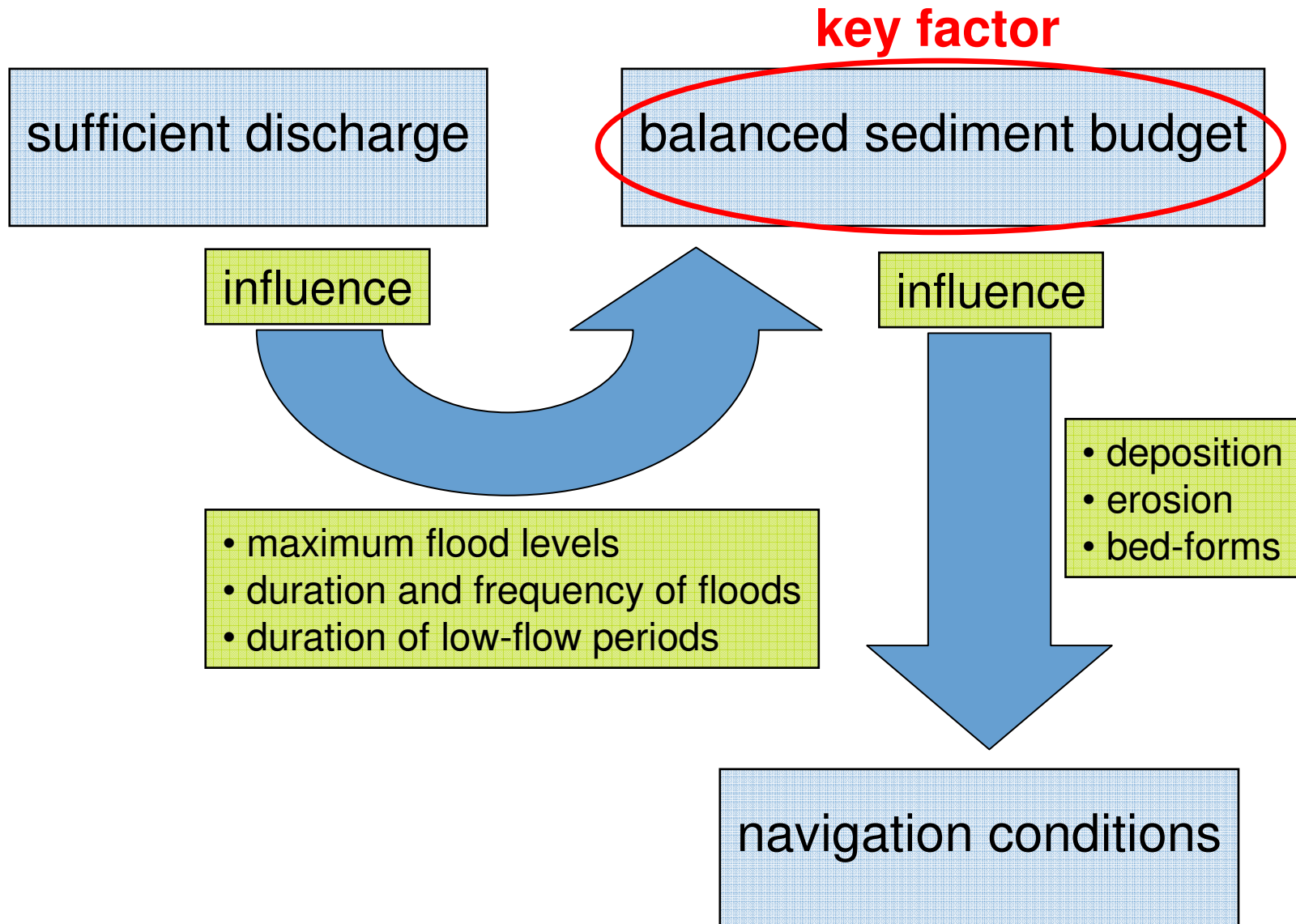


Climate projections for sediment budgeting and river morphology of German waterways

