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http://english.jschina.com.cn/23261/201804/t20180411_5281612.shtml

Adaptation Support Tools for Urban Land and Water Management and Room for River
城市土地和水管理的适应支持工具与河道扩容

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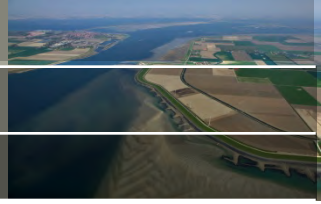
ir Frans H M van de Ven 博士

Session 9: Climate Adaptation　论坛9：气候适应
2nd International Forum on Low Carbon Development for Cities　第二届城市低碳发展国际论坛
"Acting Together for Low Carbon, Livable, and Prosperous Cities"　"共同为低碳、宜居和繁荣城市行动"
Seoul, Republic of Korea, 2-5 September 2019　韩国首尔，2019年9月2日至5日

Overview 综述



- Our flooding challenges 洪水挑战
- Solution strategy 解决策略
- Adaptation planning and design 适应规划和设计
- Adaptation Support Tool 适应支持工具
- Room for the River 河道扩容

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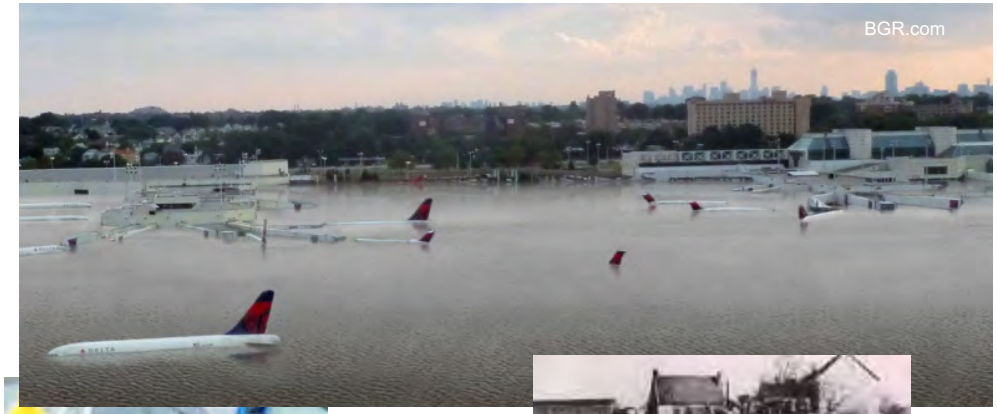
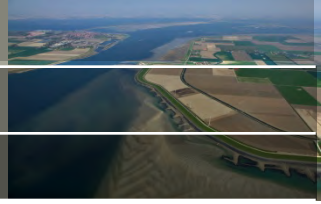
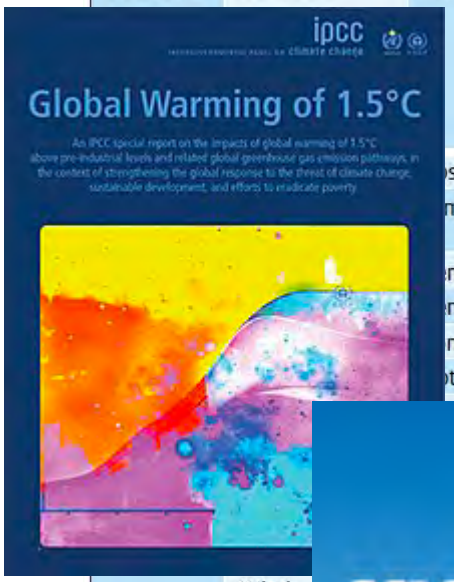
Flooding (coastal, fluvial, pluvial, groundwater)
洪水（沿海，河流，雨水，地下水）

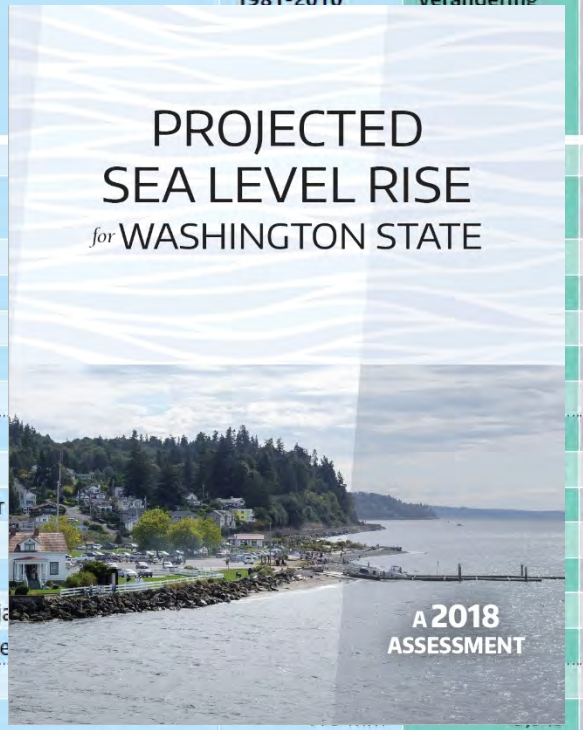


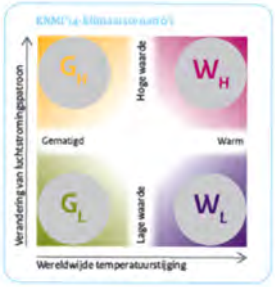
..while climate changes, sea level rises, …
..气候变化，海平面上升，……

