

The Future of Flood Modelling

Fons Nelen - Director Nelen & Schuurmans

Utrecht Region , The Netherlands

欢迎



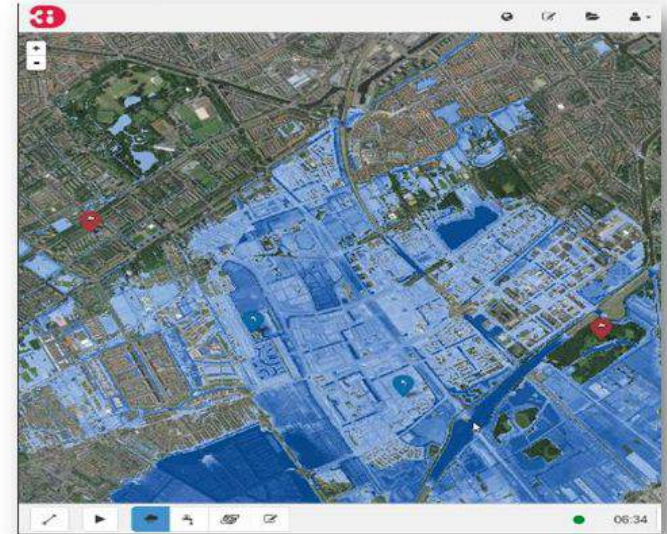
智慧水利資訊管理
3Di Water Management

Future of Flood Modelling

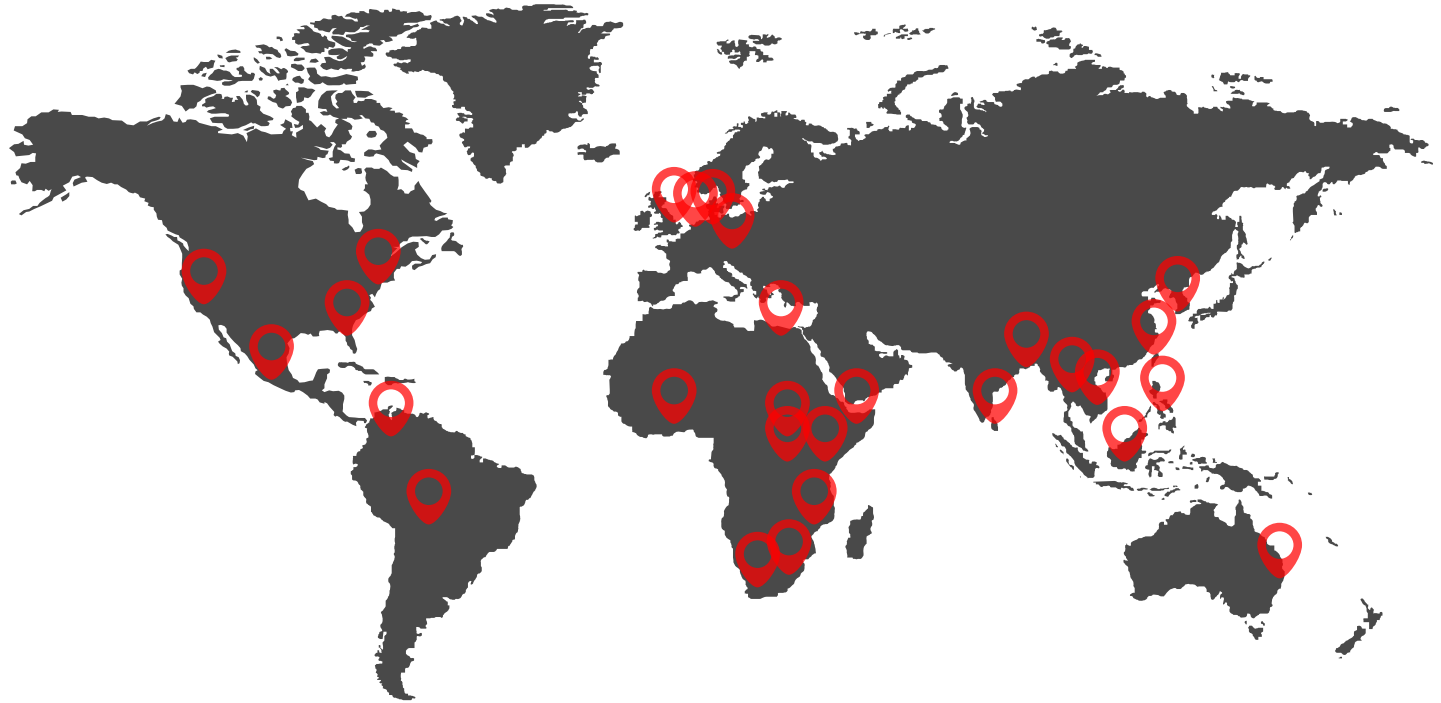


Mission

Contribute to a healthy, safe and resilient living environment by making the best information on the water system available.



Where we operate



Customers & Partners



About 3Di

New Computational Core

- Em. Prof. Dr. Ir. Guus Stelling
- Fast & accurate using subgrid
- Integral OD, 1D & 2D
- Interactive

Communication Tool

- Fosters collaboration
- Visual output
- Cloud-based
- Information portal

Lasting Value

- 'Stresstesting' Regions
- Resilient Spatial Planning
- Flood Early Warning
- Operational Water Management



Newest techniques

- Faster calculations:
 - Subgrid and quadtree computation cells
 - Mass conservative calculations
 - Converging Newton iteration matrix solving

- Use detail data for accurate results
 - e.g. LiDAR height data

- Integration of:
