



# Utilizing AI for Flood Risk Management

The value of domain knowledge  
and quality data



**Nelen &  
Schuurmans**

13-7-2023



“In fact, the business plans of the next  
10,000 startups are easy to forecast:  
*Take X and add AI.*” (2014)

**Not AI but domain knowledge is what sets you apart from the rest**

IDEAS MADE TO MATTER | ARTIFICIAL INTELLIGENCE

**Why it's time for 'data-centric artificial intelligence'**

Sources:

<https://www.wevolver.com/article/not-ai-but-domain-knowledge-is-what-sets-you-apart-from-the-rest>

<https://mitsloan.mit.edu/ideas-made-to-matter/why-its-time-data-centric-artificial-intelligence>



# AI and Extreme Events

PRO:

- › AI is scalable in size and speed, utalizes big data and new (IT) science.

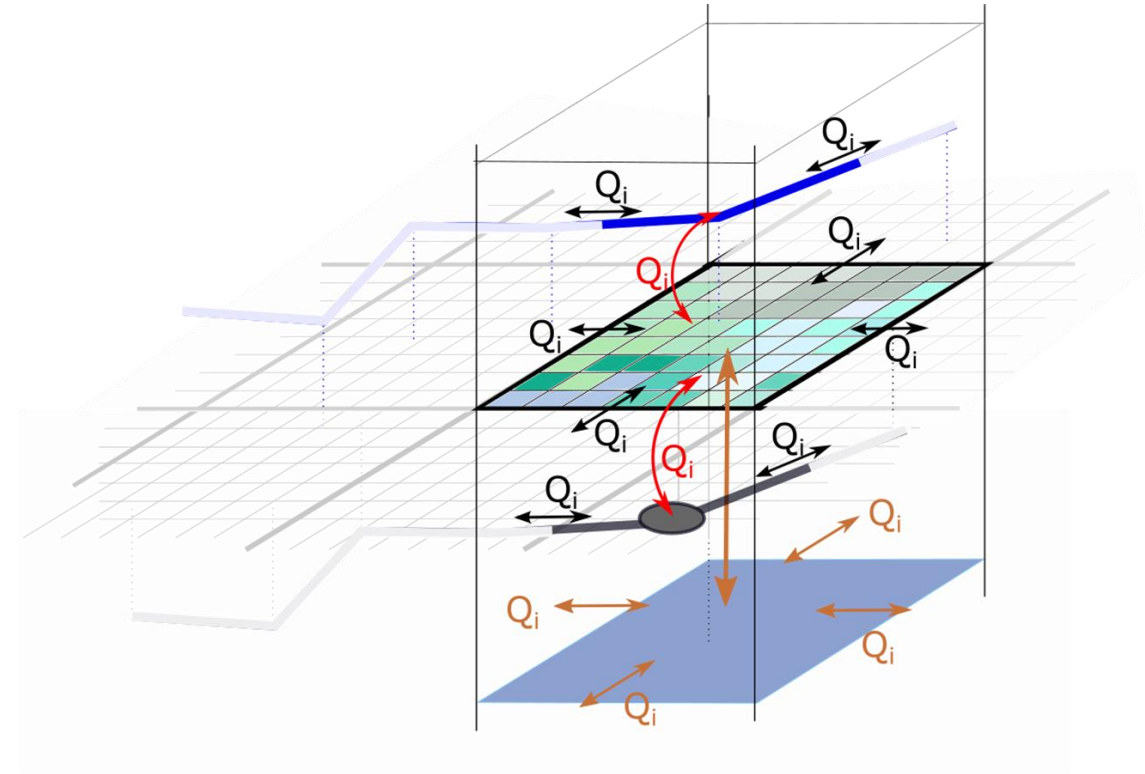
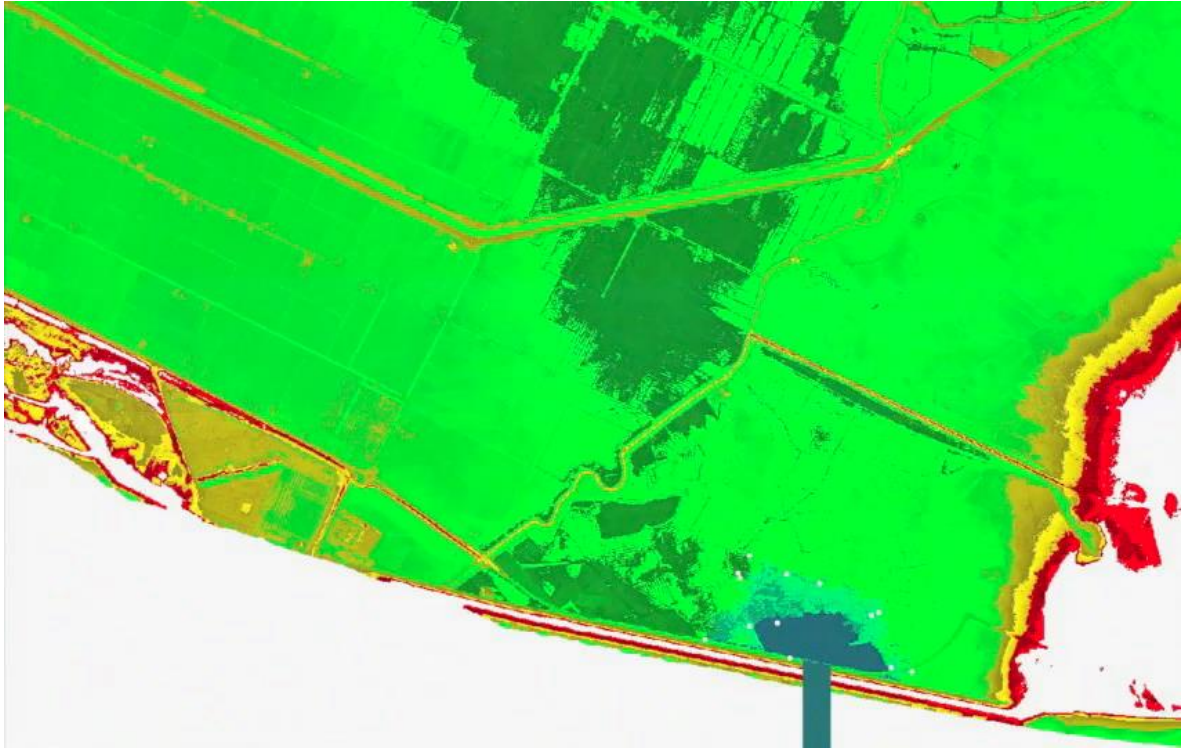
Challenge:

