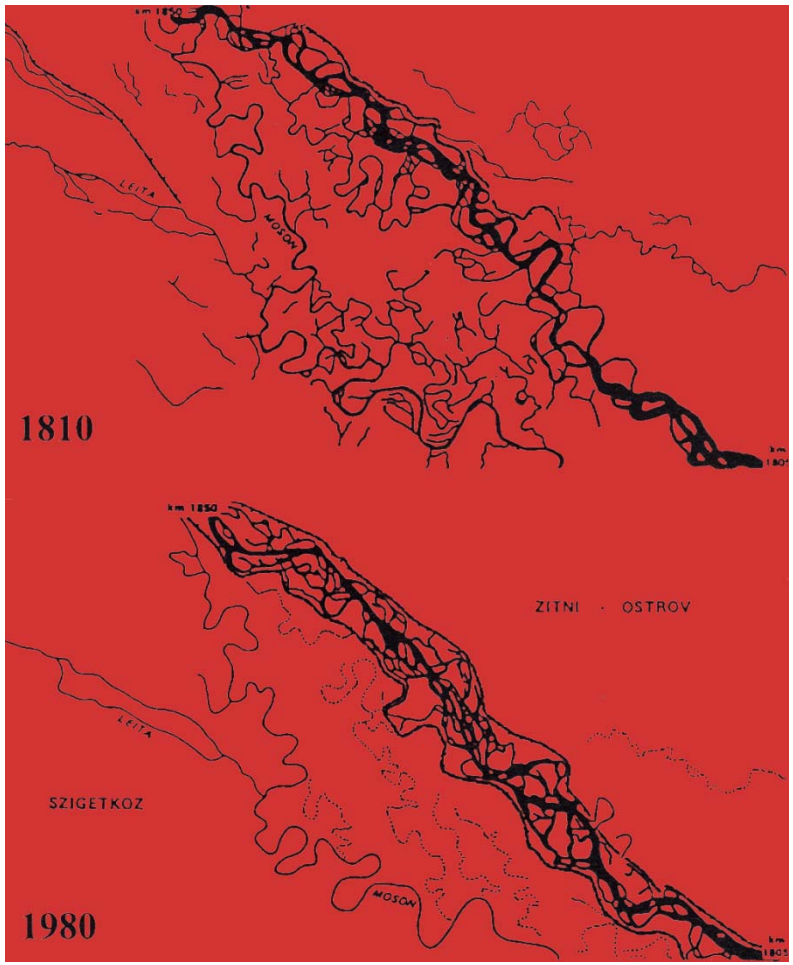
Danube and Rhine Rivers: Threats of navigation to wetlands – what we have lost

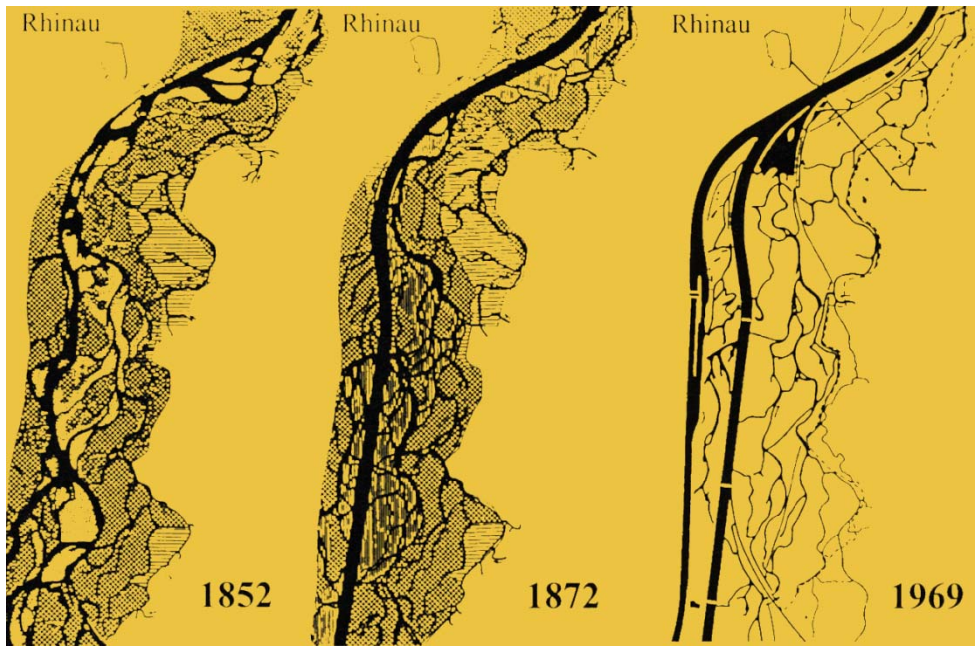
Jürg Bloesch ex-Eawag,
IAD President (1998-2004), Editor Danube News

