



Optimizing the climate adaptation process

Interactive and instant assessment of impacts of extreme events and of suitable adaptive measures

! MP4 hyperlinks do not work. Same movies are accessible through the internet hyperlinks

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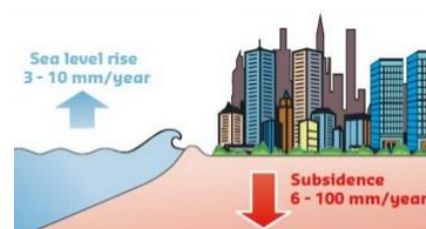
www.deltares.com

Focus of **Resilient Cities** program on:

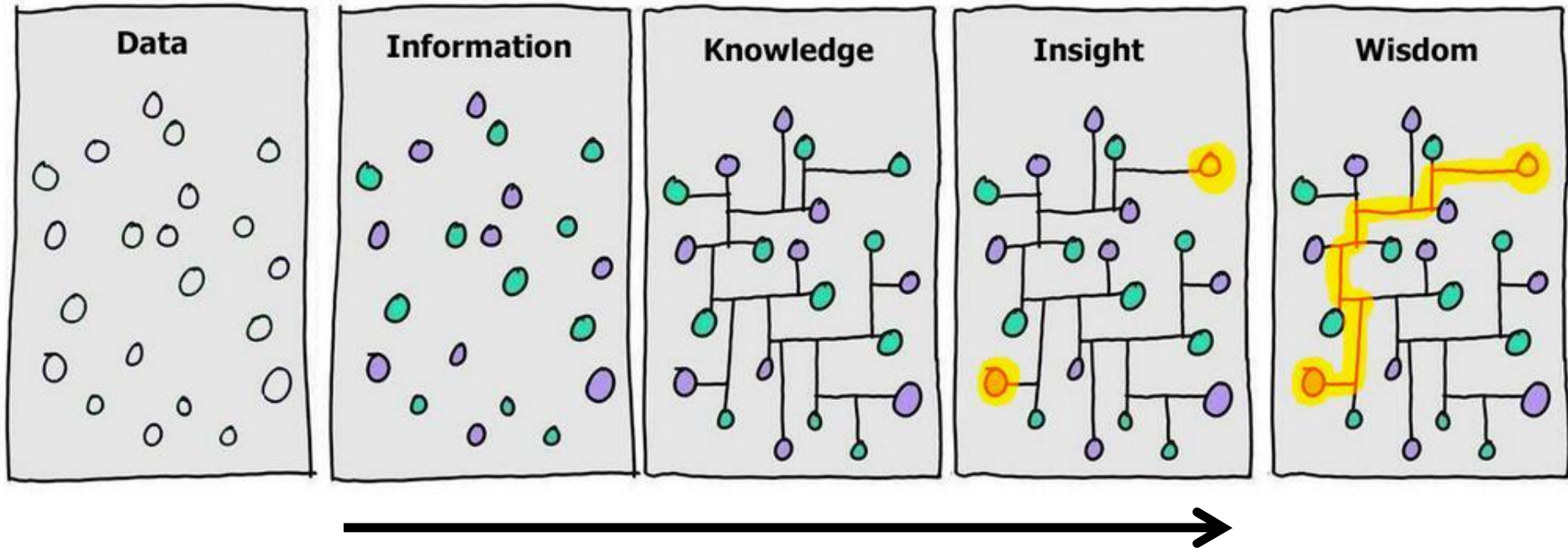
- Gaining **full understanding** of the **physical urban system**, to...
- make cities **safe, healthy, productive & sustainable**

Three lines of research:

- 1) **Integral modeling** of the physical urban **system**
- 2) **Water and subsurface sensitive** urban **planning & design**
- 3) **Subsidence** forecast and solutions



'Integral modelling & design toolkit': connecting information & people



Provide open access tools through portals to stimulate use



Kennisportaal
Ruimtelijke Adaptatie

[GUIDE](#)

[TOOLS](#)

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[INCENTIVE PROGRAMME](#)

[NAS 2016](#)

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Tools

How to proceed with spatial adaptation? Here you can find a selection of tools allowing you to start your spatial adaptation journey. The Climate Adaptation Atlas contains maps visualizing an overview of floods, waterlogging, drought and heat, in accordance with the KNMI scenarios where relevant. Guiding models give guiding principles for spatial adaptation for 11 types of landuse. Urban Green-Blue grids is a website providing a large amount of visualized measures and examples that contribute to a water resilient and climate proof city. The Climate Adaptation App likewise provides inspiring and sometimes surprising adaptation measures. A useful selection tool helps to provide suitable measures for your specific situation. The MLV quickscan assists to determine where and which multilevel safety measures are promising and relevant for an area. The guide to aligning adaptation is a website providing tips, recommendations and examples to link adaptation to other investments being fulfilled in a city. Other tools are available beside this selection. These tools can be found in the [tools overview](#).



STRESS TEST GUIDE

Determine climate change resilience

[Go to tool >](#)



CLIMATE ADAPTATION ATLAS

Visualising the effects of climate change and water

[Go to tool >](#)



MLV EXPLORER

Quickscan tool for flood risk assessment

[Go to tool >](#)



