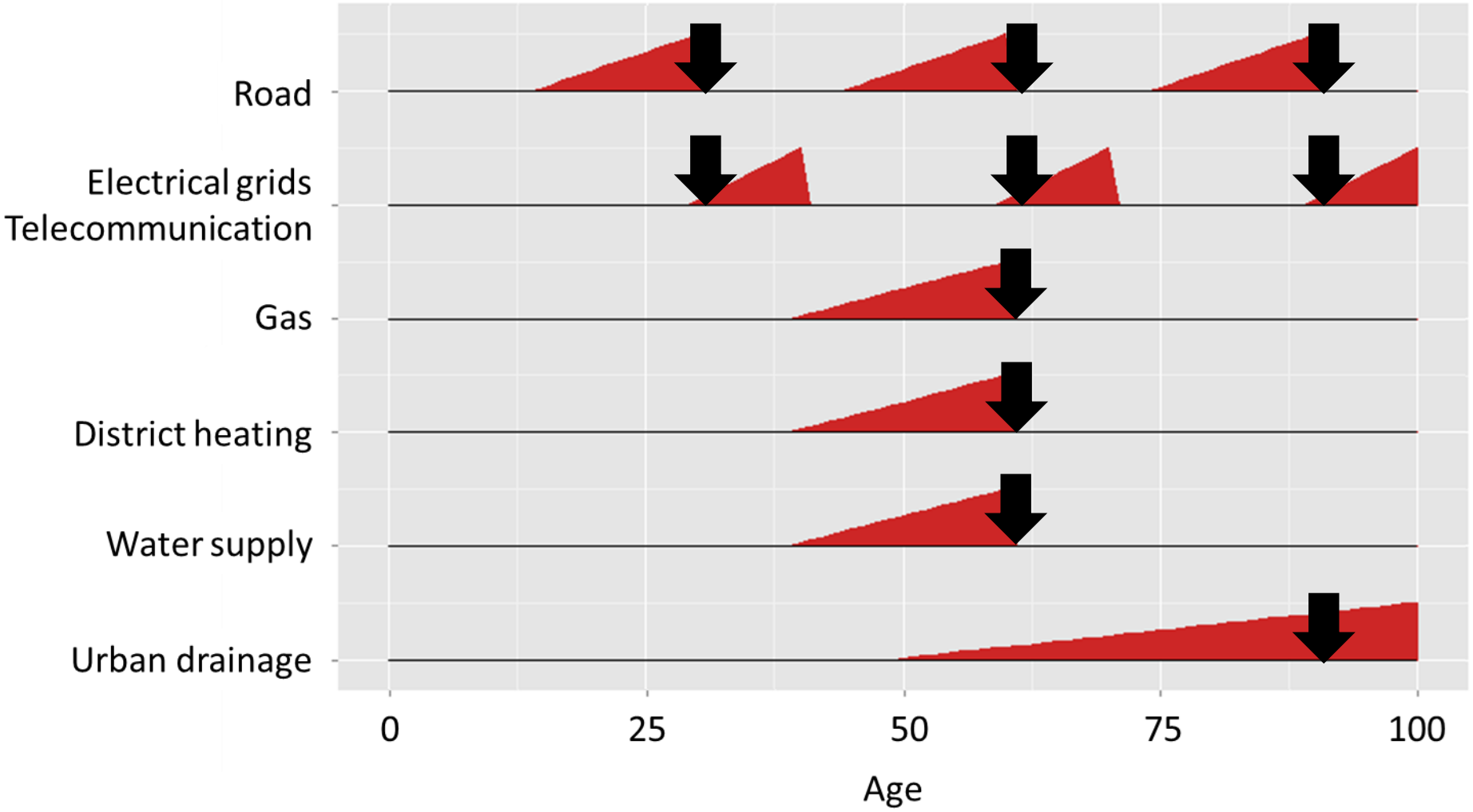
Tscheikner-Gratl (2016)



6 times construction sites

Integrated approach

Tscheikner-Gratl (2016)



3 times construction sites

Challenges

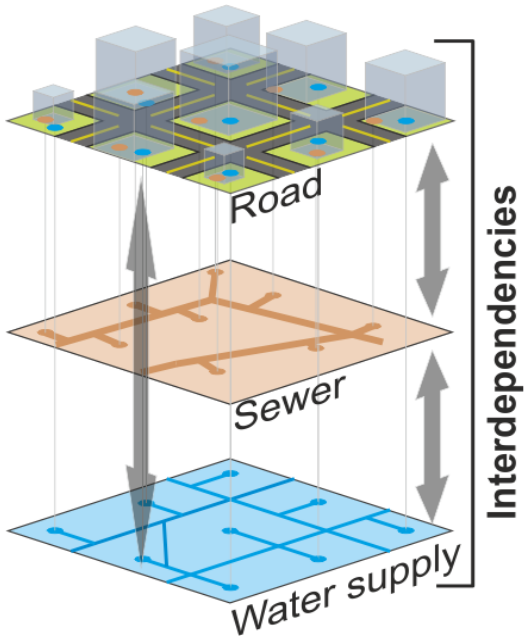
Challenges

- Different goals for the different stakeholders involved

Loucks et.al. (2017)

