

RTC-Tools Interactieve Sessie



Nelen &
Schuurmans

8-6-2023



Operational Water Managers





Road to polders from mountains



Polder Control with RTC-Tools

Boran Ekin Aydin – Bernhard Becker



**Nelen &
Schuurmans**

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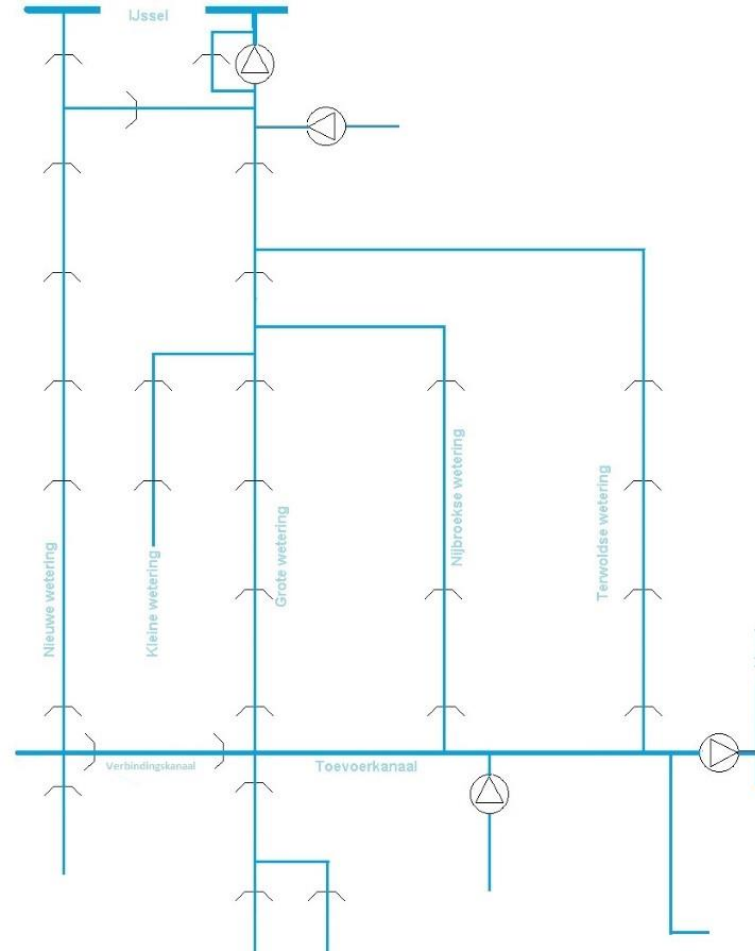


