

Rotterdam Resilient Delta City



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Climate Adaptation



Climate Resilience



City Resilience



Rotterdam Resilient Delta City

Dutch Delta

The Netherlands is a delta of 4 rivers: Rhine, Meuse, Schelde and Eems

Prone to flooding: 59%

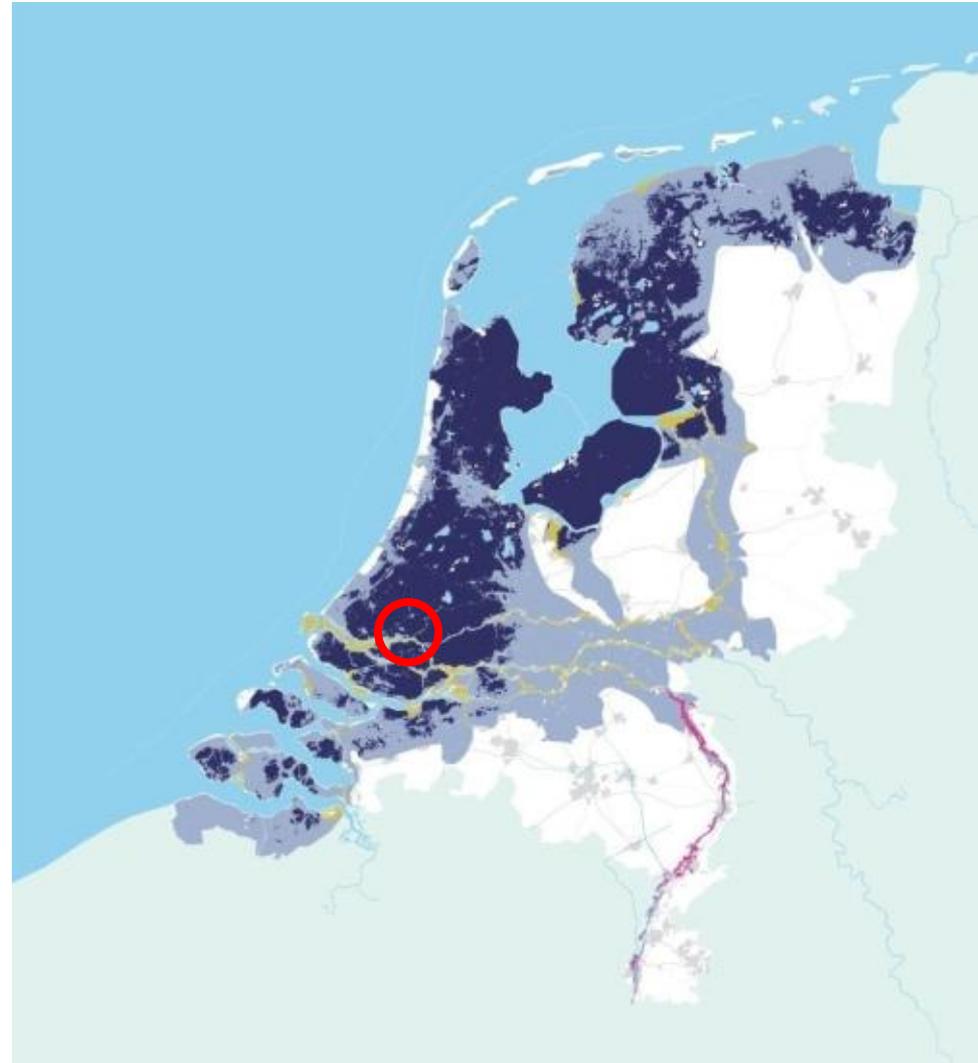
■ Below sea level: 26%

■ Above sea level: 29%

■ Outside dikes: 3%

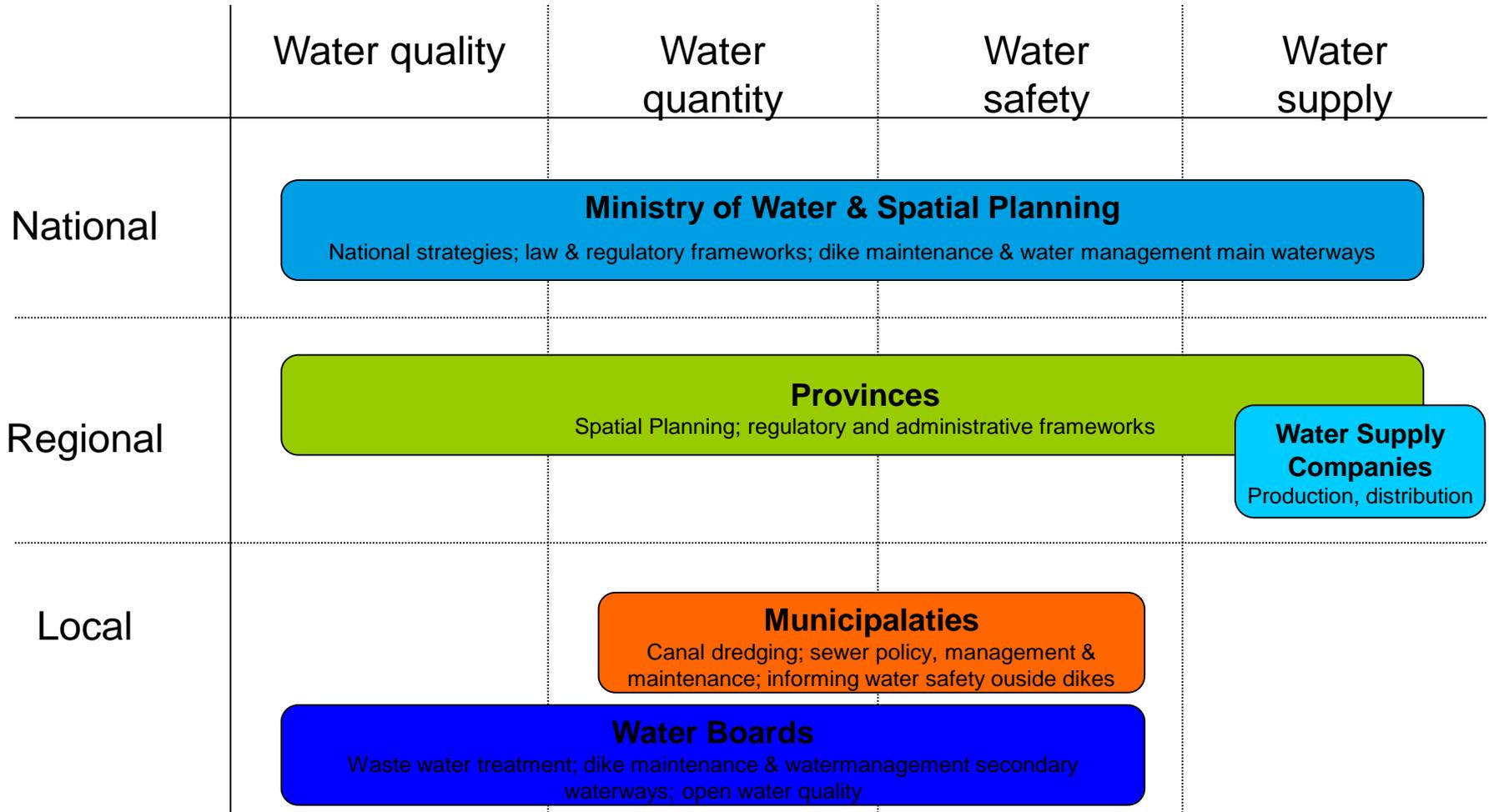
More than 22.000 km of dikes

Coastline of 880 km



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Watermanagement in The Netherlands



Rotterdam

City of water, Delta city

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City

