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Spain Water
and IWHR, China

Nature-Based Solutions for Water Security

a business opportunity



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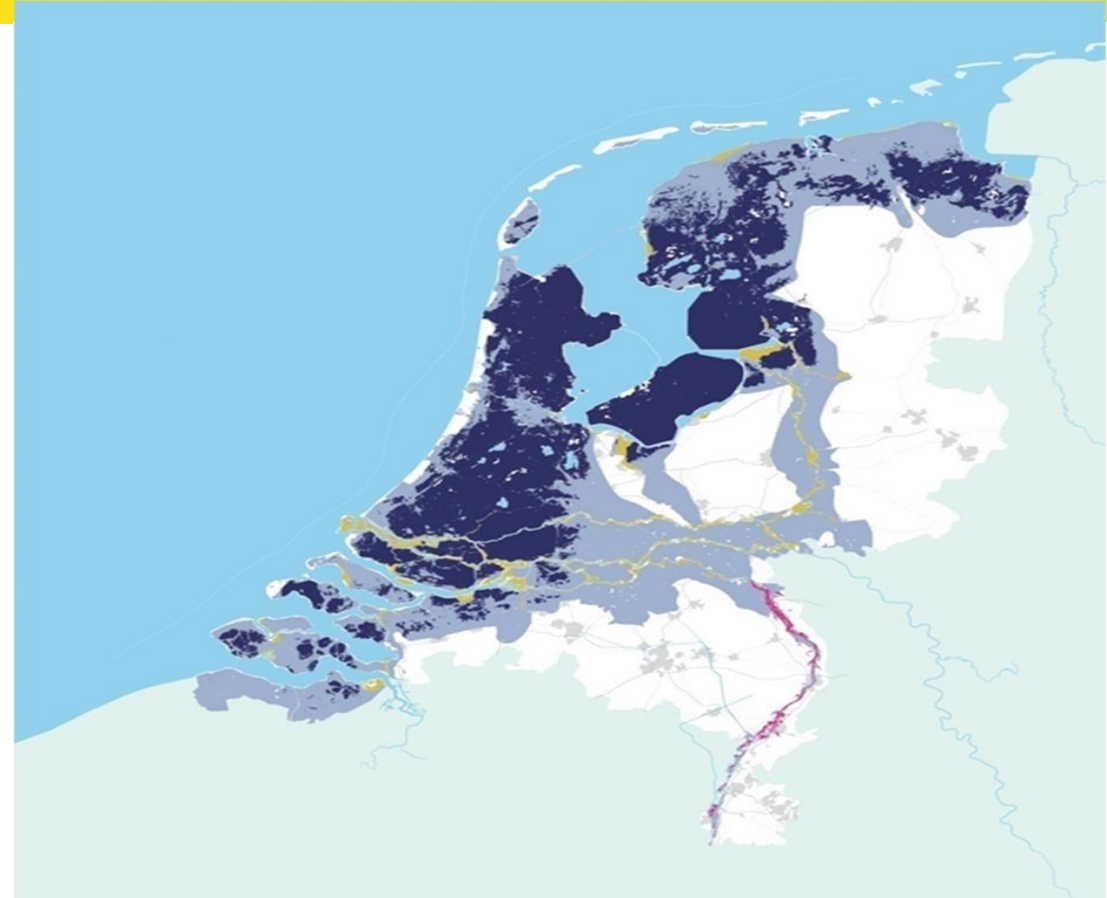
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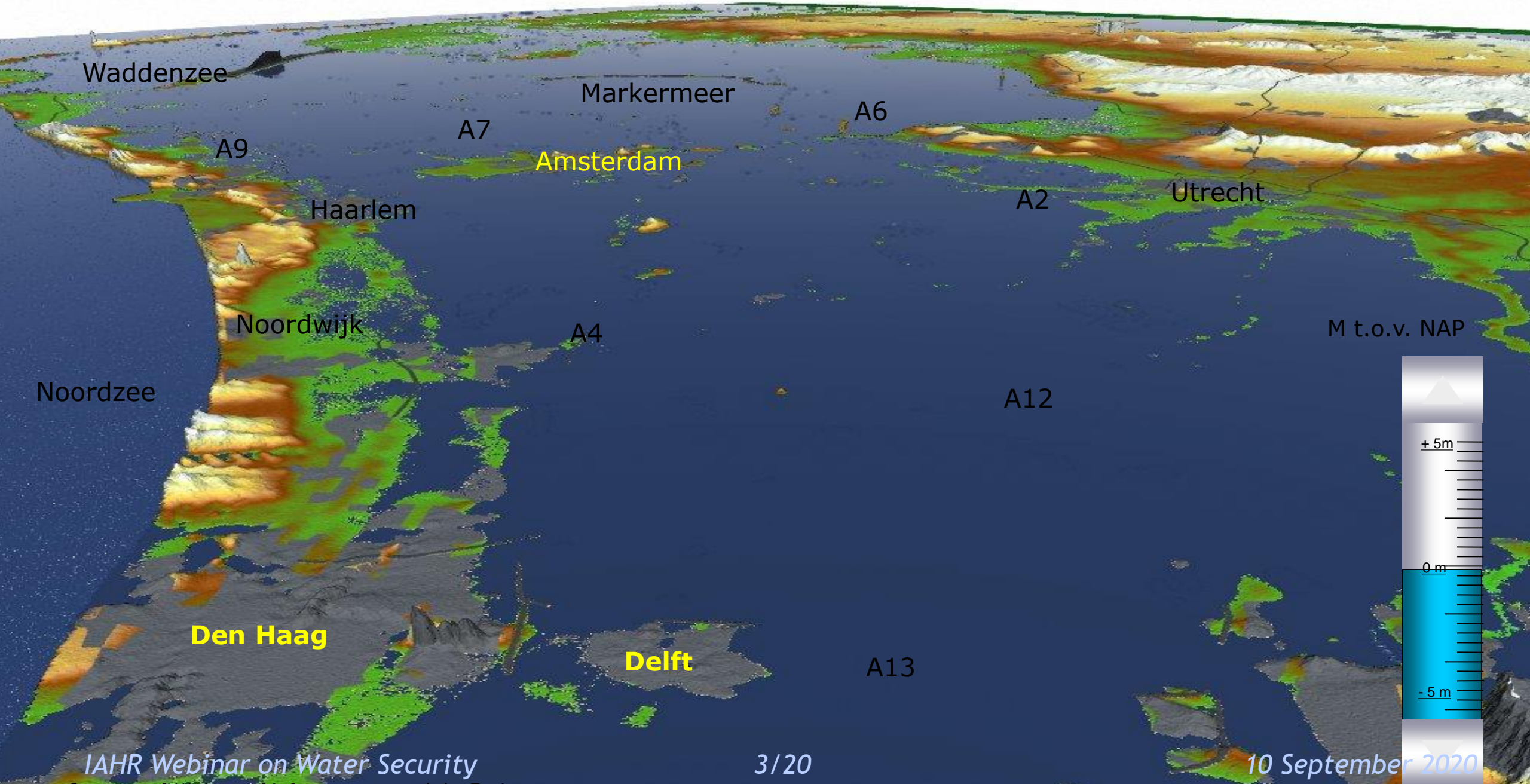


