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by 2025

Climate change - a threat or a possibility?



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PALACE

HOTEL

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Presentation overview

- Introduction and framework
- The strategy of the Climate Adaptation Plan
- The challenges for Copenhagen
 - rain
 - sea
 - heat
 - ground water
 - biodiversity
- The possibilities for Copenhagen
 - a greener and more liveable city
 - green growth
- The solutions



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Copenhagen in the future



Climate capital of the world

6 goals for Copenhagen:

- Energy - from coal to wind
- Transport – from cars to bikes and hydrogen
- Buildings - higher energy efficiency
- Urban development - low energy use
- Behaviour - more climate friendly.
- **Adaptation - adapting to a future climate.**



2015 20 % CO₂-reduction



2025 CO₂-neutral Copenhagen

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The 8 commandments of adaptation in Copenhagen

- acting responsibly and in time
- avoiding misinvestments
- securing that investments return as economic growth
- maximum synergy with other planning
- flexibility regarding changes in prognoses for future climate
- climate adaptation has to be a quality in it self for citizens and businesses
- that adaptation takes place on the basis of high quality analytical work
- centralised management of the adaptation work



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Municipal climate adaptation planning



Risk assessment

- Possibility * cost



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Assessing the risks

Costs Probability	Low	Medium	High
Low probability	Risk can be tolerated	Risk can be tolerated	Moderate risk
Probabilty	Risk can be tolerated	Moderate risk	Risk can not be tolerated
High probability	Moderate risk	Risk can not be tolerated	Risk can not be tolerated

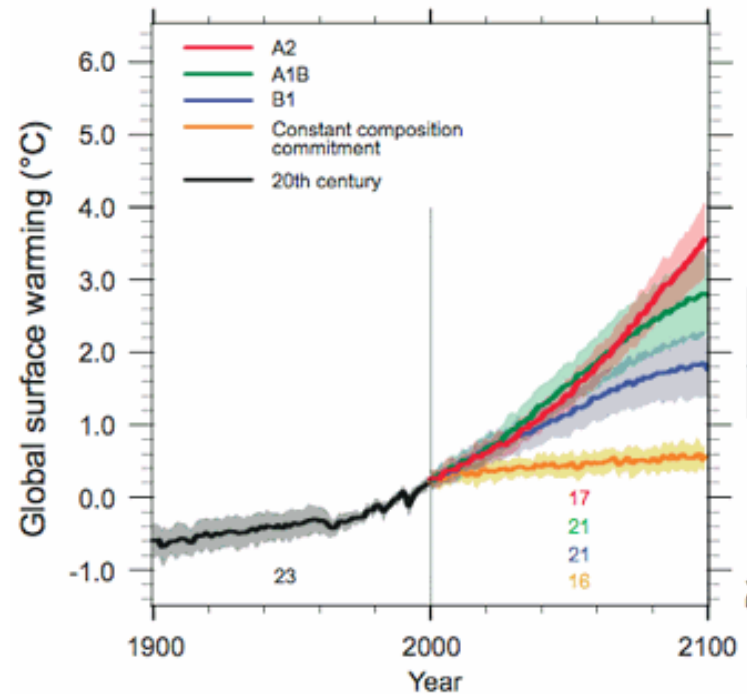
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Continuous revision of plan

- The prognoses are uncertain
- The demands to the city in the future are unknown
- The technological development is unknown
- The uncertainties are uncertain

