

Retrospective analysis of water management and water governance in Amsterdam

Master thesis

Sannah Peters (6629741)

Supervisors:

Maarten Ouboter – Waternet

Kees van Leeuwen – UU & KWR



Table of Contents

1 Introduction

2 Research aim & question

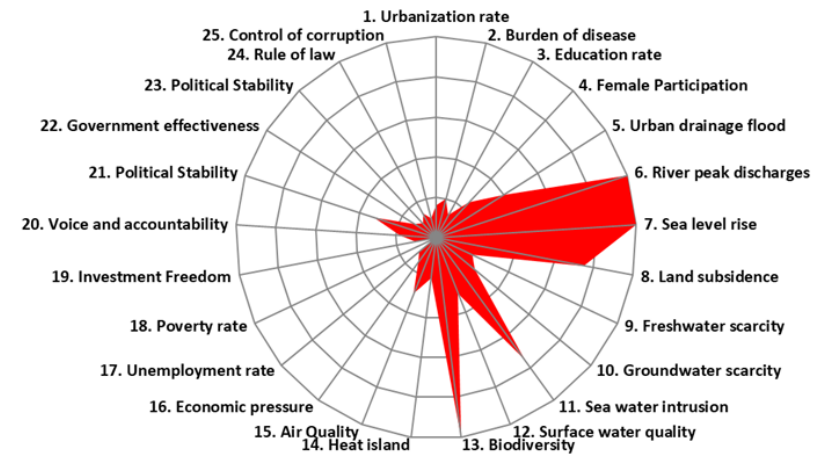
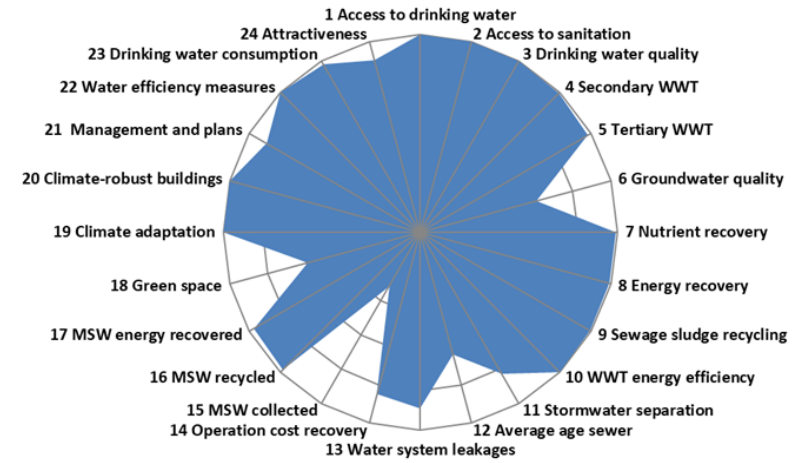
3 Research method

4 Main results

5 Discussion

6 Conclusion

1. Introduction



Introduction

- Major investments are expected to be made to meet future challenges and to improve agricultural infrastructures.
- Challenges and transitions from the past are learning experiences and offer the opportunity to gain more knowledge about certain actions.
- Waternet **likes** to know how the city of Amsterdam has developed into one of the best performing cities in the world in terms of water management and governance
- Sharing knowledge with other cities to find possible leapfrogging trajectories

2. Research aim

- To understand how water management and governance developed historically in the city Amsterdam
- How this can be used to further improve water management
- How these lessons from Amsterdam and its partner cities can help other cities in the world to meet their future developments and challenges.
- Narrow the knowledge gap

2. Research question

‘How did water management and governance evolve in the city of Amsterdam from the year 1672 to the present and what can be learned from this to enhance a city’s ability to address its water challenges?’

2. Subquestions

- SQ1: What major challenges in the field of water management and governance has Amsterdam encountered over the past centuries?
- SQ2: How did the water management and governance practices in the city Amsterdam develop based on these major challenges?
- SQ3: What can be learned from experiences in the partner cities of Amsterdam?
- SQ4: How can water management of Amsterdam be improved to meet current and future challenges?
- SQ5: Based on past experiences (SQ2 & SQ3) which leapfrogging trajectories can be suggested?
- SQ6: What can city developers learn from these experiences?