The illness of rivers: Uniformity

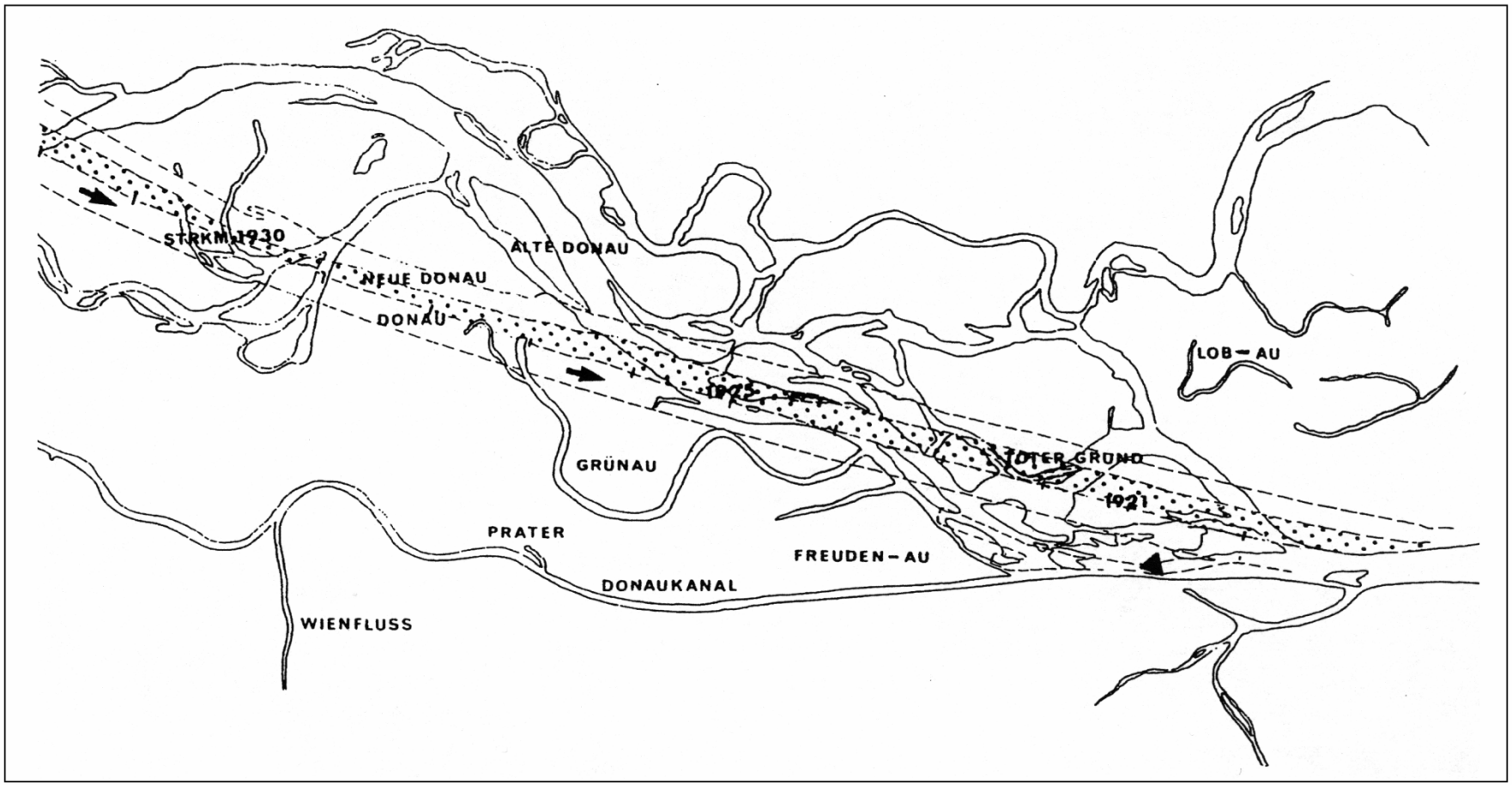


Yellow: Rhine
Red: Danube

After F.Mallard, in Bloesch (2002)



