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Anticipating extreme showers in urban areas - dealing with uncertainties

ECCA, Hamburg 2013

18 March 2013

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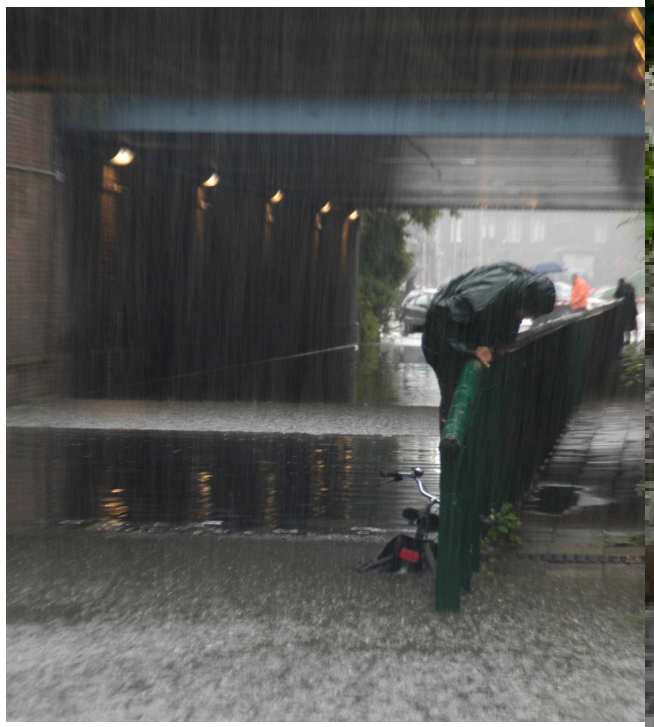
- expert water at Tauw consultancy.