Dr.-Ing. Markus Promny
Federal Institute of Hydrology, Koblenz, Germany

BACKGROUND

Requirements for stable navigation conditions



APPROACH

sediment budget analysis

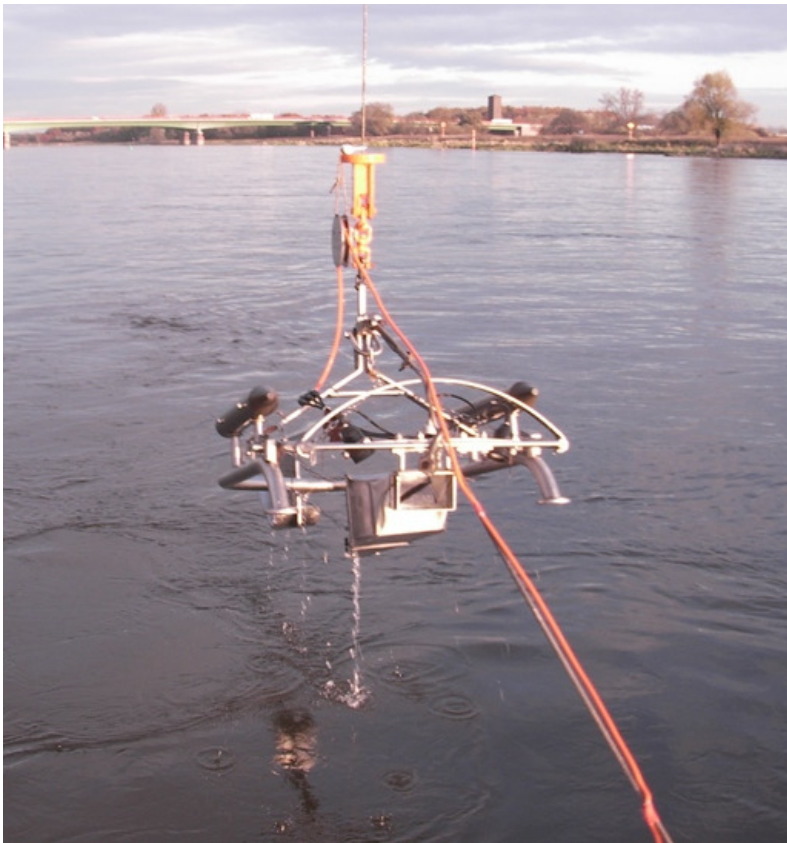
Tools:

- sediment transport measurements
- bed-level surveys
- bed-load tracer experiments