Polder Nijbroek





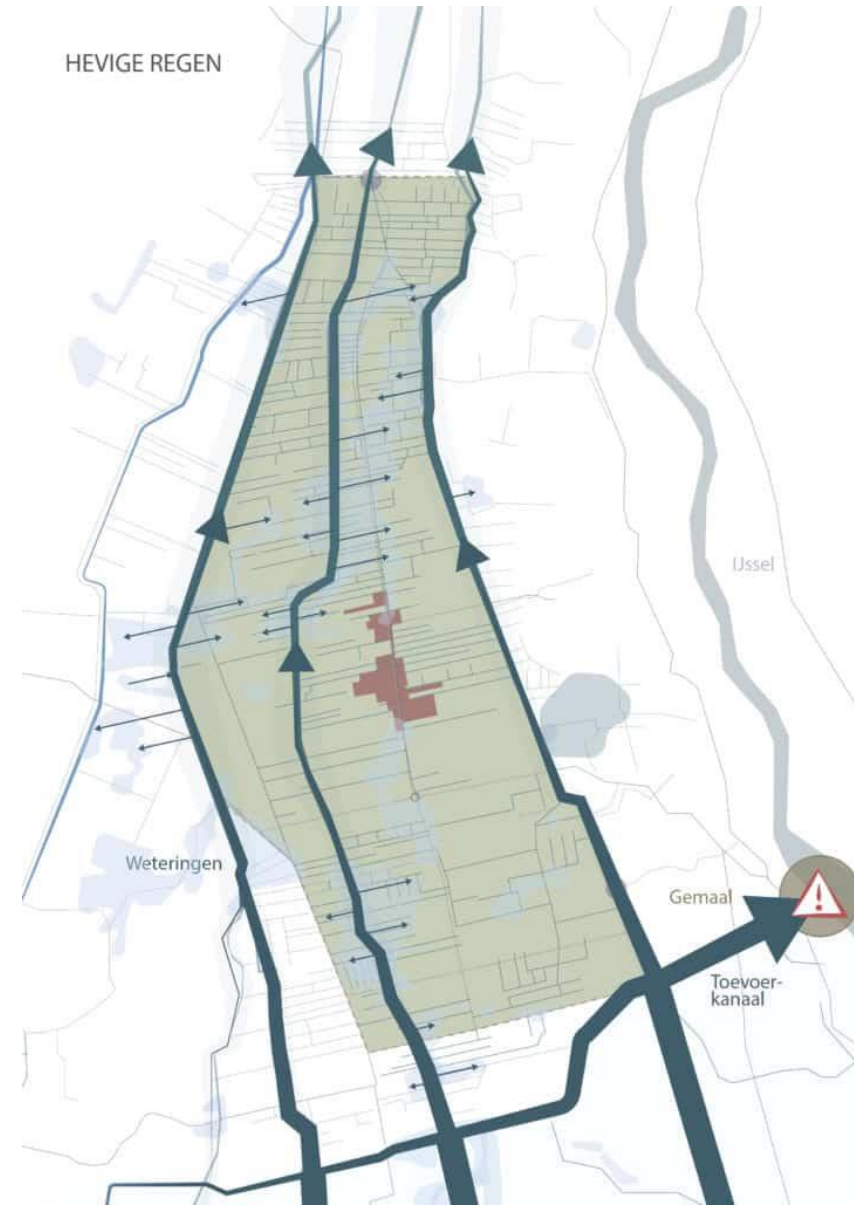
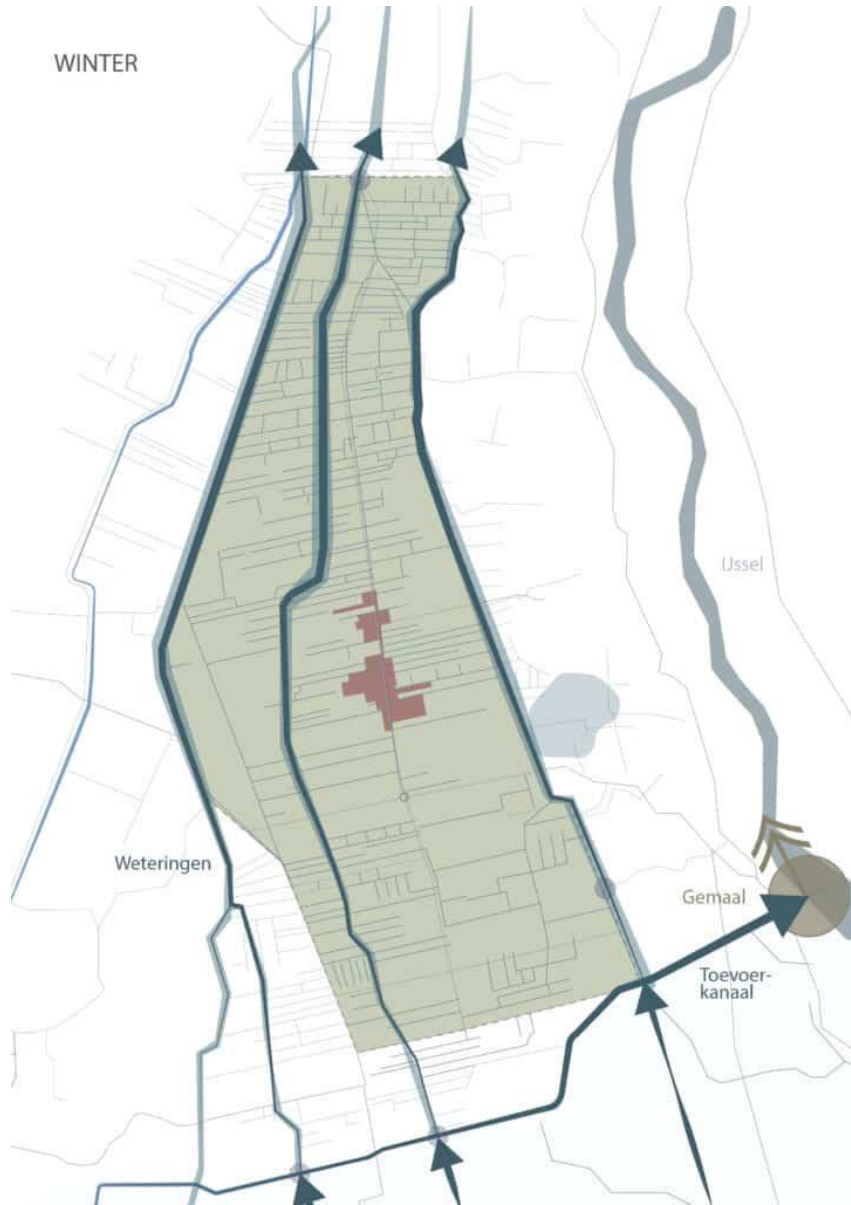
Polder Nijbroek





