



Experiences in developing sustainable inland waterways

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Deltares

The national water institute of the Netherlands



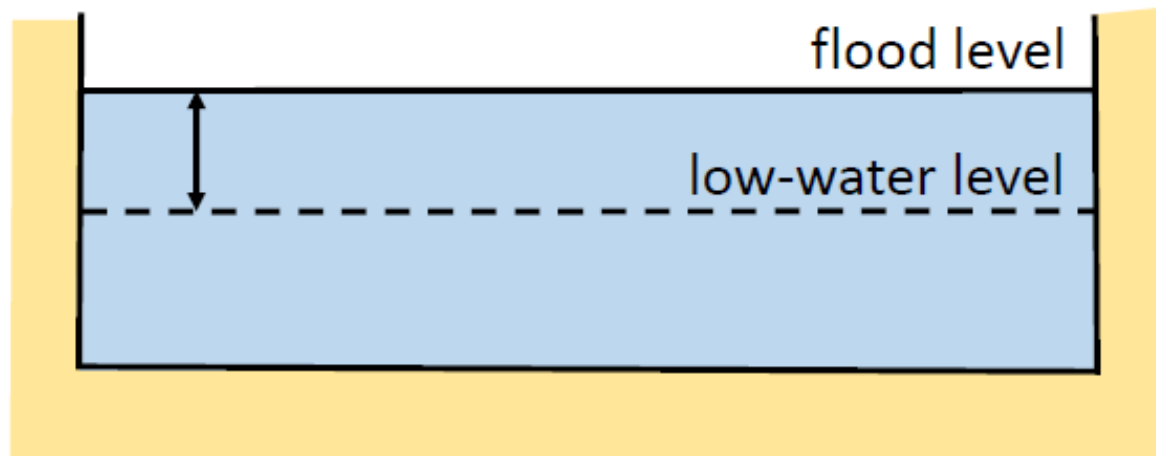
Delft University of Technology

Leading Dutch university in hydraulic engineering

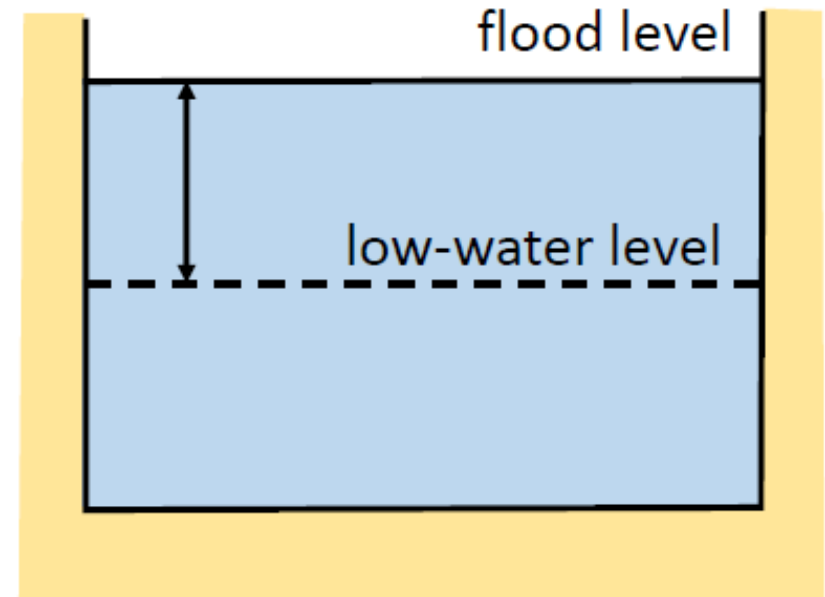
Successful inland waterway on the river Rhine ...



