

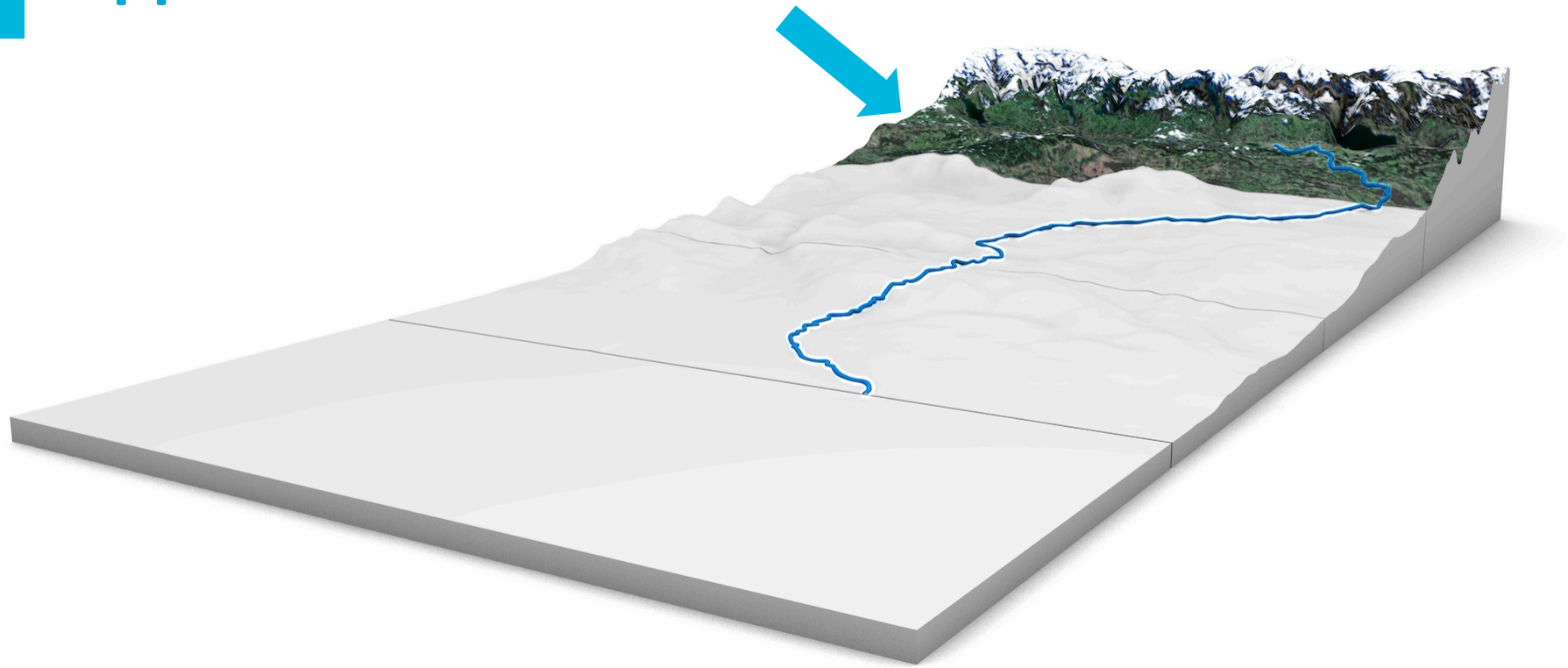
# 4.1 River interventions

## *Water & Climate*