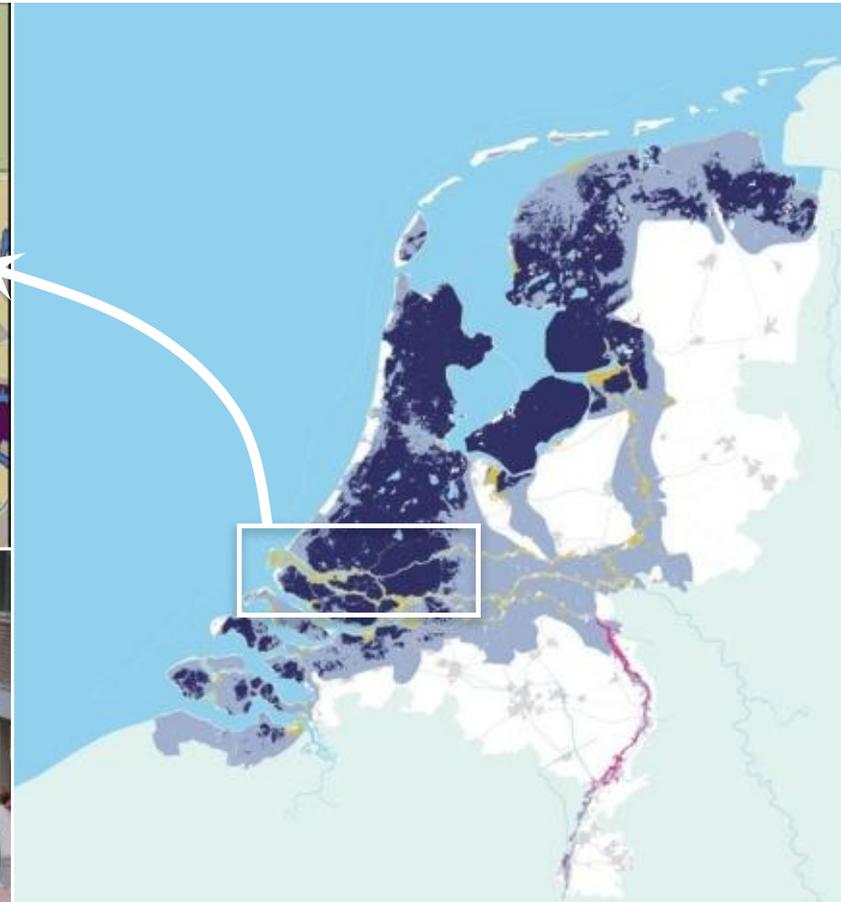
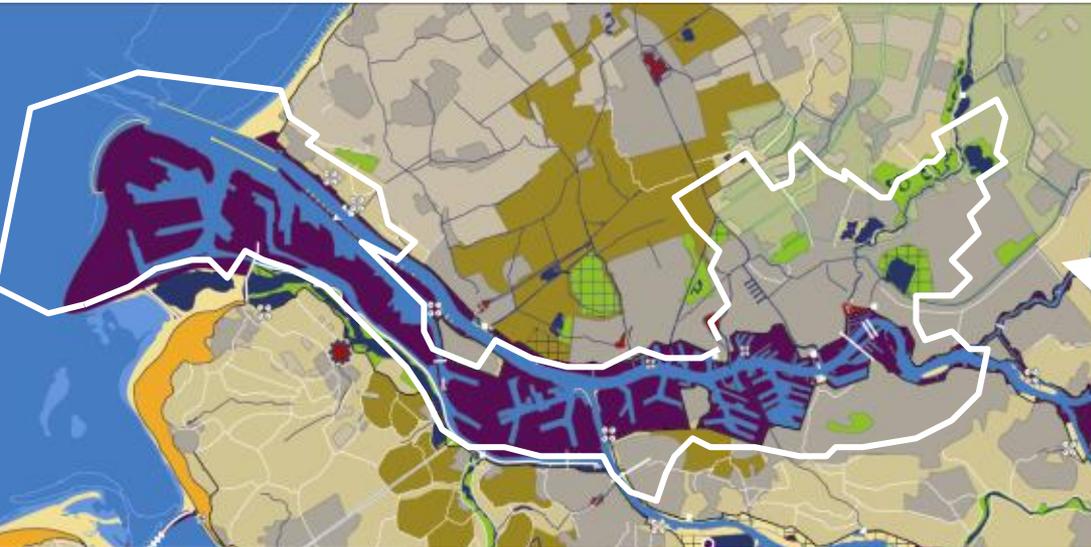
Area : 320 km²
Inhabitants: 638.000
Nationalities: 175
Municipal Budget: 4,2 billion Euro's

Region

Inhabitants: 3.600.000

Port

Area: 105 km² (50 km² commercial sites)
Length of port area: 40 km.
Direct employment: over 70,000 jobs
Goods throughput: over 400 million tonnes of goods per annum
Shipping: 33,000 sea-going vessels and 110,000 inland vessels per annum





Rotterdam, city of water...



Worldwide recognized...



ROTTERDAM, THE NETHERLANDS

The world is watching
Rotterdam, where climate
change is an opportunity

BY MICHAEL KIMMELMAN



With a still expanding world port ...





... attractive residential areas...