 - Rain radar
 - Urban drainage system
 - River flow and sea level

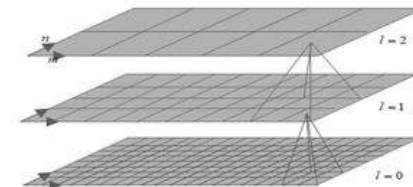
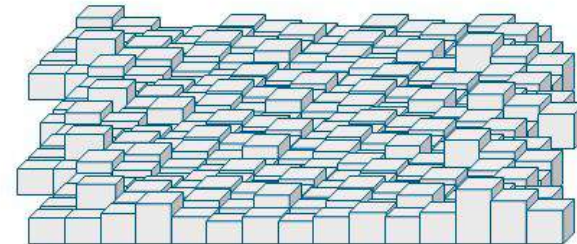


Quadtrees flood simulations with sub-grid digital elevation models



Gert S. Stalling
Professor, Faculty of Civil Engineering and Geosciences, Delft University of Technology, Delft, the Netherlands, Vrijling Professor, Faculty of Engineering, National University of Singapore, Singapore

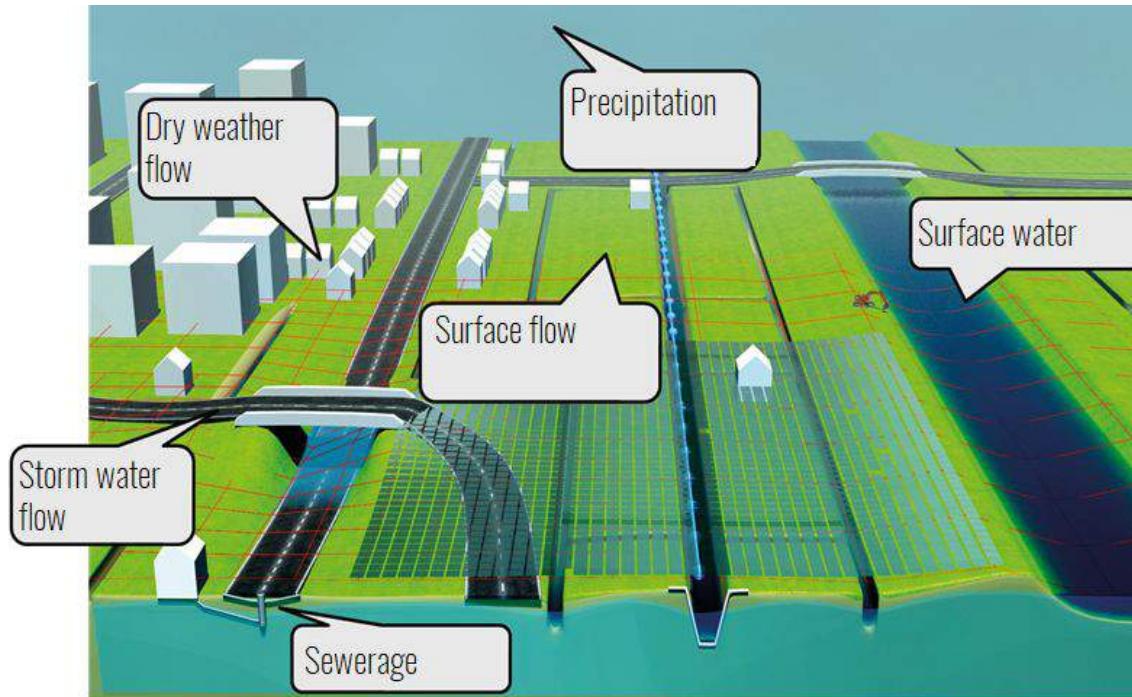
Flooding is an increasing hazard to society and good governance now implies careful water management in terms of design, planning and control of urban and rural areas. This requires that rainstorms, extreme water levels and so on are taken into account with relevant precision. A great aid in the existence of geospatial information systems with vector-based digital elevation models (DEMs). Modern technology such as LiDAR means that DEMs are of ever-increasing resolution. This paper describes how, without adaptations, a DEM can be used efficiently for detailed 2D



