

Sediment management in the Rhine catchment: Inventory of knowledge, research and monitoring, and an advice on future sediment research - „Rhein-Sed“

CHR 50 years jubilee conference

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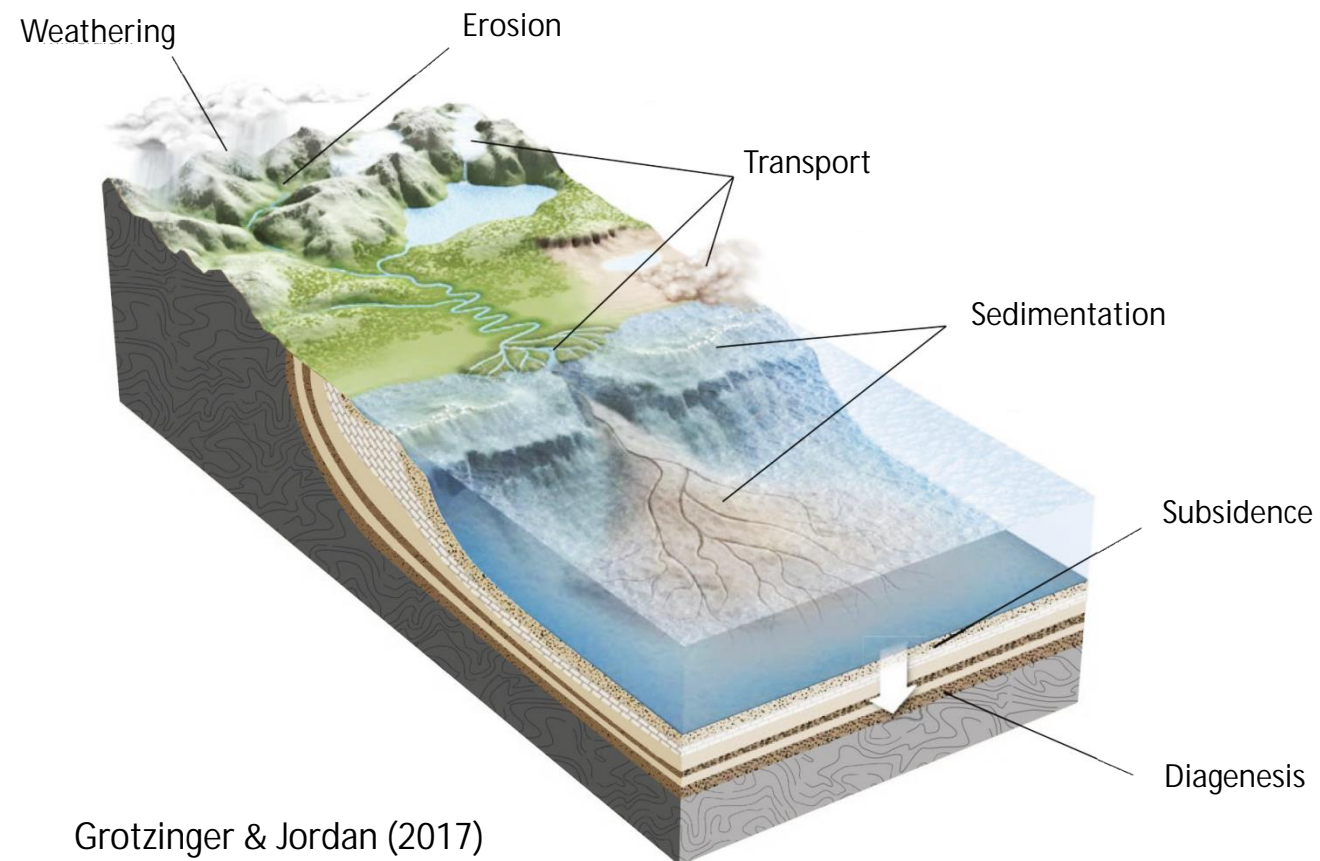
Wednesday, October 22nd

Content

- Introduction
- Objectives of „Rhein-Sed“
- Methods and activities in „Rhein-Sed“
- Exemplified research questions derived
- Future project ideas