Channelized Danube River near Vienna vs. natural braidings of 1859 After Humpesch (1994)



Reasons of river channelization

- Flood protection (dikes)
- Gain of arable & industrial land
- Human health (fight malaria)

- Navigation (waterways)

Upper Rhine
modern scenery

From Bloesch & Sieber (2003)

Synopsis of Danube and Rhine

From: Bloesch & Sieber (2003)

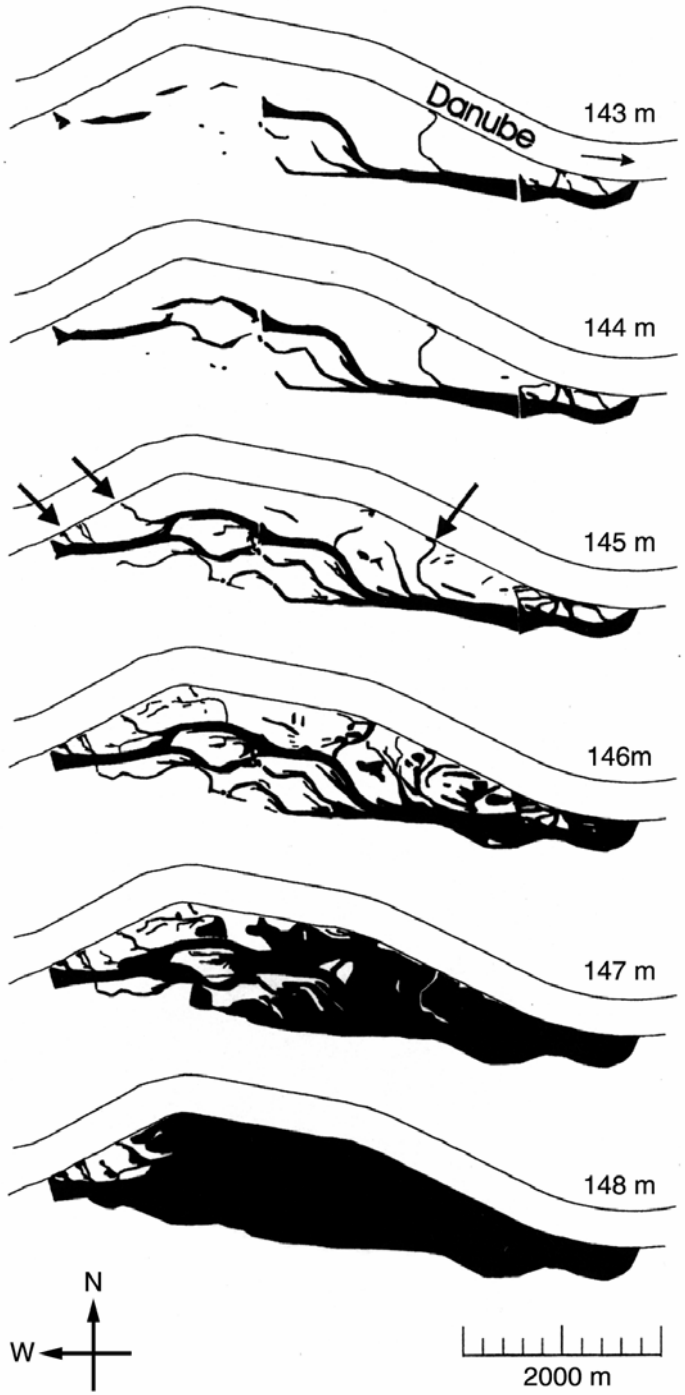
	River Rhine	River Danube
Catchment area [km^2.10^3]	185	817
Length [km]	1236	2850
Mean discharge [m^3.s^{-1}]	2180	6450
Number of (hydropower) dams in main stream	21*	55**
Morphological flood plain [km^2]	8000	23187
Recent flood plain [km^2]	1200 (15%)	8096 (35%)
Number of countries	**8**	**19 (15)**