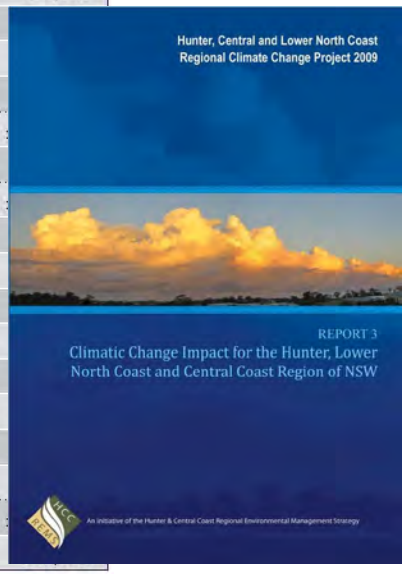


Seizoen [A]	Variabele	Indicator	Klimaat [B] 1981-2010	Gemiddelde verandering	Natuurlijke variaties gemiddeld over 30 jaar [D]
		solute niveau [E]			±1,4 cm
		mpo van verandering			±1,4 mm/ jaar
		middelde			± 0,16 °C
		middelde hoeveelheid			± 4,2%
		nnestraling			± 1,6%
		tentiële verdamping (Makkink)			± 1,9%
					± 39 uur
					± 0,48 °C
					± 8,3%
		jaar			± 11%
	Wind				± 4,7%
		per ja			
		zuid e			
Lente	Temper				
	Neersla				
Zomer	Temper		17,0 °C	+0,9 °C	
	Neersla		224 mm	+0,2%	
		jaar wordt overschreden [I]	44 mm	+1,7 tot +10%	
			15,1 mm/uur	+5,5 tot +11%	
			43 dagen	+0,5%	
	Zonnes		153 kJ/cm²	+1,9%	
	Vochtig		77%	-0,6%	
	Verdam		266 mm	+3,5%	
	Droogt	rende het groeiseizoen [I]	144 mm	+4%	
Herfst	Temperatuur	gemiddelde	10,6 °C	+1,0 °C	
	Neerslag	gemiddelde hoeveelheid	245 mm	+5,5%	





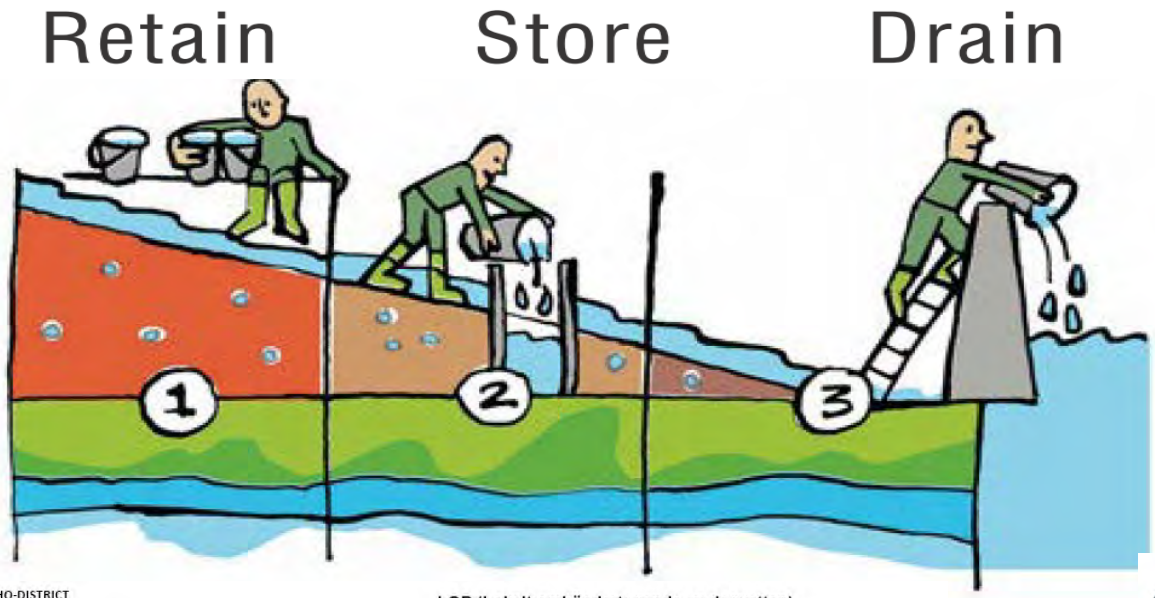




Solution strategy #1: Retain & Store!
解决方案策略#1：保留和蓄存！

Re-/Detain and Store at the source to avoid overloading the drainage capacity and flooding downstream

