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SAFE AND ATTRACTIVE WATERPROOF CITIES

Nature based solutions for integrated urban water management

IHS Rotterdam Netherlands, June 2018



Planning

09.00 - 10.00	Presentation: principles and best practices
10.00 - 10.15	Break
10.15 – 11.00	Round 1:
	- Physical solutions (30 min.)
	- Plenary presentations of main conclusions (15 min.)
11.00 – 11.45	Round 2:
	- Stakeholder identification, stakeholder involvement and value creation (30 min.)
	 Plenary presentations of main conclusions (15 min.) Wrap Up (15 min)

ARCADIS at a Glance

Consultants, project managers and engineers

Focus on Water, Buildings / Urban, Infrastructure and Environment

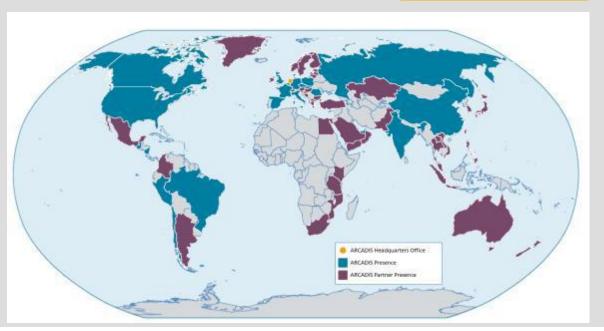
Founded in 1888

More than 27.000 staff, +300 offices worldwide

Top 3 in Europe and top 10 worldwide

Business Lines





Services

Program & project management

Consultancy

Master planning & Architecture

Design & Engineering

Implementation



Urban flooding – a worldwide problem



BY 2050: 70%
OF WORLD
POPULATION
WILL LIVE IN
DELTA CITIES







Asia/Pacific and European water challenges



Flooding



Water quality



Excessive rainfall



Levee breaks (drought)



