



Ministry of Infrastructure  
and Water Management

# Flood risk management challenges in the Netherlands

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safety symposium  
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# Importance of flood risk management (FRM)

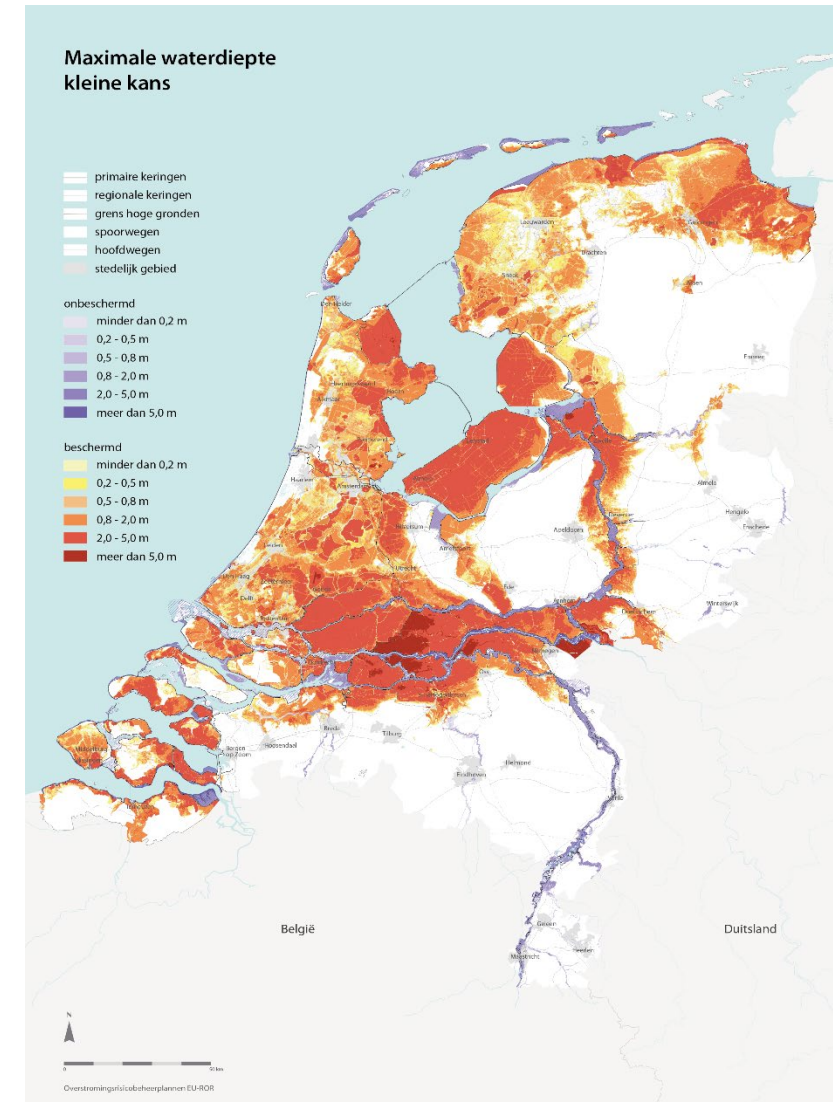
**40%** below sea level

Almost **60%** of the surface area is vulnerable to flooding (see figure)