Data to Model



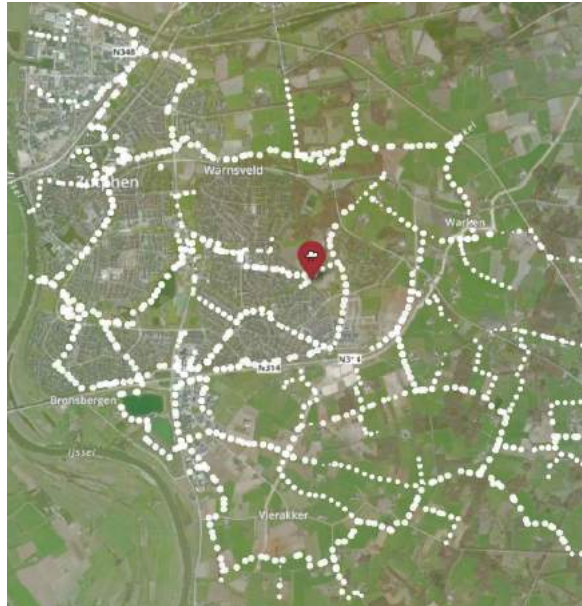
Integral Modelling



Types of 3Di Models



Integral Model

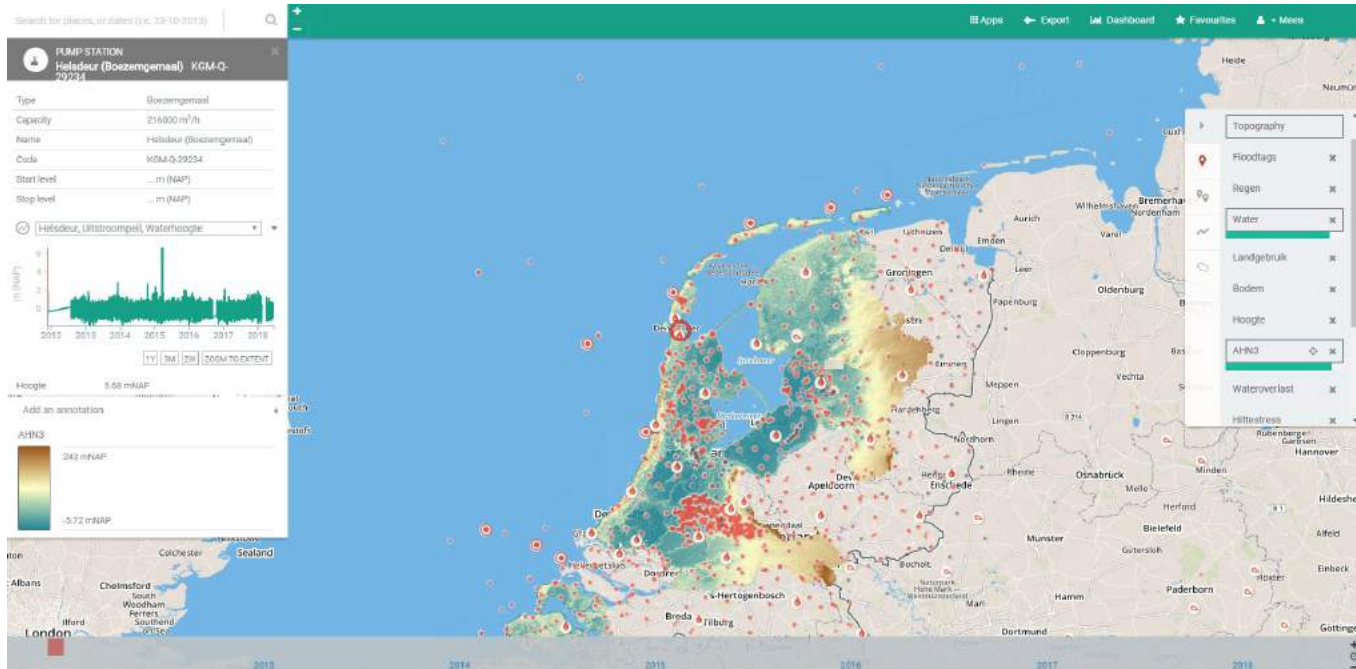