Nat situatie

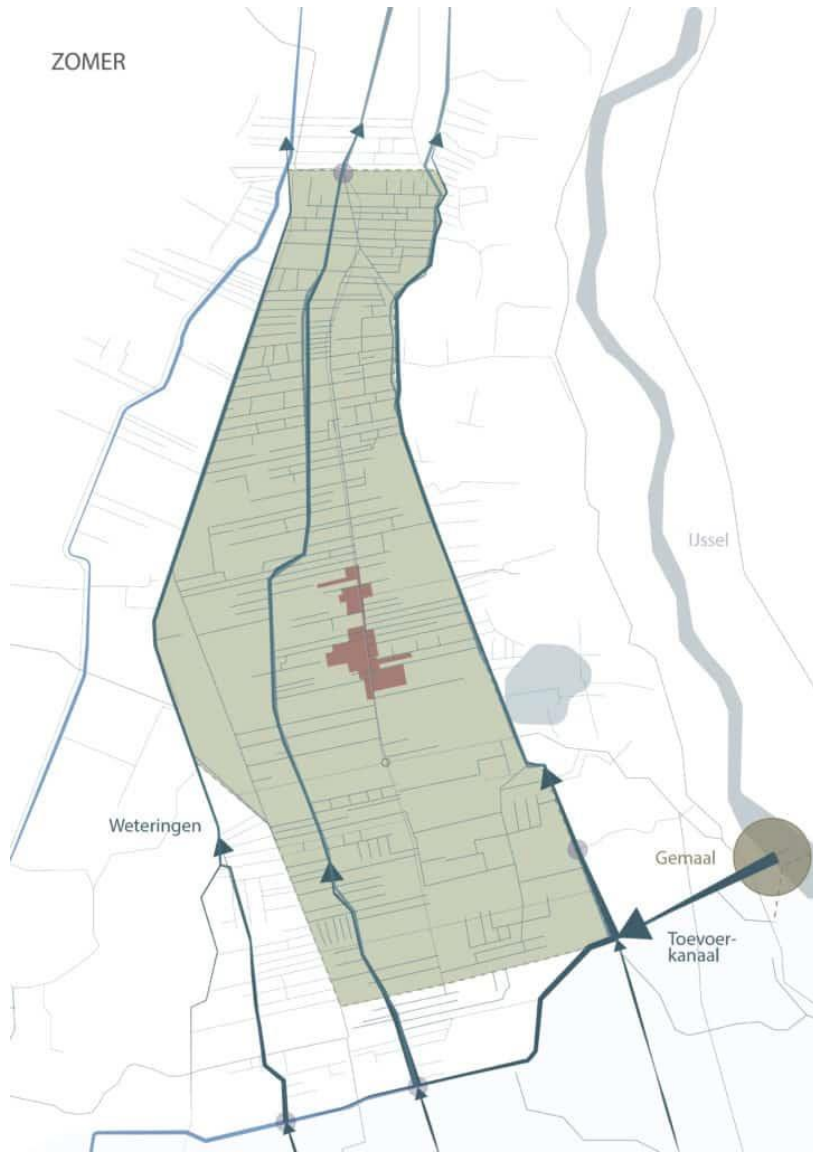
<https://waterinpoldernijbroek.nl/hoe-werkt-het-nijbroekse-watersysteem-nu/>