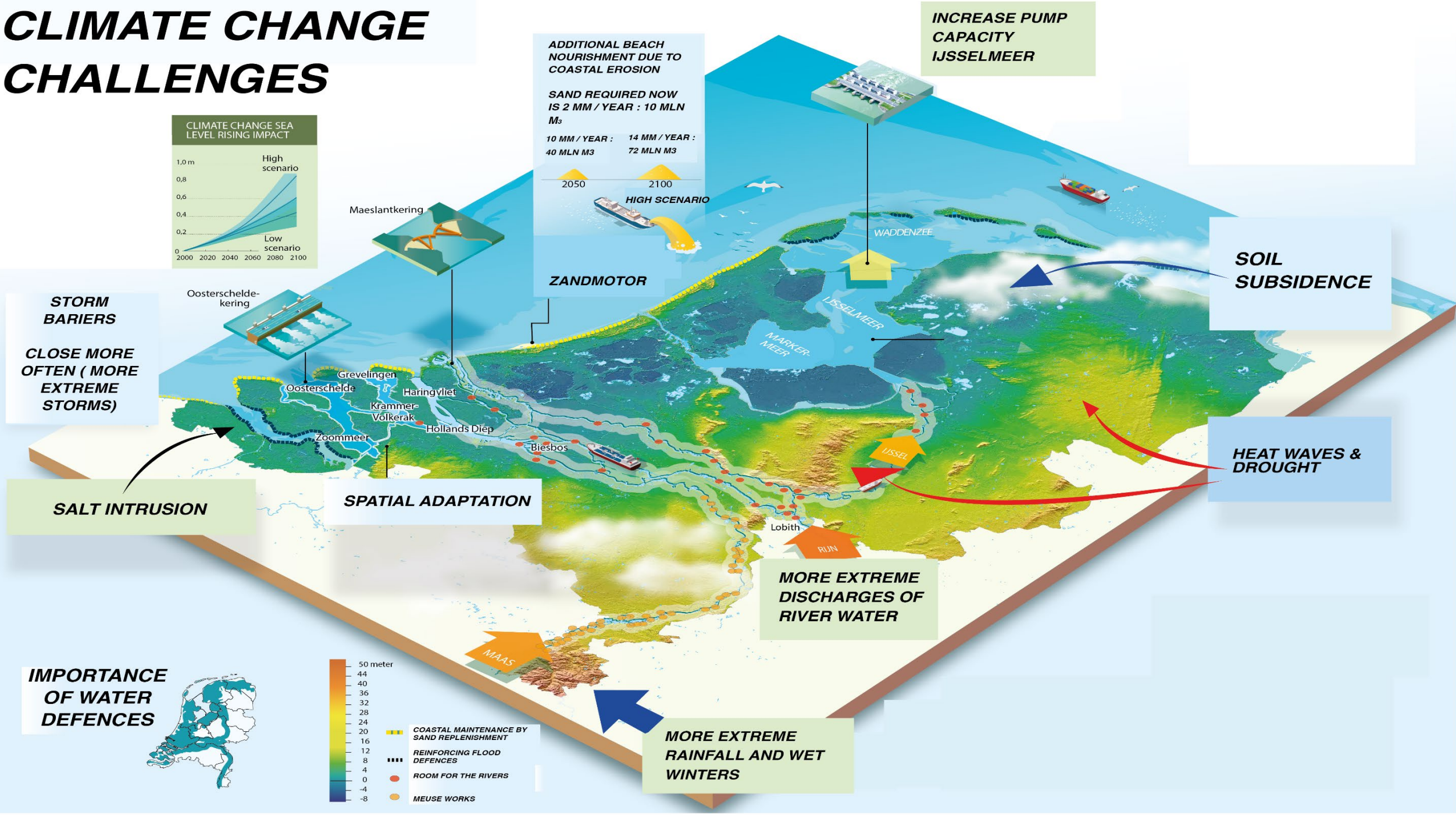
This is where most people live (about 8-9 million) and where about **70%** of our gross national product is earned

Flood protection is a necessity, particularly in view of the effects of climate change, such as rising sea levels and higher river discharges

We invest about 0.2-0.3% of GDP, which is **€ 55** annually per person, but cost will be rising due to climate change and replacement of infrastructure



# CLIMATE CHANGE CHALLENGES





# Dutch policy principles for flood risk management

**Adaptive** delta management: looking far ahead, taking timely additional measures, keeping solutions open

**Water** and soil as a **guiding** principle for spatial planning:

- fit in with the (historical) characteristics of the water system
- **go with the flow**, like Leonarda 12

