

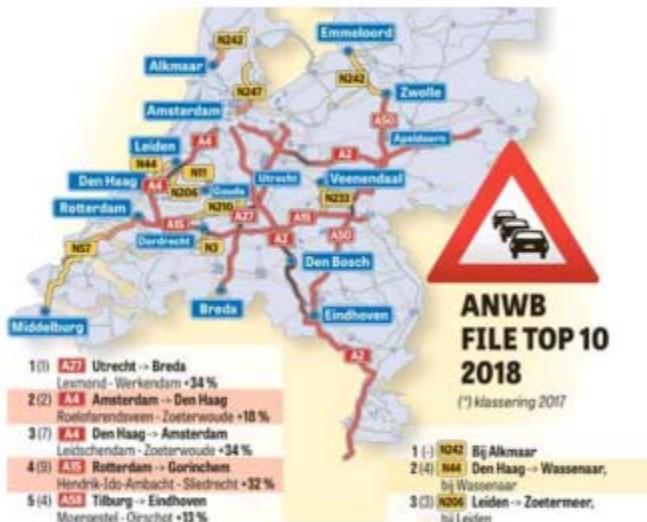
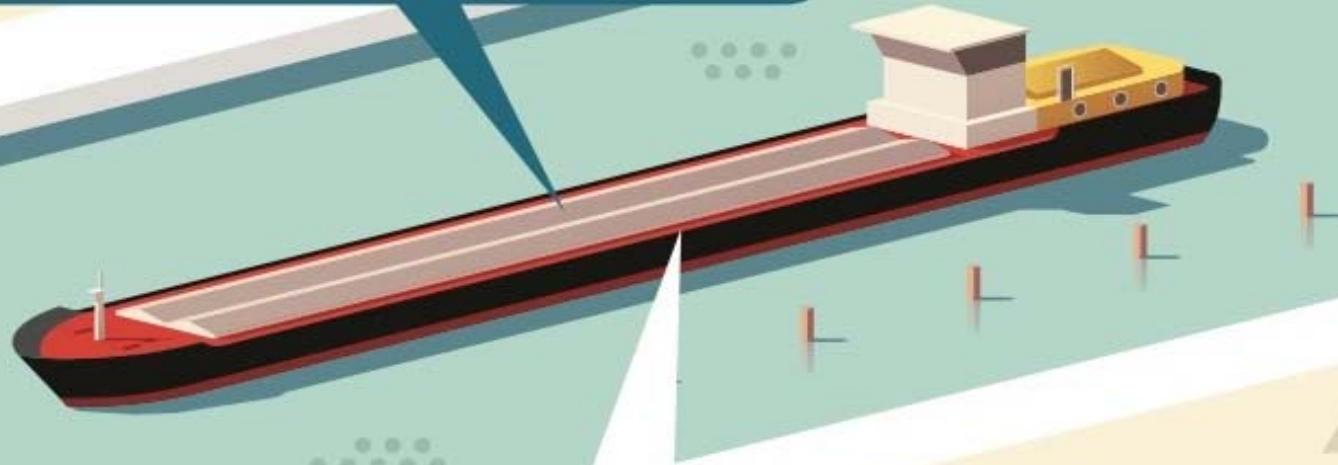
Low water challenges in Inland Navigation



Marleen Buitendijk

The beautiful story of inland navigation

VERVOER OVER WATER BIEDT KANSEN



Een standaard 3000-ton(s) binnenschip neemt eenvoudig de lading over van 100 vrachtwagens.



