



Rijkswaterstaat

Drought in the Netherlands

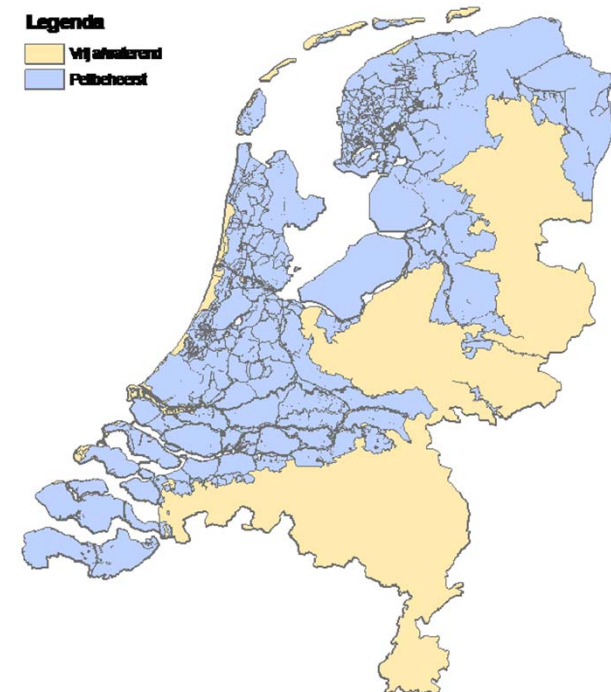
Vincent Beijk Msc – senior advisor

Rijkswaterstaat
Ministry of Infrastructure and Water



Drought in the Netherlands

- Fresh water supply from
 - surface water (lakes and rivers)
 - ground water and/or precipitation

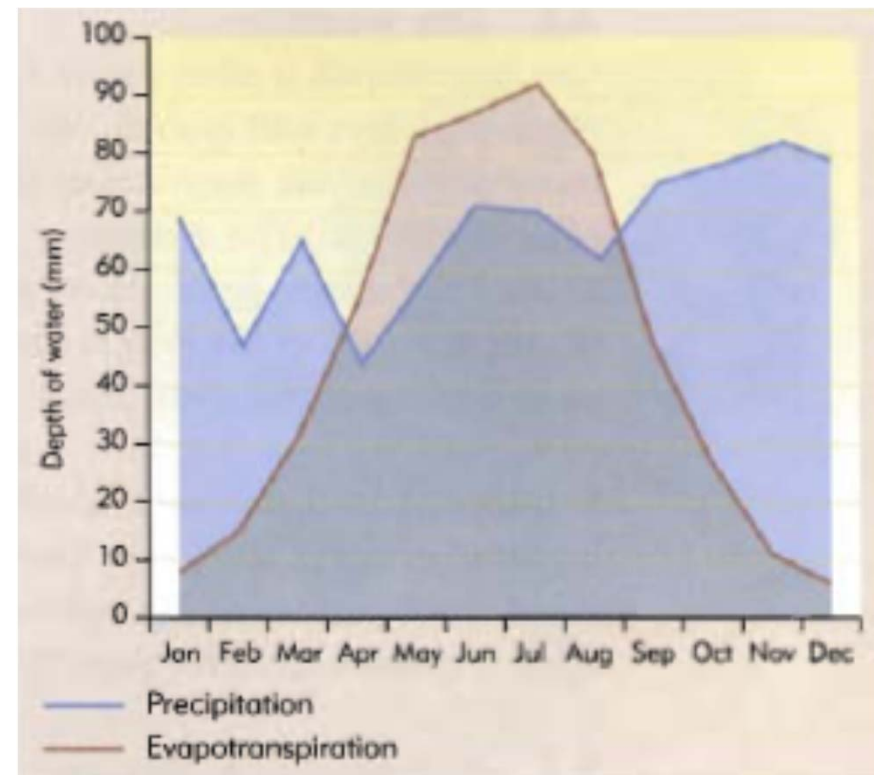




Supply of fresh water

Rivers 75%
Precipitation 25%

- Precipitation deficit in summer
- Mainly depending on supply of fresh water from the Rhine