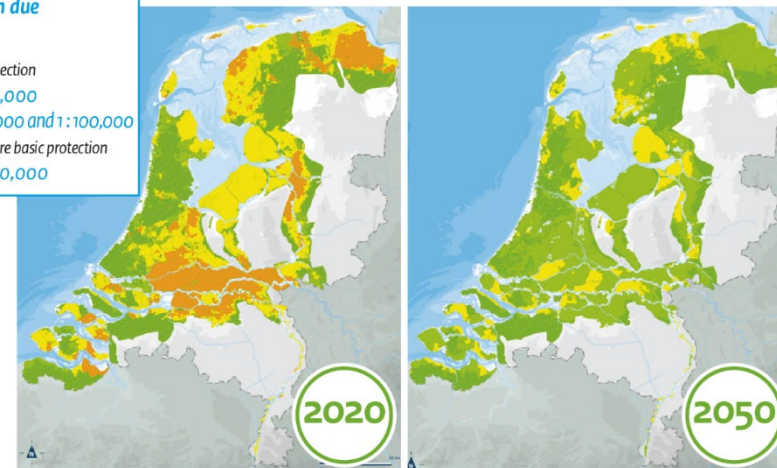


## Basic protection level & risk based flood safety standards

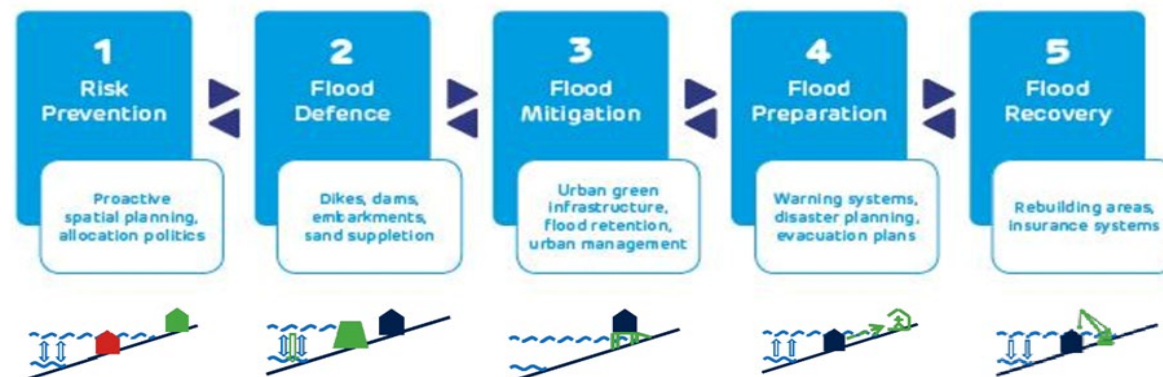
### Protection

#### Probability of death due to flooding

- Fulfills future basic protection
  - less than 1 : 1,000,000
  - between 1 : 1,000,000 and 1 : 100,000
- Does not fulfil the future basic protection
  - greater than 1 : 100,000



