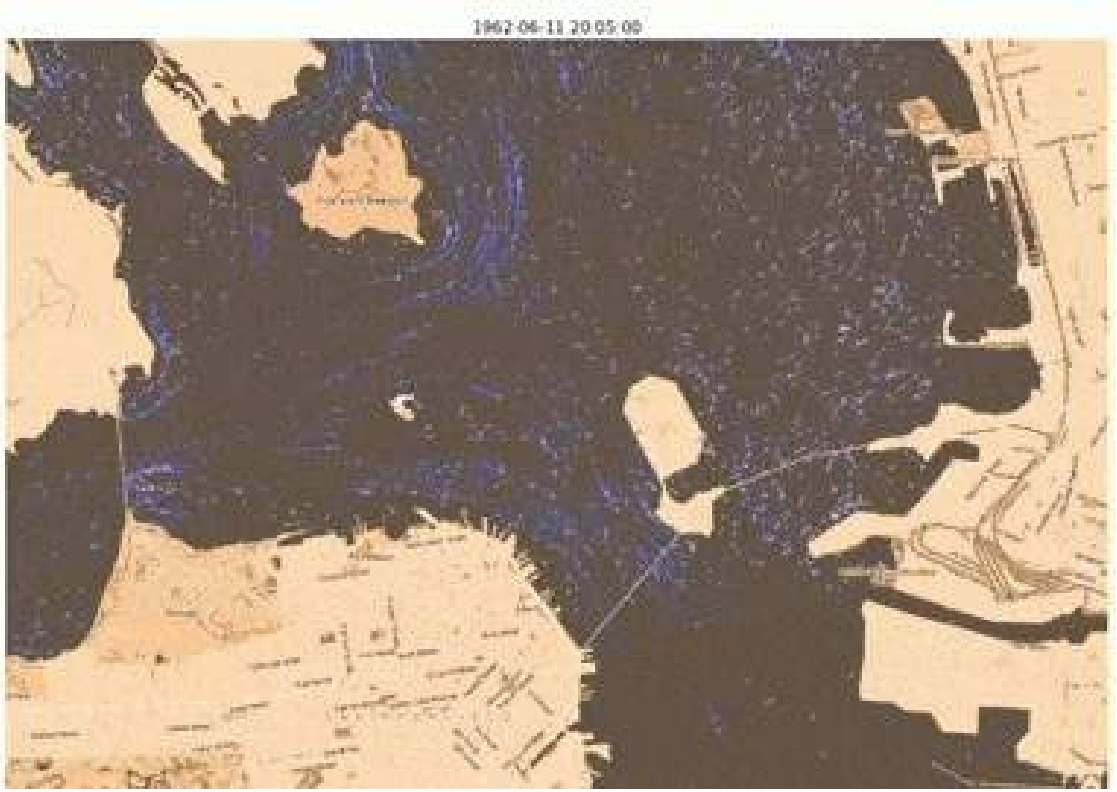
Building and visualizing hydrological models in 3di

Jonas van Schrojenstein

Nelen & Schuurmans

29-10-2015

Escape from Alcatraz

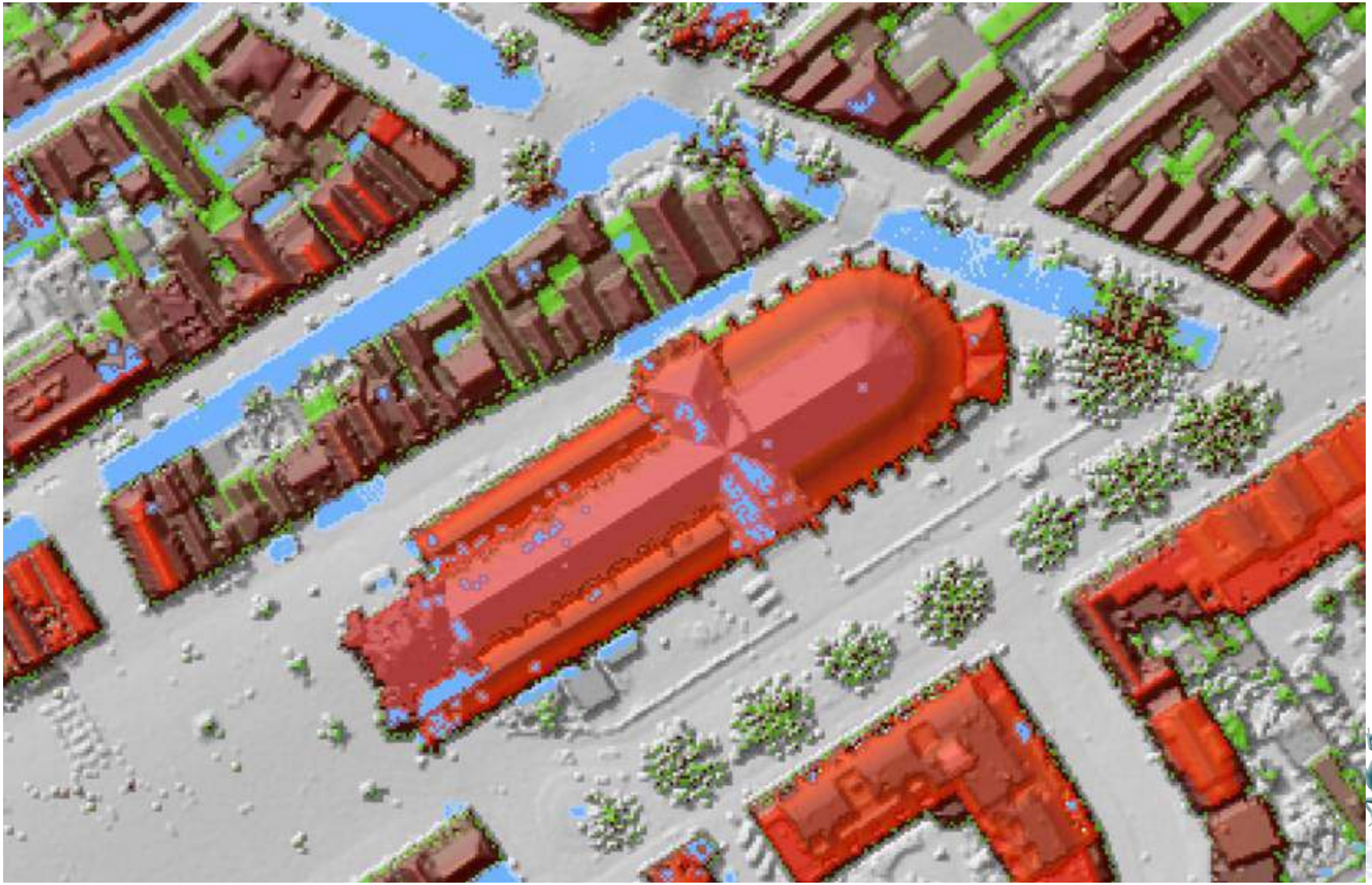


What is 3di?

Once upon a time….

- New computational core
  - Fast
  - Accurate
  - Interactive
- Communication tool
  - Information portal
  - 3D visualisation