Introduction

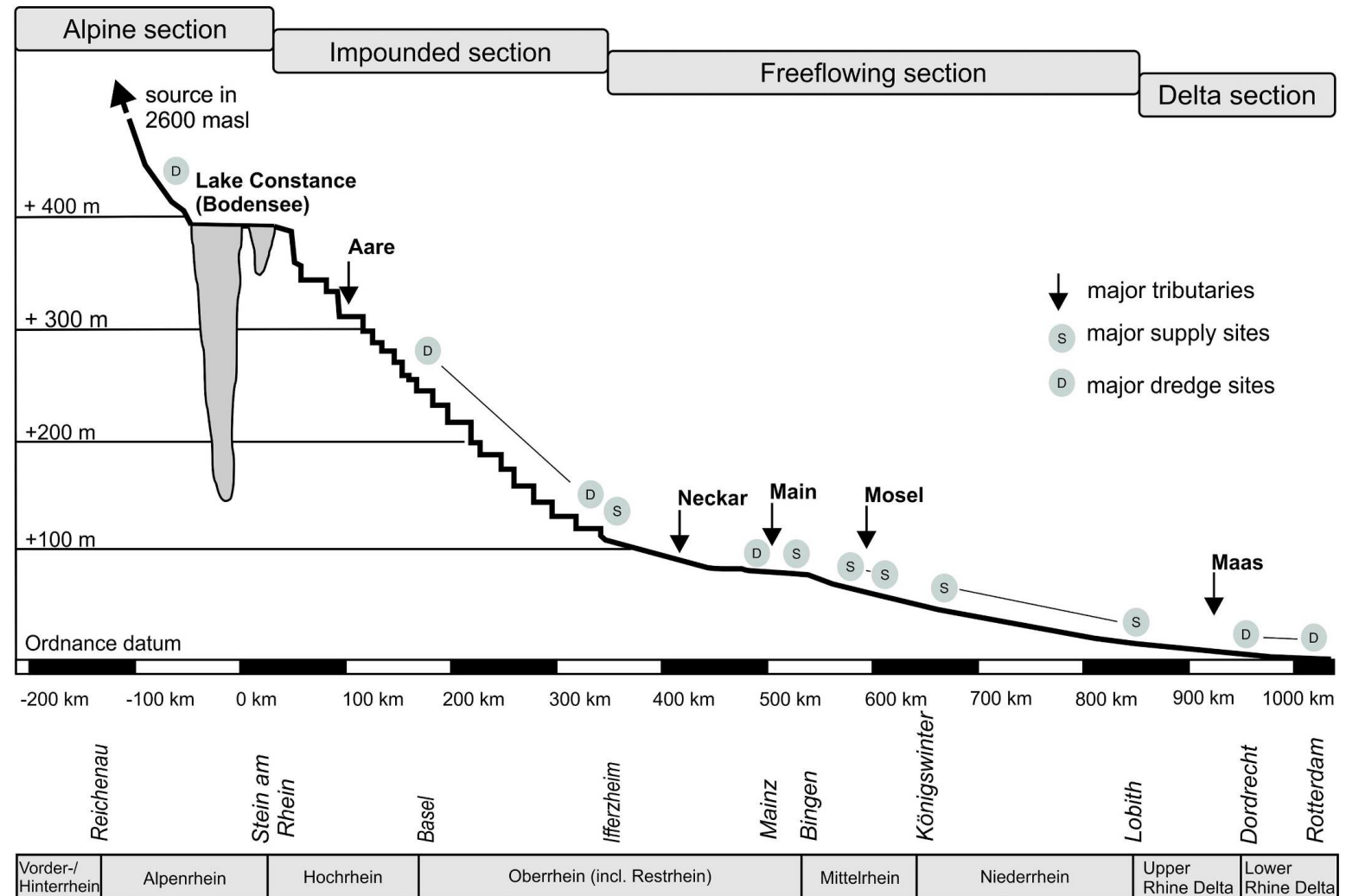
Sediment cycle



Grotzinger & Jordan (2017)