Surface Water Model



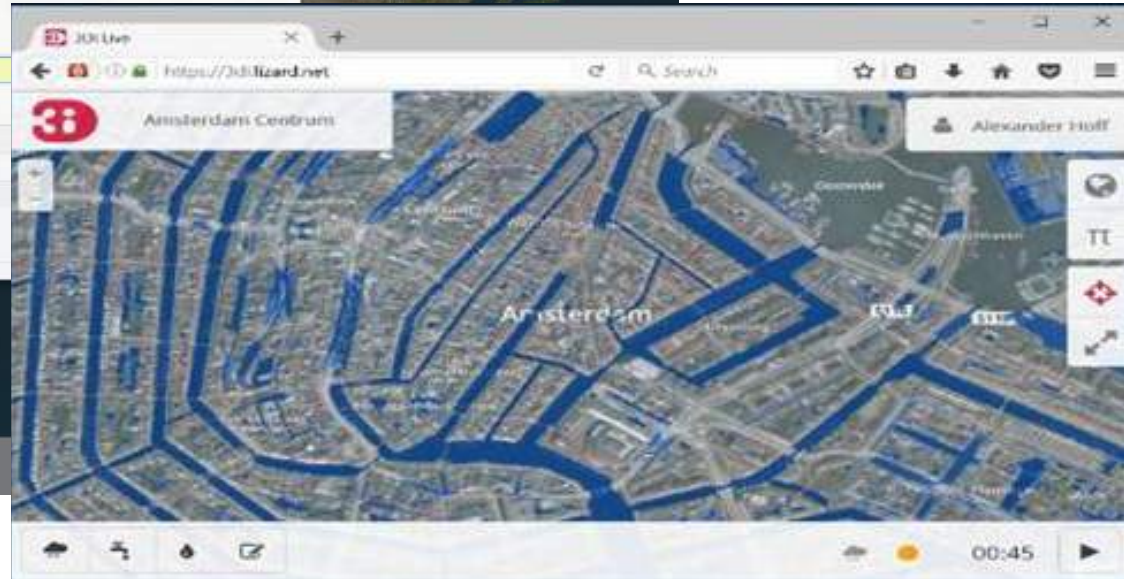
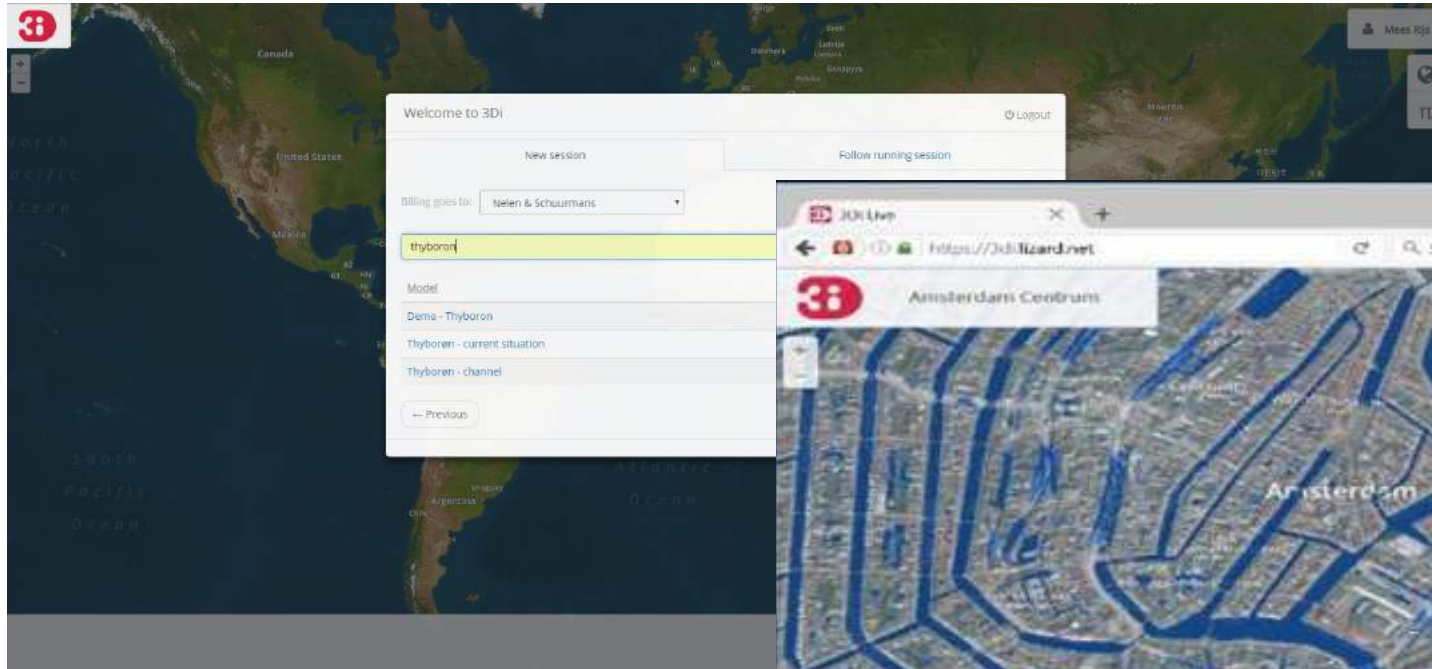
Calamity Management