Content

- Characteristics
- Management
- Information and data
- Future developments
- Reflection on EDO



Category 1

Safety and prevention of irreversible damage

1. *Stability of dikes*
2. *Soil subsidence (peat)*
3. *Nature (when dependent on soil conditions)*

precedes



Category 2

Public utilities

1. *Drinking water*
2. *Energy production*

precedes



Category 3

Small-scale use with high added value

- *Temporary sprinkling of capital-intensive crops*
- *Process water*

precedes



Category 4

Other demands (assessment on economical/societal arguments)

- *Shipping*
- *Agriculture*
- *Nature (no irreversible damage)*
- *Industry*
- *Recreation*
- *Fishery*

Rijkswaterstaat



Watermanagement during low flows

- National Coordination Committee on Water Allocation
 - Consists of different water authorities (ministry, waterboards and provinces) and the national meteorological institute
 - Active during times of low flows and/or drought
 - Monitoring and communication
 - Advising on possible measures for water allocation
 - Based on priority sequence



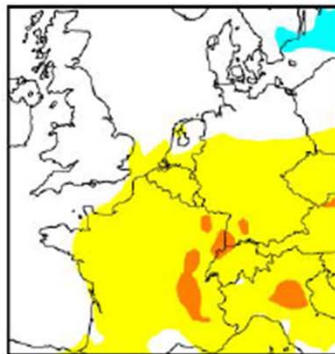
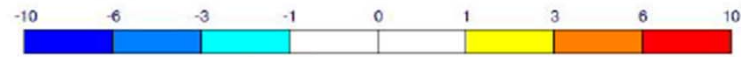
Information used

- Long-term (10-14 days) development of river flow (Rhine and Meuse)
 - Discharge (fresh water supply)
 - Water depth (inland shipping)
- Long-term weather forecast (weekly, monthly, seasonal)
 - Duration of drought event
- Short-term weather forecast (hours, days)
 - Potential local, high intensity rainfall
 - Potential high, westerly winds (storm surge)
- Soil moisture
- Demand for freshwater
 - Agriculture
 - Ecology
 - Industry

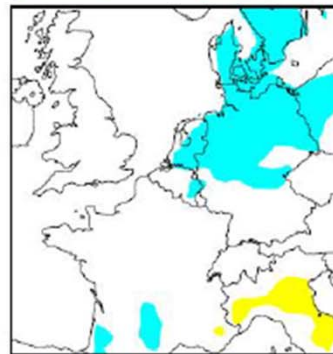


Verwachte temperatuurafwijkingen (°C)

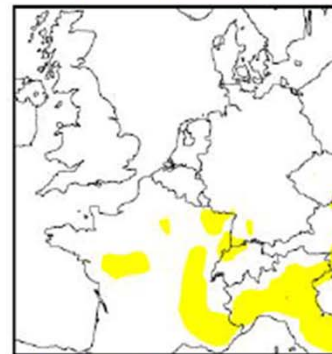
based on ECMWF run: 2017071700



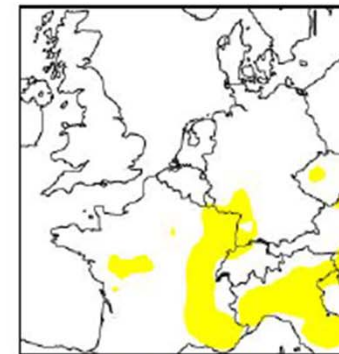
Week: 17/07 - 24/07



Week: 24/07 - 31/07

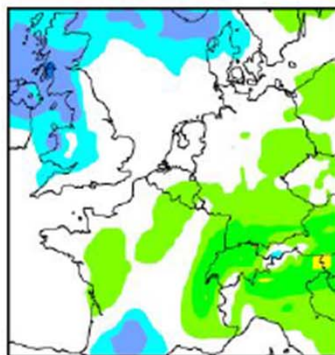
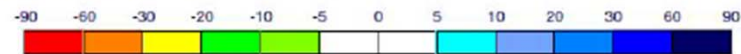