3. Research methodology

Retrospective analysis

- Trends and pressures framework (TPF)
- City Blueprint Framework (CBF)
- Data collection: Literature review & Interviews

- City Blueprint Assessments
- CBA Paris

Comparative analysis

Future developments & recommendations

- Integration of results
- Questionnaire

3. Selected periods

1672 -1682

1780 -1810

1845 -1866

1872 -1902

1930 -1955

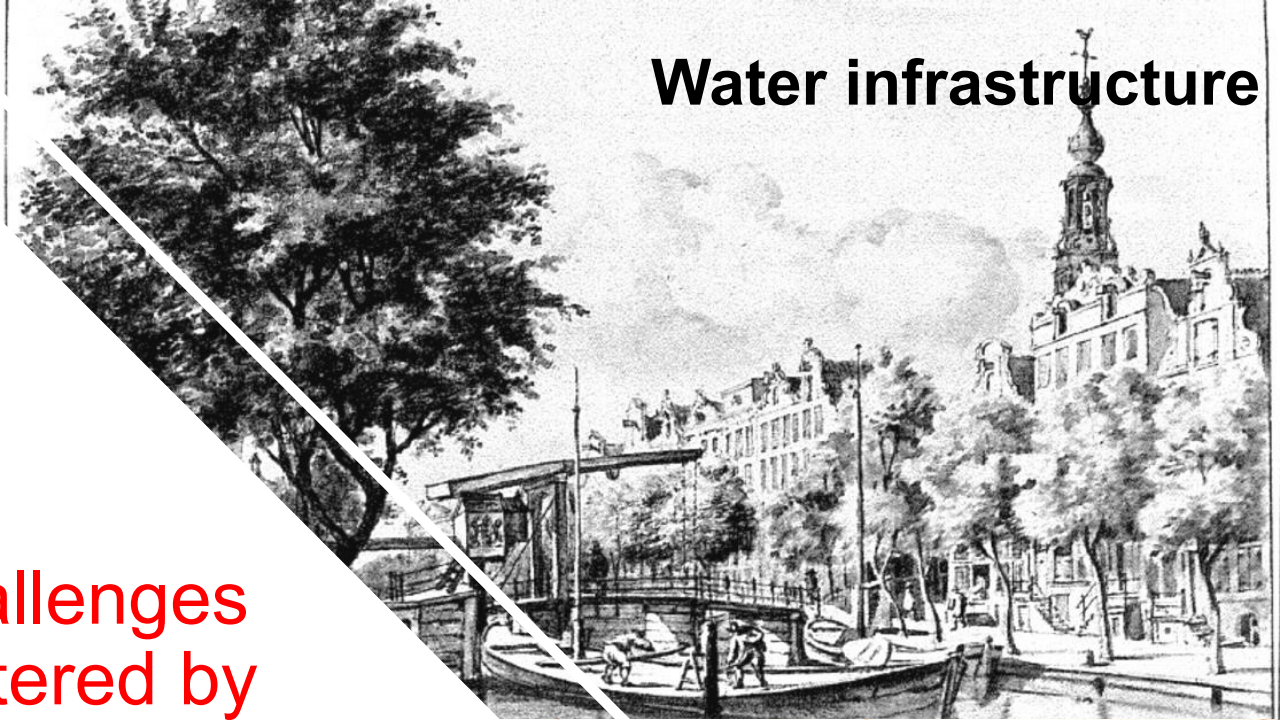
1970 – 1998 - 2006

2018 - present

Nuisance



Water infrastructure



**4.1 Challenges
encountered by
Amsterdam over the
past centuries**

Floods

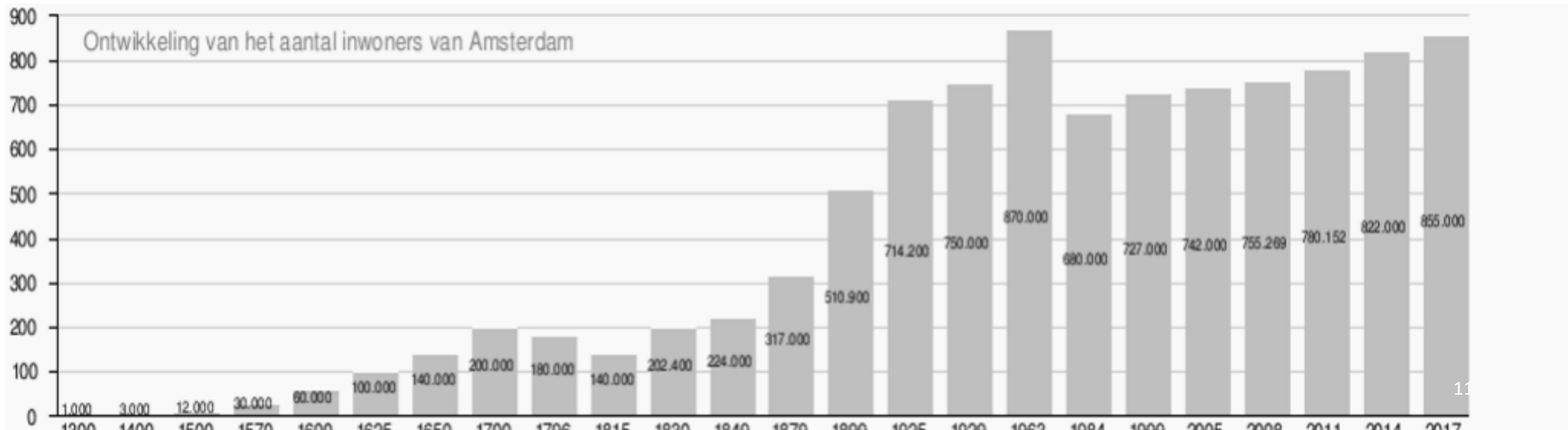


Diseases



4.1.1 Urbanization

- Economic prosperity and employment accelerate urbanization