...and a lot of architecture



Challenge

Watermanagement is core-business

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Effects of Climate Change



Sea level rise



Low river discharges



Long periods of heat



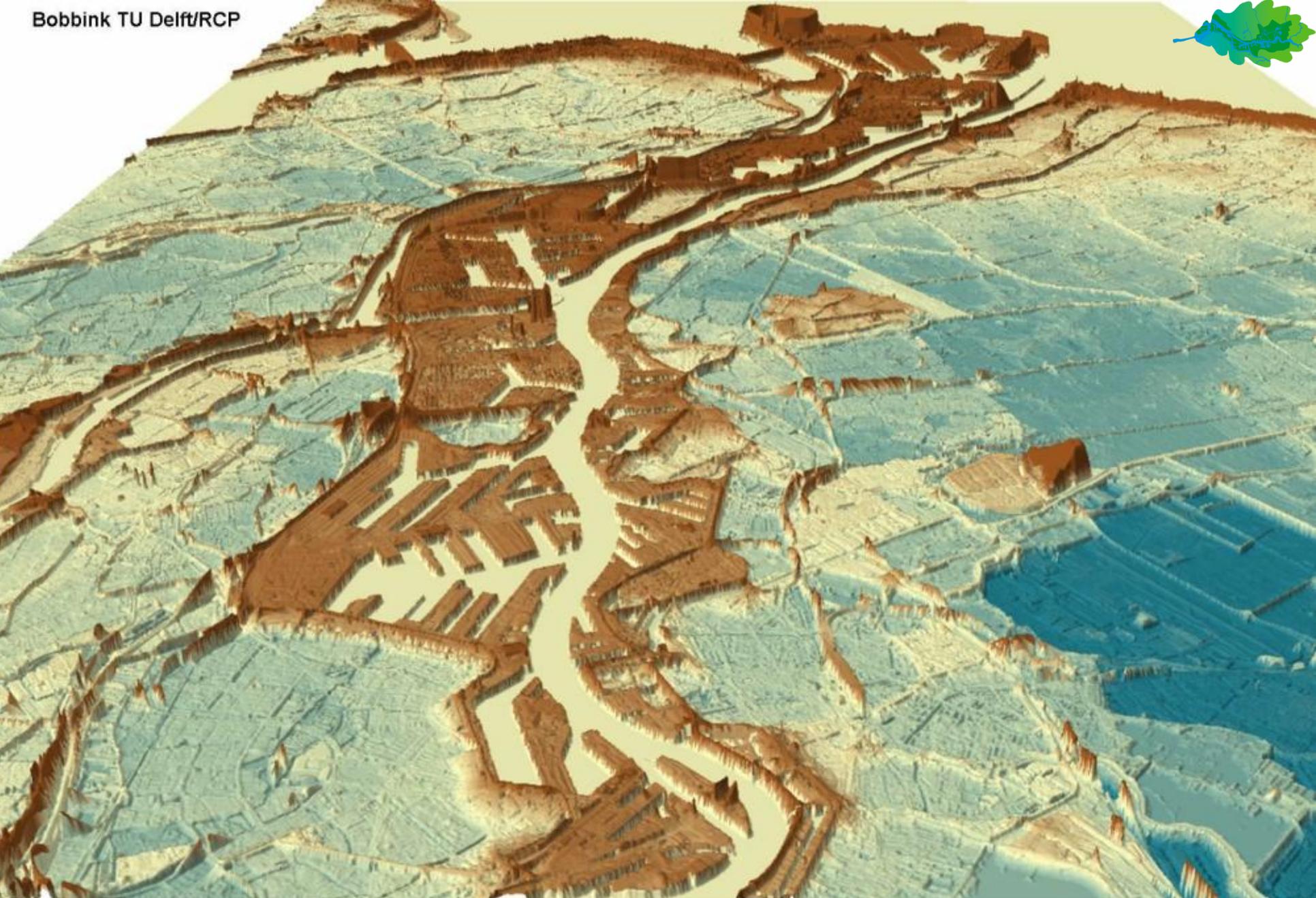
More intense rain events



High river discharges



Long periods of drought



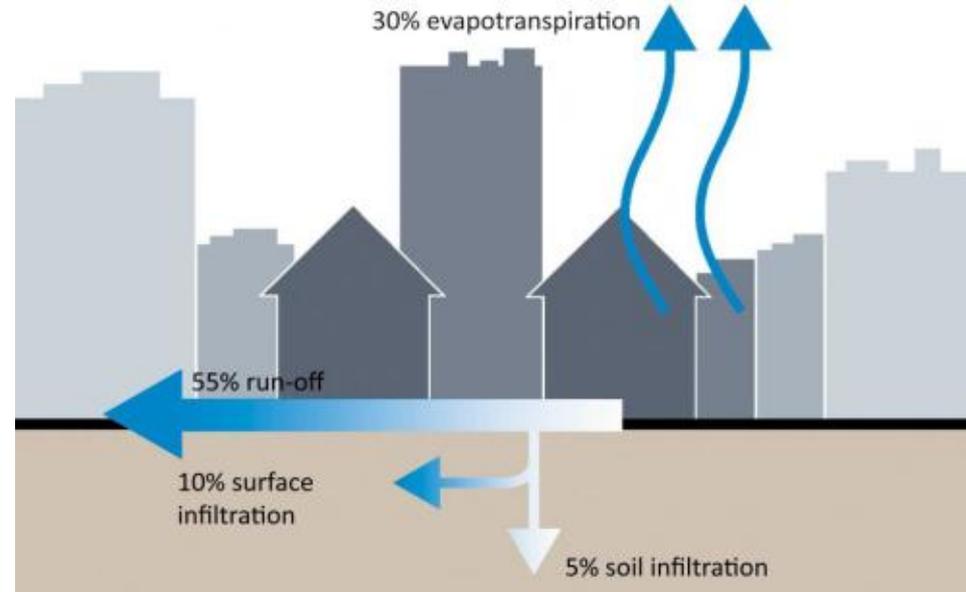
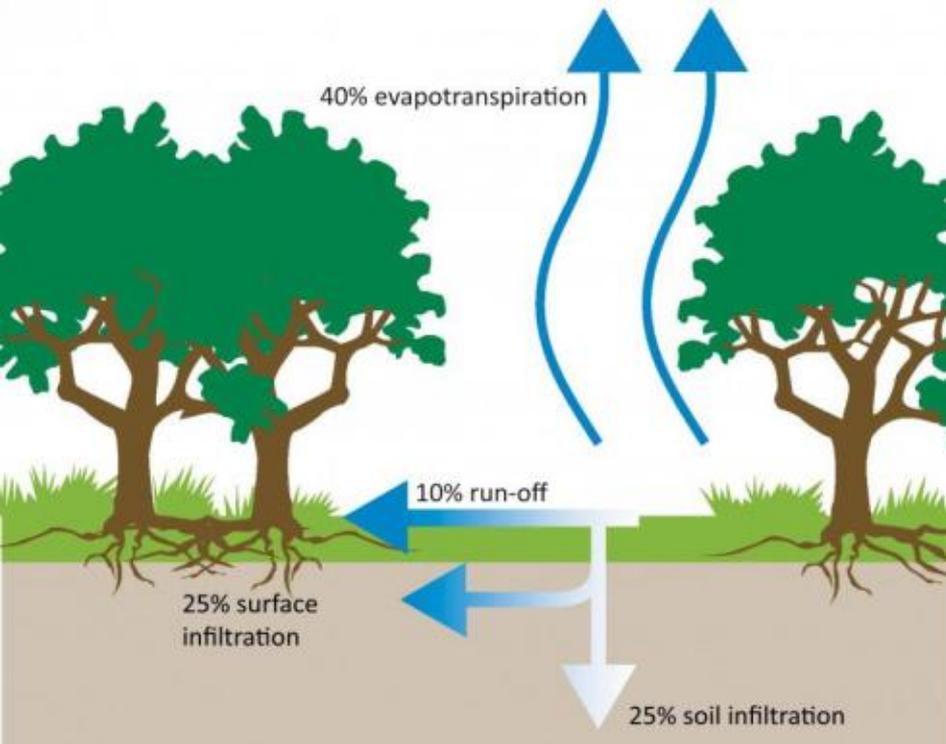
Height map: above (brown) and below (blue) sea level

