Green design for urban water management in The Netherlands

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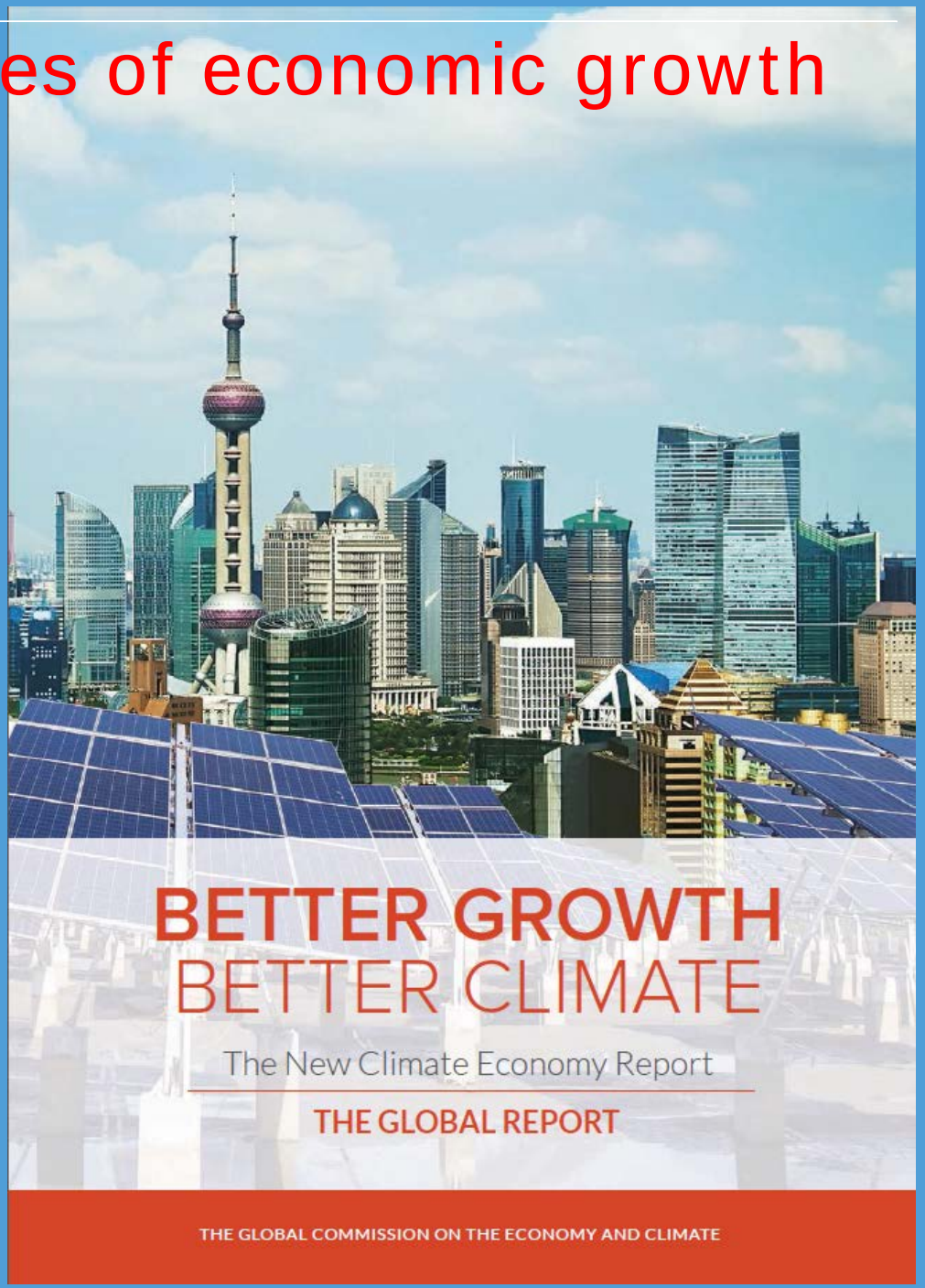
In 2050 70% of 9 billion people live in cities