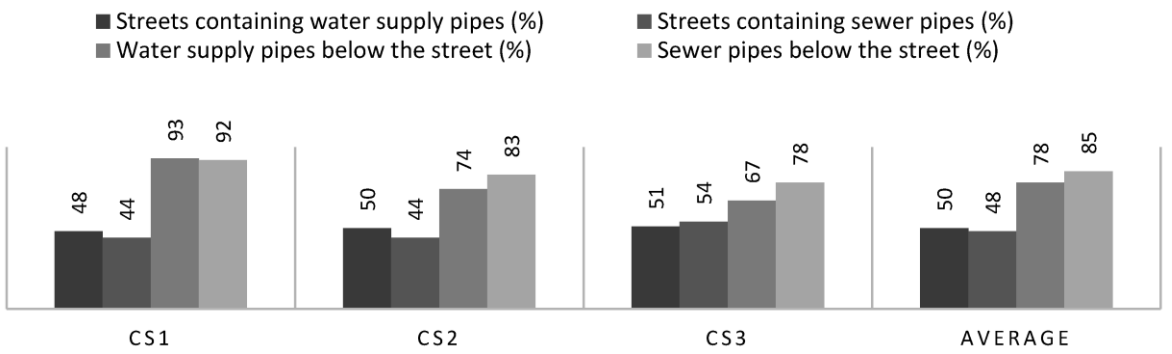
Challenges

- Different goals for the different stakeholders involved
- Interdependencies between the different infrastructures are not completely known and implementable



Challenges

- Different goals for the different stakeholders involved
- Interdependencies between the different infrastructures are not completely known and implementable
- Spatial context: Where in the street section? What about the 20% outside?



Mair et.al. (2017)

Challenges

- Different goals for the different stakeholders involved
- Interdependencies between the different infrastructures are not completely known and implementable
- Spatial context: Where in the street section? What about the 20% outside?
- Influences on the deterioration of adjacent infrastructure

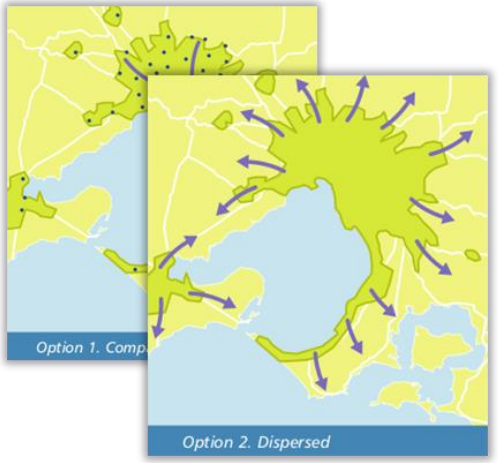
Challenges

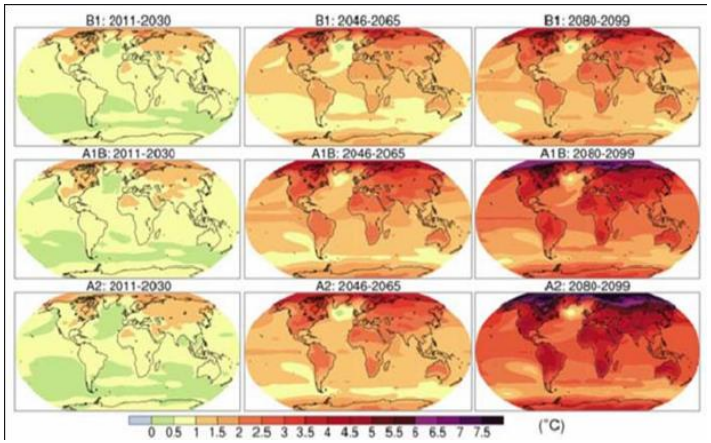
- Data management and data quality

Tscheikner-Gratl et.al. (2015)

Challenges

- Data management and data quality
- Changing environmental influences (e.g. urban development)