Week: 31/07 - 07/08

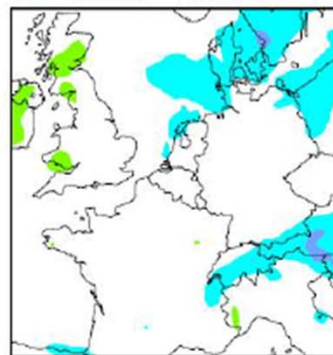


Week: 07/08 - 14/08

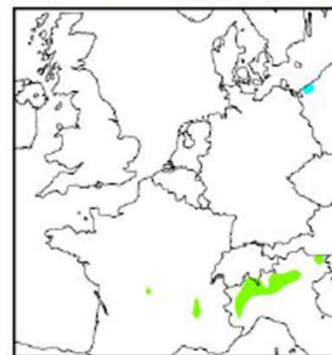
Verwachte afwijkingen in de neerslaghoeveelheid (mm)



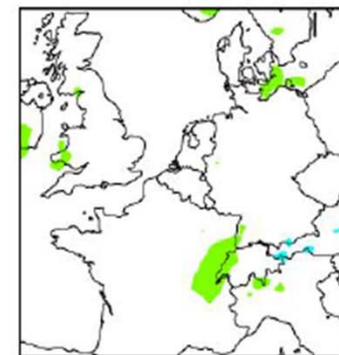
Week: 17/07 - 24/07



Week: 24/07 - 31/07



Week: 31/07 - 07/08