Store, Share & View Results





Demo Live Site





Use-Cases

Climate Adaptation

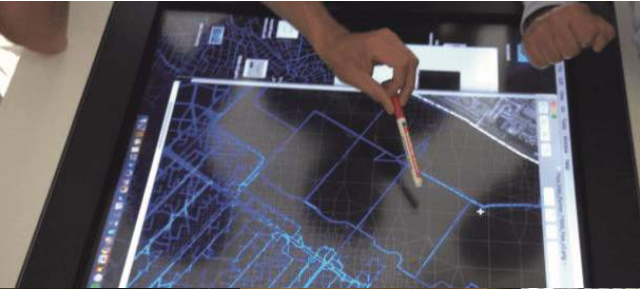


2D Surface Model



Integral Model

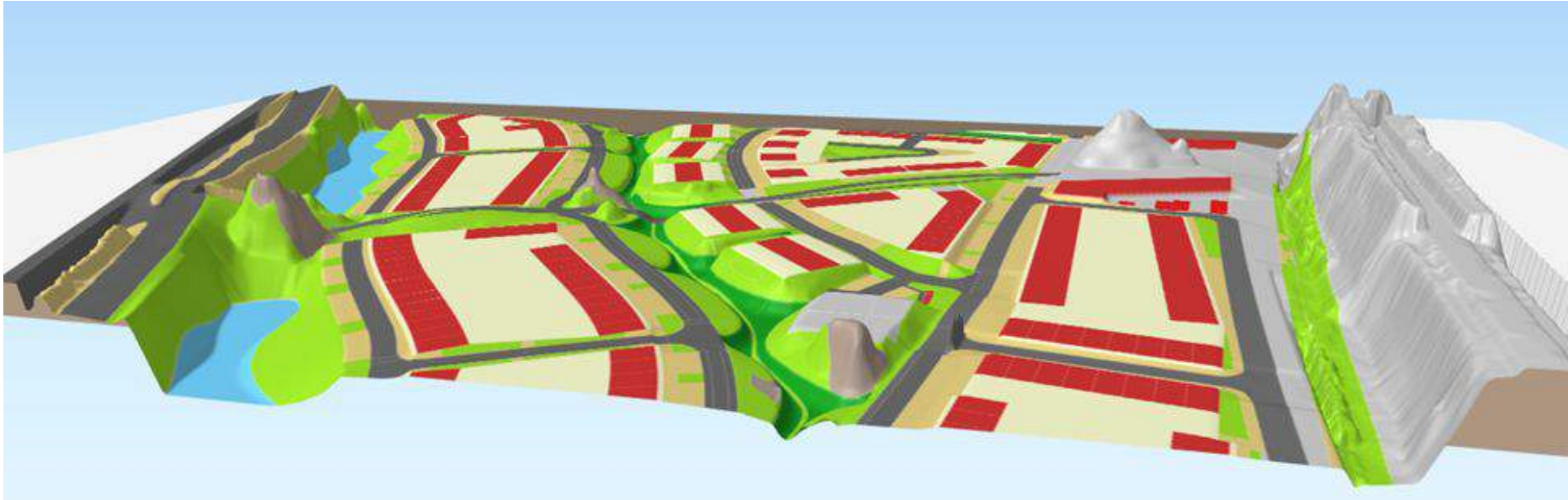
Interactive Modelling



Applications

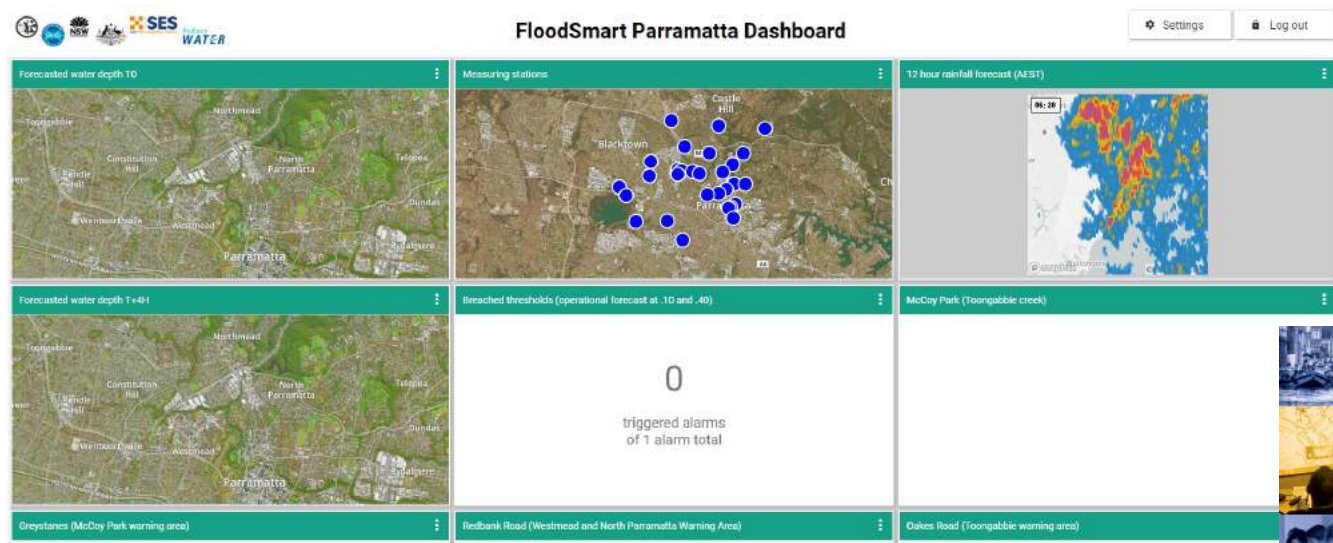
- Urban flooding due to heavy rain in climate adaption, Rotterdam, Amsterdam & The Hague
- Flash flood forecasting app to inform and warn citizens. E.g. Sydney & Ghana
- Disaster risk management to protect critical infrastructure and develop evacuation plans, Netherlands
- Typhoon flooding develop counter measures, Philippines
- Resilient urban planning, Taiwan
- Urban flood warning system for officials, Australia