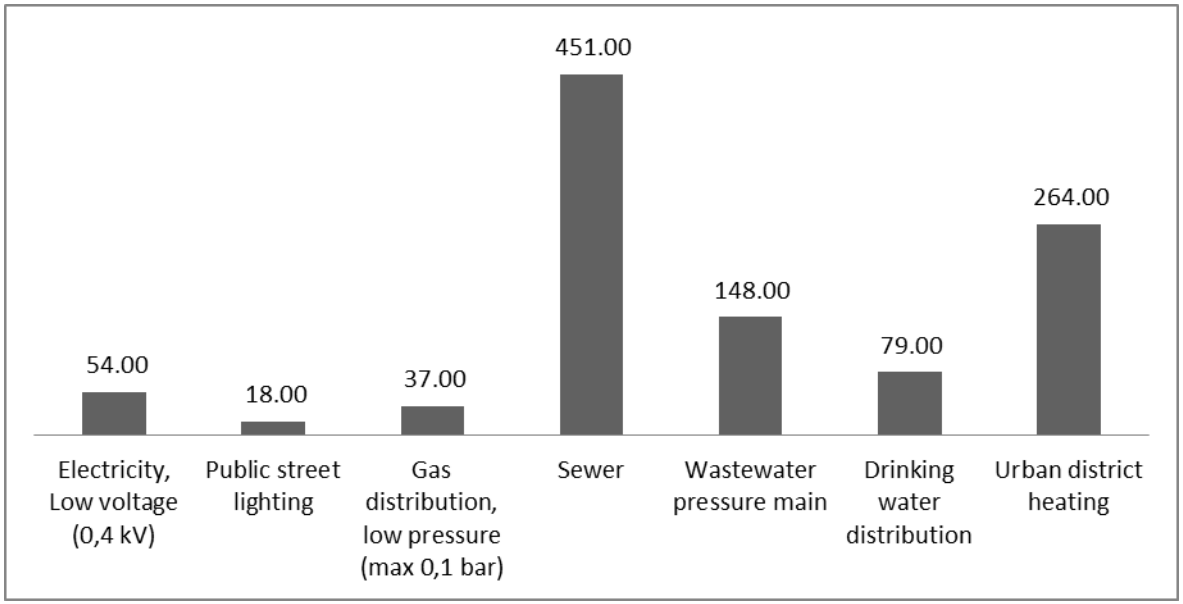


Kleidorfer et.al. (2014)