- Dense living conditions and poverty negatively affected population growth
- Diseases control
- Housing legislation in 1901
- Sub-urbanization after 1960
- Recently, high rate due to natural growth and migration.
- Effect of COVID-19



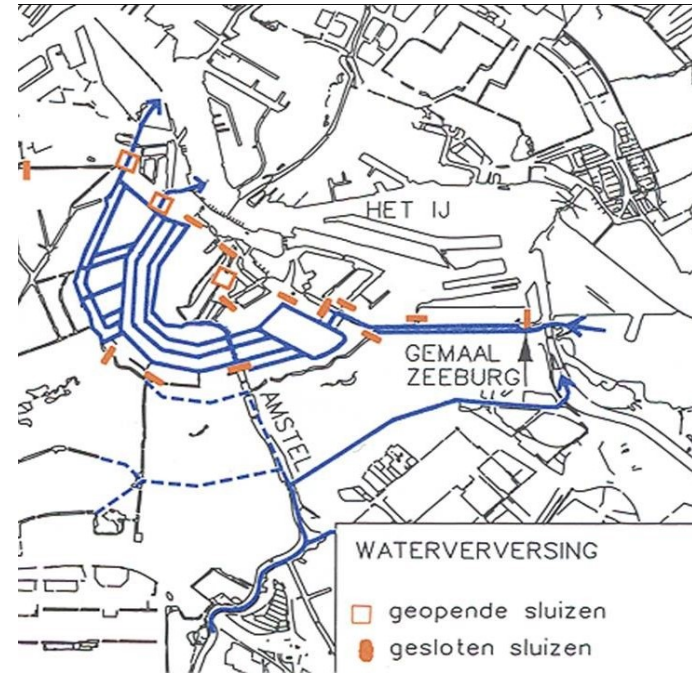
4.1.2 Burden of disease

- 17th century:
 - Plague epidemic → approximately one on eight citizens died → solid waste collection
- 18th century:
 - High poverty → high infant mortality
- 19th century:
 - Poor living conditions → cholera.
 - Poor working conditions → mortality
 - Dr. Sarphati made the connection between poor hygiene and diseases
- 20th century:
 - Legislation on hygiene facilities
 - Aids
- 21st century:
 - COVID-19



