Navigation and Ecology can live together

Improvement of navigation conditions on the Romanian - Bulgarian common sector of the Lower Danube and accompanying studies

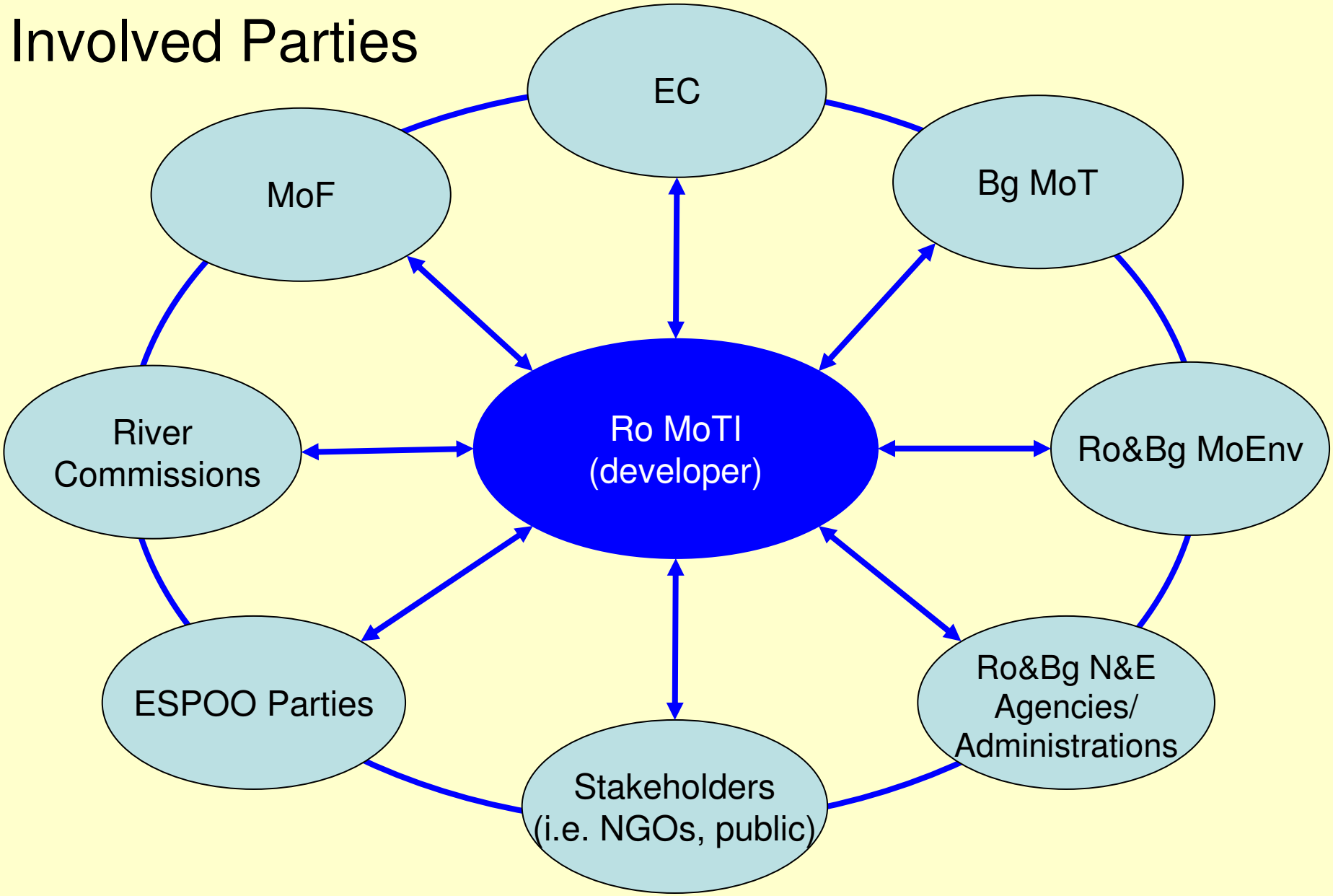
Rousse, 15.09.2009

European Inland Navigation Route
Rotterdam – Constantza

Integrated planning process

- April 2007 – contract signing between RoMoT and Consortium consisting of TECHNUM N.V. Belgium, TRAPEC S.A. Romania, TRACTEBEL DEVELOPMENT ENGINEERING S.A. Belgium, COMPAGNIE NATIONALE DU RHONE France and SAFEGE France
- since 2007 – studies
- Jan 2008 – workshop
- Oct 2008 – workshop
- Nov 2008 – workshop
- 2009 - elaboration of FS and EIA Report
- Jan/Feb 2010 – workshop
- Public consultation Jan – March 2010

Involved Parties



EU and International legislation

- Belgrade Convention
- AGN
- TEN-T
- Danube River Protection Convention
- EIA Directive
- Water Framework Directive
- Birds and Habitat Directive
- ESPOO Convention
- Ramsar Convention, etc.