... but with regrets

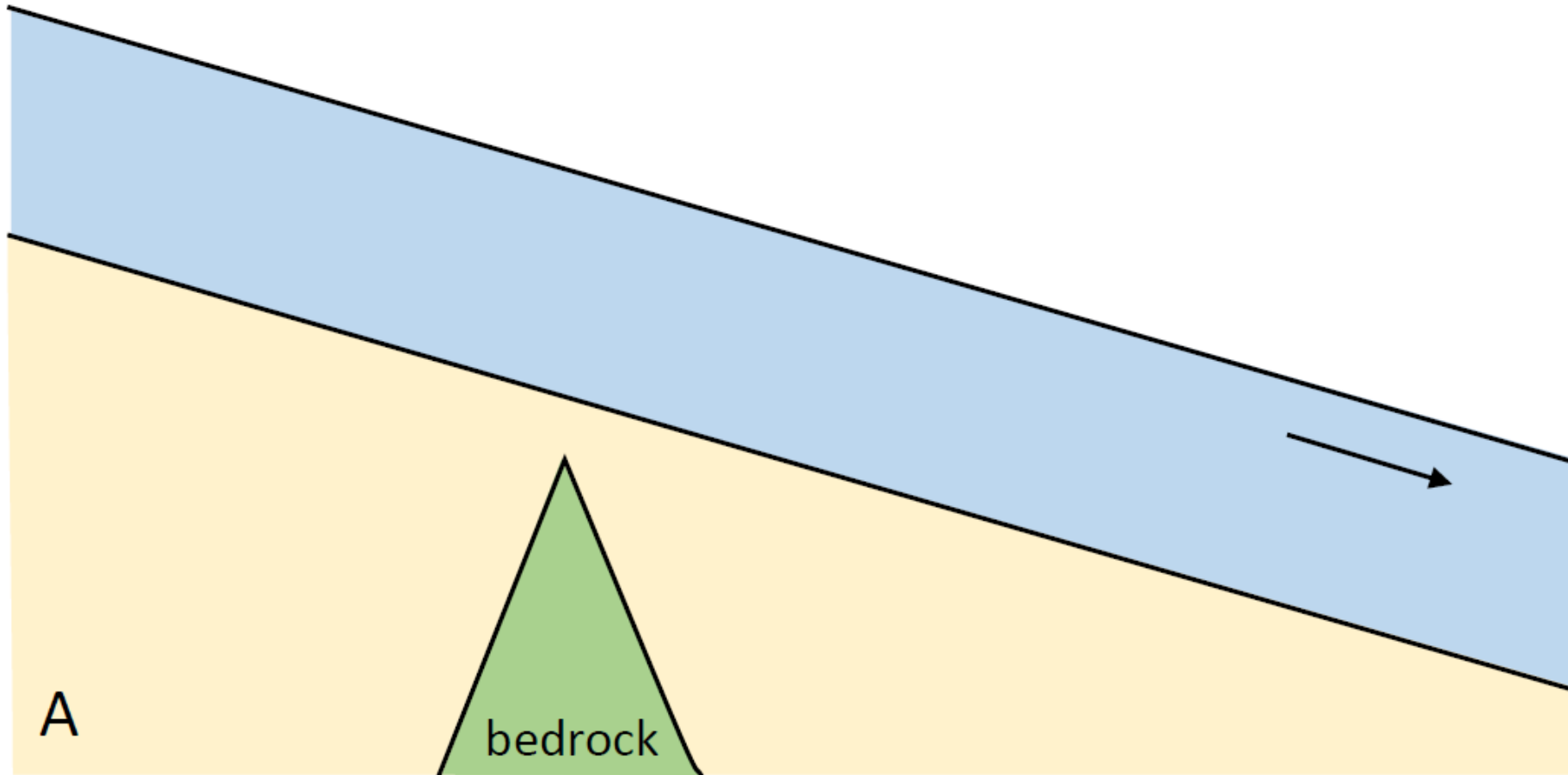


wide cross-section

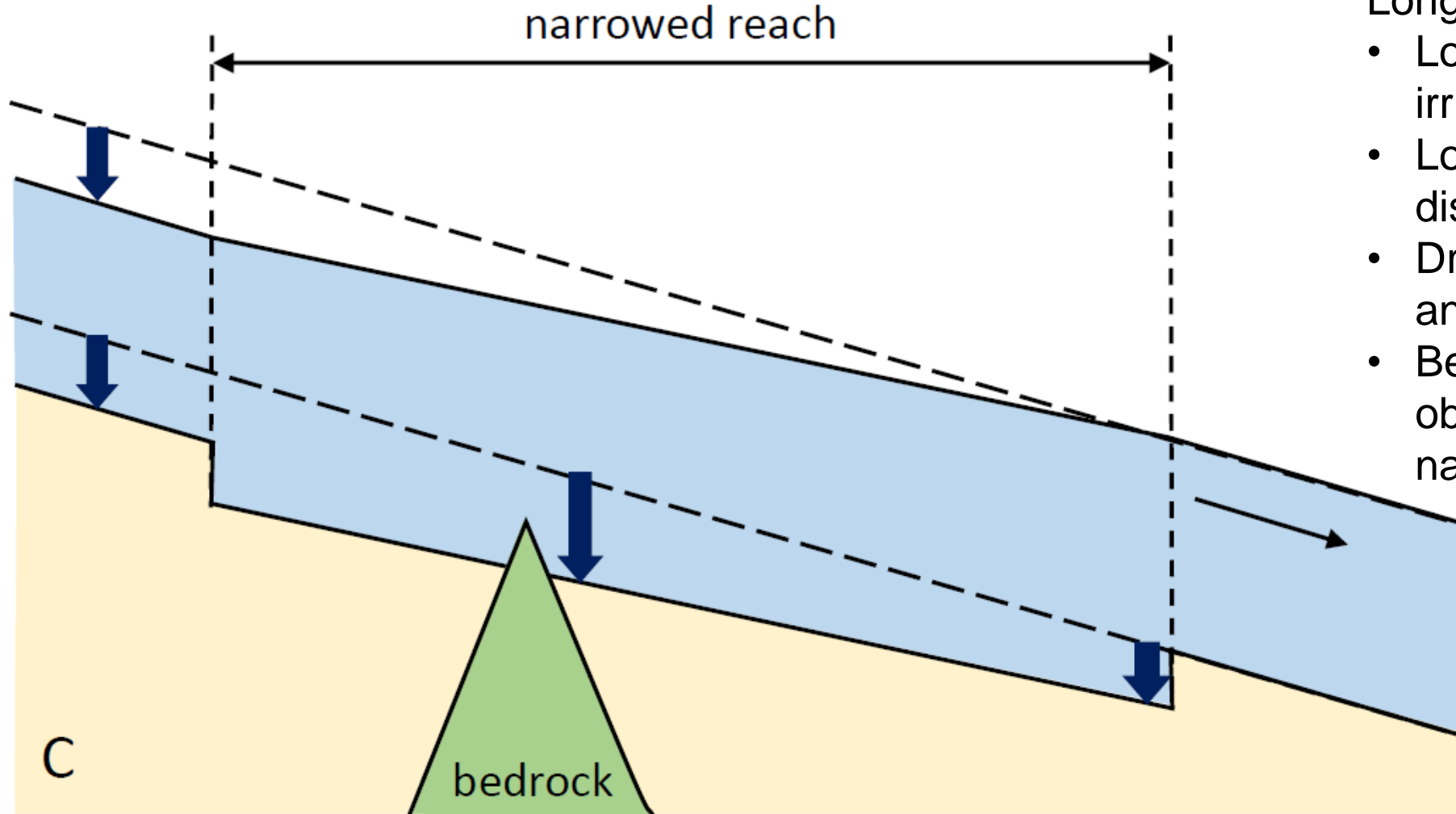


narrow cross-section

... but with regrets



... but with regrets



Long term:

- Lower water levels at irrigation intakes
- Lower water levels at distributary offtakes
- Drying of floodplains and wetlands
- Bedrock forms obstacles for navigation

... but with regrets

European and North-American countries now regret over-engineered interventions from the past