在源头储水，以避免超过排水渠能力和洪水过载



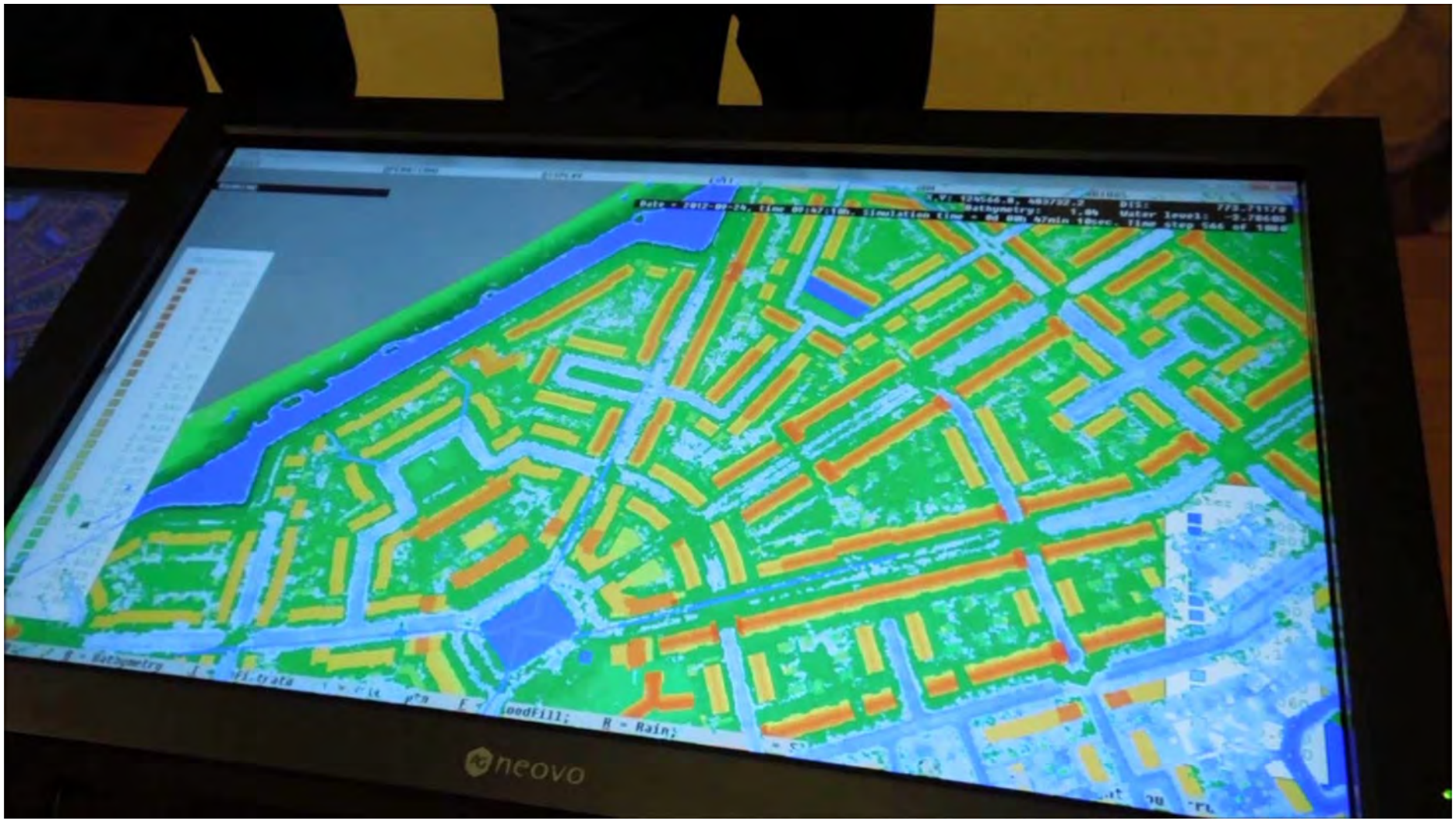
De Urbanisten

BOTKYRKA KOMMUN

Malmsjö

http://www.chinadaily.com.cn/opinion/2017-09/26/content_32491069.htm

‘Sponge size’ assessment　评估‘海绵规模'



hydrologic / hydraulic modelling to assess water retention assignment

水文/水力模型评估蓄水任务

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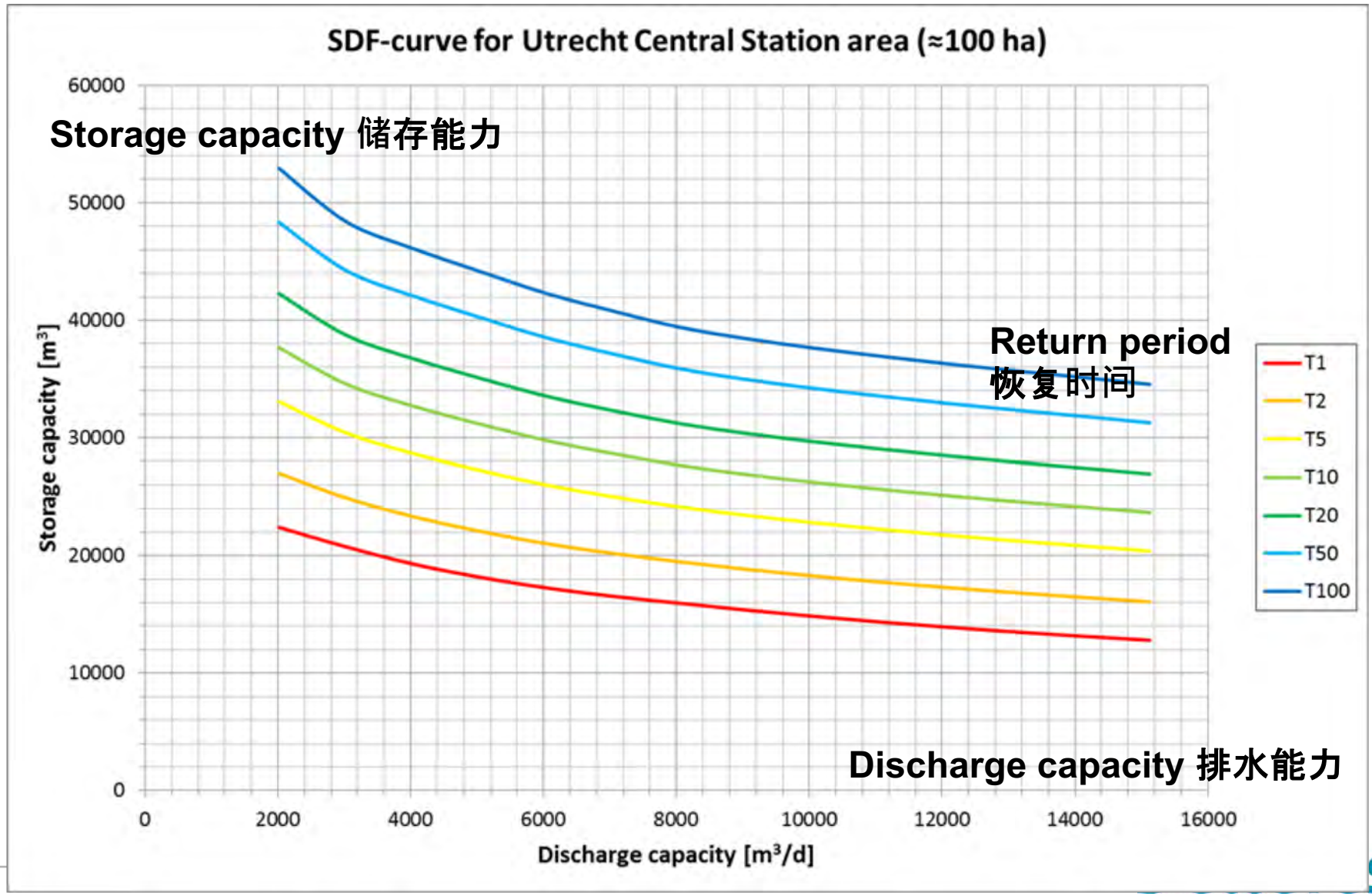
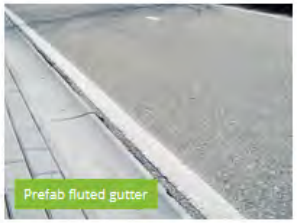
Stormwater retention assignment 暴雨储存