2018 a view in a future with climate change

January all dams closed for high water - 7 months of low water



Challenges

- Navigation challenges
- River management challenges
- Information technology challenges
- Ship technology challenges



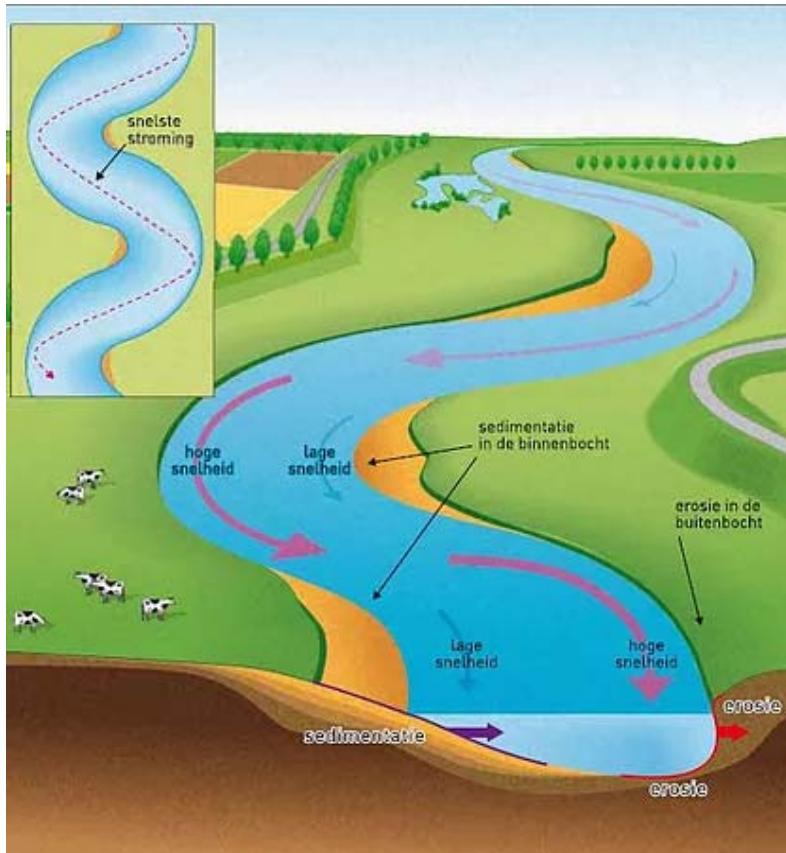
Navigation

Navigation: all actions the skipper must perform to bring the vessel "safely" from the place of departure to the place of arrival.

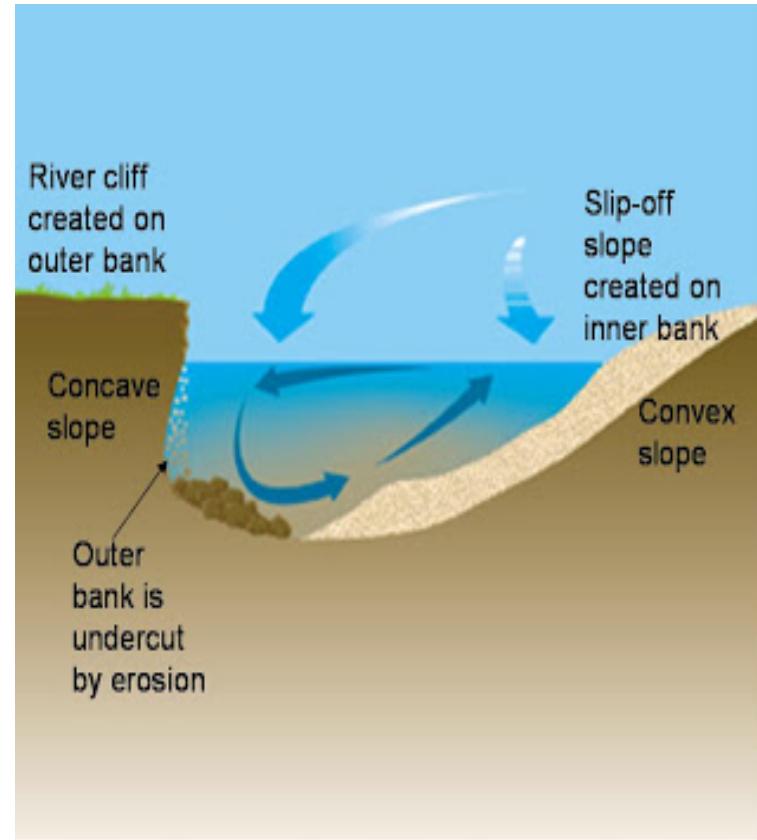


Skipper “reads” the river

Navigating is using the forces of nature.



