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THE COMPLETE WATER MAGAZINE







Green design for urban water management in The Netherlands

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Wageningen University & Research centre

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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



BETTER GROWTH BETTER CLIMATE

The New Climate Economy Report

THE GLOBAL REPORT



Climate change

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





Cities are vulnerable for climate change









Recent worldwide urban flood events





Bangkok 2011: Damage \$45 billion



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



WAGENINGEN UR For quality of life



Geography of the Netherlands focusing on the most important national waters

Jelle van Minnen 23 May 2012, EIONET Vulnerability& Adaptation in the Dutch delta

The Netherlands: A long history in water management



Rotterdam \rightarrow 100% Climate proof in 2025

ROTTERDAM APPROACH

100% climate proof in 2025

> attractive and economically strong city

holistic approach LT Vision => **ST** Actionplan

De gevolgen van klimaatverandering waarmee Rotterdam rekening moet houden:



Zeespiegelstijging



Meer intensieve neerslag



Lagere waterstanden in de rivieren



Langere hete periodes



in de rivier



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 and ecology



From grey to green solutions





URBAN FLOODPLAIN

UNDERGROUND WATER STORAGE





WATER PLAZA BENTHEMPLEIN

NL: € 9 billion investments in the next 10 years

Disconnect rain from sewage system

oppervlaktewater

rioolgemaal





Vervangingspiek komt eraan



Stichting **RIONED**

e Energy Factor

Energy from waste water





Soil sealing \rightarrow 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





Wadi's







Open water





Green roofs





Real Property lies

Urban (Rooftop) Farming





Green water square Rotterdam





Raingardens

1.00



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





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 costeffective 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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