GREEN-BLUE GRIDS

Inspiring measures and examples

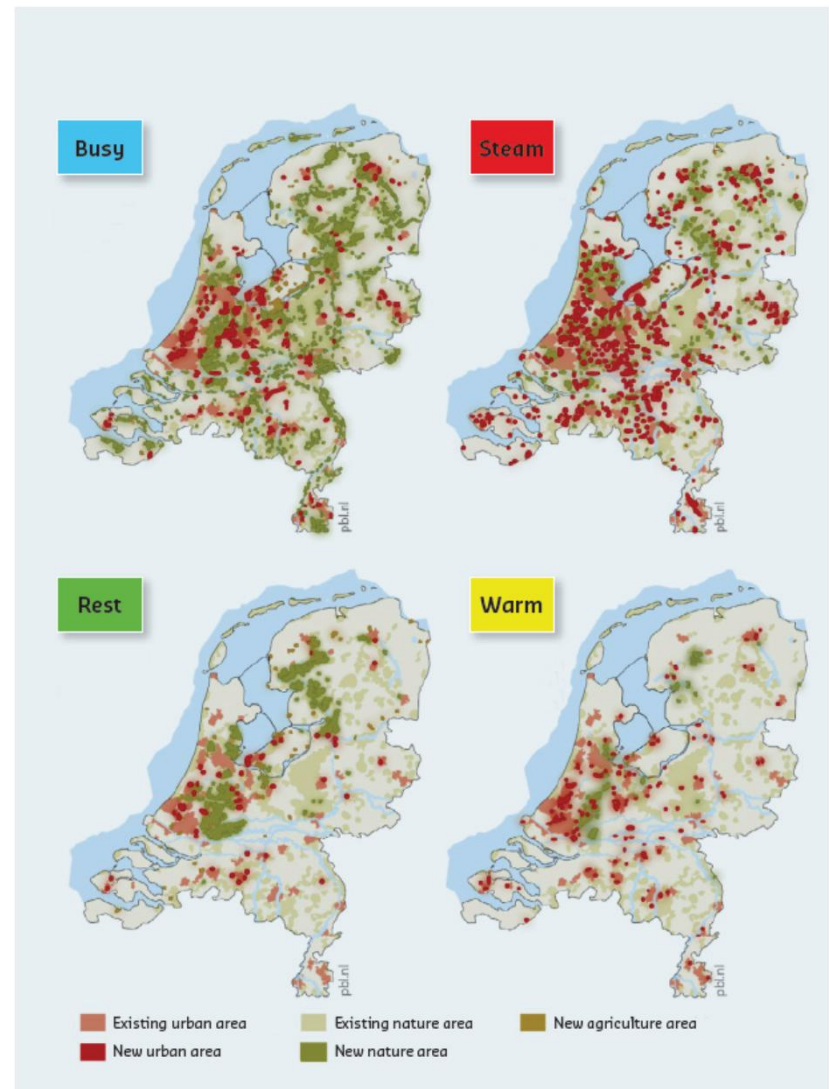
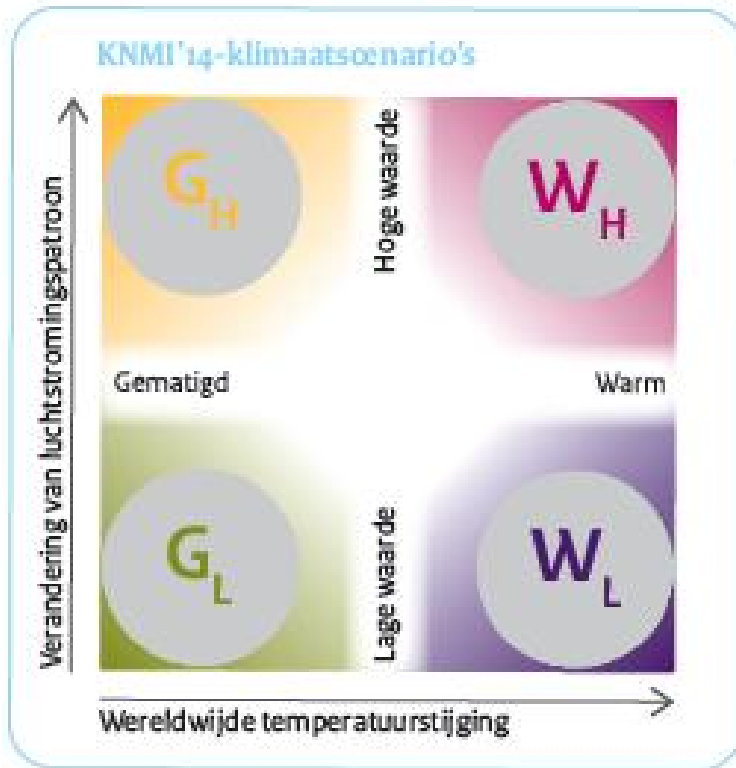
[Go to tool >](#)

<http://www.spatialadaptation.com/hulpmiddelen>

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National climate scenario's, combined with socio economic change