Challenge: increase of paved area

INCREASE OF PAVED AREA

DISCHARGE SURPLUS WATER

SOIL DEHYDRATION

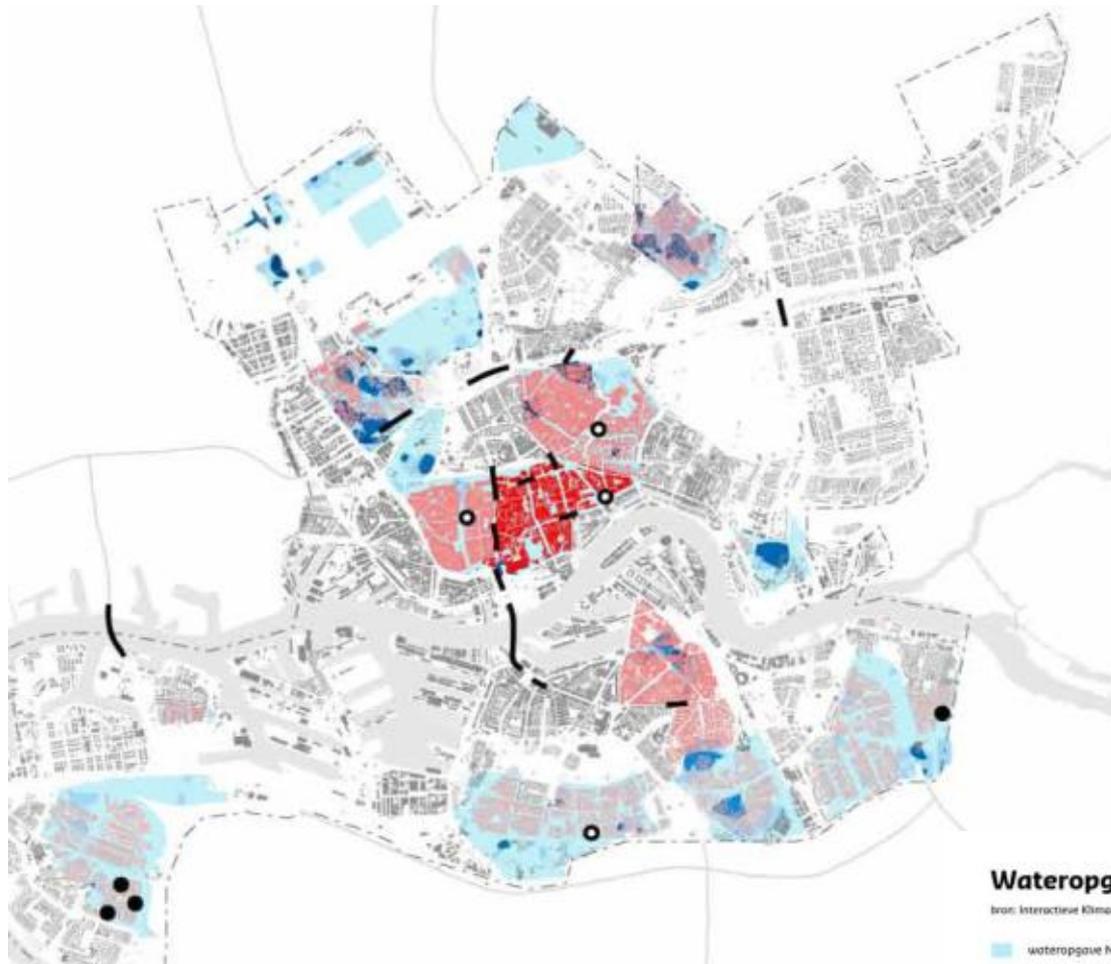


LACK OF WATER STORAGE

DEHYDRATION

HEAT

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Wateropgave

bron: Interactieve Klimaatatlas

wateropgave NBW huidig

bodemdalning (cm/jaar)

-0,1 - 0,5

0,5 - 0,1

>1

Knelpunten en kwetsbare gebieden

- knelpunt riolering
- knelpunt grondwateroverlast
- Centrumgebied met grote druk op de open ruimte
- Stedelijk met weinig open ruimte
- Stedelijk met veel open ruimte
- laag gelegen infrastructuur



Water Storage Defecit



Water is sometimes a threat, at present ...