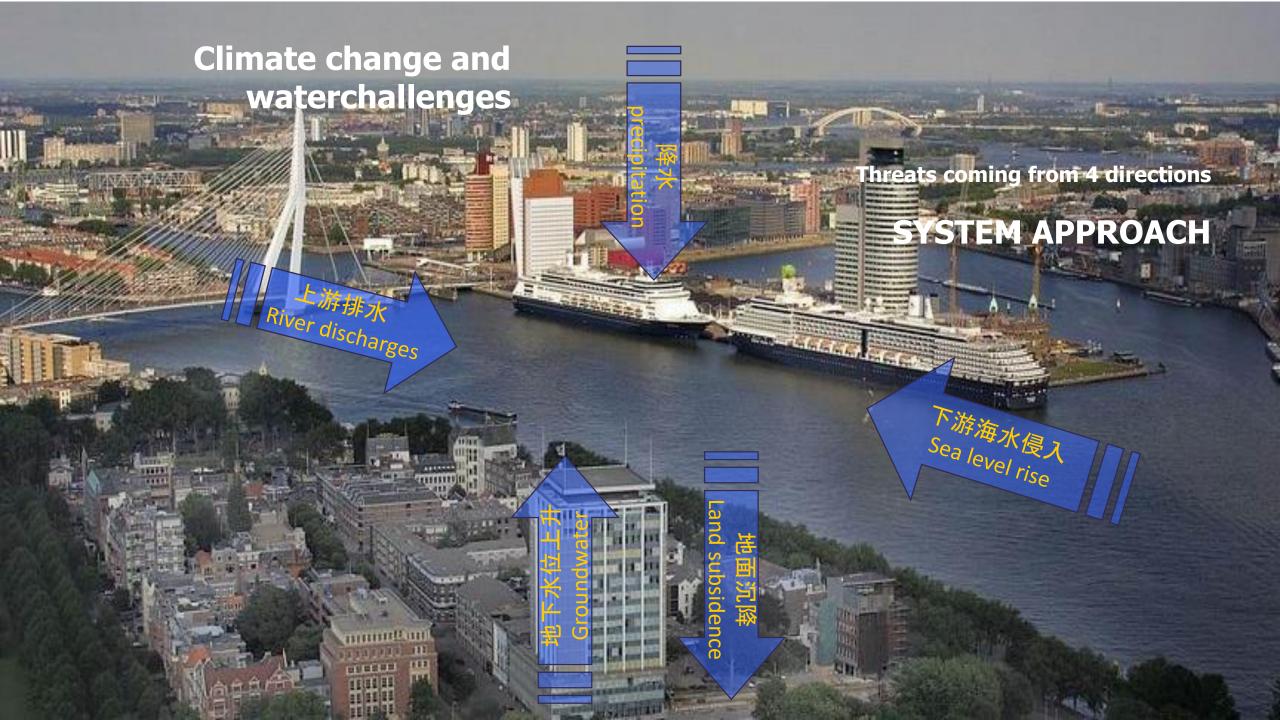
Inundated cellars

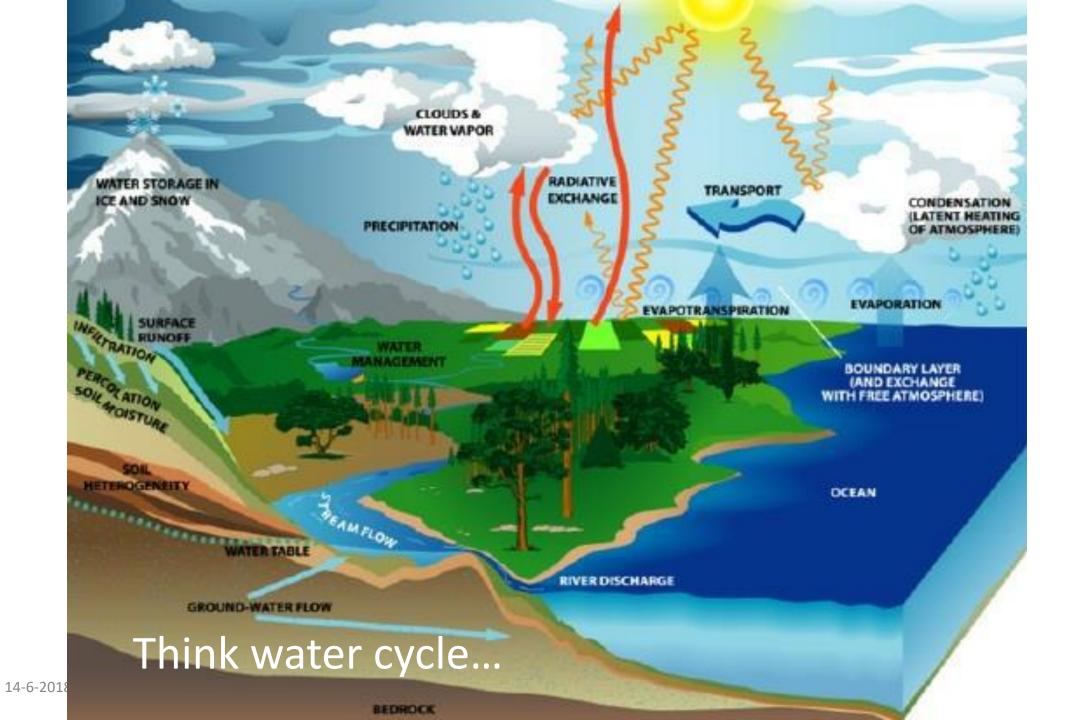


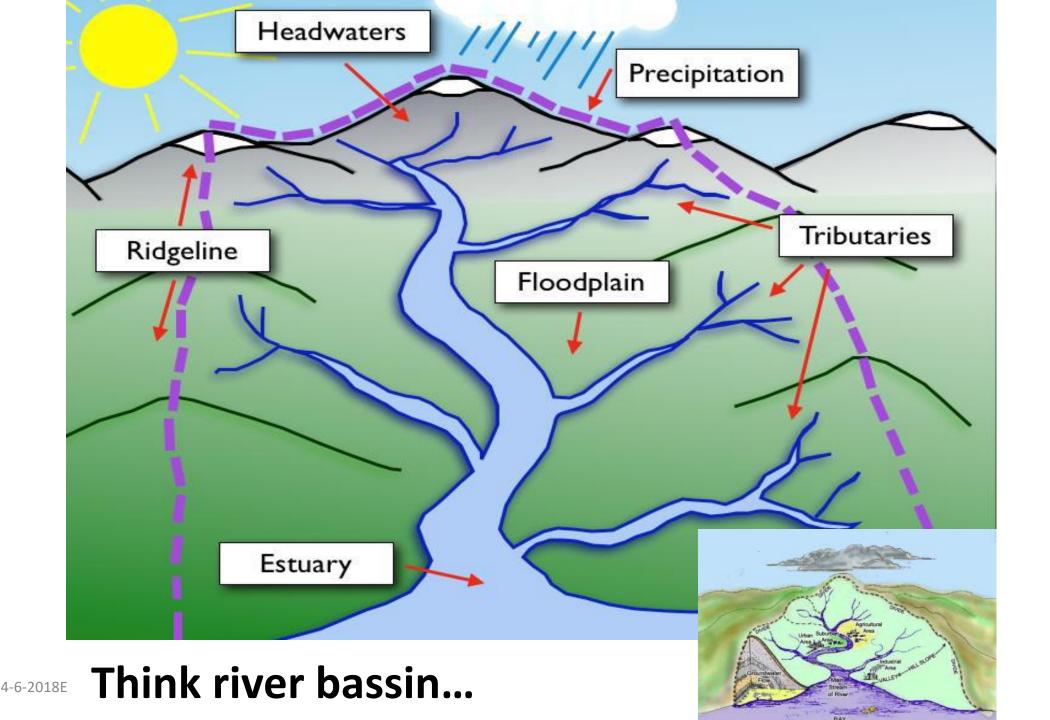
Heat waves



Background and principles for flood safe and attractive cities







Think comprehensive...



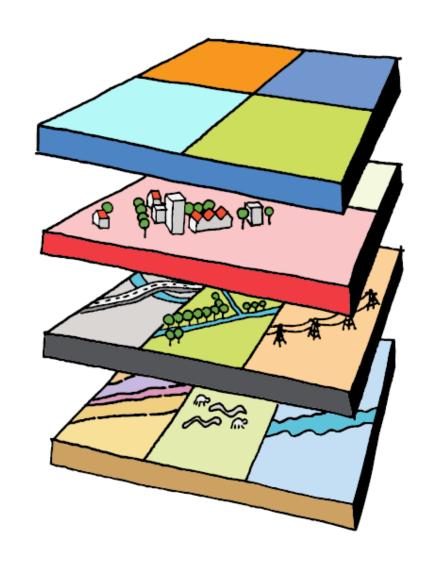
- Physical solutions
- Legislative framework
- Stakeholder involvement
- Financial strategy

Integrated Water management – layer method

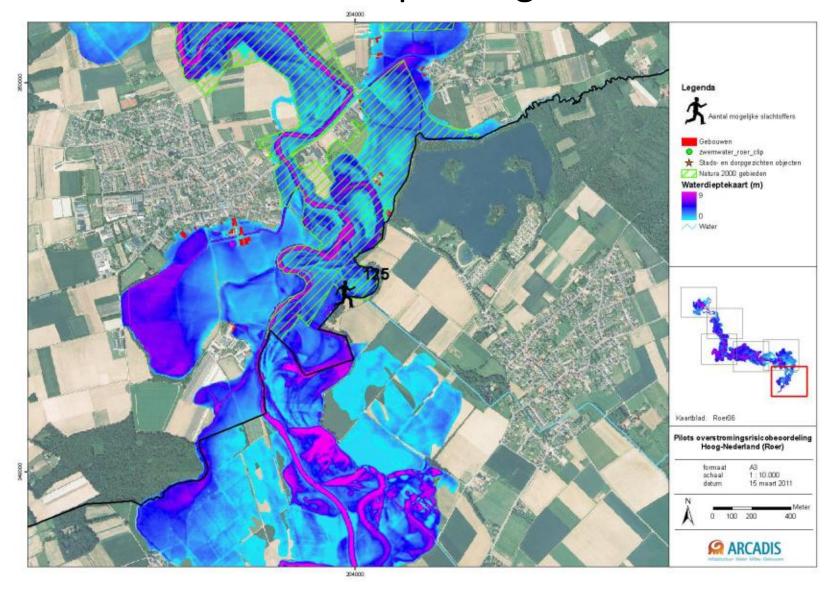
First think water, Then think urban

Layer approach From bottom to top:

- Buildings Level
- 2. Infrastructure
- 1. Water



• Flood risk assessment: develop blue green framework



Principles

Detain Discharge Retain 量小支度10-20是 minimum width 10-20m 量小宽度5-10米 minimum width 5-10m 是小安全5-10米 minimum width 5-10m 長小支座8-15米 minimum width 8-15m 個小変座8-15米 minimum width 8-15m 安全区/標계機能 可作为公共开放空间 不可有任何建筑物域率行道路 safety zone/green buffer could be public open space no buildings or vehicular road 生态证道/提供通 而乘为水道 ecological waterway/required flood zone for discharge probably all covered by water in raining season 完全区/提神政府 可作为公共开放空间 不可有任何建筑物域全行通路 safety zone/green buffer could be publis open space no buffdings or vehicular road 建设建筑后表区 可作为私家花园或瓷路 建设建筑后进区 可作为私家交通或道路 recommended bidg set back area could be private garden or road recommended bidg set back area could be private garden or road





Safe and attractive cities

From principles to best practices

17

Use Nature: protect and restore natural protective landscapes such as mangroves and beaches





Building with Nature



- Working with, in stead of against the forces of Nature
- Strengthening the beaches & dunes with enhanced natural sedimentation