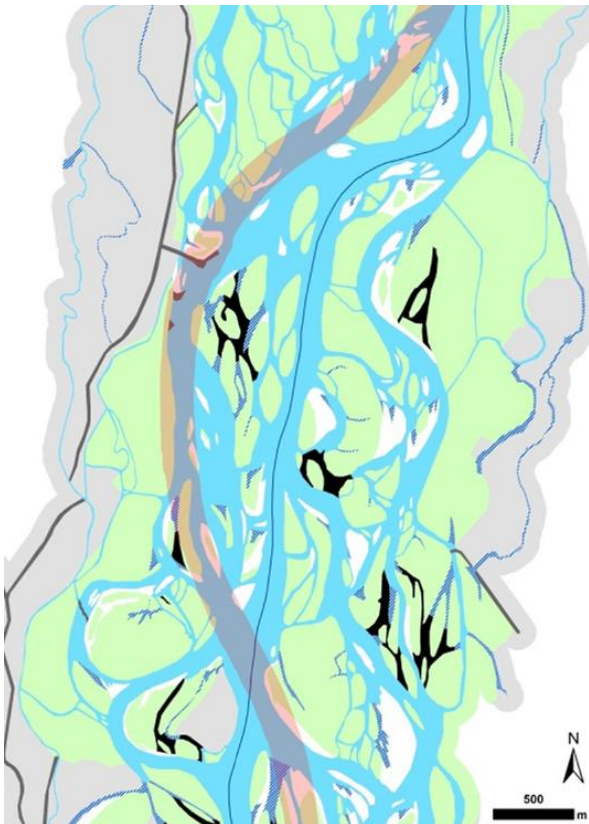
Introduction

Rhine longitudinal profile

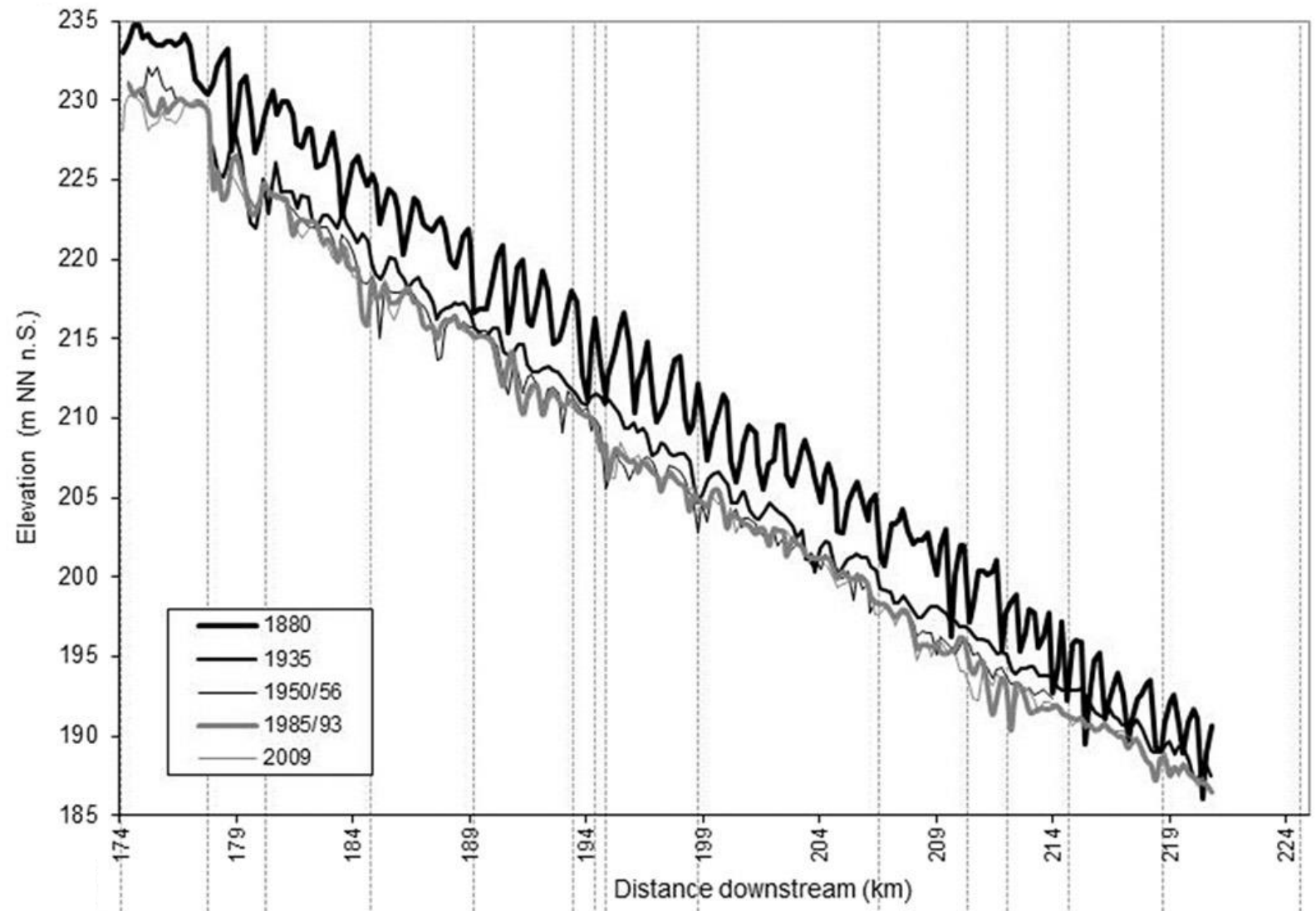