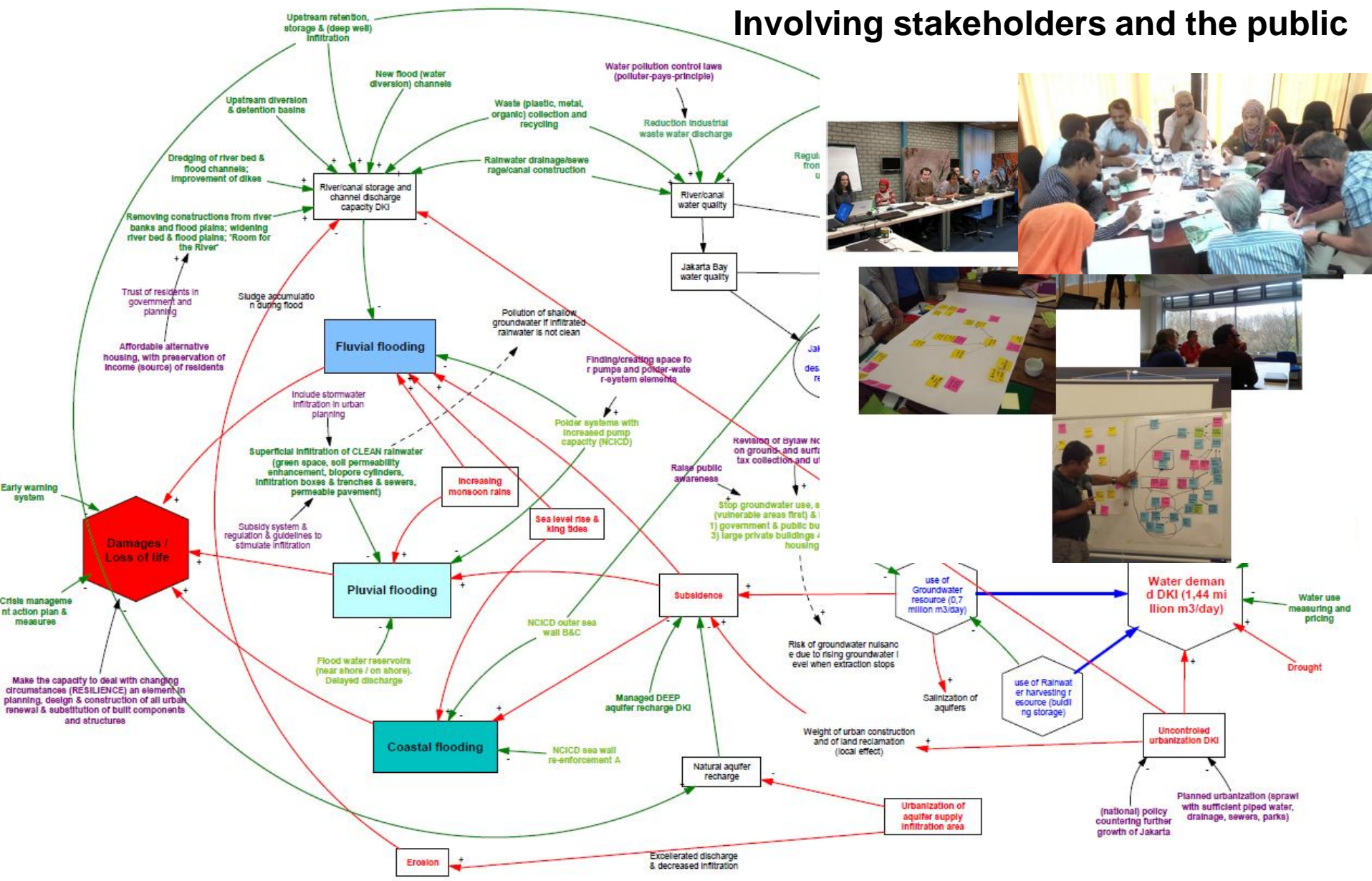
'Bridging the gap'



<http://www.klimaatscenario's.nl/kerncijfers/>

Group Model Building: creating a common understanding of a problem

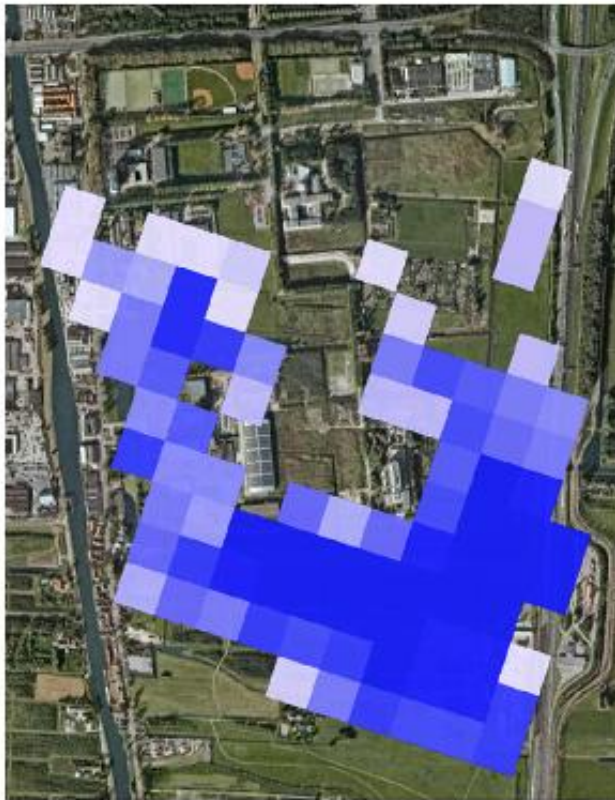
Involving stakeholders and the public



Fast progress in high resolution models and visualization

- More (open source) data against lower costs
- Cheap and fast computing
- Advancements in fast modeling algorithms