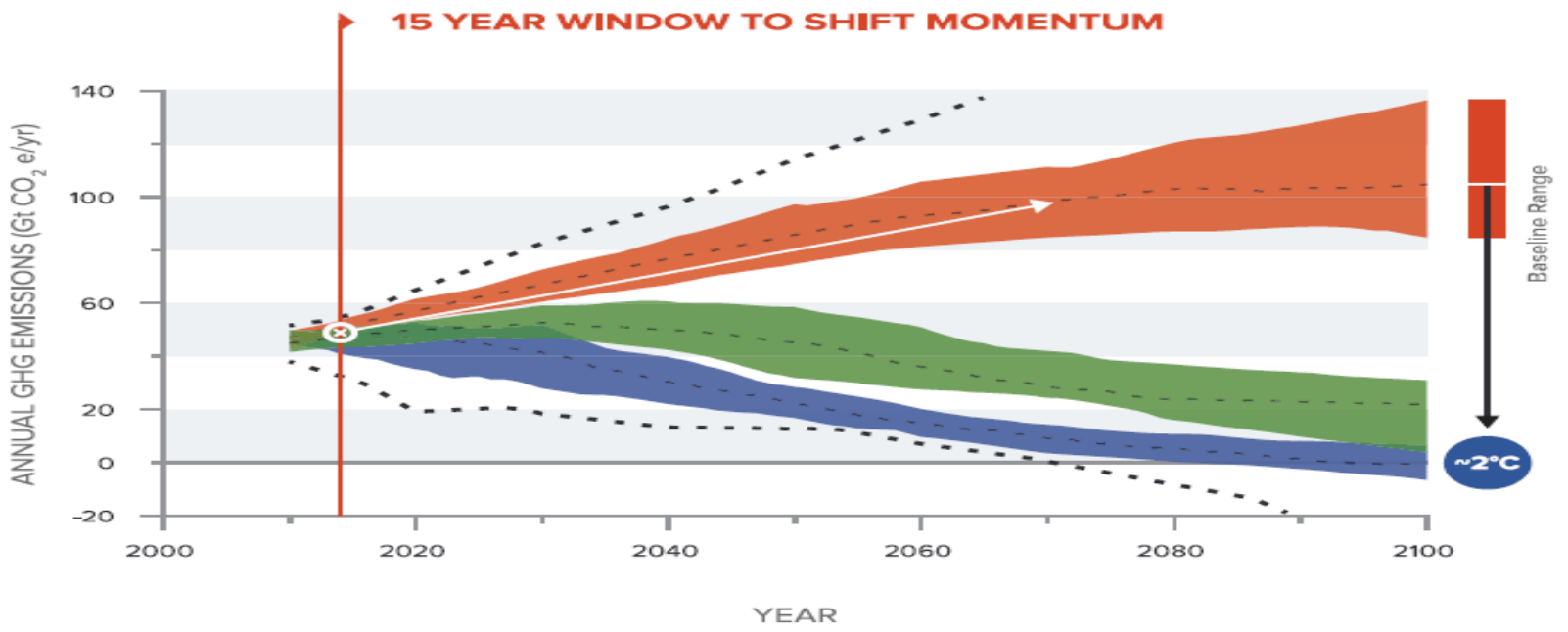
Cities are the engines of economic growth

- 80% of global economic output
- 70% of global energy use and energy related GHG emissions
- US$90 trillion invested worldwide in urban and energy infrastructure in next 15 years