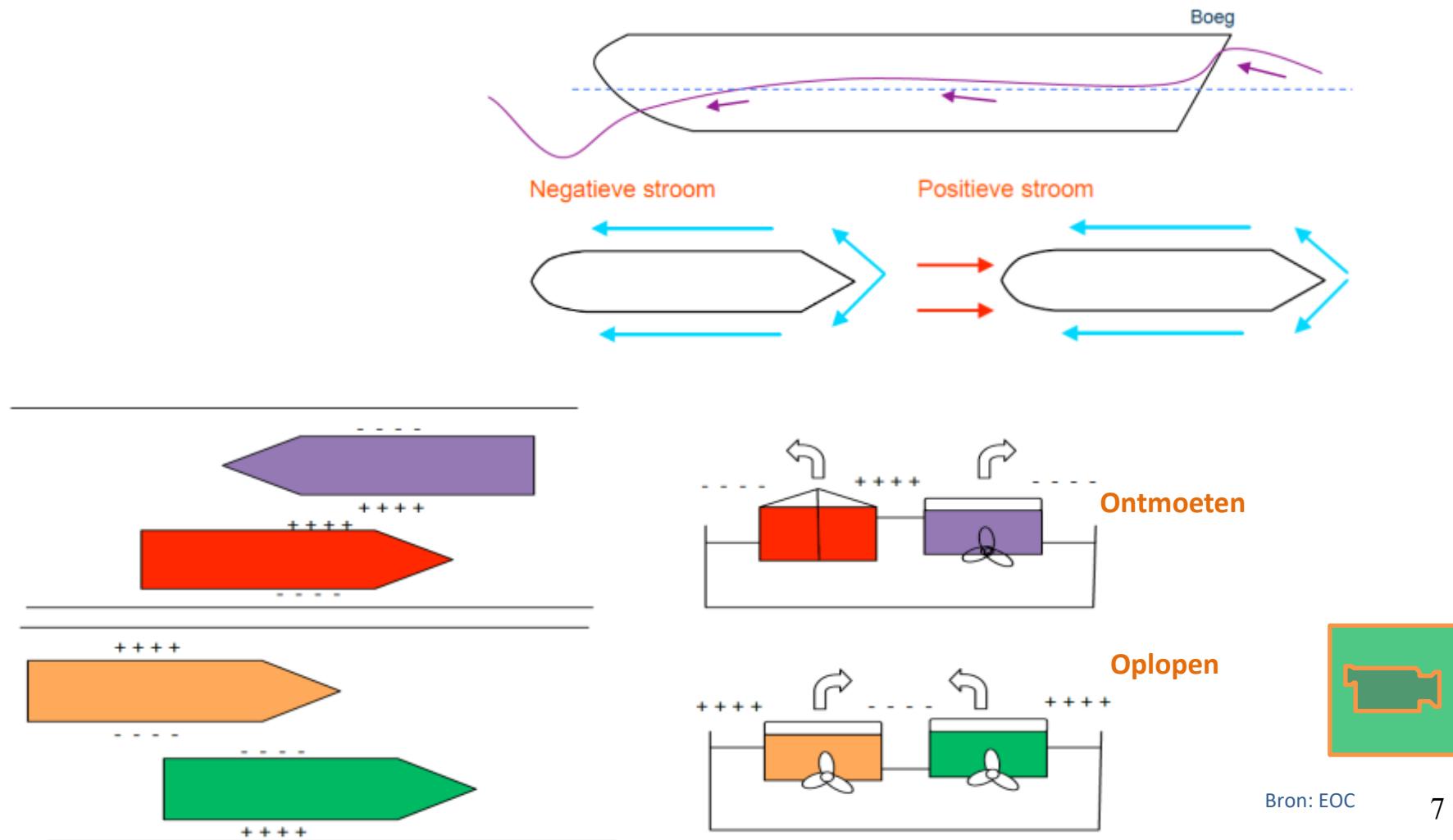
Meanderende rivier, bron: www.degeo-online.nl