Flood plain destruction in the Danube River Basin Data from Schneider (2002)

River stretch	Morphological floodplain (km^2)	Recent floodplain (km^2)	loss
• Upper Danube	1,762	95	95%
• Middle/Central Danube	8,161	2,002	75%
• Lower Danube	7,862	2,200	72%
• Danube Delta	5,402	3,799	30%

Selection of limnological concepts of river ecosystem function

• Stream zonation	ILLIES & BOTOSANEANU (1963)
• River continuum concept	VANNOTE et al. (1980)
• Serial discontinuity concept	WARD & STANFORD (1983)
• **Flood pulse concept**	JUNK et al. (1989)
• **Flow pulse**	PUCKRIDGE et al. (1998)
• Spatial & temporal heterogeneity	WARD (1989)
• Nutrient spiralling concept	ELWOOD et al. (1983)
• **Lateral connectivity, aquatic-terrestrial ecotones**	NAIMAN & DECAMPS (1990)
• Catchment hierarchy (scaling), resilience	FRISSELL et al.(1986)
• Multiple use concept	JUNK (2000)
• Riverine productivity model	THORP & DELONG (1994, 2002)



Inundation area (black) of the Danube flood plain near Vienna at different water levels (flow pulse)

Ecotones (aquatic-terrestrial zones) are hotspots of biodiversity and jewels of natural landscape

(Tockner et al. 2000)

The role of the Green Corridor Danube rkm 845 - 175

- Sturgeon (fish) migration
  - Side-arms = route of sturgeon migration
  - Iron Gate I & II dams disrupt migration
- Spawning, feeding and resting habitats for sturgeons (fish)
  - The role of “bottlenecks” (biodiversity)

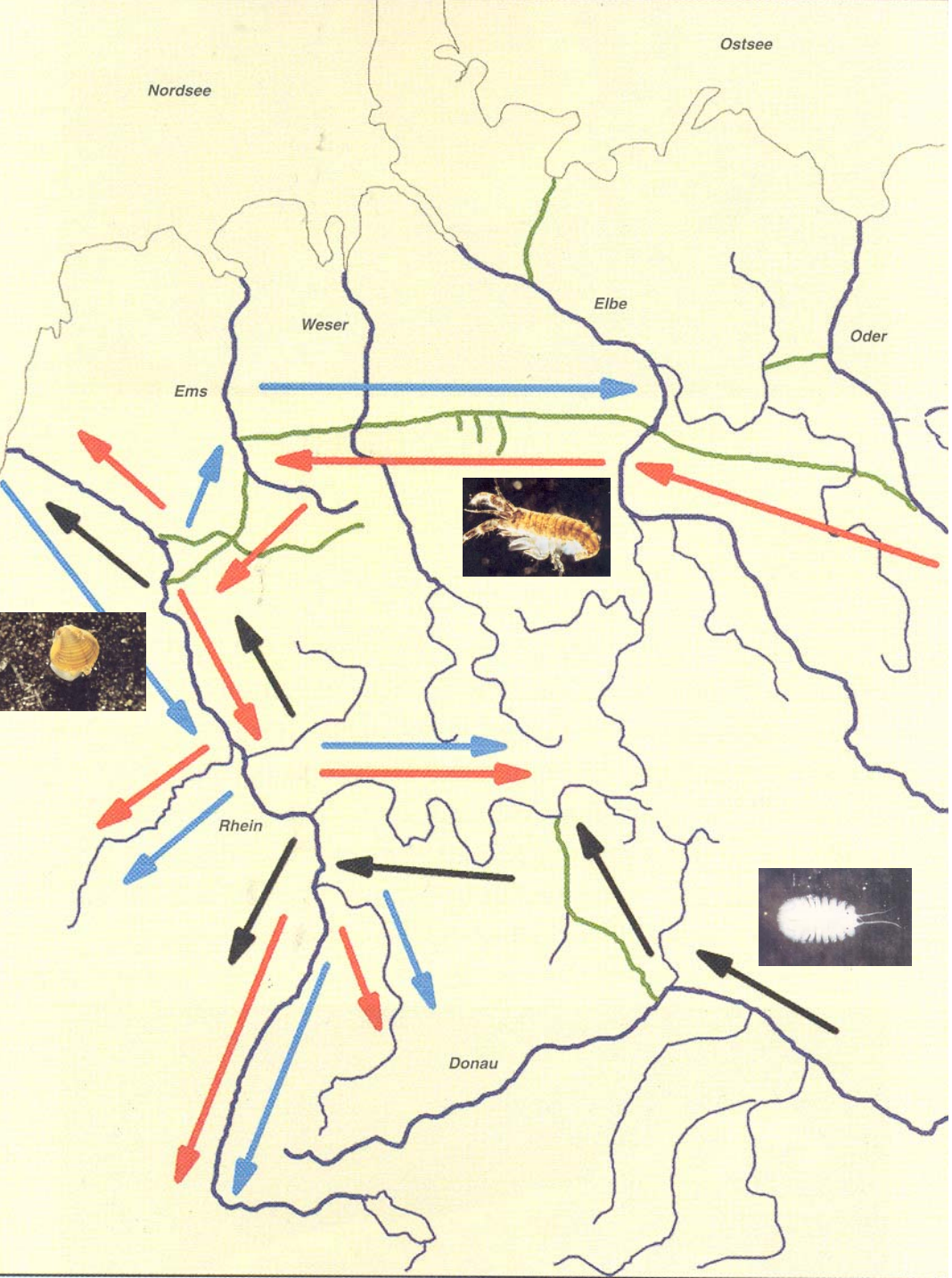
- Floodplains (lateral connectivity, habitats)