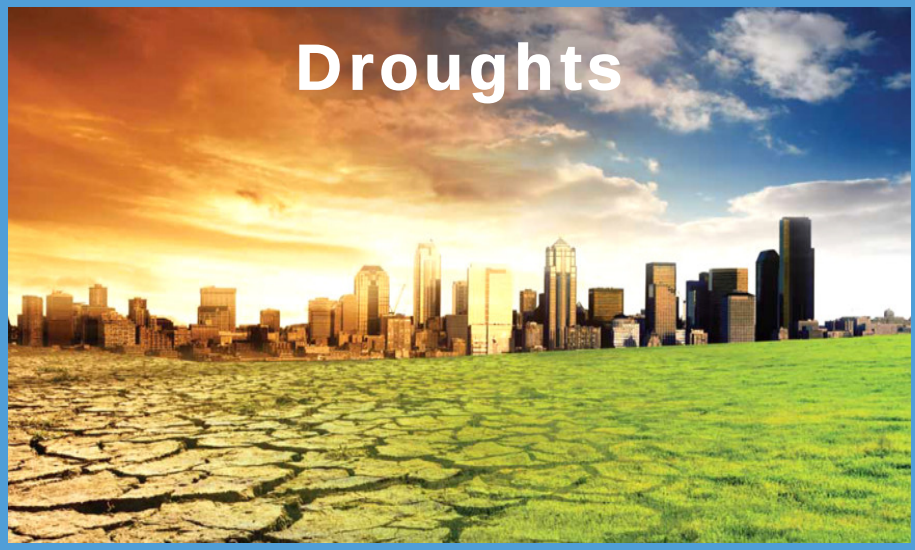
Climate change

The world is currently on track for warming of around 4°C



Source: IPCC, 2014.

Cities are vulnerable for climate change



Recent worldwide urban flood events

Climate adaptation is key

- The total costs for climate adaptation will be small compared to the total expected damage

- Integration of adaptation measures in new or redevelopment programmes today is needed to reduce additional cost in the future

The Netherlands

- Small country with a population of 17 million
- Most heavily urbanised country in EU (83%)
- Delta of four river basins
- 26% is below sea level
- 60% is susceptible to flooding
- Flood-sensitive area is densely populated
- High level of flood protection

The Netherlands: A long history in water management

Rotterdam → 100% Climate proof in 2025

De gevolgen van klimaatverandering waarmee Rotterdam rekening moet houden:


Zeespiegelstijging


Meer intensieve neerslag


Lagere waterstanden in de rivieren


Hogere waterstanden in de rivier


Langere hete periodes


Langere droge periodes

Rotterdam Climate Change Adaptation Strategy (RAS)

RAS ESSENCE

1. Robust system: maintain and improve
2. Adaptation: small scale solutions on large scale
3. Cooperate and Link in with other activities
4. Benefits for living environment, society, economy ànd ecology