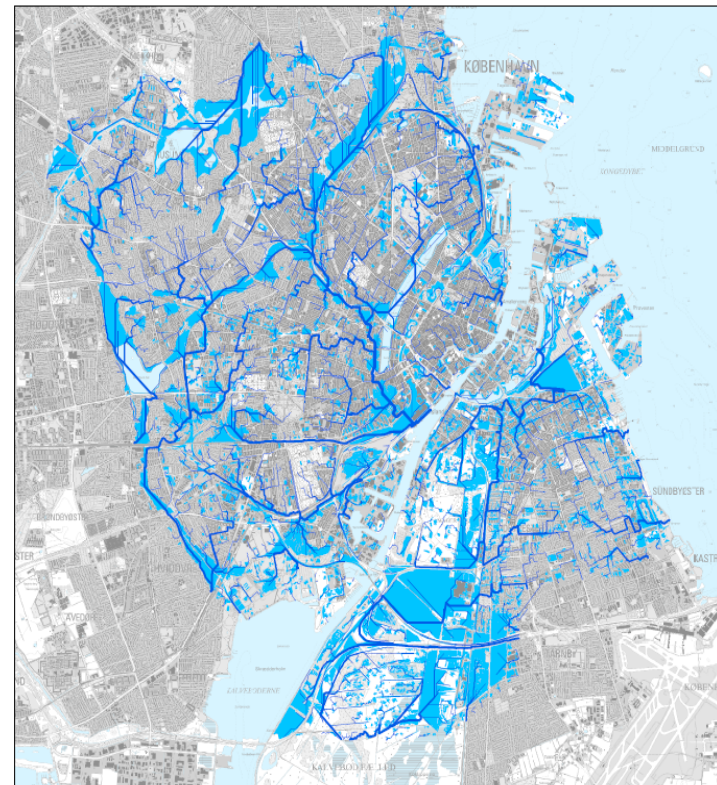




Main challenges for Copenhagen

More and more intense rain

- We estimate that in the next 100 years rainfall will increase by 30%
- 25-55% more precipitation in the winter
- 0-40% less precipitation in the summer
- Intensity of late summer precipitation will increase by 20-50%



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Rising sea levels

Copenhagen relatively well protected

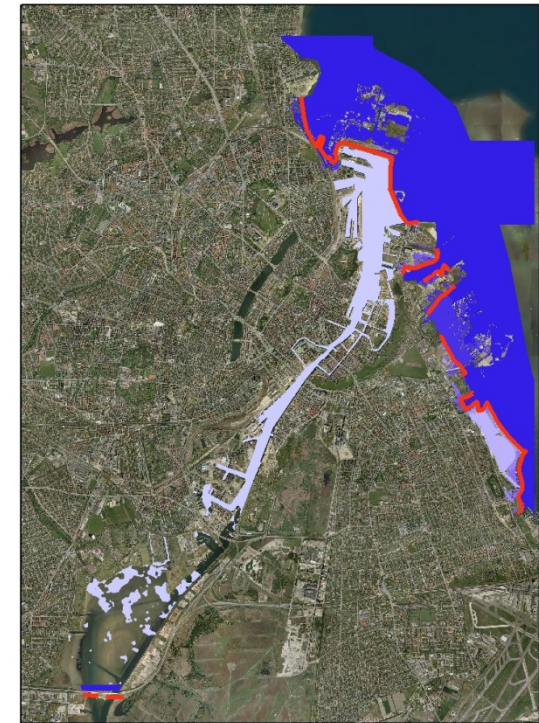
But the risk of floods will increase if the sea levels raise by a meter or more

- Estimated damage in future flooding of 2.6 meters: 1400 million Euros
- Estimated costs for flood protection: 260 million Euros
- Funding and allocation of costs of protection is undetermined

Udbredelse af højvande med maksimum i 2,82 meter
Niveau af vand ved 2,61 meter, 13 timer inde i hændelsen



