

Approach morphological modelling



Preparation of Documentation for River Training and Dredging Works on Selected Locations along the Danube River. A project funded by the European Union

14 December, 2012

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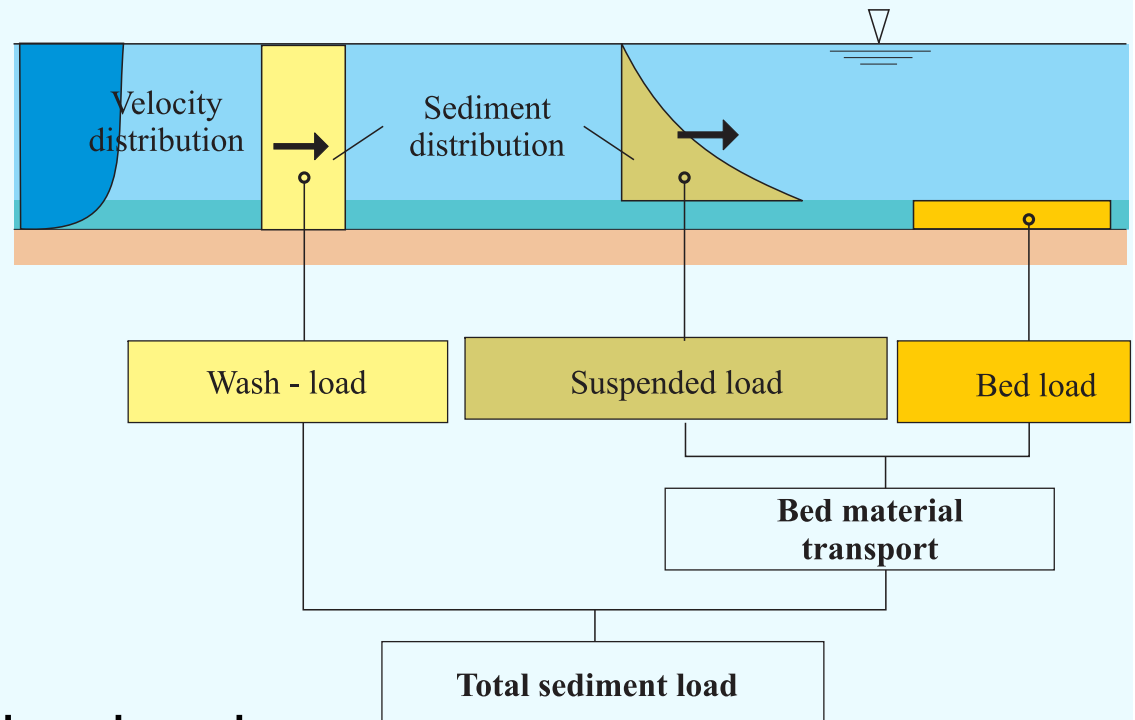
- Approach morphological modelling
- Preliminary results:
 - Susek
 - Arankina Ada
 - Cortanovci
 - Beska

Why modelling?

- Goal of the modelling (Phase 3):
 - Verify and optimize the layout and structure dimensions
 - Determine design criteria for structures
 - Assess adverse effects
 - Provide input for EIA.