Height model of the Netherlands

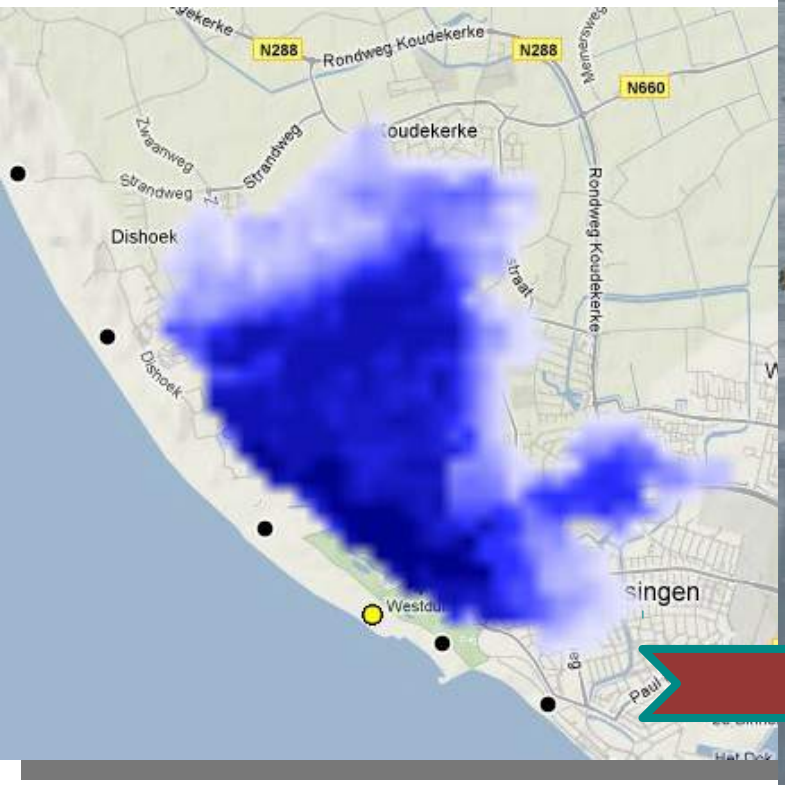


More accurate

Input 100x100m

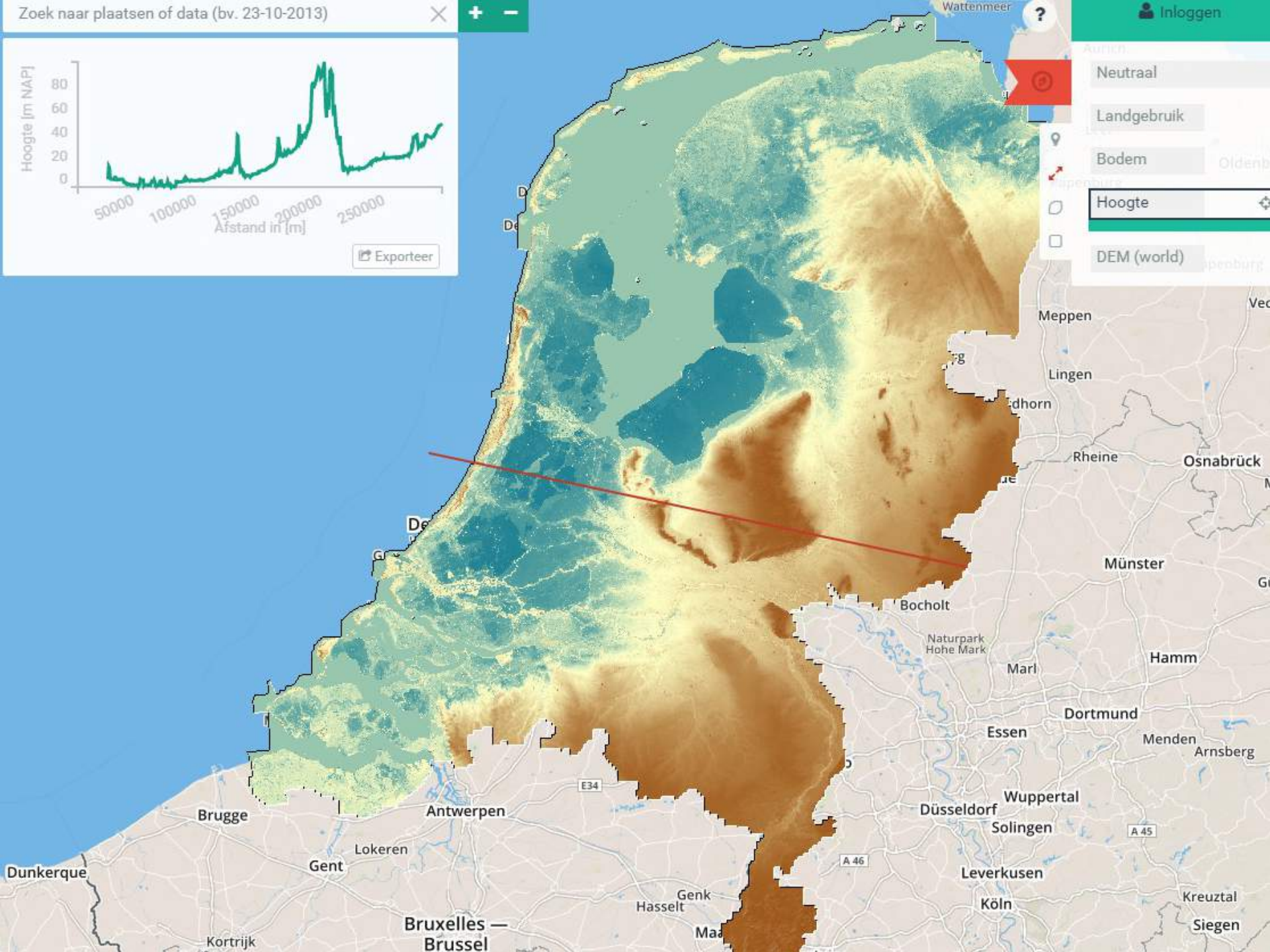
Input 0,5x0,5m

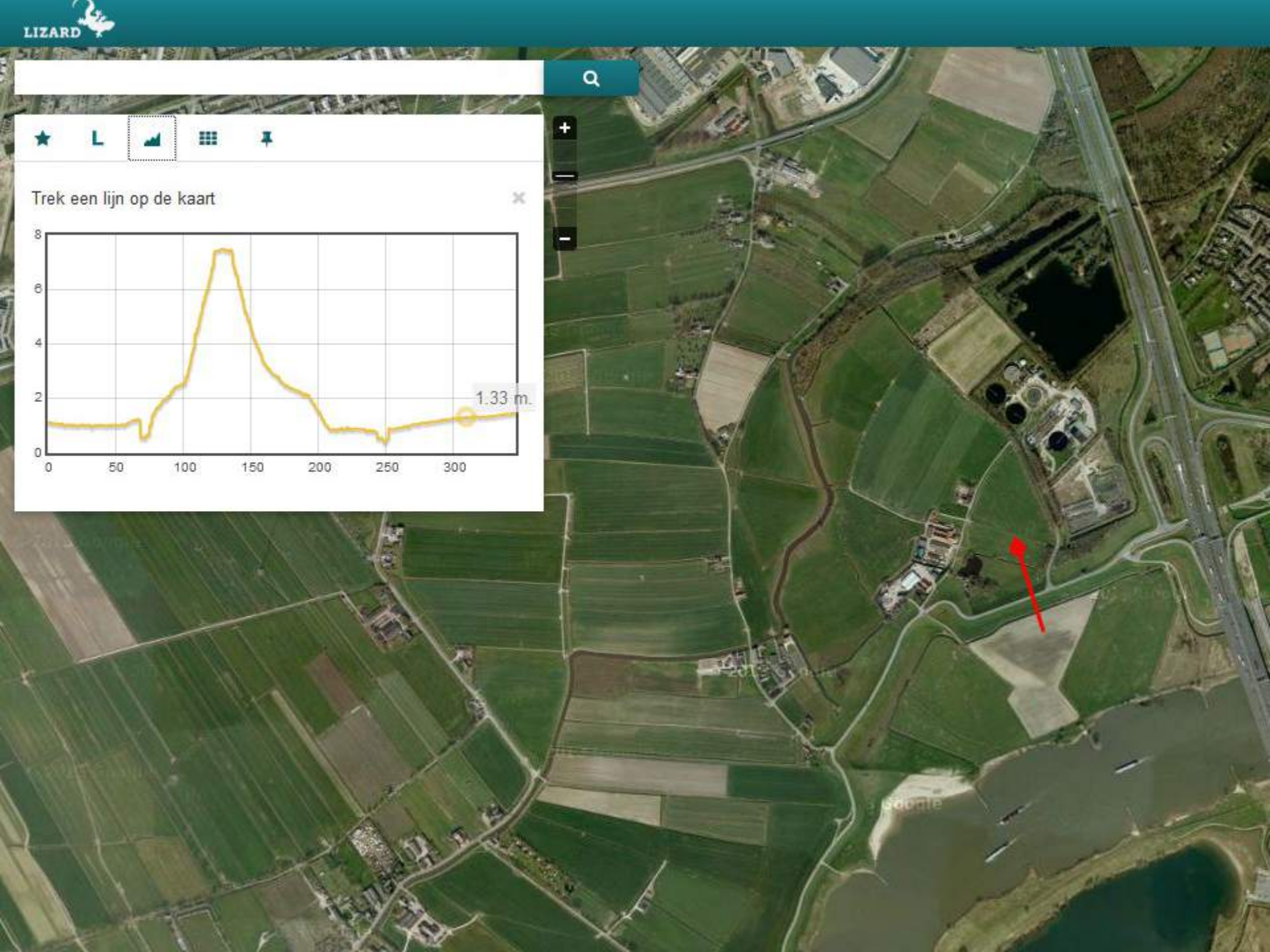
More visual


N288
Rondweg Koudekerke
N288
N660
Strandweg
Strandweg
Dishoek
Dishoek
Rondweg Koudekerke