CREATING TOMORROW



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Climate adapted

Extreme showers

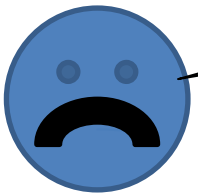
Policy

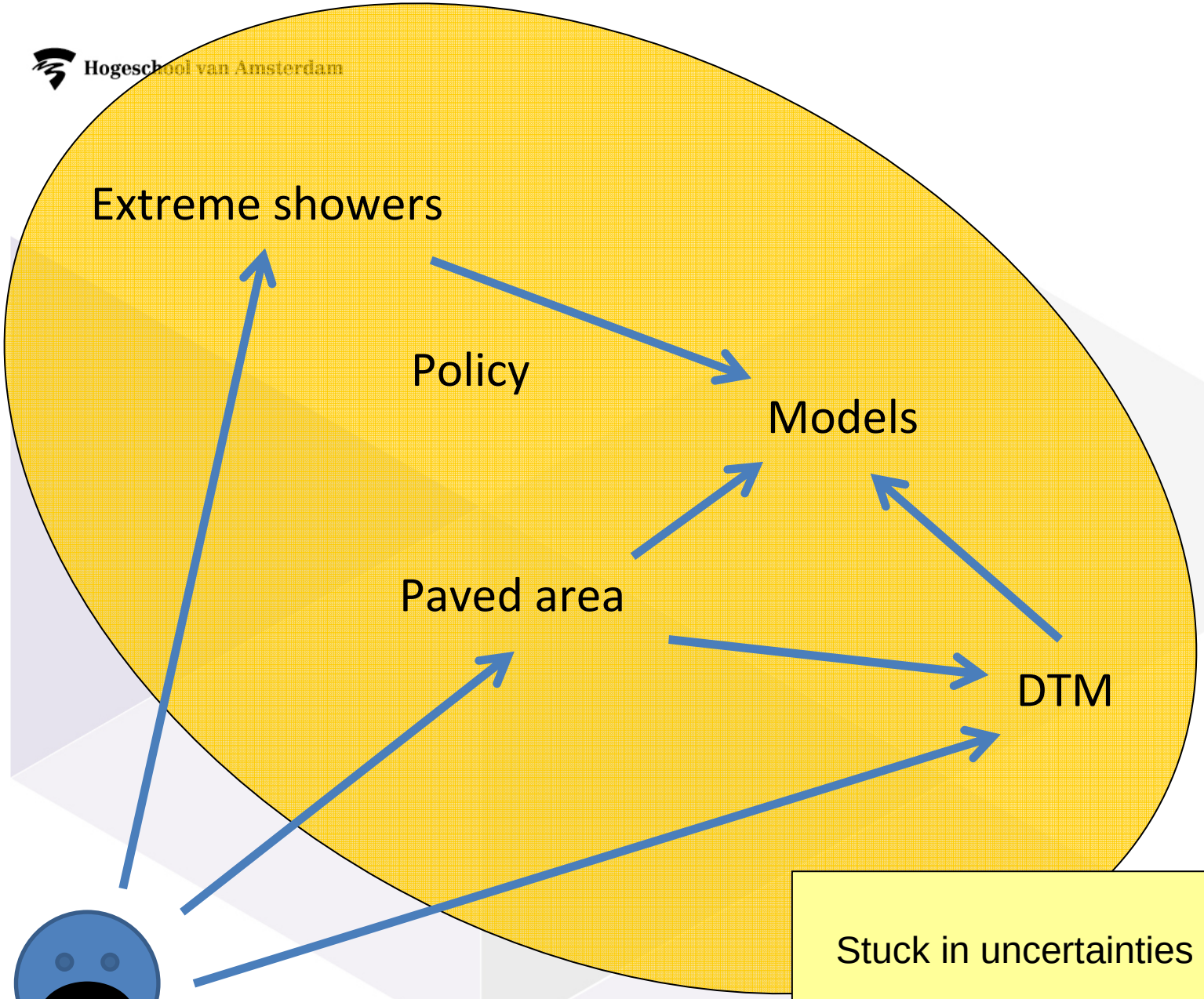
Models

Paved area

DTM

How to anticipate extreme showers





Stuck in uncertainties

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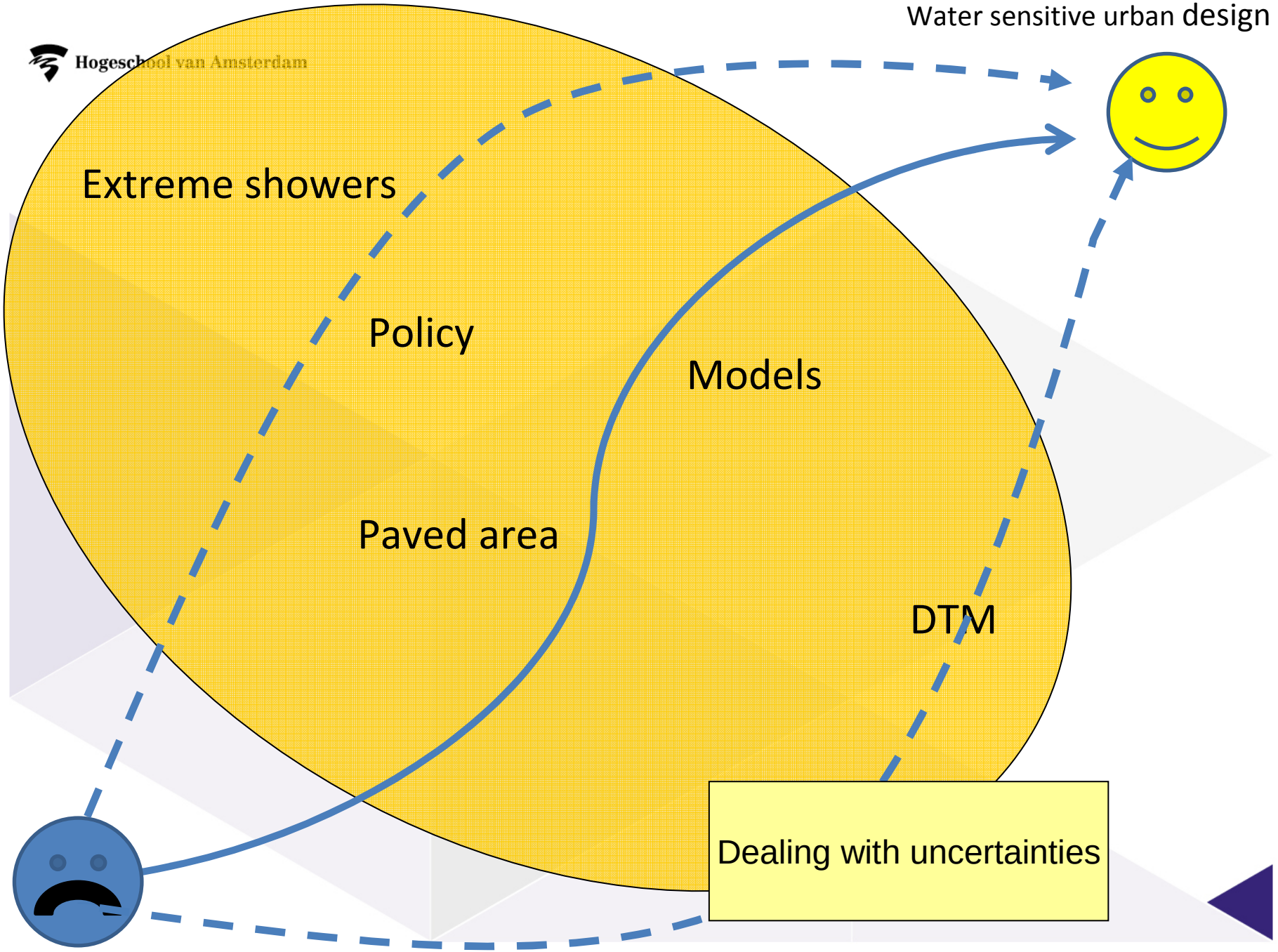
Message

Try to accept them and just do the right thing.

Because solution is logical

- Make more space for water
- Improve urban area
- Together with other stakeholders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Water sensitive urban design
Extreme showers
Policy
Models
Paved area
DTM
Dealing with uncertainties

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Increase in flooding

- Increase of impervious areas
- Climate change
- Optimized sewer systems
- Urban areas pram-friendly.

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Research

Uncertainties

Physical

- Rainfall
- Modeling
- Real situation / DTM

Political/organisational

- What is acceptable?
- How to implement?

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Rainfall (max hourly)

Extreme events in The Netherlands

- 100 years at De Bilt (Dutch meteo-station)
  - not enough for T=100?
  - Not representative?

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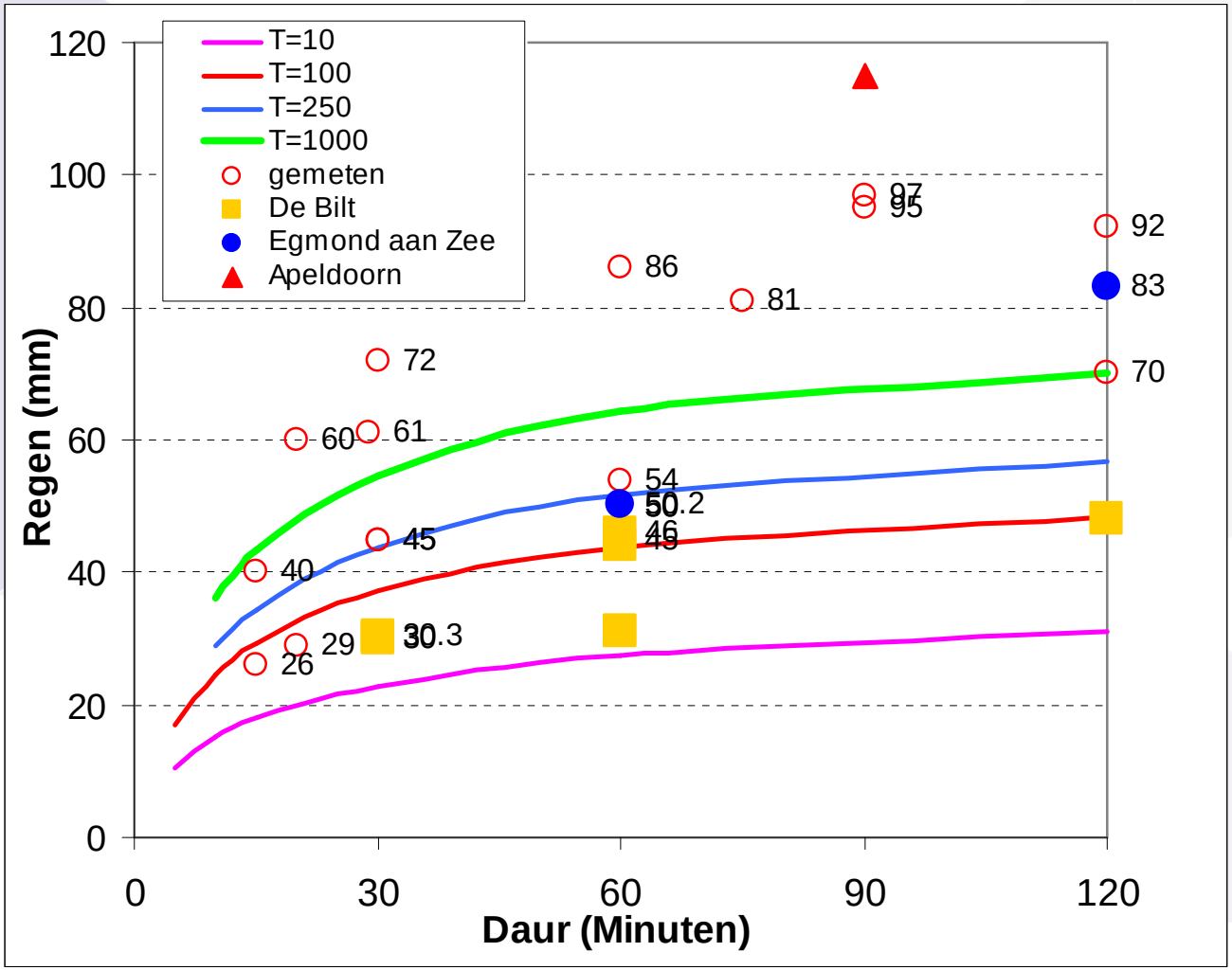
Rainfall (max hourly)



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Rainfall (max hourly)

Extreme events in The Netherlands

- 100 years at De Bilt
  - not enough for T=100?
  - Not representative?
- Almost 1000 years combining ground stations
  - Correlated? And then?
- 11 years of radar 370 times > 40 mm.
  - Correlated!
  - Peaks to low!

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Rainfall (max hourly)

Extreme events in The Netherlands

- 100 years at De Bilt
- Almost 1000 years combining ground stations
- 11 years of radar 370 times > 40 mm.
  - Correlated! But then what??
  - Peaks to low!
- Climate change
  - + 10-27% for daily rainfall in 2050
  - + Each ΔT +14%?
  - Length data range for extremes?

