UNSTABLE BED AND BANKS OF THE DANUBE RIVER AT THE "APATIN" SECTOR

THREAT TO THE LOCAL COMMUNITIES, PROTECTED AREAS, AND WATER TRANSPORT ALONG THE DANUBE CORRIDOR

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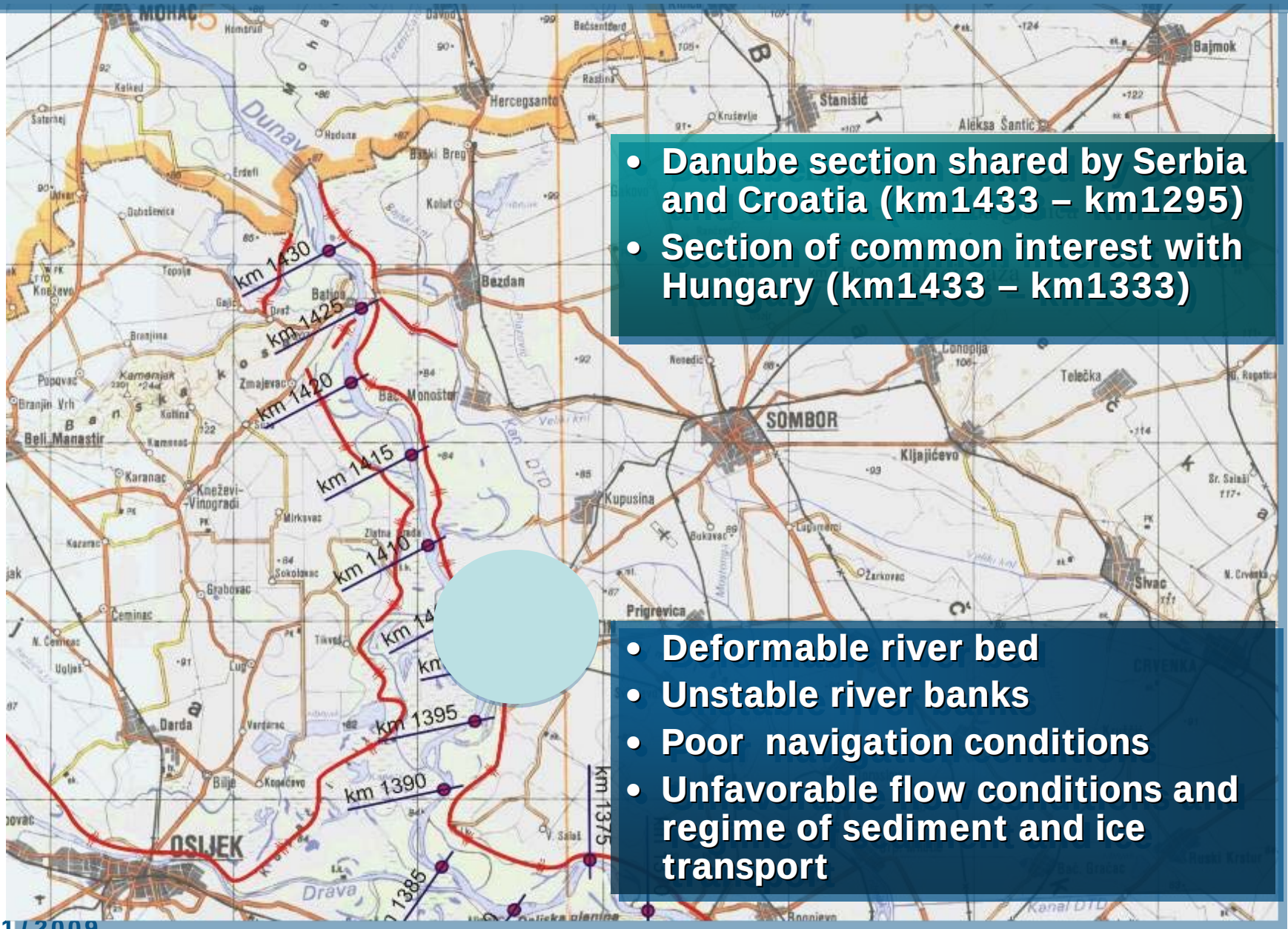
SECTOR APATIN