## Multi-layer safety & principle **retain, embed, discharge**





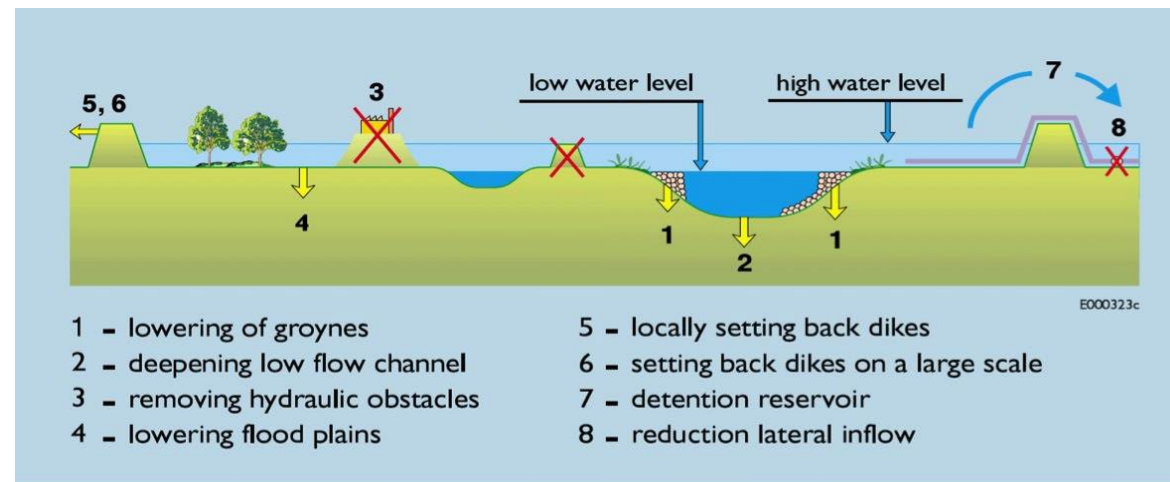
# Water safety policy rivers

**Adaptive** river management: reserving space

**Room for the river** 2005-2019: 34 projects, dikes were moved landward, floodplains were lowered and side channels were dug.

Along the undyked Meuse the **Maas Works** program started in 2005 and will continue until 2027. River widening measures are also combined with other objectives (eg. gravel extraction, nature and recreation).

Program Integral River Management (**IRM**)

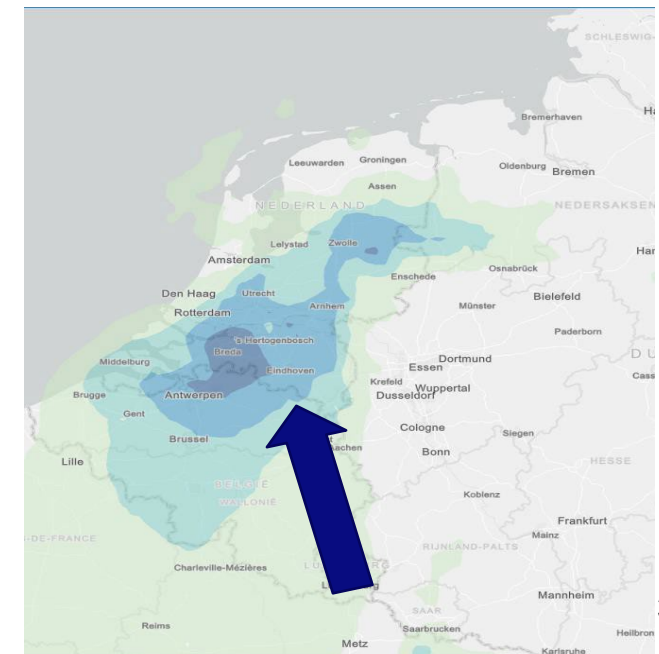
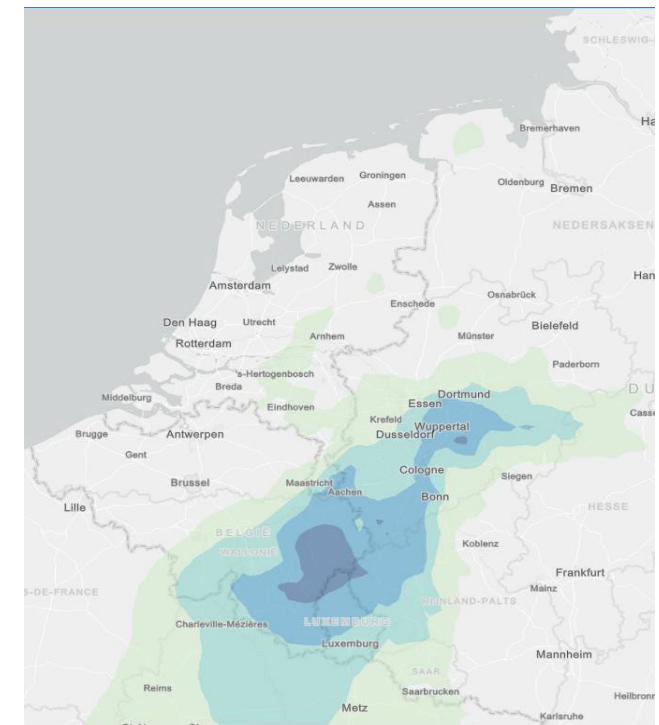