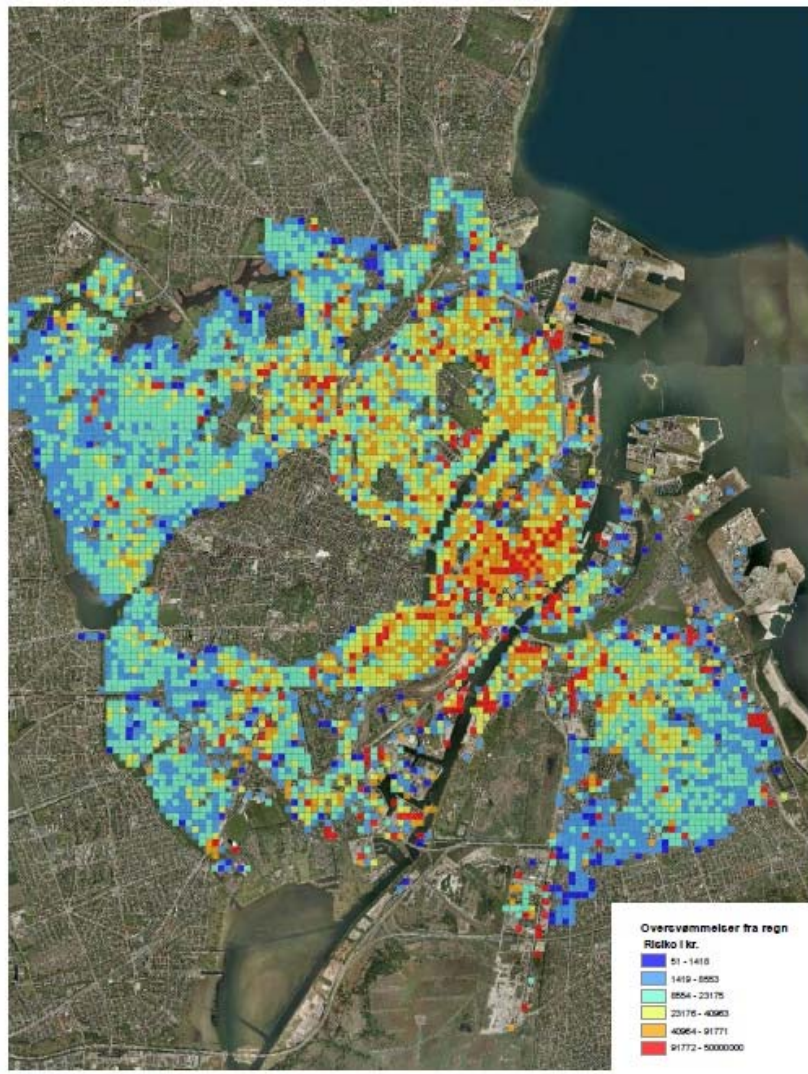
Uden beskyttelse mod højvande



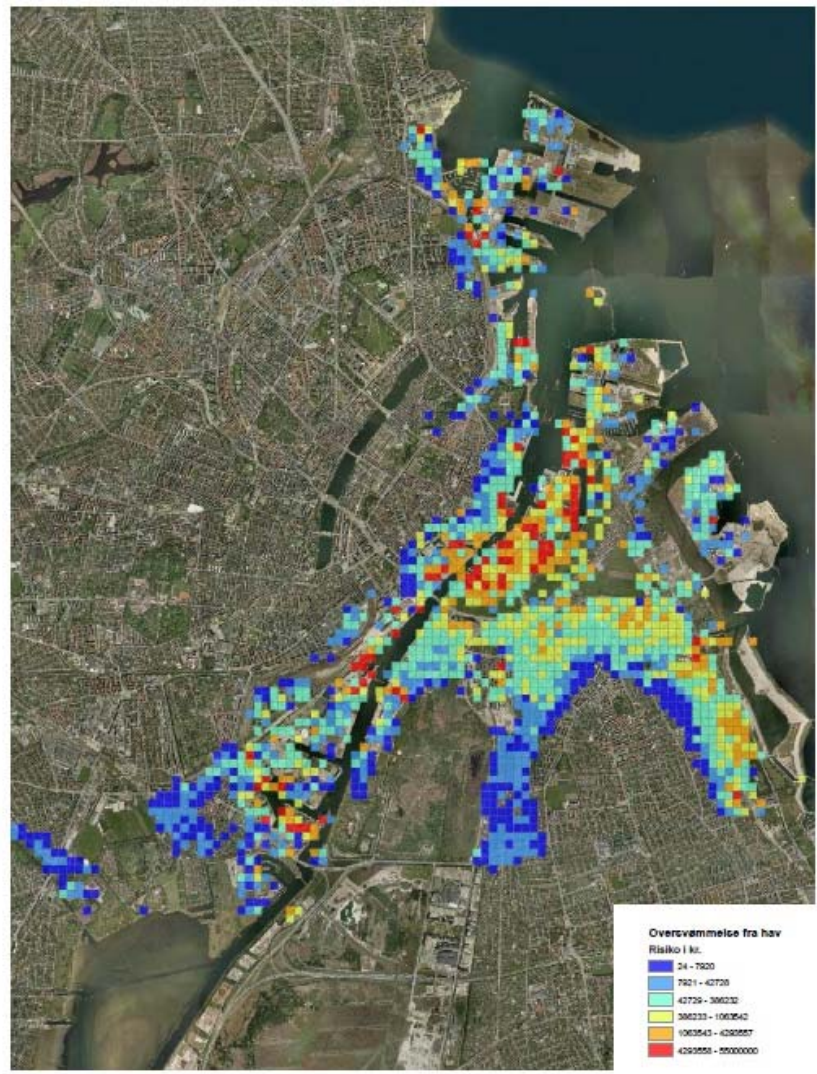
Med beskyttelse mod højvande til kote 2,55 meter