- › Extreme weather and climate change is uncertain by default.





# The behaviour of water = Physics





## Physical based numerical models (cons)

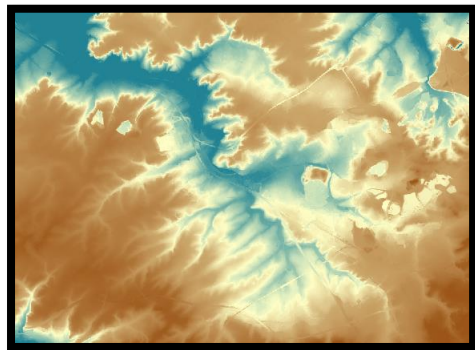
- › Are generally slow, offline and based on traditional computing concepts from 2nd half 20th century.
- › Have complex parameterisation (calibration, validation)



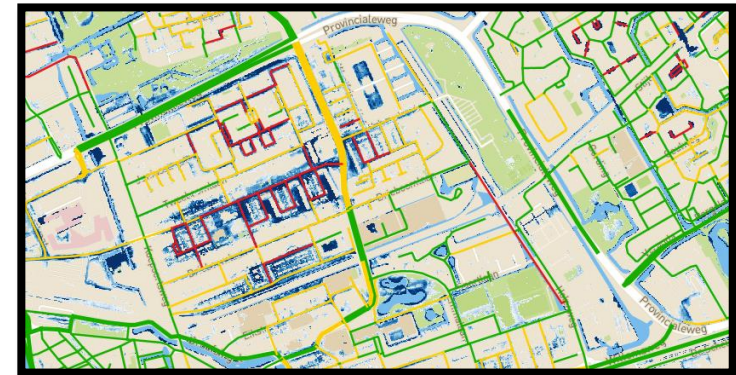
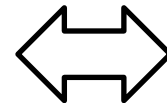
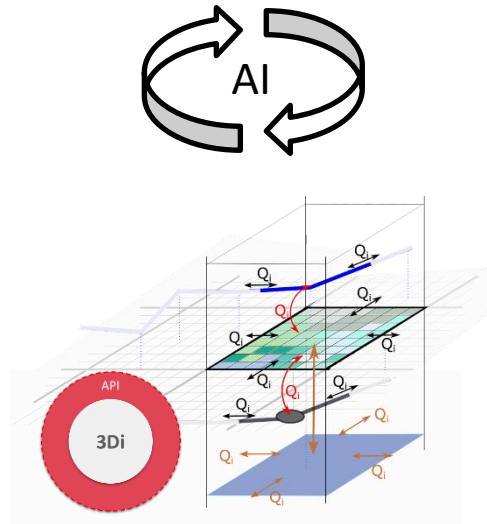
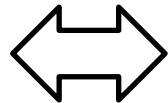


