Program

Session 51: The Waterharmonica, over 20 years experience with full scale wetland systems for converting well treated waste water into a usable surface water (Part 1 of 2)

- Venue: Longliqi Room
- Convener: Ruud Kampf; Floris Boogaard

- 10:00-10:15 Floris Boogaard Opening words of welcome, program
- 10:15-11:x0 Ruud Kampf: Lecture Introduction to the Waterharmonica 'over 20 years' experience Waterharmonica, practice and design
- INTERACTION
- 11:50-12:00 Lessons learned wrap up and introduction to second part of the workshop

Introduction: Lessons learnt

- Short Introduction (Floris Boogaard)
  - Program
  - (Dutch) challenges
  - Why lessons learnt?
  - this afternoon
- Ruud Kampf
  - 'waterharmonica'
  - interaction
- Wrap up

Introduction: Holland

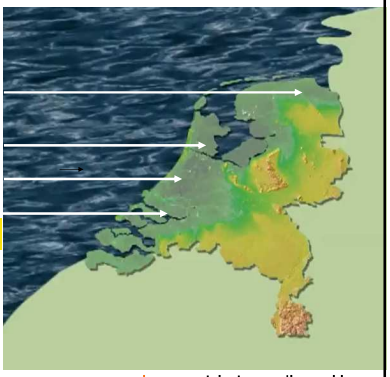
Hanzehogeschool Groningen
University of Applied Sciences

Kenniscentrum NoorderRuimte

Tauw

TUDelft
Delft University of Technology

indyma



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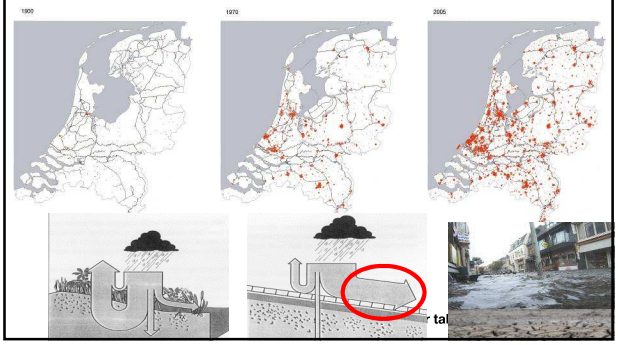
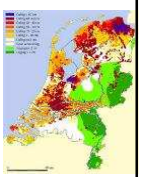
Dutch water management: Quantity

'urbanisation changed: waterbalance'

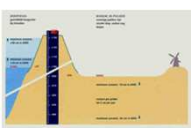
1900 **1970** **2005**



Challenges



examples of problems in the urban areas: floodings, degradation of waterways, heatstress, drought leading to lower groundwater table and subsidence with results as damage of buildings



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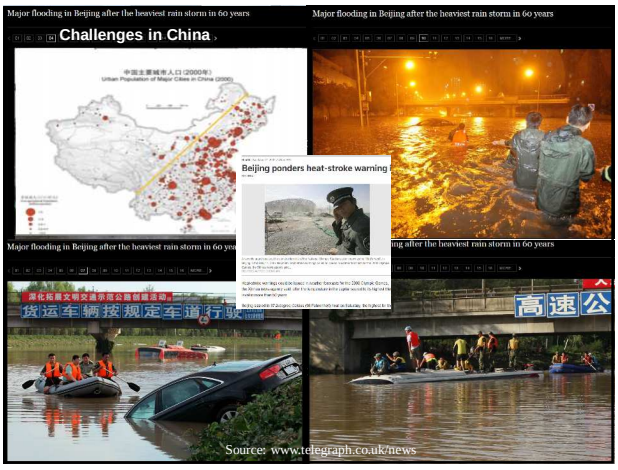
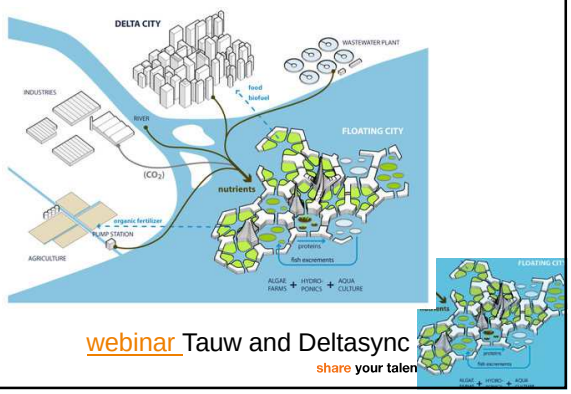