Rotterdam



New York

... and not only in Rotterdam, but worldwide



Rotterdam



St. Petersburg

Vision & Action

Not taking action is not an option

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Rotterdam: urgency to act



The climate
is changing



City deve-
lopment is a
continious
process



Keeping
trust in a
safe region



Adaptation
offers
opportunities



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Broadening scope → more integrative approach

- Water -----
- + Spatial Planning -----
 - + Climate Change -----
 - + Resilience (wide spectrum) -----

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Adaptation program: a 3-way focus

Knowledge



Knowledge



Policy

Actions



Projects



City Improvement

Exposure/Marketing



Cooperation



Economic Spin-off

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Core of the Rotterdam Adaptation Strategy

1. **Appreciate:** maintain en strenghten our robust waterinfraestructure
2. **Adapt:** extend our options → make use of the public & private space in the city
3. **Engage:** Cooperate and link in
4. **Add value:** for environment, society, economy and ecology



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Holistic, multi-level and multi-stakeholder strategy



Robust and resilient



Sewerage + watersquare



Protection and moving in tune



Dikes + adaptive building en design



Delta works, small scale projects



Storm surge barriers + 'Remove tile, plant greening'



Technology and nature



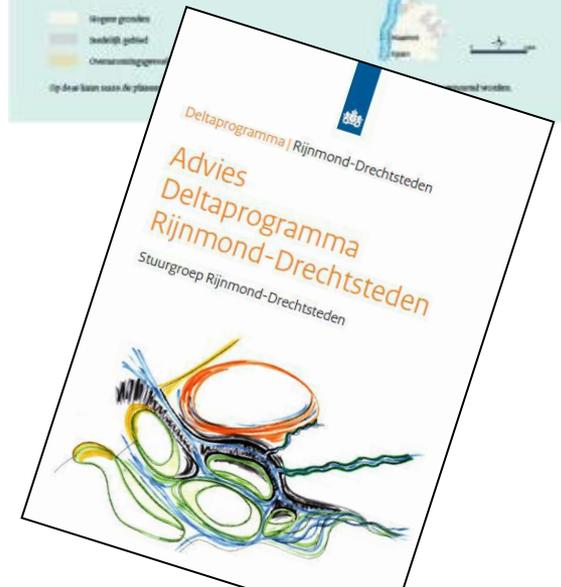
Pumping + green banks



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National Deltaprogramme

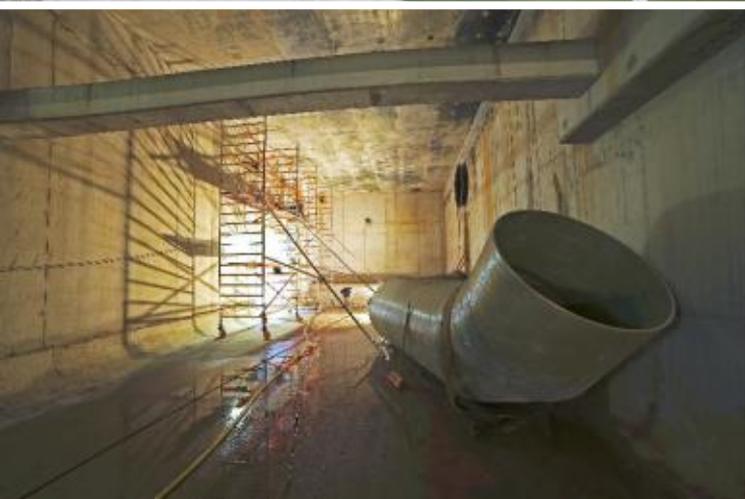
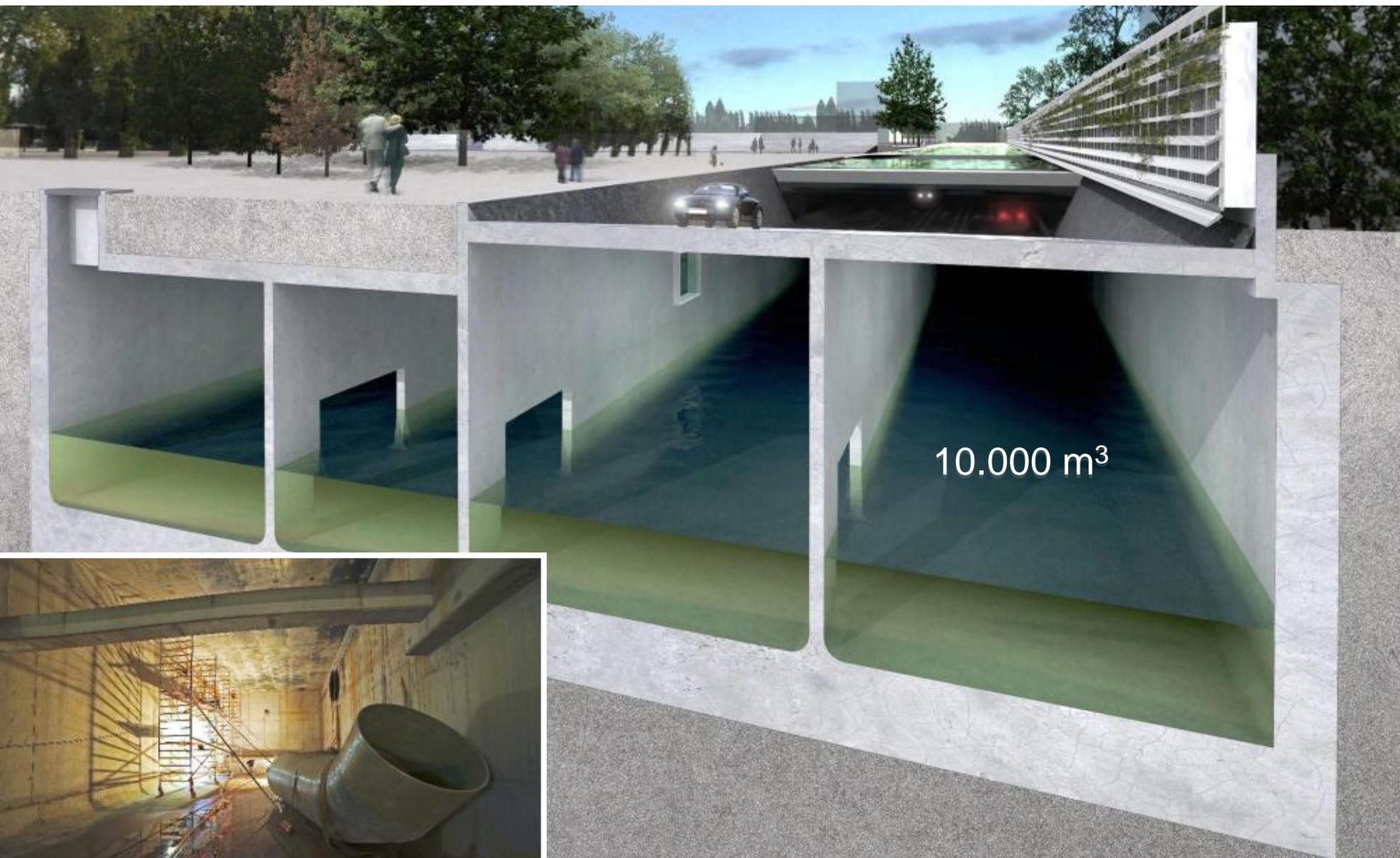
- Long term climate adaptation strategy
- Area-based approach
- Multi stakeholder strategy development
- Strategy Rijnmond-Drechtsteden: adaptive 'small steps' approach