Netherlands

- 60% is vulnerable to flooding
- 60% of economic value is earned in lowest lying parts of the country
- 70% of fresh water comes from Germany (river Rhine)
- 98% of waterbodies are artificial or heavily modified
- Water Infrastructure is one of the pillars of the Dutch economy



areas in the Netherlands **potentially** flooded without proper water management





Dutch engineering solutions



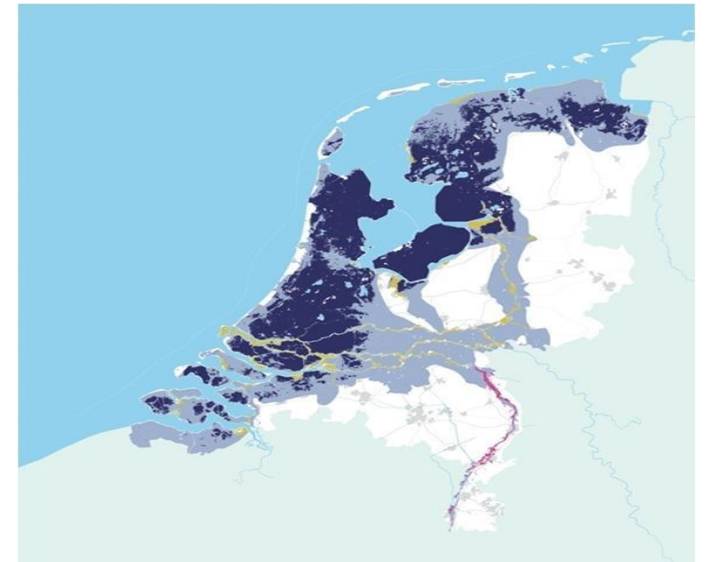


Challenges

- Water safety
- Ecology
- Renovating Infrastructure
- Urban Integration
(Healthy Cities)



nature-based
WATER SECURITY



KEY CONCEPTS OF NATURE BASED SOLUTIONS FOR SUSTAINABLE DEVELOPMENT



Ellis Penning



Global challenges



- Climate change and biodiversity loss
- Governments and donors are increasingly applying NBS to reduce hazards, mitigate and adapt to effects of climate change and to improve water management and limit heat stress;
- Demand for sustainable, resilient and multi-benefit solutions;
- Trend toward integrated, multi-benefit (and multi-party) solutions;

- Clear trend toward *with nature*
- Many pilots, and trial projects.