Resilient Urban Planning

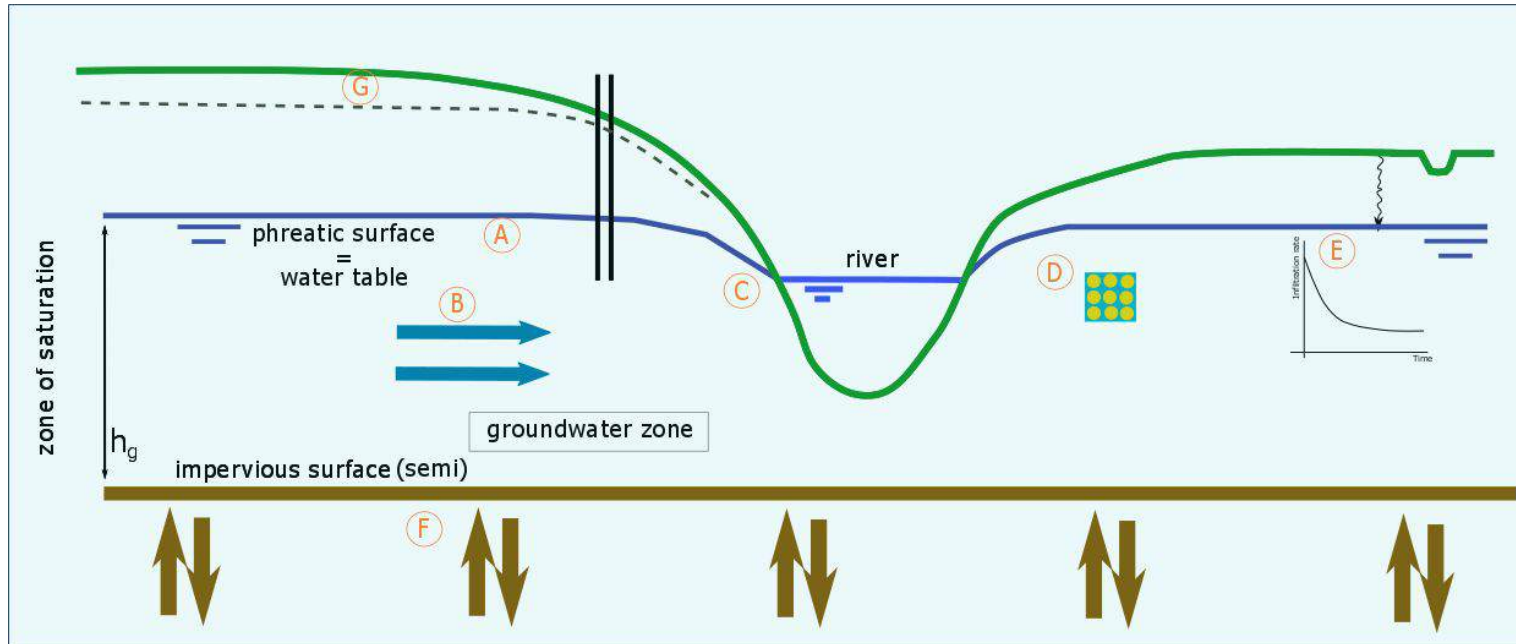




Flood Early Warning



Groundwater



Groundwater

Groundwater flow

- Darcy: $q = -k * (H/x)$
- spatial varying hydraulic conductivity
- spatial varying porosity
- spatial varying layer thickness