<http://somegeographyannalikes.blogspot.com/>

Current patterns of ships

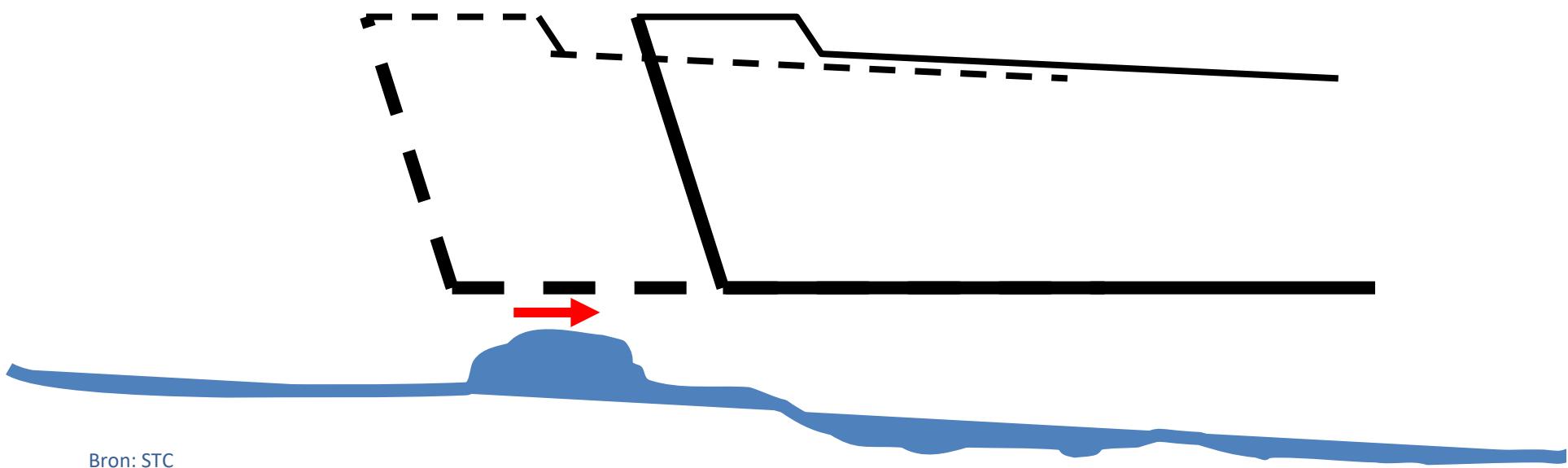
Bernoulli's principle states that an increase in the speed of a fluid occurs simultaneously with a decrease of the water surface.



Current patterns of ships

Squat

The squat effect is the hydrodynamic phenomenon by which a vessel moving quickly through shallow water creates an area of lowered pressure that causes the ship to be closer to the riverbed than would otherwise be expected.