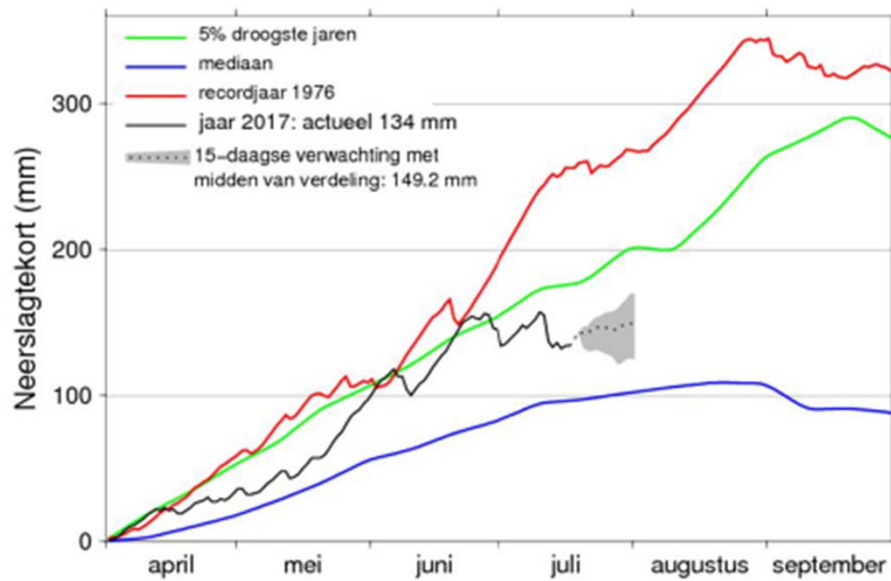
Week: 07/08 - 14/08

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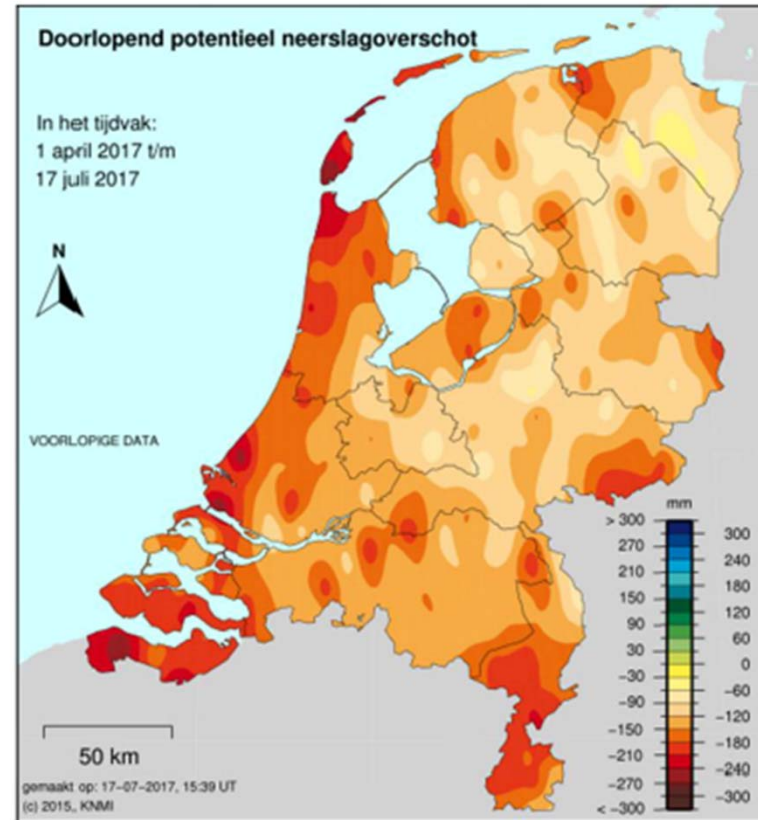


Neerslagtekort in Nederland in 2017

Landelijk gemiddelde over 13 stations

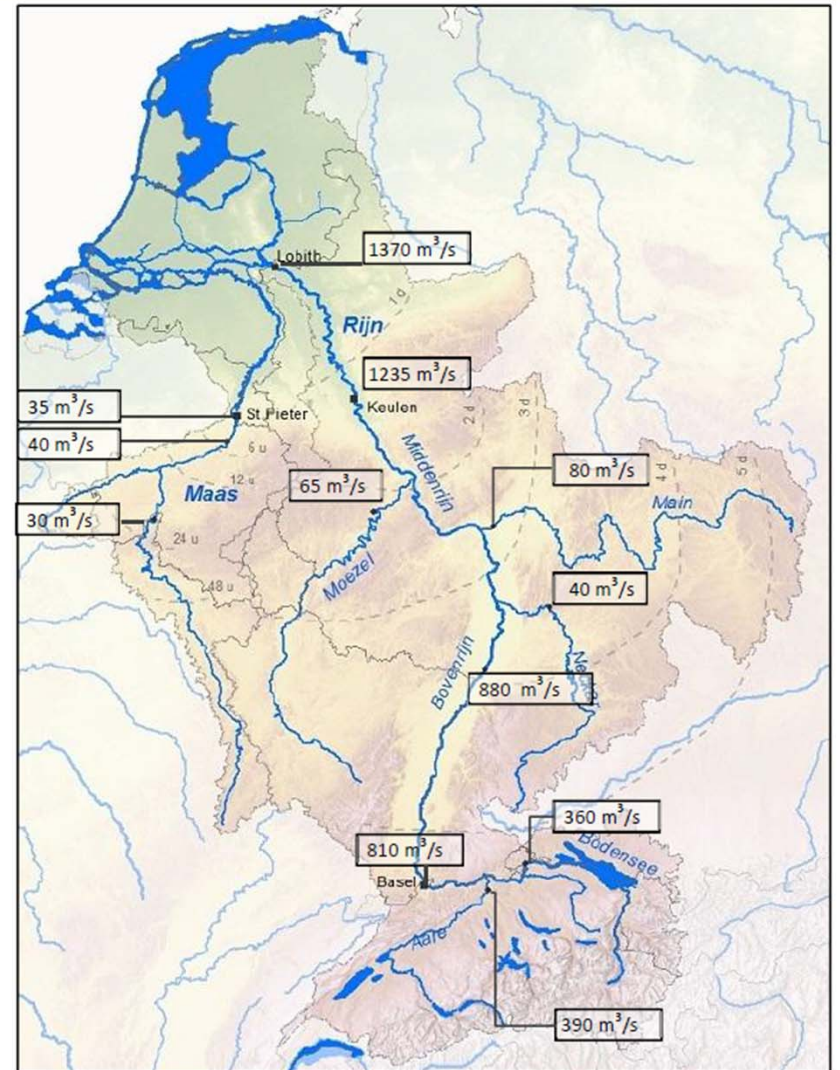
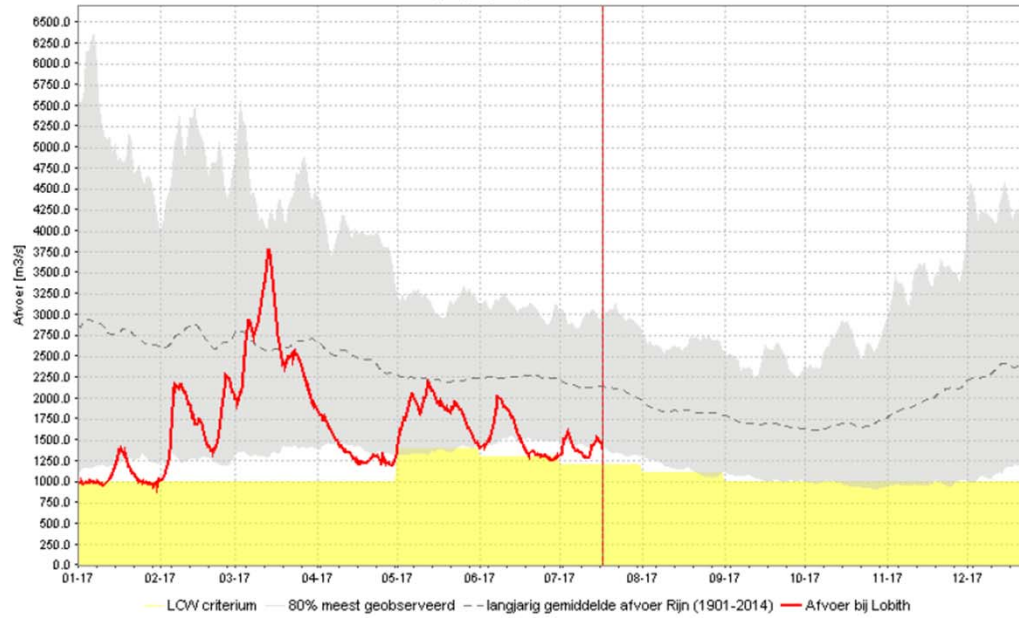