Lots of measures can be taken 采取多种措施

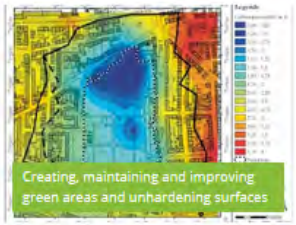

Fluted gutters


Prefab fluted gutter


Open gutters


Green squares and playgrounds


Private green gardens

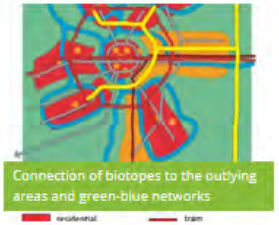

Creating, maintaining and improving green areas and unhardening surfaces


Covered gutters


Hollow roads


Ditches


Urban forests and parks


Connection of biotopes to the outlying areas and green-blue networks


Urban wetlands


Open water channels


Use of groundcover and shrubbery

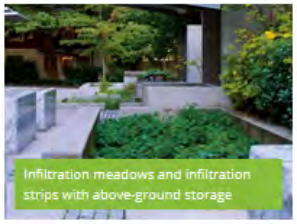

Porous paving materials


Retention roof


Grass fields and flower meadows


Urban farms


Ground infiltration


Infiltration meadows and infiltration strips with above-ground storage


Rainwater ponds for buffering and purification of moderately polluted water


Rainwater ponds for buffering and purifying extremely polluted water


Bioswales


Green riparian zones and wet biotopes


Rainwater ponds for buffering and purifying extremely polluted water

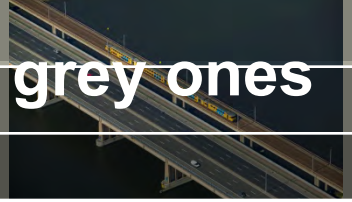

Nature-friendly bioswales


Gravel layers/trenches/reverse drainage


Infiltration meadows and infiltration

http://www.urbangreenbluegrids.com/design-

Blue-green measures preferred over grey ones
蓝绿色措施优于灰色措施



Grey measures灰色措施 → **Blue-green measures蓝绿色措施**

less space, subsurface
地表下层较少的空间,

rigid, public investment
严格的公共投资

more space, visible, multi-functional
更多可见，多功能空间

flexible and cost-effective
灵活且有成本效益

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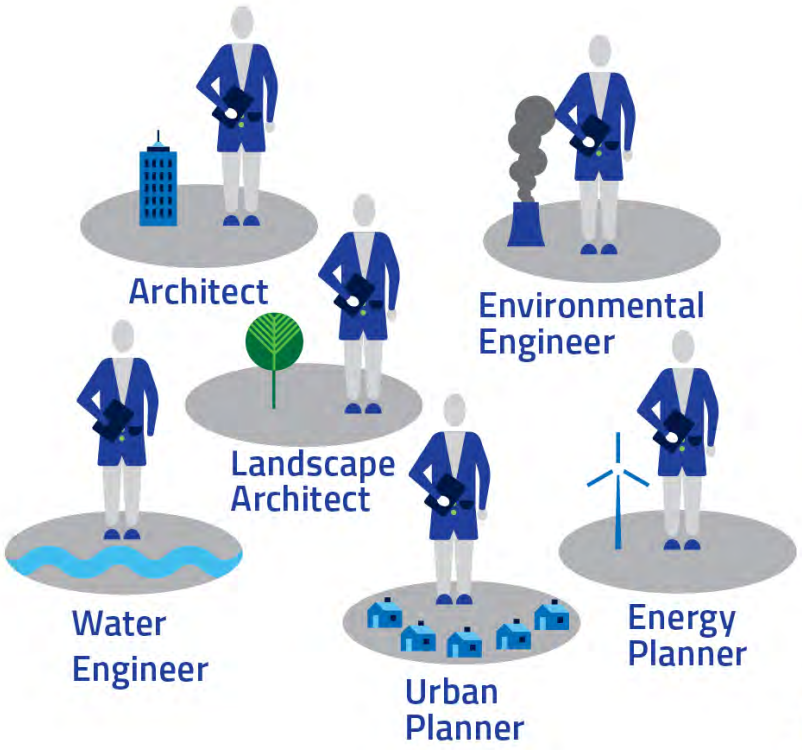
Collaborative planning required for blue-green
蓝绿色措施需要协同规划

experts from many disciplines + local stakeholders
来自许多学科专家和地方利益相关者



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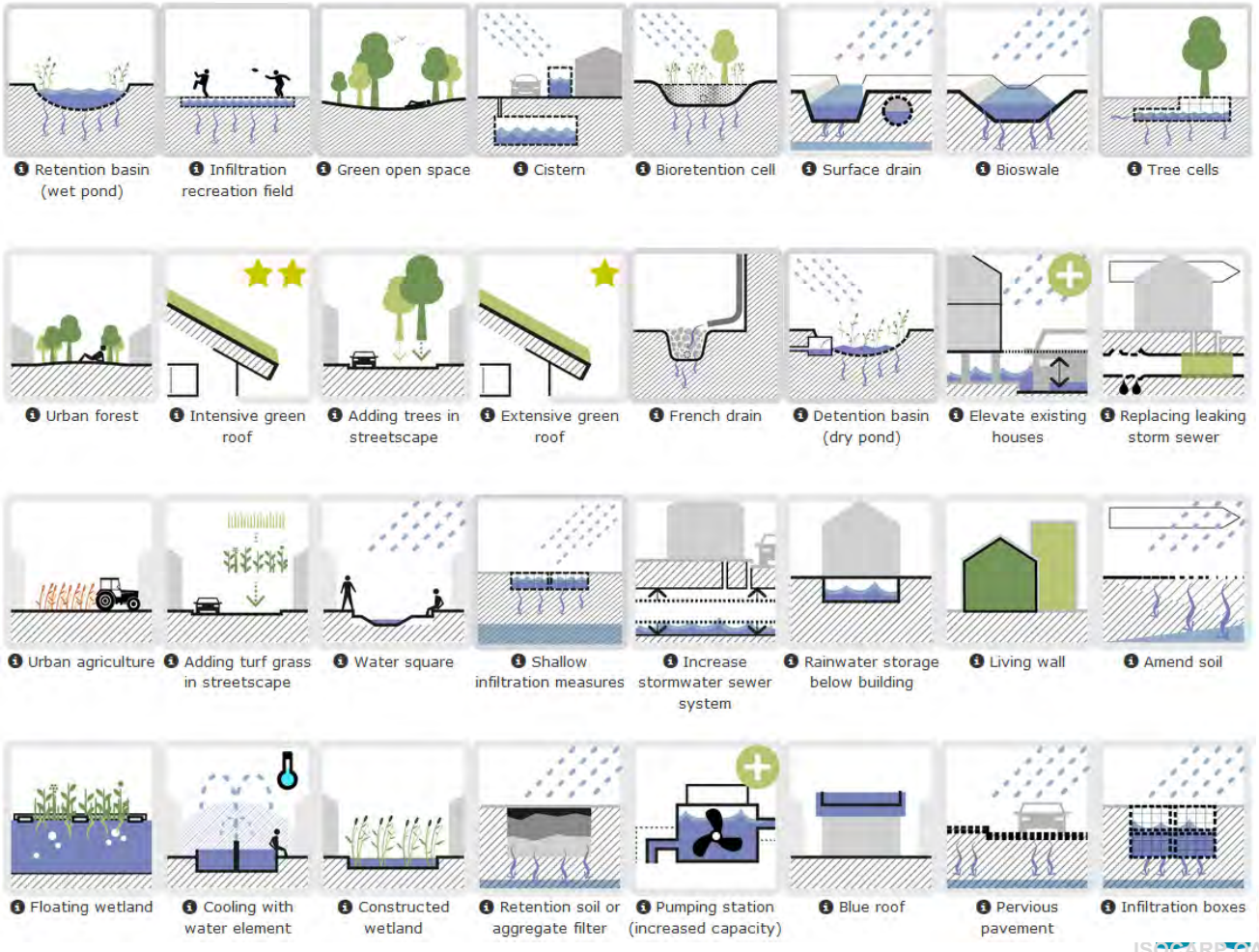
Adaptation Support Tool 适应支持工具