Results

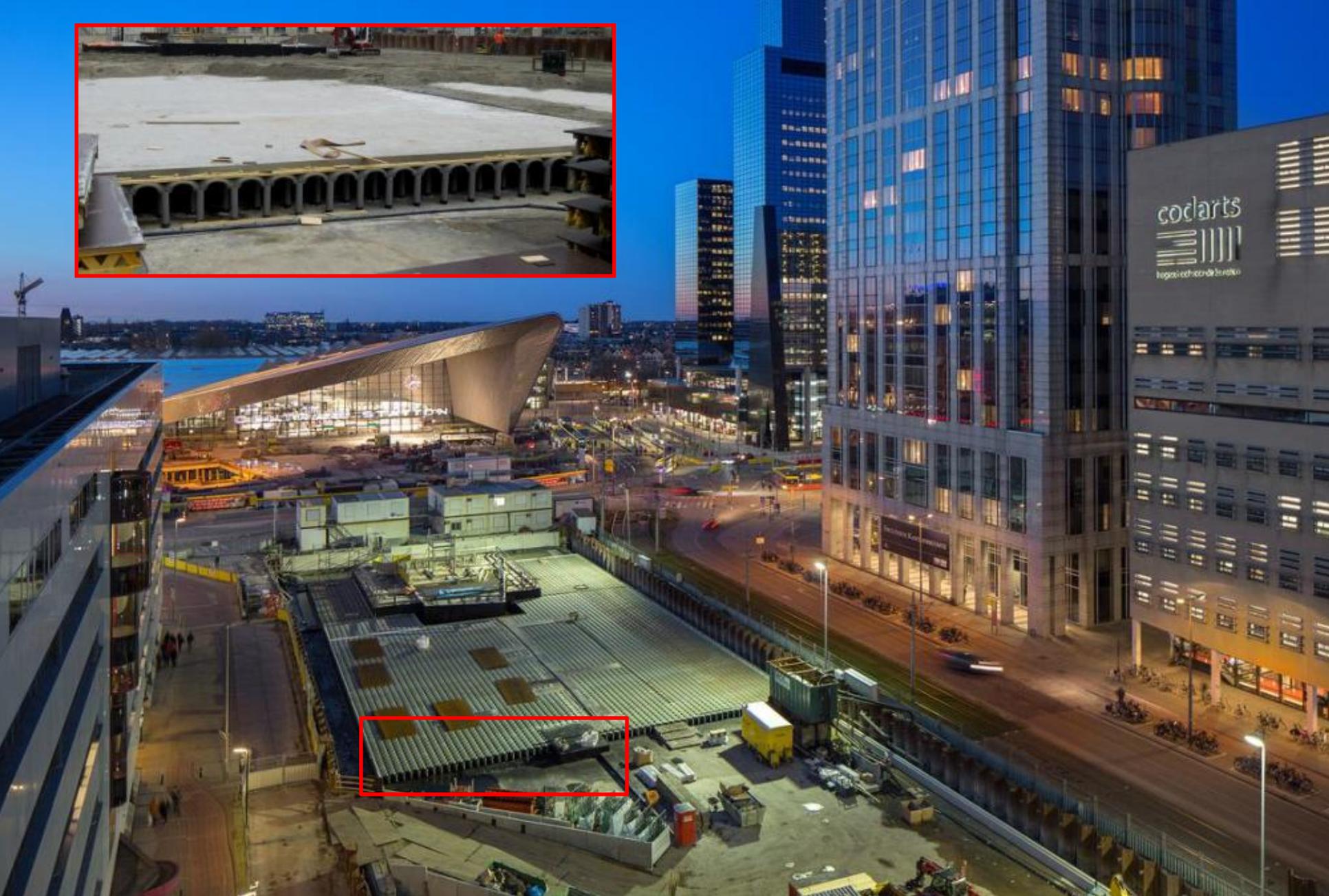
The proof of the pudding is in the eating

Multifunctional building: parking & water storage





Waterstorage Kleinpolderplein



Extended canal: waterstorage Kruisplein

Multifunctional public space: waterplaza



Waterplaza Benthemplein...





...temporarily storage of excessive rain



Community involvement: sustainable roofs program

KANSEN VOOREENDUURZAAM ROTTERDAMS DAKLANDSCHAP

Rotterdam heeft een unieke architectuur die door de geschiedenis is gevormd. Na de oorlog is vooral met auto's en gebouwen, met hoog in de hemel 100 jaar lang in de kern van de stad, de skyline van Rotterdam die 100 jaar oud is. Dit is de kern van de stad, en het is niet alleen de skyline, maar ook de manier waarop de stad is gebouwd. De gemeente Rotterdam wil haar rol spelen in de ontwikkeling van de daklandbouw. Dit betekent meer dan alleen het bouwen van daklandbouw, maar ook het creëren van een leefbaar en duurzaam gebied.

TYPEN DAKZIJDE DAKEN

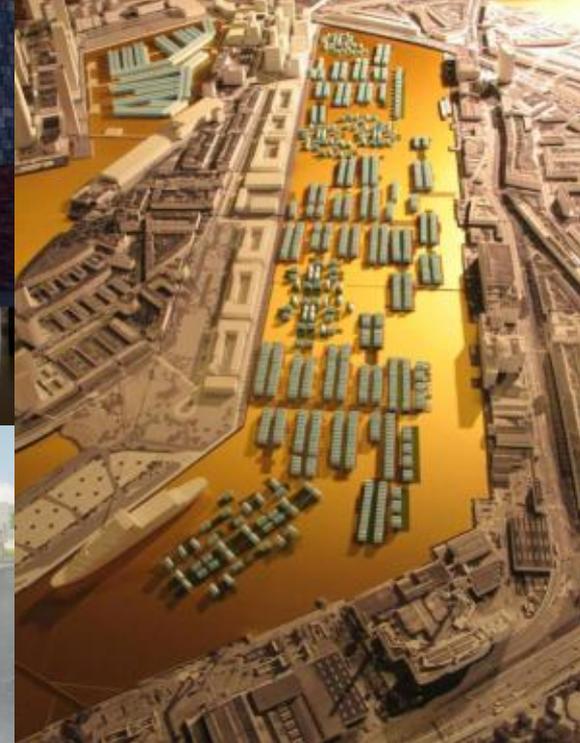
- Een dak met een laag laagte. Dit type dak is geschikt voor de meeste dakzijkanten. Het is een goed voorbeeld van een duurzaam dak.
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Cooperative approach on district level