DC: Danube navigation has a long tradition … and is needed for economic prosperity

- Provides connection Black Sea (East) – Atlantic (West) across Europe by Rhine-Main-Danube Canal (TEN-T)
- Satisfies increasing demand of goods transportation
- Is environmentally friendly (low CO_2-production)
- Is cheaper than trucks, trains, planes
- Supports economic growth, needed for our society
- Provides many working places
- Has high technical standards and safety
- Bigger vessels → more efficient transport

Transnational European Navigation Transportway (TEN-T)

- Leading body: Danube Commission
- Framework: EU Transport Ministry (RO TM)



Water Ways of Central Europe: exchange of neozoa

Jaera istri (BLACK)
Corophium curvispinum (RED)
Corbicula fluminea (BLUE)

From IKSR/ICPR (1996) & Schöll (1999)

EU- Commission: ISPA

- Instrument for Structural Policy for Pre-accession (ISPA)
- Started in 2000 for financial support of countries in Central and Eastern Europe

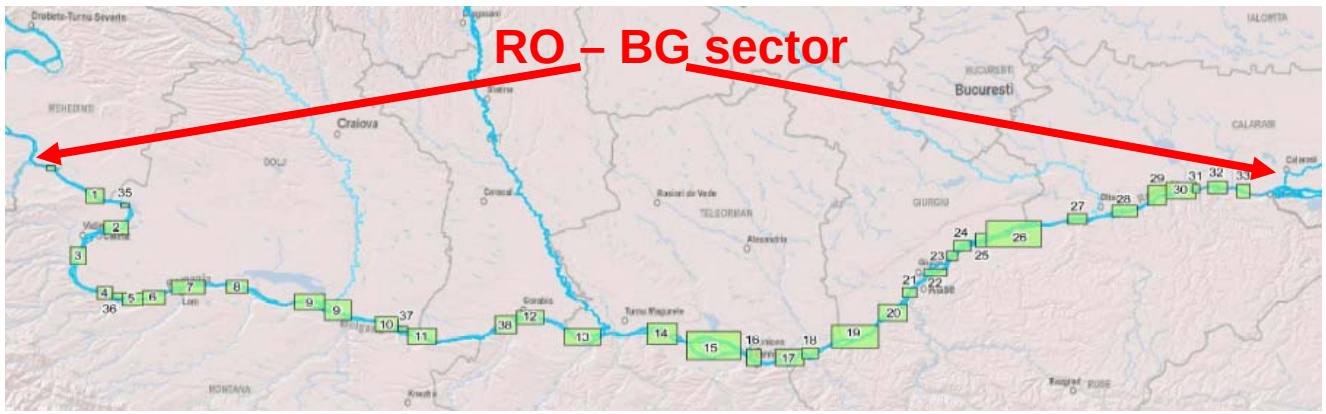
Melioration of Danube Navigation

ISPA I (2003): Calarasi – Braila stretch of the Danube (rkm 375 – 175)