Seems
like
yesterday



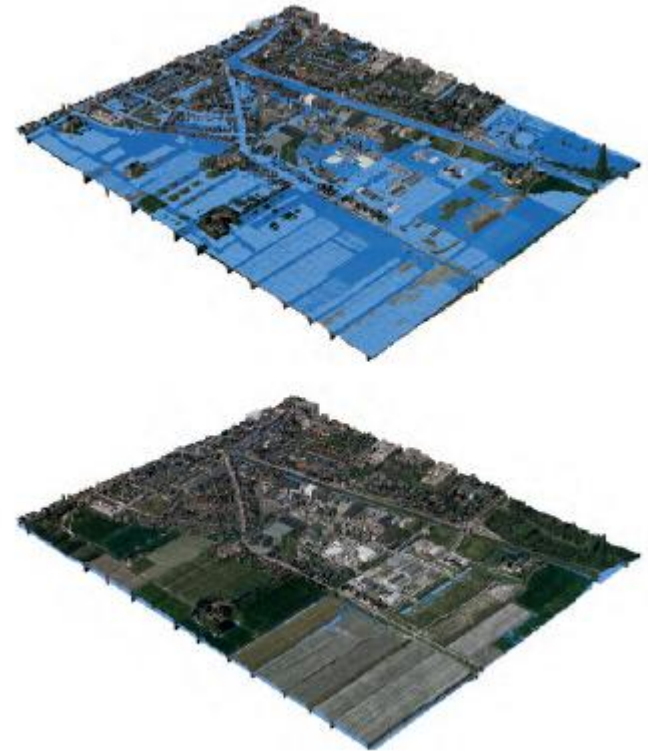
Overstromingssimulatie, bestaand model



Nauwkeurigere simulatie met 3Di

Today

Use of flood visualization in spatial planning and communication

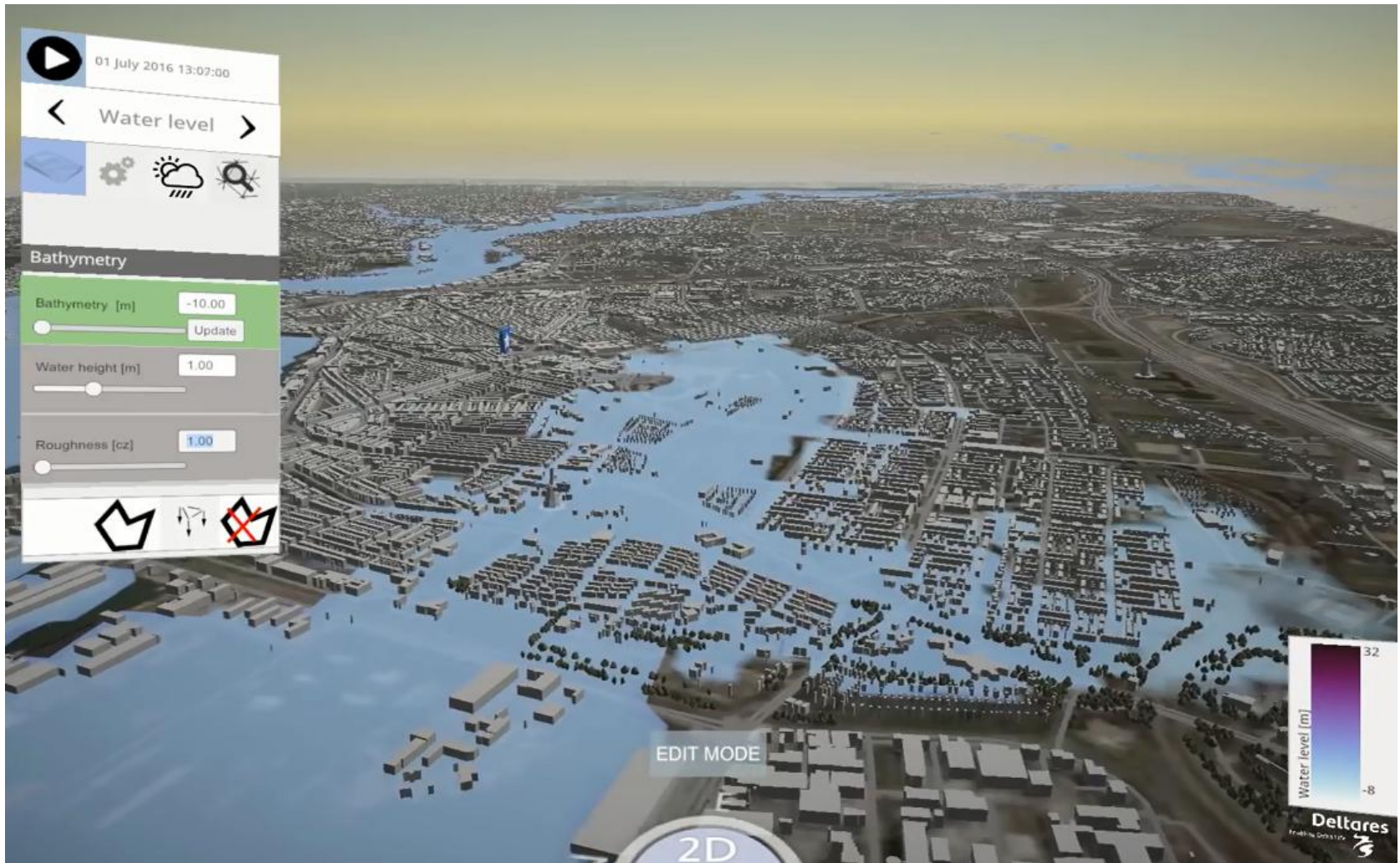


e.g. for spatial planning of areas that are allowed to flood in extreme conditions or to pinpoint investments in measures

[3Di Watergraafsmeer overstrooming.mp4](#)

<http://www.3di.nu/en/international/>

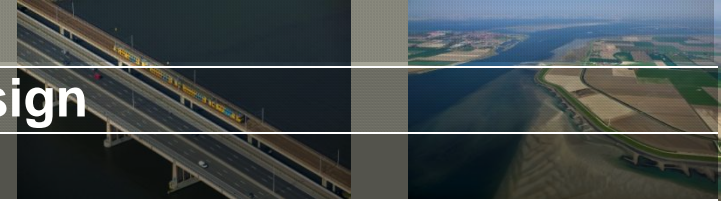
Interactive flood modelling and instant visualization



[Rotterdam-levee-intentionally-breached---3D-interactive-modelling-using-Delft3D-FM-Part-2.mp4](https://www.youtube.com/watch?v=CYf0bdoFIDw)