## AI – Combining the best of both worlds

- › We solved the challenges and created numerical model instrument for 21st century.
  - › We solved the **scalability, connectivity and interactivity**
    - › **Connectivity to other applications and 21st century AI driven tools**



AI



AI





## Example projects in Pakistan

- › Climate Innovation Challenge: Slamdam
- › Recharge Pakistan: Eco-system based adaptation







# Climate Innovation Challenge in Gilgit Baltistan

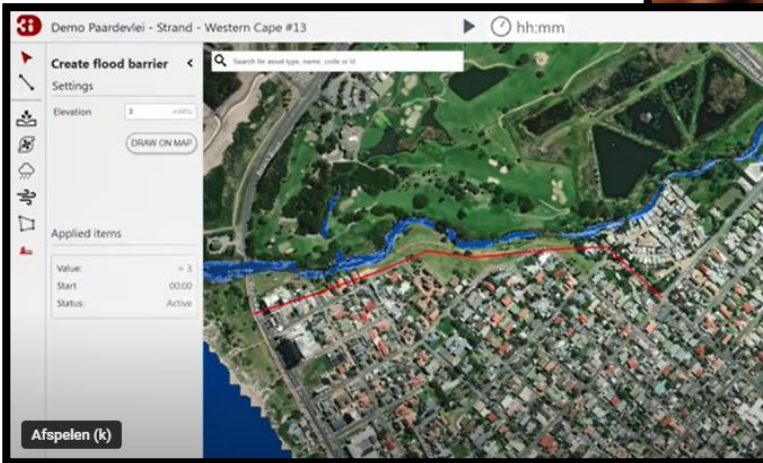
## SLAMDAM

A Rapidly Deployable  
Water-Filled Flood Barrier





# SLAMDAM Intelligence

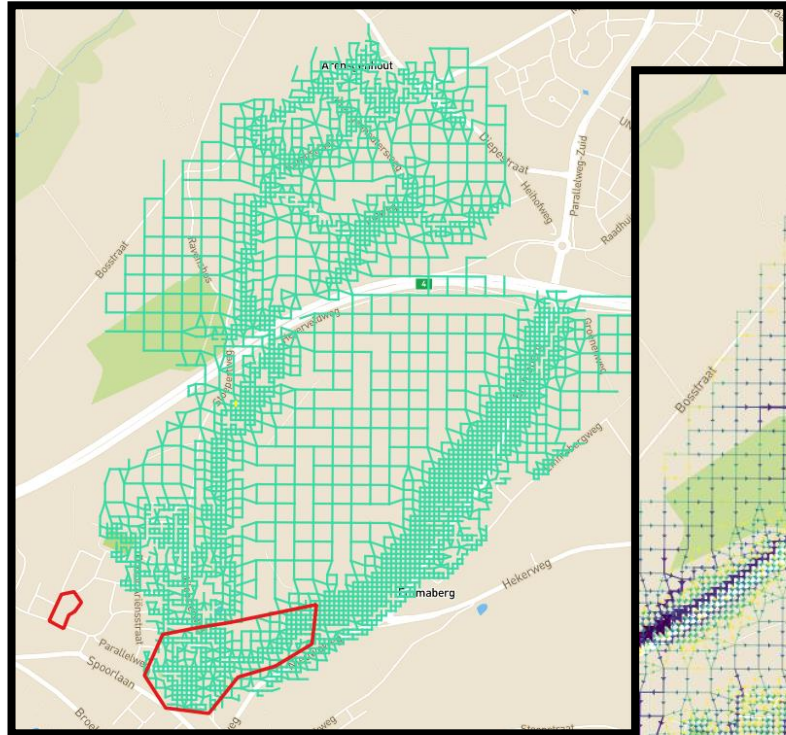




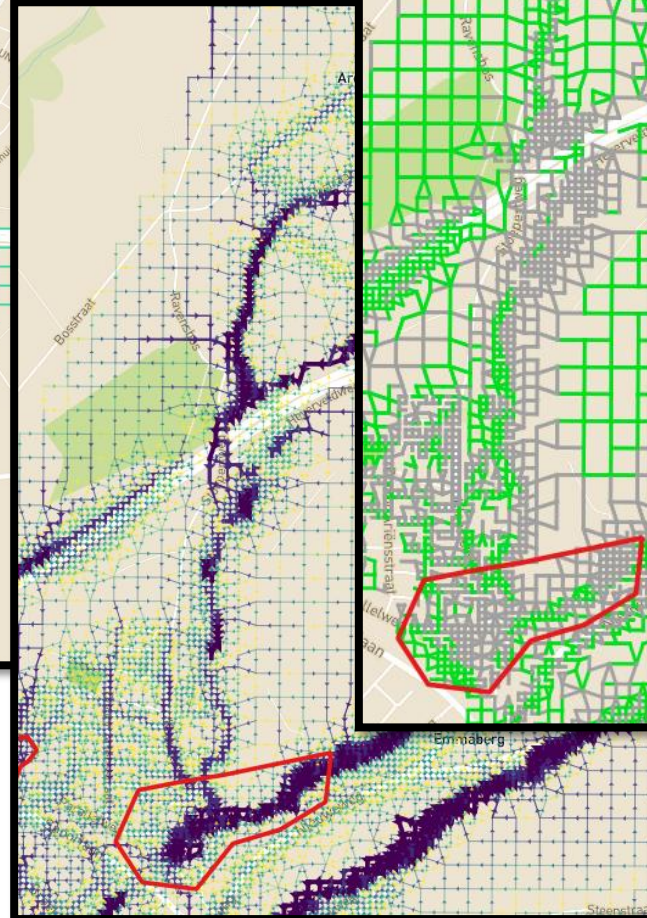
# Computer says ...