Introduction

Channelisation effects



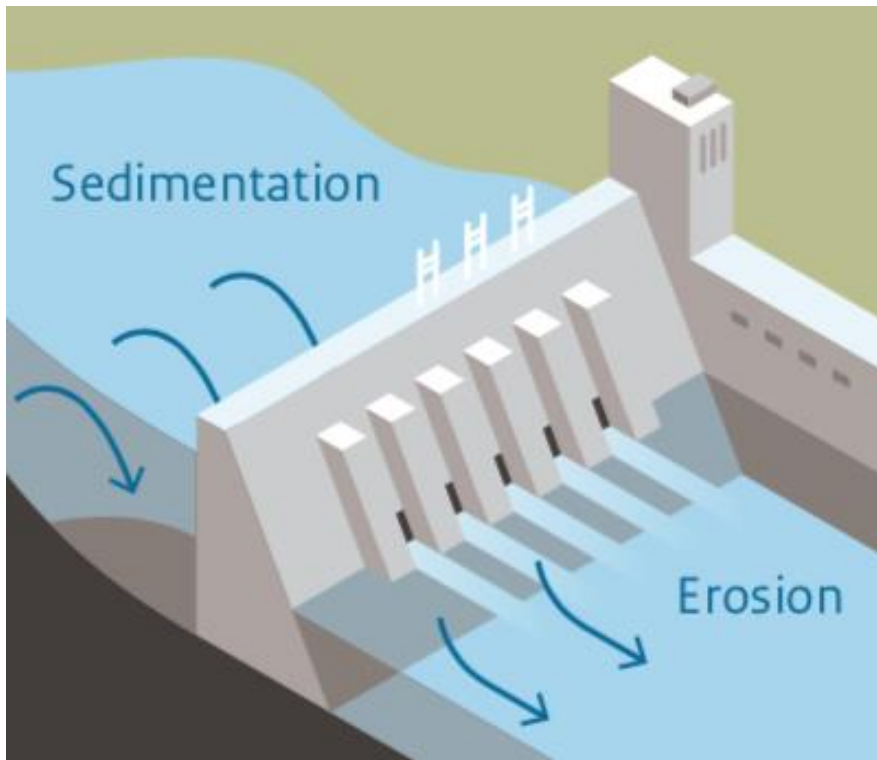
Arnaud et al. (2019)



Arnaud et al. (2019)