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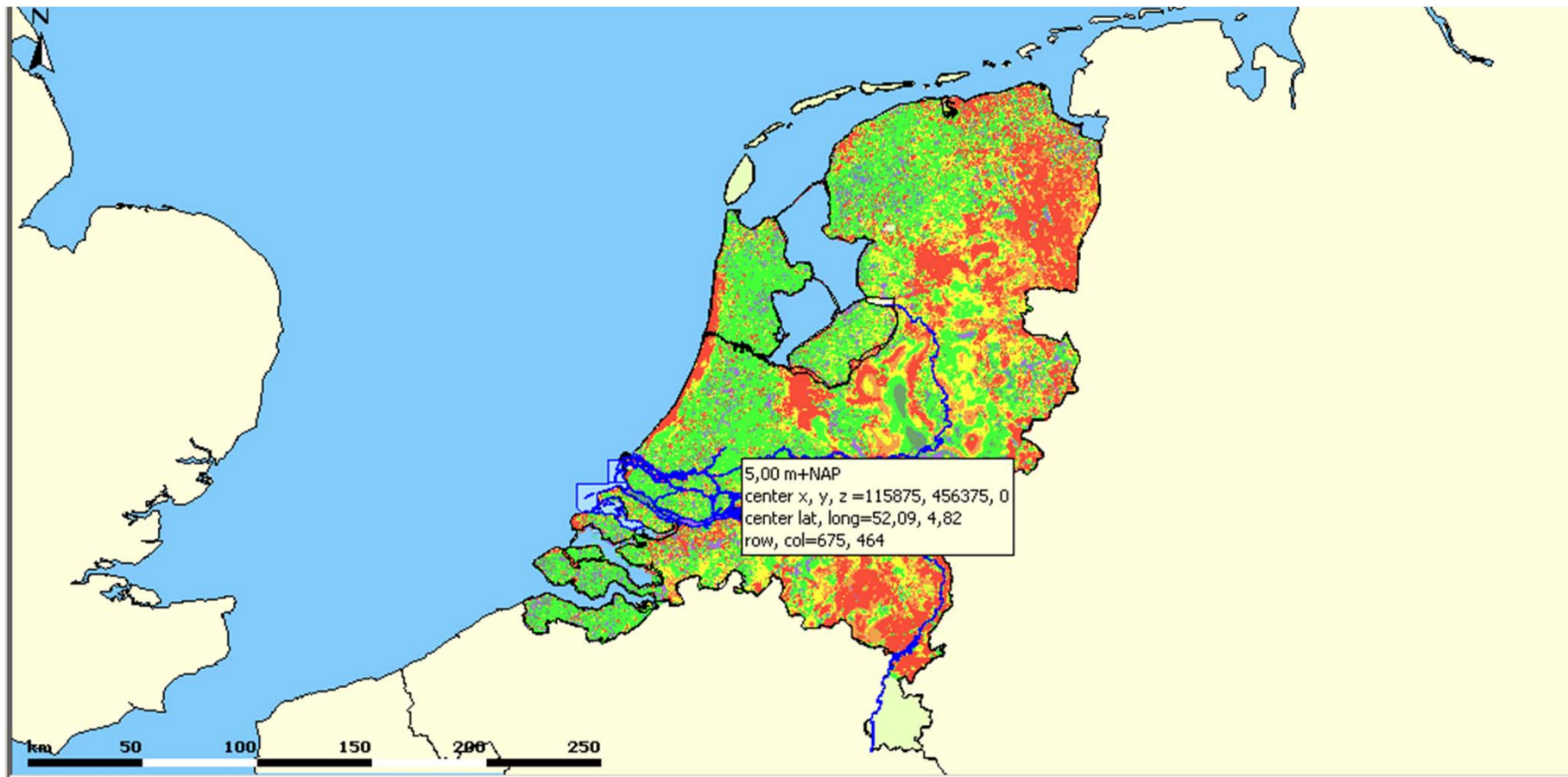