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Risk map



Risk map for flooding caused by rain in 2110

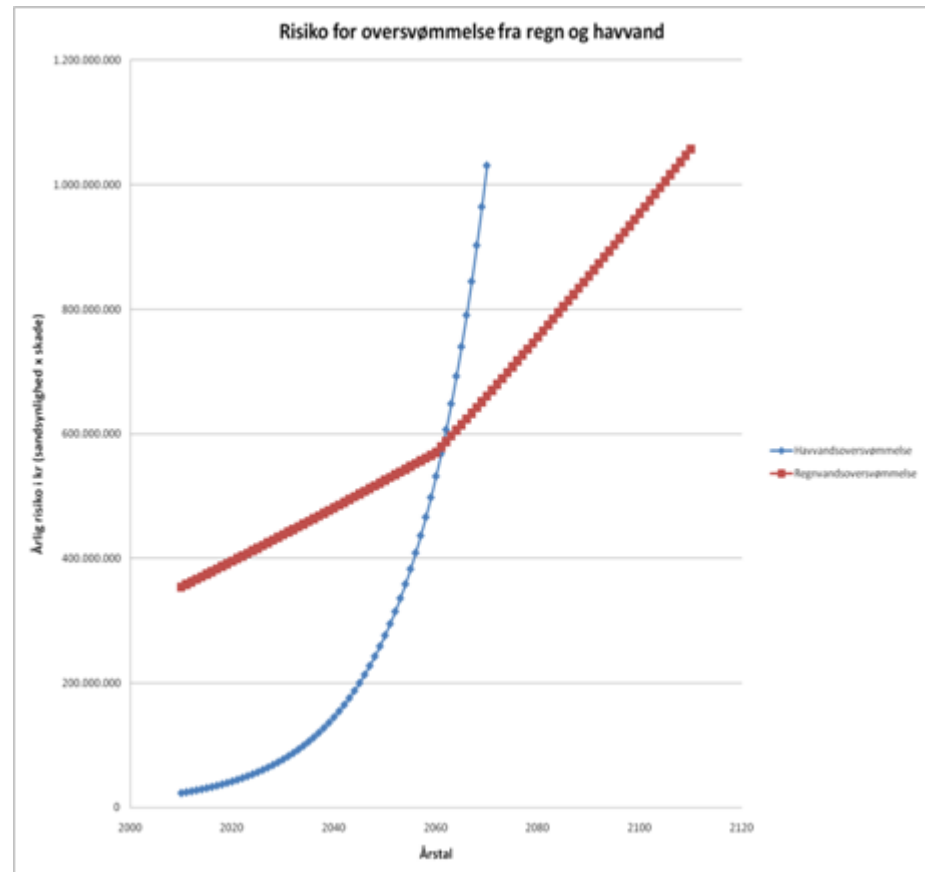


Risk map for storm surges from the sea in 2110



Risk assesment - rain vs. sea

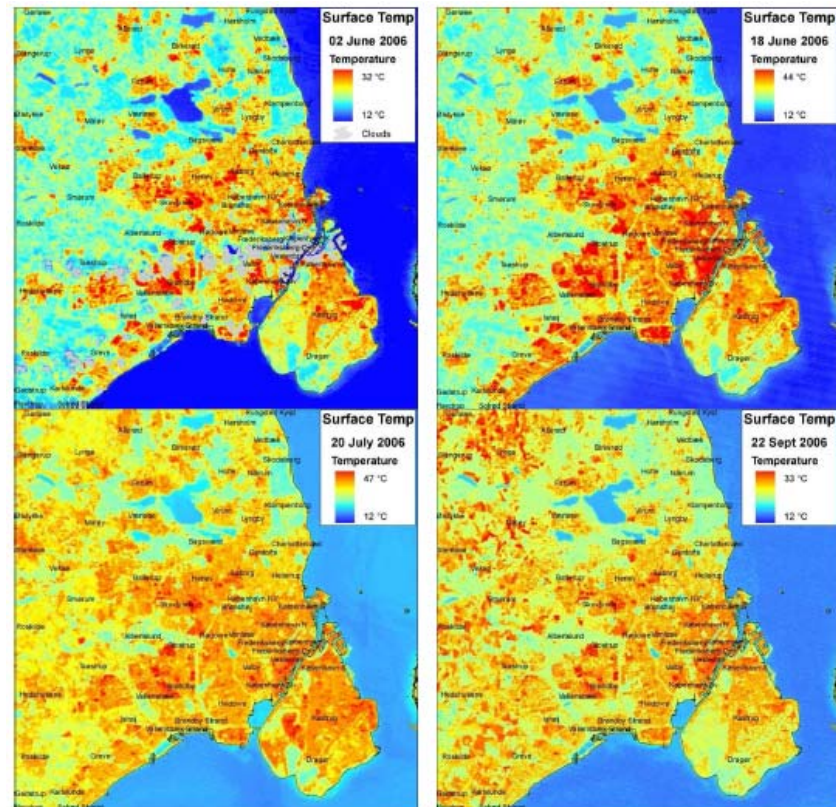
- Estimated costs and the probability of damage show that rain is the most immediate threat
- But in 30 years time - the risk of flooding will be greater (and the damage higher)
- Long decision process - complicated financing
- Consequences for urban development
- Therefore we must start planning now



Heat - ground water and biodiversity

- Higher temperatures
- More frequent heat waves
- More intense heat waves
- A weather like Paris!!!
- But this can increase the risk for especially elder and weak citizens

- Ground water levels will change
- A changing climate will also affect the biodiversity



Figur 13: Kort over overfladetemperaturer i København og omegn på fire dage i 2006, nemlig d. 2. juni, d. 18. juni, d. 20. juli og d. 22. september. Kortene er fremstillet ud fra en bearbejning af Landsat-data.

Possibilities



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A greener and more liveable Copenhagen

- Adapting to climate change is not just negative
- We can increase the recreational area - and create a more liveable city
- We can increase the health of the citizens
- We can create synergies with other planning
- We can increase the biodiversity in the city.



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A Copenhagen with economic growth

- We can use climate change to stimulate economic growth
- A climate proof city is more attractive to invest in
- The solutions we choose can stimulate technological and planning innovation
- Therefore adaptation is going to be part of the green growth work in Copenhagen



Solutions



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Rain water solutions

- Flexibility in capacity
- Quality in solutions
- Multifunctionality
- Recreation

- Plan B
- Plan B
- For extreme rainfall
- Runoff to parks
- Runoff from roads
- Temporary storage on car parks and on roads



Sea level solutions

- Two possibilities:
 - On site protection of existing housing and local dikes
 - Raising the level of new housing
 - Problematic and insecure
 - Will decrease the use of the existing harbour
- Building a dike/sluis at the entrance of the harbour
 - Expensive - but efficient
 - Recreational use



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A greener Copenhagen is a climateproof Copenhagen

- Integrated solutions - heat, water and biodiversity
- We make the city greener as it develops and in areas where there is an increased risk of flooding
- Public buildings and areas
- We want to focus on projects that can provide new knowledge and inspiration
- Partnerships with private land owners





**Examples from the real world
- and the future....**

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Handling more water and developing a recreative waterfront

Main problem: a polluted harbour and a combined sewage system.