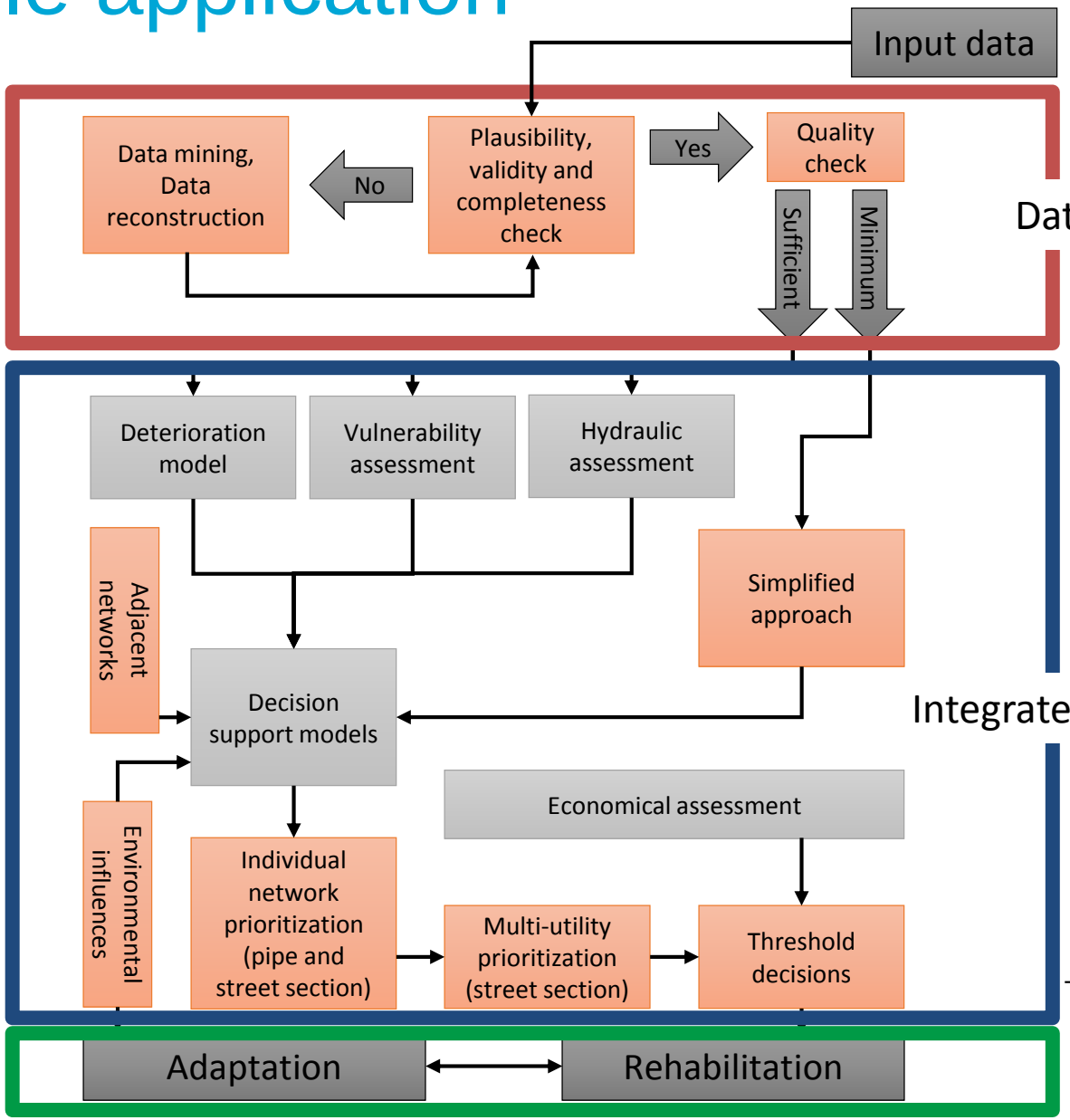
Challenges

- Data management and data quality
- Changing environmental influences (e.g. urban development)
- Economic factors: what are the savings for different infrastructure? Social costs?

Typical cost values for construction of different infrastructure in the Netherlands



Example application



Tscheikner-Gratl (2016)