Bron: STC

Nautical Challenges

- Keel clearance
- Narrow fairway
- Congestion
- Complex navigation

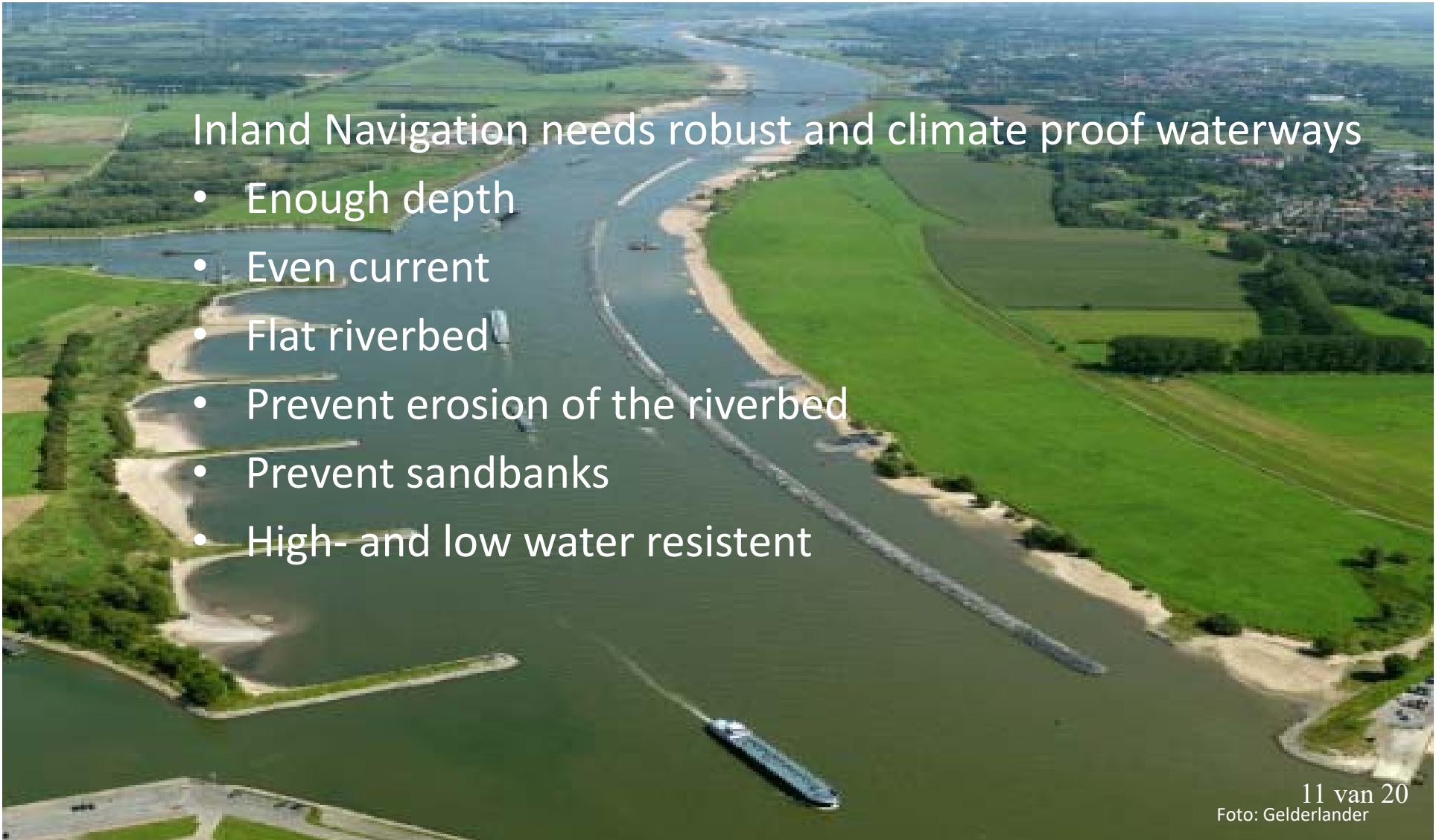


Challenges in River management

- Navigation challenges
- River management challenges
- Information technology challenges
- Ship technology challenges



Robust and climate proof waterways

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- Inland Navigation needs robust and climate proof waterways
- Enough depth
 - Even current
 - Flat riverbed
 - Prevent erosion of the riverbed
 - Prevent sandbanks
 - High- and low water resistant