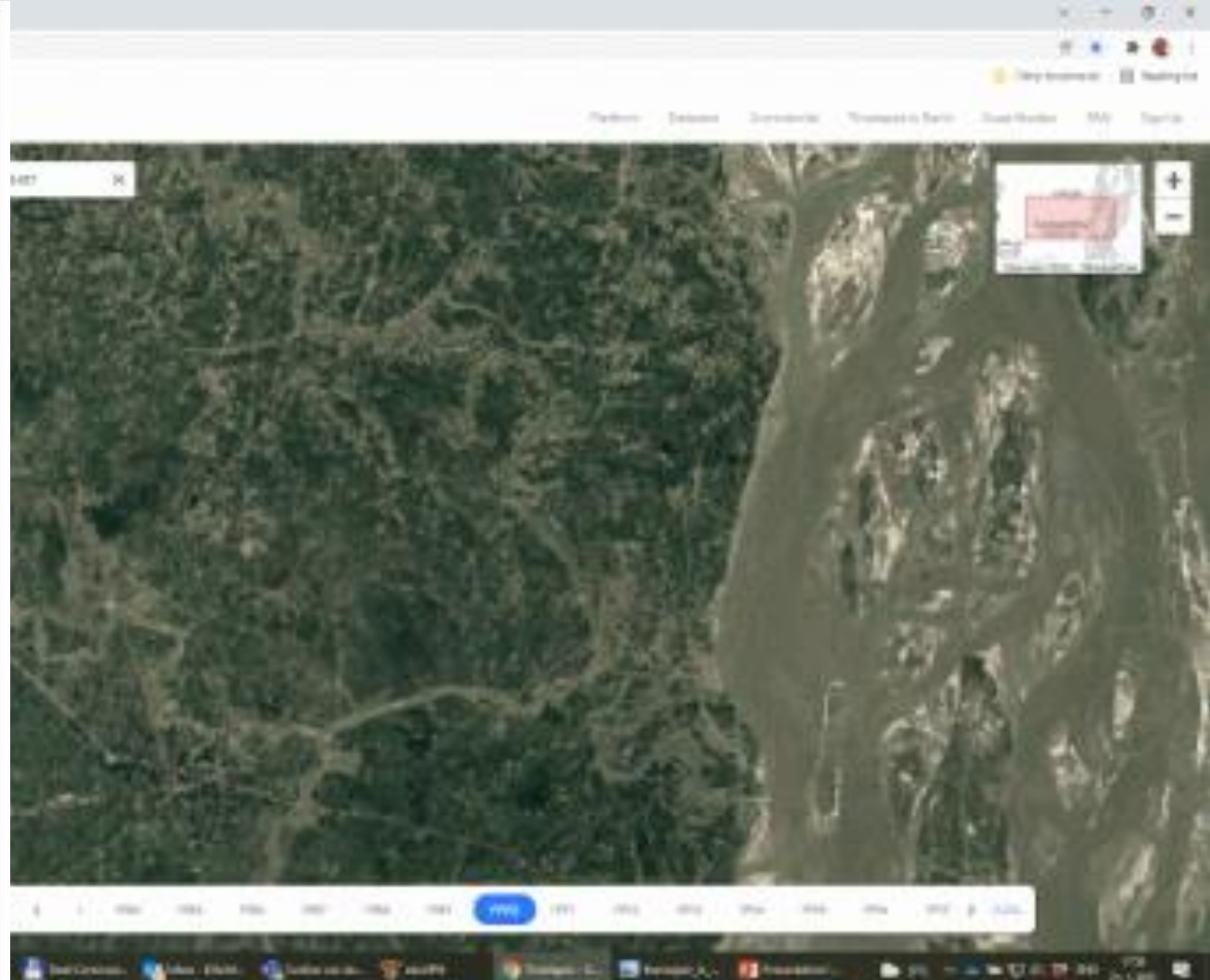
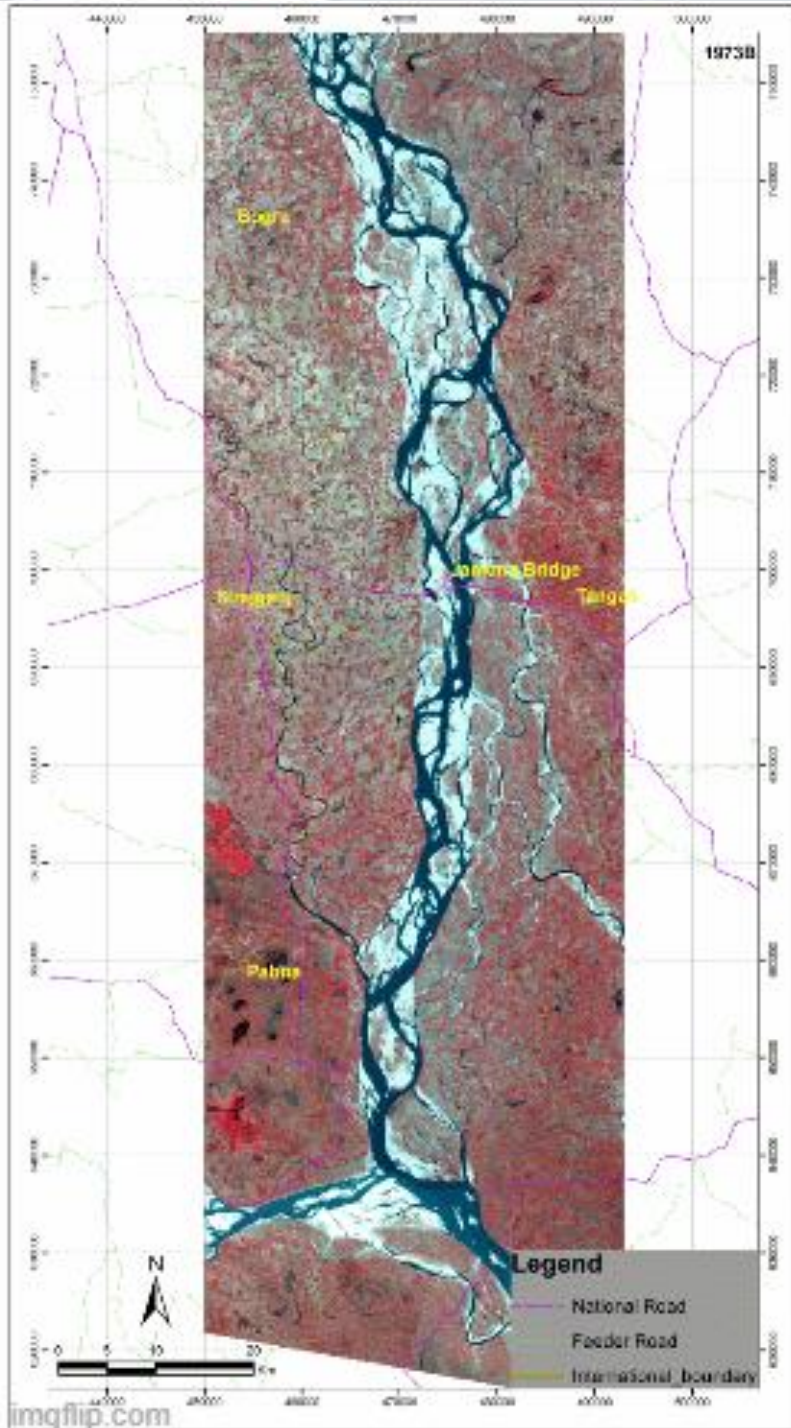
Video:
https://www.wsa-oberrhein.wsv.de/Webs/WSA/Oberrhein/DE/SharedDocs/Videos/Geschiebezugabe_EN.mp4;jsessionid=CB3F196B016294B7312314D5FBEECE3E.live21323?__blob=publicationFile&v=10