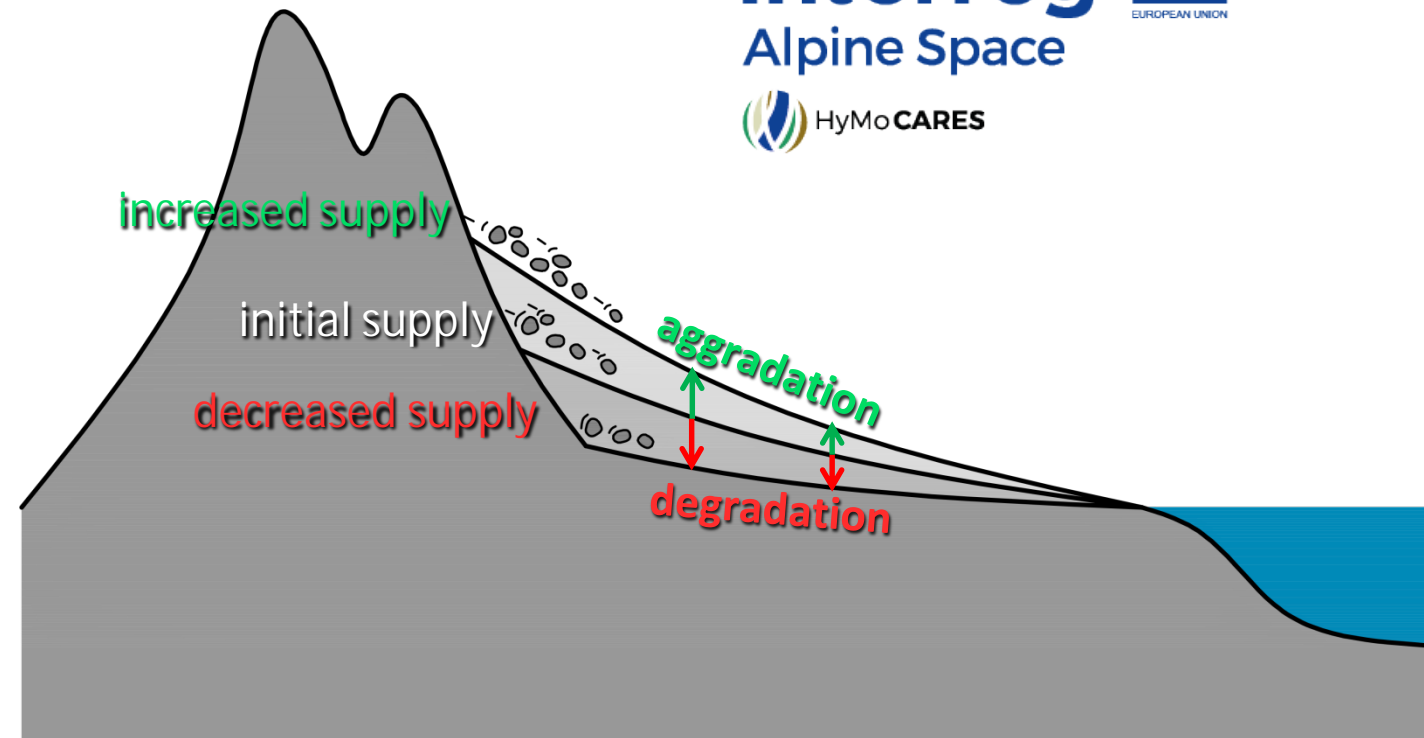
Introduction

Effects of sediment barriers



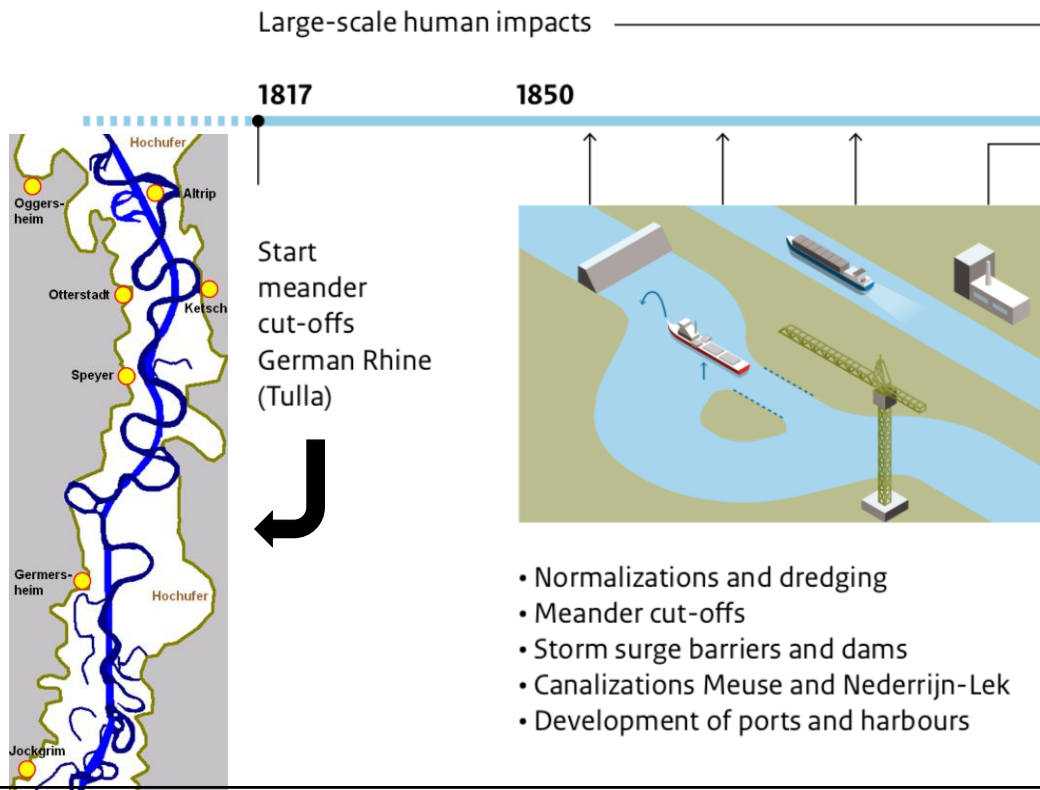
(Rijkswaterstaat)