Suitability

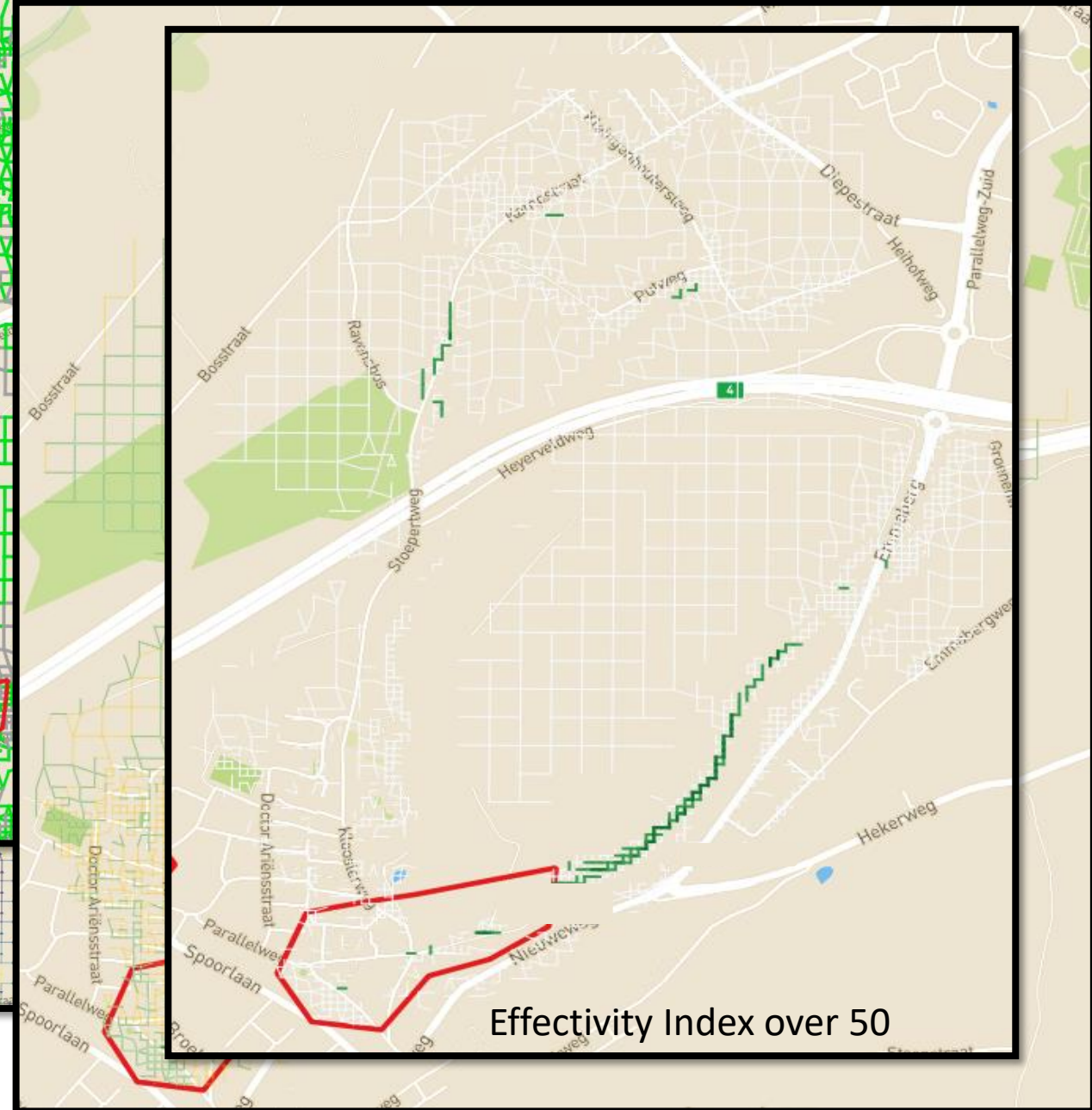
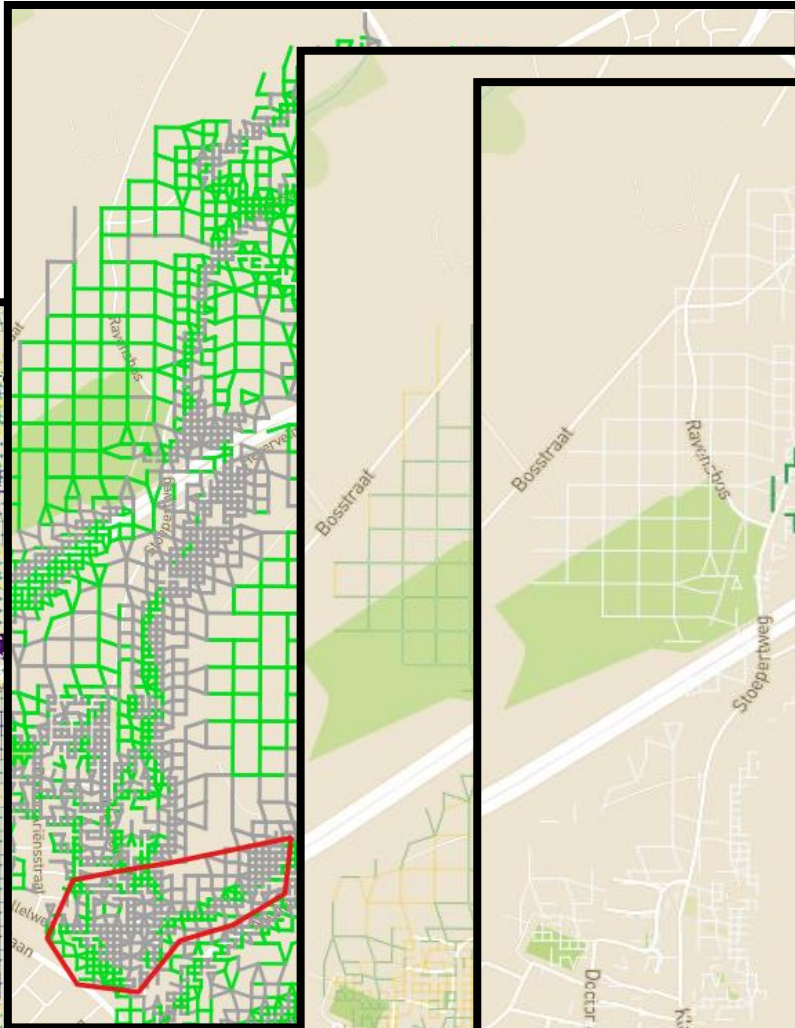
Effectivity Index