## Hackaton: What if the extreme precipitation of July 2021 would fall somewhere else in the Netherlands?

### July 2021 weather system is very extreme

- Locally much more than 200 mm in 2 days
- Very large area with more than 110 mm in 2 days (around 20.000 km<sup>2</sup>)
- **The spatial scale** is exceptional (size the **half** of the **Netherlands**)
- **Probability is larger** than before. Climate has already changed.
- What could happen? And are we prepared for that?
- Precipitation areas of comparable size and intensity can also happen in the rest of the Netherlands:
  - **Moved** the **weather system** over the **Netherlands**
  - Determined the impact for free-flowing drainage areas and controlled polder systems, with a focus on:
  - Flooded areas
  - Impacts: affected people, damage, business interruption ...



## Estimated Impacts (polder)

- **7 days of flooded fields** in the most positive circumstances (if there are no system failures)
- **Large areas** (agricultural area and urban areas) with **impeded drainage** for a substantial duration (> 7 days)
- A lot of **stress** on regional **embankments**, breaches due to liquefaction are not ruled out
- Impacts:
  - Large areas with **crop damage**
  - Potentially **damage** to **water infrastructure**, sewerage water on streets
  - Badly located buildings will be flooded
  - Insecure electricity coverage
  - **Total damages: 100s of Millions to Billion...**





# Advisory Taskforce Flooding and High Water

- Aim Advisory Task Force on Flooding and High Water: **draw lessons** + **accelerate measures** to protect all Dutch regions
- Advisory Task Force is made up by representatives of the central government, umbrella organisations of subnational authorities (*like provinces, waterboards, local councils*), regional authorities Limburg and the Delta Programme Commissioner.
- **Two advisory reports:** the first was in March 2022, the second (and last) in October 2022.
- Implementing the **25 recommendations** of this initial advisory report will increase the resilience to future extreme rainfall events.

Increase water awareness, improve risk communication and self sufficiency

Improve real-time monitoring rainfall prediction/river discharges, design warning system flash floods.

Communication between water managers about maintenance of infrastructure during high water occurrence (summer)

Create climate change robust water systems and regional systems (regional water system analysis)

Prepare for extreme weather events and its impact in spatial planning (stress tests, water and soil as guiding principle)

Enhance existing and new international cooperation, particularly in regional water systems



# Joint cross-border flood risk stress test

Main objective: jointly assess the current state of transboundary river catchment by **identifying flood-prone hazard areas** under extreme weather conditions and **societal impacts**

Stromende wateren

## Step 1: **Flood hazard assessment**

- Develop (or update) a joint **hydro-dynamic model** for the entire transboundary river catchment
- Defining a joint set of relevant extreme weather **scenarios** and initial **conditions** e.g. initial storage capacity etc. (sensitivity analyses)
- Run the hydro-dynamic model and **assess its resulting flood hazard maps** in consultation with experts – identify current and future **bottlenecks** in the water system

## Step 2: **Flood impact assessment**

- Determine the number of potential affected inhabitants, land use, vital infrastructure (power networks, roads), etc. for each hydro-dynamic model run
- Discuss potential **cascading-effects** due to flooding in the area