This is not the other side of the river

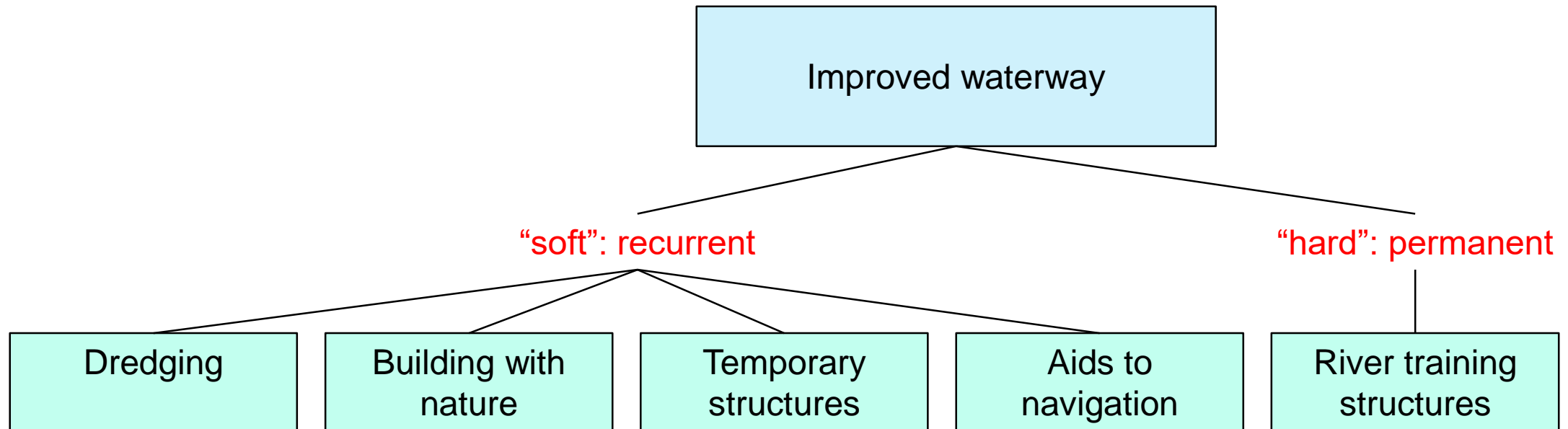


India:

- Larger sizes and discharge variations than in Europe
- Mobile braided rivers: Indian morphology