Raster store – cloud computing

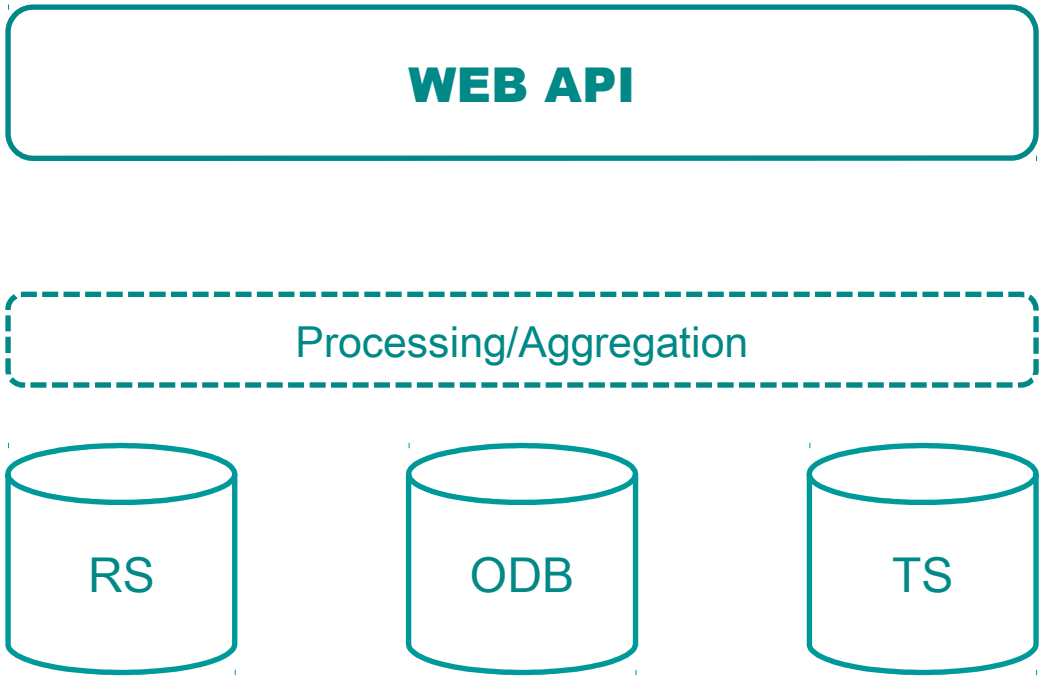
- Storage of raster data
- Fast calculations
- Quick extract of parts of the Netherlands for modelling


Zoek naar plaatsen of data (bv. 23-10-2013)
Hoogte [m NAP]
80
60
40
20
0
50000
100000
150000
200000
250000
Afstand in [m]
Exporteer
Inloggen
Neutraal
Landgebruik
Bodem
Hoogte
DEM (world)
Wattenmeer
Meppen
Lingen
Rheine
Osnabrück
Münster
Bocholt
Naturpark Hohe Mark
Marl
Hamm
Dortmund
Essen
Menden
Arnsberg
Wuppertal
Düsseldorf
Solingen
Leverkusen
Köln
Kreuztal
Siegen
Brugge
Antwerpen
Lokeren
Gent
Dunkerque
Genk
Hasselt
Bruxelles — Brussel
Kortrijk
E34
A 46
A 45

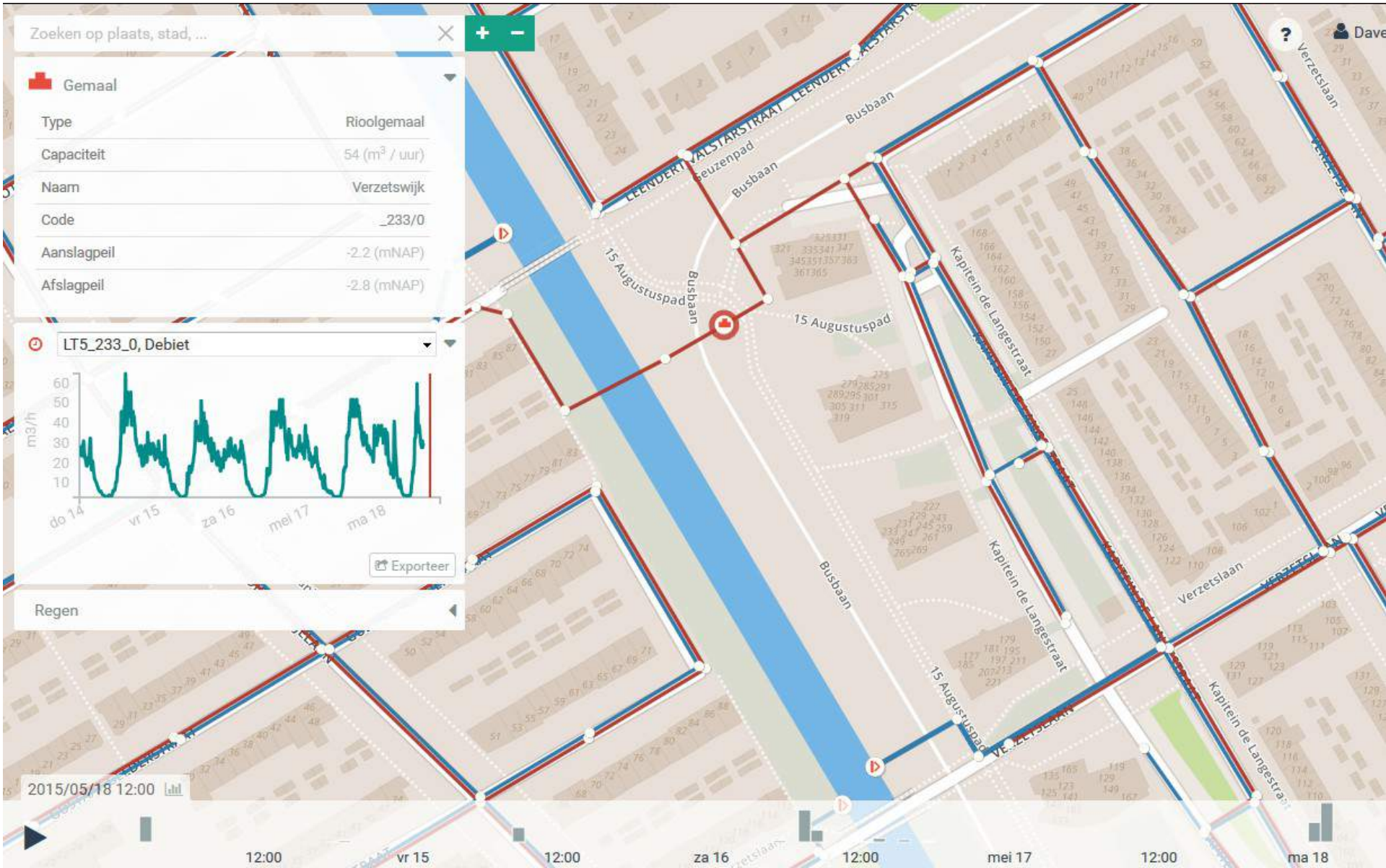

LIZARD
Trek een lijn op de kaart
8
6
4
2
0
0
50
100
150
200
250
300
1.33 m.