<https://www.youtube.com/watch?v=CYf0bdoFIDw>

Latest : interactive sand box for coastal design



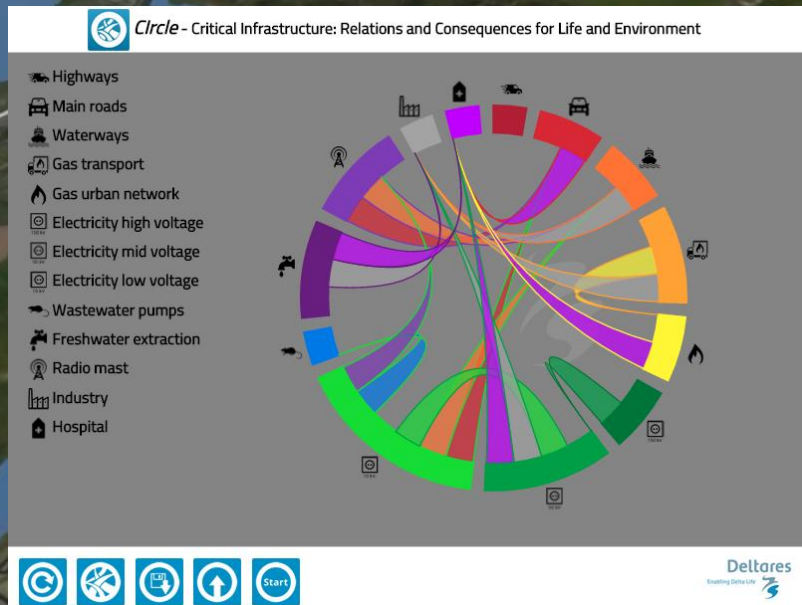
New interactive design tool for the direct visualization of coastal interventions

Urban application is in the making...

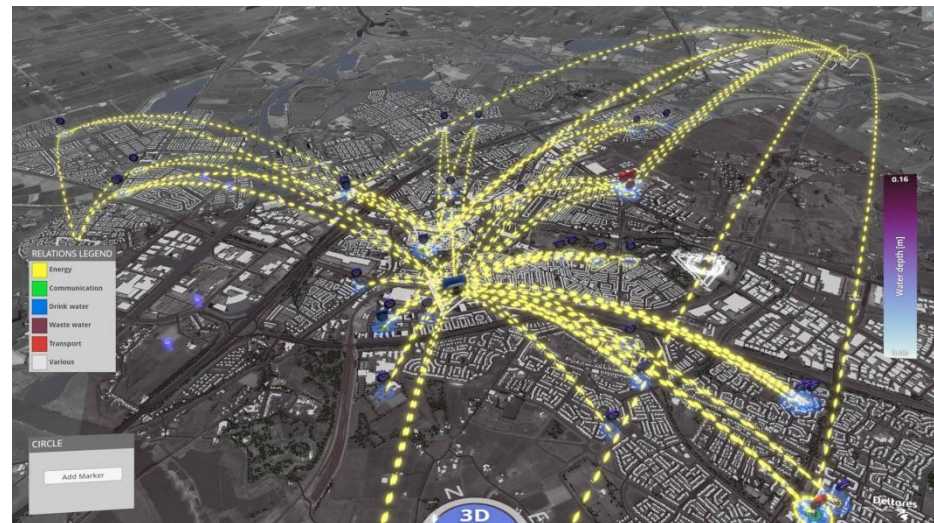
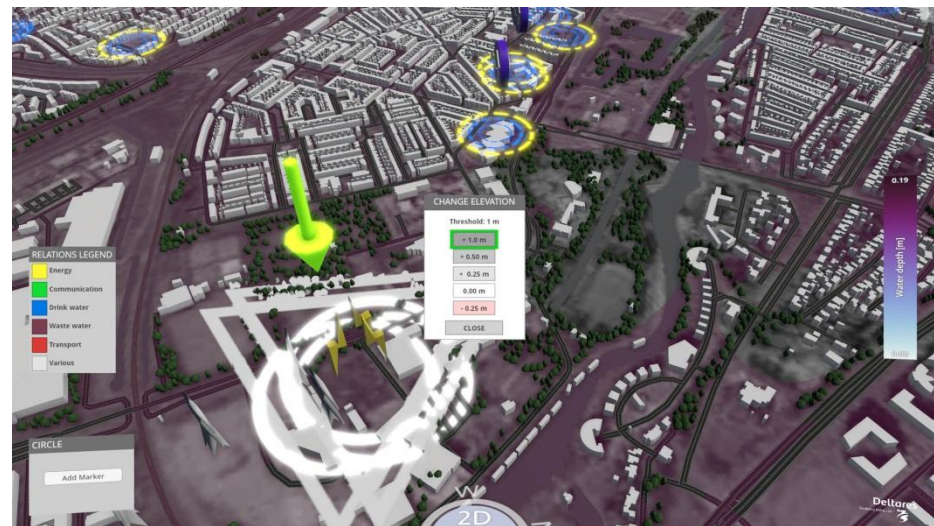


<https://www.deltares.nl/en/news/interactive-sandbox-new-interactive-design-tool-for-the-direct-visualisation-of-coastal-interventions/>

Identifying cascading system failures of vital infrastructure



2017: interactive adjustment of object vulnerability

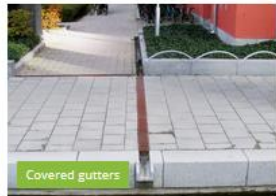


[Circle demo 2017.mp4](#)

<https://www.youtube.com/watch?v=R204VdO216U>

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Lots of solutions, and free internet tools to help you chose