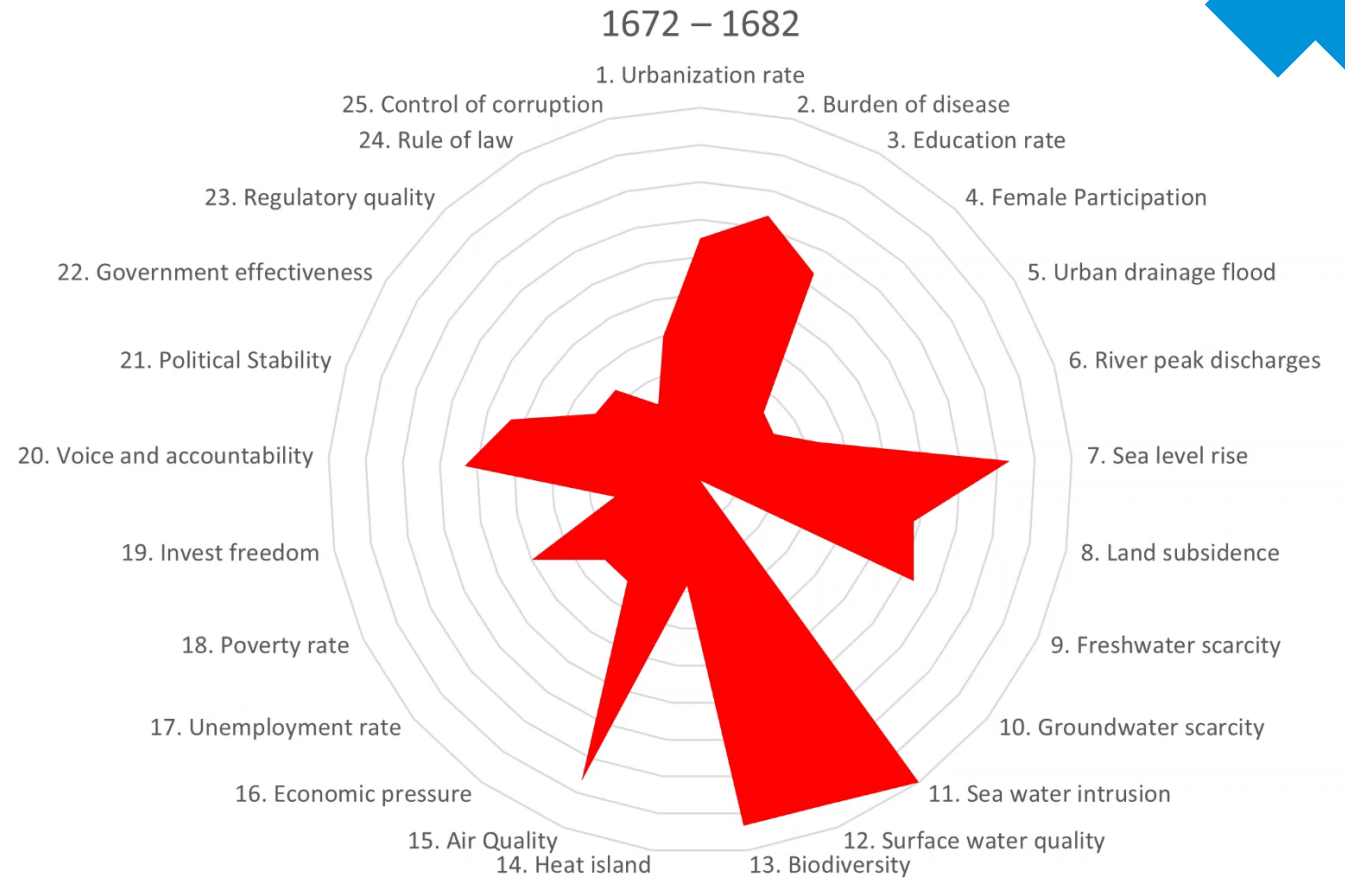
4.1.3 Surface water quality

- **Poor water quality in** all periods until 1921
- **High densities of population & industries** → pollution
- Flushing system
- Termination of tidal action
- First water **purification plant built** in 1921
- Legislation