From grey to green solutions

Hard solutions **Hybrid solutions** **Soft solutions**

less space, dike → ***more space, no dike***

less flexible, extra investment → ***flexible and cost-effective***







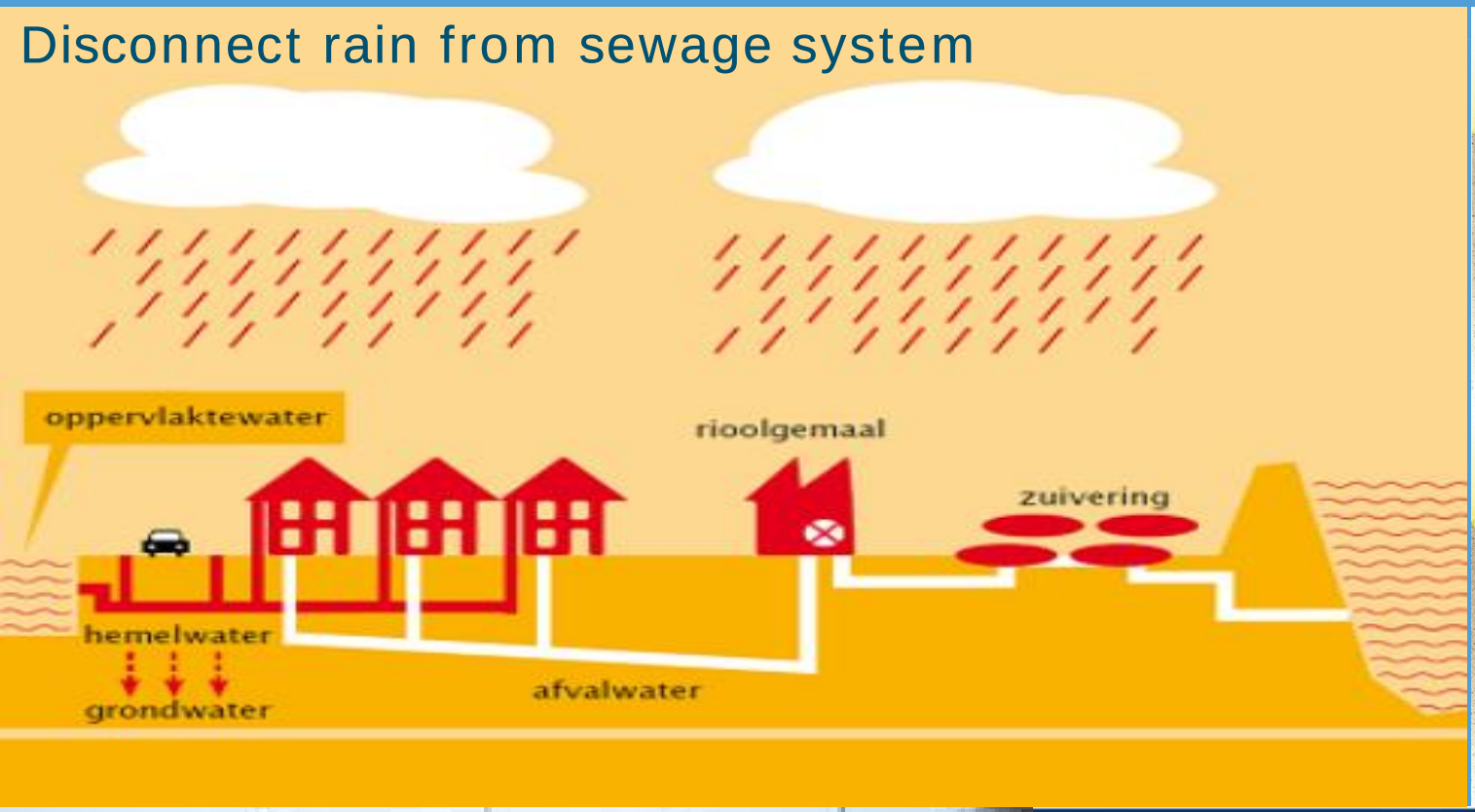

URBAN FLOODPLAIN

