THE HYDROLOGICAL PERSPECTIVE

Hydrological resilience of sandy soils at the catchment scale

Anna Luisa Hemshorn de Sanchez

Wouter Berghuijs, Ype van der Velde, Anne van Loon, Dimmie Hendriks

RESHAPE
nature-inspired water-system solutions

VU VRIJE UNIVERSITEIT AMSTERDAM

Deltares

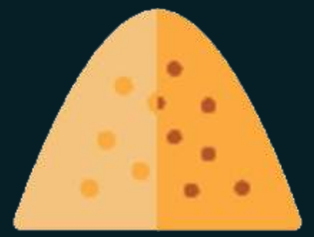
IVM Institute for Environmental Studies

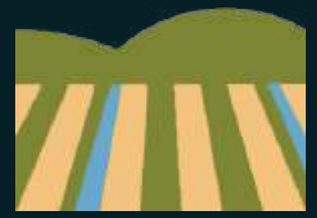
NWO

What is my background?

- BSc Civil and Environmental Engineering
- MSc Watermanagement
- Flood risk management
- Research on land-atmosphere interactions
- PhD in hydrology

What is the aim of this PhD project?





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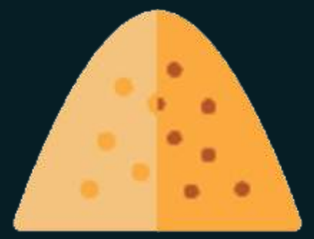
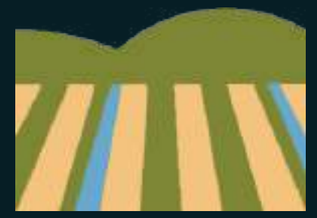




Develop
nature-inspired watershed-scale guiding principles (NIPs)
that promote the current and future hydrological resilience
of water-systems of the Netherlands.

1 Which are the most relevant (sub-)surface and climate characteristics for a catchment's hydrological resilience?

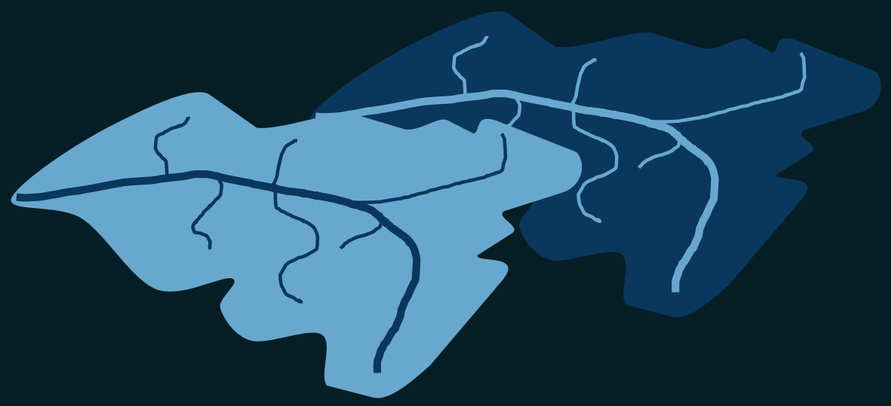
Get hydrological fingerprints of global catchment collection

Cluster fingerprints

Identify controls of different responses

2 How do highly modified Dutch catchments compare globally in their hydrological functioning and resilience?

Gather Dutch discharge data for selected catchments
Delinate catchments
Gather meteorological data and catchment characteristics
Compare Dutch catchments to global catchments

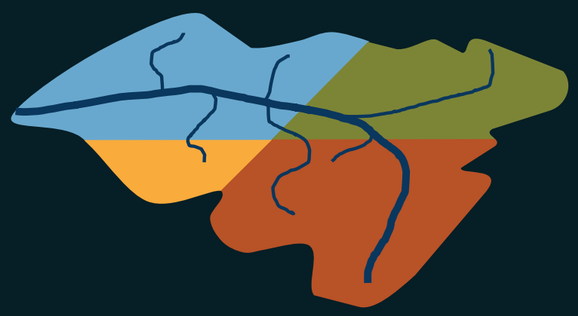


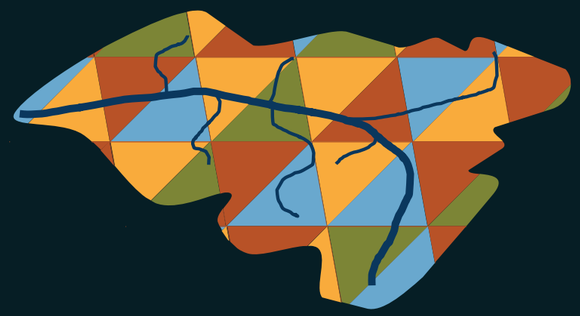
3 Does spatial distribution of (sub-)surface characteristics within a catchment influence its resilience?