Visualizing data in Lizard

- BigData storage of (open) data of end users and partners
- Dissemination via well-documented API (Back End).
- Continuous development: > 4 fte

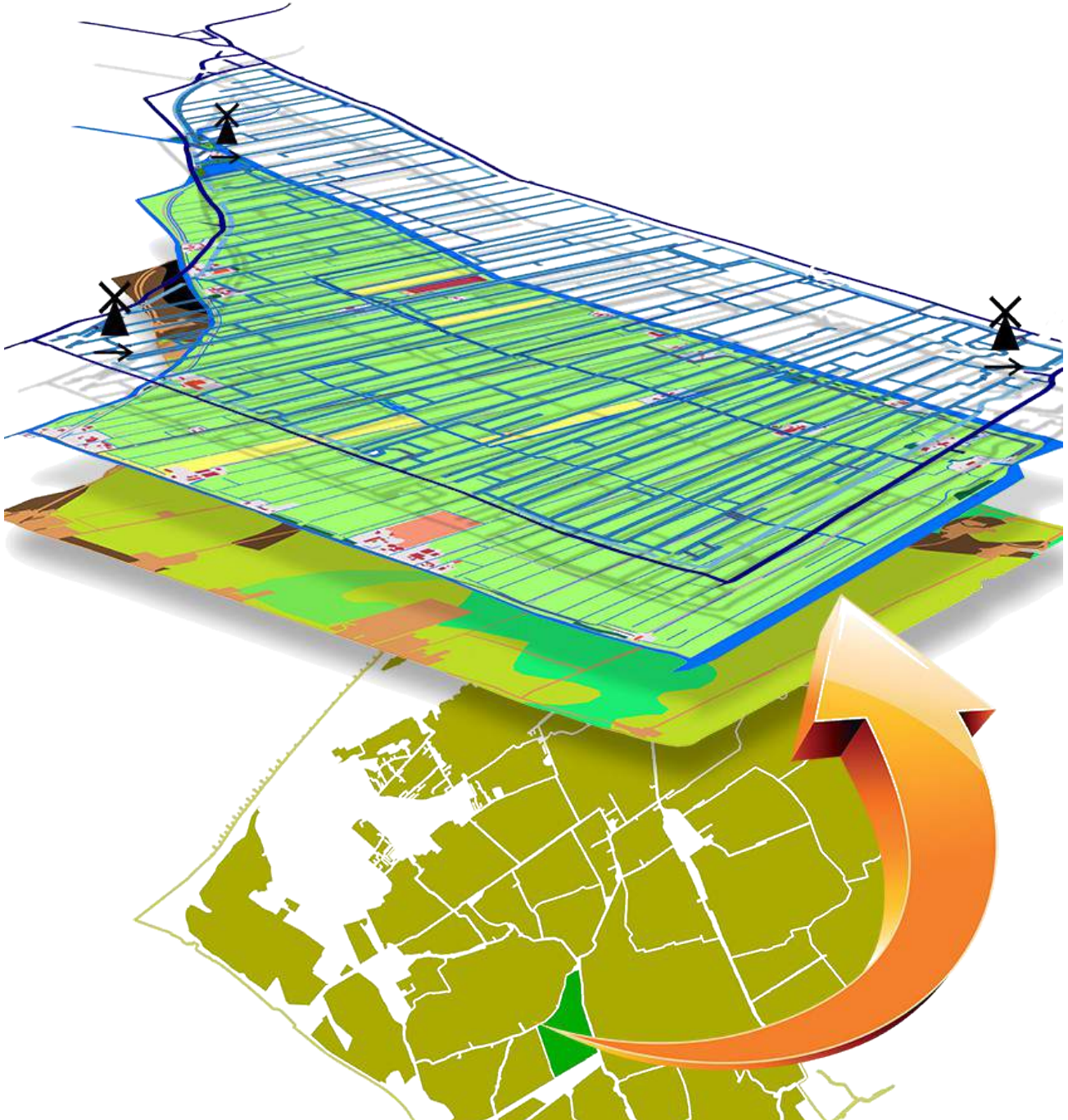


Visualizing data



Visualizing data

- Postgis
- Raster store
- Tilestache
- Utfgrid
- Leaflet
- Hadoop



AHN 2

Ondergrond

Landgebruik

IRIS

Beheerpakket

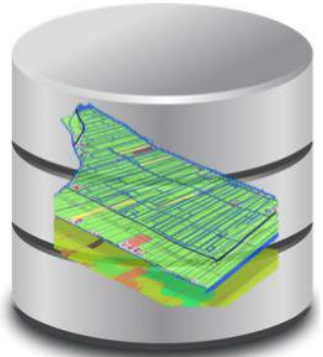
Combinatie

Data controle

Conversie

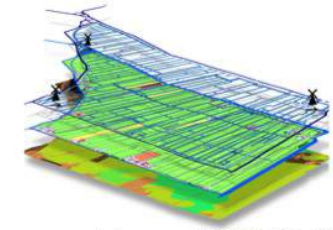
Visualisatie

Voorportaal



Version control

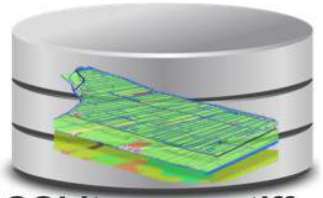
Modellen databank



$$u_t + \frac{\sum_{\partial\Omega} {}^{*}u\bar{Q}\bar{n}_f + uV_t}{V} + \frac{\iint_{\Omega} \tilde{h}gD_x\zeta}{V} + \frac{\iint_{\Omega} \tilde{\tau}_b^u}{V} = 0$$