Building with nature: Sand Engine 2011-2017



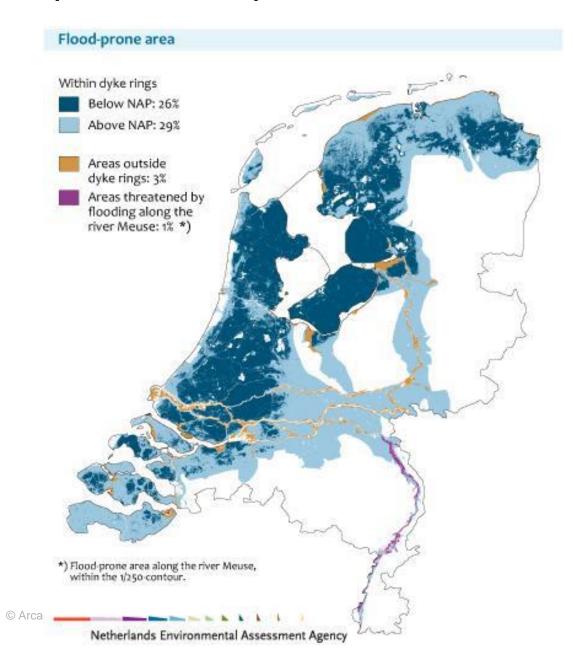
Multi purpose flood protection

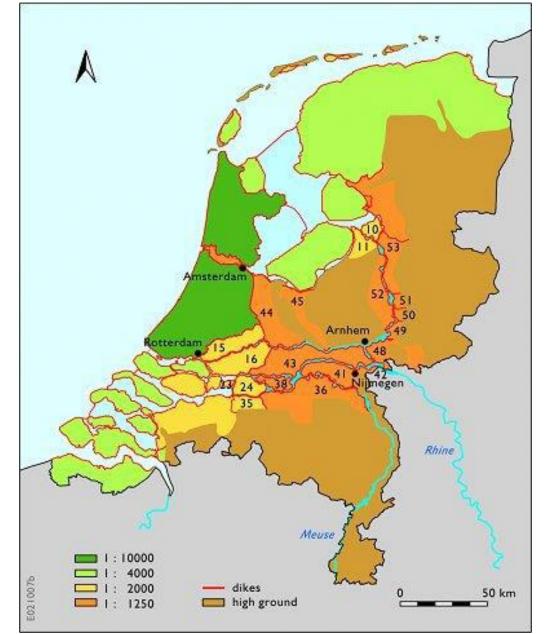
Function combinations: safe and attractive

14 June 2018

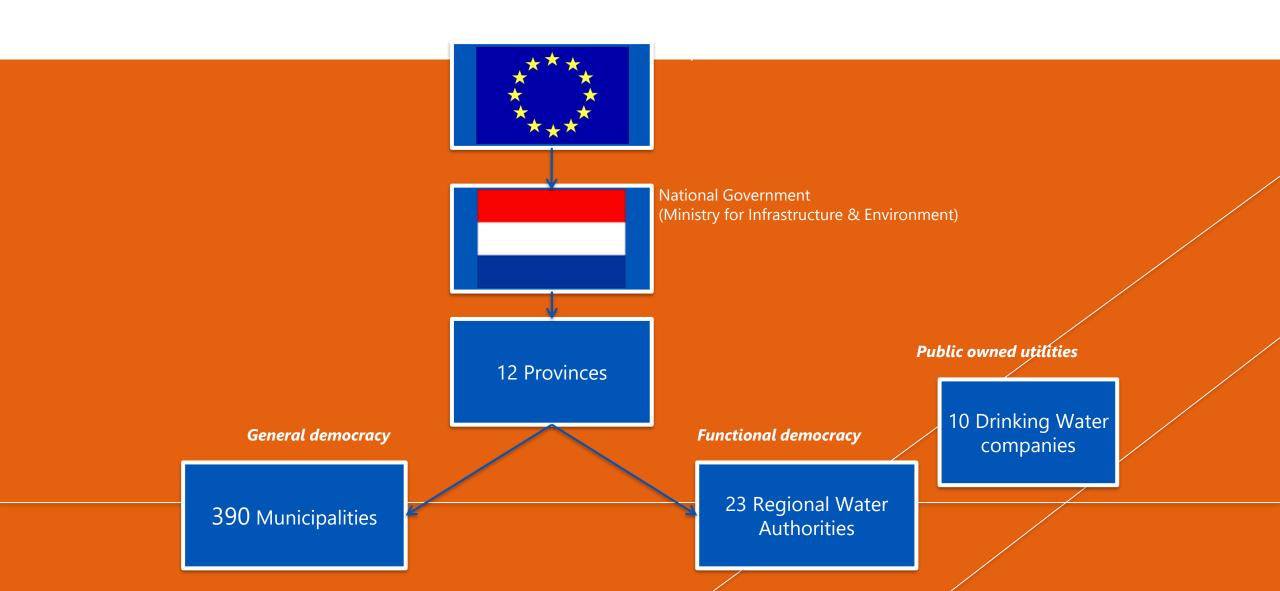
Comprehensive flood protection in The Netherlands

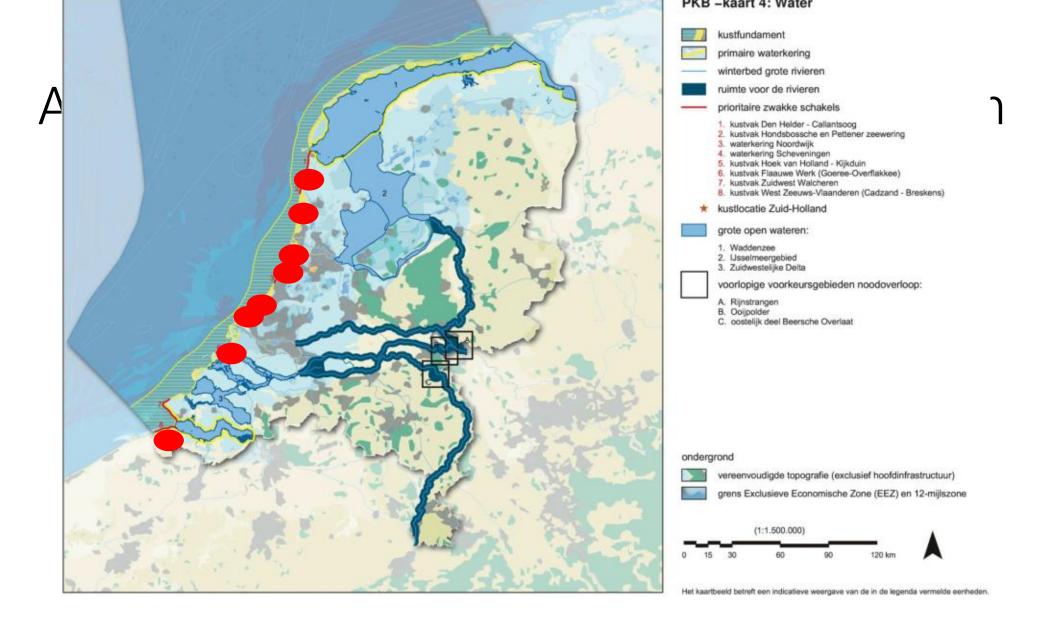












Coastal Weak Links (Zwakke Schakels)