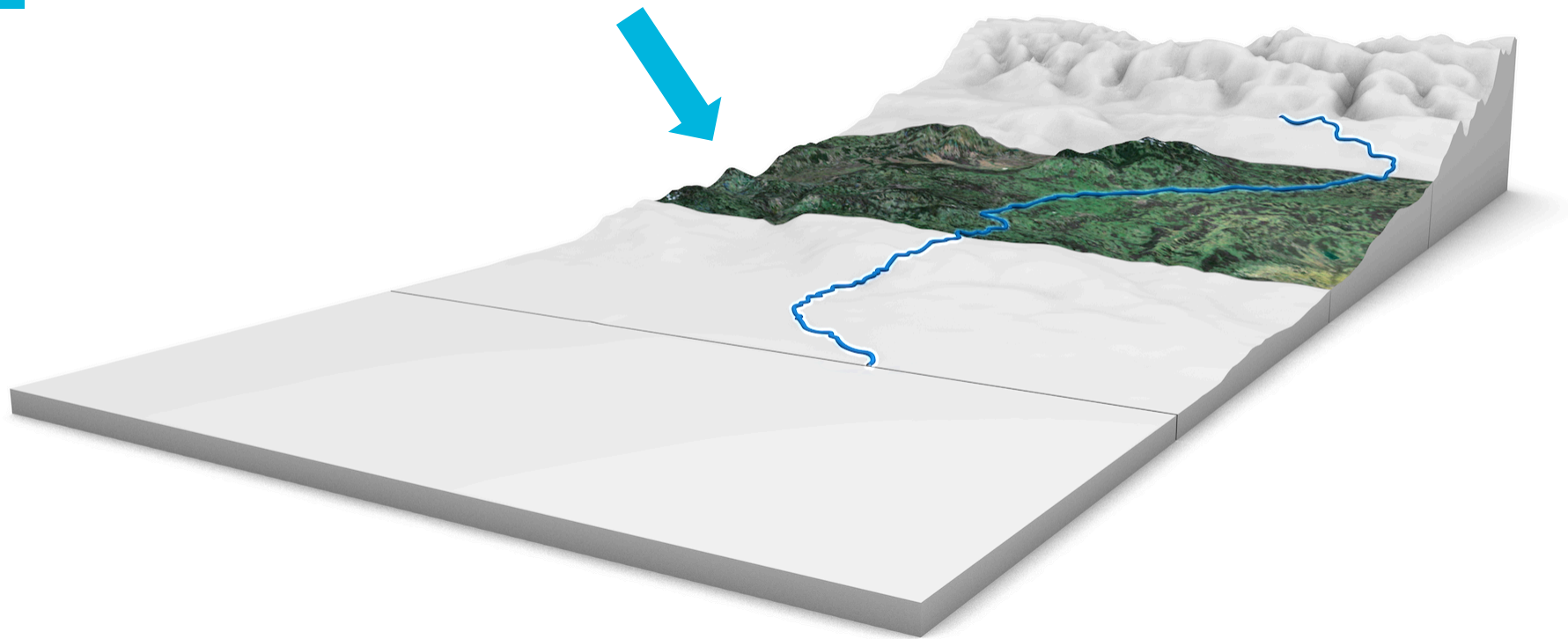
K. Lendering, M.Z. Voorendt, S.N. Jonkman, Faculty Civil Engineering and Geo Sciences