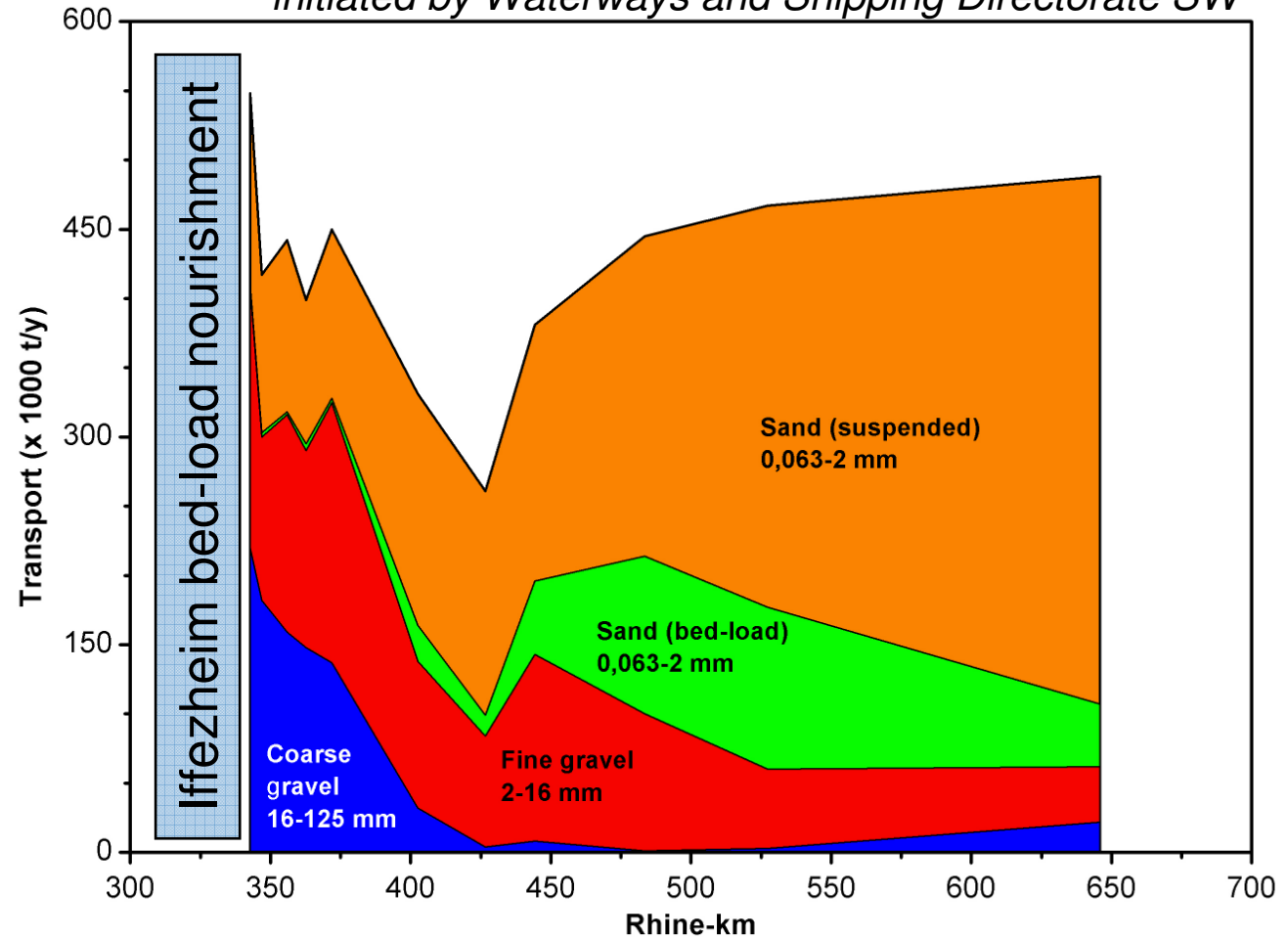
→ present sediment budget

Rhine: BfG-report 1702 (2010)

initiated by Waterways and Shipping Directorate SW

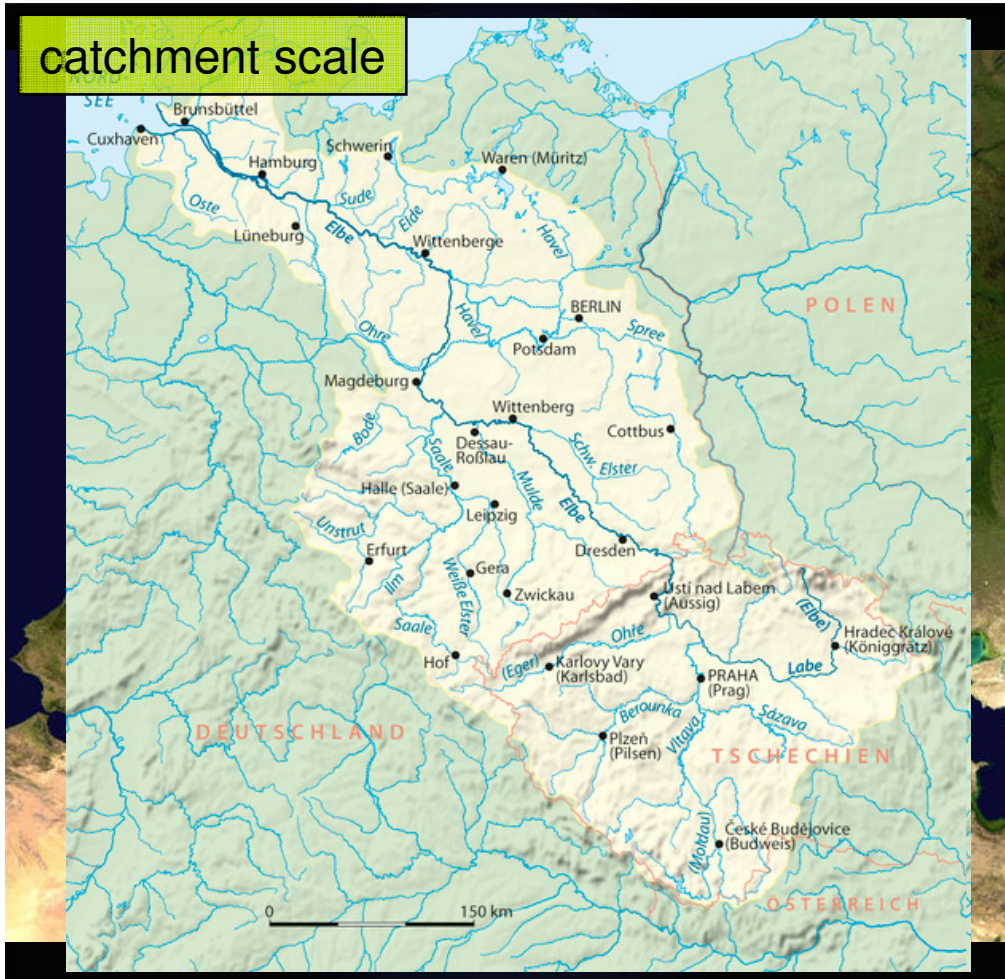


BfG-type bed-load sampler



APPROACH

climate projections



global emission scenarios

global climate models

regional climate models

hydrological models

hydro- and morphodynamic models

source: Wikimedia Commons

➔ projection of sediment budget until 2100

Project KLIWAS (www.kliwas.de)