Data analysis of similar or nested catchments

Modelling of the same catchment with different configurations

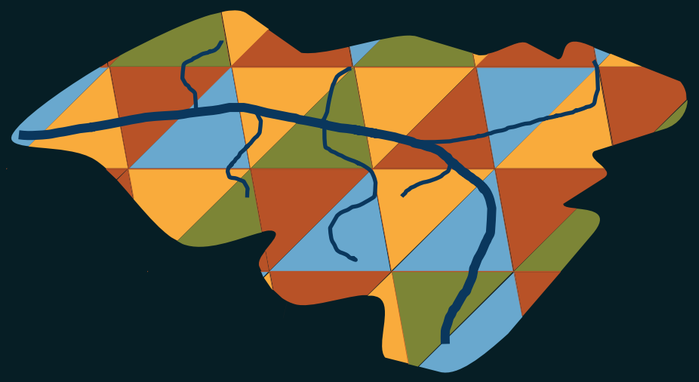
Identify the role of spatial configuration within a catchment





4 Which are the most effective NIPs to increase the hydrological resilience of Dutch catchments with current and future climates?

Choose NIPs and location based on previous results
Implement NIPs to existing hydrological models
Simulate current and future climates
Compare runs with and without NIPs



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A		
B		
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THANK YOU!

RESHAPE

nature-inspired water-system solutions

Governance voor een transformatie naar veerkrachtige zandlandschappen in Nederland

Hanneke Peeters – Utrecht University

RESHAPE
nature-inspired water-system solutions

Wat is mijn achtergrond?

Organisatiewetenschappen BSc
Tilburg university

Governance of Sustainability MSc
Universiteit Leiden

Junior projectleider Landelijk gebied
Provincie Utrecht

PhD - Environmental Governance
Universiteit Utrecht

Indirecte drivers
e.g. instituties, consumptie
patronen, normen en waarden etc.

Directe drivers
e.g. landgebruik,
milieuvervuiling etc.

Figure 1. Indirecte en directe drives. Geïnspireerd door Diaz et al. (2019) en Visser et al. (2021).

Doel van het onderzoek

Het doel van dit onderzoek is om meer inzicht te krijgen in **transformatieve veranderingen** door te analyseren welke **Governance** benaderingen en instrumenten gebruikt kunnen worden door actoren om naar een veerkrachtig water- en bodemsysteem op de hoge zandgronden toe te werken.

Onderzoeksrichtingen

1. Het identificeren van verschillende perspectieven van stakeholders

2. Het begrijpen van de interactie tussen *drivers*: wat houdt het systeem in stand?

3. Het analyseren van bestaande Governance benaderingen

4. Wat kunnen we leren van het gezamenlijk ontwerpen van *transformative pathways*?

Bedankt!

Tot straks bij de postersessie

RESHAPE
nature-inspired water-system solutions

Introduction and research

Jose David Henao Casas

Postdoc – VU Asmterdam

PhD. Agroengineering

RESHAPE
nature-inspired water-system solutions

VU VRIJE UNIVERSITEIT AMSTERDAM

Background

- **(2009-2015)** Geological engineering – Universidad Nacional de Colombia
- **(2014-2017**) Hydrogeological monitoring of a natural reserve - Universidad Nacional de Colombia & Minambiente
- **(2017-2019)** Erasmus Mundus Joint Master Programme Groundwater and Global Change - IST Lisboa, IHE Delft & TU Dresden
- **(2019 - 2023)** PhD in agroengineering and early-stage researcher - TRAGSA, Universidad Politecnica de Madrid, MARSoluT ITN
- **(2023 - 2024)** Water resources specialist - 52impact
- **(2024-present)** Postdoc – VU Amsterdam