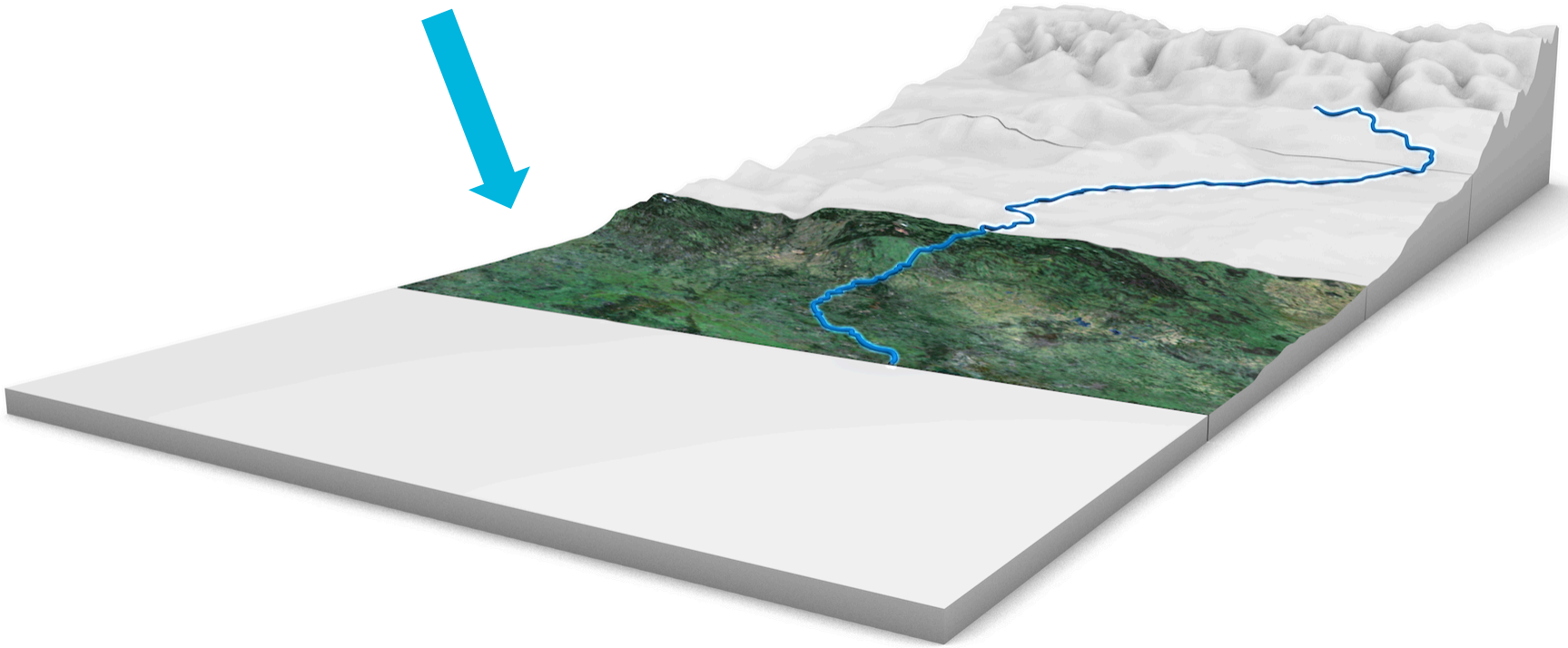
# Upper course



# Middle course

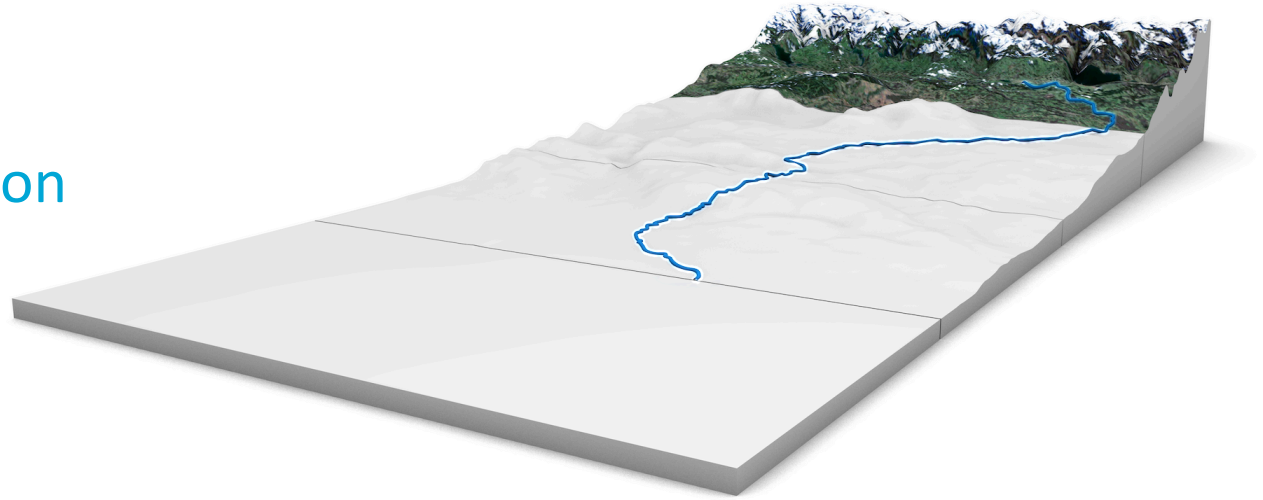


Lower course



# Upper course

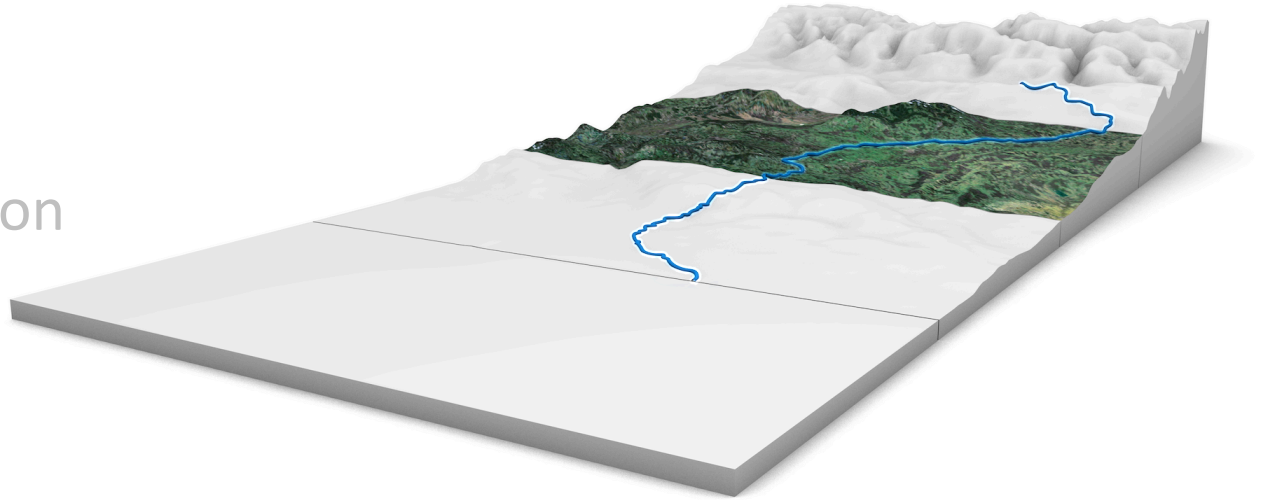
- Energy generation
- Water supply
- Navigation
- Safety