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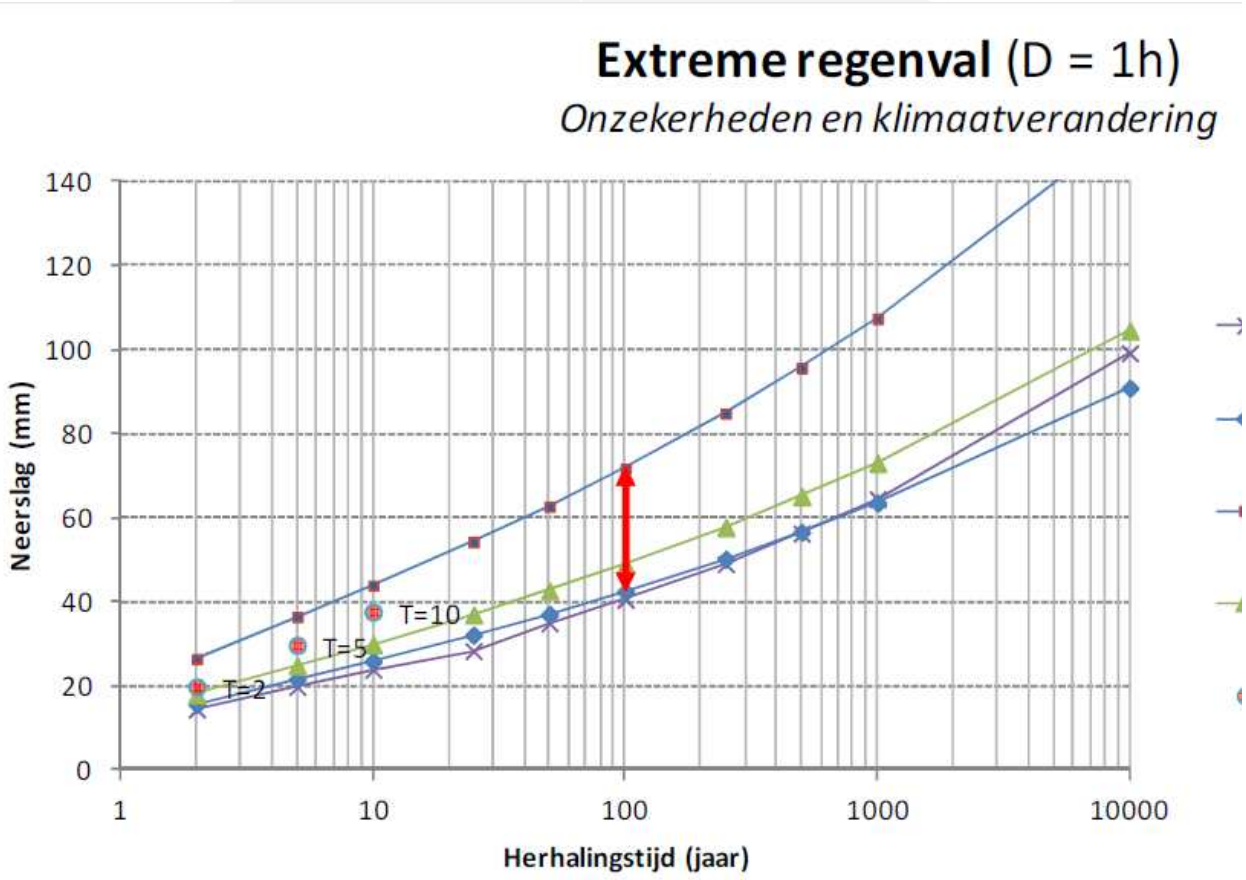
Rainfall

40 – 70 mm in 1 hour!



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Modeling

The models are getting better!

SOBEK 1D/2D, InfoWorks 1D/2D, 3Di

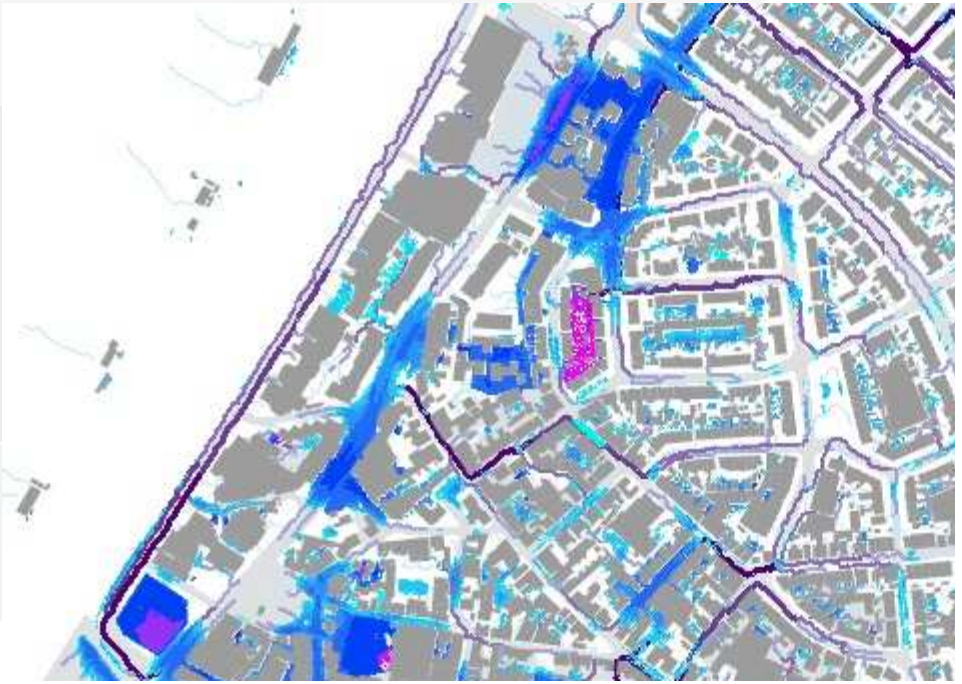
However

- No validation
- Still some major problems
  - Contribution of unpaved?
  - Water on streets or in sewer

Modeling of surface flow

Start simple!

Even if not always correct!



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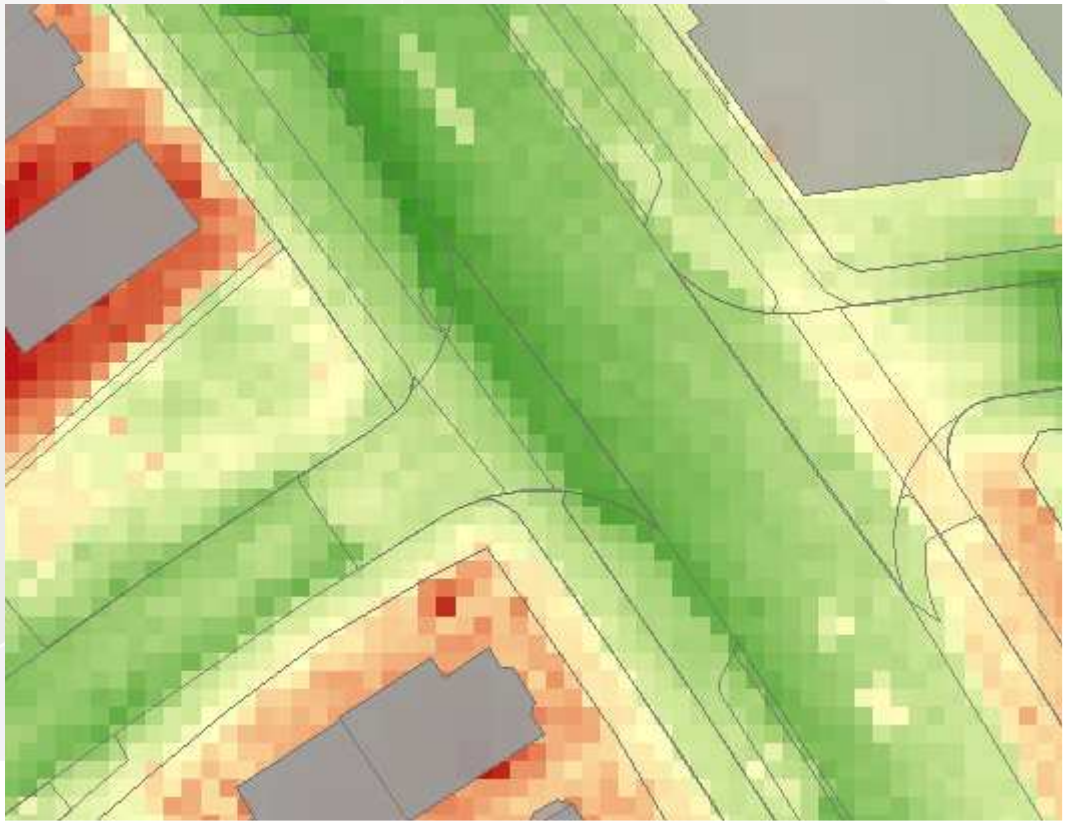
DTM