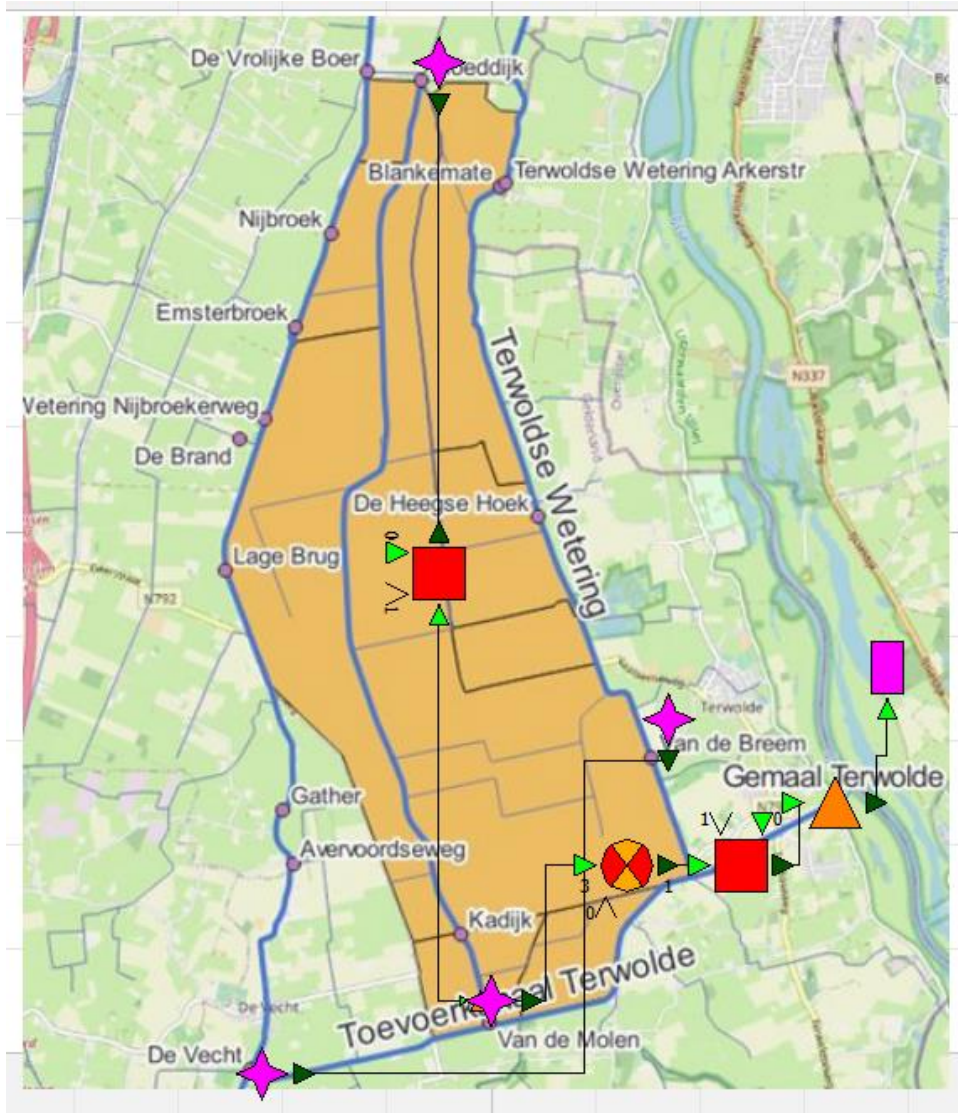
Droog – huidige situatie

<https://waterinpoldernijbroek.nl/hoe-werkt-het-nijbroekse-watersysteem-nu/>





RTC-Tools model



RTC-Tools optimization model schematization:

- Weirs
 - Vloeddijk
 - De Vecht
 - Van de Molen
 - Van de Breem
- Pump
 - Gemaal Terwolde
- Storage nodes
 - Nijbroek
 - Toevoerkanaal
- Node
 - Toevoerkanaal
- Lateral inflow
 - SOBEK-RR
 - ML