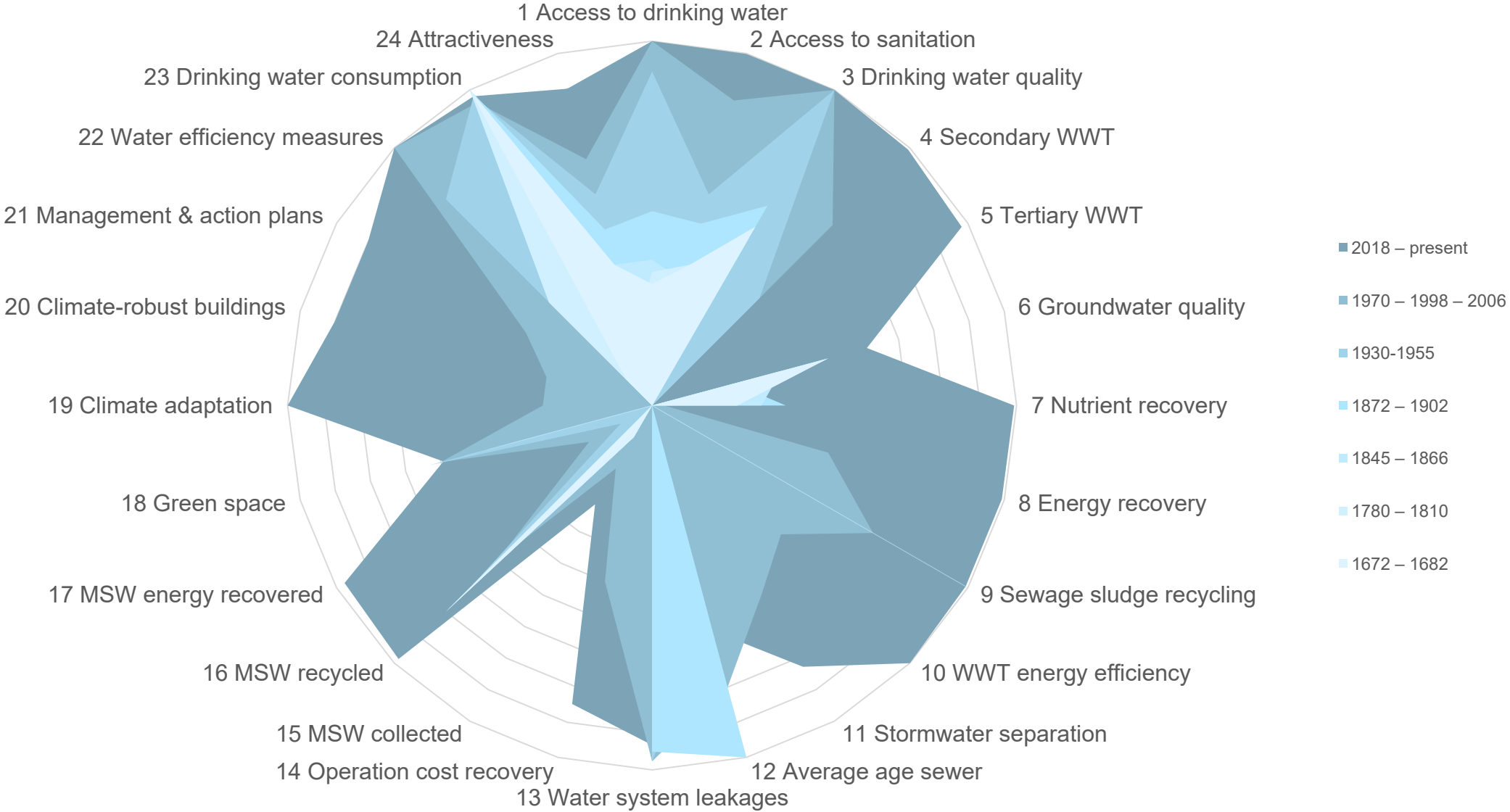


4.1 Development of trends and pressures

- Fluctuation of urbanization
- Crisis to crisis over time in burden of disease
- The sea always affected the water system
- Recently, pressures on quality of surface water and air quality has decreased
- Economic indicators vary strongly over time due to different crises
- Governance capacities did not affect the city very much.