Water level Waal lower than expected



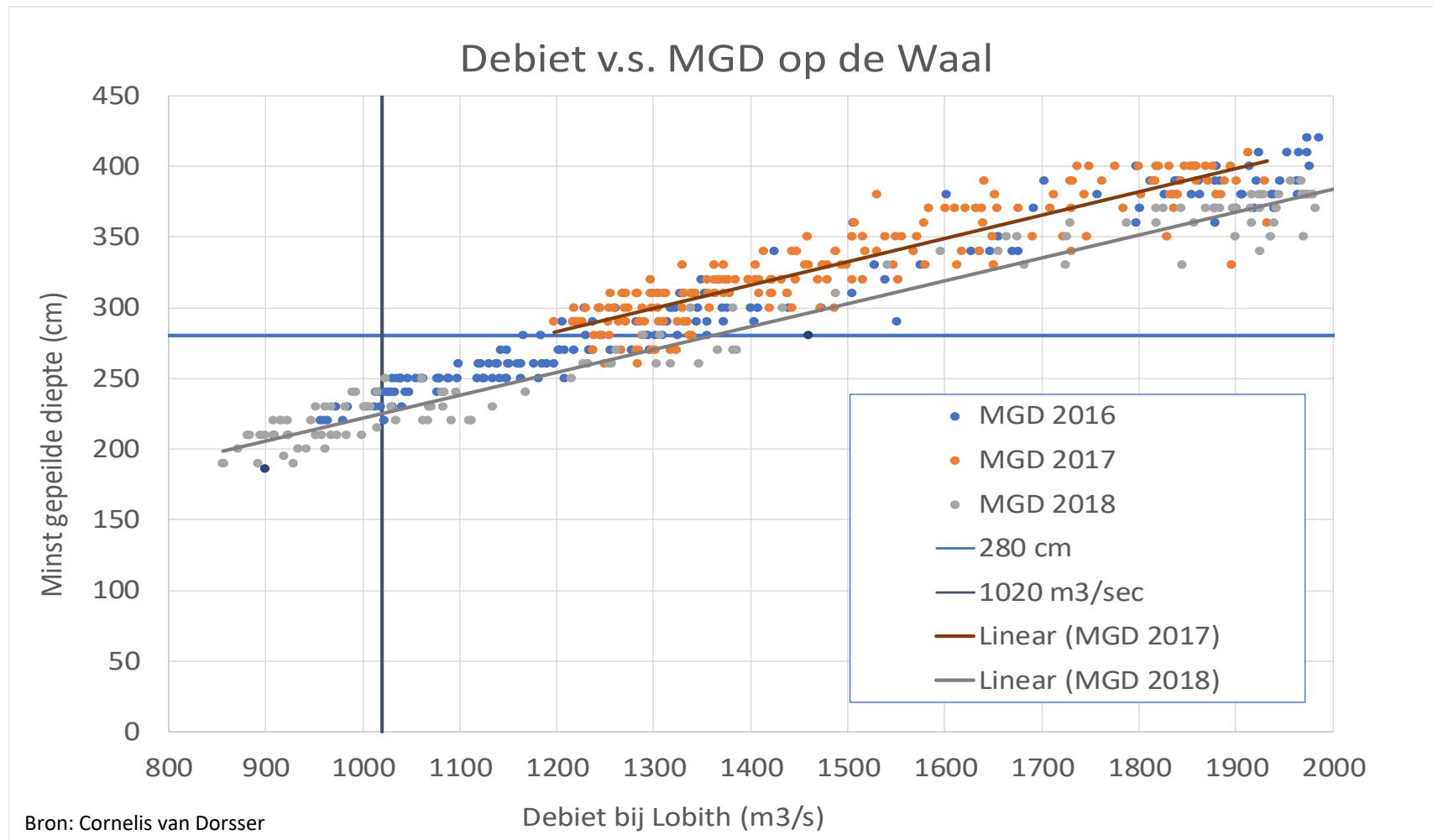
▲ Drukte van schepen op de Waal bij lage waterstand. © Paul Rapp

Nergens is het water lager dan op de Waal, halve meter is 'spoorloos'

NIJMEGEN - Het water in de Nederlandse rivieren staat door de aanhoudende droogte laag. Maar nergens is het zo extreem als op de Waal. Het peil van de rivier is zelfs een halve meter lager dan met de huidige waternaamvoer uit Duitsland zou moeten. Schippers luiden nu de noodklok.