IN EXECUTION PHASE

ISPA II (2007): Romanian - Bulgarian stretch of the Danube (rkm 845 – 375)

IN DESIGN PHASE



DC: ISPA I measure 2002 RO 16 PA 011

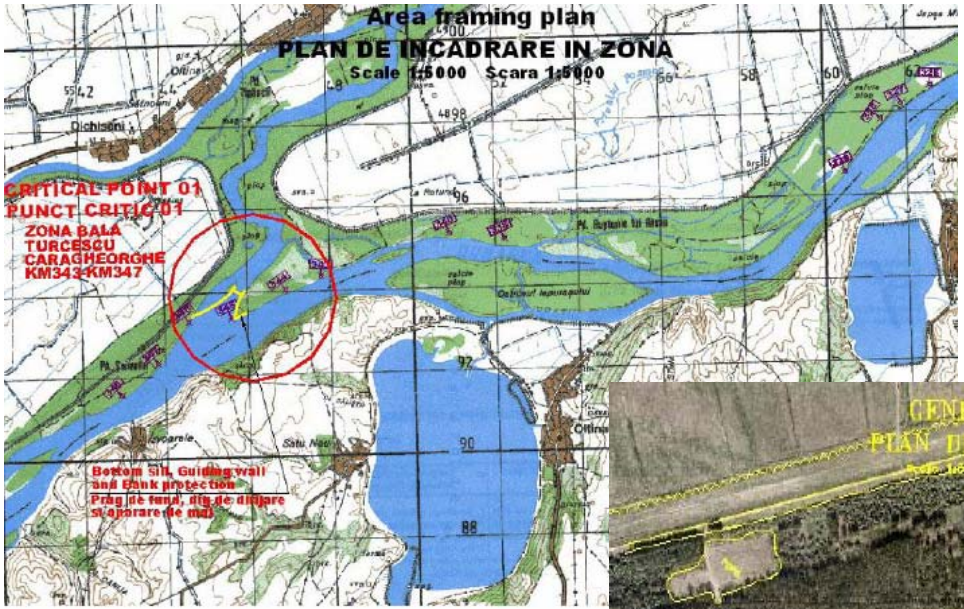
- Based on Danube Convention
- Objectives: **promote sustainable mobility**, improve navigation conditions, with high **economic return**
- **Avoid degradation and „aging“ state of riverbed**
- Steering Committee (6): Ministry of Transport, Construction & Tourism
- 3 Technical Consultants
- Feasibility study, EIA & public consultation (ensuring fish/sturgeon migration, restocking & monitoring of impact)
- Project Stages: geotechnical surveys – topographical and bathymetrical surveys – mathematical modelling (2D: hydrodynamics flow, sediment transport) - design

ISPA I: Braila – Calarasi (rkm 175 – 375)

- 1920s: short cut Bala Branch (Q = 2,000-14,000 m^3/s)
  - 80% of discharge into branch ⟶ bank erosion
  - 20% (2003: 13%) of Q into Old Danube ⟶ silting up
- 1980-1990: Dredging Old Danube: ~700,000 m^3/yr

- Requirements
  - depth -2.50m below ENR for low water levels
  - navigable channel width 180 -150 m
  - minimum curve radius 1000 m