- Ecological and societal functions



# Animation Bad Säckingen- Rheinkraftwerk

# Middle course

- Energy generation
- Water supply
- Navigation
- Safety
- Ecological and societal functions





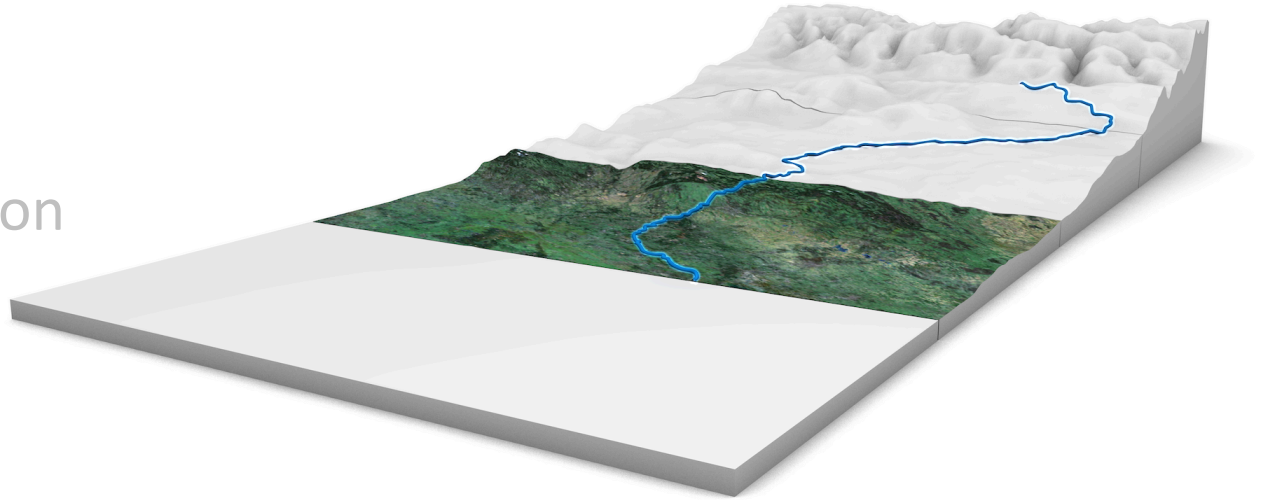


Driel Weir in the Rhine (source: Hanselpedia )