Excellent 1*1 of 0,5*0,5

- But walls? Culverts? Tunnels
- Gardens
- Developments/changes



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Legislation

Unclear in The Netherlands

- Up to T=2 in sewer
- More extreme: unclear
  - In general safety in streets
  - Up to what level
- Efficient discharge of surplus water

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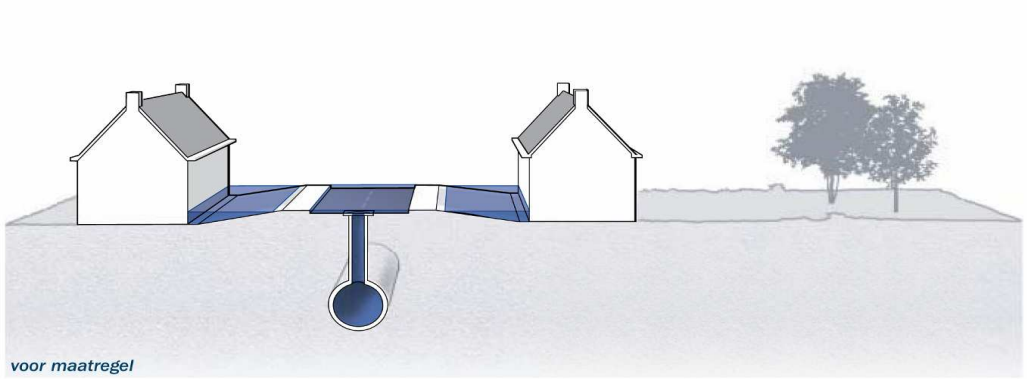
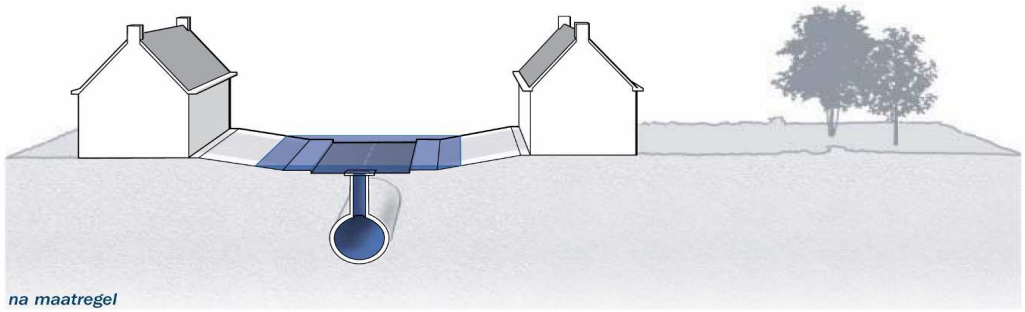
What to do?

Spot on horizon is clear!

- More space for water
  - Street kerbs / street profile





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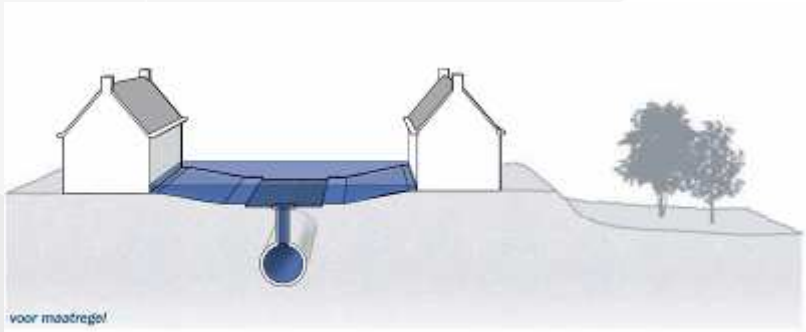
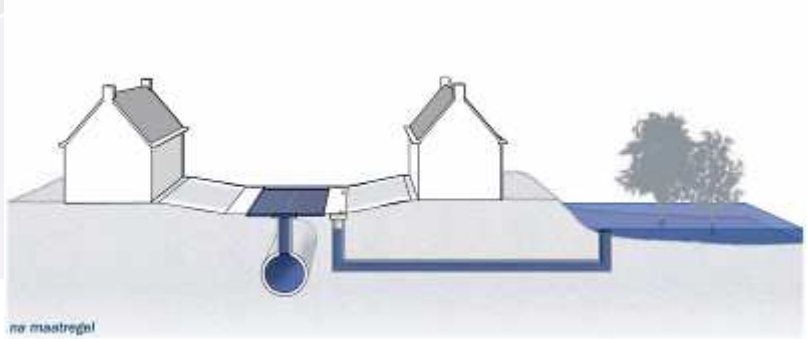
What to do?

Spot on horizon is clear!

- More space for water
  - Street kerbs / street profile
  - Dedicated depression (parks, squares)





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What to do?

Spot on horizon is clear!

- More space for water
  - Street kerbs / street profile
  - Dedicated depression (parks, squares)
- Prevent flow towards vulnerable areas

4 steps to overcome uncertainties

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4 steps

1) Evaluate really extreme event (60 mm in 1 short time)
2) Assess vulnerable locations
   ➔ To be solved/accepted
3) Investigate solutions (if costly/critical maybe extra research)
   - Mainly on surface
   - Retain water, divert it to surface water, local depressions
4) Choose actions
   - Direct
   - Future fitting in other opportunities
   - Change vision on urban space