to find out what can be done where & how effective that is

Adaptation Support Tool to see 适应支持工具

- what can be done 可以用来做什么
- where, and how effective that is 应用领域 ， 效果如何



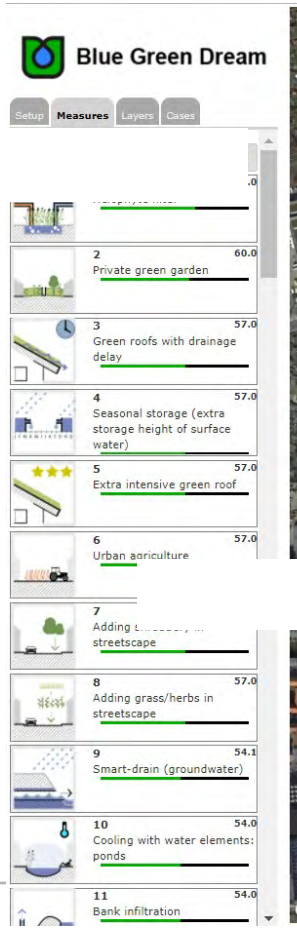
Adaptation Support Tool 适应支持工具

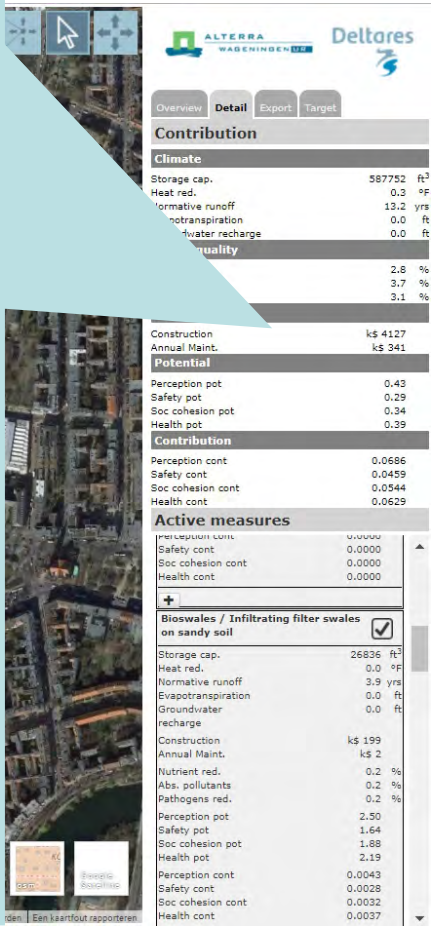
Van de Ven, Frans H.M., Robbert P.H. Snep, Stijn Koole, Reinder Brolsma, Rutger van der Brugge, Joop Spijker, Toine Vergroesen (2016). Adaptation Planning Support Toolbox: Measurable performance information based tools for co-creation of resilient, ecosystem-based urban plans with urban designers, decision-makers and stakeholders, Environmental Science & Policy, http://dx.doi.org/10.1016/j.envsci.2016.06.010

Resilience performance indicators include:

弹性性能指标包括：

- Retention capacity 蓄水能力
- Peak flow reduction 峰值流量减少
- Groundwater recharge 地下水补给
- Cooling effect 降温功效
- Water quality improvement: 水质提高
  - Nutrients营养
  - HMs, PAHs, mineral oil, etc
  - Bacteriological quality细菌质量
- Costs of implementation & maintenance 实施和维护成本
- Perception 感知
- Safety 安全
- Health 健康
- Social cohesion 社会凝聚力