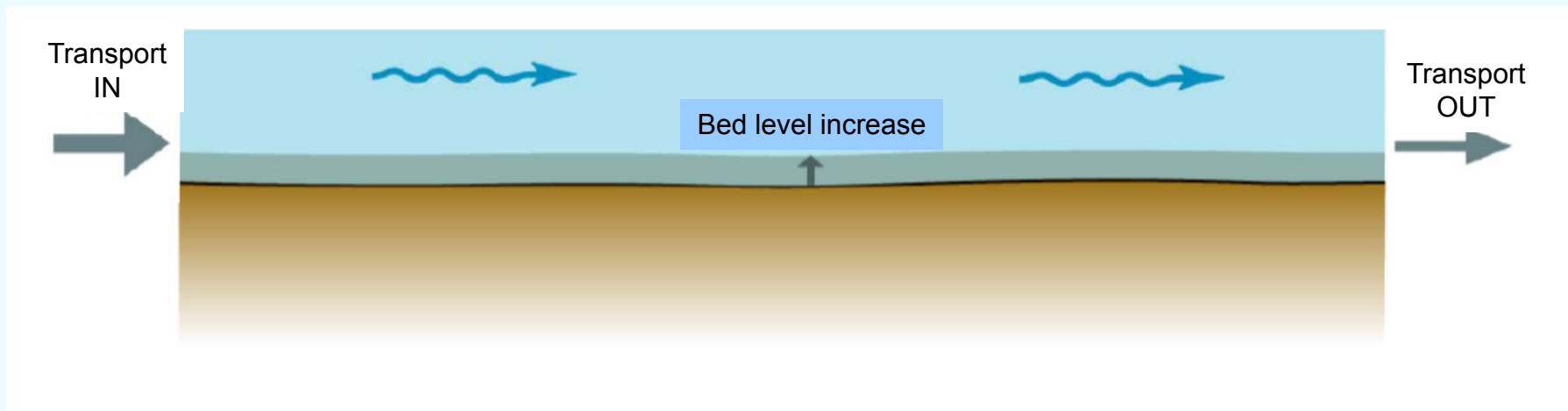
Introduction

- River morphology: "study changes of the river shape";
- Sediment transport depends on:
 - Flow velocity;
 - Grain size.
- River transports sand:
 - Bed load;
 - Suspension:
 - wash load;
 - suspended load.
- The morphology of the river is governed by the bed and suspended load



Introduction

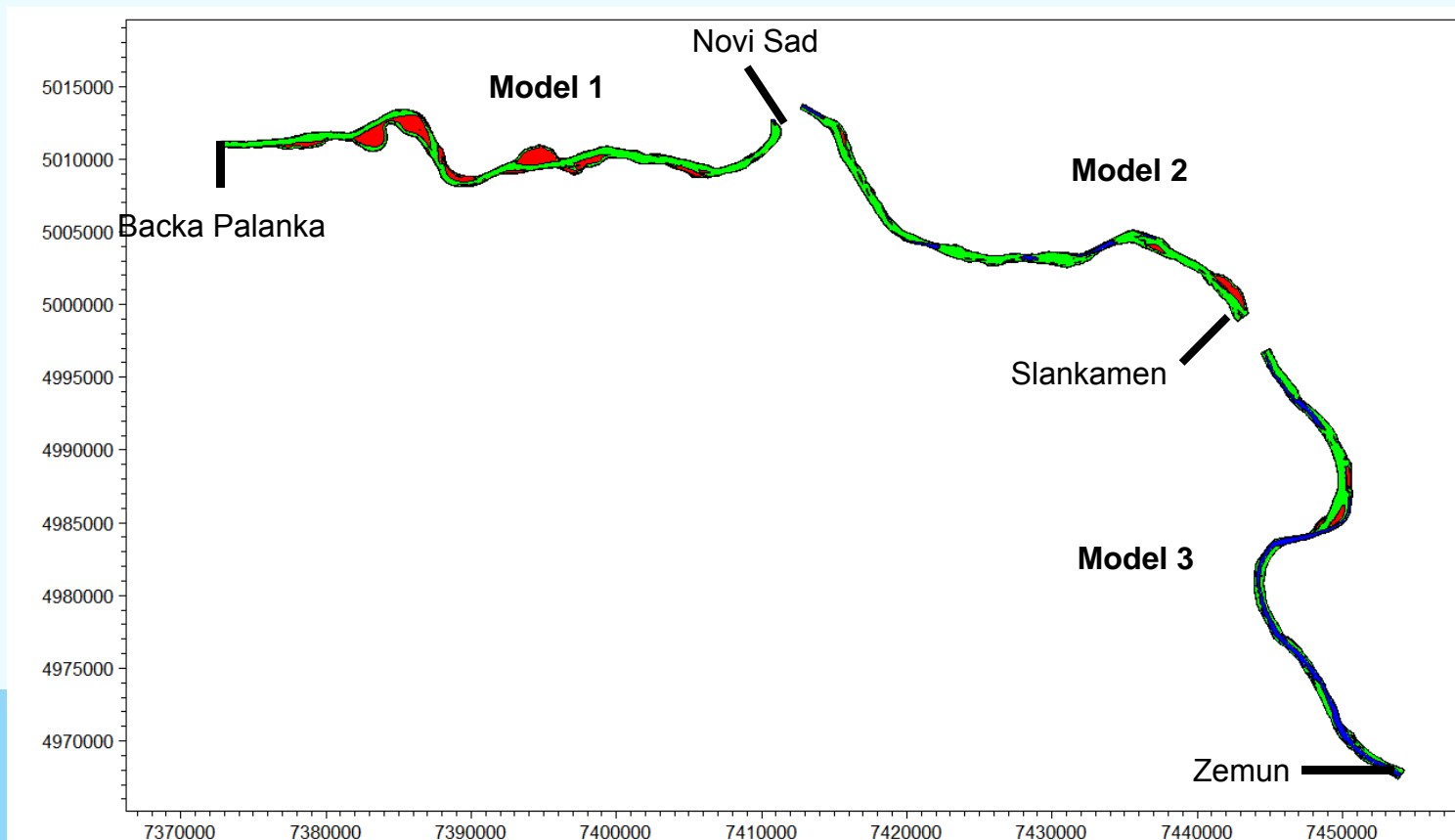
- Bed level increases (sedimentation) if more sand enters at a location than leaves



- Bed level decreases (erosion) if less sand is entering at a location than leaves
- No changes if: transport in = transport out (equilibrium)

Model setup

- Three sub models have been prepared:
 - Backa Palanka – Novi Sad;
 - Novi Sad – Slankamen;
 - Slankamen – Zemun.