Lobith (Rijn) - gemeten afvoer





Groundwater anomaly



Water balance



Balans (waterverdelingsnetwerk)

Aanvoer

Vanuit Hoofwatersysteem:	179 m ³ /s
Neerslag open water:	0 m ³ /s
Lozing regionale watersystemen:	124 m ³ /s

Aanvoer Totaal: 148 m³/s

Afvoer

Naar Hoofwatersysteem:	146 m ³ /s
Verdamping open water:	23 m ³ /s
Onttrekking regionale watersystemen:	57 m ³ /s

Afvoer Totaal: 168 m³/s

Aanvoer:	148 m³/s
Afvoer:	168 m³/s
Bergingsverandering:	0 m³/s

Verdringingsreeks

(waterverdelingsnetwerk en regionale systemen)

Categorie	Vraag	Tekort
1.1 Stabiliteit keringen:	89.5 m ³ /s	0 m ³ /s
1.2 Klink en zetting:	1.7 m ³ /s	1.6 m ³ /s
1.3 Natuur:	26.5 m ³ /s	0 m ³ /s
2.1 Drinkwater:	25.2 m ³ /s	0.9 m ³ /s
2.2 Energievoorziening:	21.9 m ³ /s	0 m ³ /s
3 Hoogwaardig gebruik:	9.6 m ³ /s	- m ³ /s
4 Overig:	121.6 m ³ /s	0.3 m ³ /s

Berekende waterbalans waterverdelingsnetwerk

04-06-2014





Future developments

- Further validation and calibration of hydrological model
 - Groundwater
 - Evaporation
 - Chloride concentrations
- Optimization tools
- Preparing for 'future weather'



Some thoughts on EDO

- Very useful for insights on drought situation at scale of river basin
 - Seasonal prediction of drought in the Netherlands
- Potential tool for drought management at European or riverbasin scale(?)
- Higher refresh rate is needed for use during drought events
- Added value for Dutch drought management is still ambiguous
 - Fairly large scale