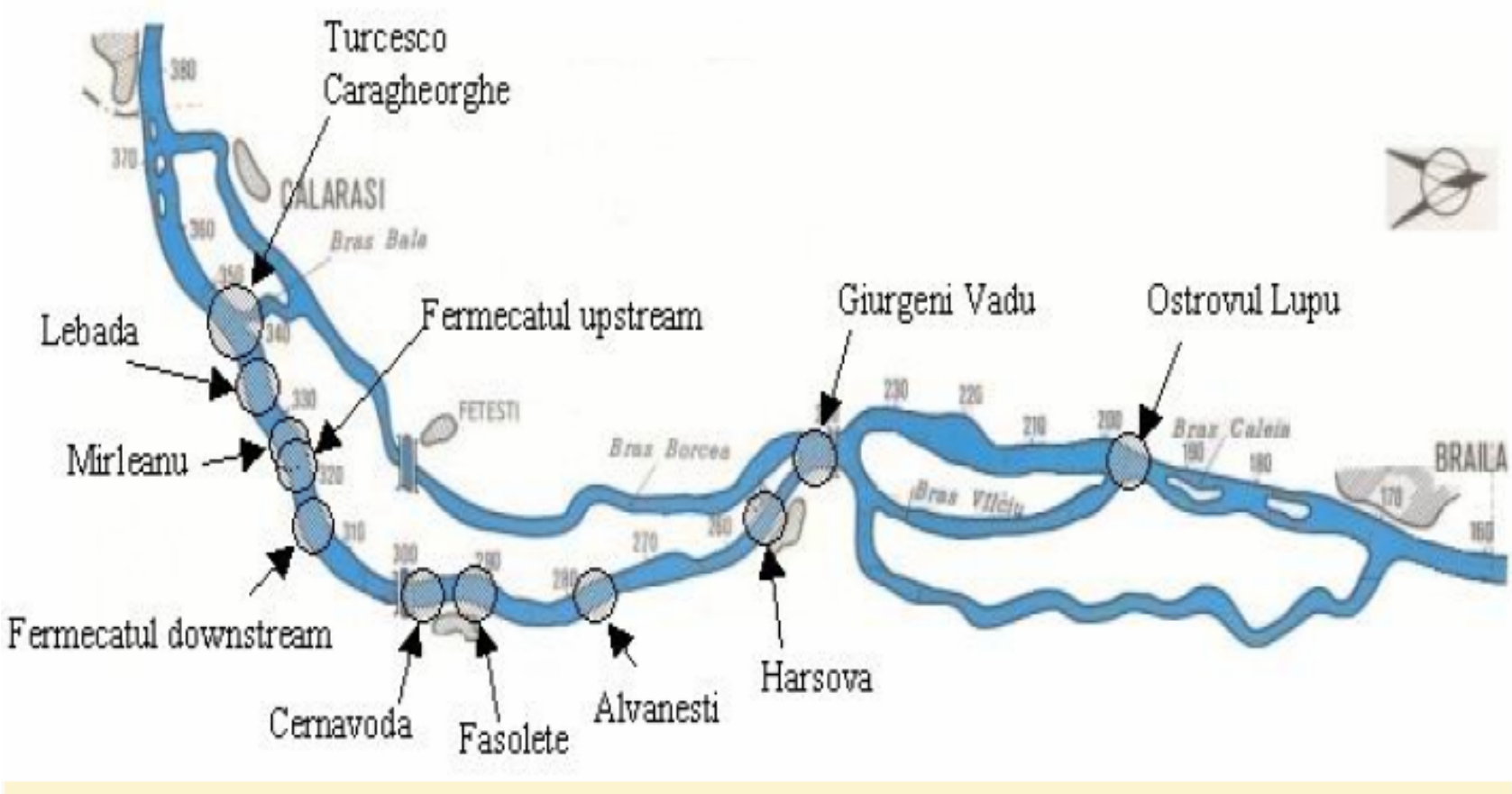
ISPA I: Stage I, Critical point 01 – Bala Branch



- **Guiding wall to direct flow into Old Danube**
- Bottom sill, upper end at medium Q level
- Within 300 m: bed and bank erosion protection
- Dredging sandbar

Source: Alexandru Balcu, Trapec S.A.