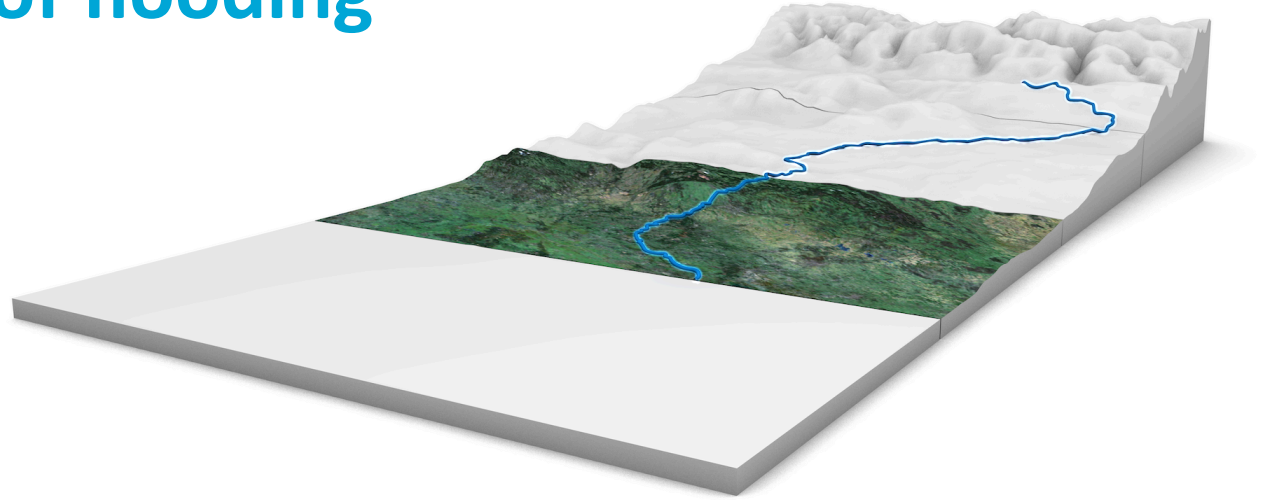
# Animation Lock

# Lower course

- Energy generation
- Water supply
- Navigation
- Safety
- Ecological and societal functions