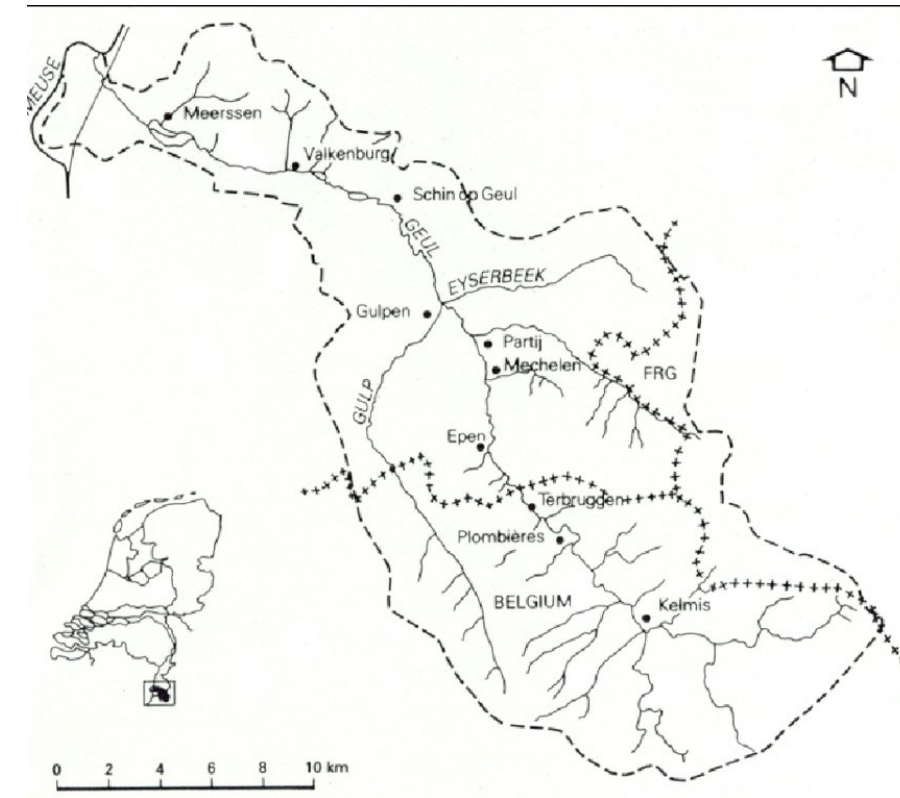
Bron: Topografische Dienst Kadaster.



# Rapid Assessment: System analysis of entire Geul river basin

What can we learn from the July 2021 floods in the Geul river catchment about its **hydrological response** to heavy rainfall, the associated **floodings** and their **consequences** in order to find **measures** that are potentially suitable to mitigate impacts of future floods?

- How do the **physical characteristics** of the Geul river catchment determine its response to heavy rainfall?
- How were the **flooded areas** at the July 2021 flood event **distributed** and what were **impacts** of the flooding?
- What types of measures are potentially suitable and effective in **short and long term** to mitigate the (most severe) consequences?



# Summary FRM in NL



Extreme weather events can happen anywhere, will happen more frequent and more extreme (beyond standards). We cannot prevent all floods, but **risks** and **disasters** can be **managed**.

This requires a shift in focus from flood defence to improved **spatial planning** (risk prevention by using water and soil as guiding principles in zoning), **mitigation** measures, **awareness**, **crisis management** and **recovery**.

Measures to better deal with flooding should be **risk based** and **adaptive** (uncertainties) and should ideally **contribute** to tackling other (climate) challenges (such as drought).

It is urgent to get a better understanding of entire (particularly cross border) regional water systems by working together on **transboundary stress tests** and **system analysis**.





# Thank you!

## Some useful links:

- > [Delta facts, English versions | STOWA](#)
- > [Deltawerken - Welcome to Deltawerken.Com / Delta Works .Org](#)
- > [Water safety | Rijkswaterstaat](#)
- > [Room for the River Programme | Dutch Water Sector](#)
- > [Home - Spatial adaptation \(klimaatadaptatienederland.nl\)](#)
- > [Flood Risk - Deltares](#)
- > [Publicaties - ENWinfo](#)