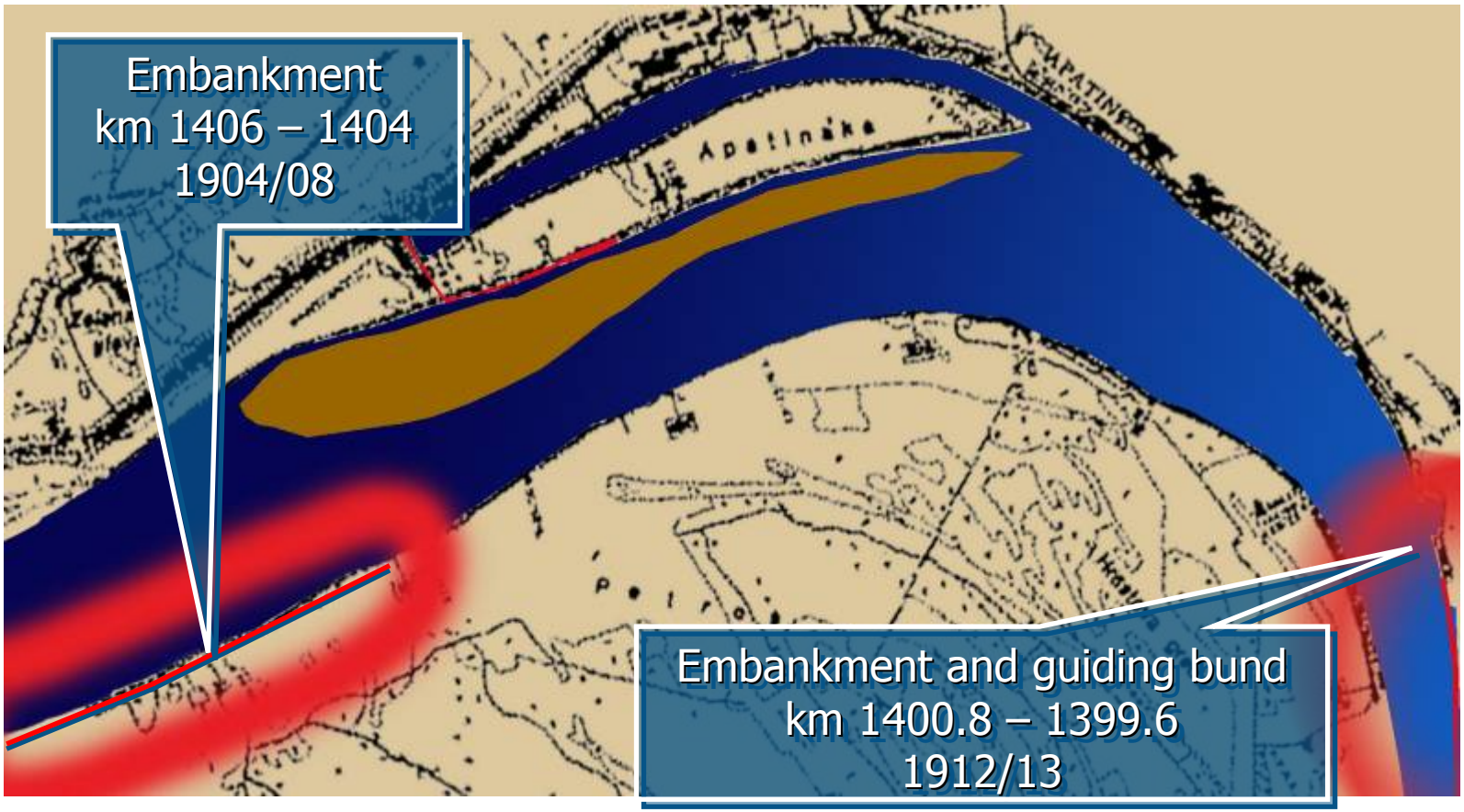


- Danube section shared by Serbia and Croatia (km1433 – km1295)
- Section of common interest with Hungary (km1433 – km1333)

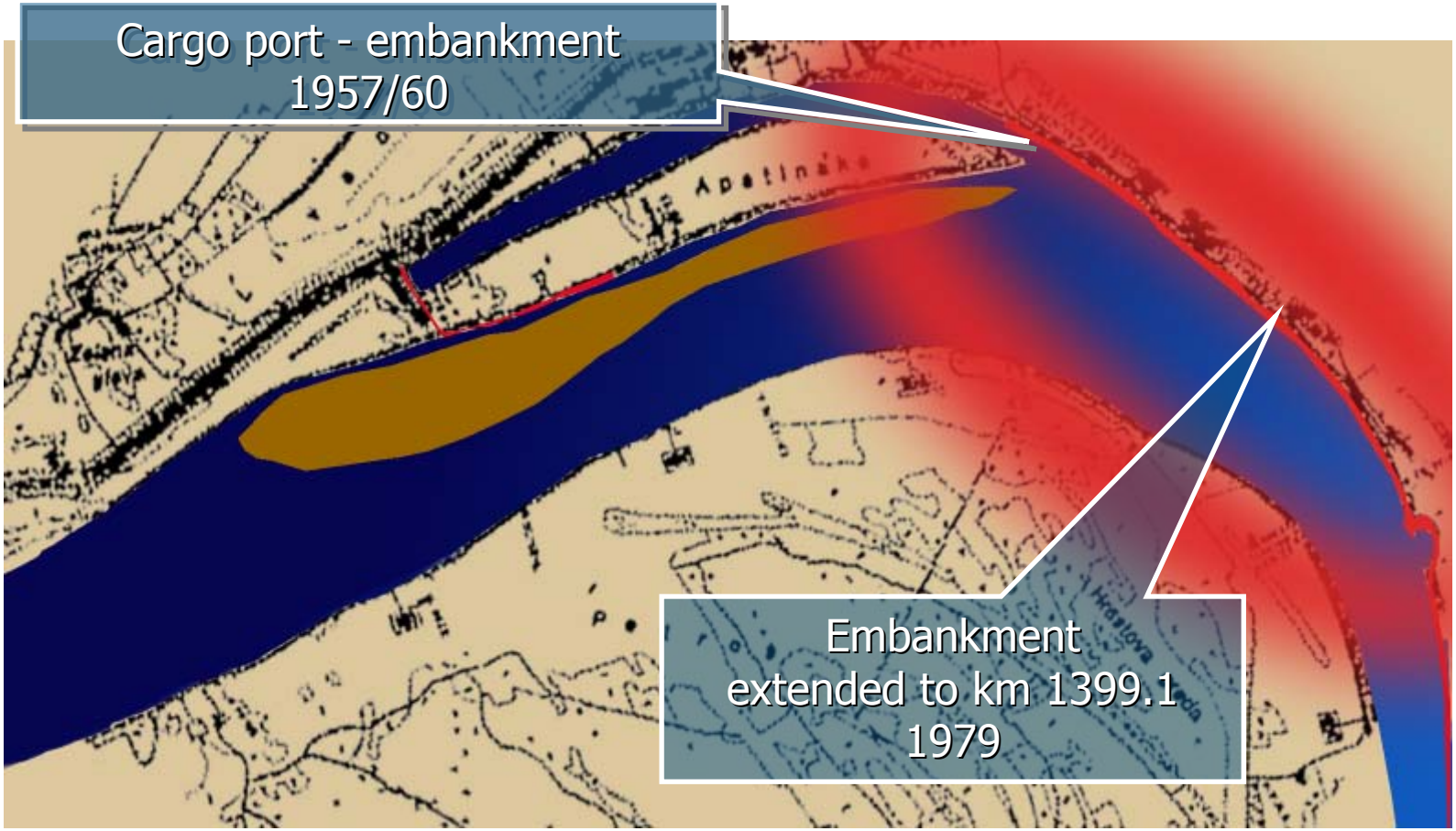
- Deformable river bed
- Unstable river banks
- Poor navigation conditions
- Unfavorable flow conditions and regime of sediment and ice transport

PREVIOUS RIVER TRAINING WORKS

- **Monitoring of the riverbed changes - XIX century**
- **First training works – begining of XX century**