Retrospective analysis of Amsterdam over a period of 350 years based on the City Blueprint





gl a s

em mer

kr aa n

4.2 Drinking water and health

4.2 Drinking water and health

- Drinking water from the river Vecht transported by ship
- Construction of water tanks (Hudden & Sarphati)
- 1786 Establishment of the 'Versch-Water Societeit'
- 1851 Establishment of Amsterdam dune water company led by Van Lennep
- 1853 Drinkwater from the dunes
- 1896 Company transferred to **municipality** → Gemeentewaterleidingen
- Expansion of system
- 1957 River water infiltration in the dunes
- Improvement of water treatment

DUIN-WATERLEIDING.

COMMISSARISSEN en DIRECTEUREN der
WATER-MAATSCHAPPIJ berigten bij deze,
uit aanmerking der tijdsomstandigheden, besloten

HET DUINWATER

tijdelijk verkrijgbaar te stellen, dagelijks, te beginnen
met MAANDAG 12 DECEMBER e. k., van des morgens
acht tot des namiddags vier ure, aan de Fontein
buiten de Willemspoort alhier, tegen betaling van
EEN CENT PER EMMER.

Niemand zal meer dan Twee Emmers te gelijk kunnen
bekomen.

Amsterdam, 9 December 1853.

Commissarissen en Directeuren der Duinwater-Maatschappij,
ARTHUR R. ADAMS, J. VAN LENNEP,
Commissaris. *Voorzitter.*

J. G. JÄGER,
Secretaris.

NB. Er wordt geen Geld gewisseld.



secr ee t



me st



p ü p



r w z i

4.2 Wastewater disposal and treatment

4.2 Wastewater disposal and treatment

- 1870 Linear sewer system
- 1912 Discontinuation of linear sewer system
- 1904 Start of construction modern mixed sewer system
- 1926 First WWTP
- 1955 Construction of rainwater sewerage
- 1986 All houses are connected
- 2005 Relocating WWTPs → new centralized WWTP
- 2015 Connecting boats to sewerage
- **2016 Nutrient recovery (struvite)**





4.2 Solid waste

- Outsourcing waste processing
- 1919 first incinerator in operation.
- Upscaling incinerators
- 2003 Establishment of AEB → expansion waste disposal & recycling
- 2006 Cooperation between AEB & Waternet