Bron: Gelderlander

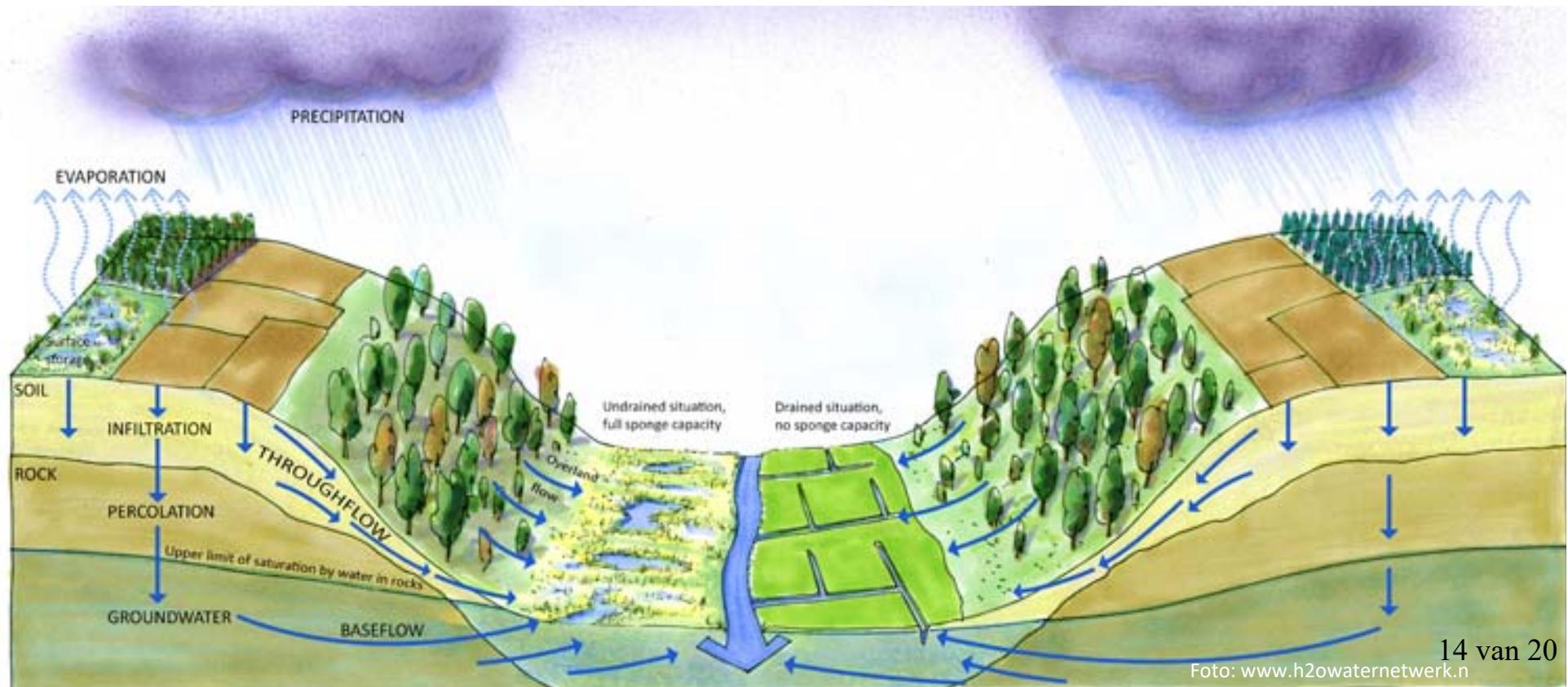
Depth Waal - MGD 2,80m



Bron: Cornelis van Dorsser

Store and keep water in the system

- Improve pomp capacity by locks
- More locks with water basins
- Buffering of water in the system (extend the water cycle)