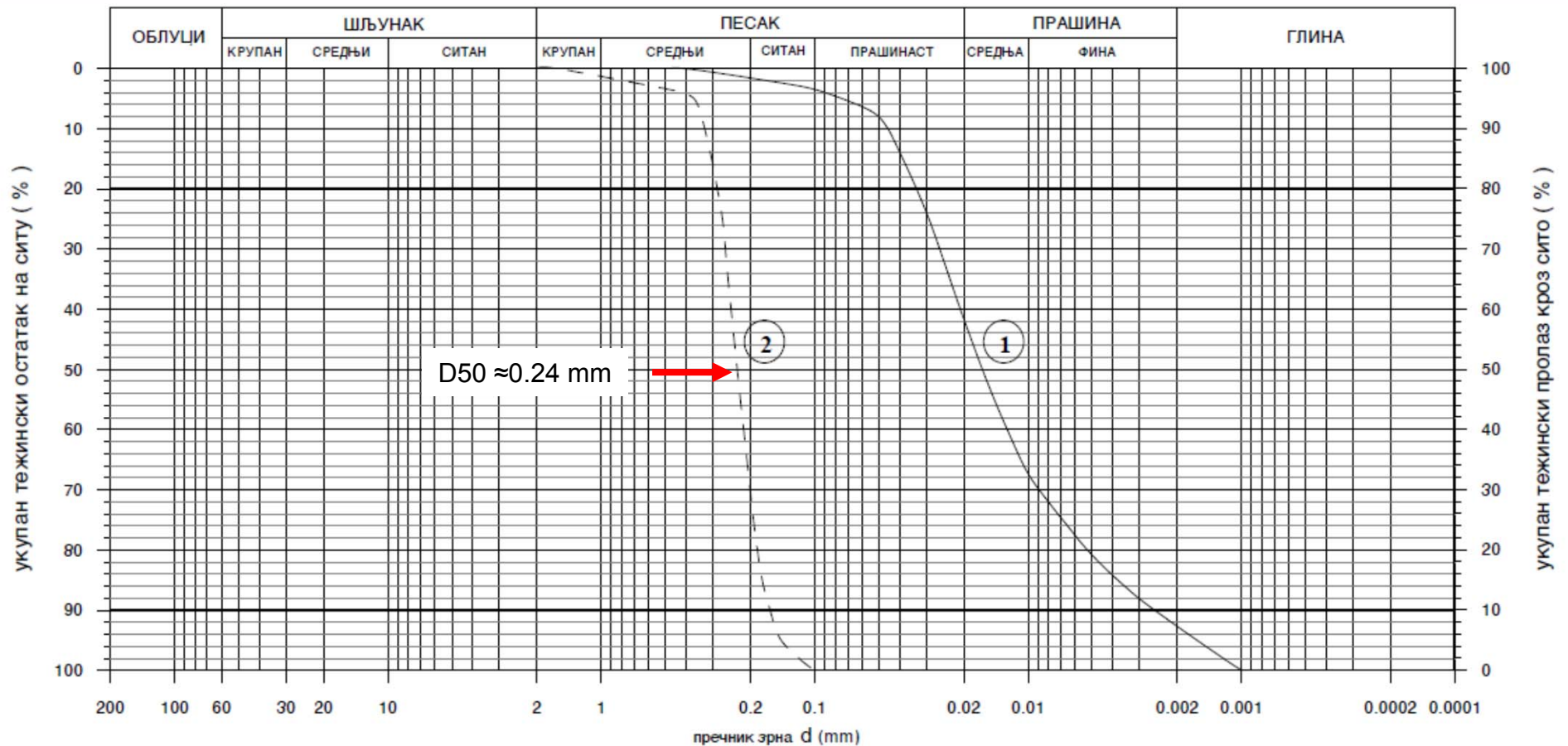


Model setup

- Model input:
 - Discharges at upstream boundaries
 - Sediment transport at upstream boundaries
 - Water levels at downstream boundaries
 - River bed level (NO_2012 cross-sections)
 - Grain size (D50)