DEMO



Delft-FEWS



RTC-Tools





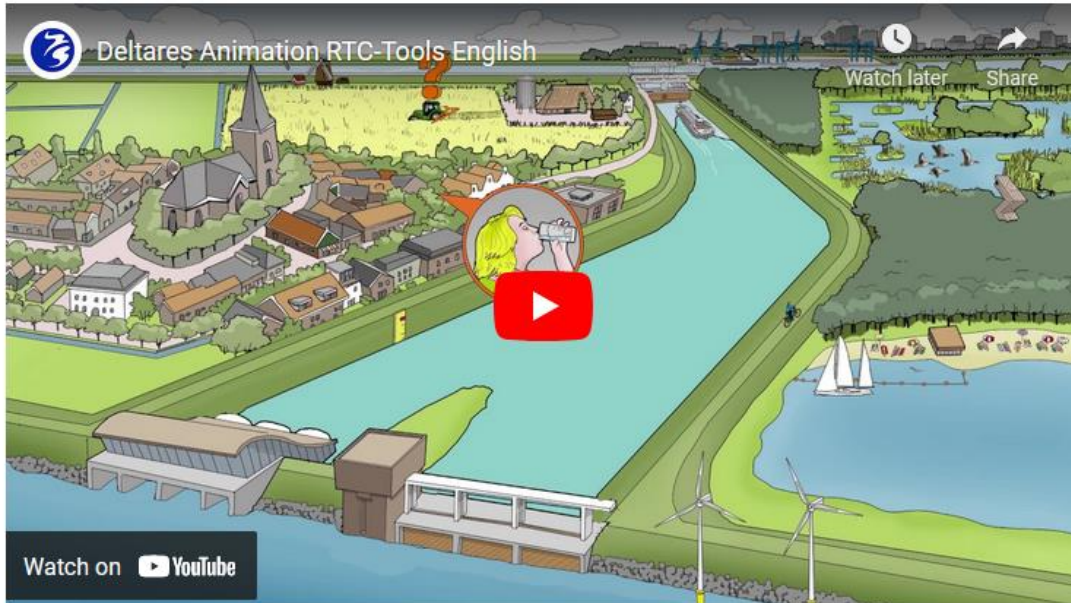
RTC-Tools



RTC-Tools

- › A toolbox for (real-time) control and optimization of water systems
- › Websites
 - › <https://www.deltares.nl/en/software/rtc-tools/>
 - › <https://oss.deltares.nl/web/rtc-tools>

- › Open source
- › Building blocks with various flow equations (Modelica)
- › Comes as Python package
- › Conflict resolution with goal programming and weighting factors
- › Ensemble optimization
- › Integrates in Delft-FEWS for operational use  **Delft-FEWS**



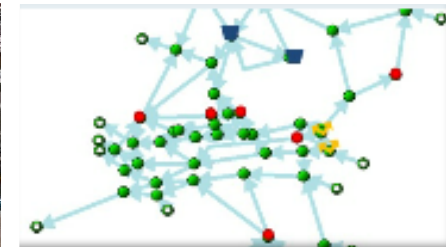
RTC-Tools Application fields

Hydropower



Niagara Falls (Canada)
British Columbia (Canada)
Drau (Austria)

Water allocation



Quick Water Allocation
Scanning Tool QWAST
(Netherlands)

Polder systems



Hoogheemraadschap van
Rijnland
Waterschap Noorderzijlvest





The future

Operation

- › Operational schedule advise for operators every day
 - › Climate change: new challenges for flood and drought management
 - › Decision support for new staff members
- › Smart operations:
less energy costs, less CO₂ emission, less flood/drought damage
 - › Anticipation on weather forecast instead of pump switch on/off levels (aan-/uitslagpeil)
 - › Avoid pump operation on days with only little rainfall: prefer gravity flow through sluices above pumping (bij voorkeur spuien (laagtij) in plaats van malen)
 - › Take action in advance in case of heavy rainfall (voormalen: hoe veel, wanneer starten?)
 - › Flexible target water levels (streefpeil) during drought periods

Investments and long-term strategy

- › Postpone investments for new infrastructure
 - › Large pump stations (uitwateringsgemalen) are a huge investment
 - › Better usage of existing assets might allow to postpone investments
- › Use the canal system as “energy buffer”
 - › align energy consumption with wind and solar power generation
- › Large scale operations
 - › Coordinate the usage of canals and infrastructure among the water authorities
 - › for drainage (flood)
 - › and water supply (drought)





Questions

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