Comprehensive waterfront protection - case Scheveningen



The challenge: safety and quality combined

Safety Risk management





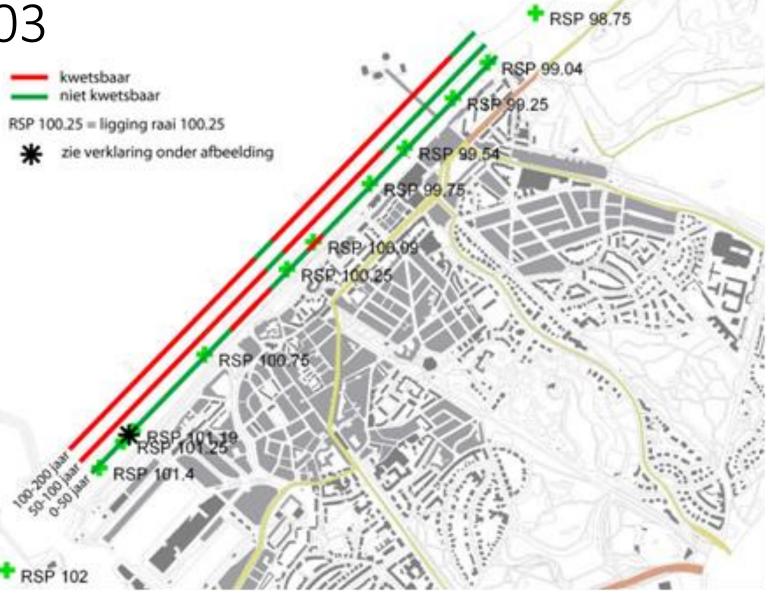




Spatial quality
Economic vitality

Assessment 2003





Stakeholder engagement

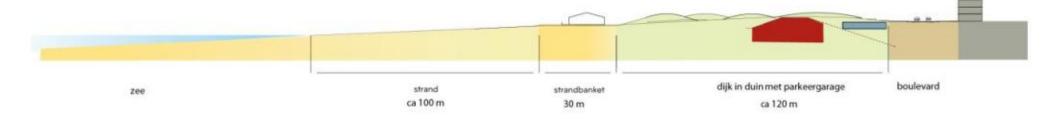




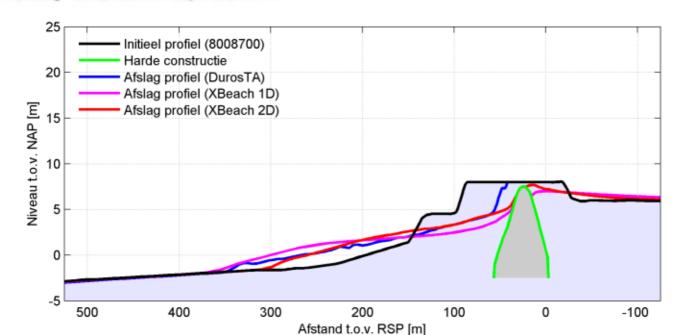


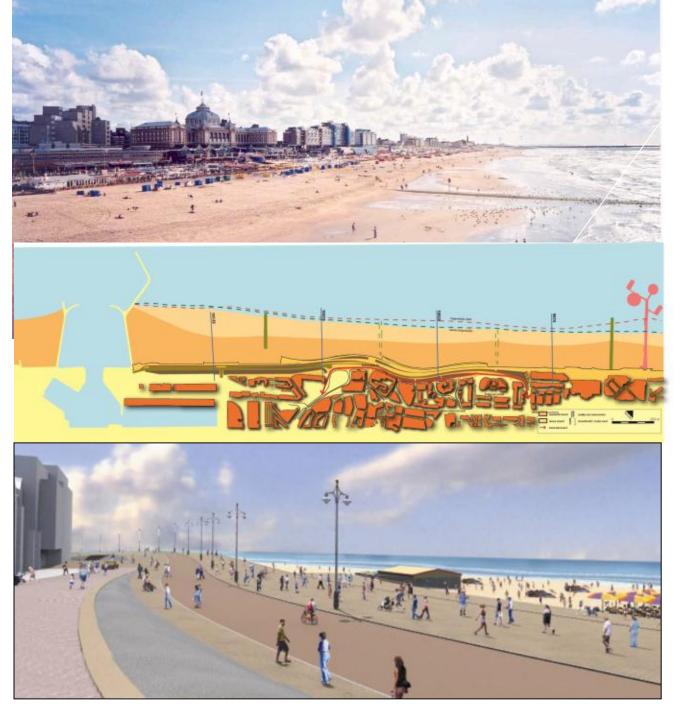


Assesment options, preferred solution: Cross-section hybrid coastal defence "Dvke in dune"



Afbeelding 11 Principedoorsnede Dijk-in-Duin



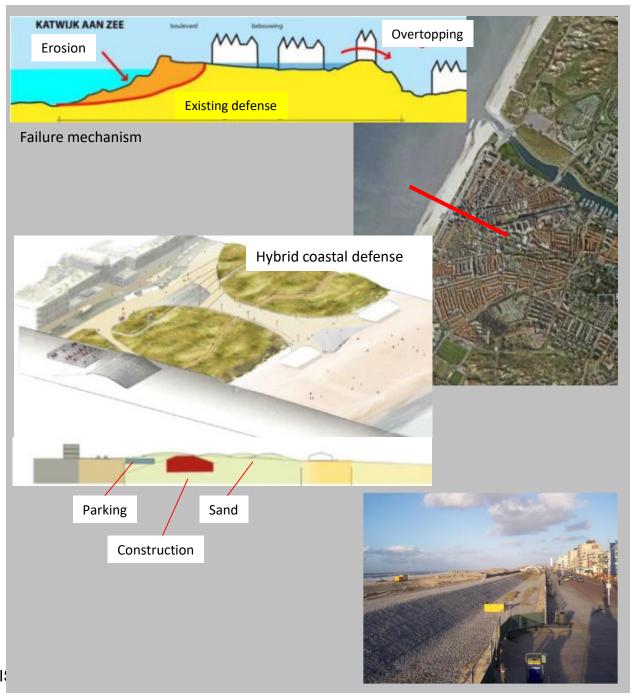


• Scheveningen safe and attractive:

• Dyke in dune

 Reinforcement and Boulevard Development





Hybrid coastal defence Katwijk

Katwijk, The Netherlands

Design of new coastal defense in tourist area

Stakeholder involvement & Spatial planning

Project management

Assist Client in tender phase

Client Government/Waterboard
Year 2008-running
Amount 2.5 M€

Katwijk impressions after completion









Upgrade to hybrid solution: Hondsbosche en Pettemer Sea Defence





Transforming a dike into a landscape

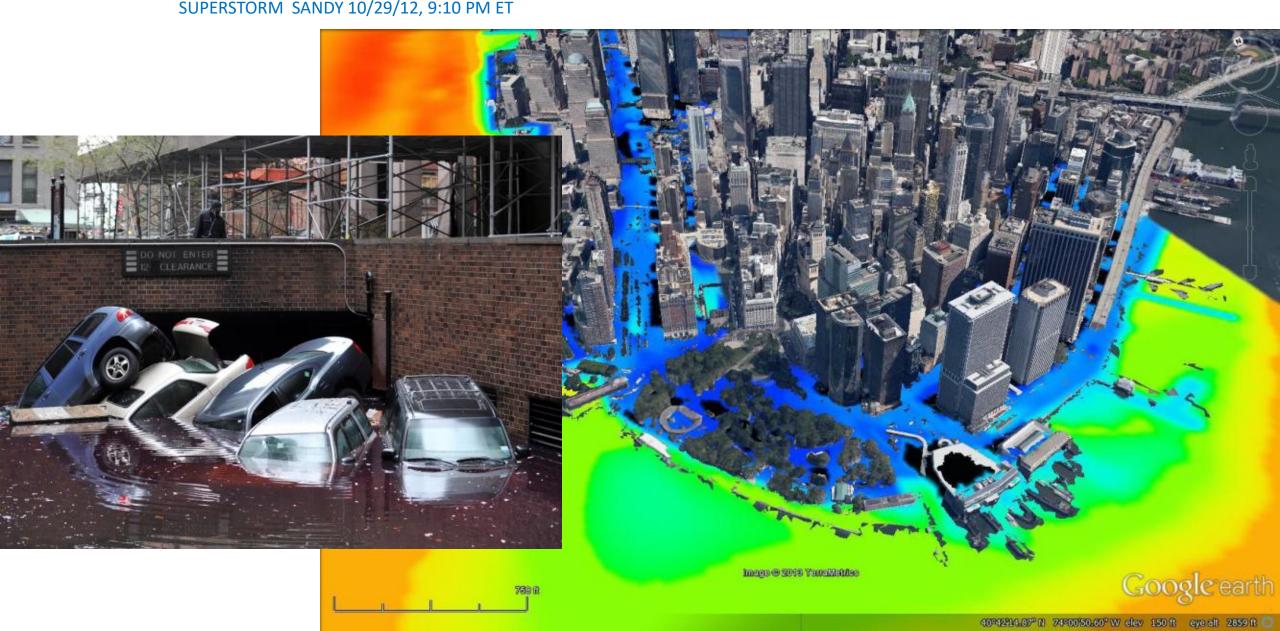
Reinforcement plan coastal defence based on an integrated approach:

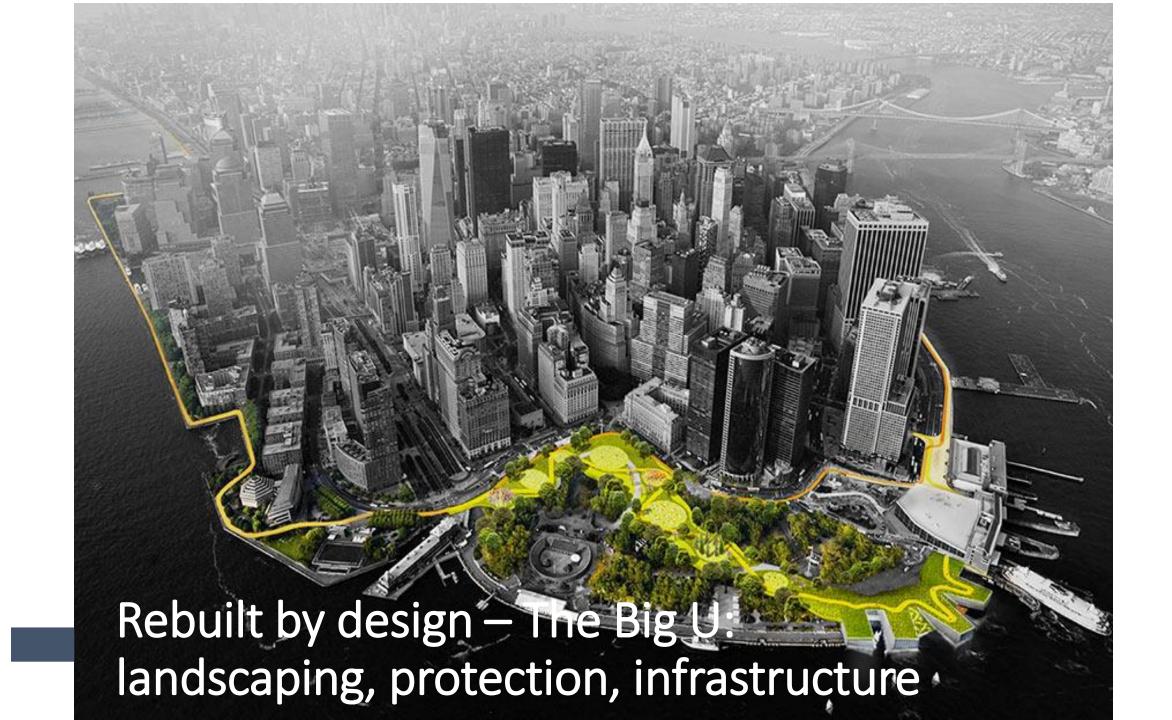
- Design
- Integration/ embedding in environment, landscaping
- Technical calculations
- Environmental impact assessment
- Permitting



流量-3D模拟洪水的深入 SUPERSTORM SANDY 10/29/12, 9:10 PM ET

FLOW-3D MODEL FLOOD DEPTH







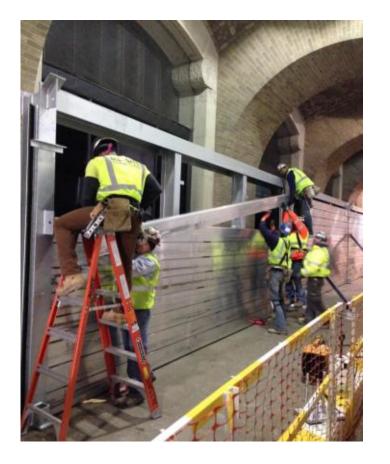
Resilient critical infrastructure



NY temporary flood resiliency proofing

• NYC Telecom client downtown buildings temporary flood walls





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Bellevue Hospital emergency department