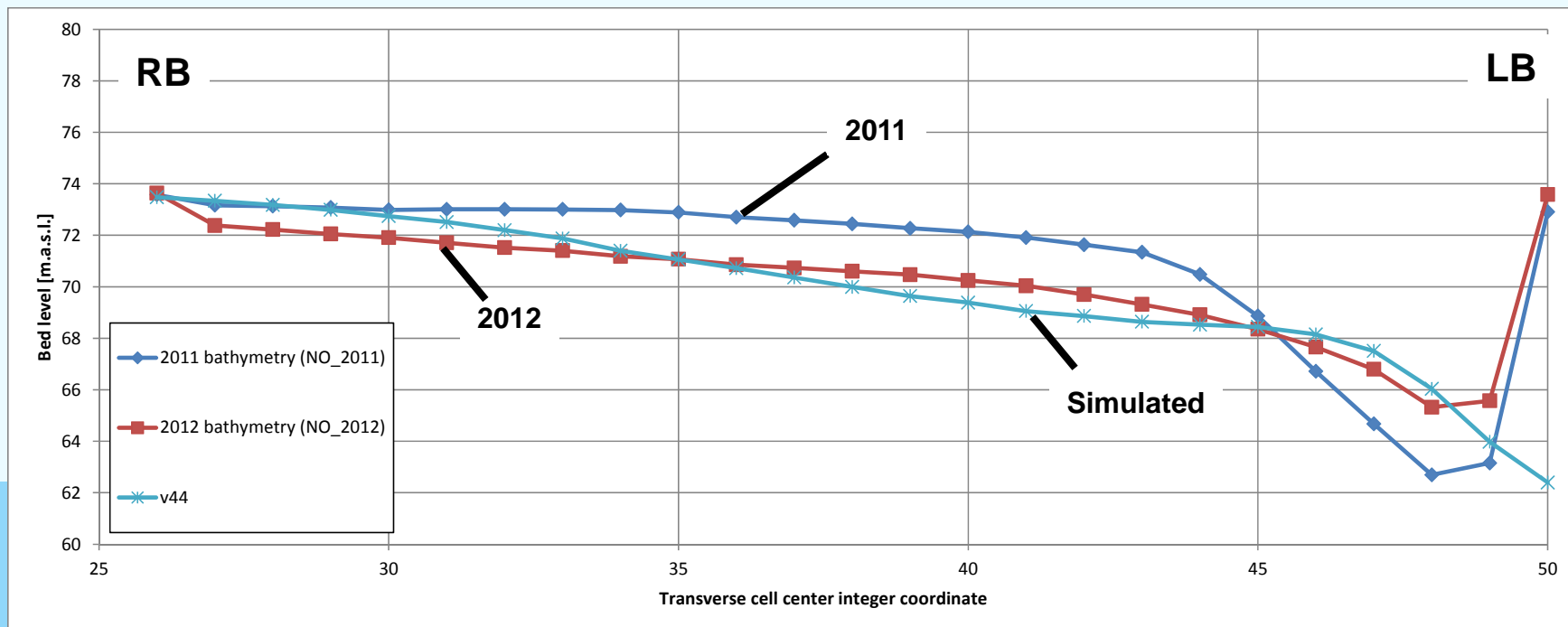
Model setup

- Grain size distribution (Jaroslav Cerni, 2011):