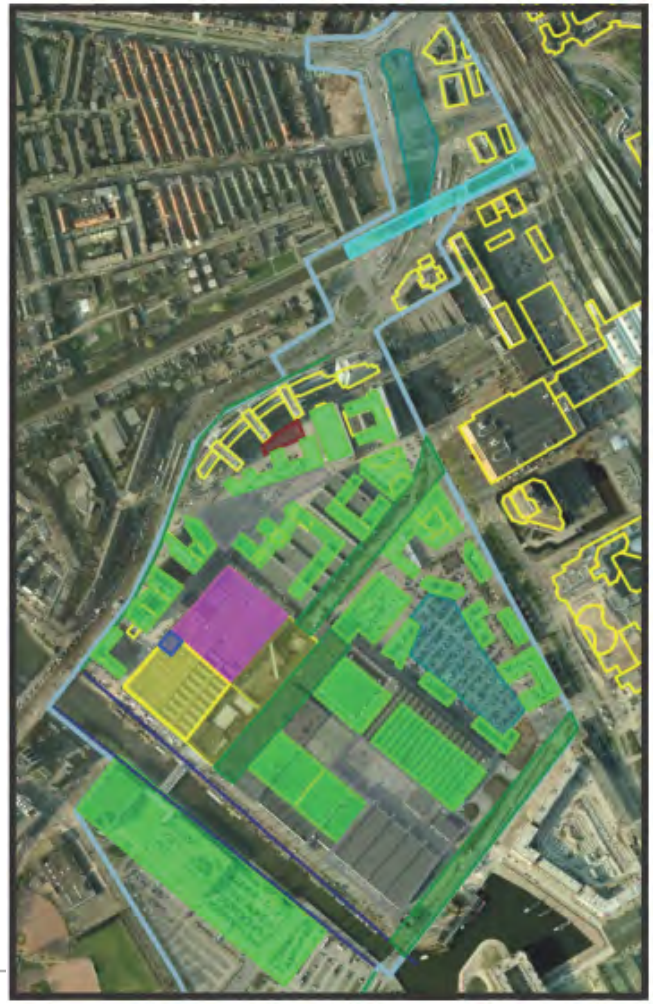


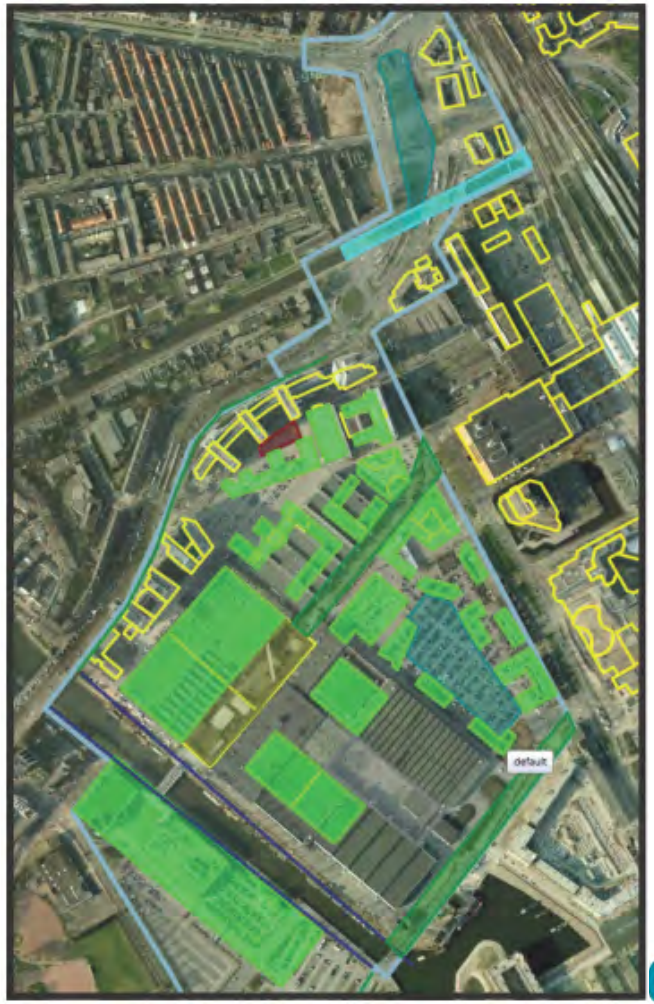


Results of AST workshops: AST研讨会的结果：

Compare performance of alternative plans 比较其他计划

Utrecht - Beurskwartier





Van de Ven, F.H.M., P. Bosch, R.J. Brolsma, J.J. Kok, E.S. van der Meulen, F.E. Schasfoort, C.L. ten Velden, A.J.J. Vergroesen (2016) Green, comfortable, attractive and climate resilient Utrecht Centre-West area : Smart Sustainable Districts – deep dive Utrecht opportunity 3. Deltares/TNO report 1220357, http://publications.deltares.nl/1220357_000.pdf

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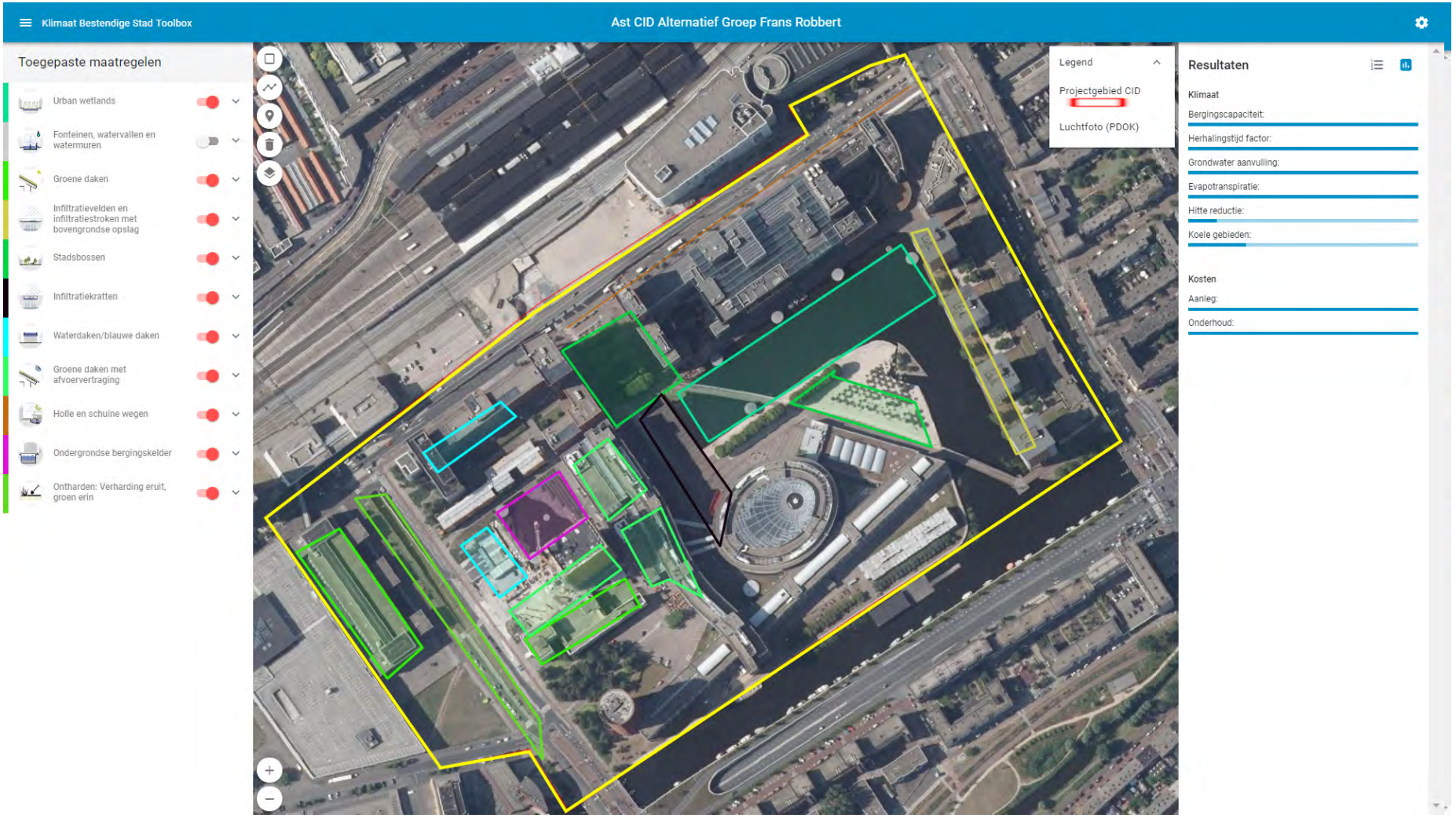
Adaptation Support Tool 2.0　适应支持工具2.0