Integral River Management - IRM

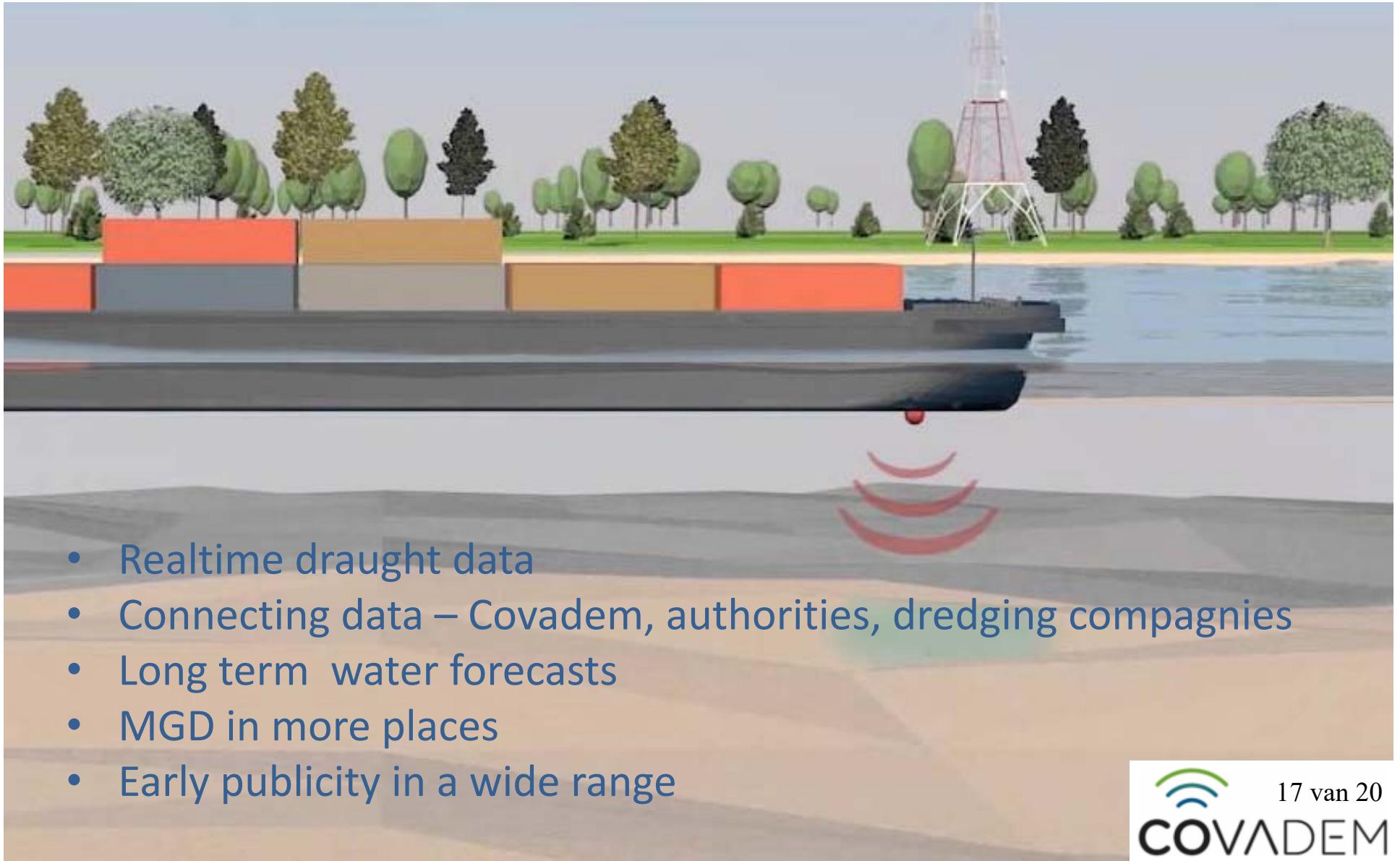


Challenges in Information technologies

- Navigation challenges
- River management challenges
- **Information technology challenges**
- Ship technology challenges



Draught information - MGD



- Realtime draught data
- Connecting data – Covadem, authorities, dredging compagnies
- Long term water forecasts
- MGD in more places
- Early publicity in a wide range

Challenges in Ship technology

- Navigation challenges
- River management challenges
- Information technologies challenges
- **Ship technology challenges**



What can the inland shipping industry do?

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- An aerial photograph of a wide river, likely the Rhine, showing several bridges crossing it. In the foreground, a long cargo ship with multiple barges is moving downstream. The river banks are sandy and show signs of erosion. In the background, a city skyline is visible under a clear sky.
- Decrease depth
 - Increase the turnover rate
 - Increase capacity - push barges
 - Build ships that are more resistant to low water levels
 - Alternative propulsion techniques

There is enough space on the waterways to contribute to society wide issues as road traffic congestion and CO2 reduction. But will there be enough water in the river to make it happen?