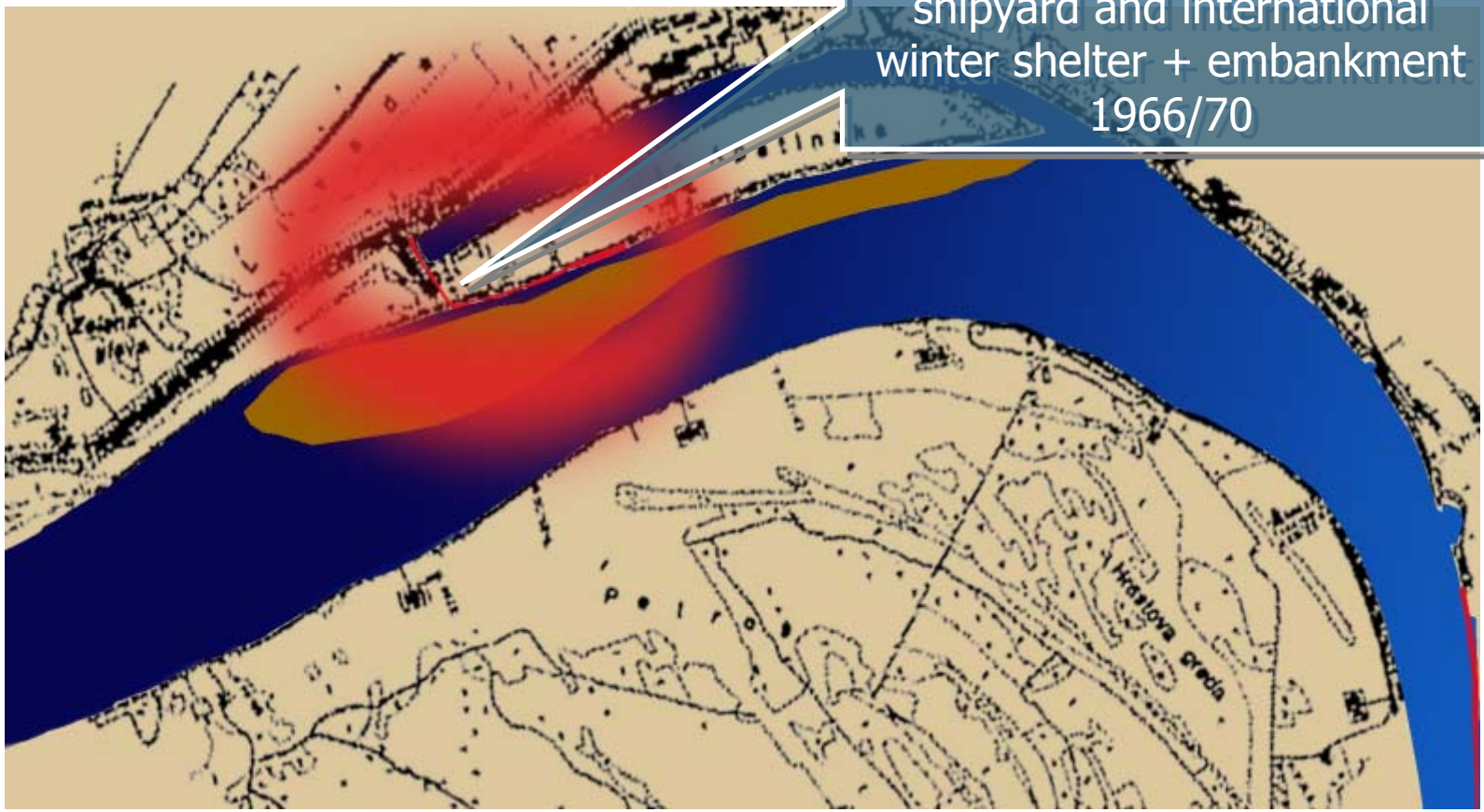


PREVIOUS RIVER TRAINING WORKS



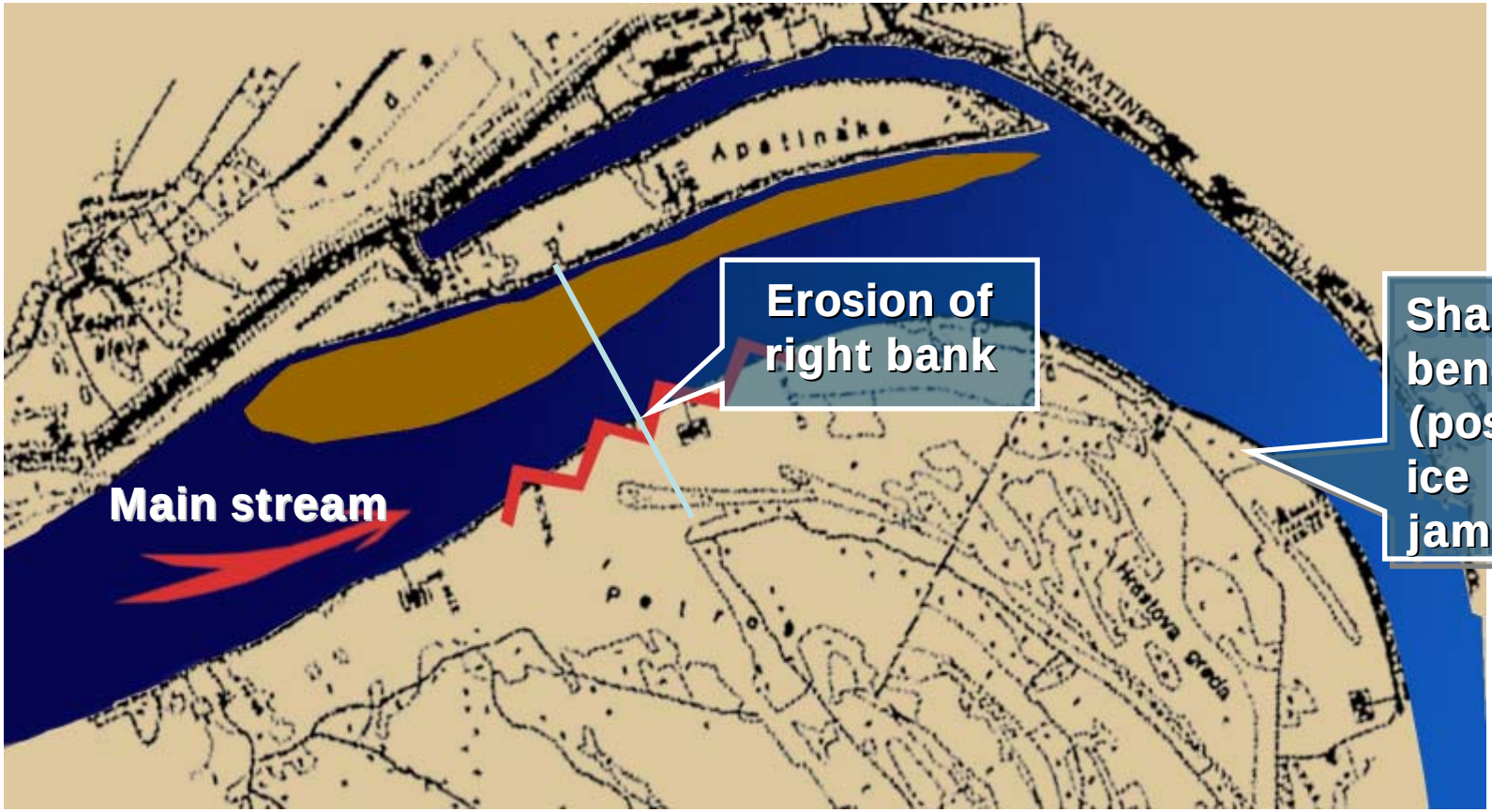
PREVIOUS RIVER TRAINING WORKS

Closure dam at km 1403.6 - the left branch of the Danube at the Apatin isle became a shipyard and international winter shelter + embankment 1966/70