Building a green framework and programmatic clusters for and with the neighbourhood





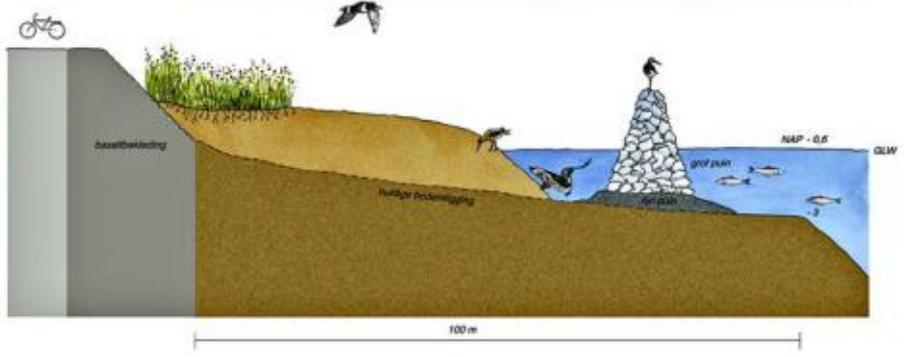
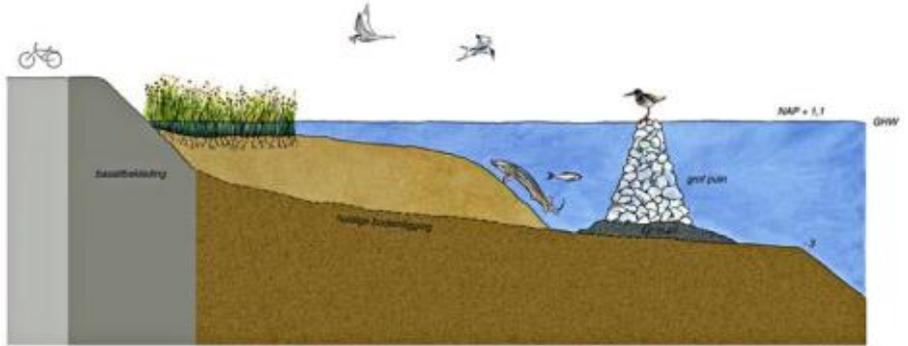
Opportunity: adaptive area development



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Huidige situatie
Current



Toekomstige situatie
Future



Implemented: The Green Gateway

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Key drivers of the Rotterdam Climate Proof programme

- Political commitment for sustainable development (budget!)
- Clear goals and vision to act
- Cooperation with national programmes Knowledge for Climate and Deltaprogramme
- Strategy/policy development along with implementing projects and focus on economic spin-off (results!)
- Early cooperation with internal and external stakeholders
- Open mind to experiments and pilot projects
- Government-to-government cooperation leads to business opportunities



Rotterdam welcomes
Delta Cities from around the world



URBACT RESILIENT EUROPE



100RC & URBACT & Connecting Delta Cities

Rotterdam Exchange

Water Management &
Multi-Benefit Solutions

POWERED BY THE
ROCKEFELLER FOUNDATION

100 RESILIENT CITIES



Next Level

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ROTTERDAM RESILIENCE STRATEGY.

**READY FOR THE
21ST CENTURY**

CONSULTATION
DOCUMENT

AN EXPLORATIVE JOURNEY INTO THE UNKNOWN

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100 RESILIENT CITIES

ABOUT US

THE CHALLENGE

BLOG

CITIES

PLATFORM PARTNERS

CITY R

PORTO ALEGRE
BRAZIL

PUNE
INDIA

QUITO
ECUADOR

<http://www.100resilientcities.org>

RIO DE JANEIRO
BRAZIL

ROME
ITALY

ROTTERDAM
THE NETHERLANDS

SAN FRANCISCO
UNITED STATES

SAN JUAN
PUERTO RICO

SANTA FE
ARGENTINA

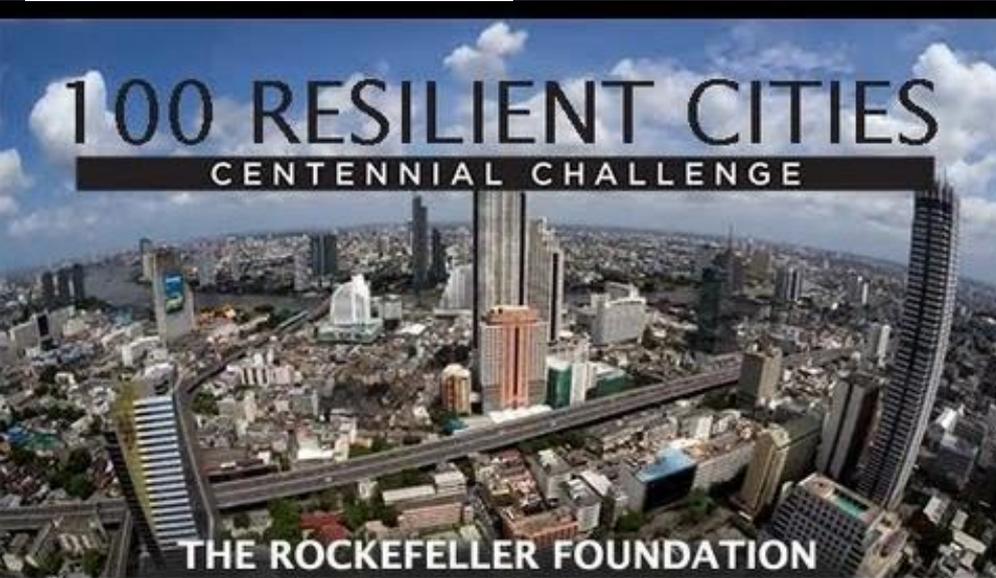
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2013 December: Rotterdam selected
2014 March: starting workshop
2014 November: start phase 1 (PRA)
2015 June: start phase 2 (Strategy)
2016 May: launch resilience strategy
2017 June: 1-Year-Event