Infiltration

- Horton:
- Spatial varying infiltration rate

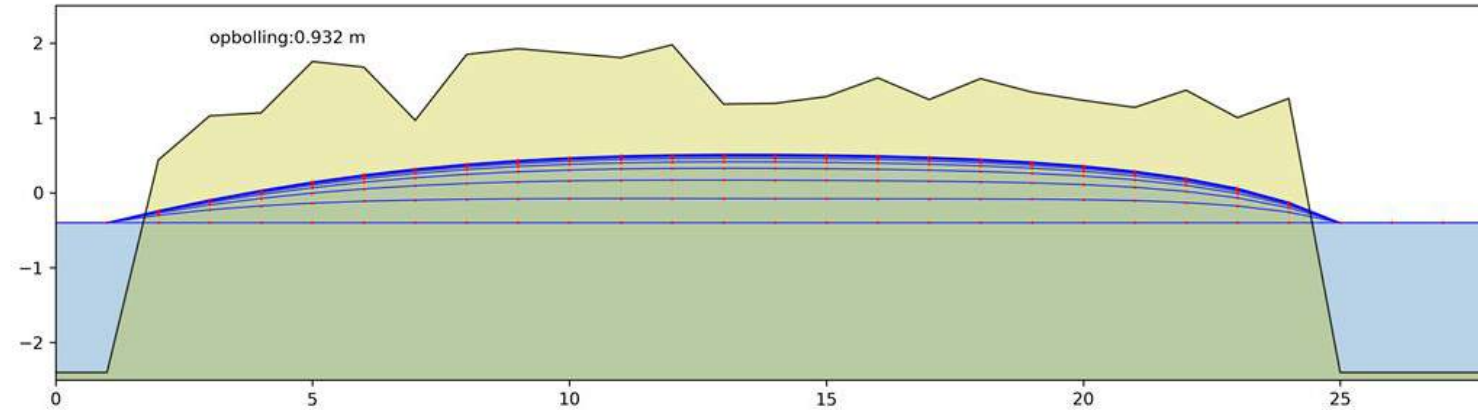
Seepage and leakage

- Spatial varying

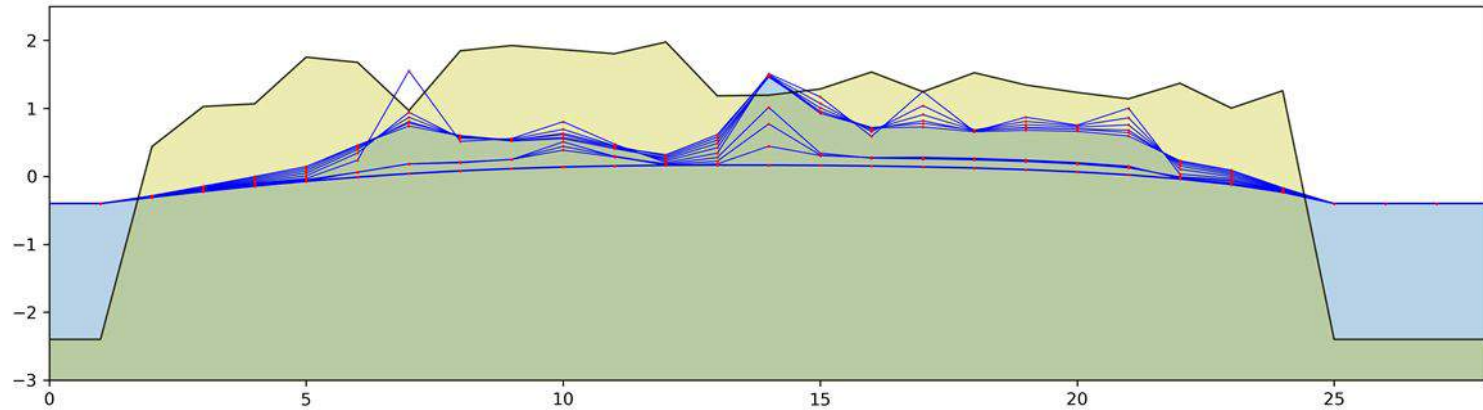
Test Case - Prinseneiland



Stationary



Rainfall



Useful Links

- [> Online Documentation](#)
- [> Video Content](#)
- [> Results Portal](#)
- [> Floodmap Portal](#)
- [> Nelen & Schuurmans](#)

谢谢



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