RIVER BED DEVELOPMENT BEFORE 2002

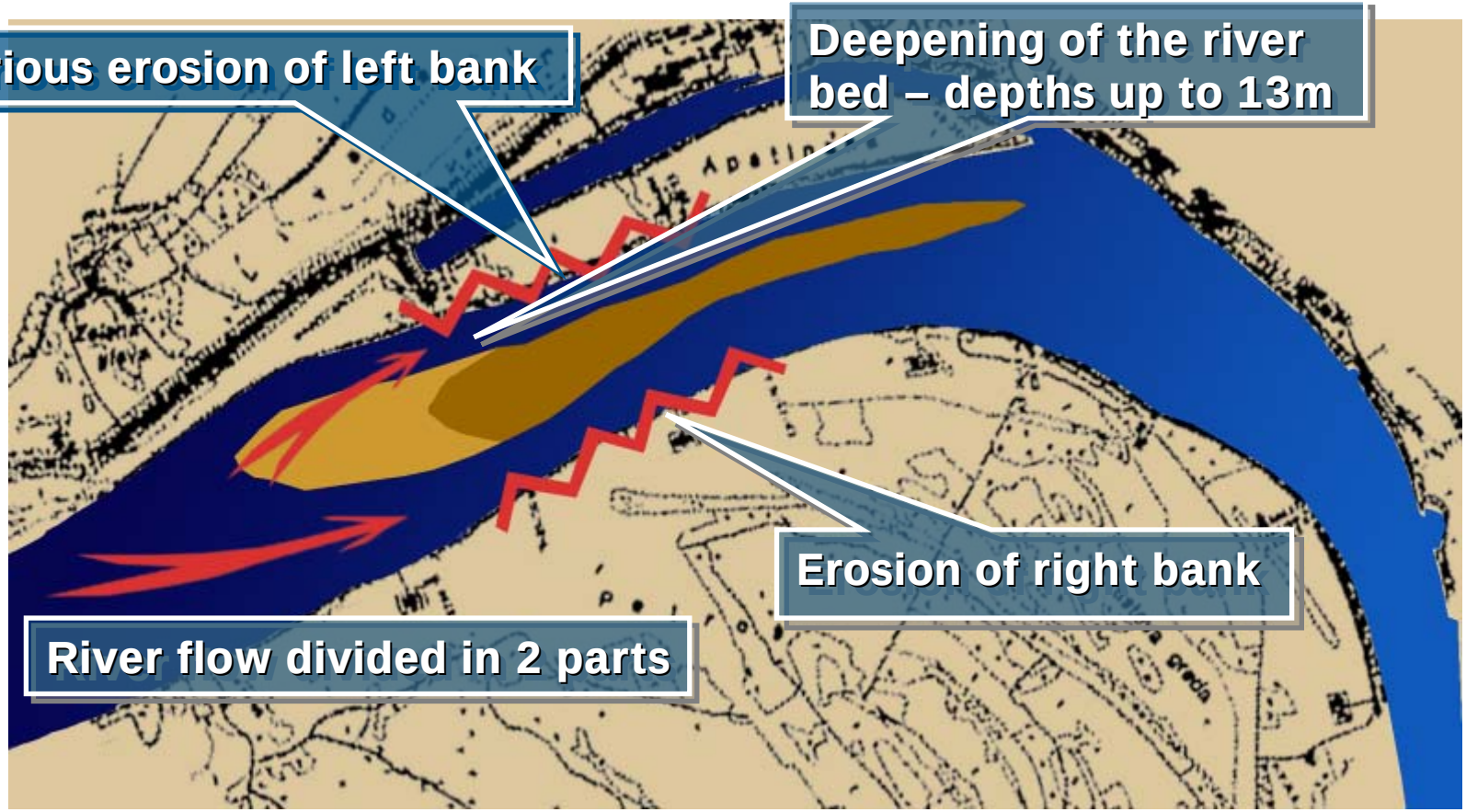
SERBIA



CROATIA

RIVER BED DEVELOPMENT DURING FLOOD 2002

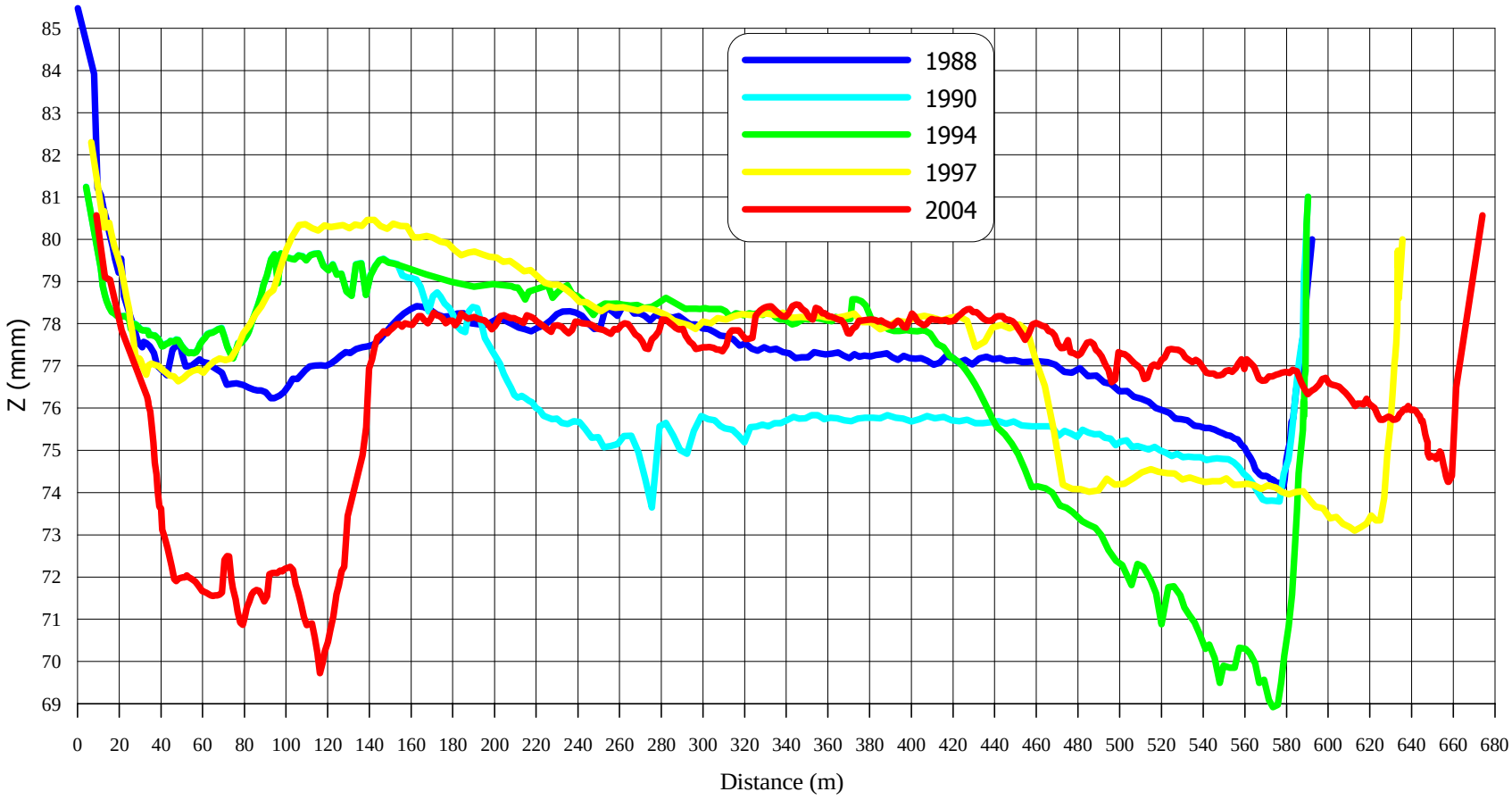
SERBIA



CROATIA

EVOLUTION OF A CHARACTERISTIC CROSS-SECTION

EP 24/1



LOCAL PROTECTION OF LEFT BANK (SERBIA)

Objective: protection of Apatin city, including harbor, shipyard, international ship winter shelter, customs office, and city beach

UNSATISFACTORY NAVIGATION CONDITIONS

FEASIBILITY STUDY 2004-2006

Ministry for capital investments – IWT Department