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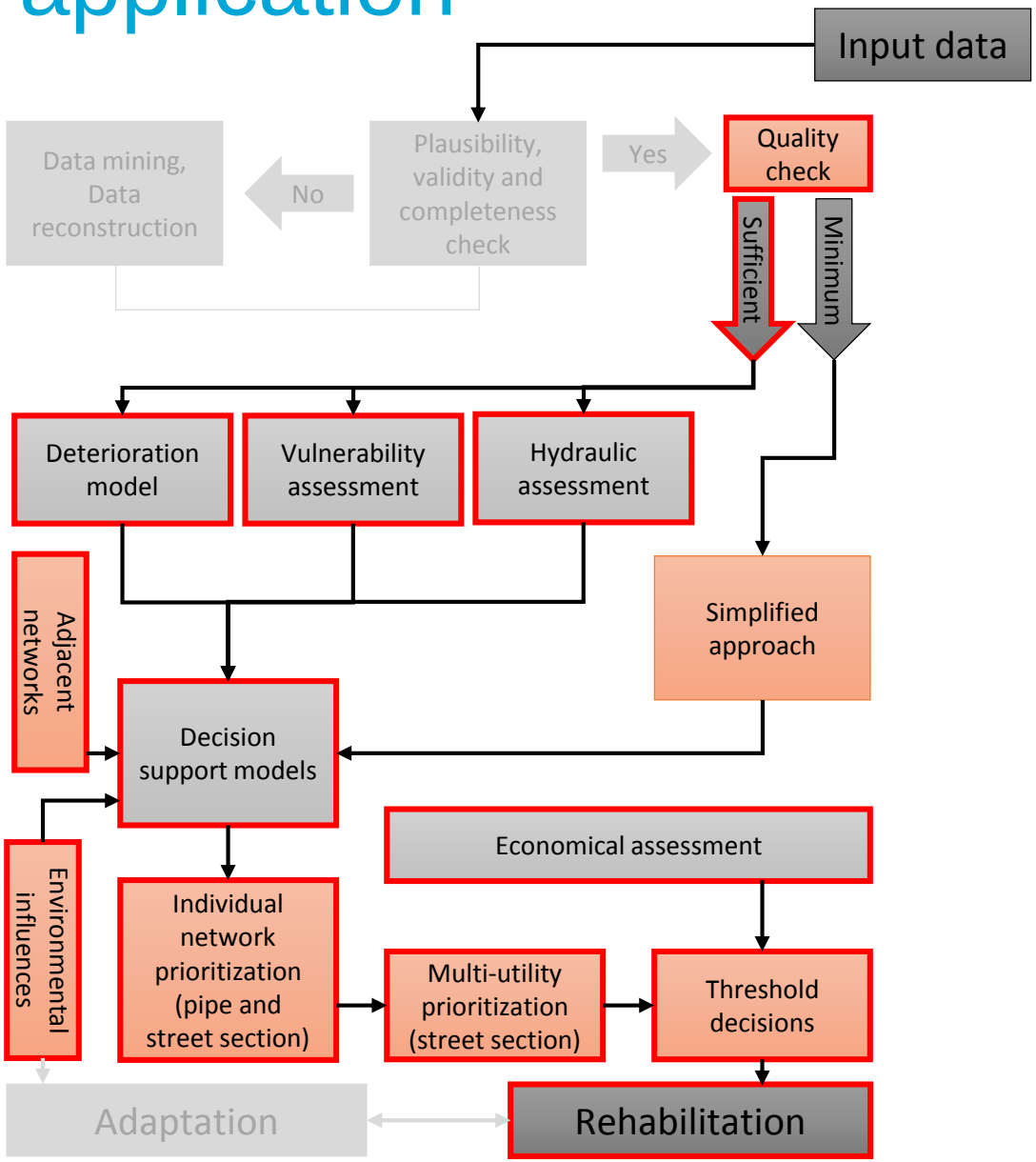
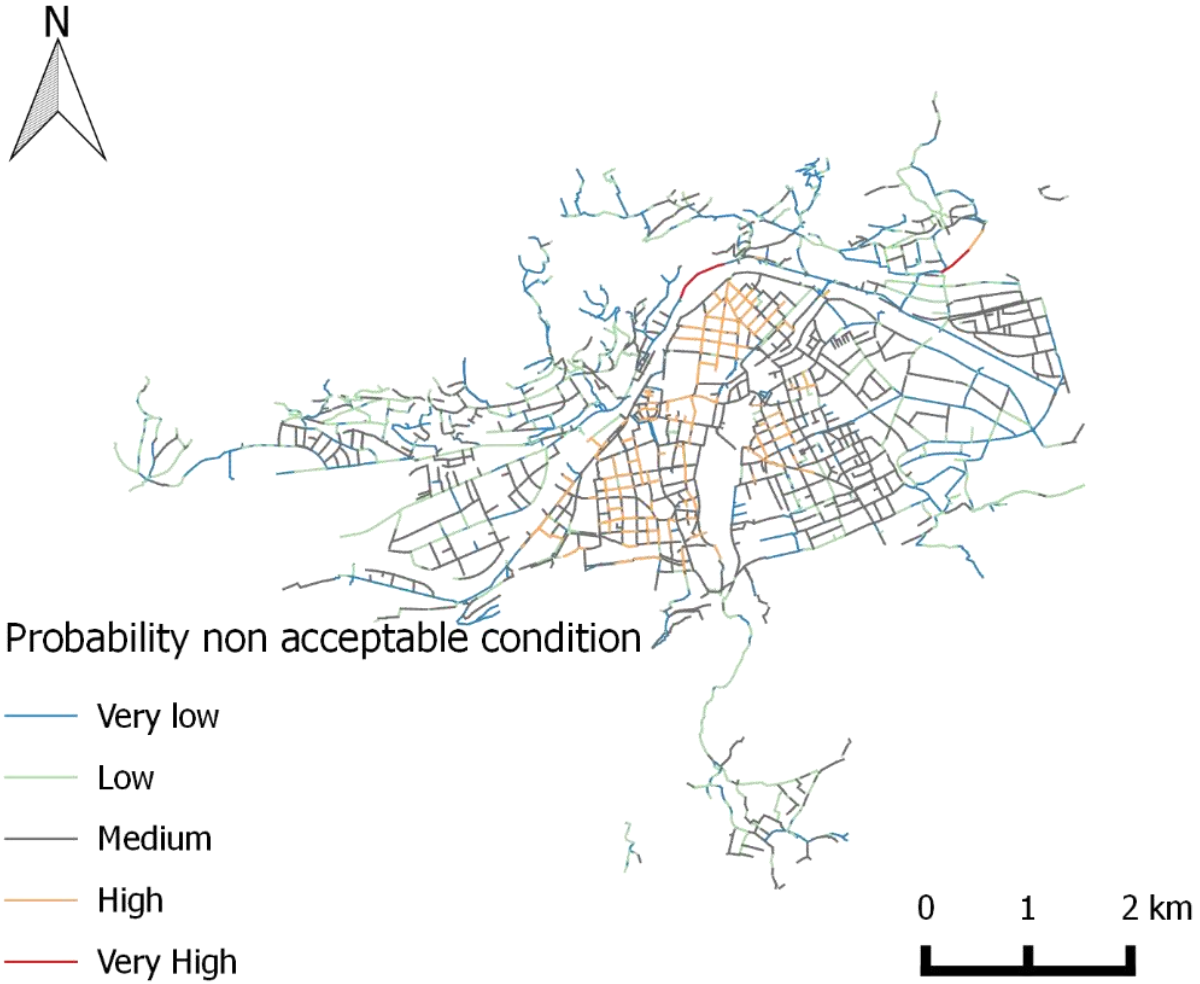