New cities



webinar Tauw and Deltasync

share your talen

But existing urban area
Multifunctional approach

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101 solutions

101 solutions?

Example Amsterdam
SUDS & constructed wetlands

- waterdunes www.climatescan.nl

re your

Good examples are not hard to find…

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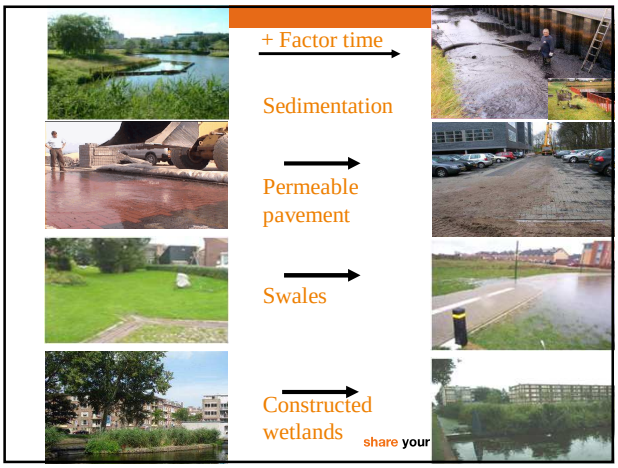
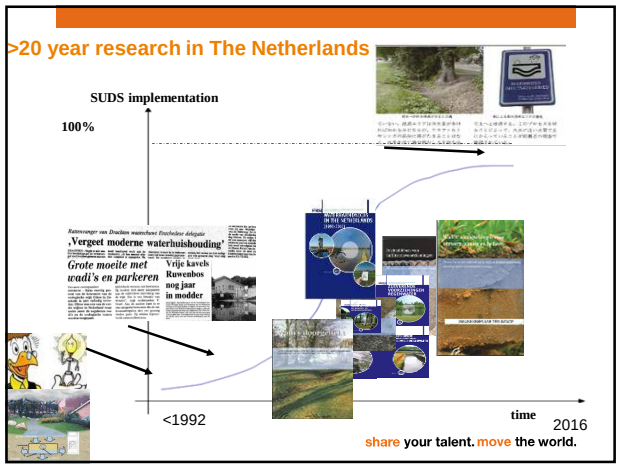
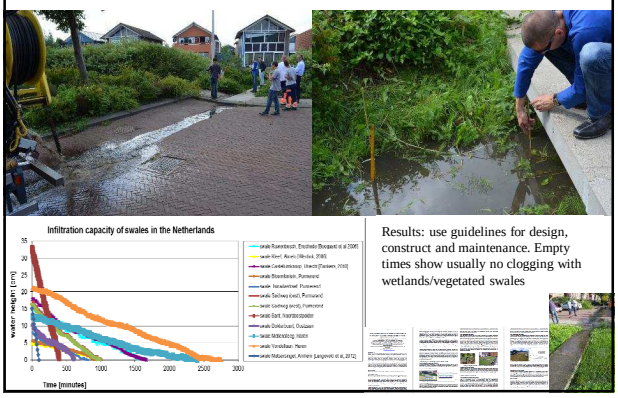




Research on SUDS:

Example of research: wetlands&bio-swales

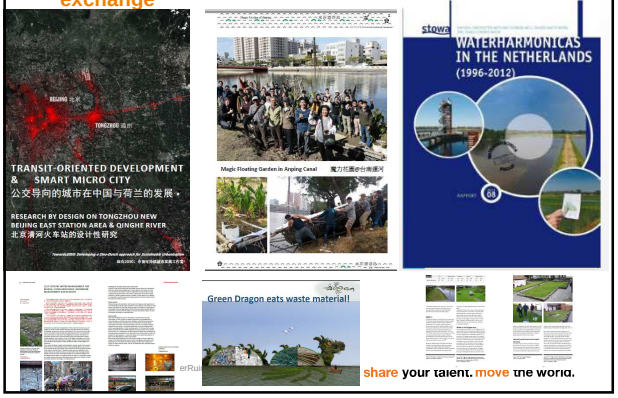


Results: use guidelines for design, construct and maintenance. Empty times show usually no clogging with wetlands/vegetated swales

Example:
International knowledge exchange: guidelines

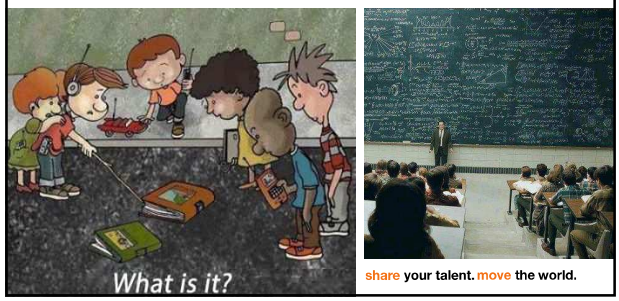
Parameter	Unit	Recommended values Netherlands	Germany	United Kingdom	Belgium
Infiltration capacity	m/day	> 0.5	0.86 < Kd < 86.4	-	> 0.086
Distance ground water	m	> 0.5	> 1		
Thickness of filter soil	m	0.3 – 0.5	> 0.1 (average 0.3)		0.3 - 0.5
Area swale to drained area	%	5 – 10	> 7 (average 5 - 20)		5 – 10
Distance to houses	m	> 1	1.5 depth constr. zone		
Overflowing frequency	n/yr	1 to 2	0.2		0.2 - 0.5
Swale water depth	m	< 0.3	< 0.3	< 0.1	< 0.3
Spare capacity	m	0.1		0.15	
Time to empty	hour	< 24	< 24	retentiontime > 10 min.	< 24
Width of bottom	m	> 0.5		0.6	0.5 - 1
Width of water surface	m	4			
Slopes	-	1 : 3 or less		1 : 4 or less	1 : 3 or less
fraction of humus in toplayer	%	3 - 5	2 - 10		
Max velocity	m/s			1 - 2	

Publications for international knowledge exchange

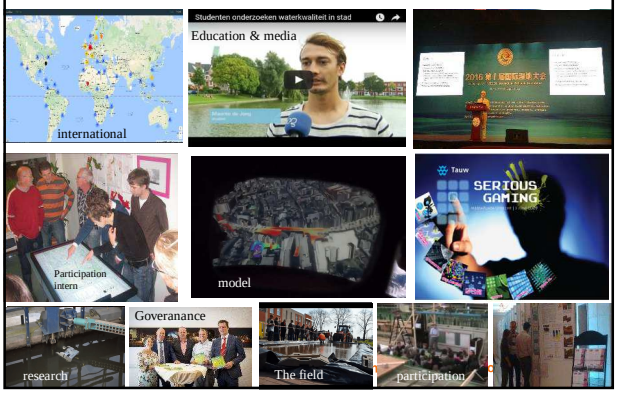


Knowledge exchange with next generation

- How to share this knowledge?
- How to reach stakeholders?
- How to speak a multidisciplinair language?



Tools for international knowledge exchange on sponge cities



Lessons learnt

- So: please interact
- Program Lessons learnt
  - (this afternoon):
    - Cost effective
    - Low maintenance
    - Multifunctional (adding art, social science etc)
    - Multidisciplinar
    - Participation
    - Real impact (from impact factor to social media)
    - Educational (from sttudents to politicians)
    - Innovation
    - Sustainable (Circular economy, local vegetation and materials, ..)
    - **Sharing (international) BMPs**
- Ruud Kampf