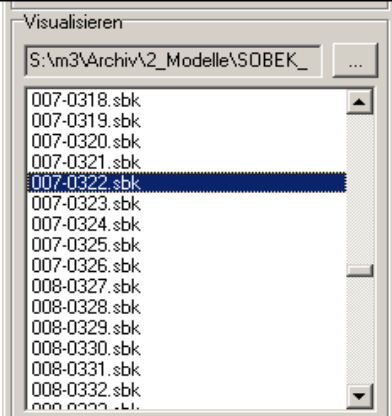
initiated and financed by the Federal Ministry of Transport, Building and Urban Development (BMVBS)

APPROACH

morphodynamic models

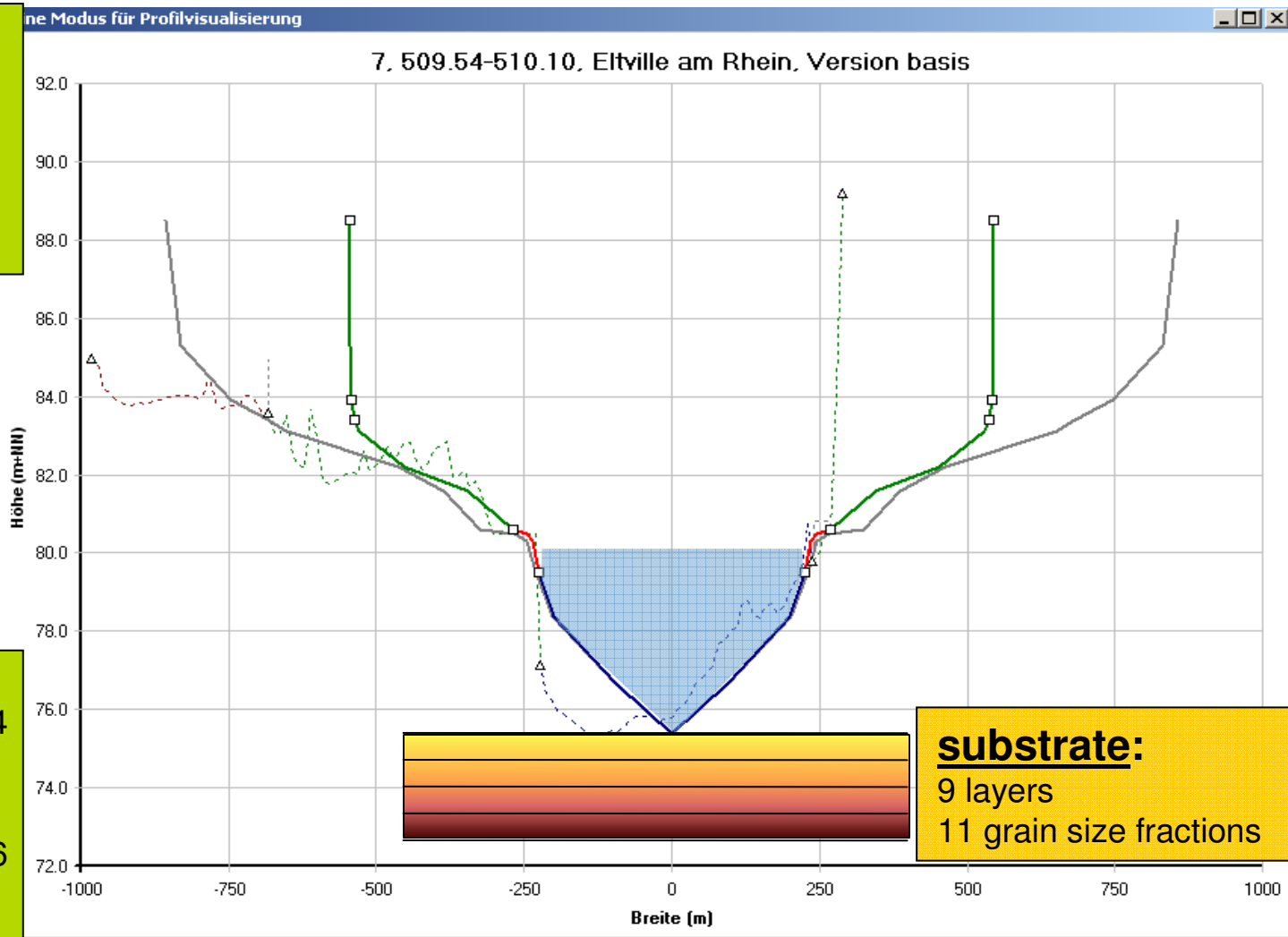