Upstream Watershed



Cumulative Discharge



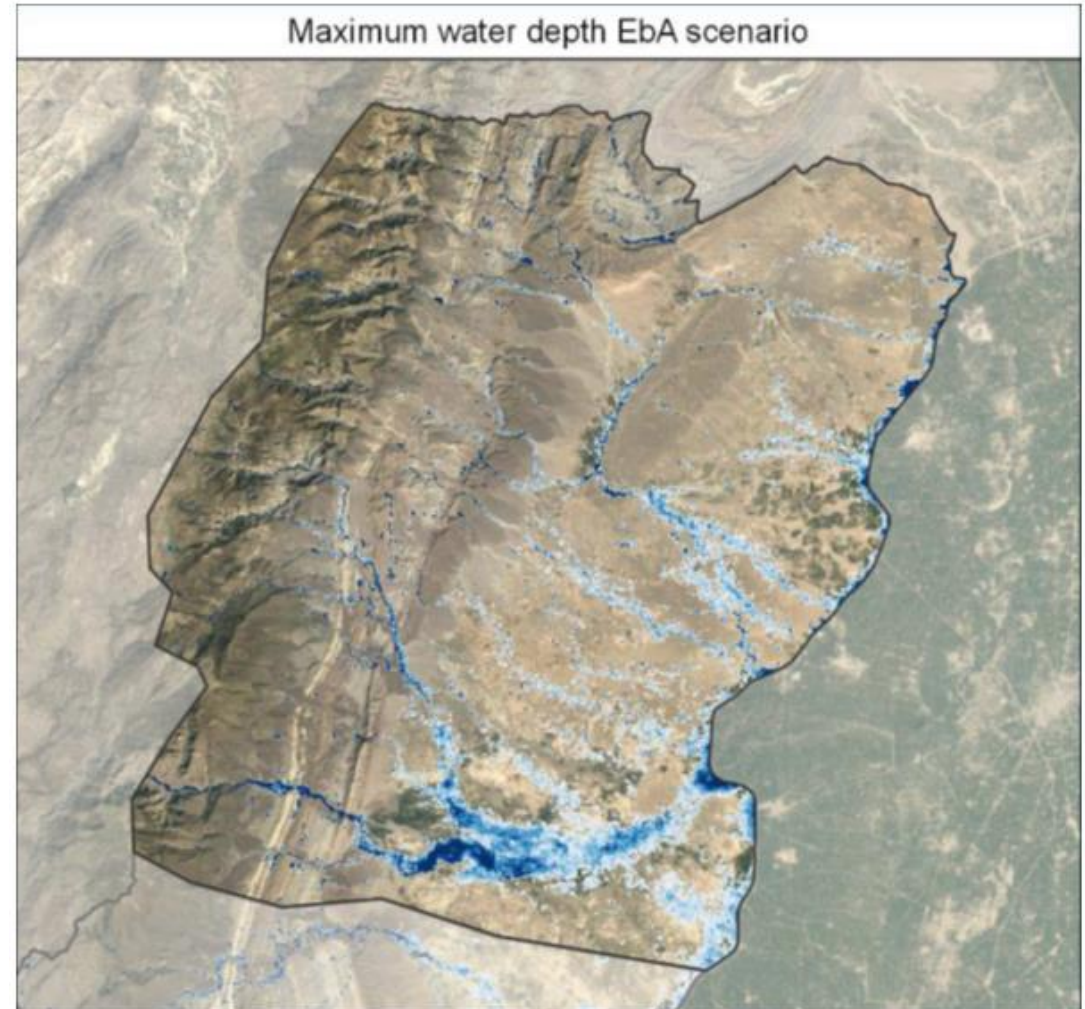
Effectivity Index over 50



## Recharge Pakistan – Nature-Based Solutions

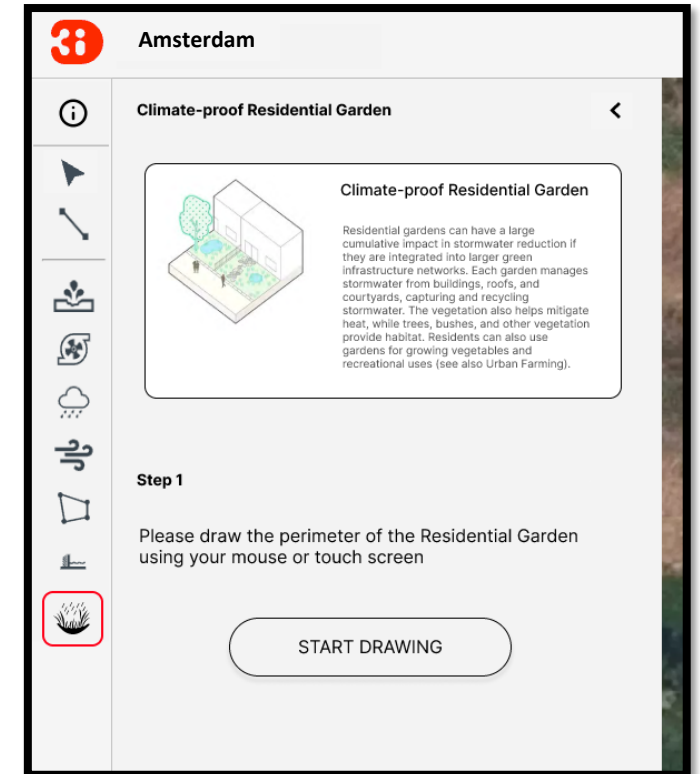
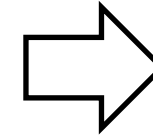
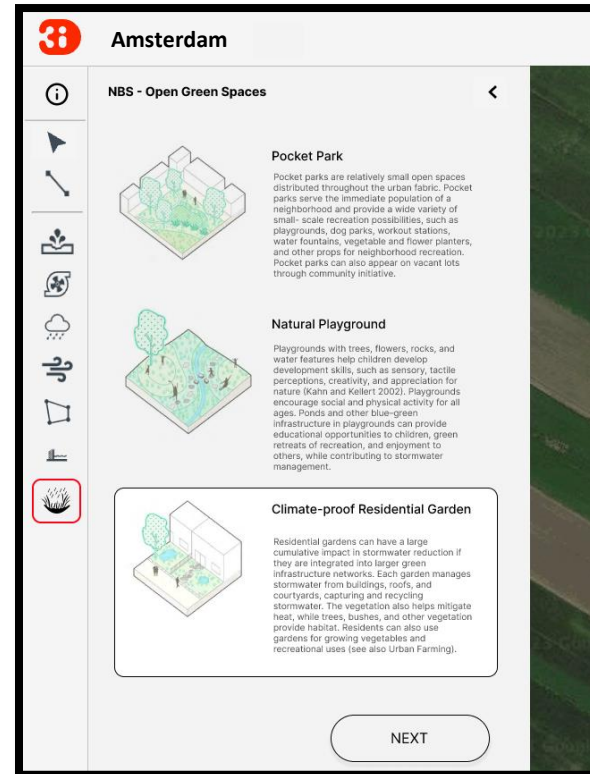
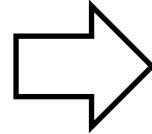
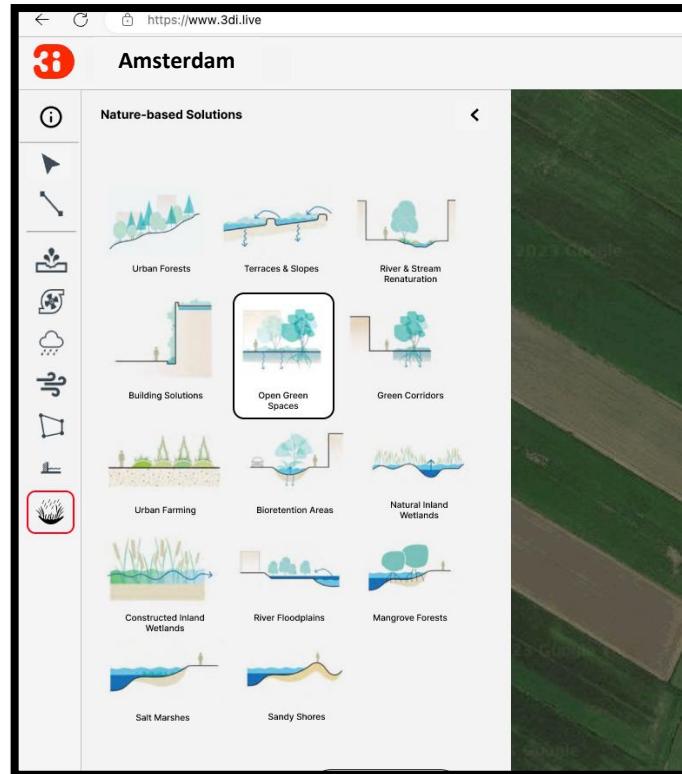
*“The hydrological modelling of Nelen & Schuurmans has shown us the impact that our intended Green Infrastructure (GI) interventions have on reducing climate induced flood risks throughout the Indus River Basin.”*

- › Masood Arshad PhD, Senior Director, Footprint, WWF-Pakistan





# Nature-Based Solutions (1/2)



Based on: Catalogue of Nature-Based Solutions for Urban Resilience (World Bank)

<https://openknowledge.worldbank.org/entities/publication/c33e226c-2fbb-5e11-8c21-7b711ecbc725>





# Nature-Based Solutions (2/2)

**Amsterdam** ▶ ⌚ hh:mm

**Climate-proof Residential Garden**

**Climate-proof Residential Garden**

Residential gardens can have a large cumulative impact in stormwater reduction if they are integrated into larger green infrastructure networks. Each garden manages stormwater from buildings, roofs, and courtyards, capturing and recycling stormwater. The vegetation also helps mitigate heat, while trees, bushes, and other vegetation provide habitat. Residents can also use gardens for growing vegetables and recreational uses (see also Urban Farming).