PIONEERED BY THE
ROCKEFELLER FOUNDATION

100

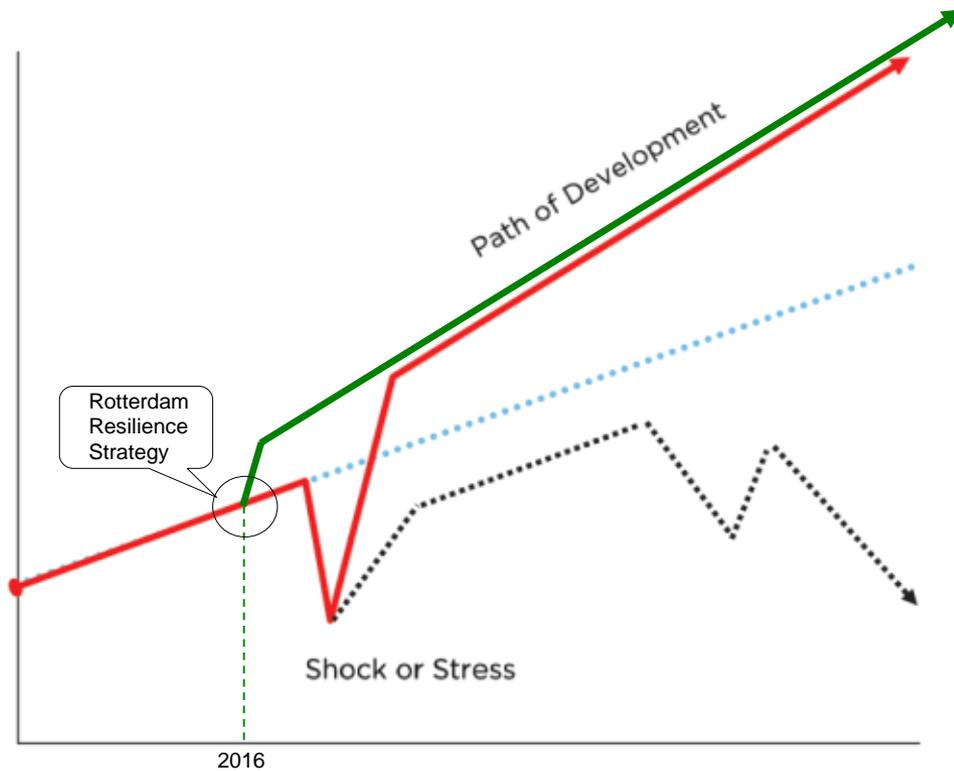
RESILIENT CITIES



Urban Resilience

is the capacity of **individuals**, **communities**, **institutions**, **businesses** and **systems** within a city to *survive, adapt, and grow* no matter what kind of **chronic stresses** and **acute shocks** they experience

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Shocks and stresses can bring opportunities for cities to evolve and in some circumstances transform.



100 RESILIENT CITIES

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New York: black-out by Hurricane Sandy in okt. 2012

Inadequate protection of critical infrastructure

Source: Iwan Baan

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3 June 2016: Flooded Seine River in Paris hits 6m

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23 June 2016 Randstad: extreme weather. Damage €20 mln

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2017: tensions between groups of citizens

www.resilientrotterdam.nl

1946



2016



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SEVEN QUALITIES OF RESILIENCE

THE RESILIENCE LENS



REFLECTIVE

using past experience to inform future decisions



RESOURCEFUL

recognizing alternative ways to use resources



ROBUST

well-conceived, constructed, and managed systems



REDUNDANT

spare capacity purposely created to accommodate disruption



FLEXIBLE

willingness and ability to adopt alternative strategies in response to changing circumstances



INCLUSIVE

prioritize broad consultation to create a sense of shared ownership in decision making



INTEGRATED

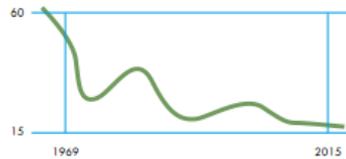
bring together a range of distinct systems and institutions

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Increasing dynamics in urban environments

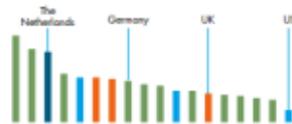
Cities are the point of convergence for many disruptive developments

Average lifespan of companies in the S&P Index



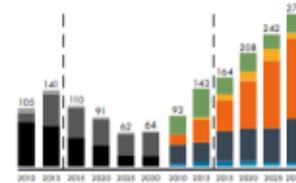
Average lifespan of companies is decreasing

Open Economy



The Netherlands has a very open economy, with Rotterdam being even more open; it is quickly exposed to global changes

Energy Transition



The energy transition is already happening: global investments in sustainable energy since 2010 now exceeds that in fossil energy

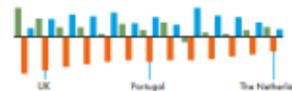
From a linear to a circular economy based on renewable energy

Technology changes faster than companies



Technology changes exponentially; companies change logarithmically

Employment



Technology has the greatest negative impact on labor groups, undermining social stability

Technological innovation changes economical model and impacts employment (a.o. Internet of Things)

Climate change: 1990 to 2100



Climate change effects liveability and increases risk of disruption of city

Climate change causes structural stress in Netherlands

Complexity - Interconnection

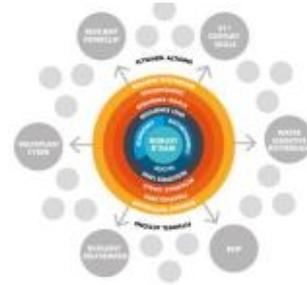
“CITIES THAT HAVE CONSIDERED THEIR RESILIENCE IN A HOLISTIC WAY WILL BE BETTER PREPARED FOR THE FUTURE.”

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OUR RESILIENCE GOALS.

- | | | | |
|--|--|---|----------------------------------|
|  | 1. Rotterdam: A balanced society | → | Social resilience |
|  | 2. World port city built on clean and reliable energy | → | Energy resilience |
|  | 3. Rotterdam Cyber Port City | → | Cyber resilience |
|  | 4. Climate resilient Rotterdam to the next level | → | Climate resilience |
|  | 5. Infrastructure ready for the 21 st century | → | Critical Infra resilience |
|  | 6. Rotterdam Networkcity – truly our city | → | Resilient Governance |
|  | 7. Anchoring resilience in the city | | |

Holistic approach





Thank you for your attention

www.rotterdamclimateinitiative.nl

www.resilientrotterdam.nl

And... be creative for a resilient Rotterdam!