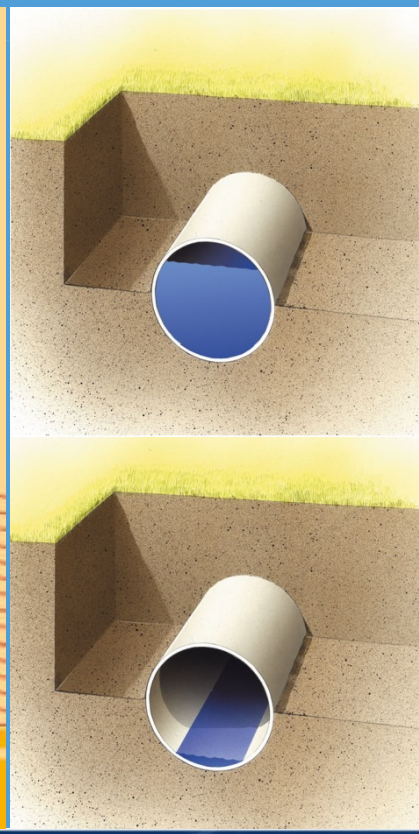
UNDERGROUND WATER STORAGE

WATER PLAZA BENTHEMPLEIN

NL: € 9 billion investments in the next 10 years

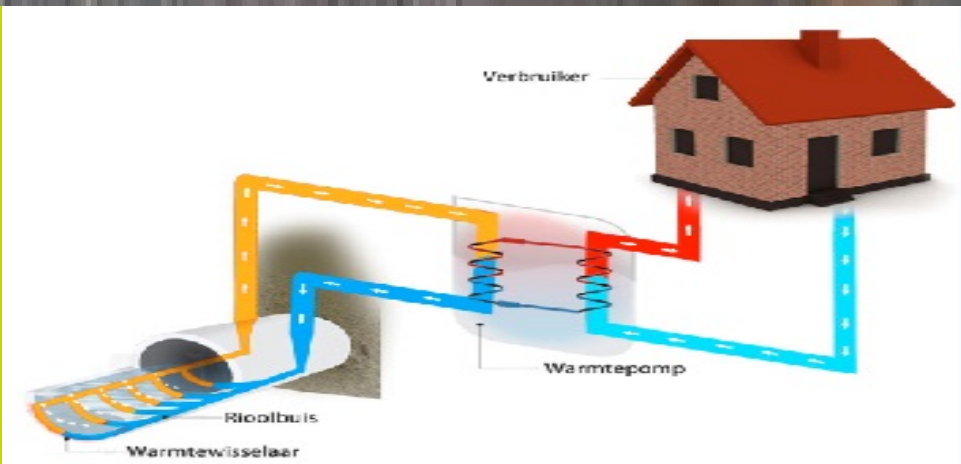
Disconnect rain from sewage system





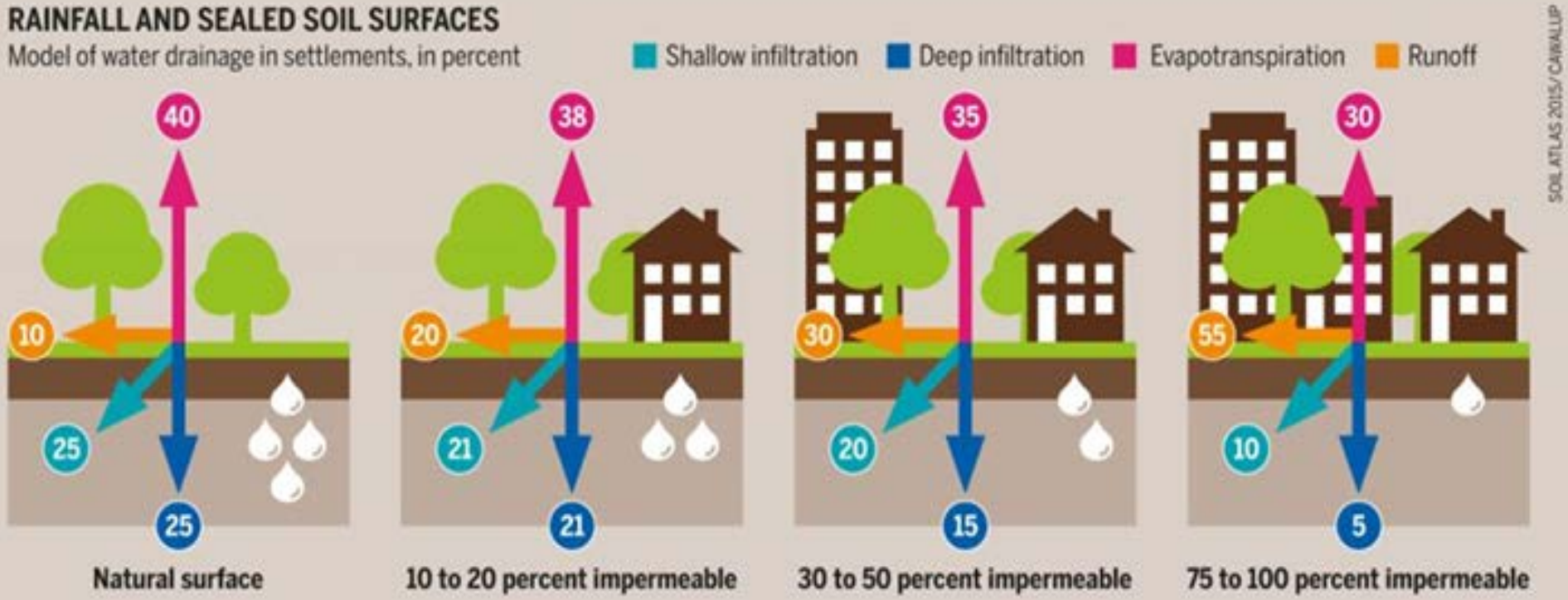
The Energy Factory