Research

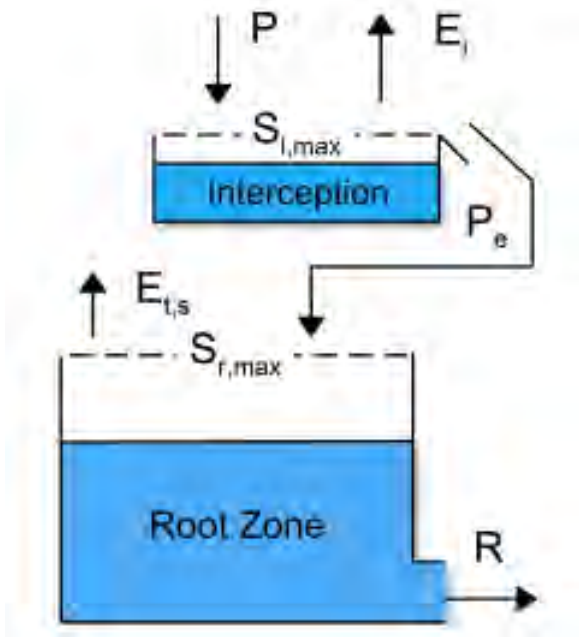
- RESHAPE
- GroundedExtremes
- 1) Groundwater drought analysis in the Netherlands, with a focus on sandy landscapes to the east and South
- 2) Modelling of potential futures and assessment of adaptation measures for hydrological extremes

GROUNDEDEXTREMES
Understading and governing groundwater to reduce the risk of hydrological extremes

RESHAPE
nature-inspired water-system solutions

Groundwater drought analysis

- Analysis of groundwater drought, improving on previous efforts (e.g., use of non-linear models to simulate time series)



Collenteur et al., 2022

Groundwater drought analysis

- Analysis of groundwater drought, improving on previous efforts (e.g., use of non-linear models to simulate time series)
- Drivers:
  - Climatic drivers: precipitation and evaporation
  - Surface features: land use, population, soil type, etc.
  - Subsurface (hydrogeology): hydraulic conductivity, depth to water table, etc.

Groundwater drought analysis

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- Drivers:
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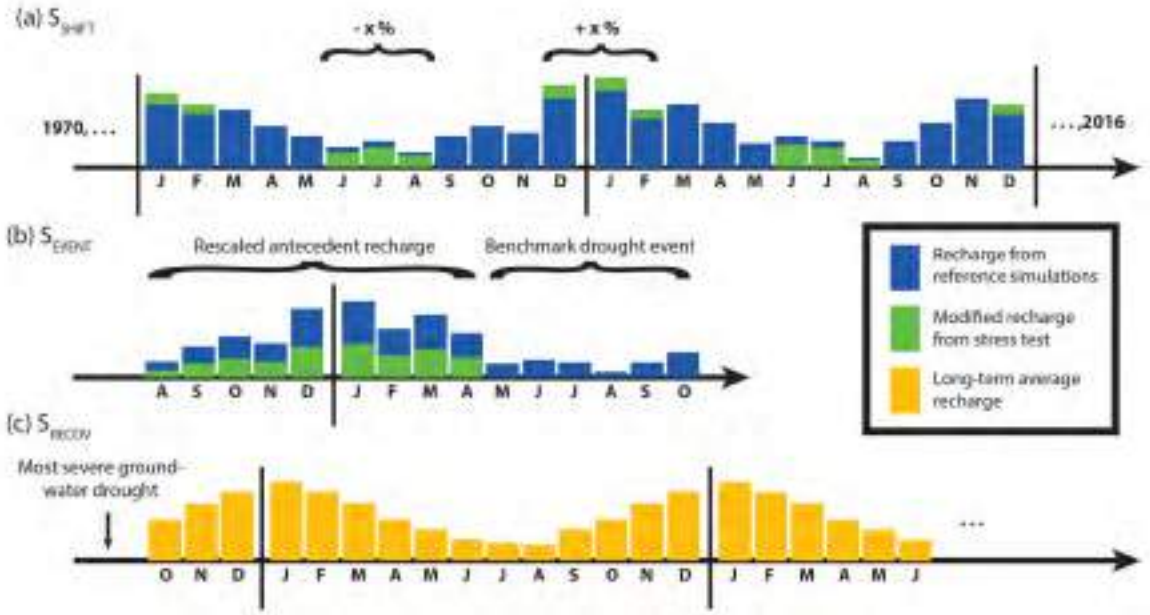
  - Surface features: land use, population, soil type, etc.
  - Subsurface (hydrogeology): hydraulic conductivity, depth to water table, etc.
- Models and stress test