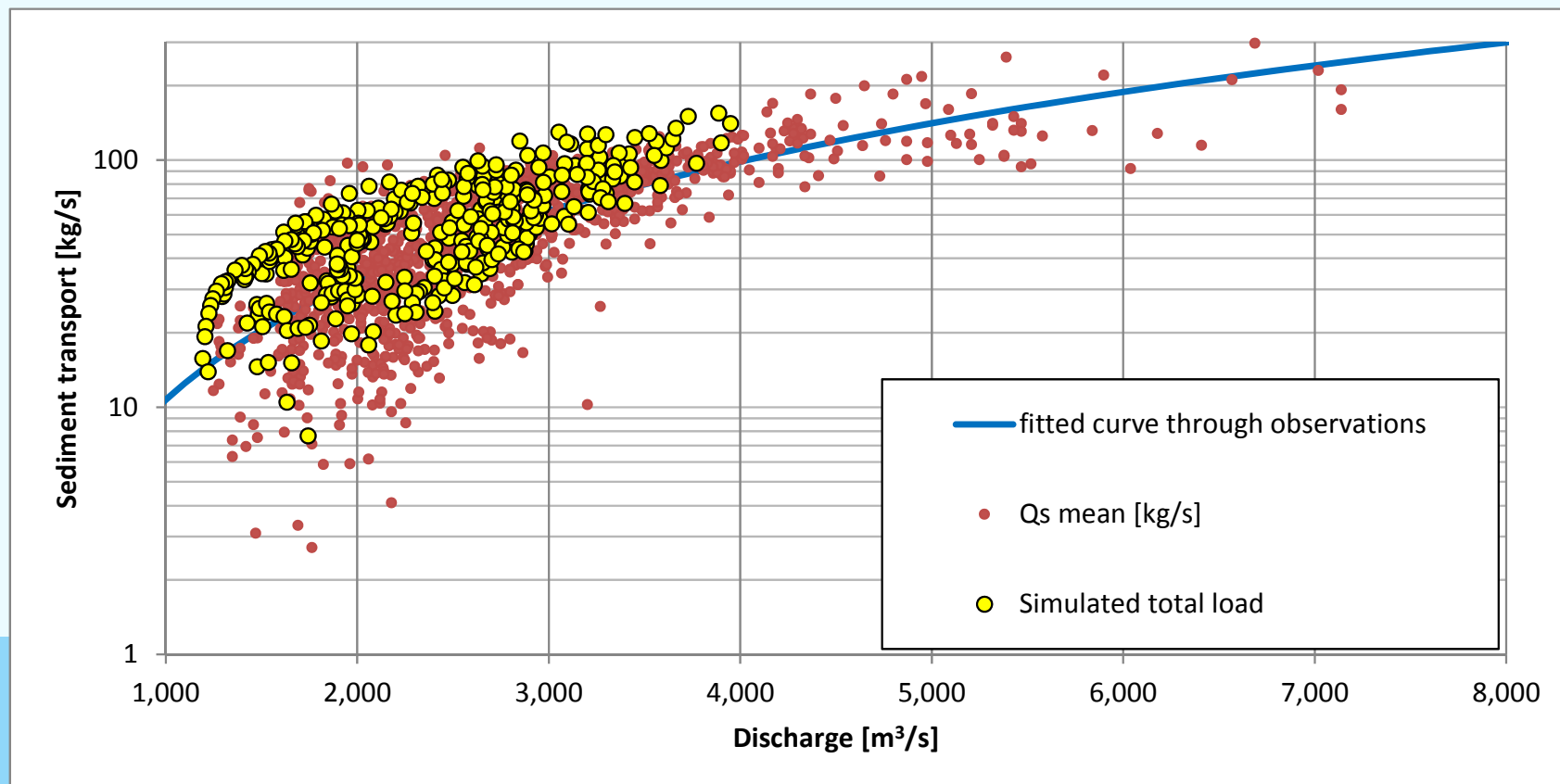
Calibration of the model

- Match for the period July 2011-July 2012:
 - Water levels
 - Sediment transport
 - Observed bed level changes:
 - Global erosion/sedimentation pattern
 - Bend behaviour