Development of sustainable inland waterways



River training experiences in Brahmaputra-Jamuna



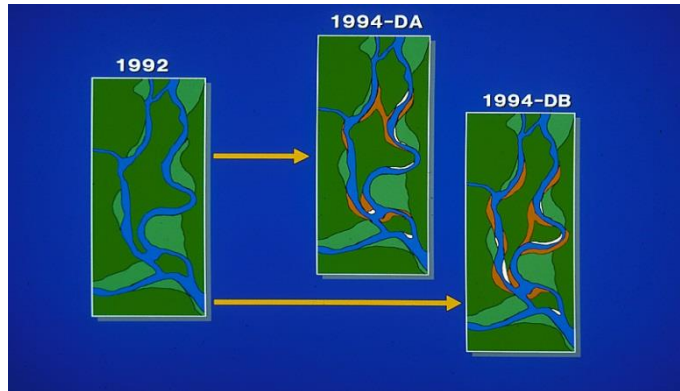
Open-access studies on river training along the Brahmaputra-Jamuna River:

https://www.mdpi.com/journal/water/special_issues/river_training_studies

- A century of riverbank protection and river training in Bangladesh
- Bank protection structures along the Brahmaputra-Jamuna River, a study of flow slides



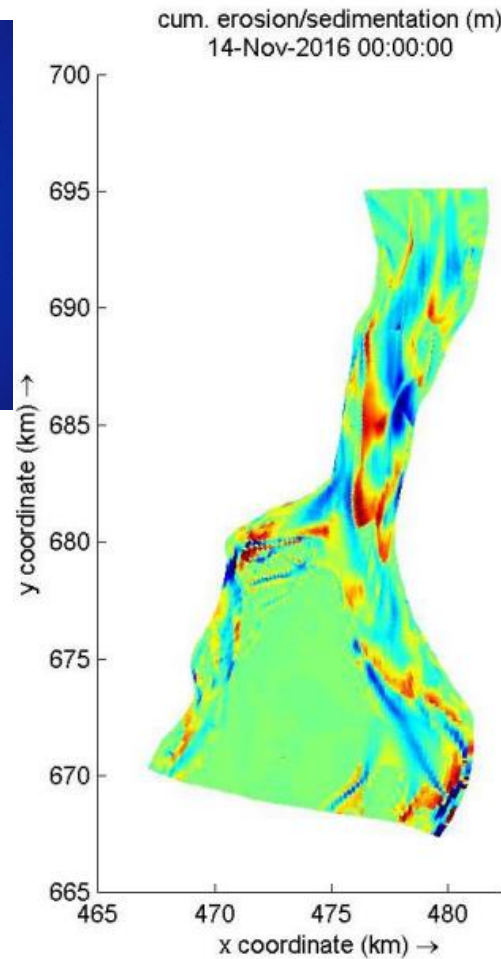
Modelling tools for river training



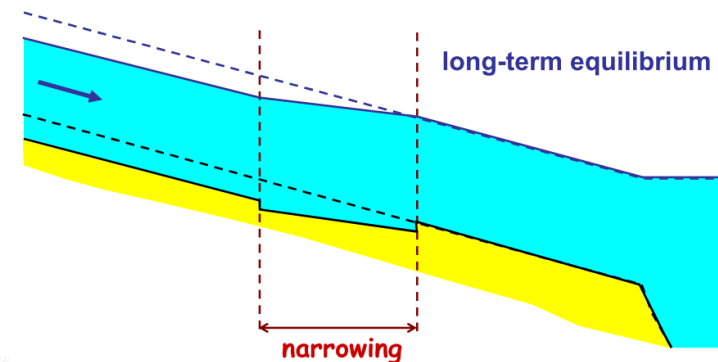
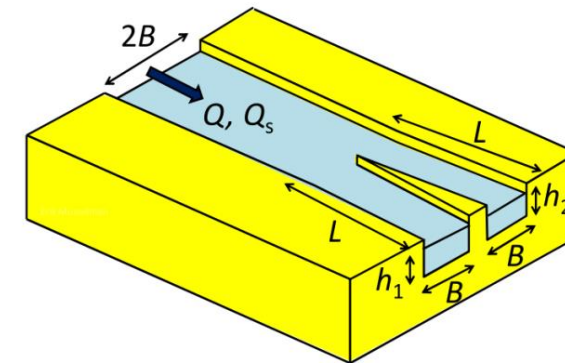
empirical probabilistic



physical



numerical



analytical

Conclusions

1. Respect for mighty river
2. Hybrid solutions
3. No blueprint:
 - *Adaptive approach, learning by doing, monitoring, seizing of opportunities*
4. Caution with narrowing and sediment extraction





Thanks!