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4 steps / uncertainties

1) Evaluate really extreme event (60 mm in 1 short time)
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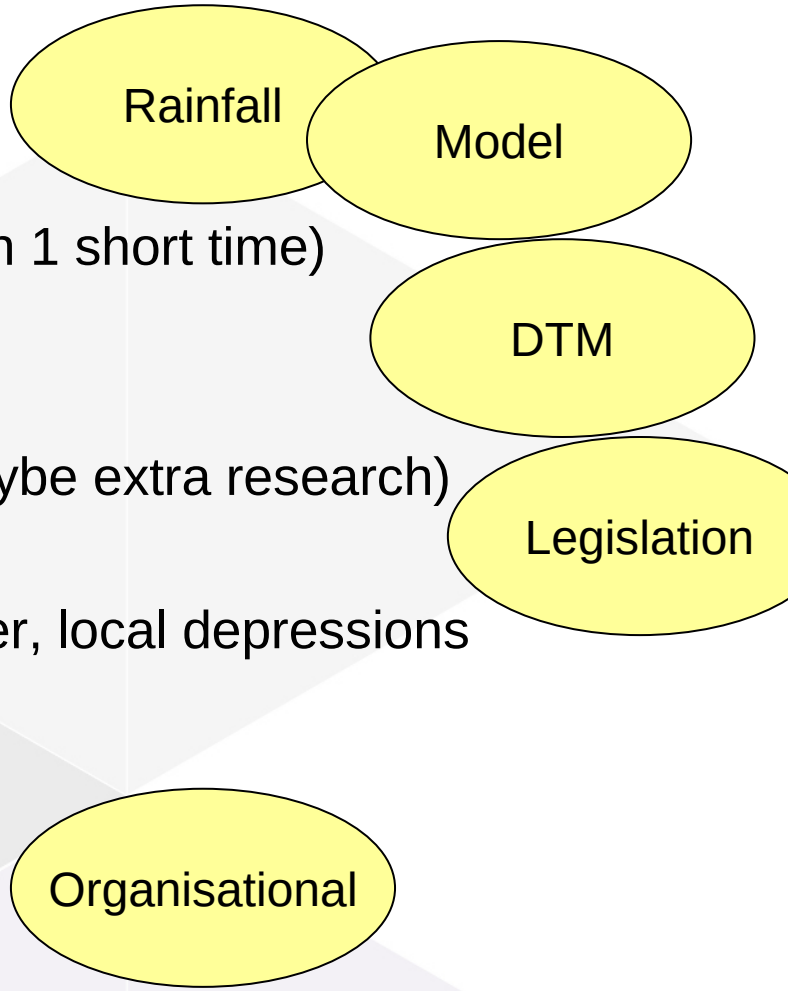

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Implementation

- Sewer/water manager **+** other stakeholders
- Communication

➔ Flood maps / workshops touch table

- Create awareness of their role for water
- Show advantages
  - Reduces risk of flooding
  - Improves living area
  - Space for green & water ➔
    - Heat stress
    - Restore original water cycle
    - Biodiversity

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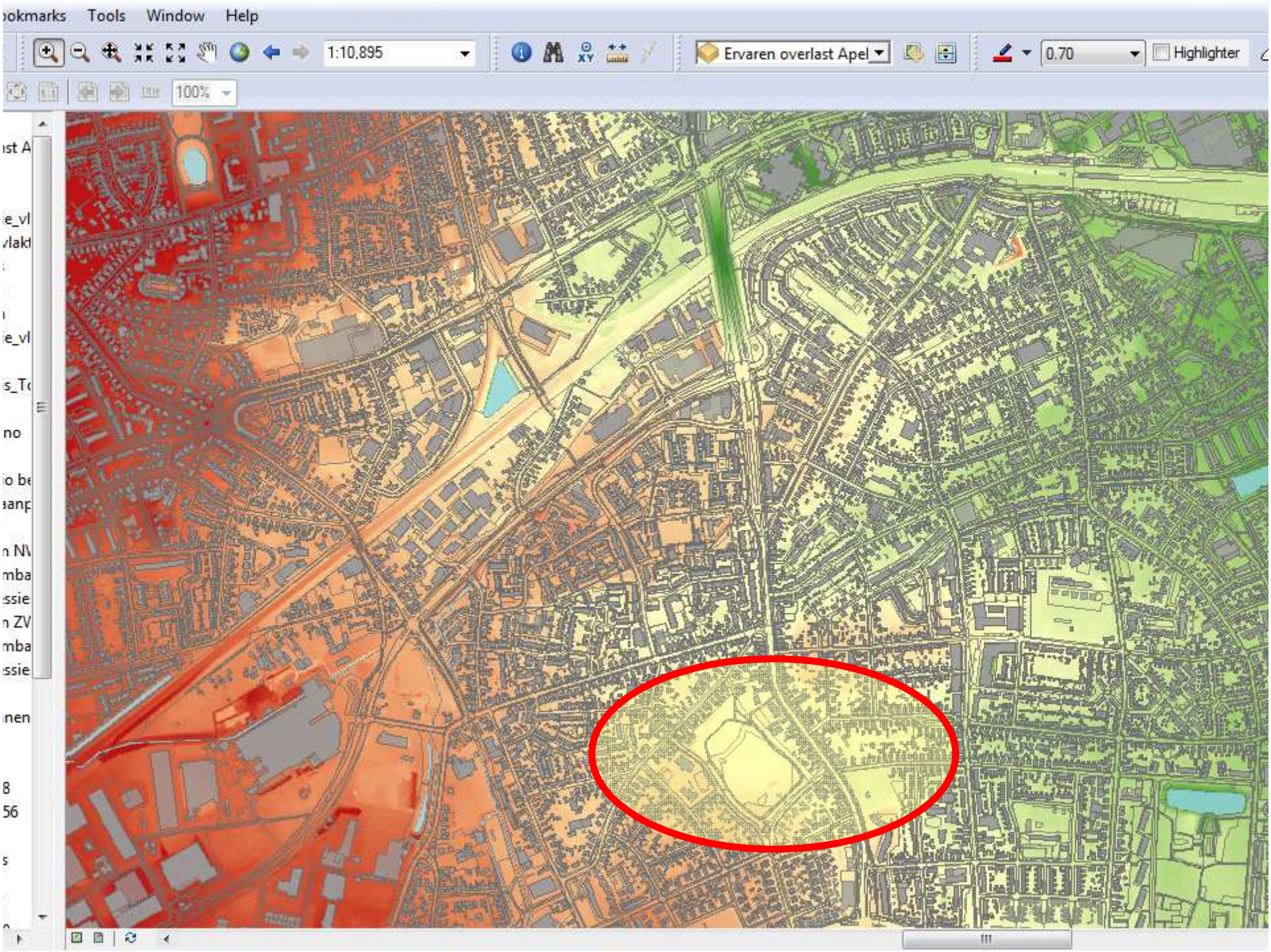
Urban flood maps