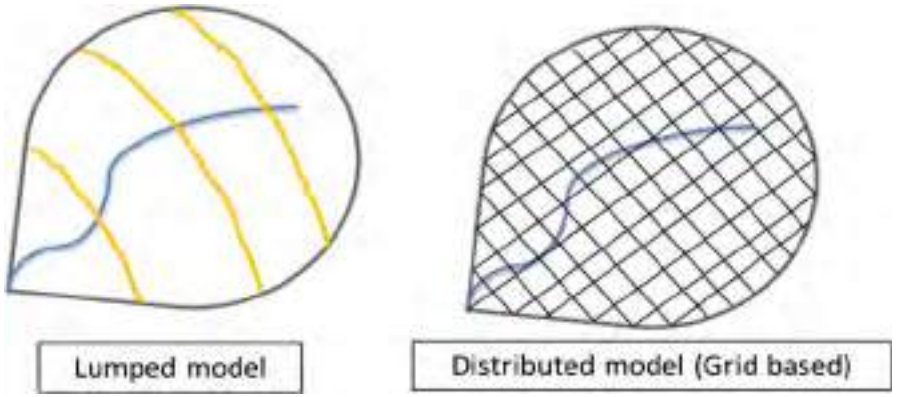


Hellwig et al., 2022

Modelling futures and adaptation

- There are many possibilities for numerical models:

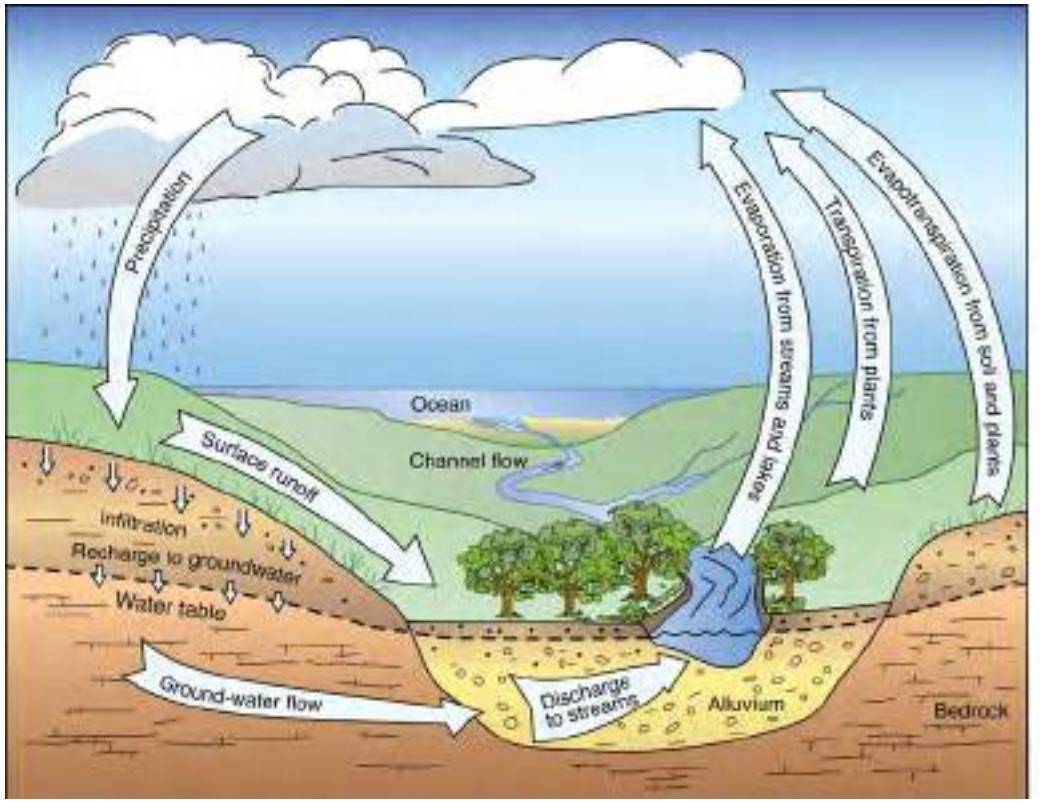
- Lumped vs. distributed models



Rosli et al., 2021

Modelling futures and adaptation

- There are many possibilities for numerical models:
- Lumped vs. distributed models
- Hydrological systems: groundwater, runoff, the critical zone