• Elevated emergency department & critical infrastructure \$280 million

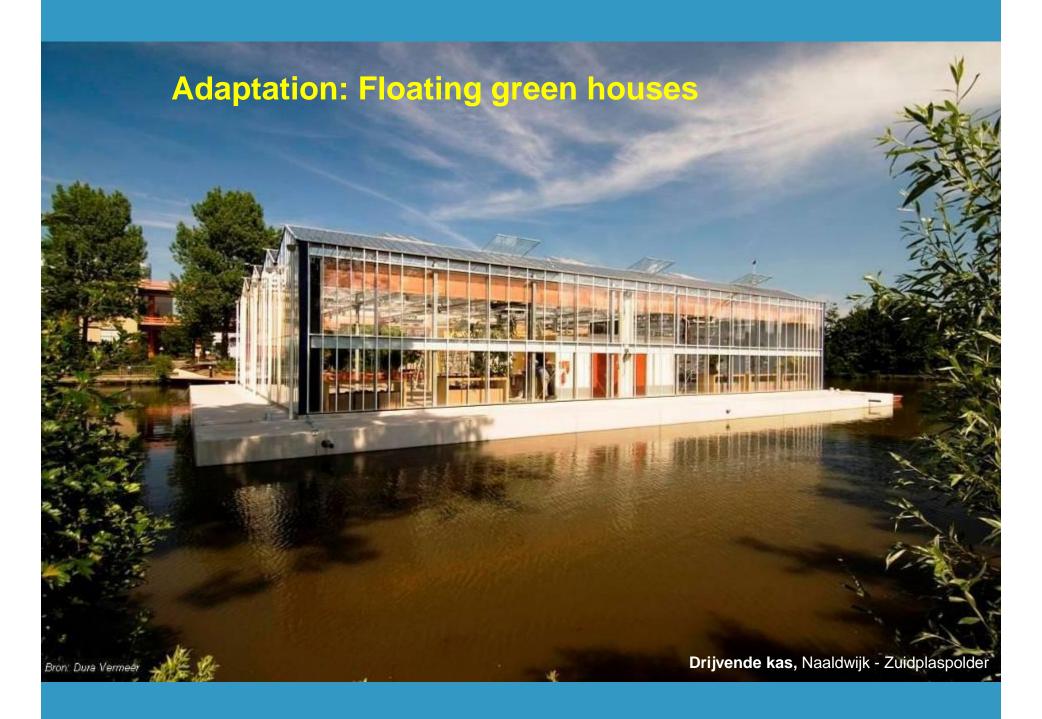


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Adaptive building







Rainproof, sponge cities

Maximize retention



Rotterdam

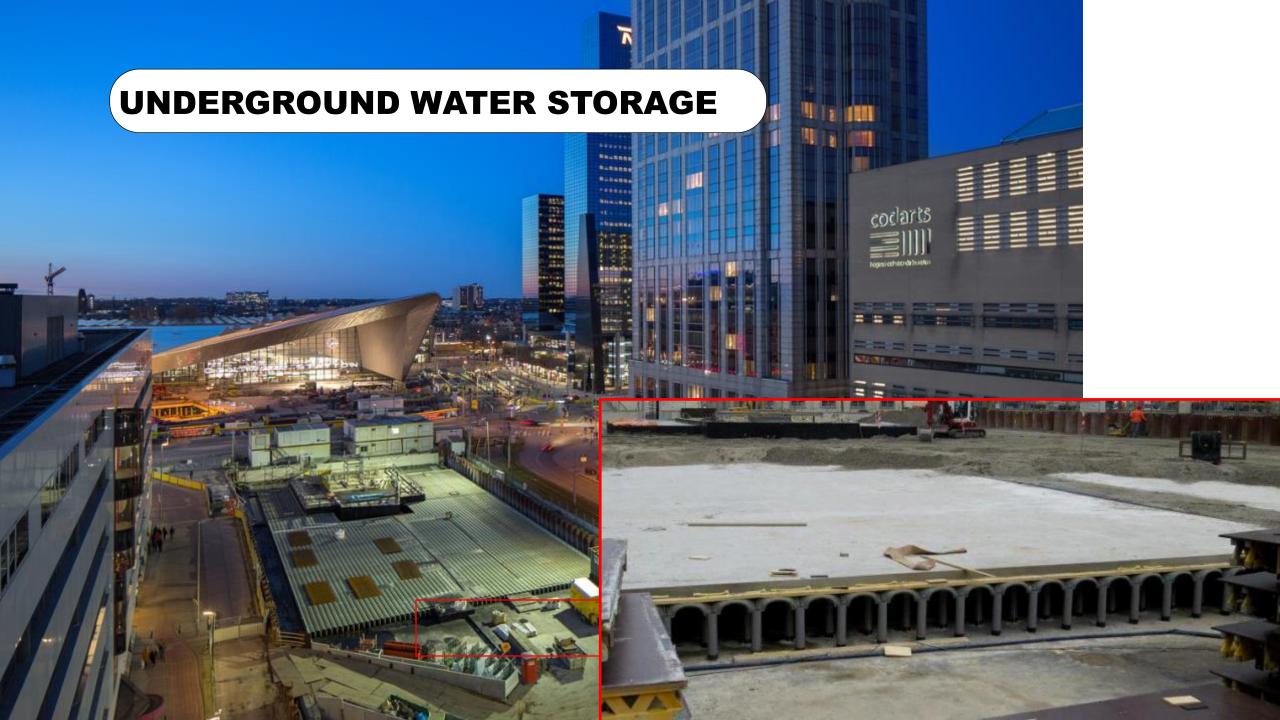
Climate Change Adaptation Strategy







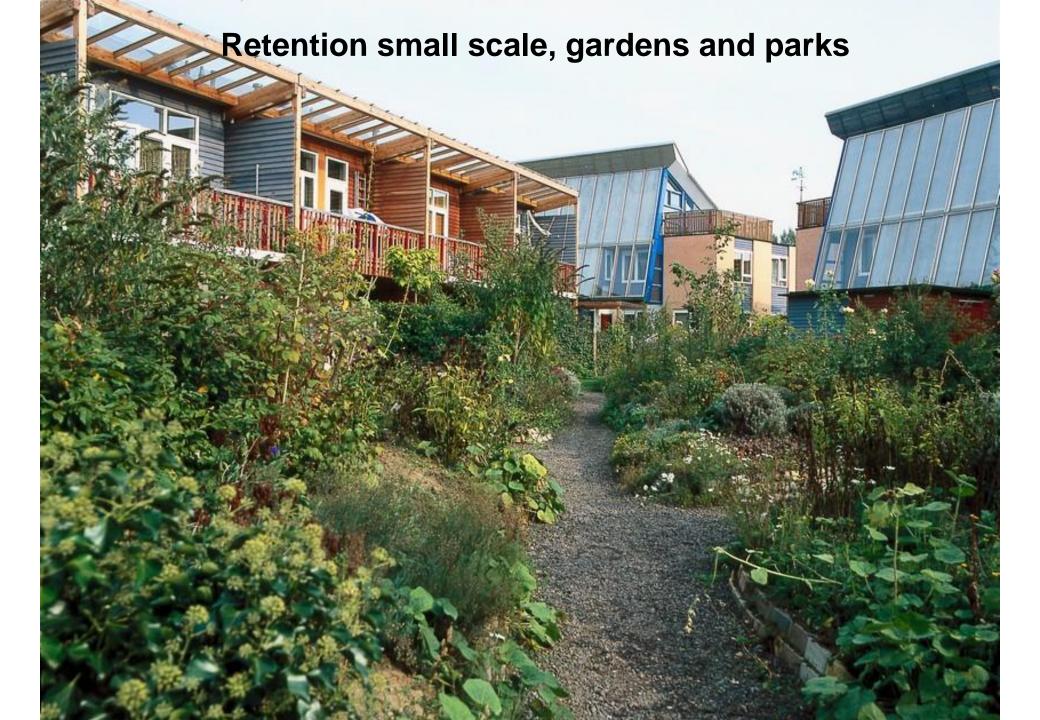
Design & Consultan for natural and built assets









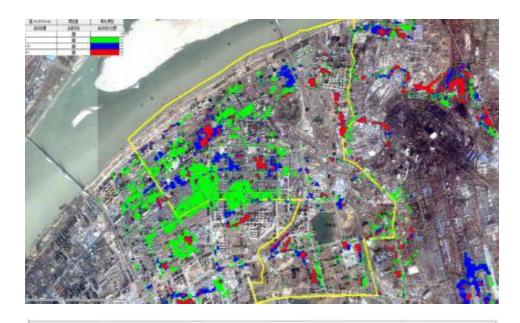




Wuhan Sponge City















Increase retention on regional scale:

Room for the River

River dikes and levees:

National rivers levees emergency act

- "Almost-floods" of 1993/1995
- Evacuation of 250.000 people
- Most of the emergency levee reinforcement works
- Room for the river, Meuse River works