- Local situation
- Occurred floods
- Flood evaluation
  - DEM LiDAR: 1 point/m^2
  - Type of surface: houses, roads & water
  - Extreme storm: e.g. 60 mm (T=100 + climate change)
    - 20 mm in sewer (not simulated)
    - 40 mm on surface
  - Sewer system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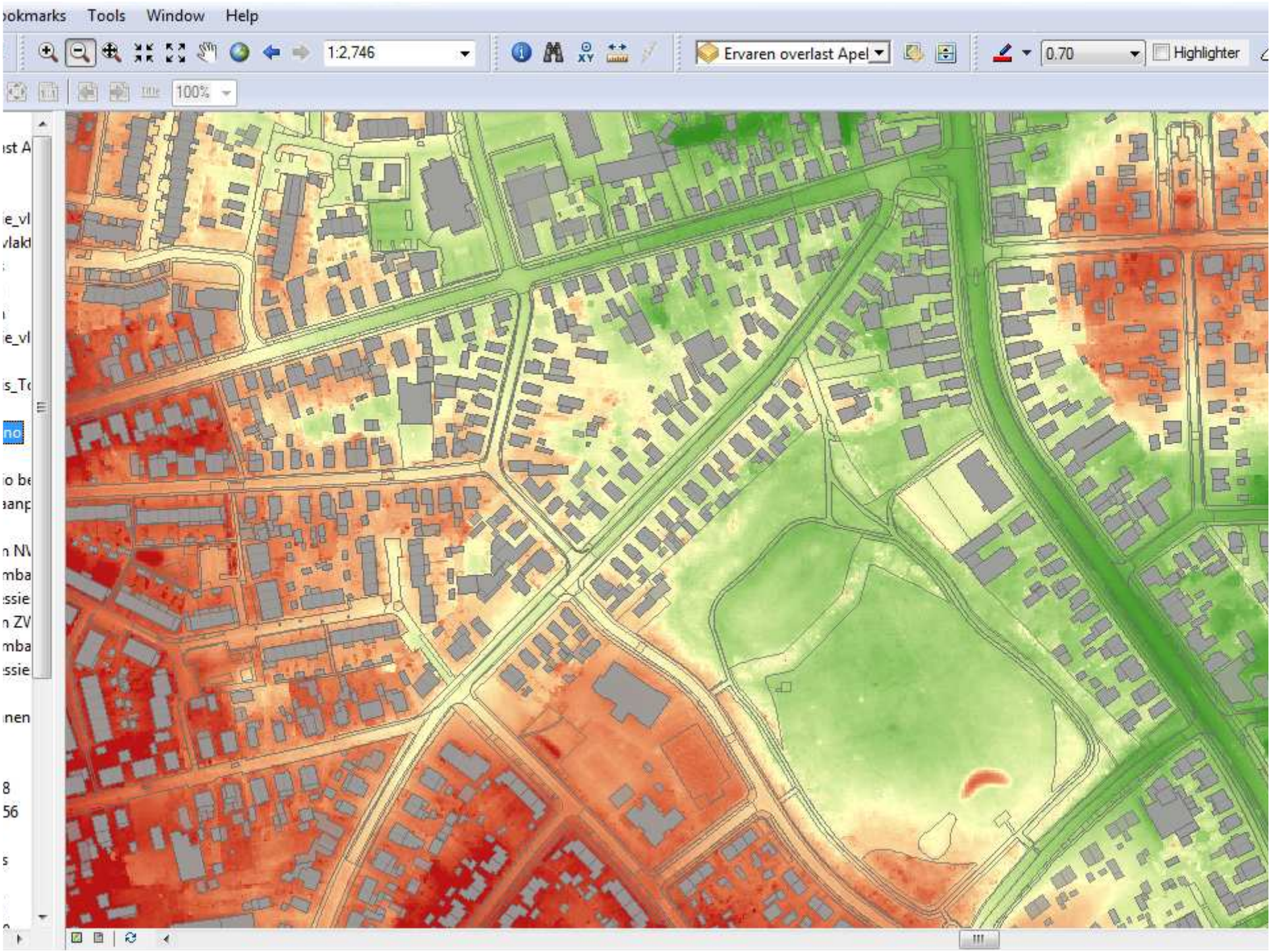
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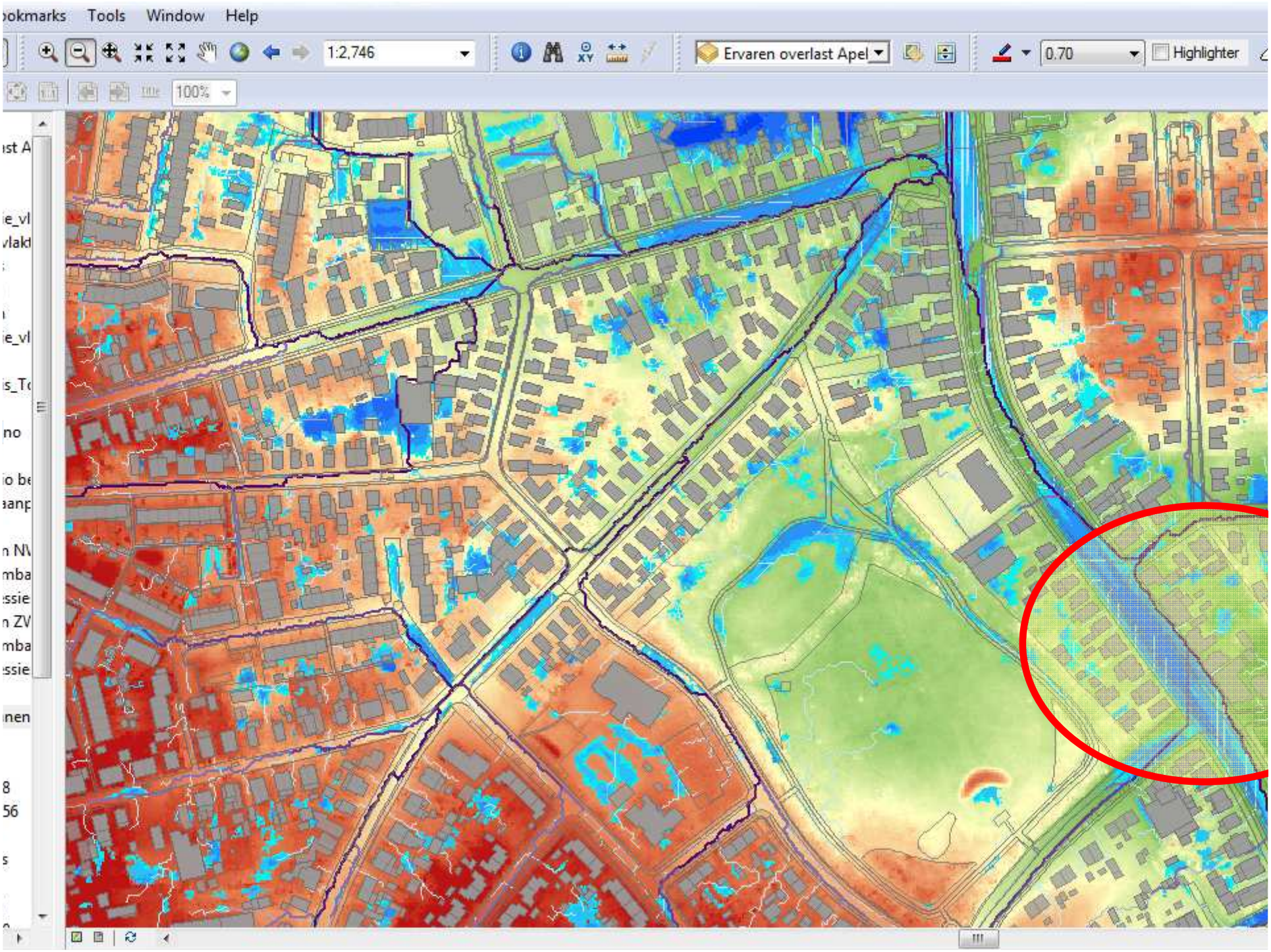