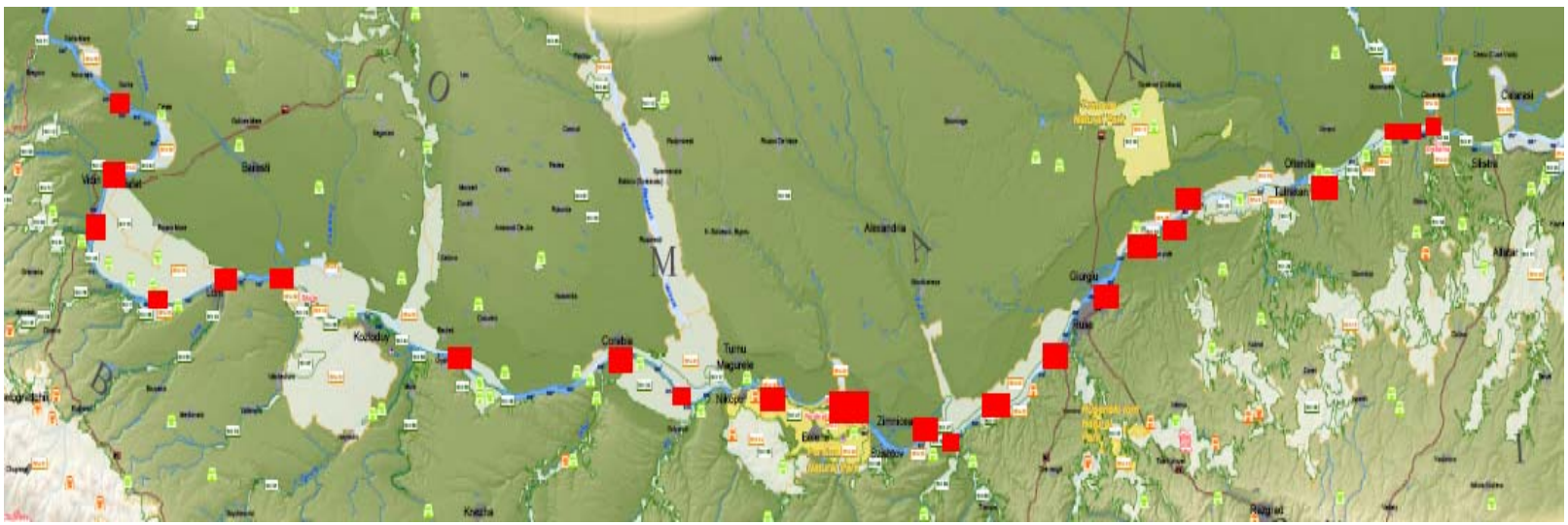
ISPA I: Critical points along the stretch Calarasi - Braila (rkm 375 – 175)



Source: Alexandru Balcu, Trapec S.A.

ISPA II: Improving navigation on the common Romanian-Bulgarian Danube

- All critical sectors are in or close to protected areas (white)



Sources: Technum, Belgium (bottlenecks) & WWF (map protected sites)

Conflict of Interest: Economy vs. Ecology (what is sustainable?)

- EU WFD: “good ecological status” by 2015
- EU FFH Directive
- EU Bird Protection Directive
- Bern Convention (SAP)
- Floodplain Protected Areas / National Parks
- NATURA 2000 network
- etc

Pressure: Navigation (mobility)

- TEN-T: more traffic, bigger vessels, more infrastructure, increased impact
- Enhances exchange of neozoans
- Pollution (oil release, accidents)
- Dredging: removal of „bottlenecks“, habitats
- Local bank protection: prevent erosion
- Bottom sills, channelization: disconnection of floodplains

The View of Technical People vs. Resilience of Nature

- River Rhine: a priori waterway / canal
- Technical impacts are mitigated since ecology has a certain political importance
- e.g., dredging of accumulated sediments
- Reference state not known, not of interest
- Ecological function = black box

- SEA and EIA can mitigate impact (e.g. groynes instead of sills)
- Conservation (Danube) vs. Restoration (Rhine)
- Can resilience of nature restore destruction?

Reality based on experience

- “Salami” tactics – what is the reference?
- Economy (DC, EU TM) stronger than ecology (ICPDR, IAD, WWF)
- Political lobbying matters
- NGOs have limited power
- etc

Project ideas based on ISPA 2

- Wetland inventories & habitat requirements
- Hydrological modeling: flow dynamics vs. groundwater table (floodplain forests)
- Hydromorphological inventories & mapping (CEN standards)
- Effect of flood/flow pulse on biodiversity
- Ecosystem services: economic value of wetlands
- etc