An unattractive harbourfront

A plan for reducing sewage overflow was made and accepted by the city administration in 1992

Developing a park along the harbour front



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Tools

- construction of rain- and sewage water reservoirs



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Harbour baths - a huge improvement of the quality of life



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- Separating roof water
- Cleaning run off from roads through new technology
- Creating recreational areas
- And it works.

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Harrestrup Å

Combined solutions for climate adaptation, wastewater planning, water planning and recreational urban life



Local drainage of water - in local district of Husum



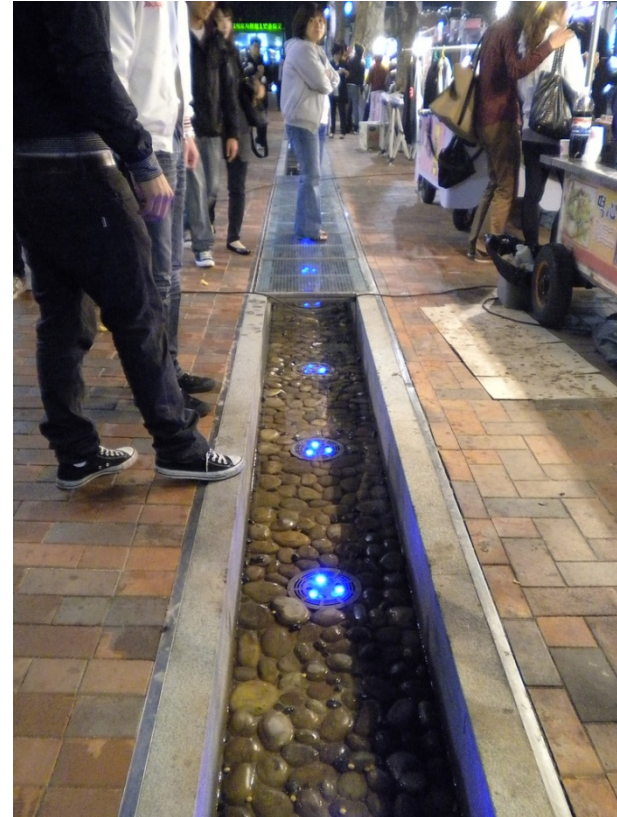
- Problems with sewage overflows into streams and parks - uncontrolled
- Problems with water in basements (25% in last major rainfall)
- Unattractive road.



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Are there any problems????

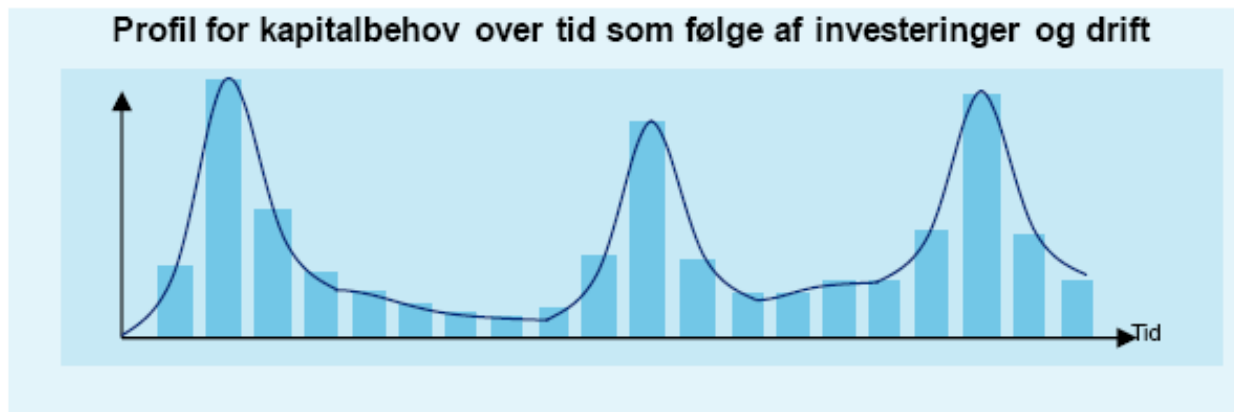
- Oh, yes!
- At planning level:
 - At least two different set of logics:
Architects and engineers
 - We need to get the different logics to cooperate!
- Political and public awareness
 - We have to make the problems accessible and understandable for the public and the politiciansong planning horizon vs. short political attention span
 - How do you inform without scaring. Communication strategy?