→ Yet, uptake at project scale is still challenging



The Global Assessment
Report on Biodiversity and
Ecosystem Services

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Exploring nature-based solutions: the role of green infrastructure in mitigating the impacts of weather- and climate change-related natural hazards



“...instead of automatically defaulting to grey solutions like dikes and pipes for flooding, we first should look at restoring floodplains or wetlands. Rather than building sea walls, we need to think about conserving sand banks...Planners should compare green to grey and identify new opportunities for investing in nature, including a combination of green and grey approaches when nature-based solutions alone are insufficient. As planners explore how to accommodate infrastructure demands in the future, the lesson is clear: **think about green before investing in grey.**”

EEA Technical Report No 12/2015, Published September 2015



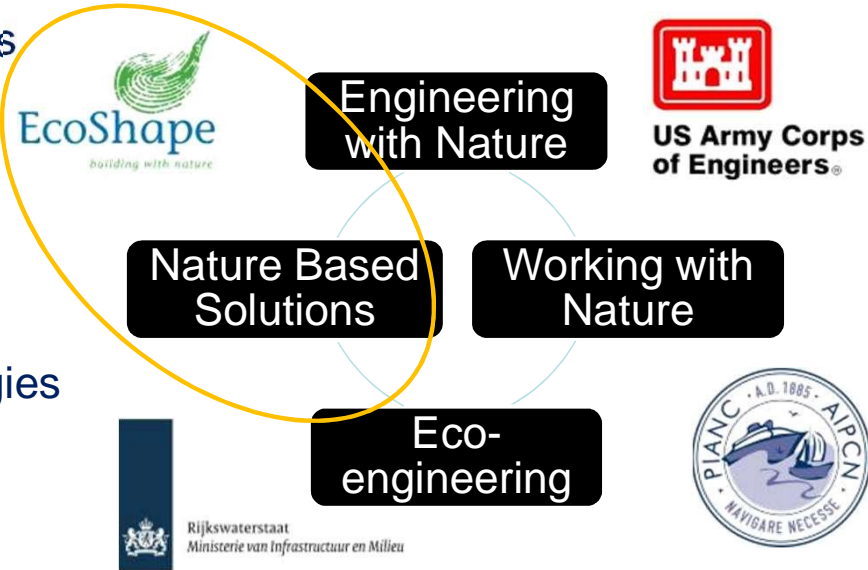
NBS Philosophy as an alternative



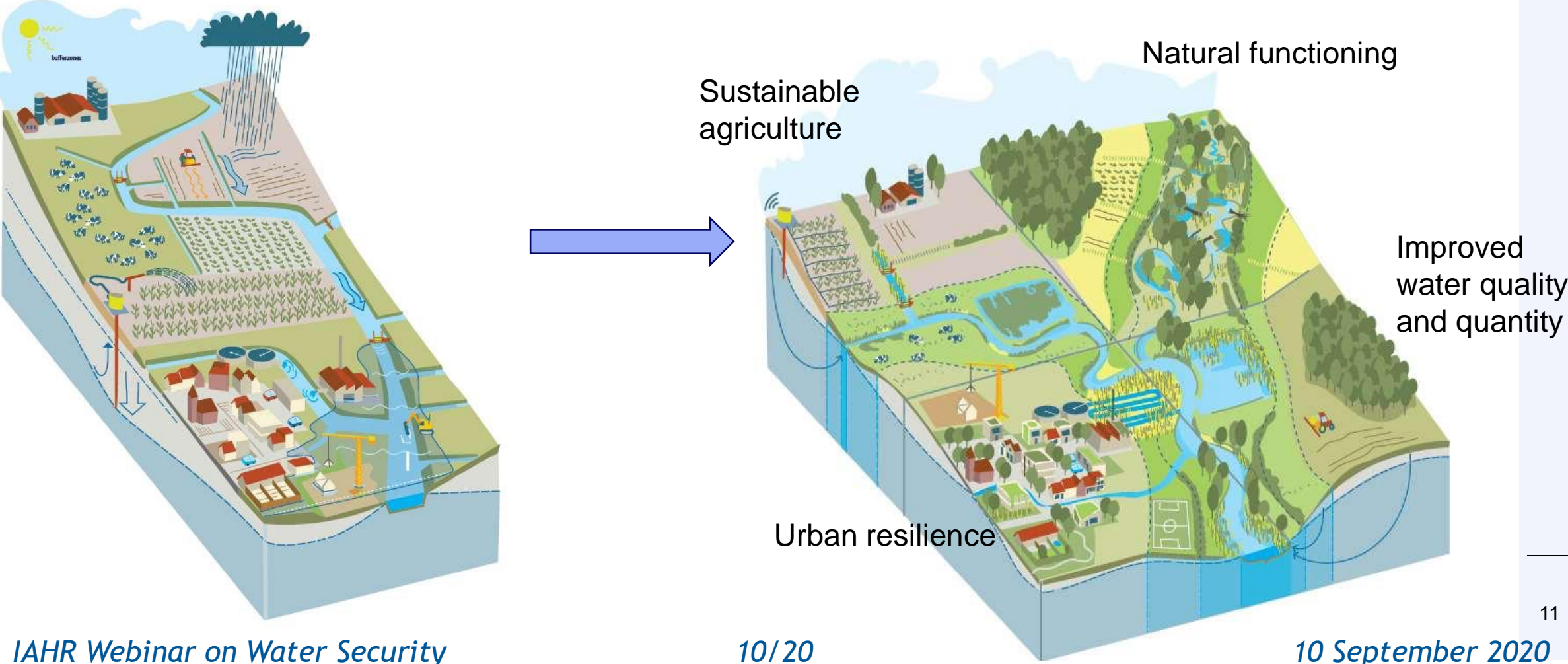
- Conventional infrastructure design solutions typically not meet (all) these challenges