Inland waterways maintenance and development agency PLOVPUT

University of Belgrade
Faculty of Civil Engineering

Ministry for agriculture, forestry and water resources management – Directorate for water

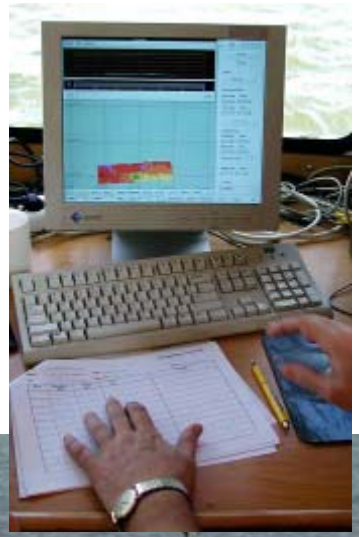
Institute Jaroslav Cerni

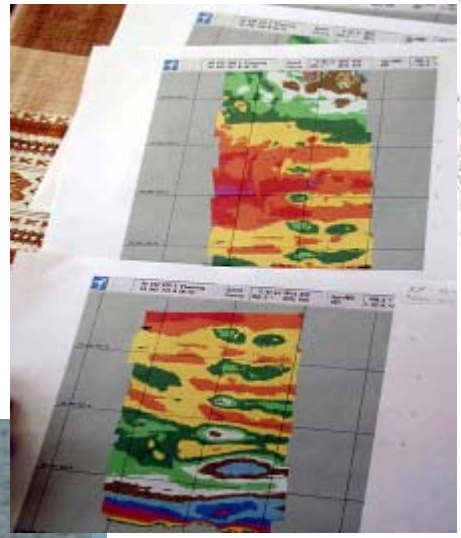
1. Field investigations – detailed survey of river morphology, 2 series of flow and sediment transport measurements (December 2004 and May 2005)
2. Hydraulic study - 1D (HEC-RAS) and 2D models (FEM, RMA2)
3. Preliminary design