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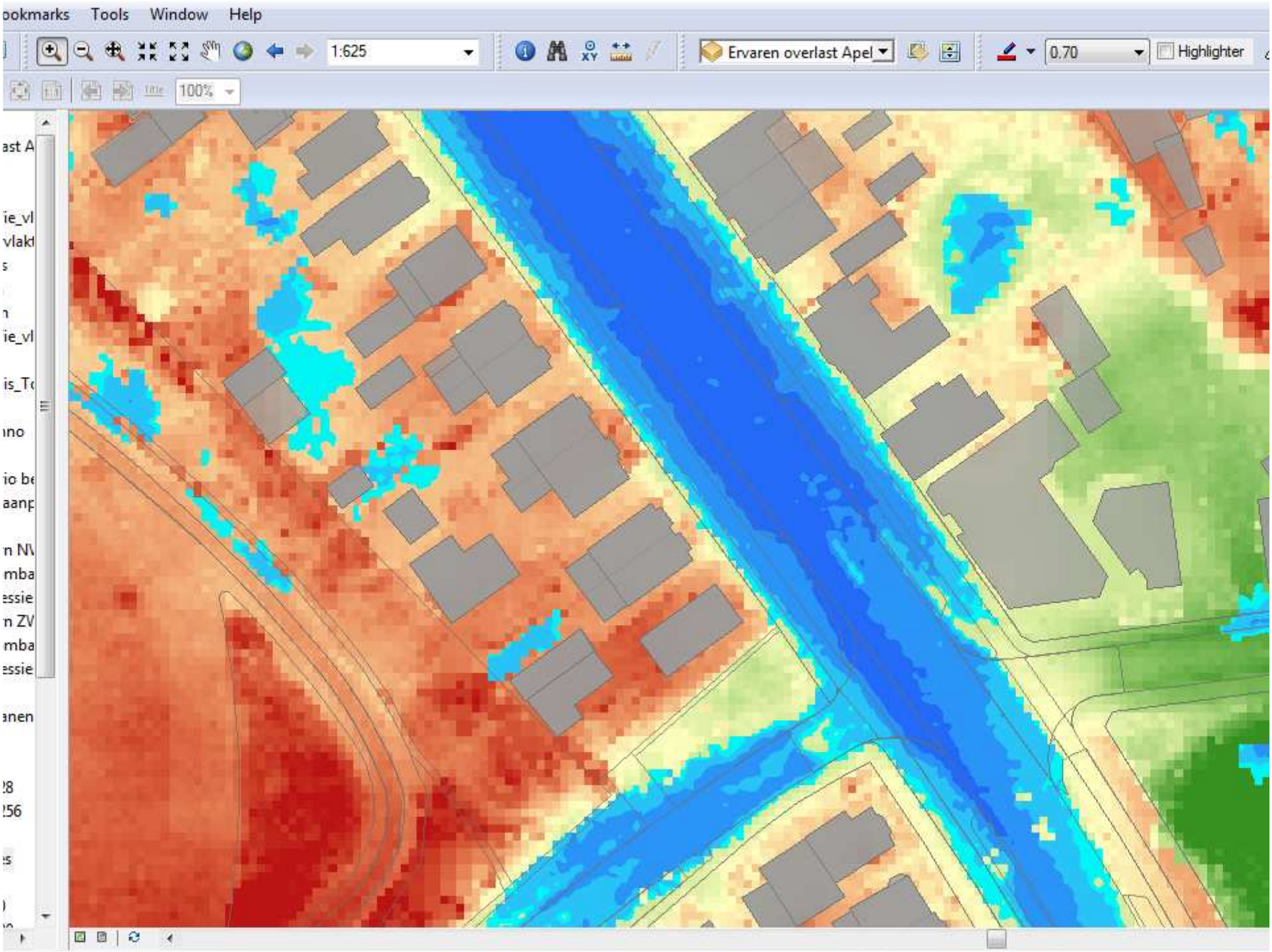
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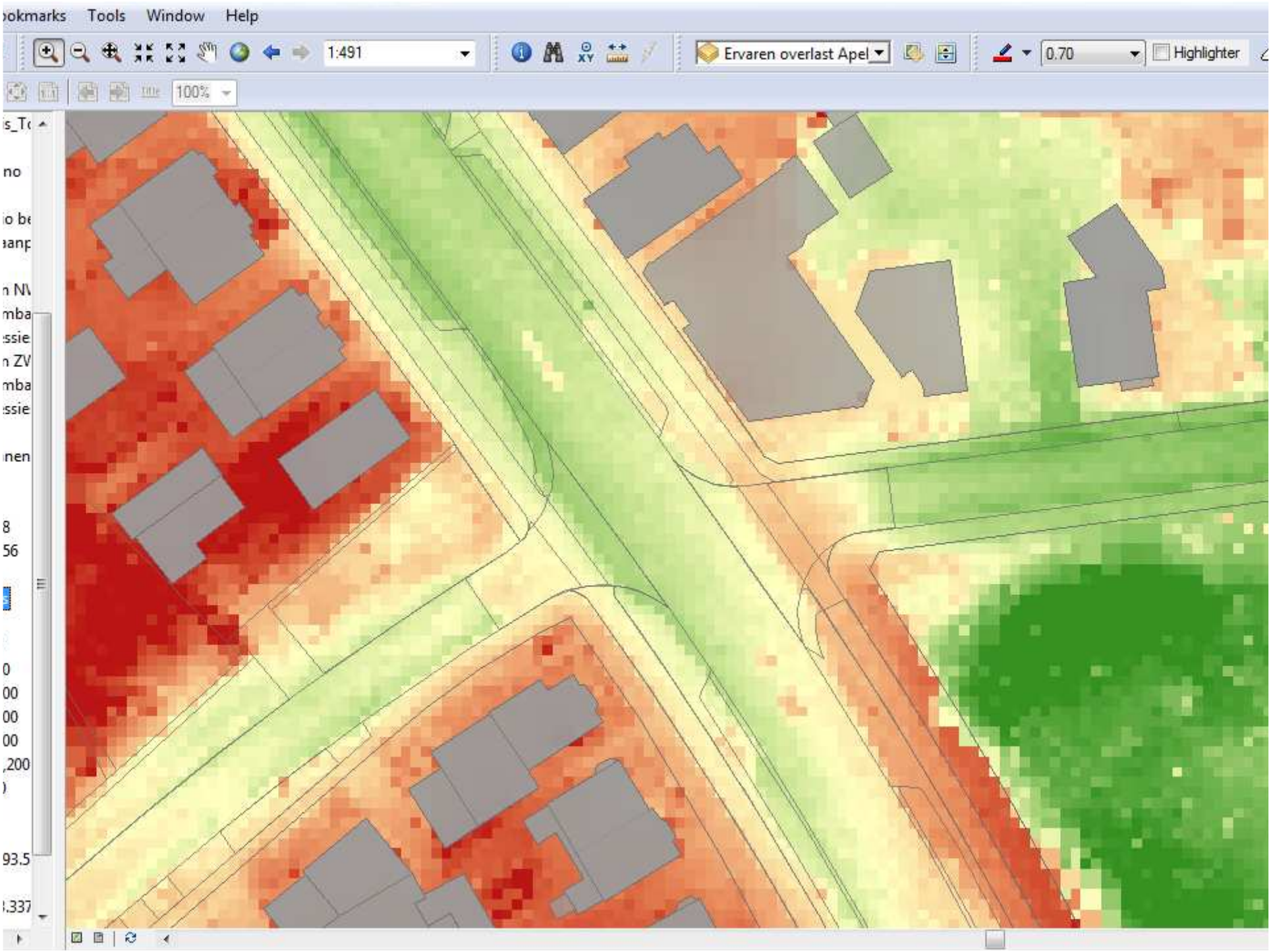
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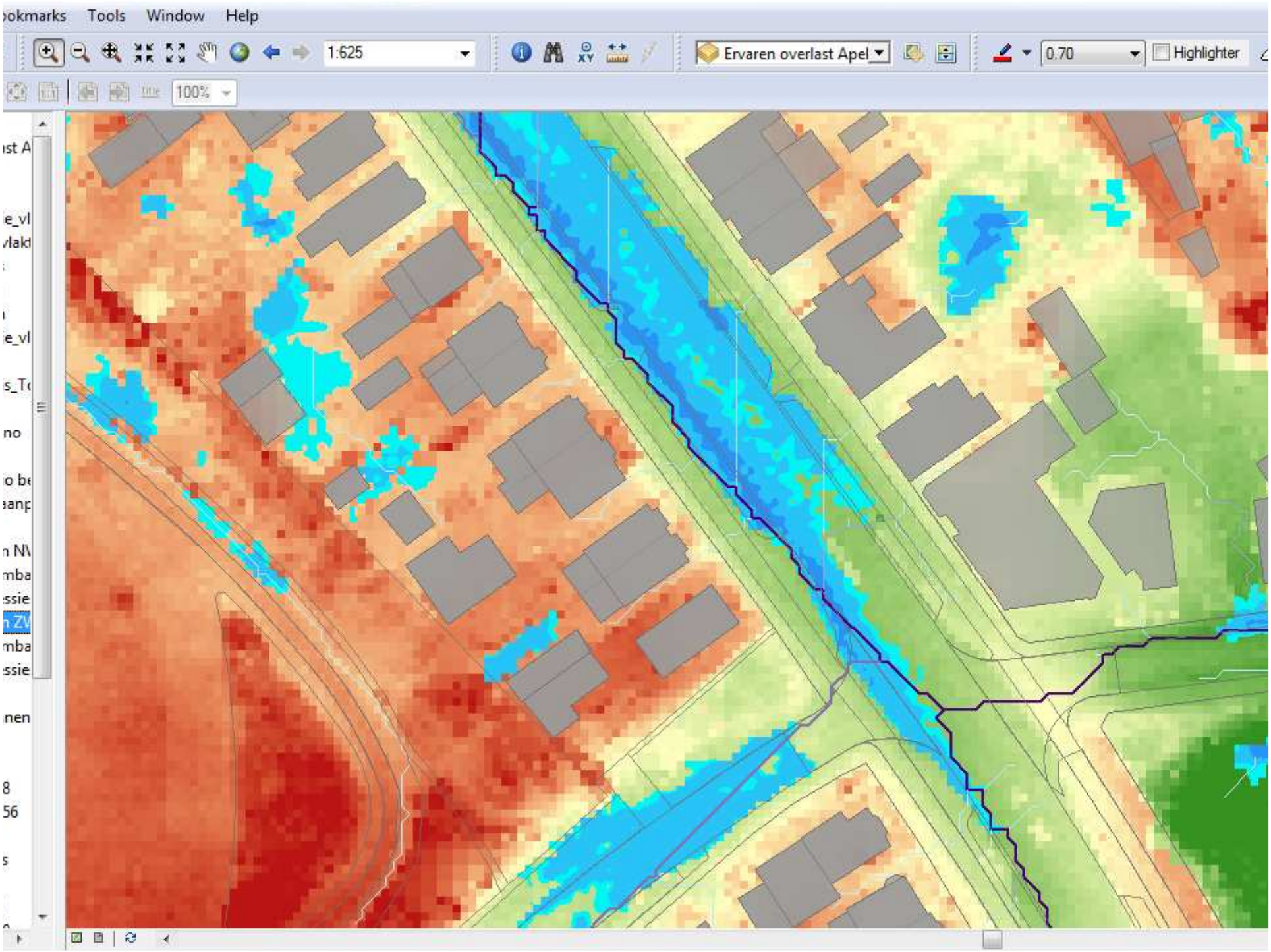
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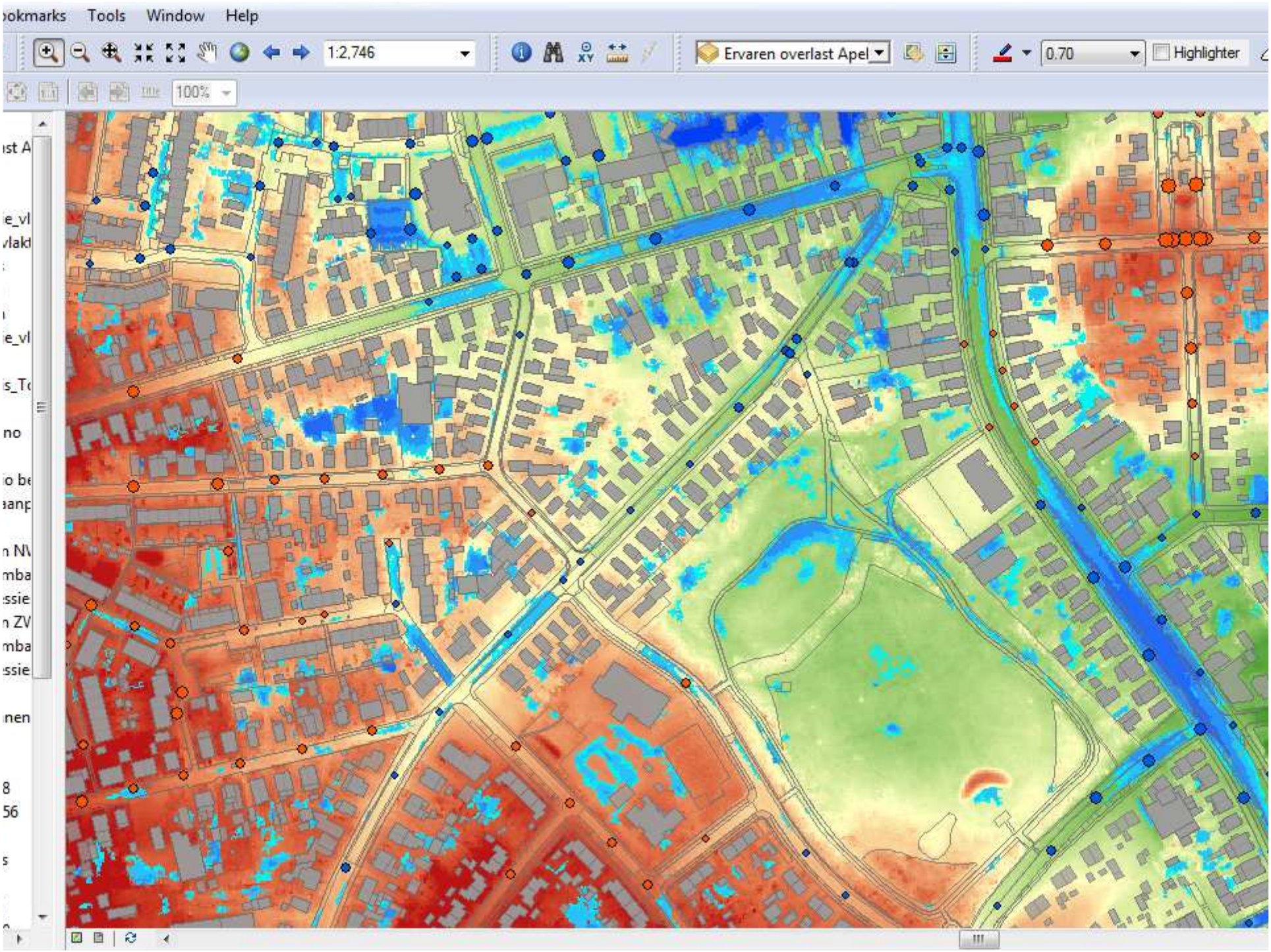
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Workshop

Discuss situation at extreme event

Find some solutions

Create awareness

Stakeholders

- Water,
- Green,
- Road,
- Mobility,
- Urban design,
- Project management

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Evaluation

Appears to work

- uncertainties are no obstacle

Results in

- more awareness for space for water
- collaboration
- more resilient urban areas in the future

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Questions?

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- Annelies Straatman
- Eric van Dijk