Source: https://geokansas.ku.edu/hydrologic-water-cycle

Modelling futures and adaptation

- There are many possibilities for numerical models:
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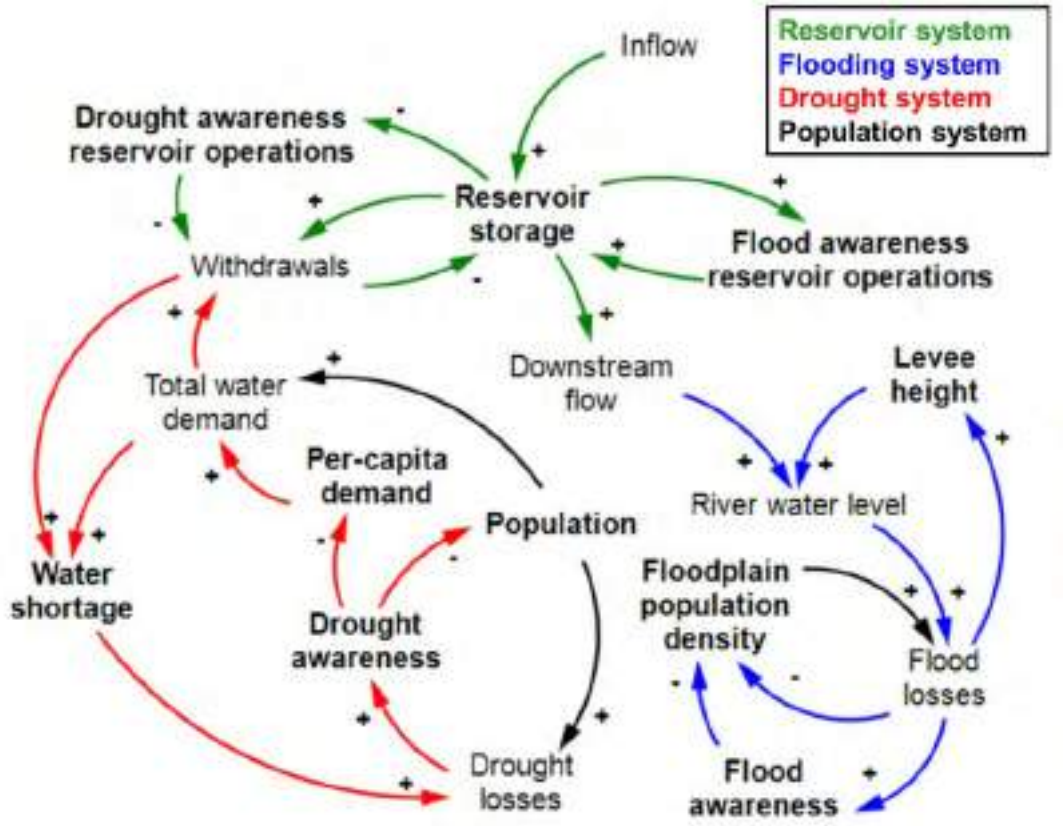
- Social systems: biophysical, agent-based modelling (various agents possible), system dynamics modelling