Toolbox Climate Resilient City www.crctool.org



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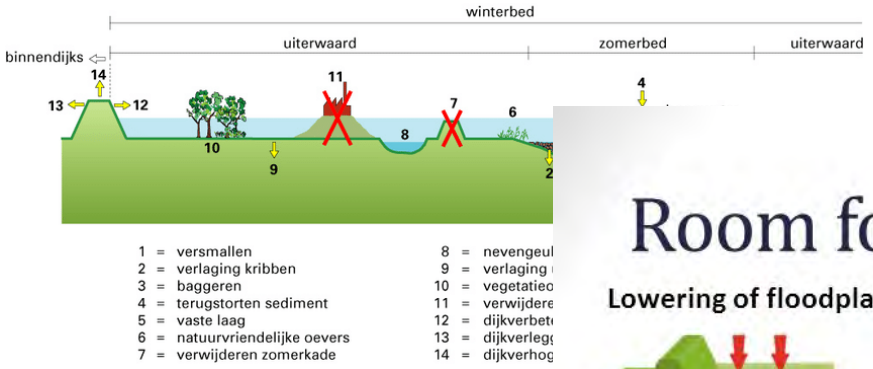
Creating urban resilience together 共同创造城市韧性

The New Orleans - Adaptation Support Tool 新奥尔良 - 适应支持工具

Room for the River 河流扩容



1 = versmallen
2 = verlaging kribben
3 = baggeren
4 = terugstorten sediment
5 = vaste laag
6 = natuurvriendelijke oevers
7 = verwijderen zomerkade
8 = nevengeul
9 = verlaging
10 = vegetatieo
11 = verwijdere
12 = dijkverbet
13 = dijkverleg
14 = dijkverhog

Room for the River (The Netherlands)

Lowering of floodplains

Deepening summer bed

Water storage

Dike relocation

Lowering groynes

High-water channel

Depoldering

Removing obstacles

Strengthening dikes

Only in areas in which creating more room for the river is not an option.

video

SOURCES: Room for the River Project

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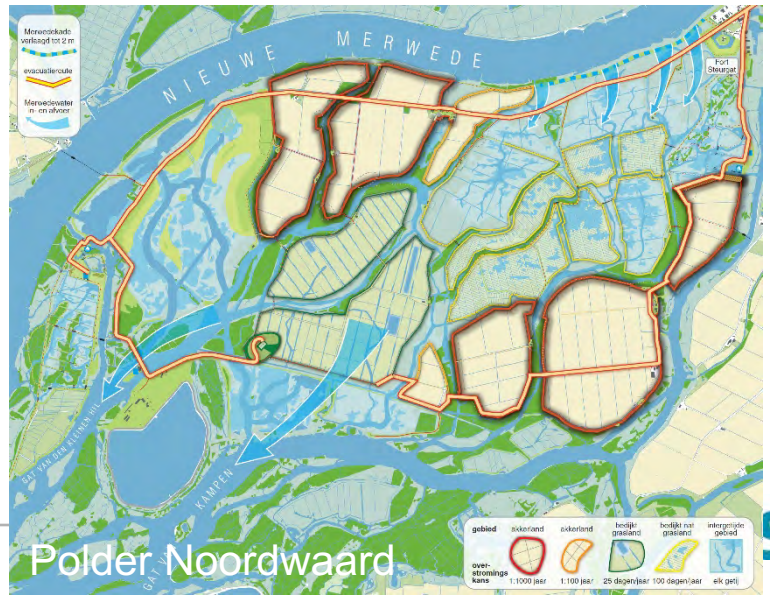
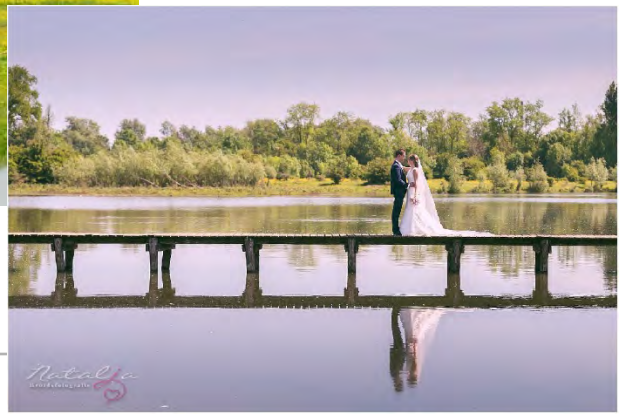
Room for the River projects 河流扩容项目