- Starting point is the system (environment & people)
- Select resilient design solutions and strategies
- Sustain the natural system and its services
- Integrate multiple functions & stakeholders

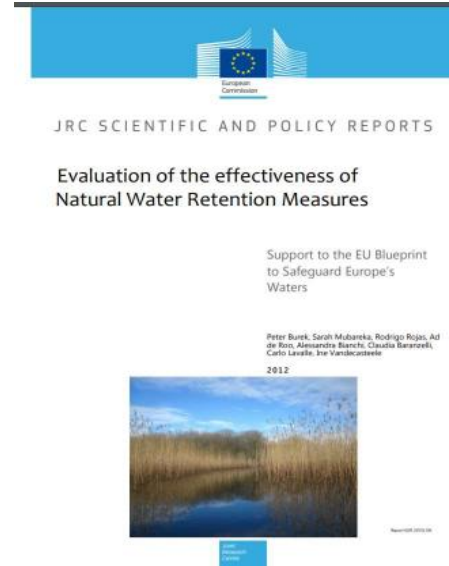


Towards climate robuste catchments



Climate robust agriculture

- Reduce drainage capacity of land
- Create natural water retention areas
- Increase groundwater levels
- Increase organic content of soils
- Select climate robust crops



Increase groundwater recharge

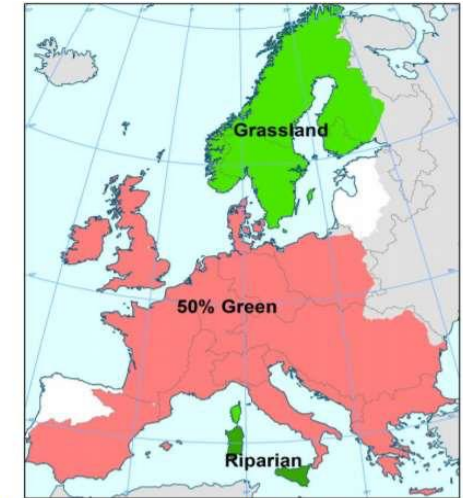


Figure VI-1: Most effective regional measures to increase groundwater recharge per region