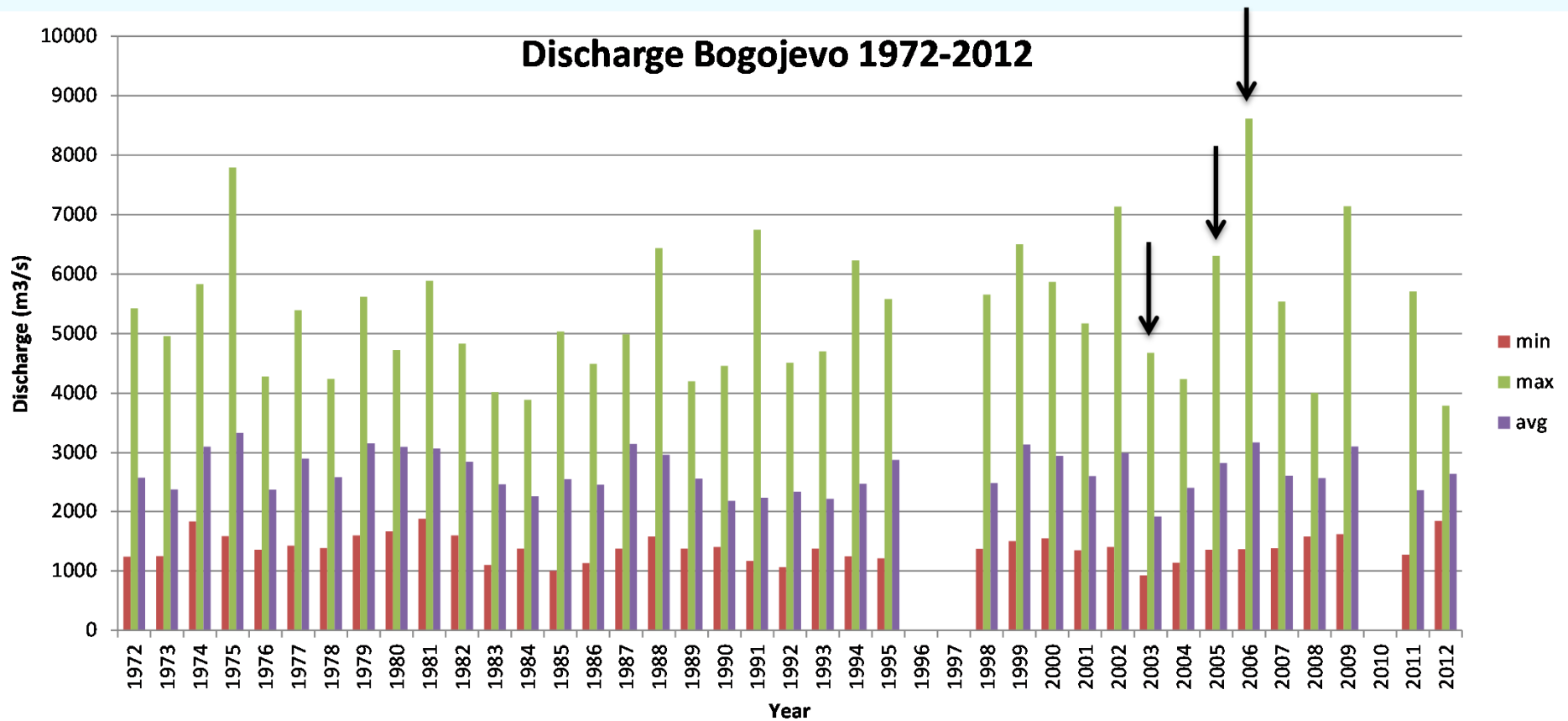
Calibration of the model

- Submodel 1 and 2: the total sediment transport in the model matches observed total transport at Novi Sad