Energy from waste water



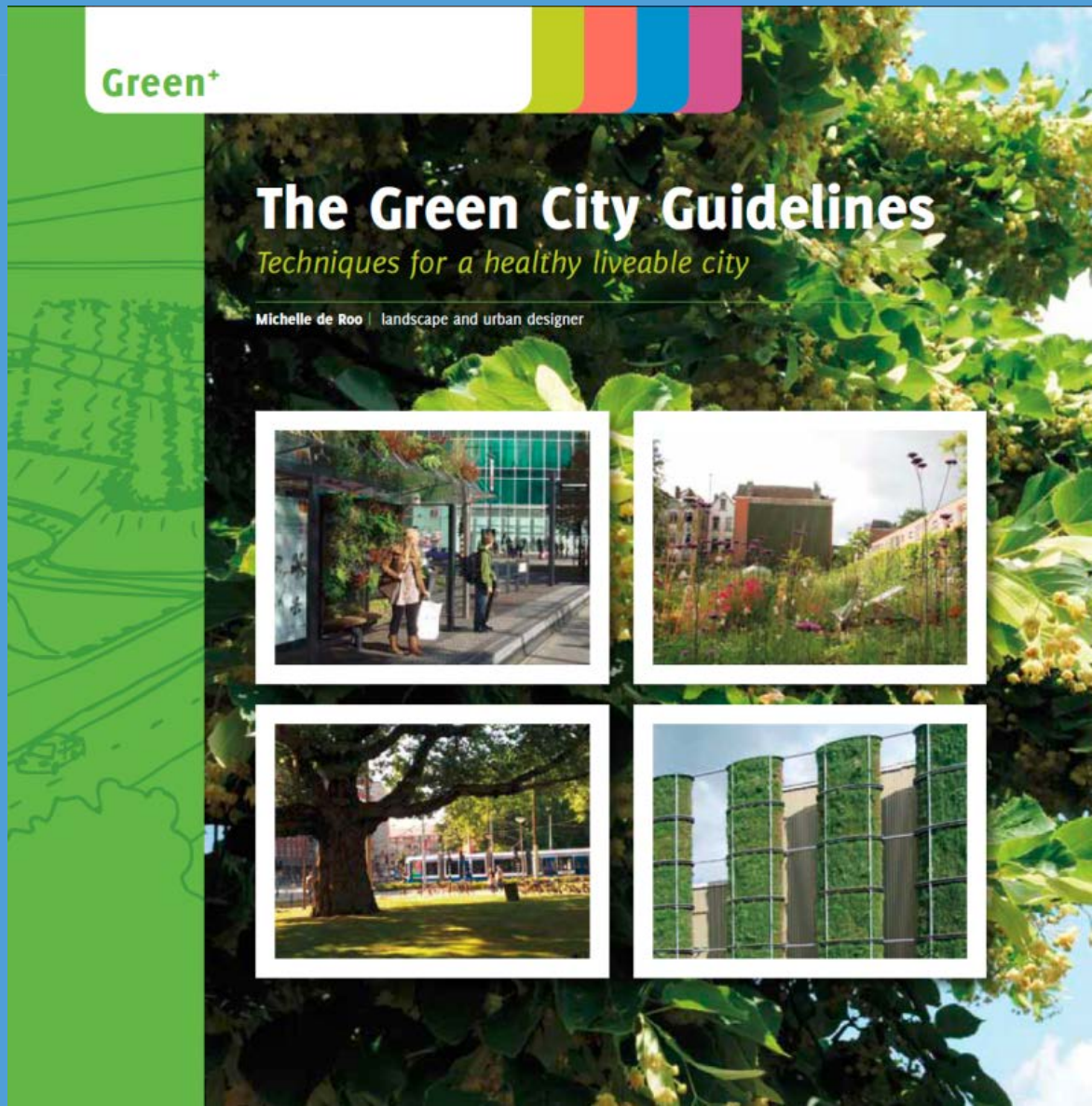
Soil sealing → Sealed = lost

- 46% urban surface NL sealed
- Soil is the natural basis for human, animal and plant life



Green cities: How can we increase the ‘sponge’ capacity of our cities?