Reduce floods

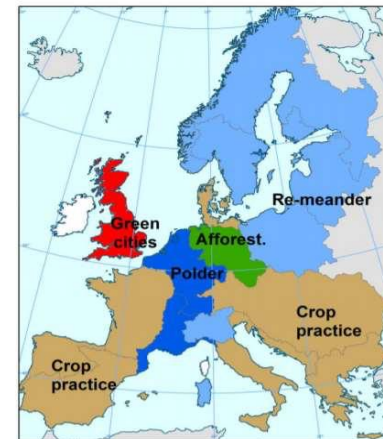


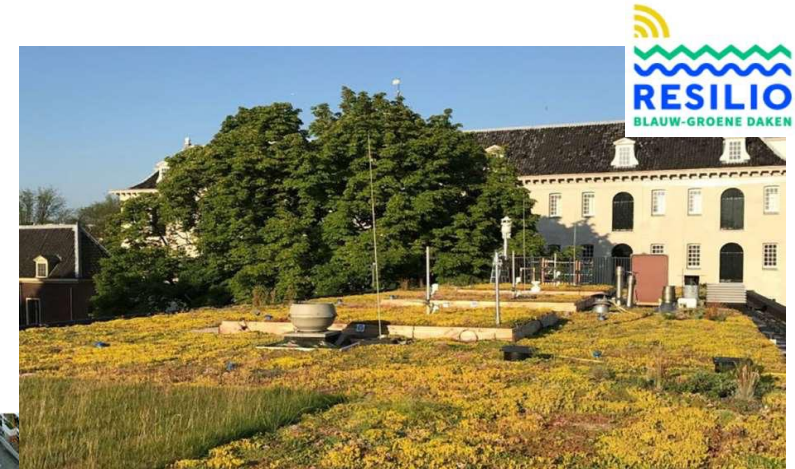
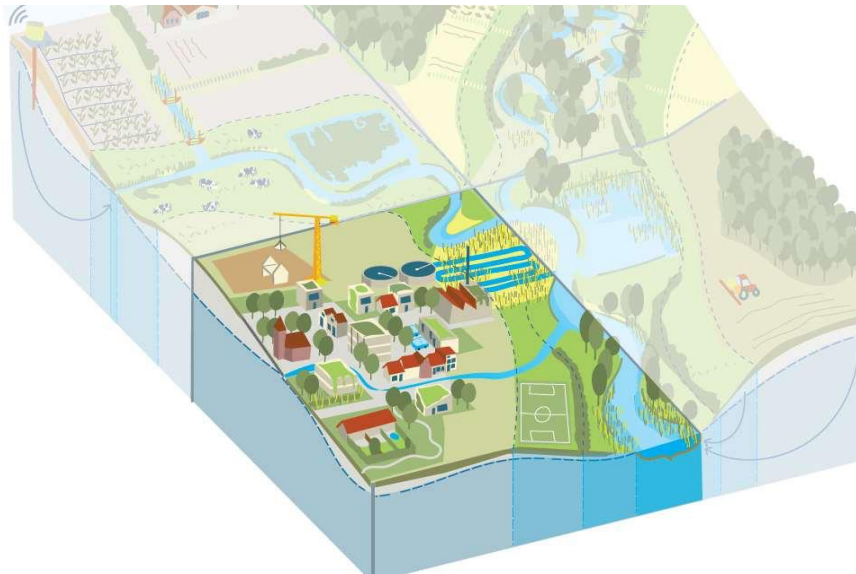
Figure VI-1: Most effective regional measures to reduce flood peaks (here: 20 year return period)

Increase low flow



Climate Adaptive Cities

- Re-green paved areas where possible
- Decouple rainwater systems from sewer system
- Implement wadi's and bioswales
- Create water storage in/below streets and public parks
- Stimulate green roofs
- Create green buffer strips close to urban streams (longitudinal parks)



<https://clevercities.eu/milan/>

Restoration of water quality and quantity

- Restore groundwater fluxes
- Use natural crop protection
- Stimulate wise soil management
- Restore stream profile
- Create vegetated buffer strips

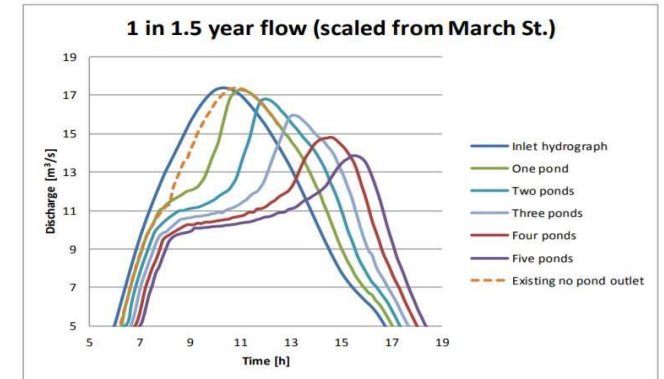


Fig.22 - 1 in 1.5yr flow. Attenuation of hydrograph from 1-5 ponds. The dashed line shows the effect of the existing floodplain; extra attenuation is afforded by one pond, and further attenuation by a series of ponds. Spray (2016) - <https://tweedforum.org/eddlestone-project-databas>



Interreg
North Sea Region
Building with Nature
European Regional Development Fund



EUROPEAN UNION

<https://tweedforum.org/our-work/projects/the-eddlestone-water-project/eddlestone-water-project-videos/>

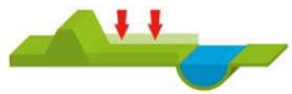
Restoration of the natural system

- Reforest where possible
- Close drainage channels
- Restore flood zones along streams
- Reforest streams for shading
- Stimulate meandering of streams