Tscheikner-Gratl (2016)

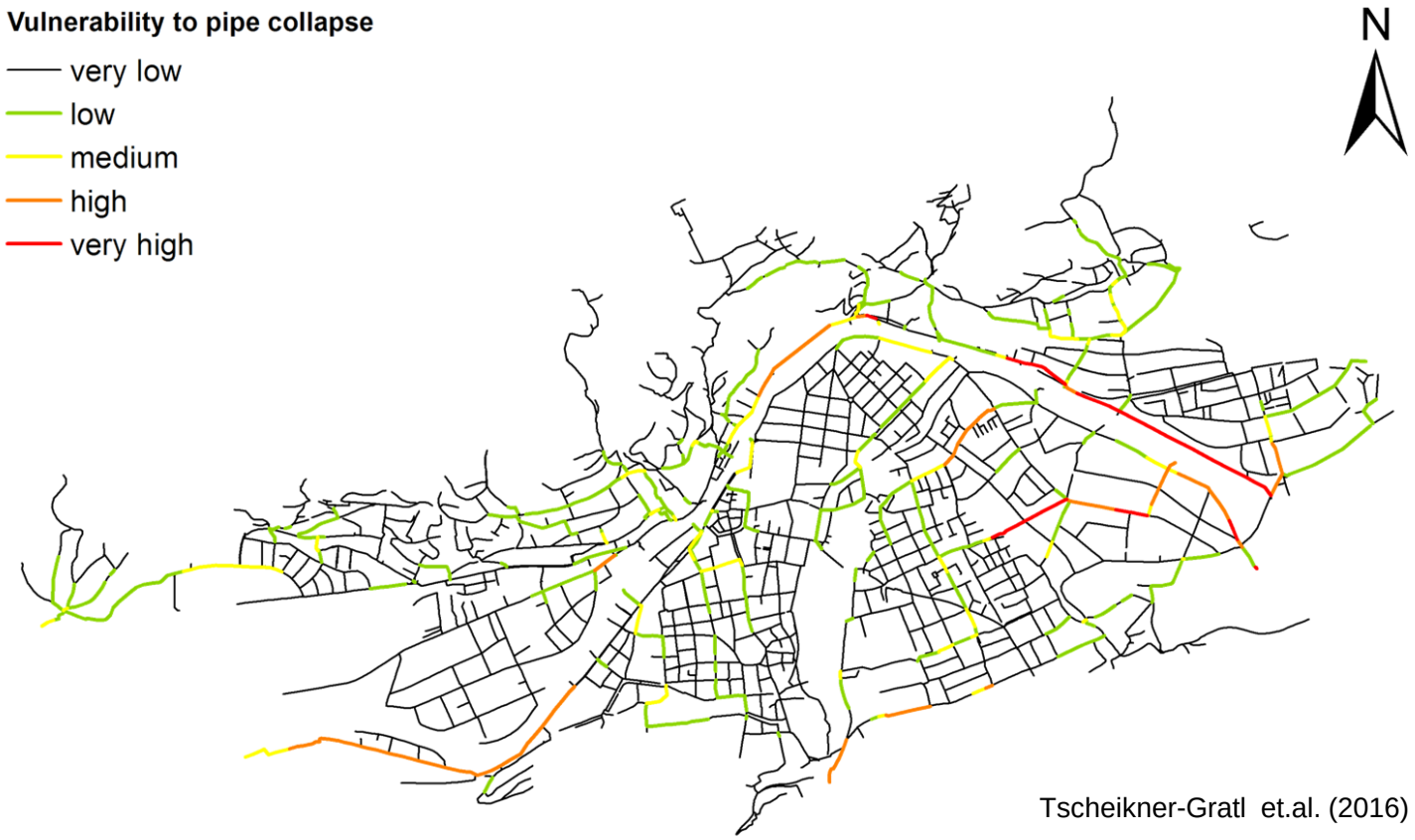
Example application

- Sewer condition → Binary logistic model



Example application

- Sewer Vulnerability → Achilles model



Tscheikner-Gratl et.al. (2016)