example cross section

river Rhine
1-D Model SOBEK
(deltares.nl)



calibration:
bed level change 1993-2004

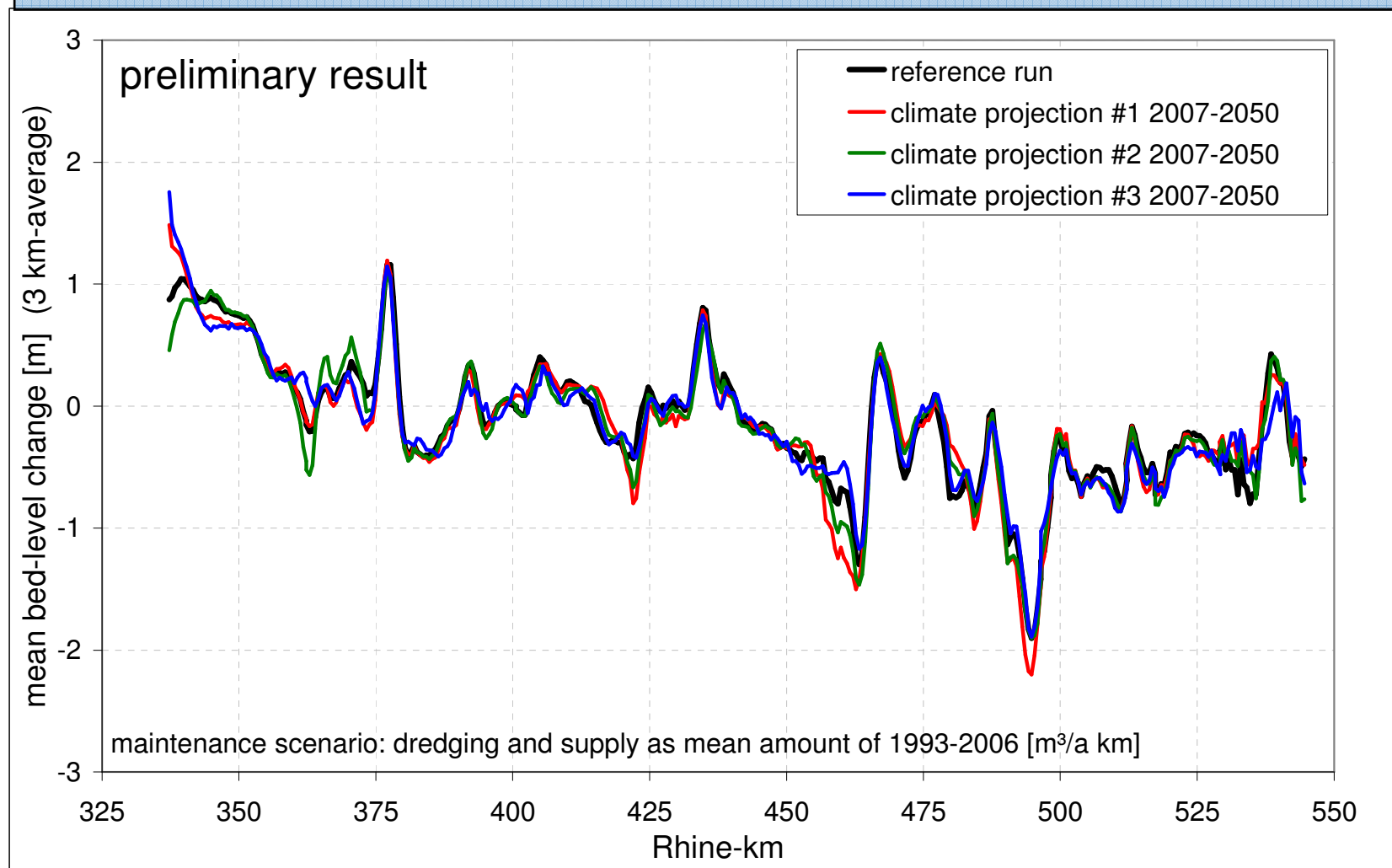
validation:
bed level change 1996-2006
transport rates