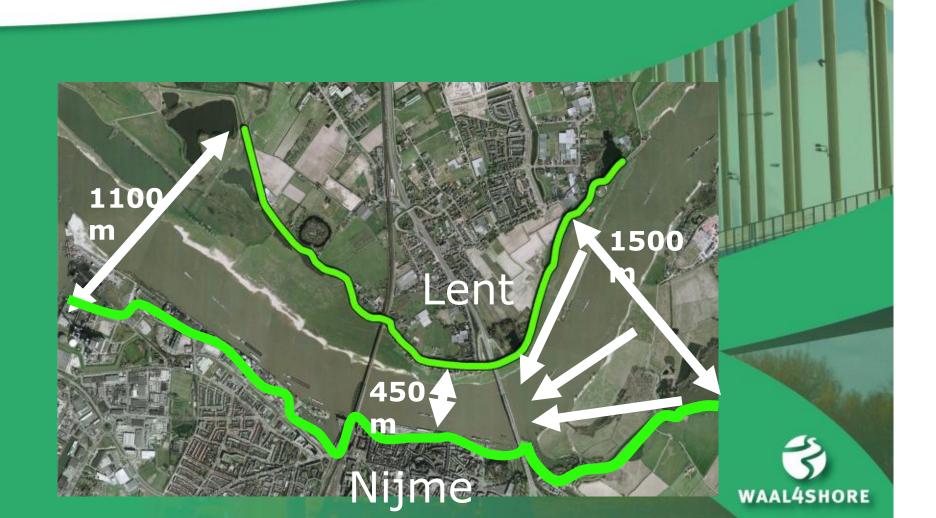


Netherlands Room for the River Program



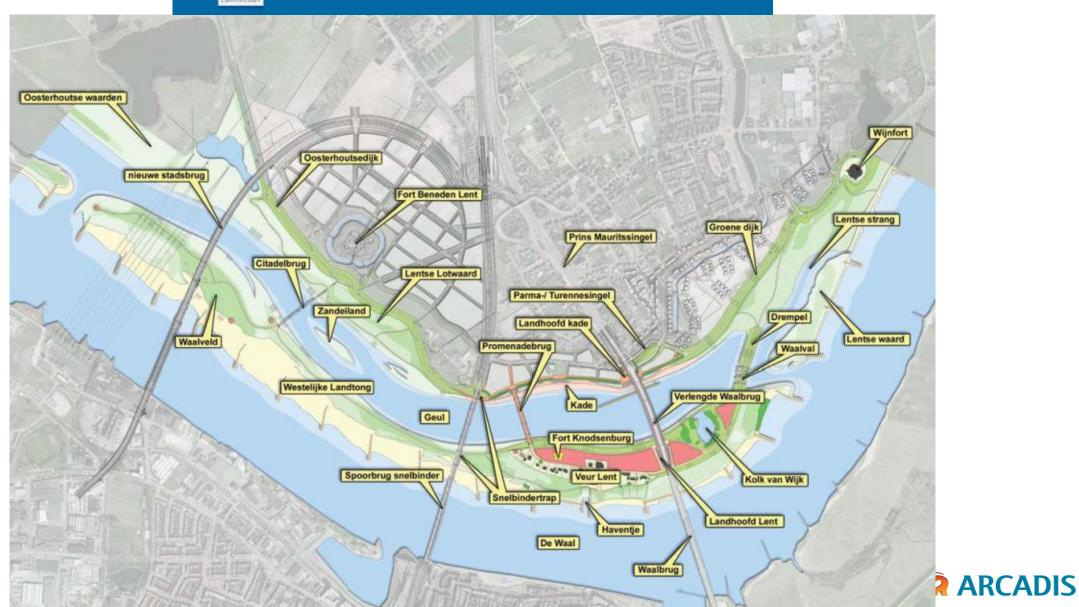


Nijmegen 'Bottleneck'





ADAPTATION STRATEGIES FOR EUROPEAN CITIES





Added Value with increased flow capacity

Building resilience creates value: Value for the public benefit Economic value which can finance

resilient action

Taizhou Master Plan
Central lake: water retention and urban identity



德清森泊度假公园及周边区域概念规划设计

Deging Senbo Green Parks & Surrounding Area Conceptual Master Plan







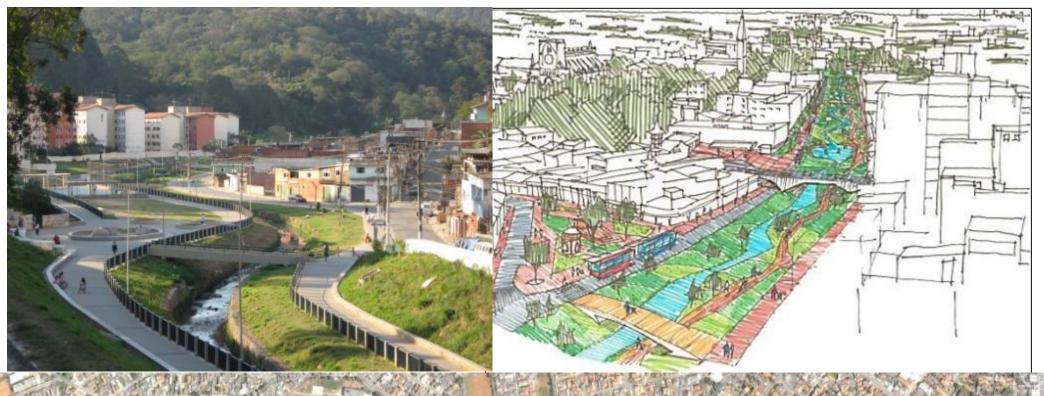


Protect 12 million inhabitants subject to flooding and intense rainfall Innovations to create more green public spaces to absorb storm water More attractive and livable, managing 60 % of the rainwater



Rio Tiete Linear Parks Sao Paulo

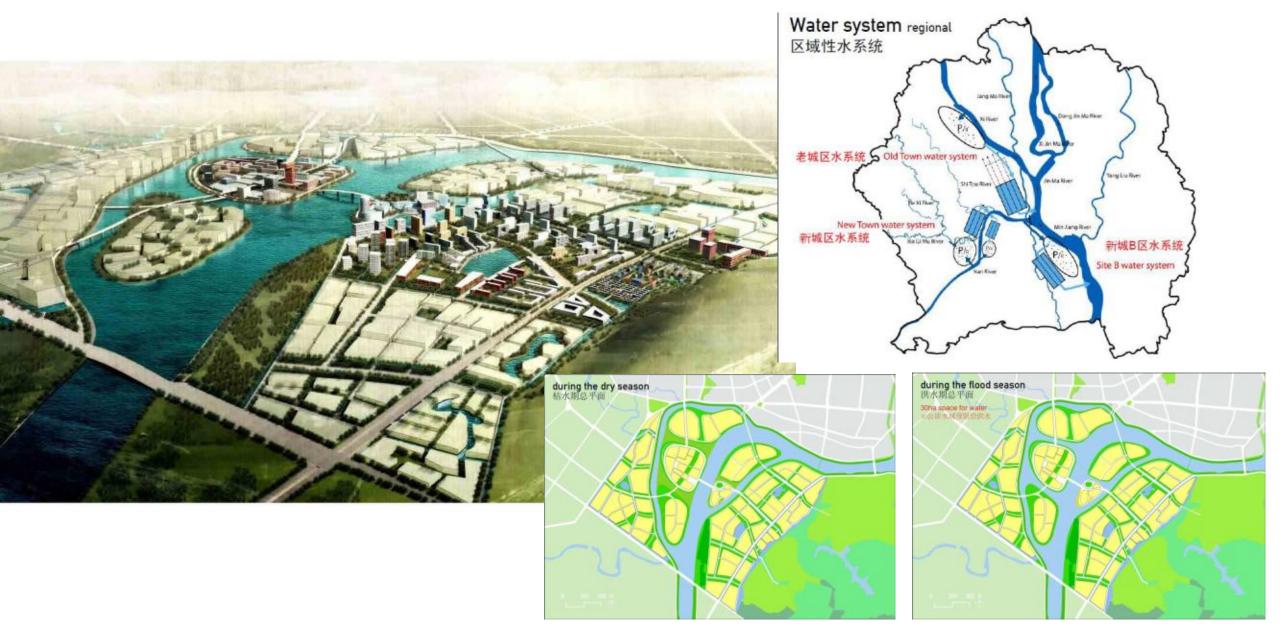






Xinjin Chengdu Master Plan

Tidal city maximizes waterfronts along the river: water retention and urban identity



Xinjin Chengdu Master Plan, with MVRDV

Tidal city maximizes waterfronts along the river: water retention and urban identity





Partnerships are needed

"Every city has a different set of needs but every city needs a Chief Resilience Officer. While '100 Resilient Cities' is helping to hire the first 100, other cities don't have to wait."