Rekenkern

Rekenserver



SQLite en geotiffs

QGIS

Tabellen

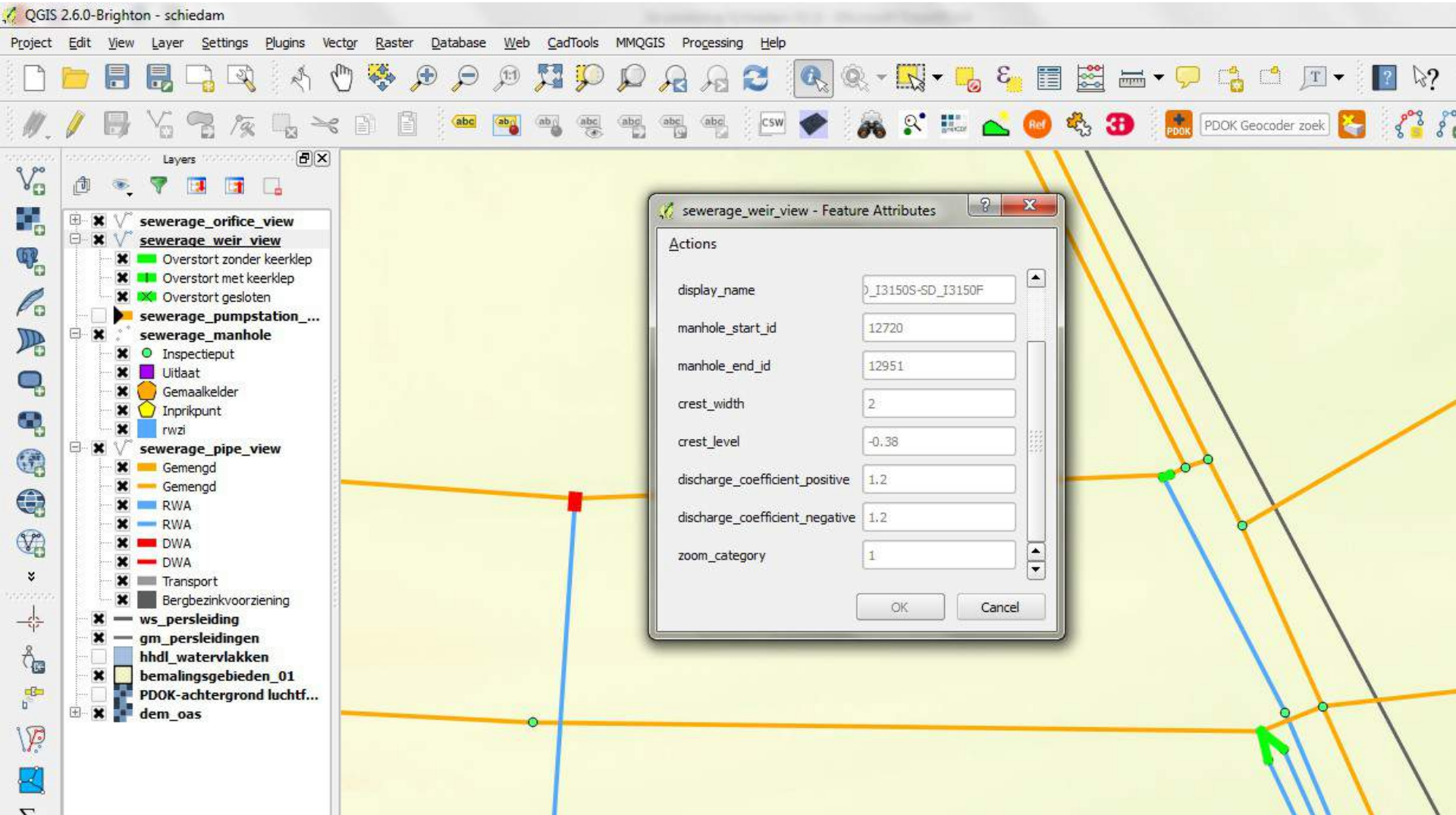
SQL

Modelleur

Building a hydrological model

- QGIS
- GDAL
- Tortoise HG

QGIS


QGIS 2.6.0-Brighton - schiedam
Project Edit View Layer Settings Plugins Vector Raster Database Web CadTools MMQGIS Processing Help
PDOK Geocoder zoek
Layers
sewerage_orifice_view
sewerage_weir_view
Overstort zonder keerklep
Overstort met keerklep
Overstort gesloten
sewerage_pumpstation_...
sewerage_manhole
Inspectieput
Uitlaat
Gemaalkelder
Inprikpunt
rwzi
sewerage_pipe_view
Gemengd
Gemengd
RWA
RWA
DWA
DWA
Transport
Bergbezinkvoorziening
ws_persleiding
gm_persleidingen
hhdl_watervlakken
bemalingsgebieden_01
PDOK-achtergrond luchtf...
dem_oas
sewerage_weir_view - Feature Attributes
Actions
display_name
D_I3150S-SD_I3150F
manhole_start_id
12720
manhole_end_id
12951
crest_width
2
crest_level
-0.38
discharge_coefficient_positive
1.2
discharge_coefficient_negative
1.2
zoom_category
1
OK
Cancel

Logging

Graph	Rev	Branch	Description	Author	Age	T
	30	default	float rasters voor crop en soil	martijn.siemerink	12 days	
	29	default	Fix chainage length for structures and cross sections.	Sander Smits	13 days	
	28	default	case sensitive files	Fedor	13 days	
	27	default	Update mdu and inp files.	Sander Smits	2 weeks	
	26	default	new sqlite	martijn.siemerink	2 weeks	
	25	default	default included groundwater in duifpolder_slice	martijn.siemerink	2 weeks	
	24	default	Merge.	Sander Smits	2 weeks	
	23	default	Update generated mdu and inp files.	Sander Smits	2 weeks	
	22	default	updated groundwater .tifs	martijn.siemerink	2 weeks	
	21	default	added groundwater .tif's	martijn.siemerink	2 weeks	
	20	default	upgraded bathymetry	martijn.siemerink	2 weeks	
	19	default	Regenerate mdu and inp files.	Sander Smits	2 weeks	
	18	default	Remove obsolete files.	Sander Smits	2 weeks	
	17	default	default Regenerate mdu and inp files.	Sander Smits	2 weeks	
	16	default	model improved. Created new sqlite. ID's are all changed, now trying	martijn.siemerink	2 weeks	

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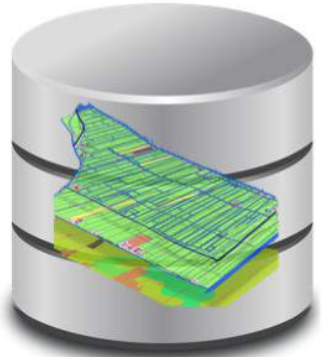

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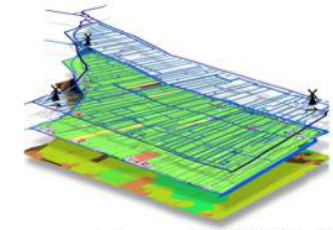

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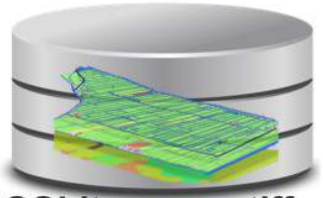
Rekenkern