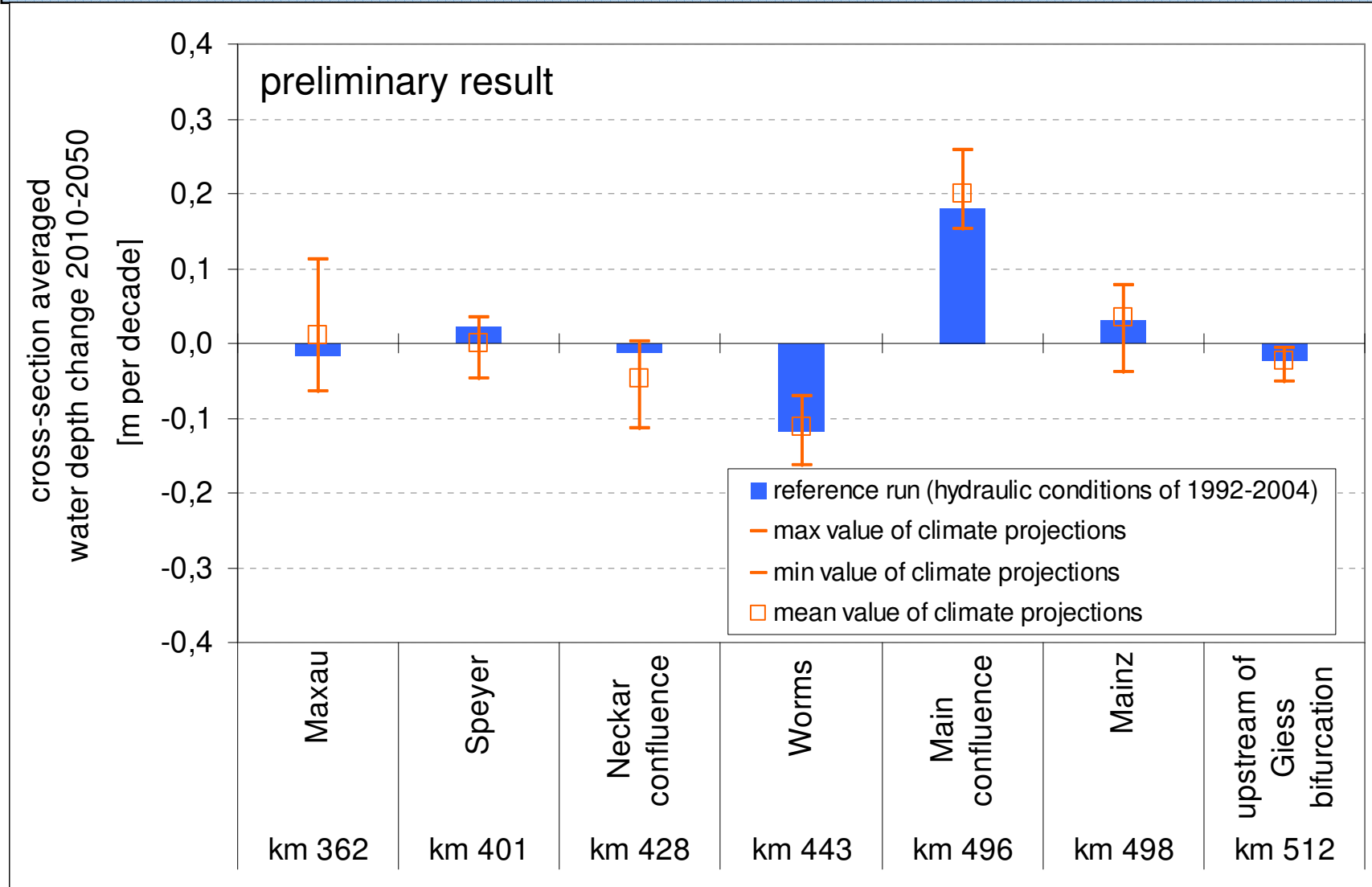
STATE OF THE PROJECT

- first sets of projections have passed the model chain
- morphodynamic calculations running until 2050