Slope adjustment



Introduction

The Rhine River is still adjusting to measures in the past 200 years

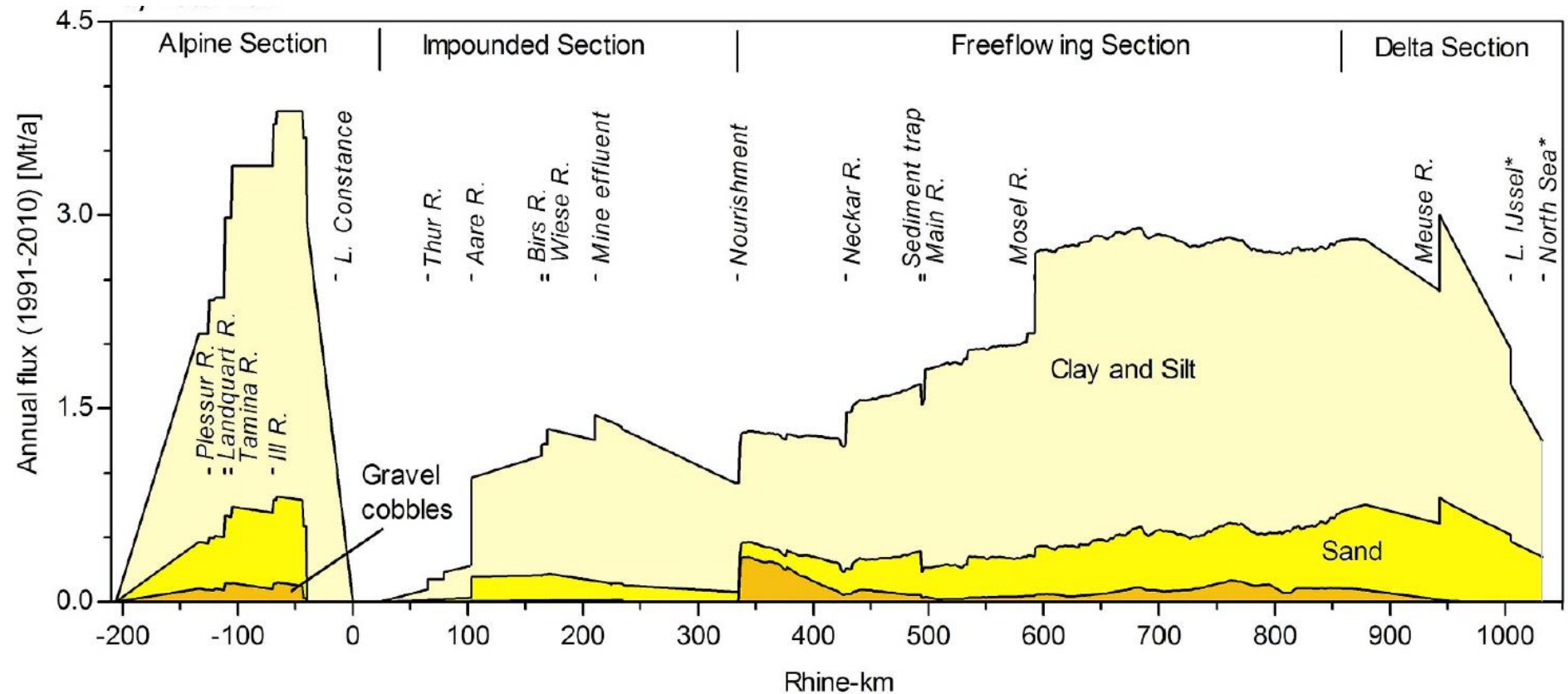


Effect of climate change

(Rijkswaterstaat)

Introduction

Rhine sediment budget (1991-2010)



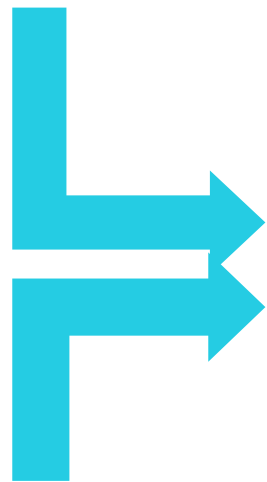
Objectives

- Establishment of a coherent overview on sediment-related problems and activities at the Rhine River and relevant tributaries, especially activities affecting the sediment transport in the Rhine basin