Rekenserver



SQLite en geotiffs

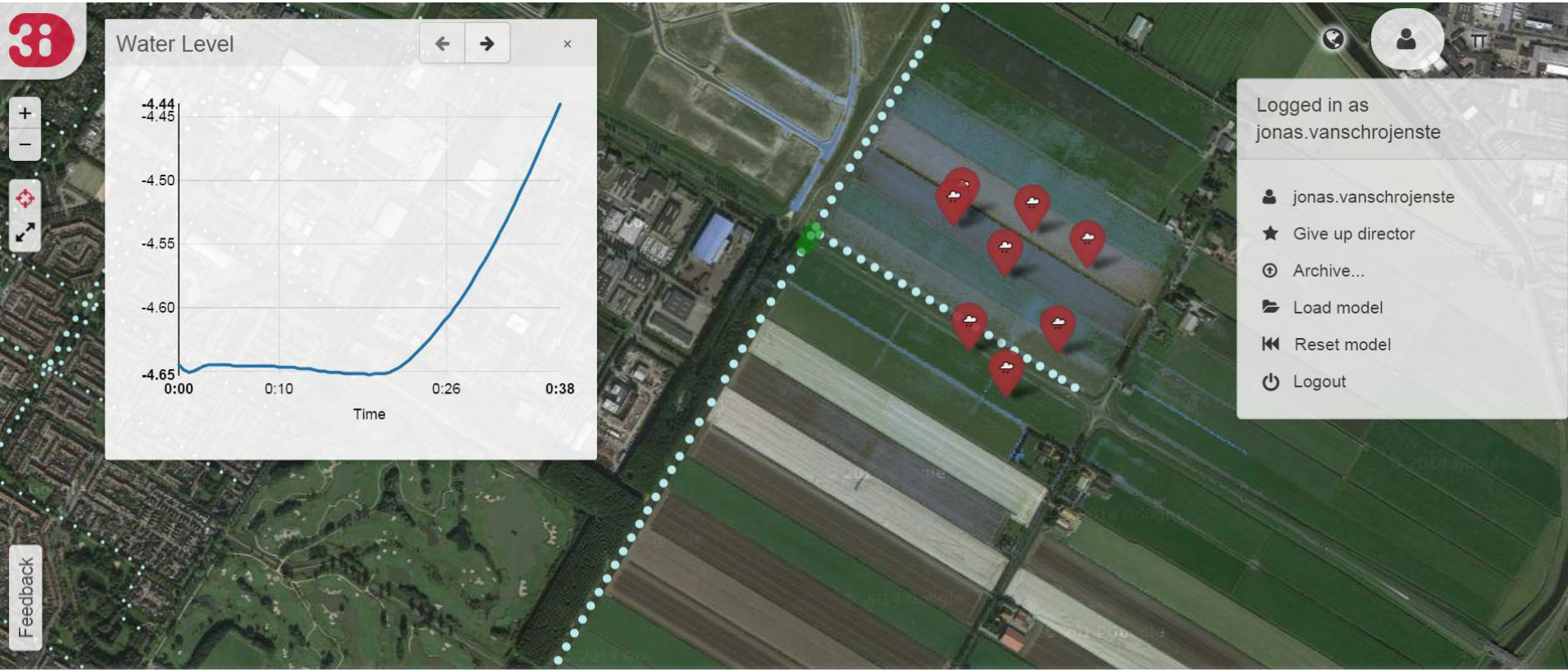
QGIS

Tabellen

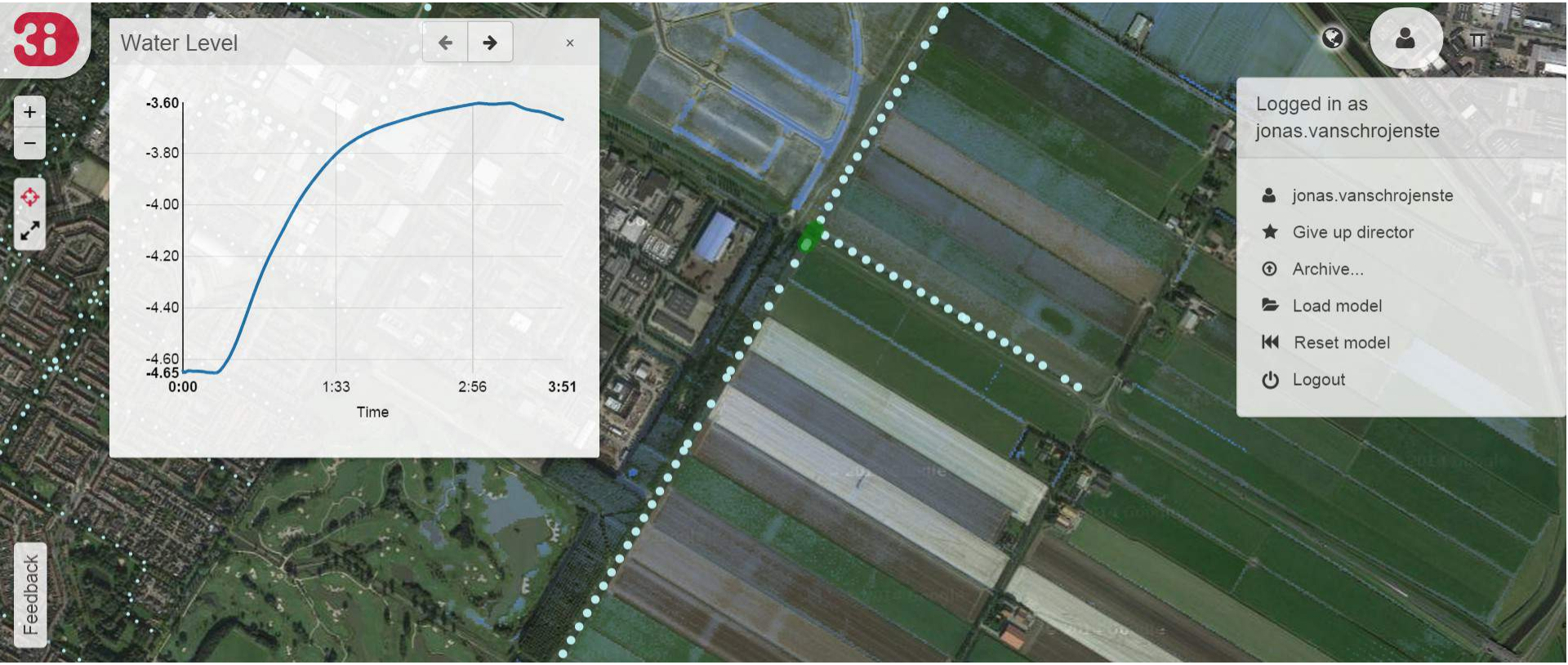
SQL

Modelleur

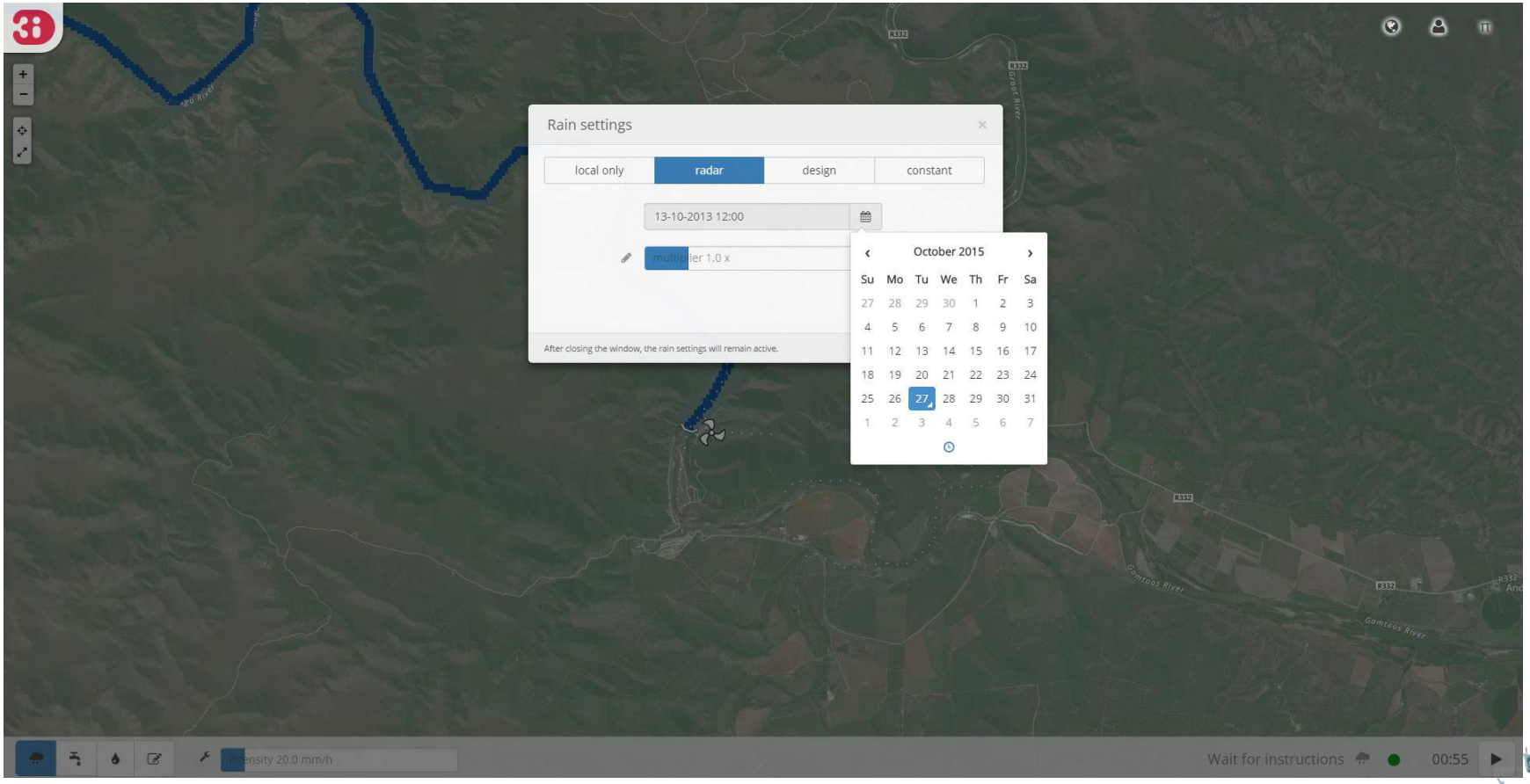
Running the model



Running the model



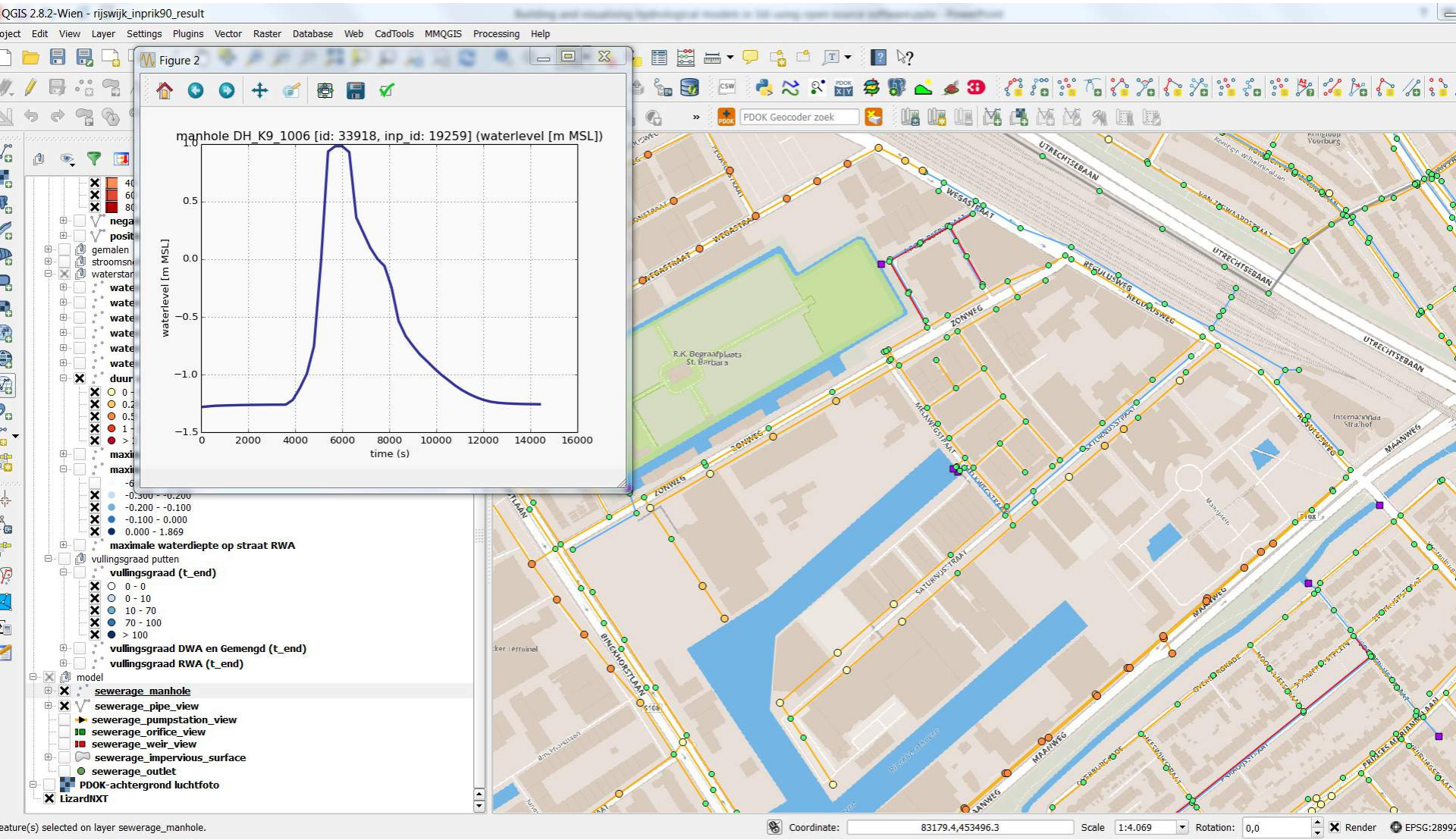
Running the model

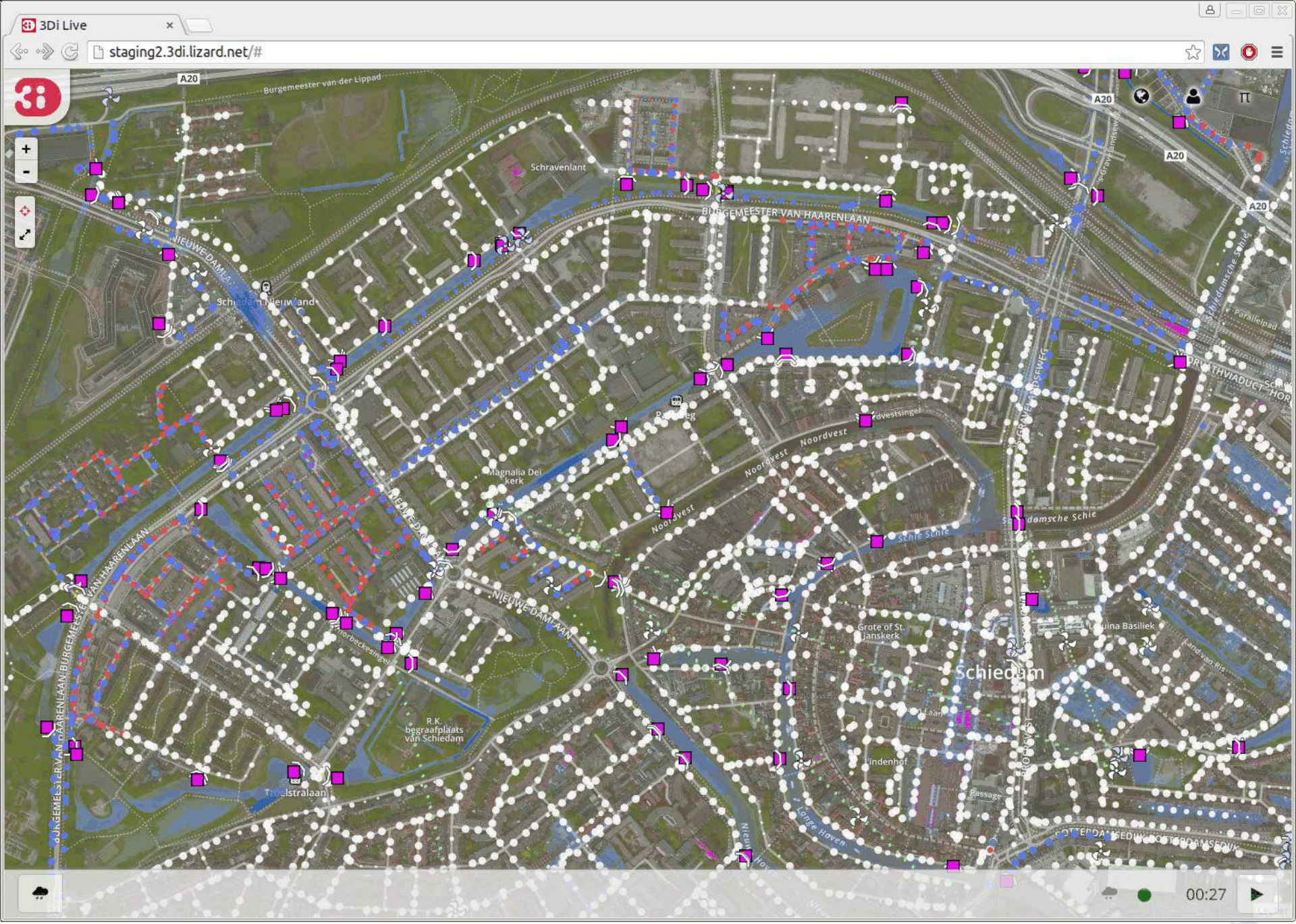


Running the model

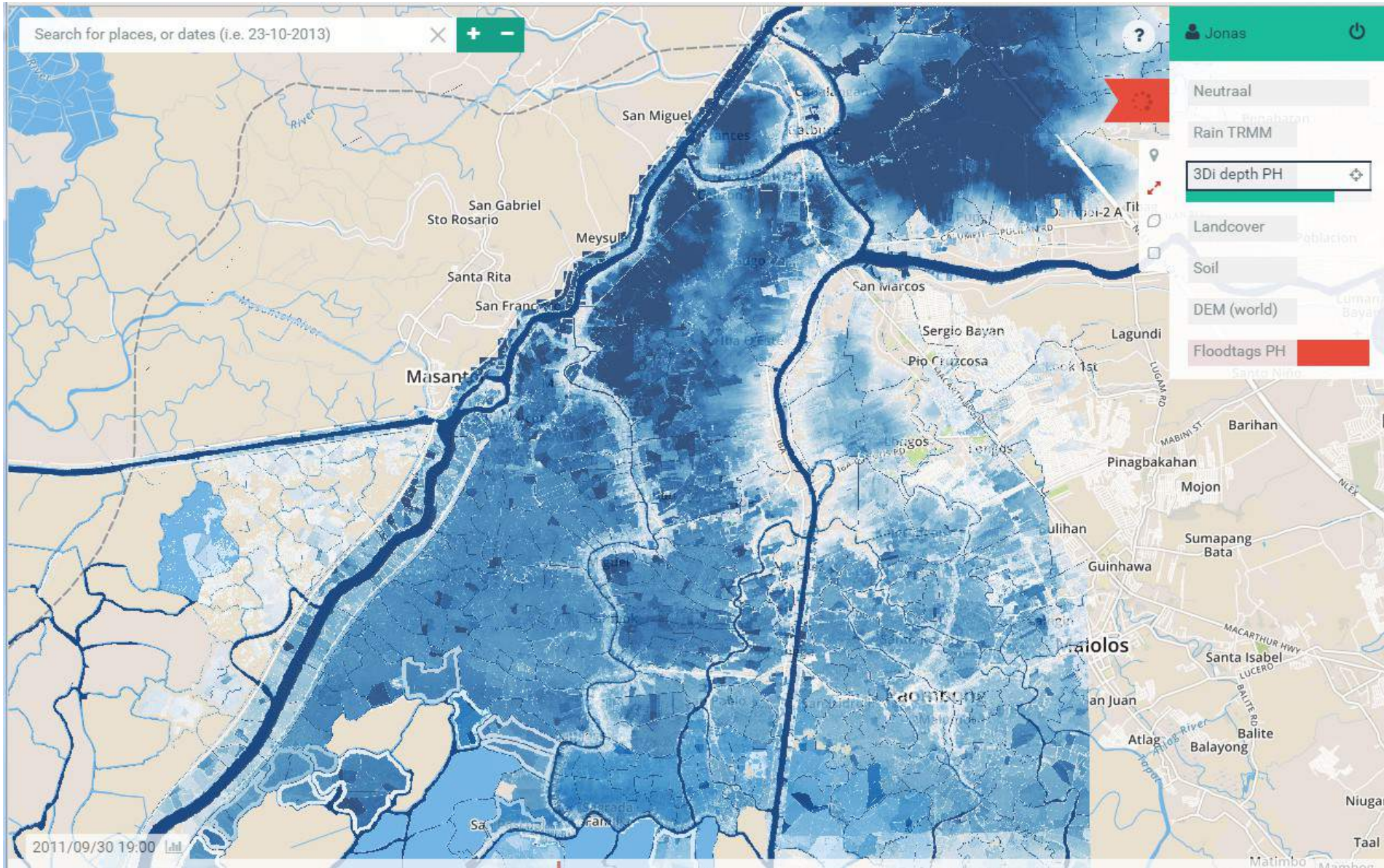
- Stack:
  - Bootstrap
  - Angular
  - Leaflet
  - D3

QGIS


QGIS 2.8.2-Wien - rijswijk_inprik90_result
Figure 2
manhole DH_K9_1006 [id: 33918, inp_id: 19259] (waterlevel [m MSL])
waterlevel [m MSL]
time (s)
maximale waterdiepte op straat RWA
vullingsgraad putten
vullingsgraad (t_end)
vullingsgraad DWA en Gemengd (t_end)