Financing

- Many stakeholders
- Long term investments
- But the payment is not evenly spread

Figur 1: Illustration af de omkostninger over tid



Kilde: Deloitte

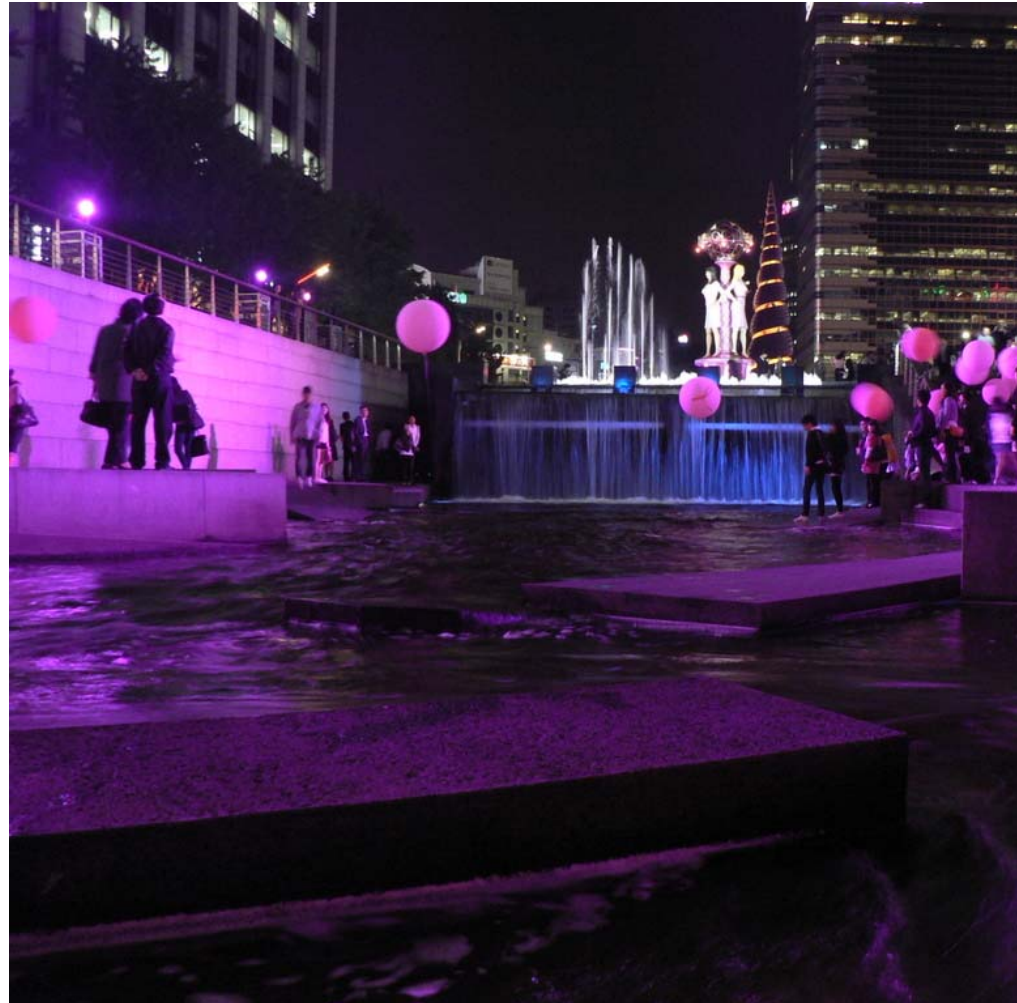
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Water, water everywhere....

- We need to prioritize in some areas:
 - groundwater or local drainage of rain water
- We have to live with a lot more water in the city - also rain water.
 - So health issues and water borne diseases becomes an issue
- We have to work on the development, innovation and design of elements that we can use
 - We have to make water a lifestyle choice



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Thank you for your attention

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