Nature Based Solutions in rivers

Room for the river



Lowering the flood plain



Deepening the summer bed



Water retention



Dyke relocation



Lowering perpendicular groynes and building attracting groynes



High water channel



Depoldering



Removing obstacles



Strengthening dykes

benefits

- Water safety
- Ecology
- Recreation



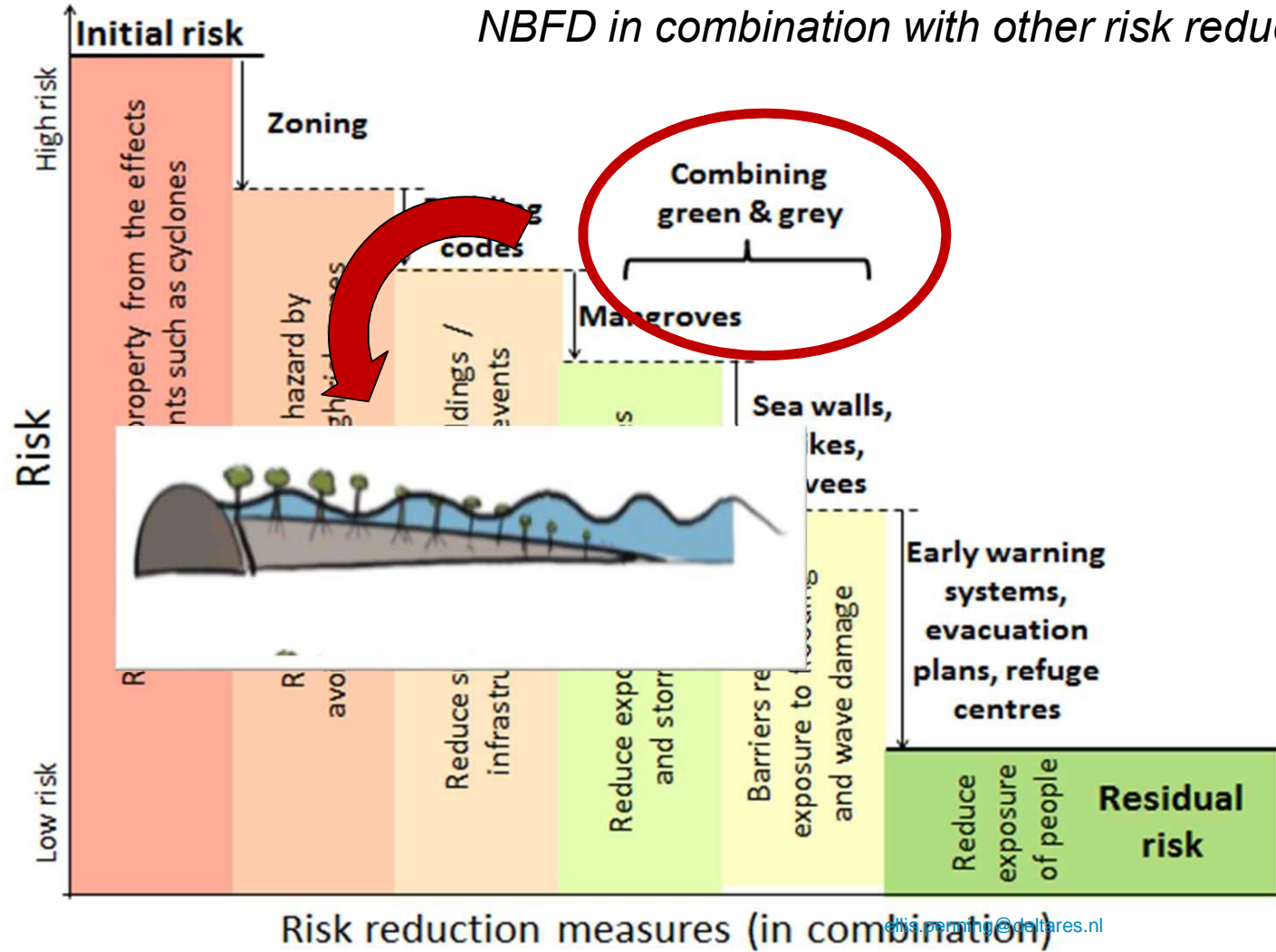
Z1

An example of including regrets in assessment technical flood defences measures versus nature based solutions

	overtopping	pipng	instability	deterioration outer slope	costs
Room for the River	++				€€€
wave dampening forelands	+			+	€
top-up crest with wall	+				€
raise defence's crest	++				€€
reduce defence's inner slope	+	+	++		€€
clothing inner slope (invisible)	+				€
add berm on outside		++			€
add berm on inside		++	+		€€€
vertical geotextile sheet		+			€€
pipng sheet bentonite		++	+		€€€
insert sheet piling		++	++		€€€
insert double sheet piling	++	++	++		€€€€€
concrete wall (hidden/covered)	++	+	++	+	€€€€€
cover outer slope & blocks				+	€€