ADAPTATION SOLUTIONS

FILTER

Project type

Scale

Adaptation target

Land use

Dominant soil type

Surface level and slope

Flat area on low ground

84 Adaptation solutions

Reset

CLIMATE INFORMATION

ABOUT

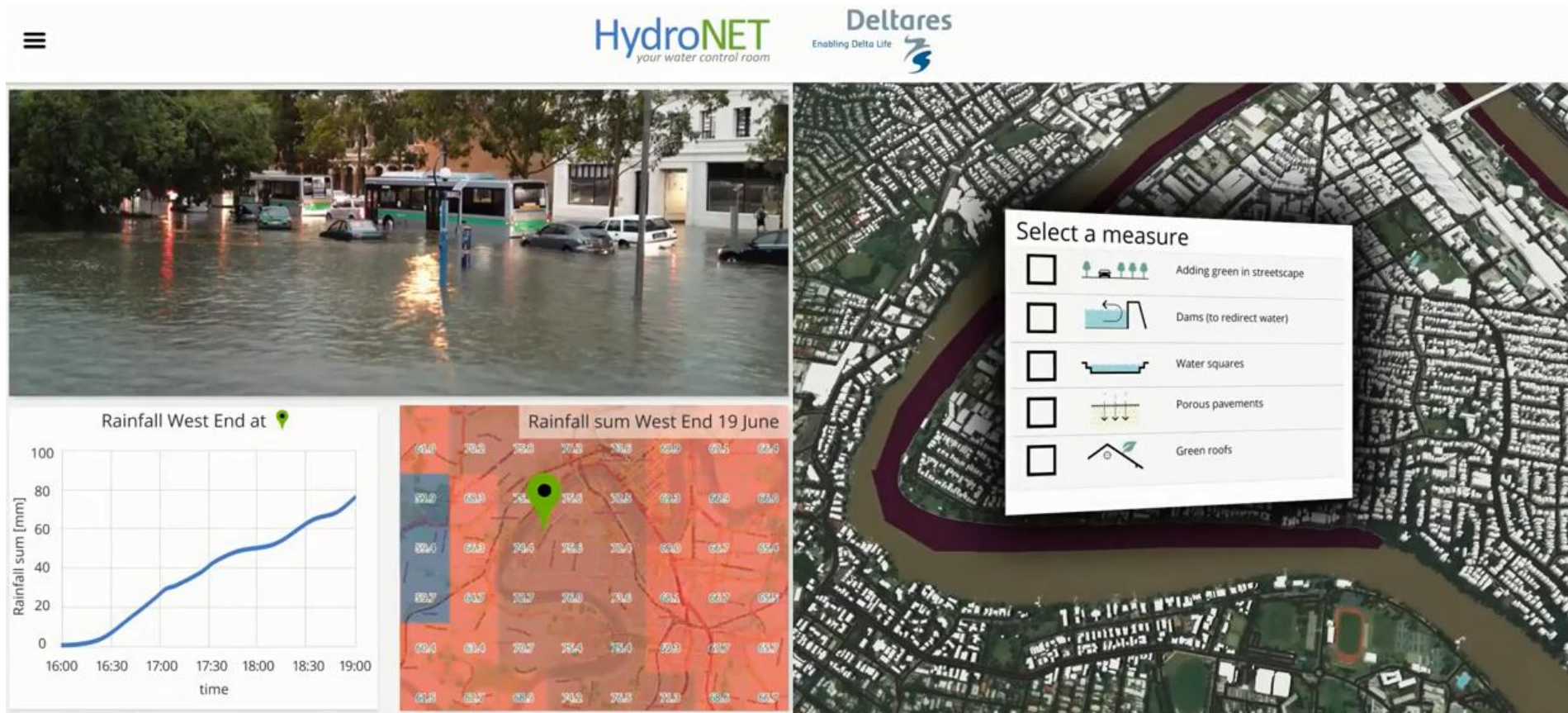
ADAPTATION SOLUTIONS		
Storage/settling tank and storage basins	Increased pump capacity	Increase capacity of sewer system
Water squares	Reduced paved surfaces	Emergency supplies and utilities
Network of waterways	Canal	Raising land
Raising the groundfloor level	Raised curbs/ hollow roads	Reconstruct combined sewer systems to separated sewer systems
Infiltration and Transport-sewer	Use of groundcover and shrubbery (instead of unplanted surface)	Rainwater storage below buildings

www.climateapp.org

www.urbangreenbluegrids.com/design-tool/

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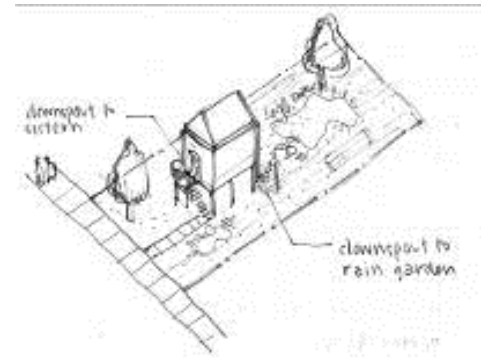
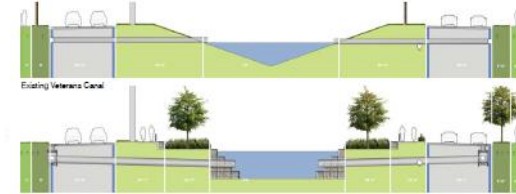
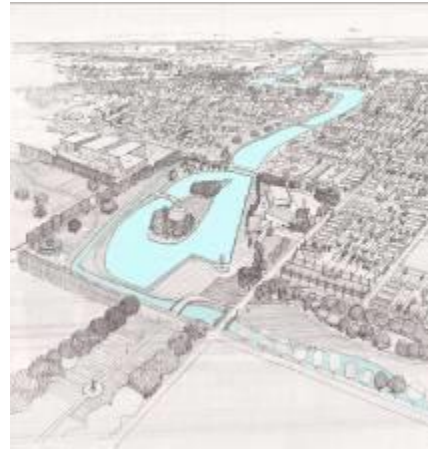
Interactive modelling and visualization of effects of measures



[Smart-Scanner-for-Water-Resilient-Cities---Demo.mp4](#)

<https://www.youtube.com/watch?v=kBCeQH4awmw>

The best way to go: join forces with designers !!!