- Green design
- Use of natural processes
- Increase infiltration capacity
- Visualize water system
- Reuse of rainwater



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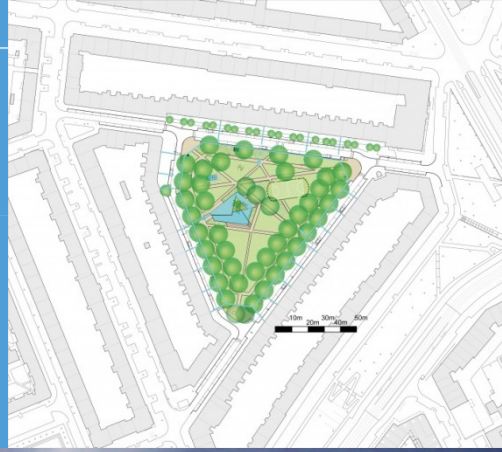
Wadi’s

Open water

Green roofs

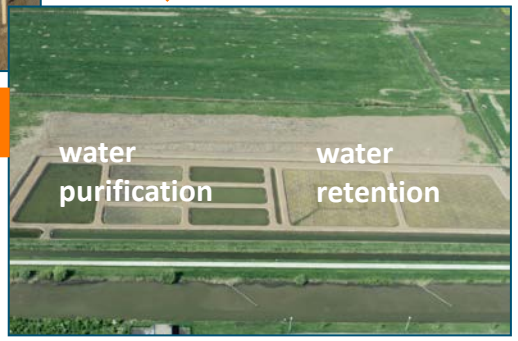
Urban (Rooftop) Farming

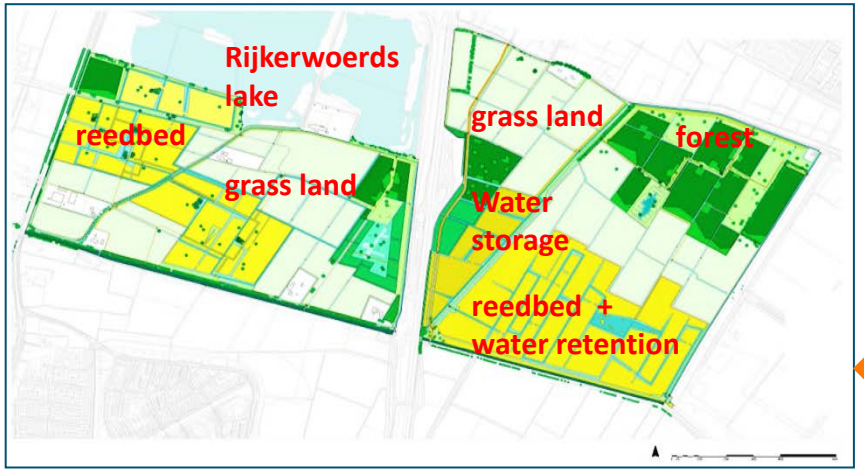
Green water square Rotterdam



Raingardens

Rich Water World: Combining water storage, retention & purification





Climate Adaptation Support Tool: Perfect Fit between storm water management guidelines and modelling

Many adaptation options to strengthen urban resilience:

Support stakeholder contribution to climate-proof design

Benefits of green infrastructure

- Green solutions for storm water management are often equal (33%) or even cheaper (44%) than conventional solutions
- Reduce damage by preventing floods
- Moderating air temperatures and improving air quality
- Enhance biodiversity
- 5 – 30% higher property value
- Improved quality of life

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Concluding remarks

- Climate change will increase urban flood risk
- The total costs for climate adaptation will be small compared to expected damage
- Integration of adaptation measures in new or redevelopment programmes today is needed to reduce additional cost in the future
- Green design is often a cost-effective approach for climate resilient cities and more quality of life

To explore the potential of nature to improve the quality of life

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