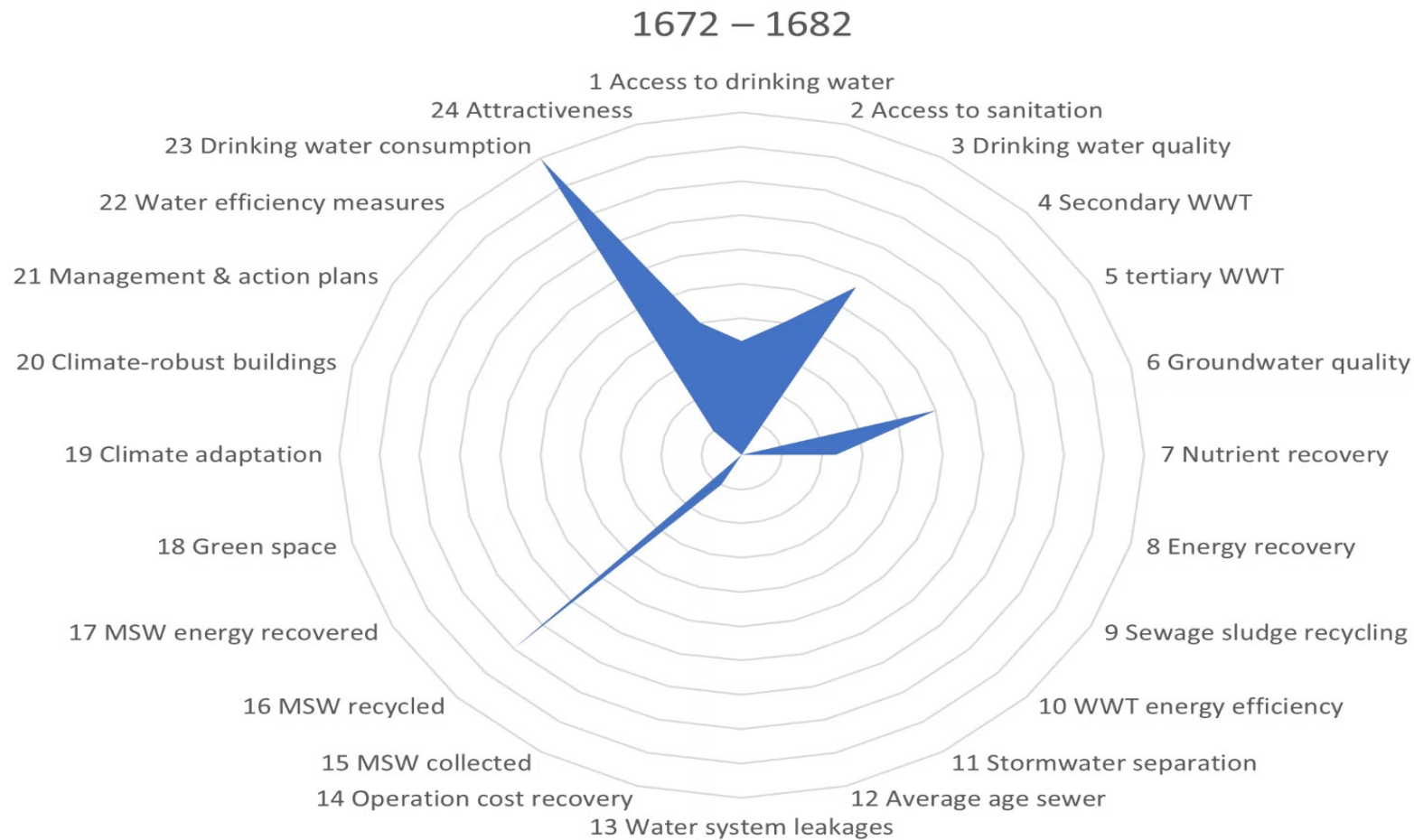
4.2 Blue-green space and climate adaptation

- Green spaces have always been available
- The greenery decreased due to city growth
- Abundance of water
- 2007 National climate adaptation strategy
- 2014 Start of Amsterdam rainproof
- Integration of climate change and adaptation