www.livingwithwater.com

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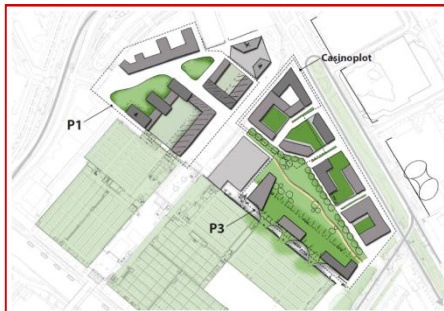
Adaptation Support Tool = design + planning + quantitative model



Jaarbeursplein



Oranjeplein



Trial allotment

Utrecht city center



Croeselaan



Catherijnesingel



Moreelsebrug



[AST ScreenCapture_08-Mar-16 15.09.51.wmv](#)

<https://www.youtube.com/watch?v=3tU68OXZWgA>

Compare planning and design variants, with Performance Indicators



Green development

Storage capacity:
15,600m³

<input type="checkbox"/>		Project Area
<input type="checkbox"/>		Green roofs with drainage
<input type="checkbox"/>		Green shores and riverbanks
<input type="checkbox"/>		Park or urban forest
<input type="checkbox"/>		Increase area of surface water
<input type="checkbox"/>		Adding trees in streetscape
<input type="checkbox"/>		Extra intensive green roof
<input type="checkbox"/>		Water squares
<input type="checkbox"/>		Porous pavement



High urban density

Storage capacity:
12,194m³

<input type="checkbox"/>		Project Area
<input type="checkbox"/>		Green roofs with drainage
<input type="checkbox"/>		Green shores and riverbanks
<input type="checkbox"/>		Park or urban forest
<input type="checkbox"/>		Increase area of surface water
<input type="checkbox"/>		Adding trees in streetscape
<input type="checkbox"/>		Extra intensive green roof
<input type="checkbox"/>		Water squares
<input type="checkbox"/>		Rainwater tank
<input type="checkbox"/>		Porous pavement

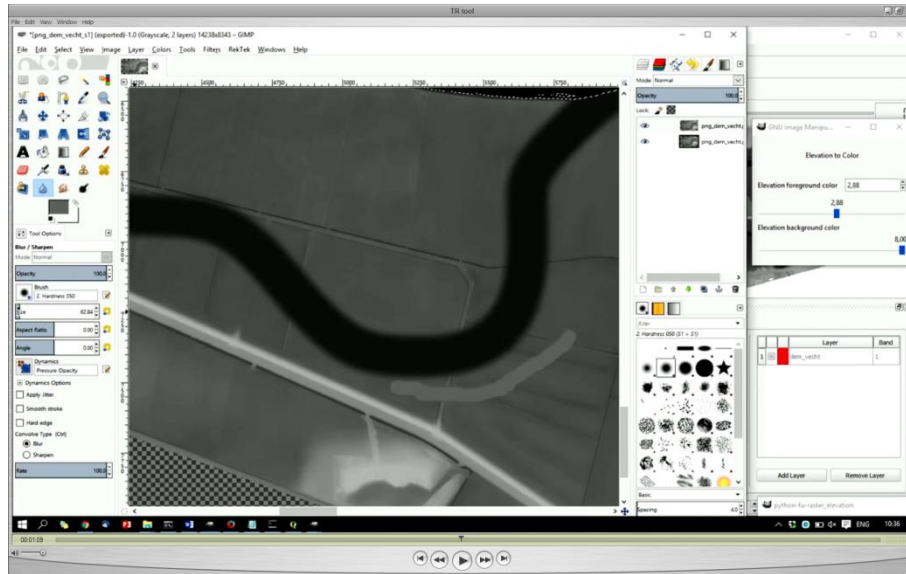


Maximizing benefits

Storage capacity:
19,528m³

<input type="checkbox"/>		Project Area
<input type="checkbox"/>		Green roofs with drainage
<input type="checkbox"/>		Green shores and riverbanks
<input type="checkbox"/>		Park or urban forest
<input type="checkbox"/>		Increase area of surface water
<input type="checkbox"/>		Adding trees in streetscape
<input type="checkbox"/>		Extra intensive green roof
<input type="checkbox"/>		Water squares
<input type="checkbox"/>		Porous pavement
<input type="checkbox"/>		Urban agriculture
<input type="checkbox"/>		Extensive green roof
<input type="checkbox"/>		Rainwater tank

→ newest: direct impact assessment of freehand design



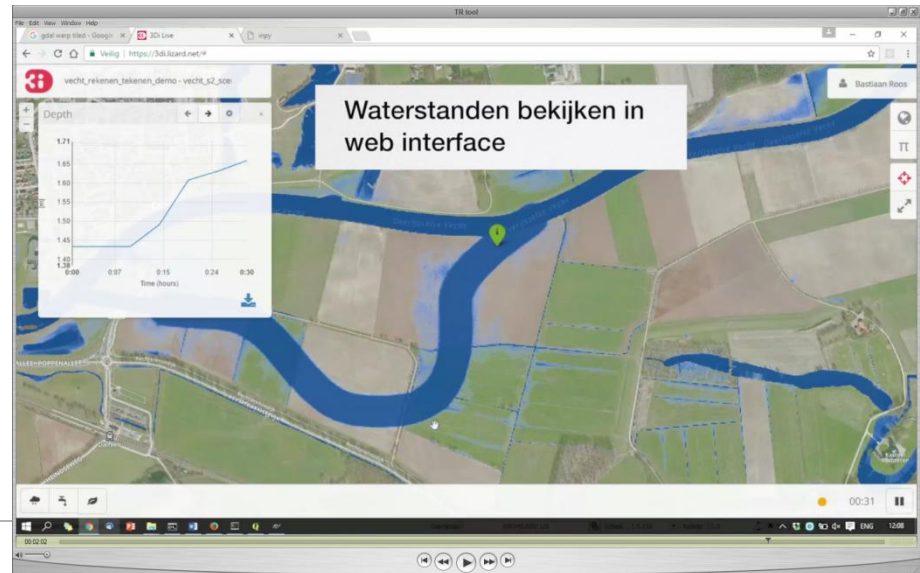
Urban version in the making...