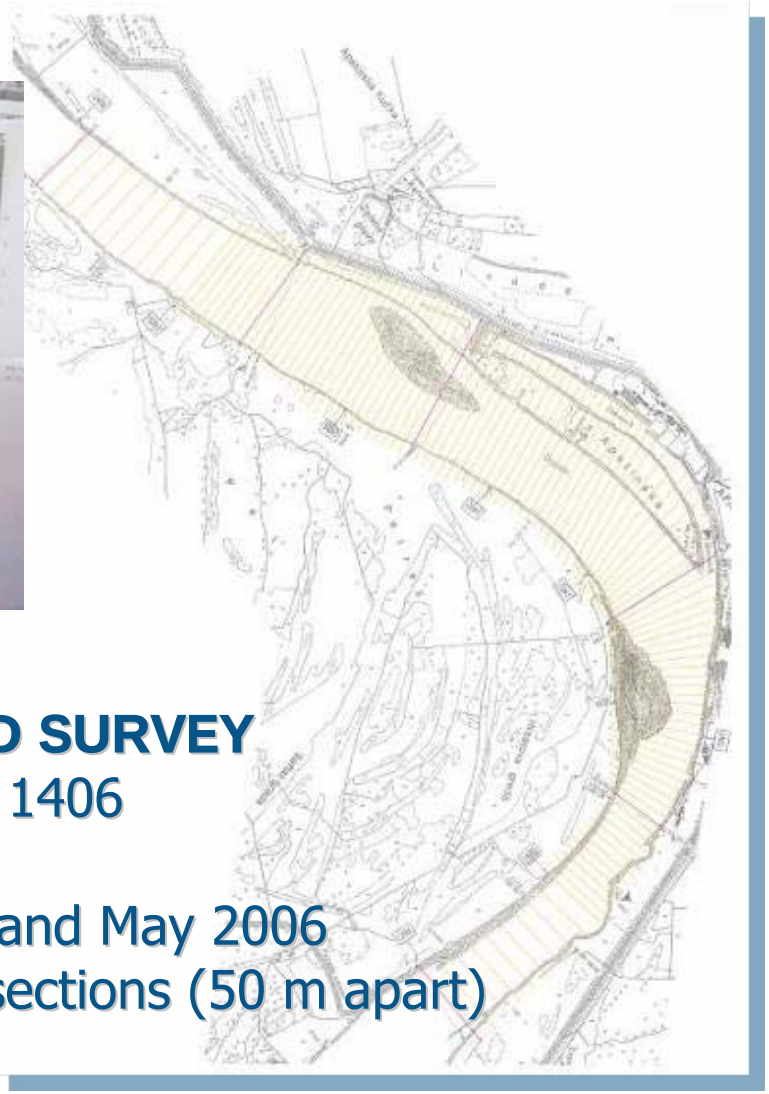
Feasibility study

Environmental impact assessment

FIELD INVESTIGATIONS







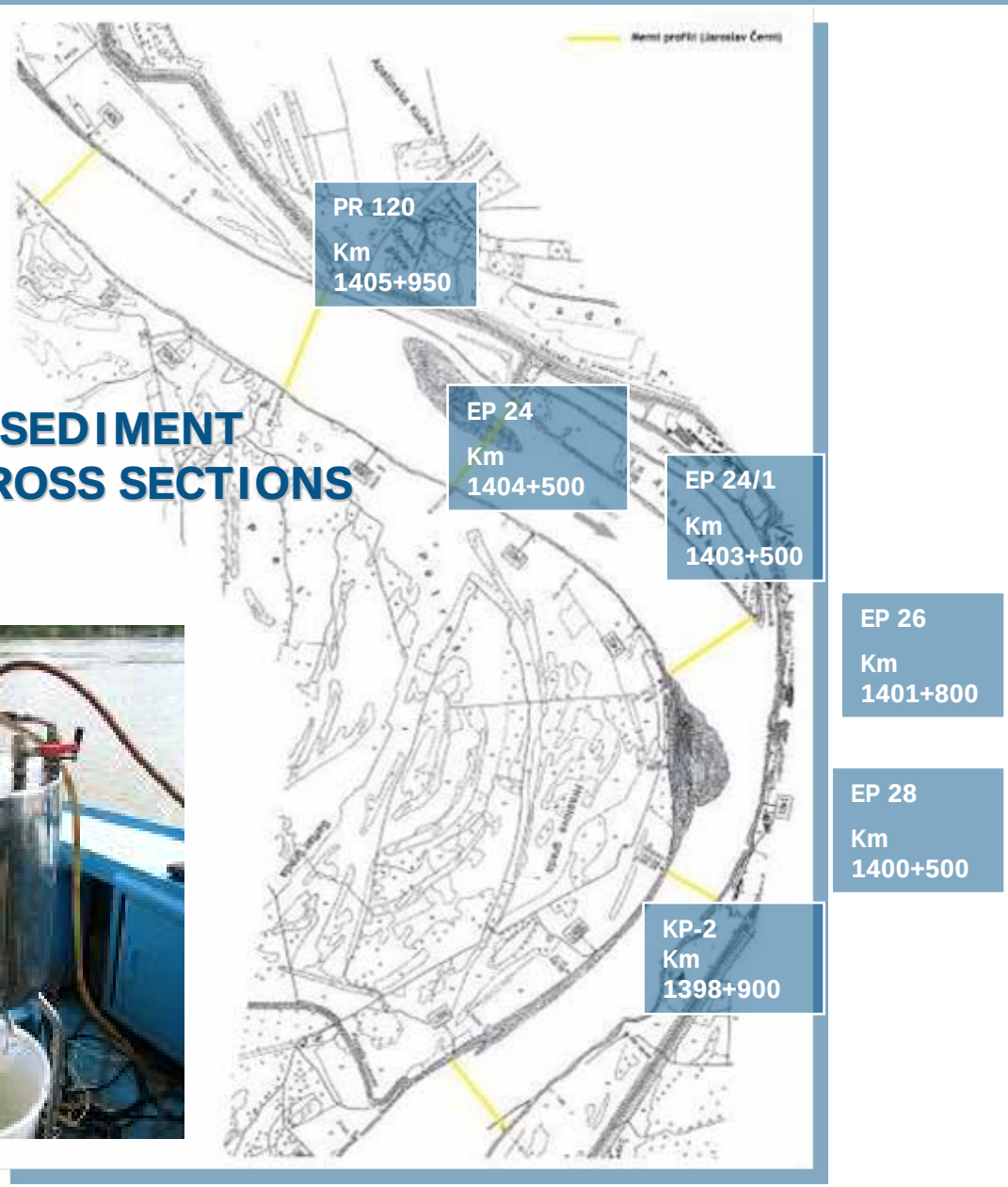
RIVERBED SURVEY
km 1399 – 1406

Dec. 2004 and May 2006
120 cross sections (50 m apart)