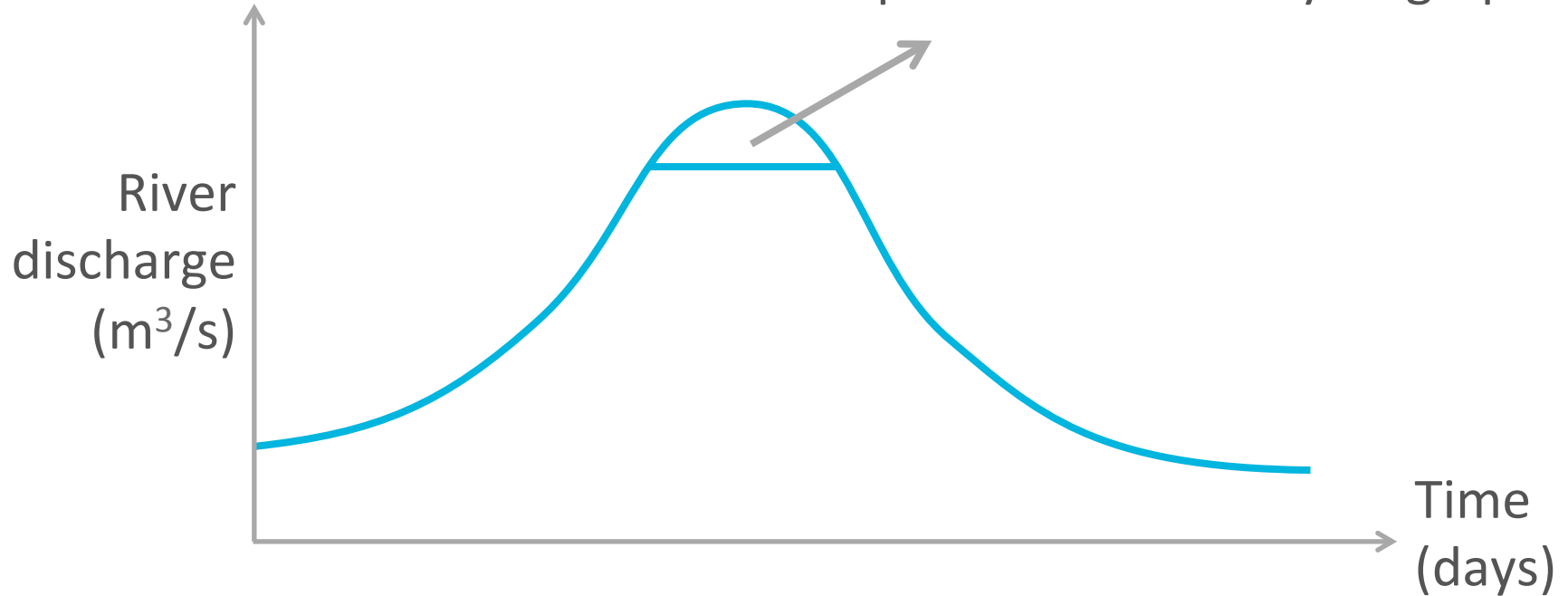
# Evaluate risk of flooding



- Flood hazards
- Presence and performance of flood defences
- Consequences in case of flooding

# Retention capacity

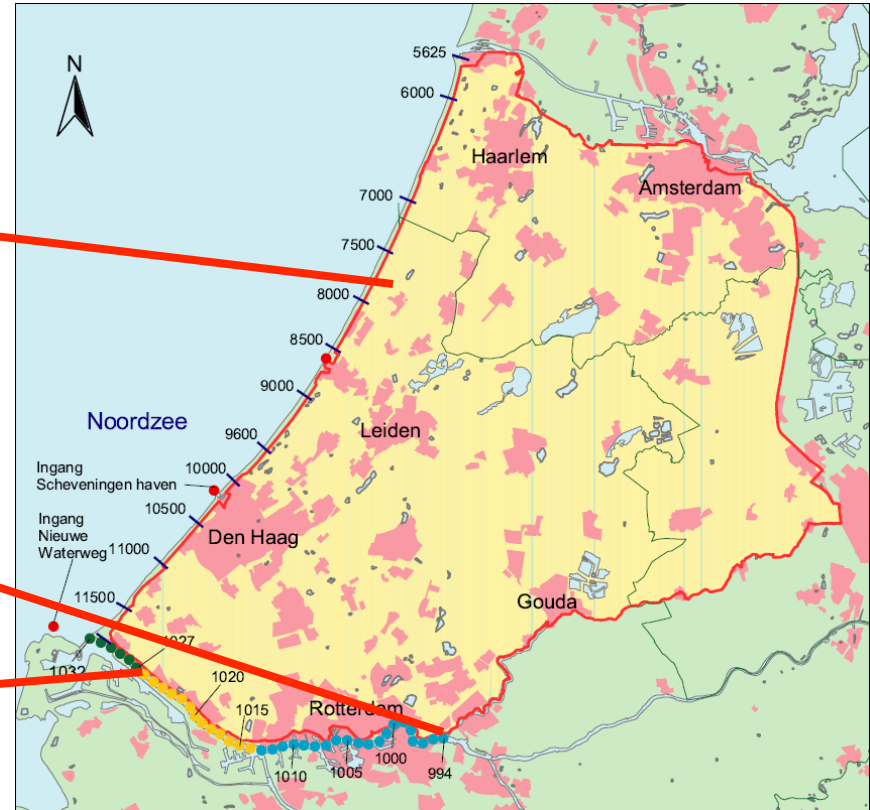
Retention capacity required to  
“peakshave” the hydrograph