Example: bed-level change of the Rhine between 2007 and 2050



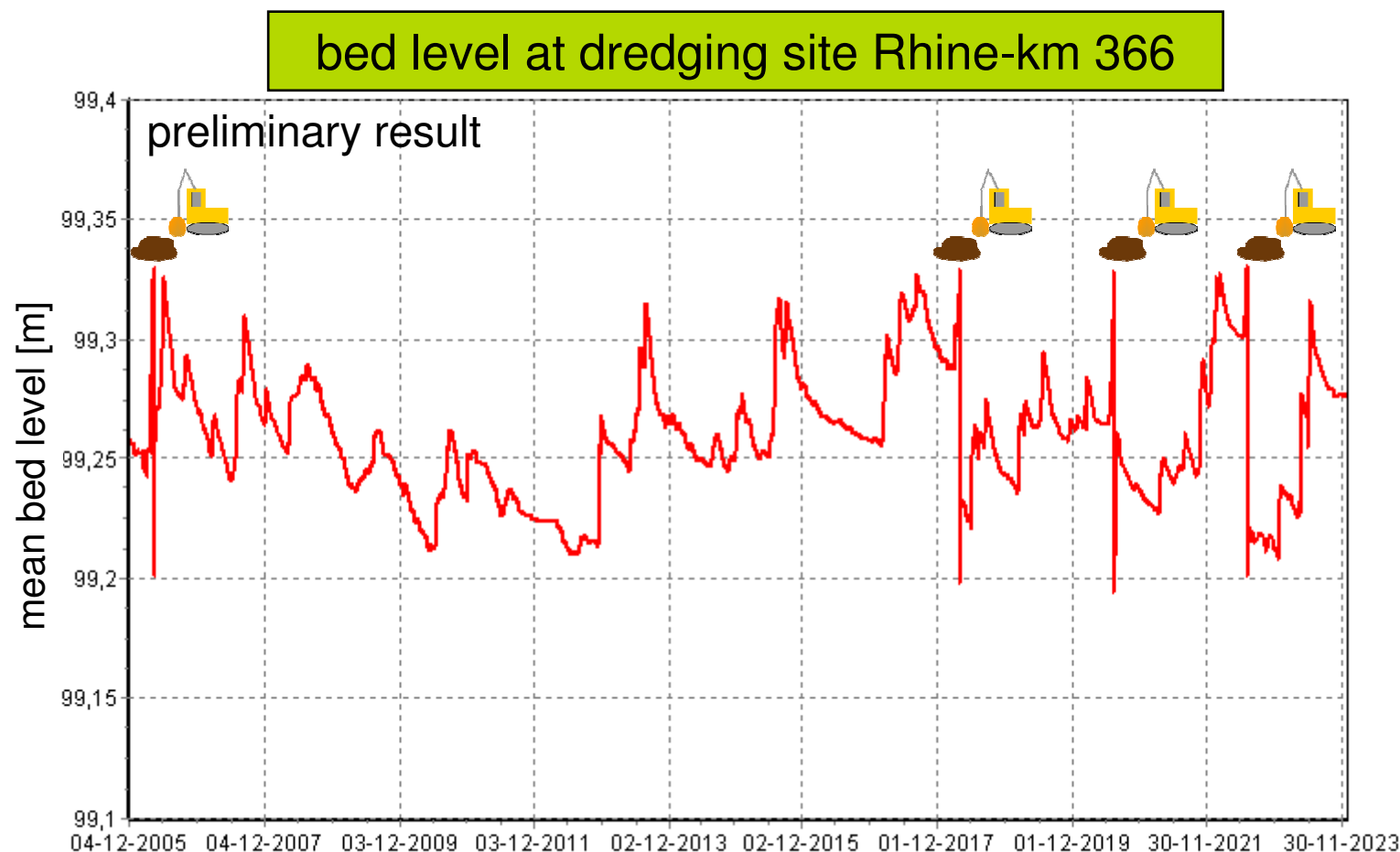
Example: water depth change along the Rhine between 2010 and 2050