[TR tool.mp4](#)

<https://vimeo.com/203346171>

<https://vimeo.com/202042996>

http://tekenenenrekenen.nu/?page_id=912



Impact of decisions and strategy evaluation: Serious Gaming



Serious gaming: Sustainable delta game

Develop a strategic policy plan for a delta city, for the next 100 years in the context of uncertain and changing conditions



- Mitigate flooding risks
- Preserve nature
- Contribute to economic development
- Pay attention to community attitudes
- Acknowledge uncertainties
- React to sudden developments



[Sustainable_Delta_game\[YoutubeDownload.nl\].mp4](https://www.youtube.com/watch?v=3RvPvNQG-N0)

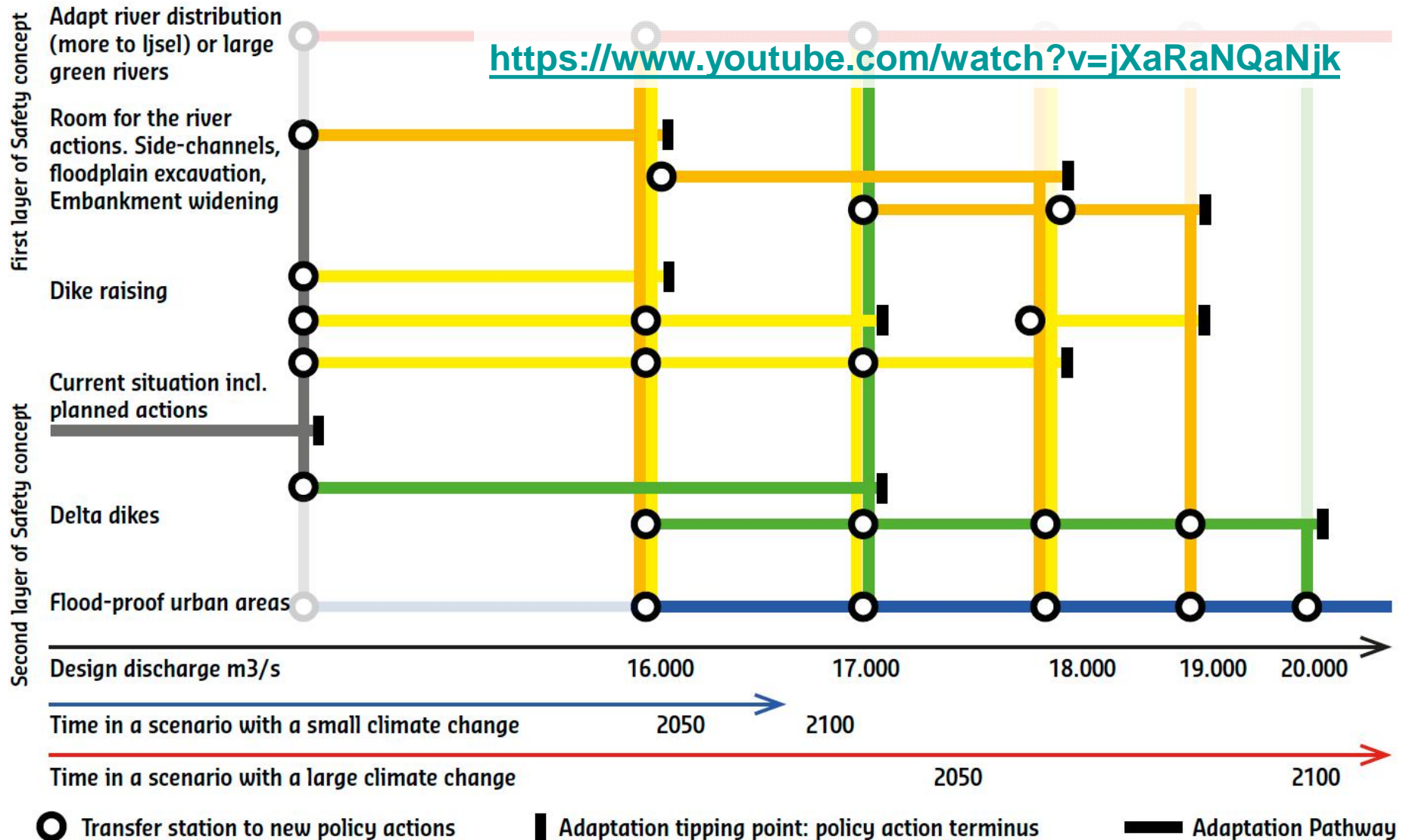
<https://www.youtube.com/watch?v=3RvPvNQG-N0>

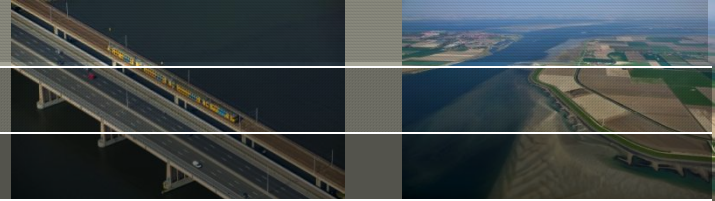
<https://publicwiki.deltares.nl/display/AP/Sustainable+Delta+Game>

Decision making under deep uncertainty → Create Adaptation Pathways

<https://www.deltares.nl/en/adaptive-pathways/>

<https://www.youtube.com/watch?v=jXaRaNQaNjk>





Thank you for your attention