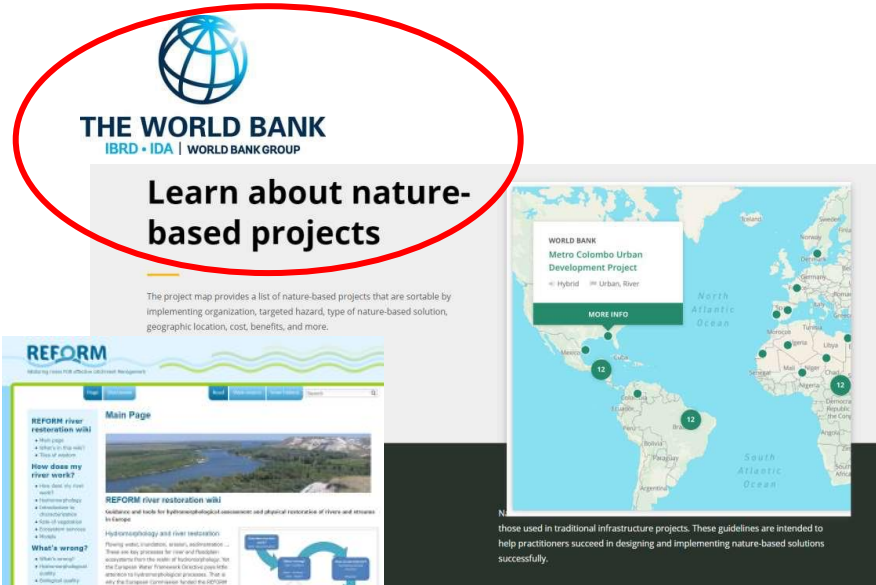
Where do Nature Based Solutions fit?



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5th september 2019 IAHR World Congress Panama

Platforms, projects and communities to share knowledge



THE WORLD BANK
IBRD • IDA | WORLD BANK GROUP

Learn about nature-based projects

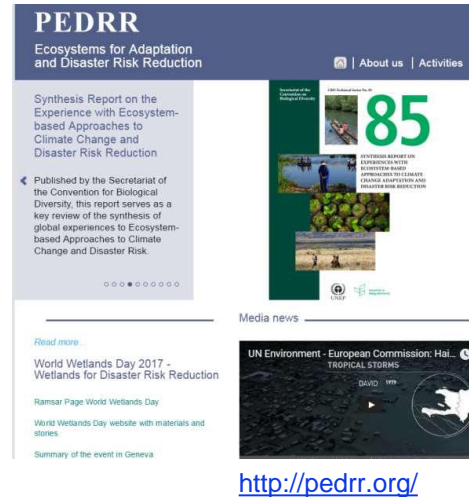
The project map provides a list of nature-based projects that are sortable by implementing organization, targeted hazard, type of nature-based solution, geographic location, cost, benefits, and more.

REFORM
Making rivers more effective through restoration

REFORM river restoration wiki

Hydroecology and river restoration: Planning and designing nature-based solutions for river and floodplain restoration in the European Water Framework Directive (WFD) context. This is the European Commission's first WFD action plan for restoring the ecological, hydro-morphological, and socio-economic health of rivers and floodplains across the region.

those used in traditional infrastructure projects. These guidelines are intended to help practitioners succeed in designing and implementing nature-based solutions successfully.



PEDRR
Ecosystems for Adaptation and Disaster Risk Reduction

Synthesis Report on the Experience with Ecosystem-based Approaches to Climate Change and Disaster Risk Reduction

Published by the Secretariat of the Convention for Biological Diversity, this report serves as a key review of the synthesis of global experiences to Ecosystem-based Approaches to Climate Change and Disaster Risk Reduction.

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SYNTHESIS REPORT ON ECOSYSTEM-BASED APPROACHES TO CLIMATE CHANGE AND DISASTER RISK REDUCTION

World Wetlands Day 2017 - Wetlands for Disaster Risk Reduction

Ramsar Page World Wetlands Day

World Wetlands Day website with materials and stories

Summary of the event in Geneva

<http://pedrr.org/>



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Case studies

Displaying 1 - 249 of 249

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enter search terms:

Scale
Type

APPLY RESET

NBS City Case Studies
Existing ecosystem-based Initiatives



US Army Corps of Engineers®

Rijkswaterstaat
Ministry of Infrastructure and the Environment



RECONNECT
<http://www.reconnect.eu/>

thinknature
www.think-nature.eu



EcoShape
building with nature

Building with Nature

EcoShape develops and shares knowledge about Building with Nature in hydraulic engineering: a new design philosophy that utilizes the forces of nature, thereby strengthening nature, economy and society

Discover our philosophy →

<https://www.ecoshape.org/en/>
<https://publicwiki.deltares.nl/display/BWN1/Guideline>



NWRM Natural Water Retention Measures

Home Implementing NWRM Catalogue of NWRM Case studies Glossary About NWRM

WELCOME TO THE EUROPEAN NWRM PLATFORM

The EU Directorate General Environment promotes the use of nature-based green infrastructure solutions (official website) and this progress included in a range of policies of which for water. A range of activities and related relevant information portals are also available on climate (Climate Adapt), on biodiversity (BIOSE), on forest (FISE).