# Room for the river (Flood Safety)

# Flood defences

## Dike ring 14: South Holland

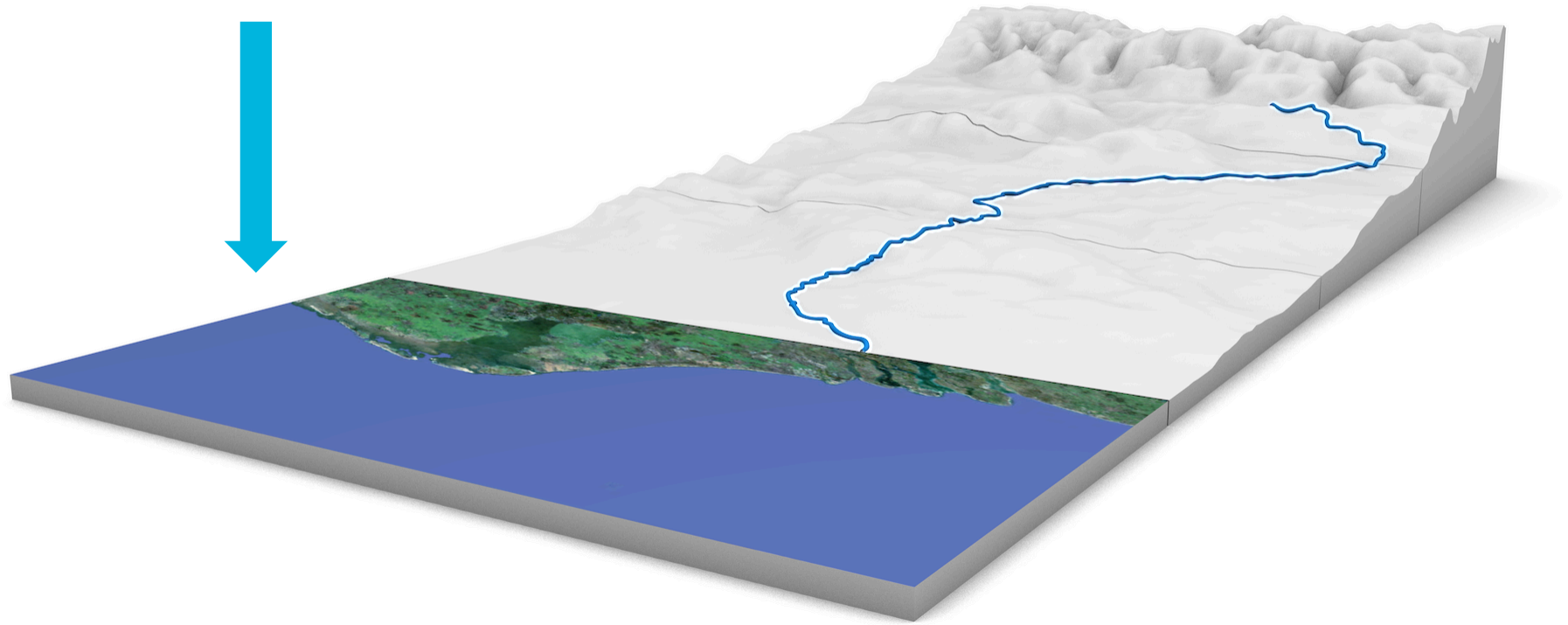


(source: HR 2006)

**Thank you for your attention!**



Delta / estuary area



# Upper catchment area

Intervention	Typical location	Energy generation	Water supply	Navigation	Flood safety	Ecology	Example
Hydro-power dam	River: upper catchment area	X	X				Säckingen Hydropower plant

# Middle catchment area

Intervention	Typical location	Energy generation	Water supply	Navigation	Flood safety	Ecology	Example
Weirs	River: middle catchment area		X	X	X		Driel
Sluices / locks	River / Delta & estuary Middle / lower catchment area			X	X		Lock Gambsheim
Groynes	River: middle catchment area			X			All along the river Rhine, example in Trechttingshausen/Wessel

# Lower catchment area

Intervention	Typical location	Energy generation	Water supply	Navigation	Flood safety	Ecology	Example
River dikes	River: Middle / lower catchment area				X		Rivierenland, Netherlands
Room for the river	River: Middle / lower catchment area				X	X	Project Noordwaard in the Netherlands