NEXT STEPS

improvement of dredging & dumping simulation

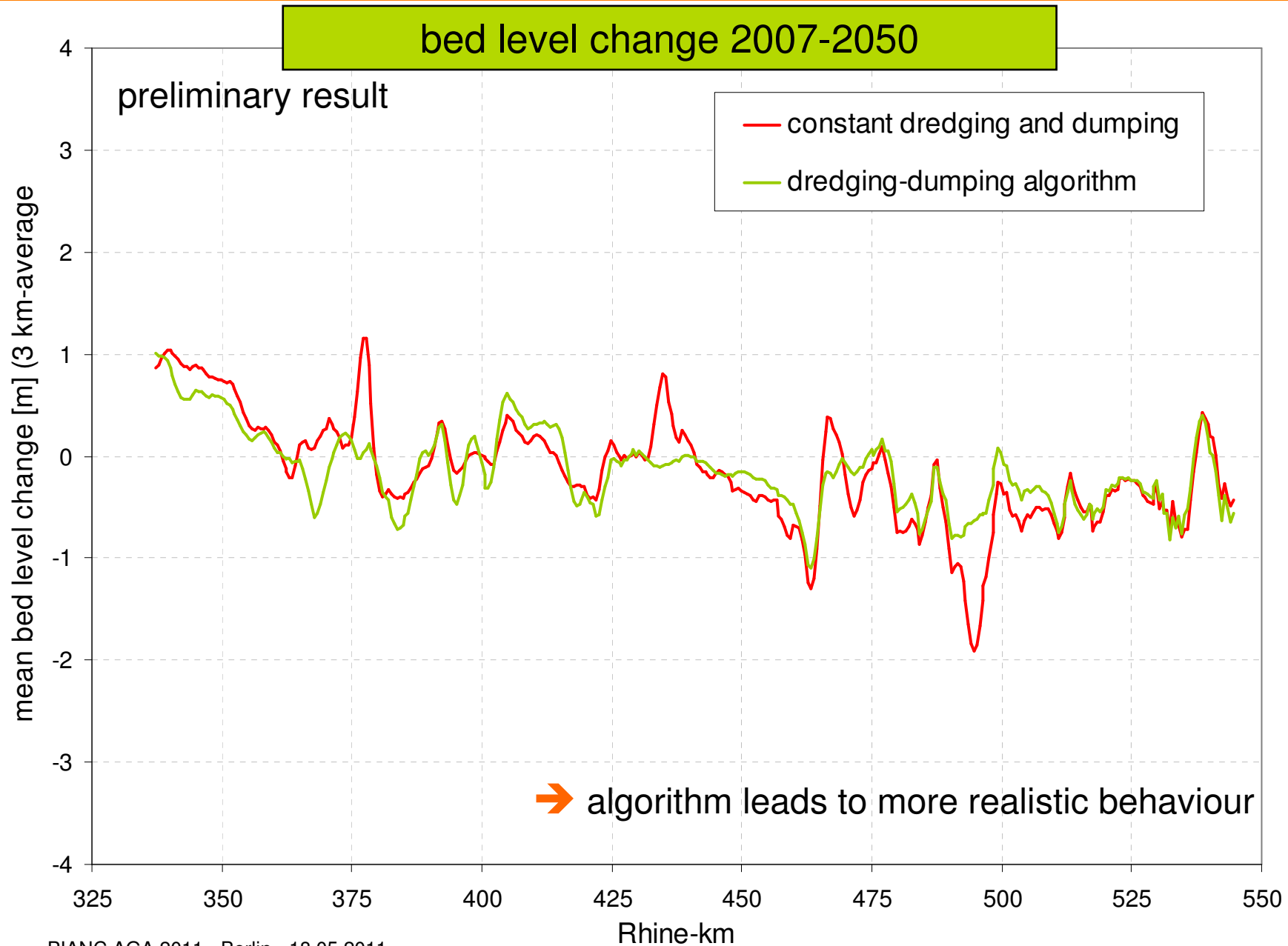
→ dredging & dumping algorithm



- automatic dredging when bed level exceeds predefined threshold
- dumping of dredged material at predefined site

NEXT STEPS

improvement of dredging & dumping simulation



NEXT STEPS

include updated climate projections (IPCC)

extending simulation time to 2100

Conclusions

- chain of models is being set up
- aim: assess potential impacts on German waterways resulting from climate change
- sediment budget is the key factor in the assessment of impacts on navigation
(as well as on ecology and water quality)
- at this project-stage model chain is operable
- robust results can be expected by the end of the project in 2013
- analysis will help to identify possible challenges and adaptation measures

Thank you very much for your attention.

Dr.-Ing. Markus Promny
Federal Institute of Hydrology, Koblenz, Germany
promny@bafg.de

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Transport, Building and Urban Development (BMVBS)



split barge downstream Iffezheim