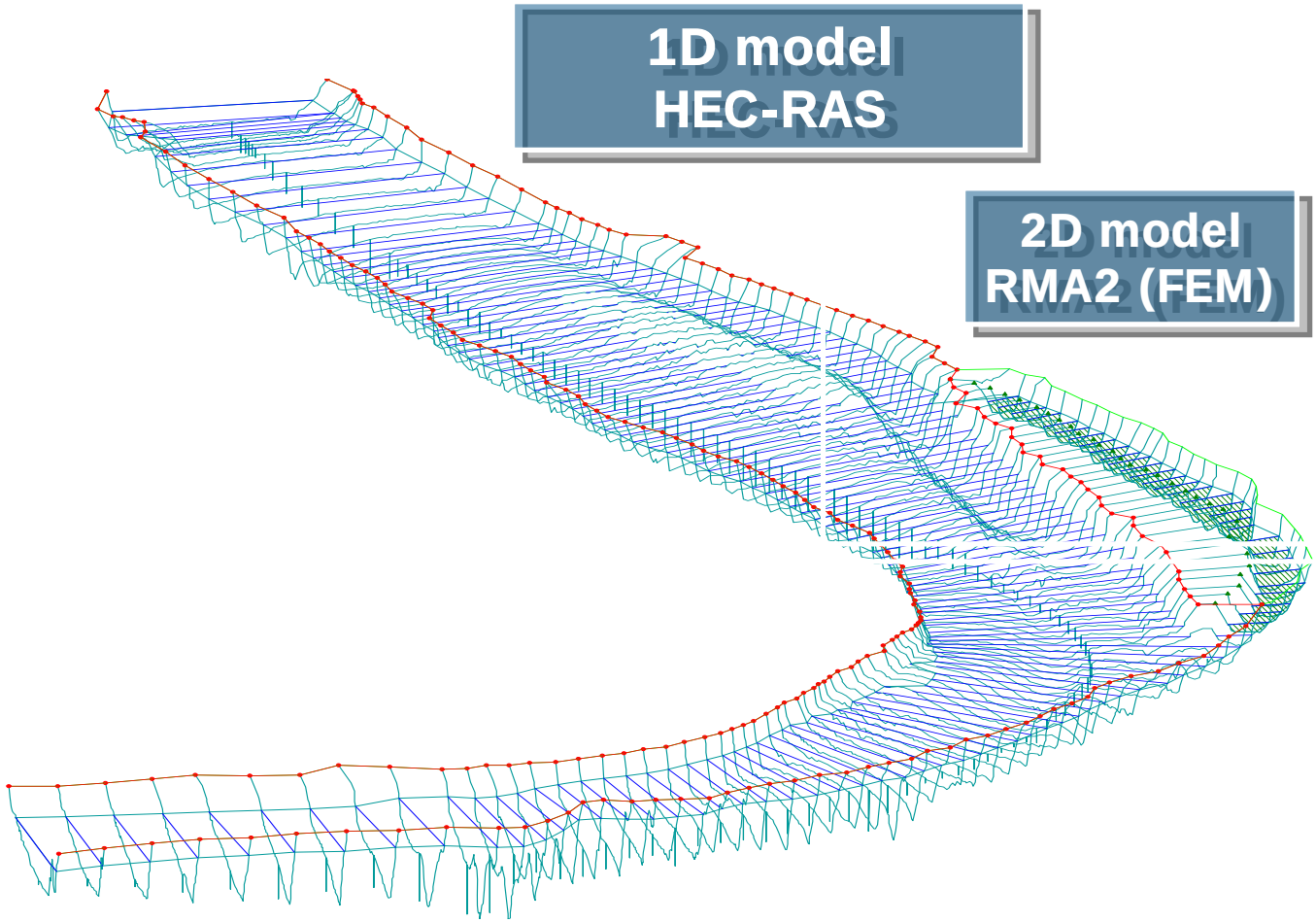
FIELD INVESTIGATIONS

2 SERIES OF FLOW AND SEDIMENT MEASUREMENTS AT 6 CROSS SECTIONS

- December 2004
- May 2005



HYDRAULIC MODELING



- model calibration and verification (data from field campaigns)
- analysis of the present state by numerical simulations
- predictions taking into account designed river training structures

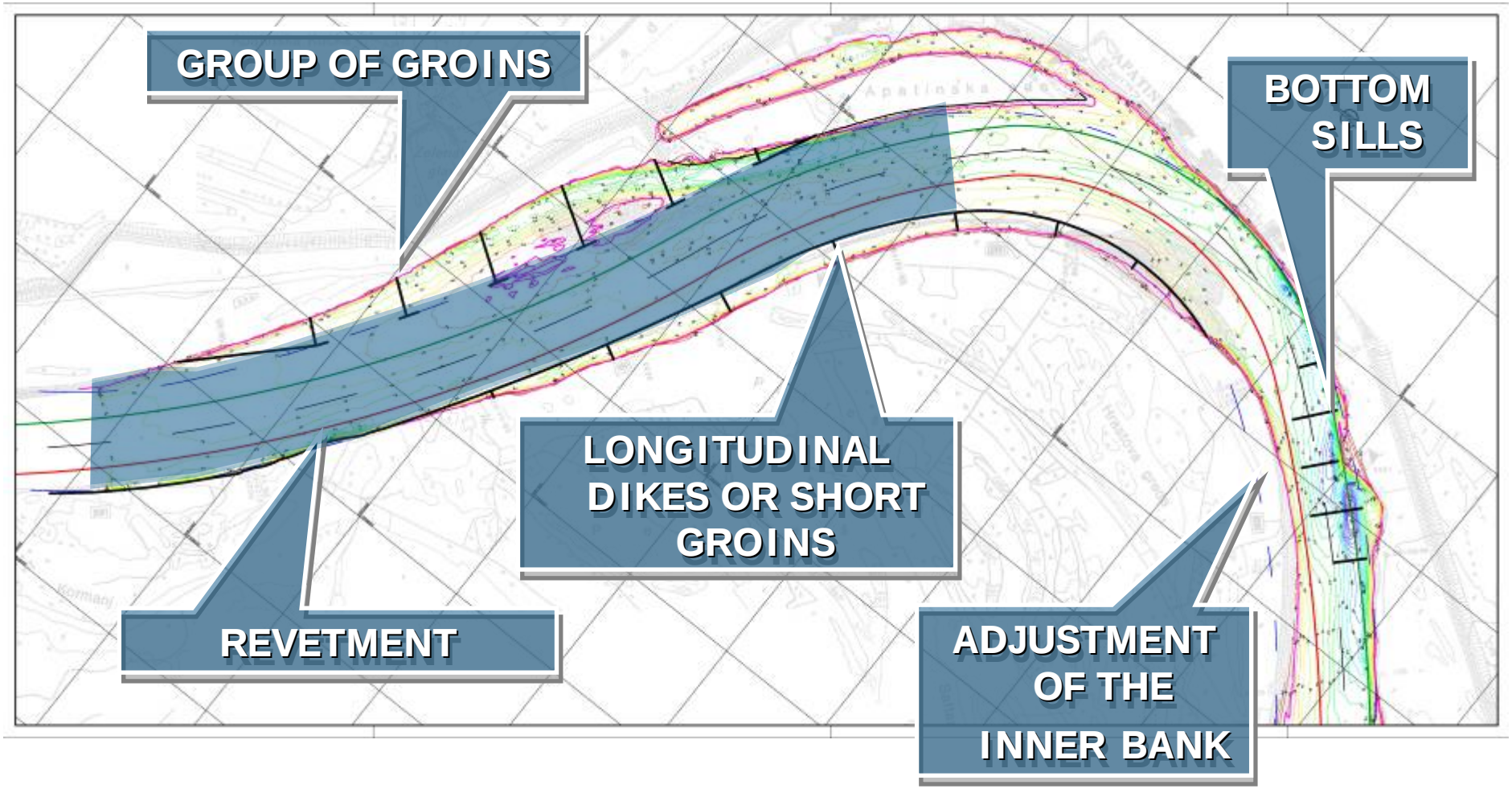
Design elements: layout of regulated riverbed