ROCKEFELLER FOUNDATION

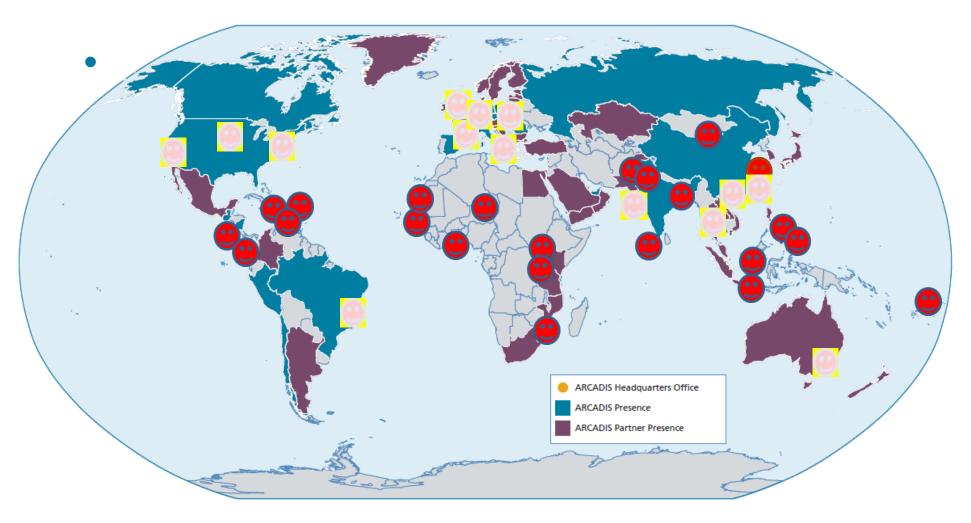






Program locations 2010-2016 ARCADIS Sesign & Consultancy for natural and built assets



















ArcadisShelterprogram



More information:

Facebook:

https://www.facebook.com/ARCADISShelterProgram

SUMMARY OF PRINCIPLES

SUMMARY OF PRINCIPLES FOR COMPREHENSIVE SOLUTIONS: SAFE AND ATTRACTIVE

- LAYER APPROACH: FIRST THINK WATER THEN THINK URBAN
- DEVELOP BLUE GREEN FRAMEWORKS & STUDIES
- BUILD WITH NATURE
- SOFT SOLUTIONS WHERE POSSIBILE, HARD WHERE NECESSAIRY
- ROOM FOR THE RIVER
- ADAPTIVE SOLUTIONS IN FLOOD PRONE AREAS
- STAKEHOLDER INVOLVEMENT
- CREATE VALUE: FOR PUBLIC BENEFIT AND TO FINANCE RESILIENCE





Thank you



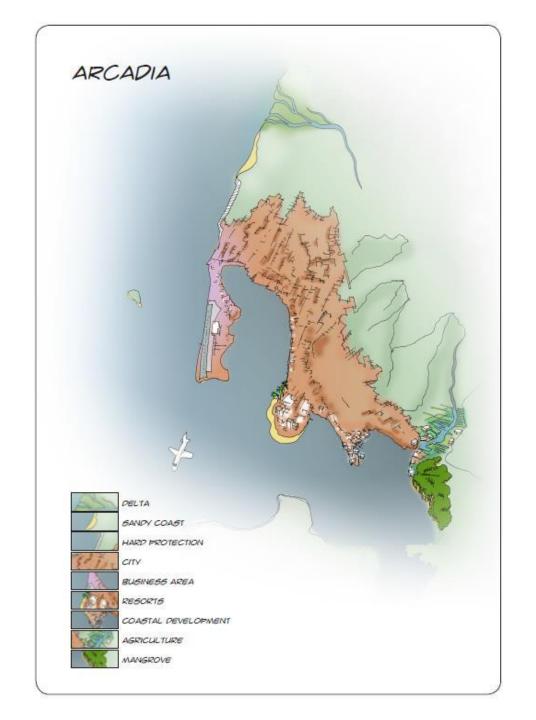


Interactive workshop

Case model city "Arcadia"

Arcadia City

- Flood prone area
- More then 20 typhoons per year
- Extreme storm in Nov 2016
- Washed away residential areas
- Over 320 casualties





Goals

- Personal Goals:
 - Learn different concepts for a sustainable, waterproof city
 - Develop the best coastal protection strategy
- General Goals:
 - Make the City of Arcadia an attractive and safe waterproof City



Location and different areas of Arcadia

- The North river Delta supplies sediments. Sea currents are mainly north to south. Has a diverse and resilient vegetation.
- People have indicated the coastline between the city and the North river suffers from erosion; 100-200m of land has been lost in 40 years time. It is a sandy coastline with no protection.
- The Business district and airport are located on the north-west peninsula, for now protected by sea walls and groins. However they have been damaged at a number of locations and need to be repaired.
- Port area: the port is sheltered behind the peninsula, but needs regular dredging because of heavy sediment inflow.
- Arcadia Central is an important tourist hub that acts like a basis to enjoy the surrounding area. However after the disastrous typhoon, tourism is low.
- Most of the settlements are located along the coast line at terrains at levels above the high watermark, experiencing no flooding other than during the typhoon.
- In general people don't want to relocate since alternative housing is not available for everyone or is not providing livelihood alternatives.
- Mangroves and seagrass areas and beach forest provides valuable environmental, but ecologically sensitive areas, that are
 important production and nursery areas for valuable fish species and non-vertebrate species (crustaceans, bi-valves etc) and
 thereby contributing to the livelihood of the local fishing communities Most of the mangroves are insufficiently managed and in a
 less than optimal condition. A condition that calls for improved protection.

Workshop Planning



10.15 – 11.00	 Round 1: Physical solutions (30 min.) Plenary presentations of main conclusions (15 min.)
11.00 — 11.45	 Round 2: Stakeholder identification, stakeholder involvement, capacity building and value creation (30 min.) Plenary presentations of main conclusions (15 min.)
11.45 – 12.00	Wrap – up



Round 1: Physical solutions

Drawing the map: 30 min.

Presentation of the main conclusions (by using the map): 5 min.

- Draw a map with physical solutions for the city of Arcadia
- Please use the concepts for a sustainable and waterproof city
- Indicate where and how you would use those concepts
- Use the map of Arcadia

Round 2: Stakeholder identification, stakeholder involvement and value creationand capacity building

Rounds each 10 min.

Round 2A

- Identify the main stakeholders at a national, regional and local level
- Discuss what and how their involvement should

Round 2B

- Identify opportunities to increase value and attract financial resources
- Look at the identified stakeholders

Round 2C

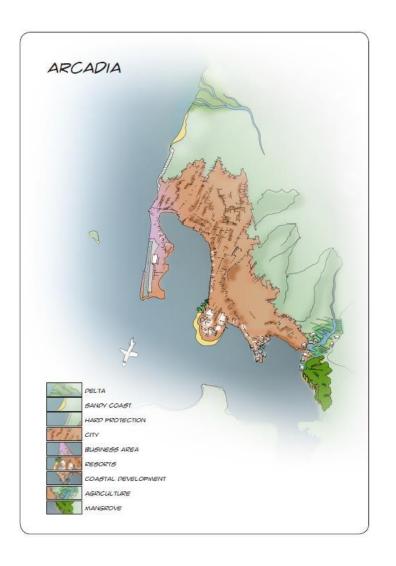
Develop a capacity building program for the short, medium and long term. Please think of which capacities are needed for whom and how these can be developed.



Case model city "Arcadia"

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Workshop Planning

10.45 – 11.30	 Round 1: Physical solutions (30 min.) Plenary presentations of main conclusions (15 min.)
11.30 – 12.15	 Round 2: Stakeholder identification, stakeholder involvement and value creation (30 min.) Plenary presentations of main conclusions (15 min.)



Round 1: Physical solutions

Drawing the map: 30 min.

Presentation of the main conclusions (by using the map): 5 min.

- -Draw a map with physical solutions for the city of Arcadia
- -Please use the concepts for a sustainable and waterproof city: search for integrated solutions which add to a creative city, building with nature, soft and flexible solutions, adaptive solutions
- -Indicate where and how you would use those concepts
- -Use the map of Arcadia



Round 2A: Stakeholder identification, stakeholder involvement Round 2B: finance and value creation

The second round is divided into two parts: Round 2A and Round 2B.

Rounds 2A and 2B each 15 min.

Presentation of the main conclusions: 5 min.

Round 2A

- Identify the main stakeholders at a national, regional and local level
- -Discuss what and how their involvement should

Round 2B

- -Identify opportunities to increase value and attract financial resources
- -Look at the identified stakeholders