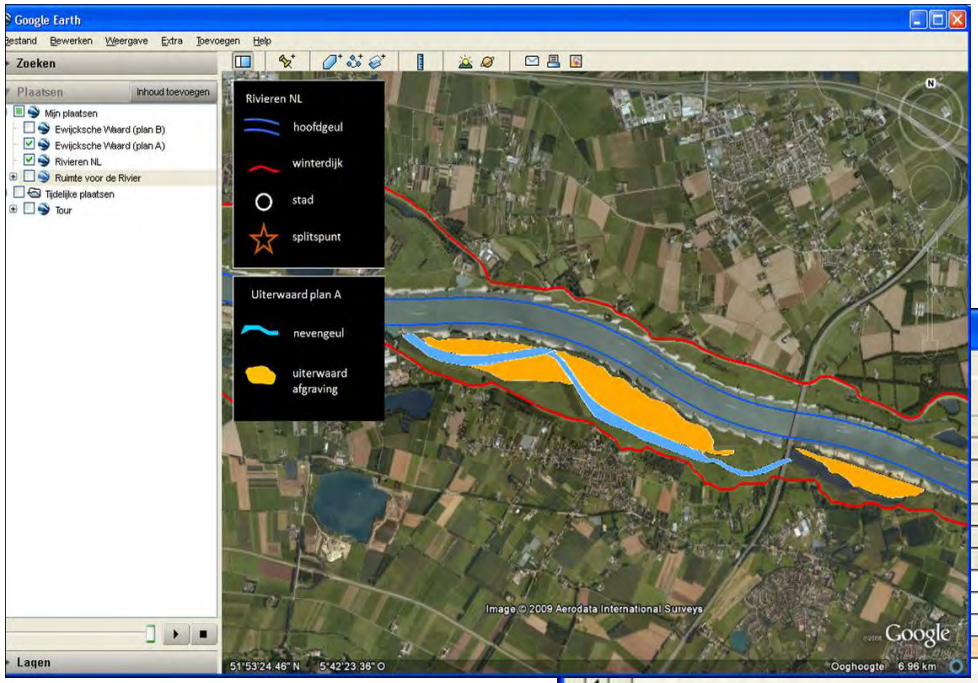
Room for the River projects 河流项目空间

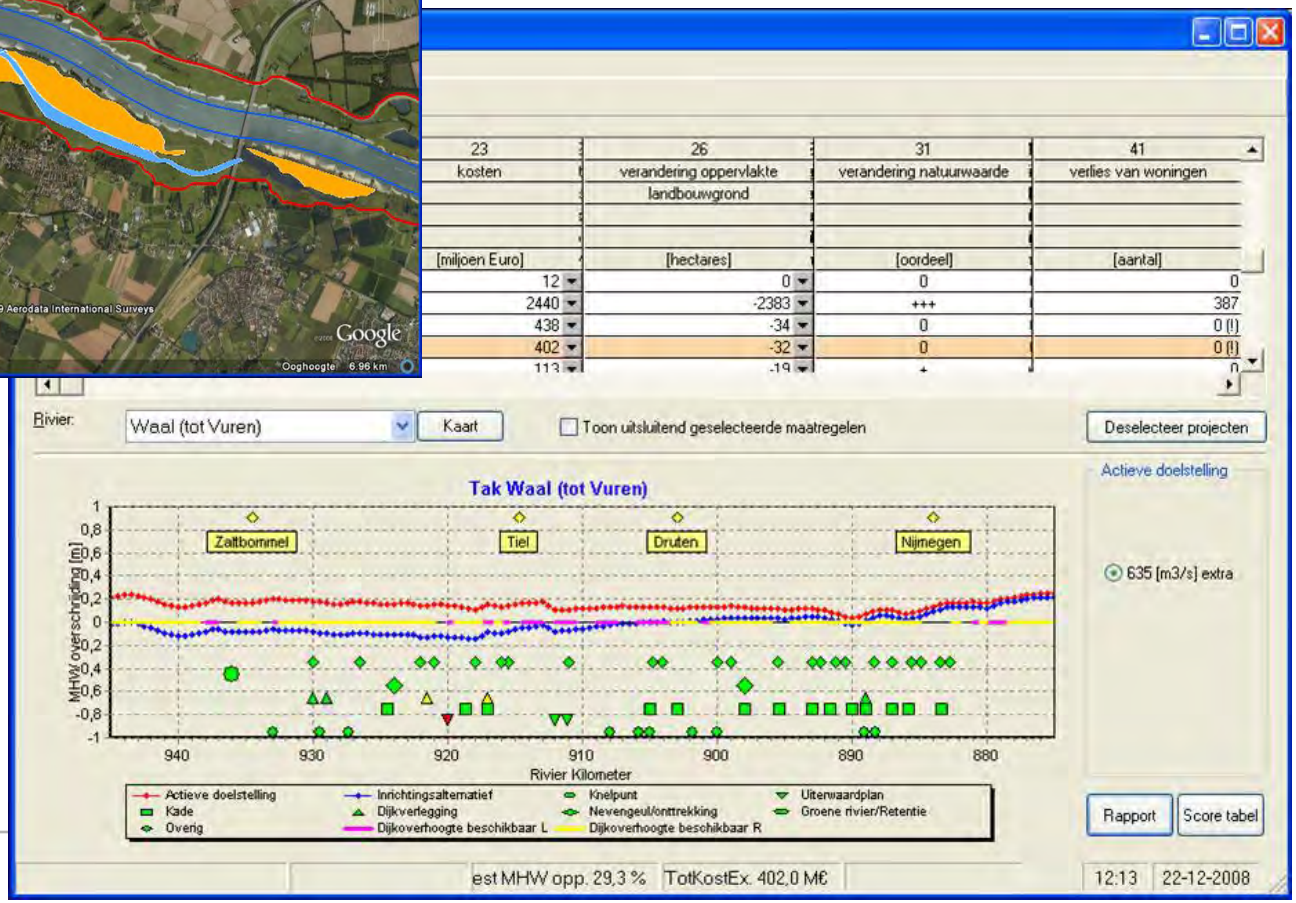
Bommelerwaard/ Loevestein

Blauwe Kamer Rhenen

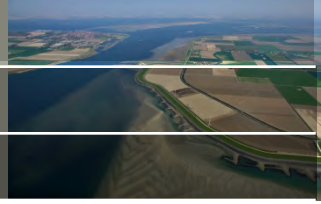


Toolbox Room for the River 河流扩容工具箱





Conclusion 总结



- On site retention is key to avoid local and downstream flooding
  源头蓄水是避免局部和下游洪水的关键
- This storage requires space　储水需要空间
- This space can be used multi-functional and provide services
  这个空间可以多功能使用并提供服务
- These functions and services bring many more benefits, economic, social and emotional, in addition to retention
  除了储水之外，这些功能和服务还带来更多的经济、社会和情感方面的好处
- Blue-green, ecosystem based adaptation measures provide all this
  基于生态系统的蓝-绿适应措施提供了全部这些
- Selection of measures is a multi-disciplinary spatial planning problem
  选择措施是一个多学科的空间规划问题
- Planning support toolboxes help planning and decision making
  规划支持工具箱有助于规划和决策

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Closing 结束

Thank you for your attention! 谢谢您的聆听!

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