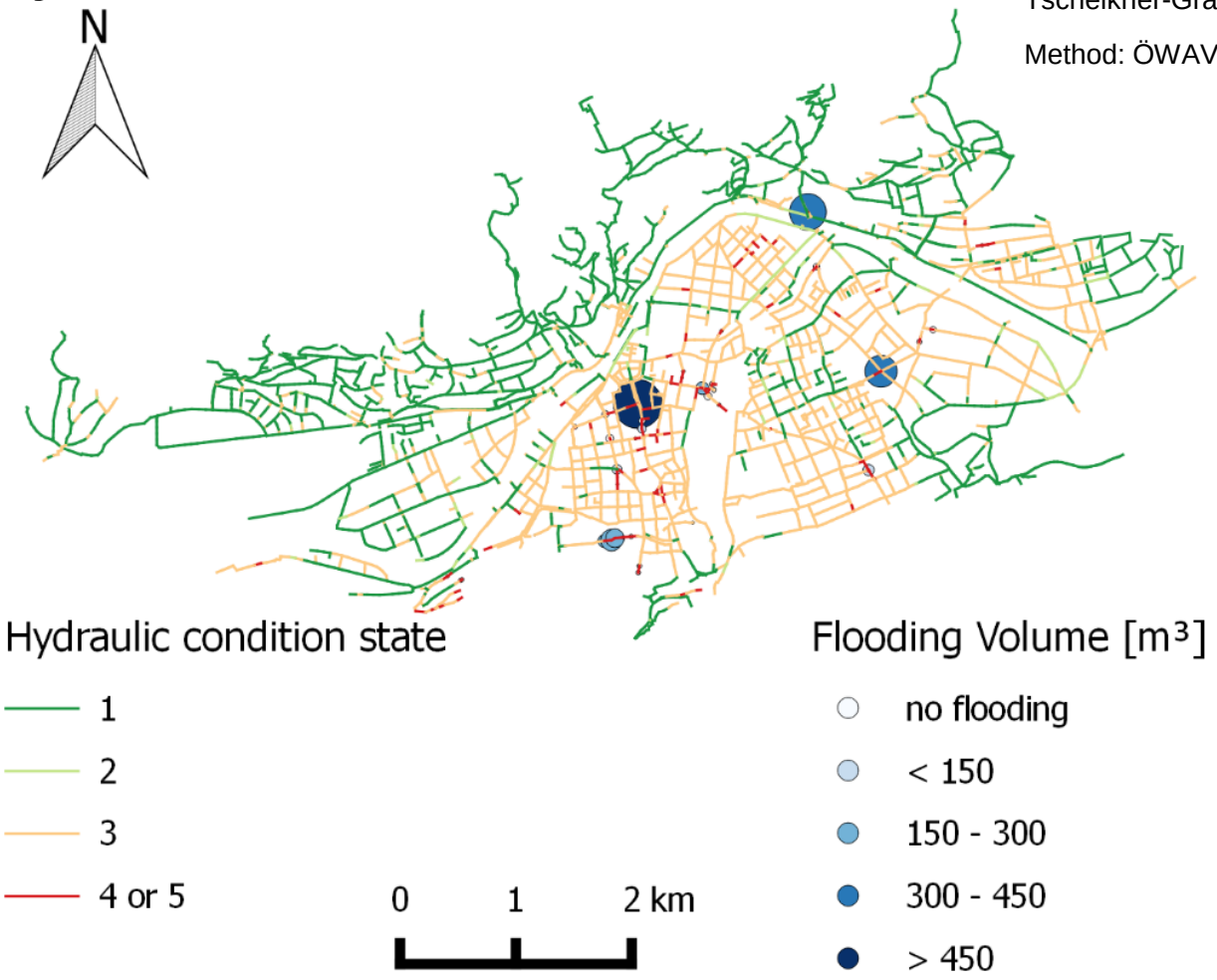
Method: Möderl et.al. (2009)

Example application

- Sewer hydraulic condition state

Tscheikner-Gratl (2016)

Method: ÖWAV-RB 22 (2015)