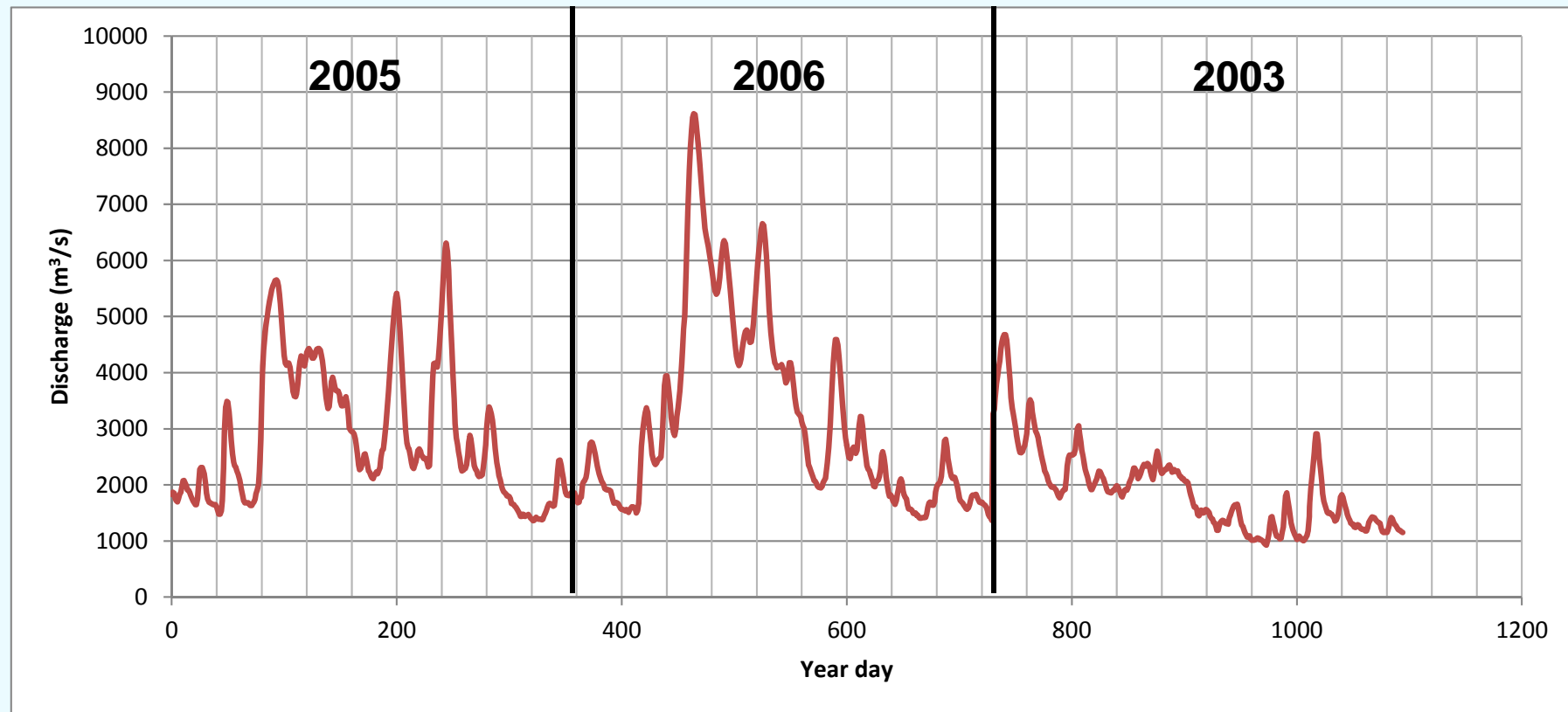
Approach to test option at sector

- Options are tested over a 3 year period containing a:
 - Low flow year: 2003
 - Average flow year: 2005
 - High discharge year: 2006



Approach to test option at sector

- Hydrograph (Bogojevo) used for simulation



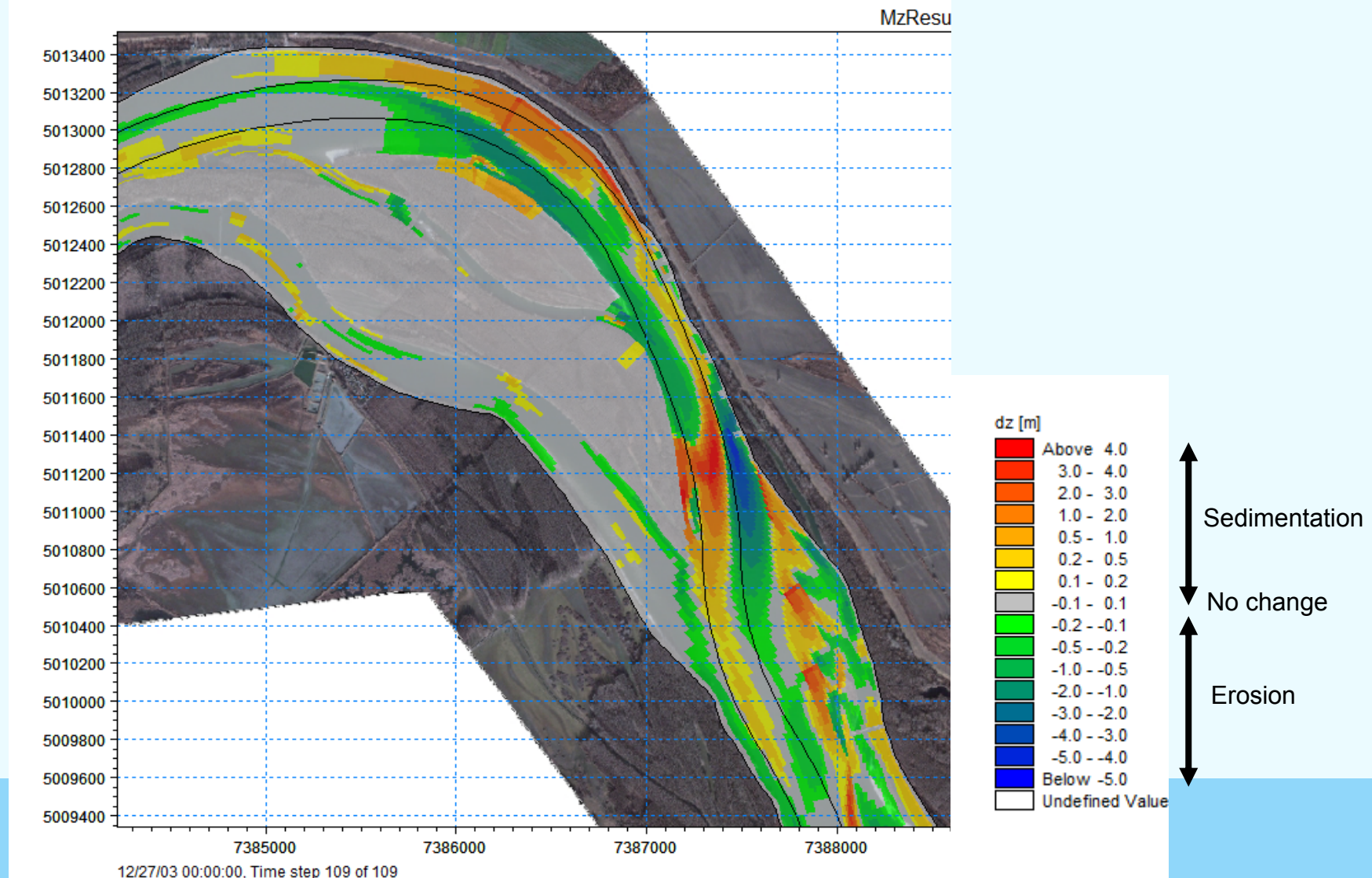
Approach to test option at sector

How to check if an option works?