Amsterdam Rainproof

4.2 Developments in water management and governance



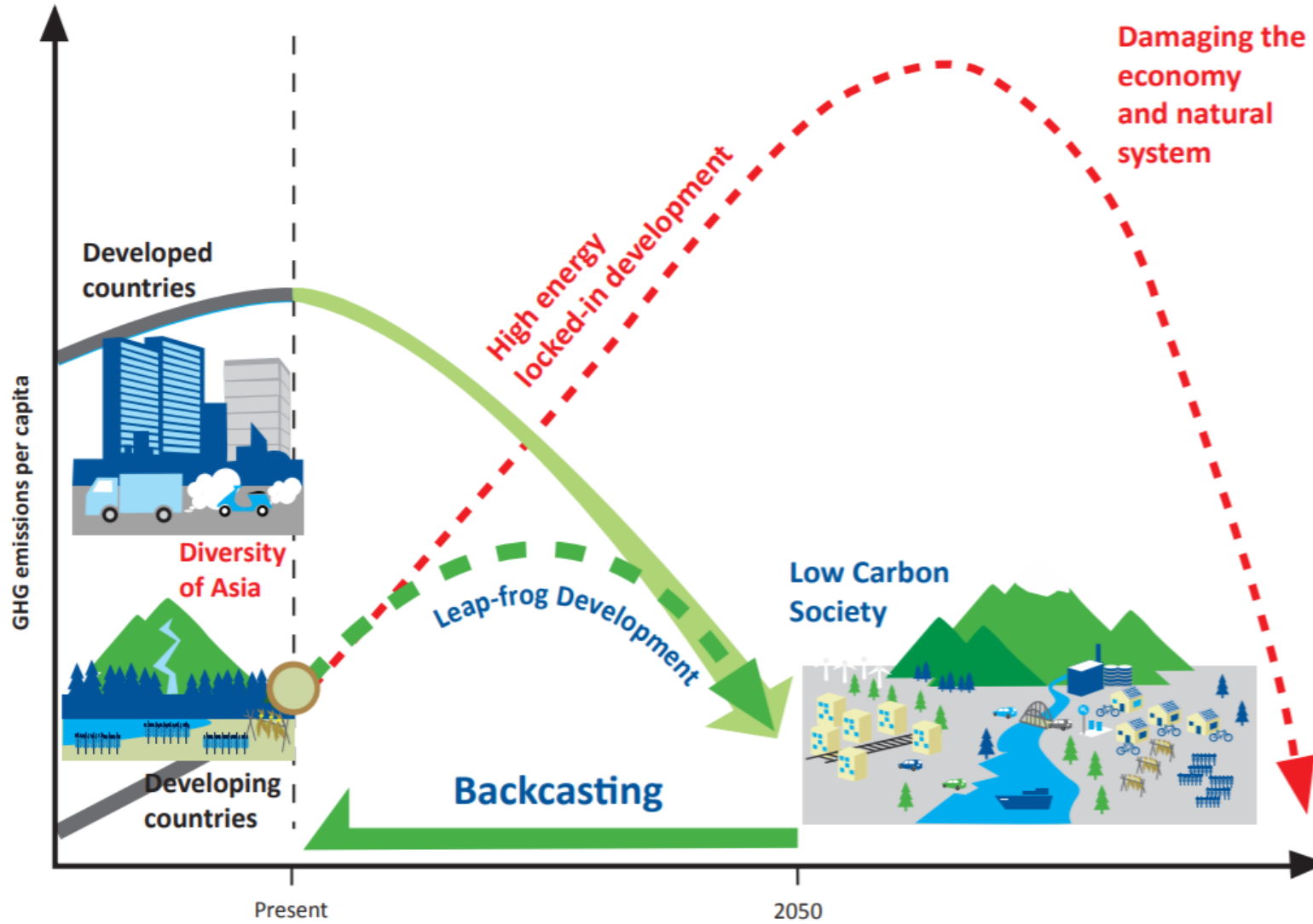
4.3 Amsterdam's water future

Expected challenges and developments:

- Climate change
- Circular economy
- Increasing pressures on the water system
- Short-term vision

Recommendations:

- Smart water management
- Technical perspective
- Citizen participation
- Biodiversity
- Long-term vision
- Maintaining IWRM



4.5 Recommendations for city development and leapfrogging trajectories

4.5 Water infrastructure

- Sufficient storage and disposal capacity
- Built in such a way that it is easily adaptable/expandable
- Avoid nuisance caused by maintenance of the system
- Design of distribution network is important to consider
- Separate versus mixed sewer system
- Rainwater drainage
- Provide enough green spaces

4.5 Water management

- Implement integrated management of the water chain and at macro level
- **Integrate** water into urban development
- Multiple discharge directions
- Ensure sufficient flow of water
- **Maintain sufficient capacity and expertise**
- Asset management
- **Public participation: education and raising awareness**



4.5 Water governance

- Close link between water technology and city administration (Hudde)
- Integrated approach (IWRM), also with non-water agenda's
- Long-term policy
- One responsible administration for **water management; prevent fragmentation**
- Communication with citizens **is key**

5. Discussion

- CBA is useful for holistic overview
- Challenge in applying CBA, as contexts and perceptions continuously changed.
- Methodology not tailored to assess the indicators in other time periods **and had to be adapted for this study.**
- Much qualitative, less quantitative data available in previous centuries
- Much more can be learned from the past

6. Conclusion

How did water management and governance evolve?

- Social and economic indicators are often the driving force
- Crises are **needed for change**
- Citizens and private organizations are essential in decision-making
- IWRM

What can be learned?

- **An integrated vision** provides more long-term solutions
- City-to-city learning
- Combining financial capital, knowledge, and good mutual cooperation are important

6. Conclusion

Integrated vision, long-term goal, **and transfer** of capital and knowledge with other cities and countries are essential in enhancing a city's ability to address its water challenges.



Any questions?

Thank you!