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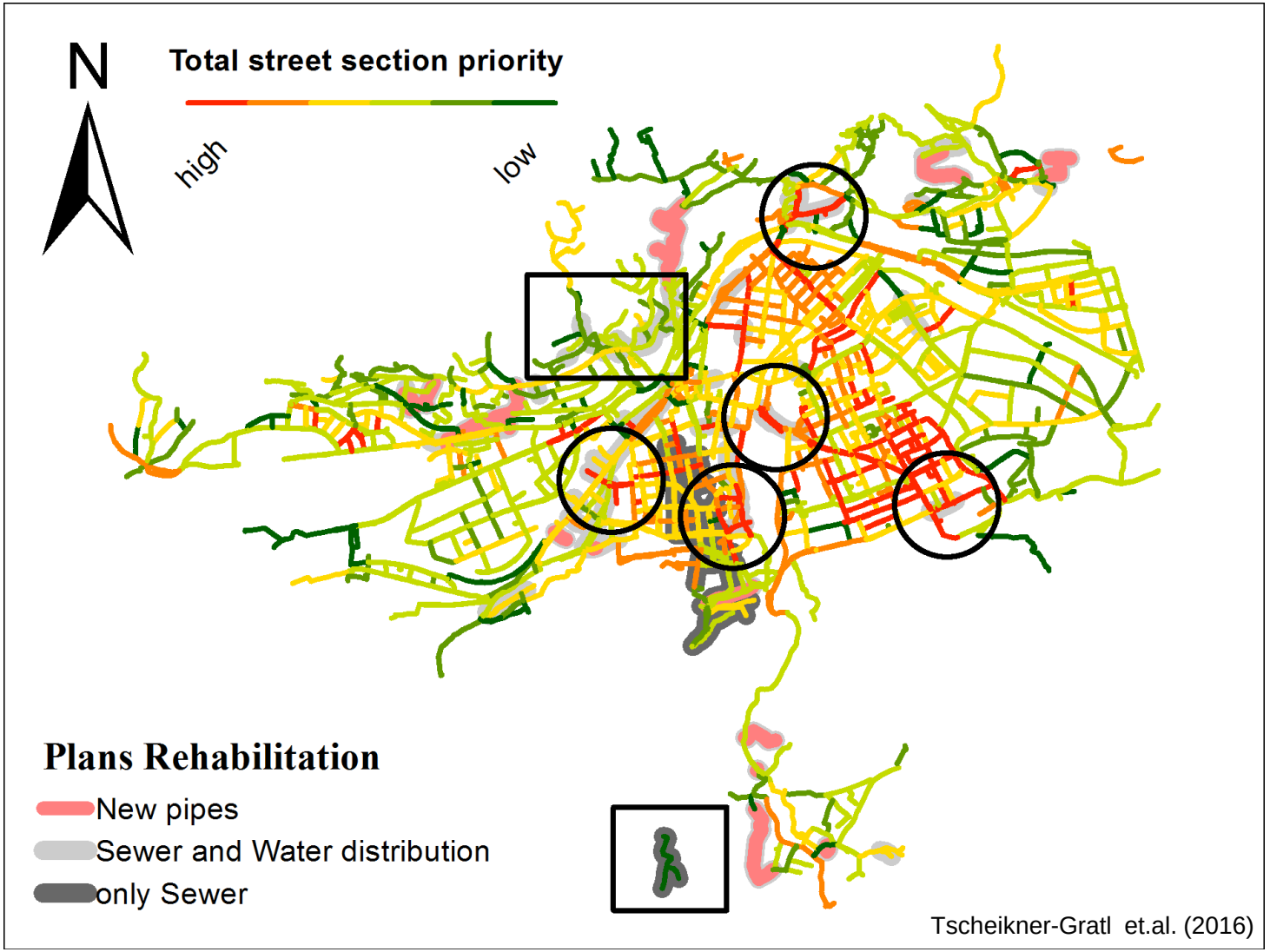

Tscheikner-Gratl et.al. (2016)

Conclusion

- Integrated rehabilitation management is a simple idea with a manifold of challenges.

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- An integrated approach can make sense for most applications. The way of the operators should lead from coexistence over coordination to cooperation.

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- Integrated rehabilitation management is a simple idea with a manifold of challenges.
- An integrated approach can make sense for most applications. The way of the operators should lead from coexistence over coordination to cooperation.
- Finding, valuing and implementing of interdependencies into the rehabilitation management process is one of the main challenges

Further Information

Tscheikner-Gratl, F. (2016) Integrated Approach for multi-utility rehabilitation planning of Urban Water Infrastructure, innsbruck university press. ISBN: 978-3-903122-05-5.

Tscheikner-Gratl, F., Sitzenfrei, R., Rauch, W., and Kleidorfer, M. (2016) Integrated rehabilitation planning of urban infrastructure systems using a street section priority model. Urban Water Journal, 13(1), 28–40. DOI: 10.1080/1573062X.2015.1057174.

Tscheikner-Gratl, F., Sitzenfrei, R., Stibernitz, C., Rauch, W., and Kleidorfer, M. (2015) "Integrated rehabilitation management by prioritization of rehabilitation areas for small and medium sized municipalities" in World Environmental and Water Resources Congress 2015: Floods, Droughts, and Ecosystems - Proceedings of the 2015 World Environmental and Water Resources Congress. DOI: 10.1061/9780784479162.201.

Mair, M., Zischg, J., Rauch, W., and Sitzenfrei, R. (2017) Where to Find Water Pipes and Sewers? — On the Correlation of Infrastructure Networks in the Urban Environment. Water, 9(2), 146–161. DOI: 10.3390/w9020146.

Thank you for your attention!

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