As detailed on DG Environment official webpage, "Natural Water Retention Measures (NWRM) support Green Infrastructure by contributing to dealing with nature and biodiversity conservation and restoration, landscaping, etc."

The current platform gathers information on NWRM at EU level. NWRM are green infrastructures applied to the water sector, which permit to achieve maintain healthy water ecosystems, and offer multiple benefits.

From this page you can find out more about NWRM definition, browse NWRM related concepts, look for individual NWRMs or select the practical guide that will help you find your way to implement NWRM, or directly access the different products: synthesis document, catalogue of case studies. For easy navigation, please consult the user's guide.

You can also join us on LinkedIn and access the NWRM community of practice gathered on our discussion forum, and you can submit a case study.

NEW: Access all main documents and datasets

JOIN OUR FORUM

MEASURES BY SECTOR

HYDRO MORPHO

DEFINITION
Natural Water Retention Measures are multi-functional measures that aim to protect water resources and address water-related challenges by restoring or maintaining ecosystems.

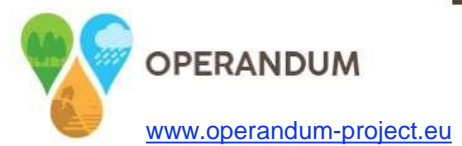


URBAN GREEN UP

UNaLab
URBAN NATURE LABS

Connecti Nature

Design guideline development
Deltares



OPERANDUM
www.operandum-project.eu

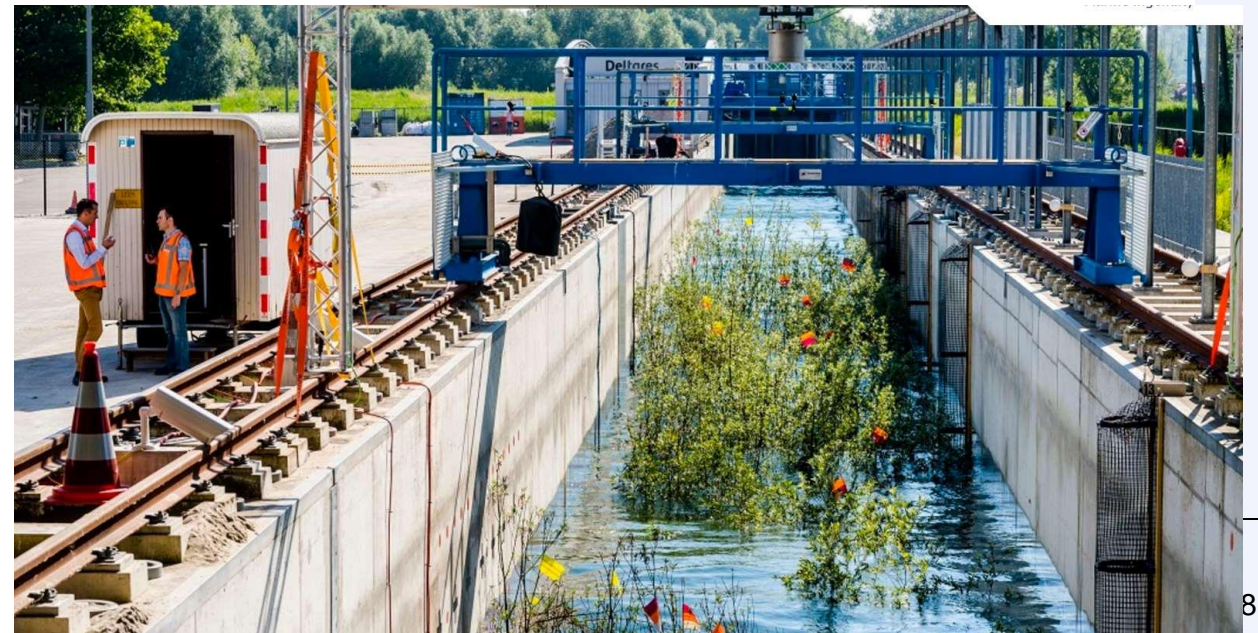
Future research needs to tackle uncertainties

- Testing extreme events
- Long term monitoring to understand and evaluate uncertainty and dynamics over time
- Define Key Performance Indicators
- Enablers for implementing/mainstreaming large scale – basin wide strategy
- Limits to functionality must be better understood – part of larger DRR strategy

KEY ROLE for IAHR



Photos – Robbert de Koning





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*hydro-environment
engineering & research
playing a key role*



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谢谢各位!



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