- Identification of knowledge gaps
- Recommendations for complementing monitoring activities
- Recommendations for the establishment of a new research program

Methods

- Establishment of a Steering Committee

- Interviews with experts



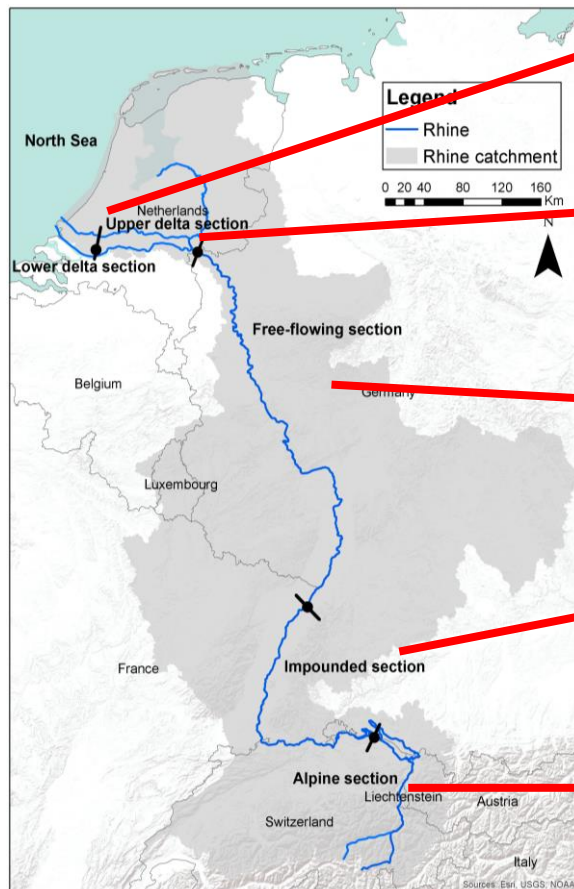
Conclusions

- Literature research



Results

Exemplified challenges found in the five sections:



Lower Delta section: Increased backwater from sea level rise affecting sediment transport