- *Scenario* simulation ("with option") (3 years)
- *Baseline* simulation ("without option") (3 years)
- minus
- *Impact* of option after simulating hydrograph (3 years)
- Check if Scenario (with option) results in sufficient depth at Design Low Navigation Level (DLNL)

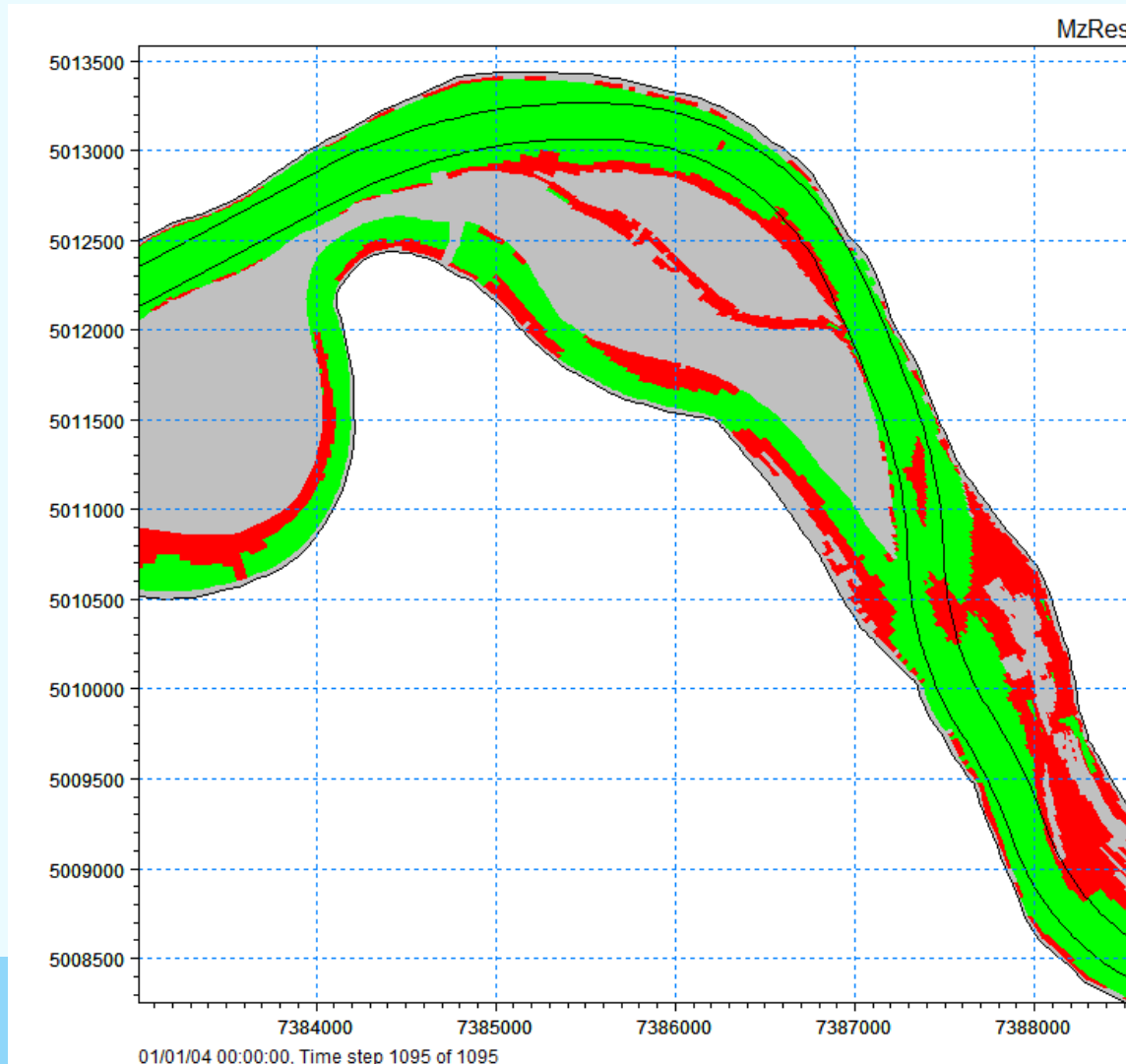
Scenario simulations – example Susek

- Scenario 1: dz after 3 years



Scenario simulations

- Scenario 1: do we have sufficient depth during DLNL?



Green = YES
Red = NO
Gray = dry



Thank you for your kind attention