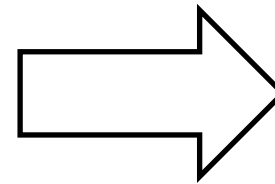
**Step 1**

Adjust the parameters

**Infiltration 20%**

**Green vs Grey 55%**

**FINISH**

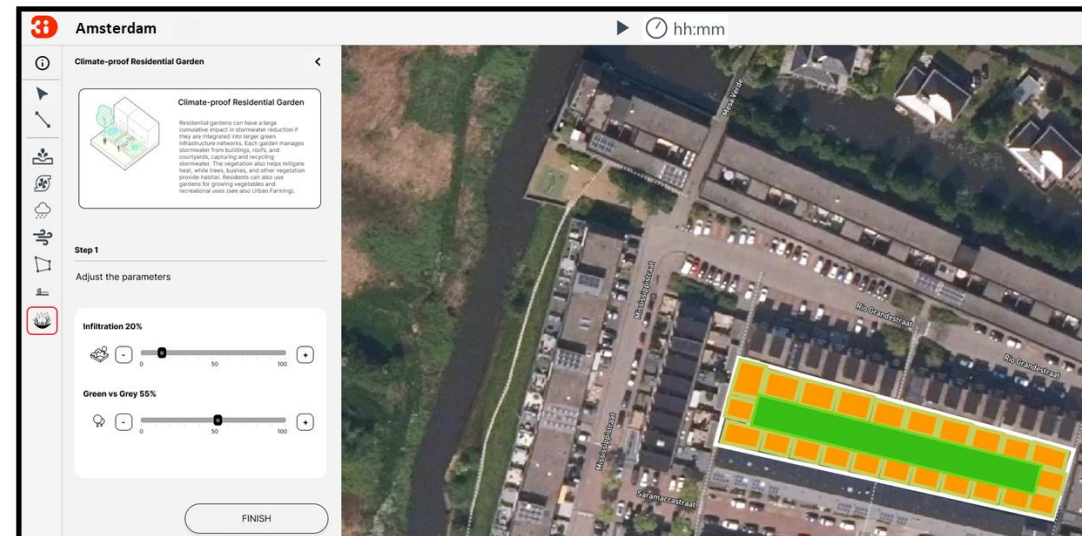
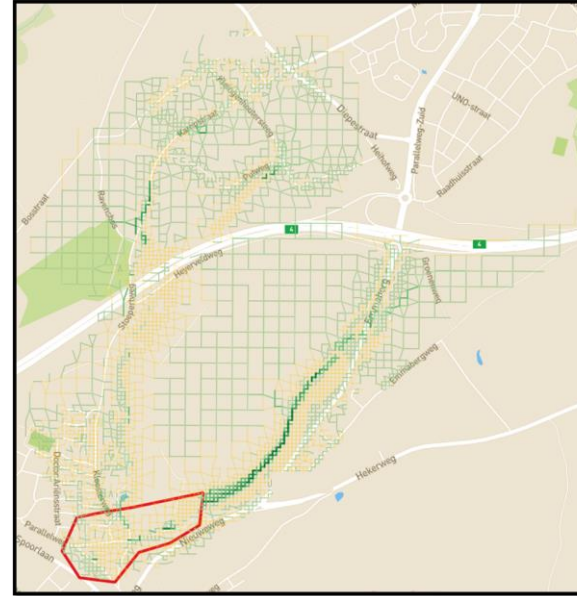
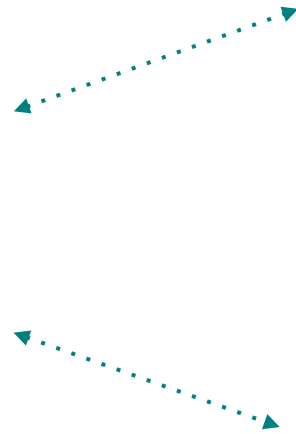
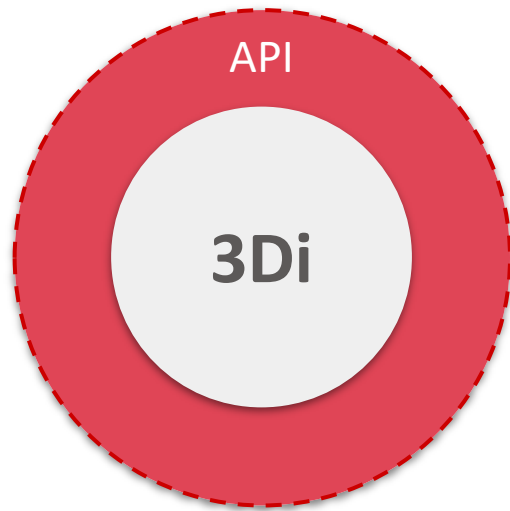


**Run Hydrodynamic Scenario**





# AI driven optioneering and designing?



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[www.3diwatermanagement.com](http://www.3diwatermanagement.com)

[www.lizard.net](http://www.lizard.net)