Resulting from:

- previous designs and studies
- experience gained from previously regulated sections
- analysis of the present riverbed conditions
- fine-tuning with alignment of upstream / downstream sections
- recommendations of the Danube Commission (b=180 m, R_{min}=1000m)

DREDGING - km1406.0 to km1402.4

b=200m, b=300m, b= 400m



FUTURE ACTIONS

STABILISATION AND IMPROVEMENT OF THE DANUBE RIVER BED NEAR APATIN

STUDY AND DESIGN

- FEASIBILITY STUDY (including EIA)
- CONCEPTUAL DESIGN
- DETAILED DESIGN

COORDINATION WITH CROATIA

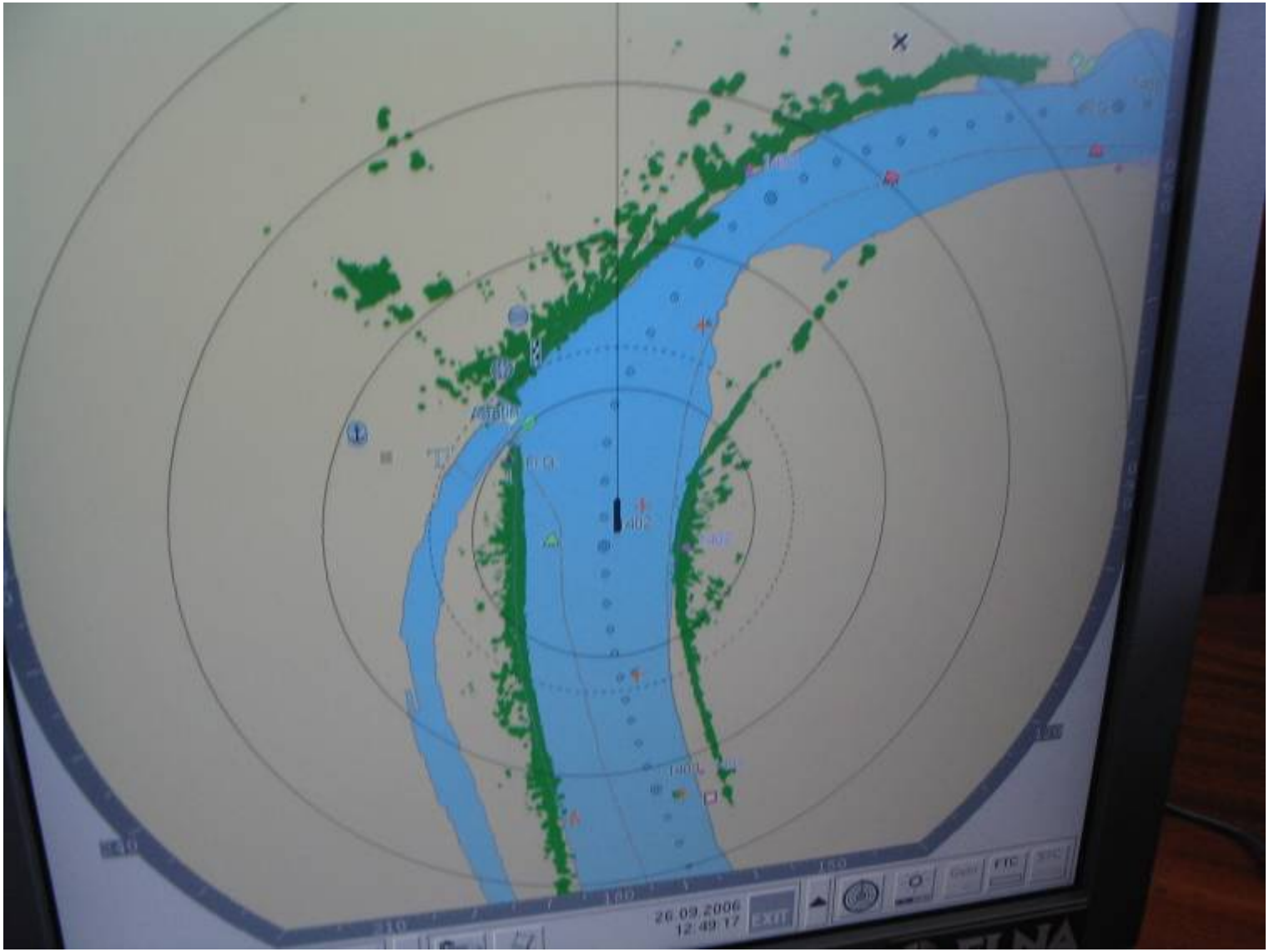
- REVIEW OF POSSIBLE SOLUTIONS AND EFFECTS
- COST ESTIMATE
- AGREEMENT ON FINANSING AND WORK EXECUTION

COORDINATION WITH HUNGARY

- REVIEW OF POSSIBLE SOLUTIONS AND EFFECTS

NEW BILATERAL COMMISSION

EXISTING BILATERAL COMMISSION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