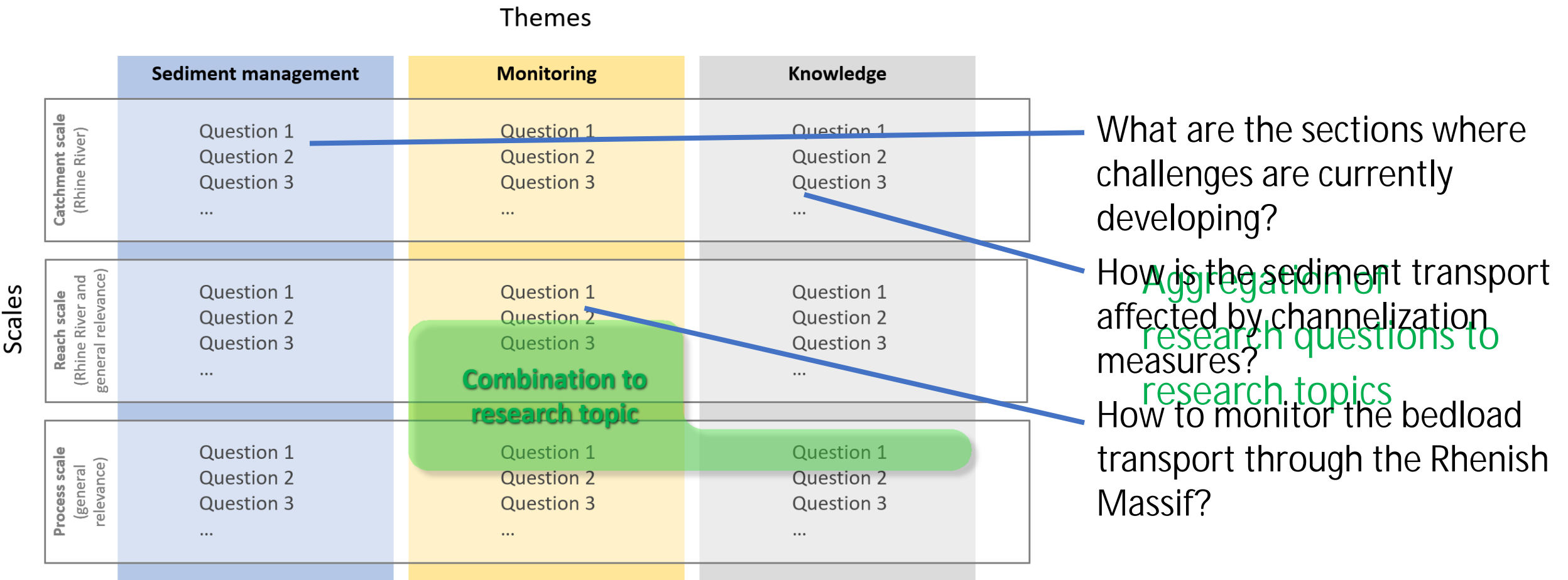
Upper Delta section: The migration of the gravel-sand transition causes bed level changes, limited understanding due to unclear causes

Free-flowing section: For sediment budgeting, missing knowledge on the exchange of sediment between main channel and groyne fields

Impounded section: Nourished sediment in Old Rhine did not cause desired morphology

Alpine section: Encroachment of vegetation on bars – Missing guidance when vegetation has to be removed

Results



Results of the Rhein-Sed project

Suggestion of 9 research topics:

1. Influence of climate change and land use change on the sediment regime
2. Impacts of river engineering (including channelization and continuity disruptions) on the entire Rhine's morphology and sediment budget
3. Impact of sediment management activities on the overall sediment budget of the Rhine River, and identification of possibilities for improvement
4. Harmonization of monitoring strategies and consideration of new monitoring techniques
5. Optimisation of sediment budgeting
6. Assessment of the transfer of coarse sediment through the Rhenish Massif
7. Determination of the demands of different sectors (hydropower, navigation, flood risk management, ecology) on a sustainable management of sediment and morphodynamics
8. Vegetation and sedimentation
9. River restoration: Bank erosion and channel widening, and the interactions with sediment regime and sediment budget

Recommendations for follow-up research

Definition of the three most important project ideas

1. Influence of climate change and land use change on the sediment regime
2. Alteration and improvement of sediment balance and continuity, sediment transport, and morphology (in the context of the spatial and temporal development of river engineering and management in the Rhine River and major tributaries)
3. Sediment transport processes and management – National and bilateral projects
 - 3.1 Individual studies on sediment processes
 - 3.2 Bilateral projects addressing sediment management

A scenic landscape photograph featuring a wide, rocky beach in the foreground. The beach is covered with smooth, dark and light-colored stones. Gentle waves are washing onto the shore, creating white foam. In the background, a long, dark bridge with multiple stone piers spans a body of water. The sky is a clear, pale blue. The text "Thank you" is overlaid in the center of the image.

Thank you