Mazzoleni et al., 2021

Modelling futures and adaptation

- There are many possibilities for numerical models:
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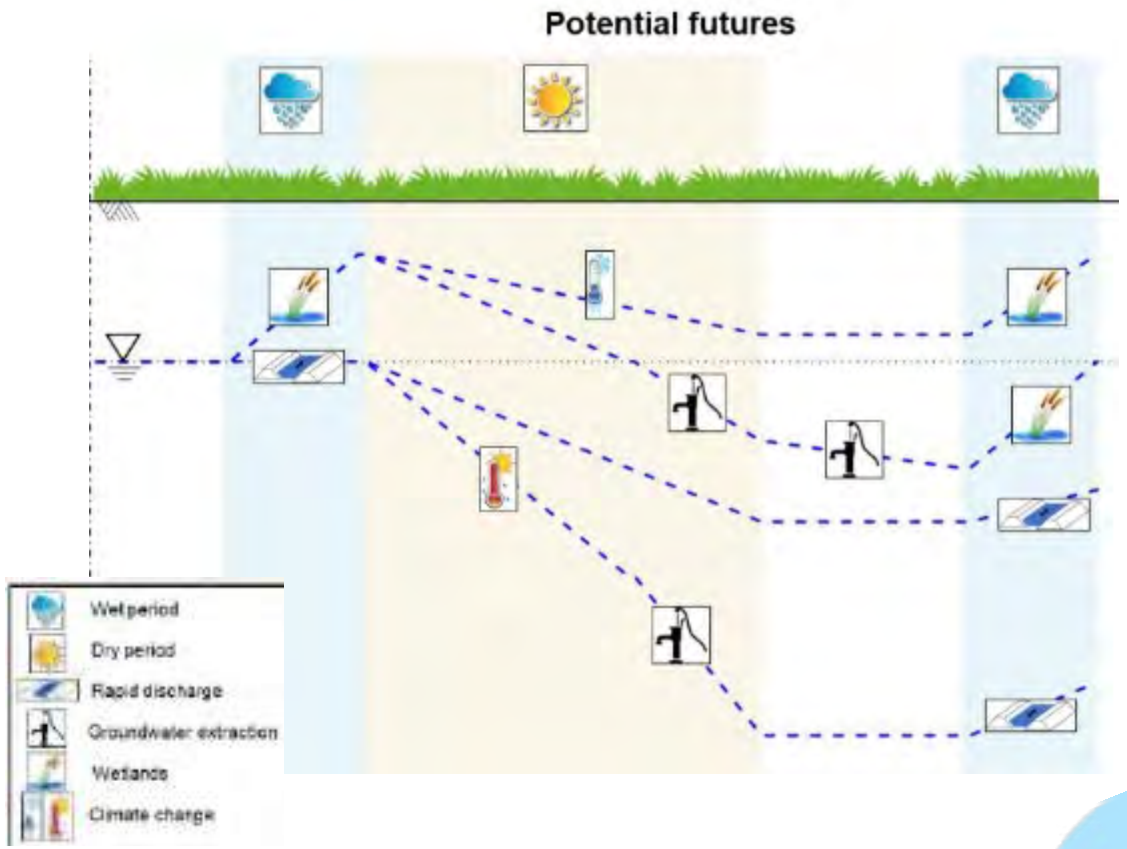
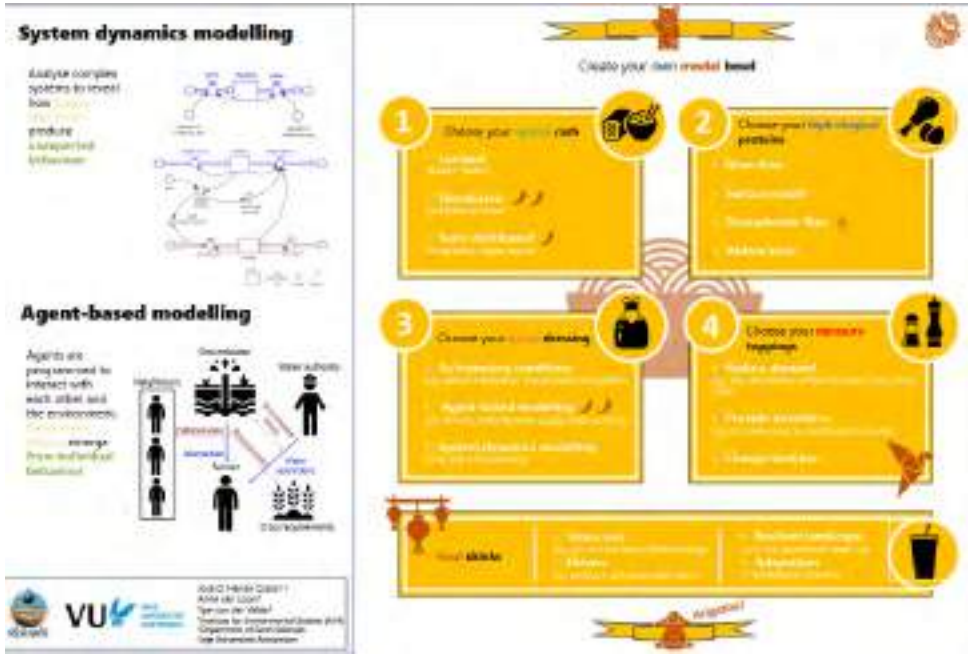
- Hydrological systems: groundwater, runoff, the critical zone
- Social systems: biophysical, agent-based modelling (various agents possible), system dynamics modelling
- Adaptation measures



Modelling futures and adaptation

- Explore potential futures
- Have a model or data? Or have particular questions?
- Come to my poster!



We have already started!

- On Thursday 31 May we visited to the Dommel water board
- Conversation about main issues with Lonneke Schilte
- Field visit to see “old” and “new” landscape paradigms with Mark van de Wouw

Thanks for your attention

References

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