vullingsgraad RWA (t_end)
model
sewerage_manhole
sewerage_pipe_view
sewerage_pumpstation_view
sewerage_orifice_view
sewerage_weir_view
sewerage_impervious_surface
sewerage_outlet
PDOK-achtergrond luchtfoto
LizardNXT
PDOK Geocoder zoek
UTRECHTSEBAAN
ZONWEG
MAANWEG
SATURNUSSTRAAT
REGULUSWEG
Coordinate:
Scale
Rotation:
Render
EPSG:28992


3Di Live
staging2.3di.lizard.net/#
A20
Burgemeester van der Lippad
Schravenlant
BURGEMEESTER VAN HAARENLAAN
NIEUWE DAMLAAN
Schiedam Nieuwland
Magnalia Dei kerk
Noordvest
Schie
Grote of St. Janskerk
Schiedam
R.K. begraafplaats van Schiedam
Lindenhof
Lange Haven
Parallelpad
00:27

Visualizing results



Worldwide application

Example projects:

- Netherlands: Amsterdam, Rotterdam, The Hague, Almere, North Holland, South-Holland
- Africa: Kenia, South-Africa, Mozambique
- Azia: Vietnam, Bangladesh, Singapore
- America: St Lucia

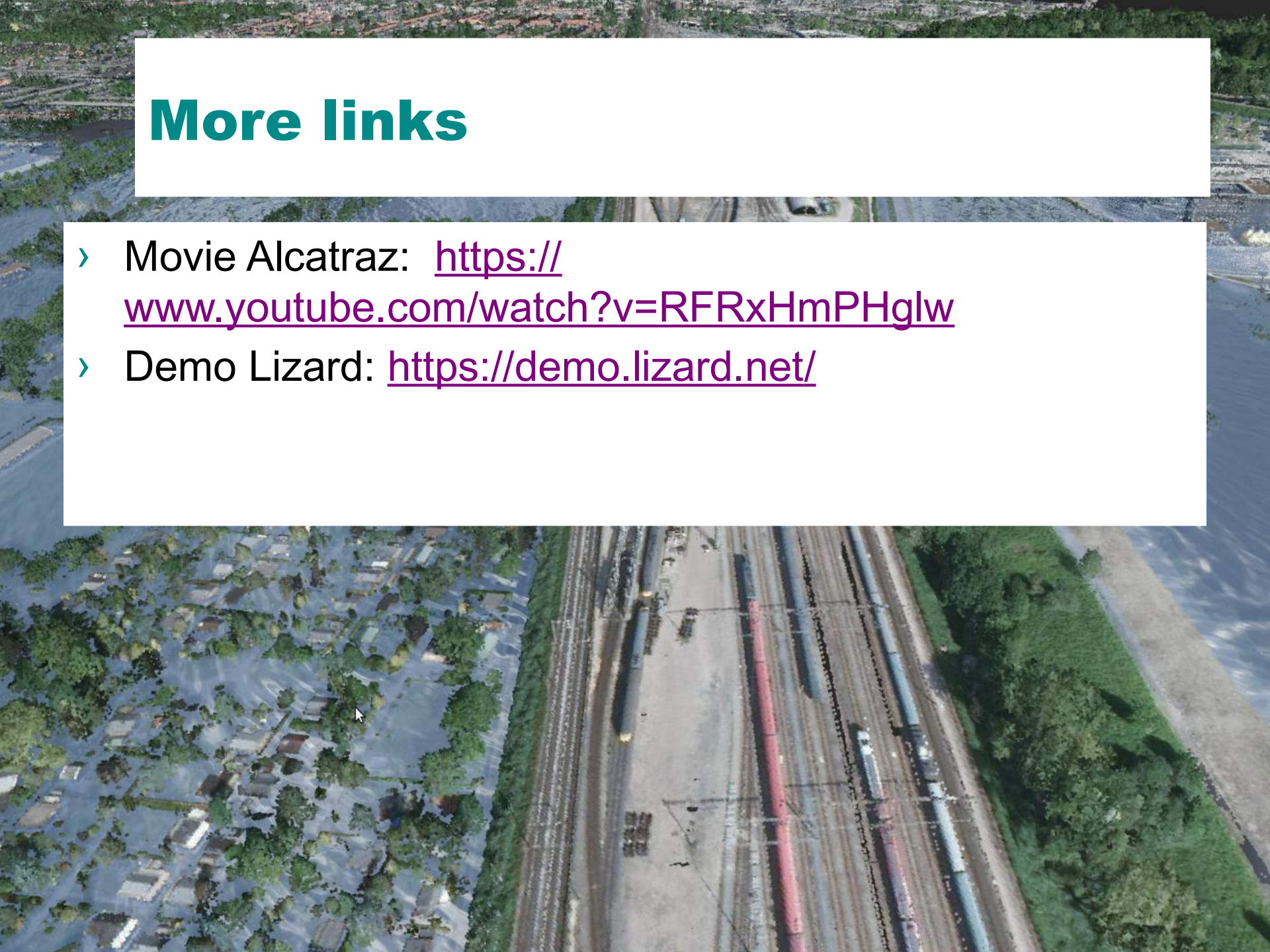
Summary

- Open source software used to build a 3di model
  - Building models : Qgis, gdal, tortoise hg
  - Running models: Leaflet, angular
  - Visualising data and results: postgis, hadoop, raster store

Colofon

- Jonas van Schrojenstein Lantman
- Jonas.vanschrojenstein@nelen-schuurmans.nl

- More information:
- http://www.3di.nu/en/international/
- www.nelen-schuurmans.nl
- http://nxt.lizard.net

More links

- Movie Alcatraz: https://www.youtube.com/watch?v=RFRxHmPHglw
- Demo Lizard: https://demo.lizard.net/