Other relevant documents

- NAIADES
- Joint Statement
- RBMP, etc.

Methodology

- Assessment of the current situation
  - Field investigations (topo-bathymetry, hydrographic and sediment investigations, morphology and banks, climate change, ice, dredging, flooding, environment)
  - Navigational constraints
- Methodology followed during the Study (still ongoing):
  - Traffic studies;
  - Numerical modeling of Hydrodynamic & morphological patterns (per Scenarios);
  - Engineer Concept Designs;
  - Environmental Baseline Studies, Impacts, Mitigation.
- Partial results
  - General principles of preliminary proposed strategies
  - Definition of scenarios
  - Alternative Development Strategies

Navigation Improvement Measures

- Guiding walls
- Groins
- Submersed bottom sills
- Banks protection
- Dredging (capital & maintenance)

Main principles applied

1. **Precautionary** principle
2. **Integrated** planning approach
3. ***Sustainable Balance*** between Navigation and Ecology – works from the water, **smart** dredging and disposal, **alternative** techniques and materials
4. Measures **prioritization**
5. **Efficient** Monitoring
6. Lower Danube is **more** than a transport corridor
7. **Least Influence** on river morphology in side river branches

Type of measures

- Aspects taken into account

  - **Phasing of Dredging Operations**, taking into account fish spawning /migration, birds nesting, other;
  - **Prioritization** of decided River Interventions
  - **Implementation Phasing** for larger river training works, mitigation;
  - **Restrict Impacts** on deep areas (ex. current velocities, sediment deposition) as low as possible (spawning sites);
  - **Applied Dredging Technique** in line with *best available technology*, in order to minimize environmental effects (i.e. turbidity)
  - **Efficient Use** of dredged material

Scenarios

- **Autonomous Scenario** (AS)
  - Present conditions
- **No Over-depth Scenario** (NOS)
  - ENR-2.5m and no over-depth of 0.50m
  - Capital dredging 0.9 million m^3
- **Basic scenario** (BS)
  - ENR-2.5m and foresee an over-depth of 0.50m
  - Capital dredging 2.2 million m^3

Scenarios

- **Enhanced Depth Scenario** (EDS)
  - ENR-3.0m and foresee an over-depth of 0.50m
  - 9.0 million m^3
- **Enhanced Engineering Scenario** (EES)
  - ENR-2.5m and no overdepth of 0.50m
  - Capital dredging 0.9 million m^3
  - 3 Alternative engineering measures (i.e. length, height).
- **Climate Change Scenario** (ACC)
  - ENR-2.5m and no overdepth of 0.50m
  - Capital dredging 0.9 million m^3
  - Predicted boundary conditions for 2071-2100

• Enhanced Engineering Scenario (EES) is a more environmentally friendly and efficient solution. Selection and design of measures are based on several criteria:

• Use as little material as possible

• Small structures preferred over large structures

• Two submersed partial bottom sills that overlap

• Reduction impact length bank protection

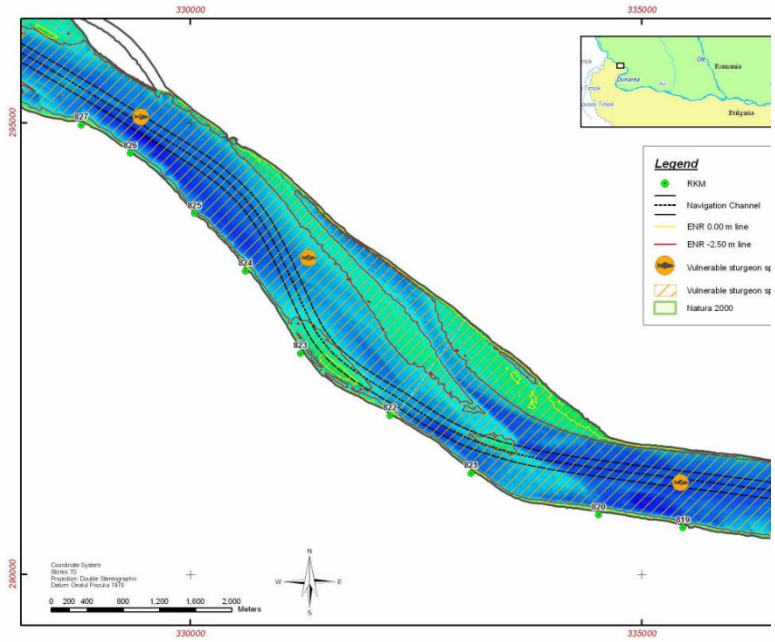
• Influence on current ratio shallow-deep water as little as possible

• Lowered or no connection between structure and major river bank

• Phasing execution and the construction of the river interventions

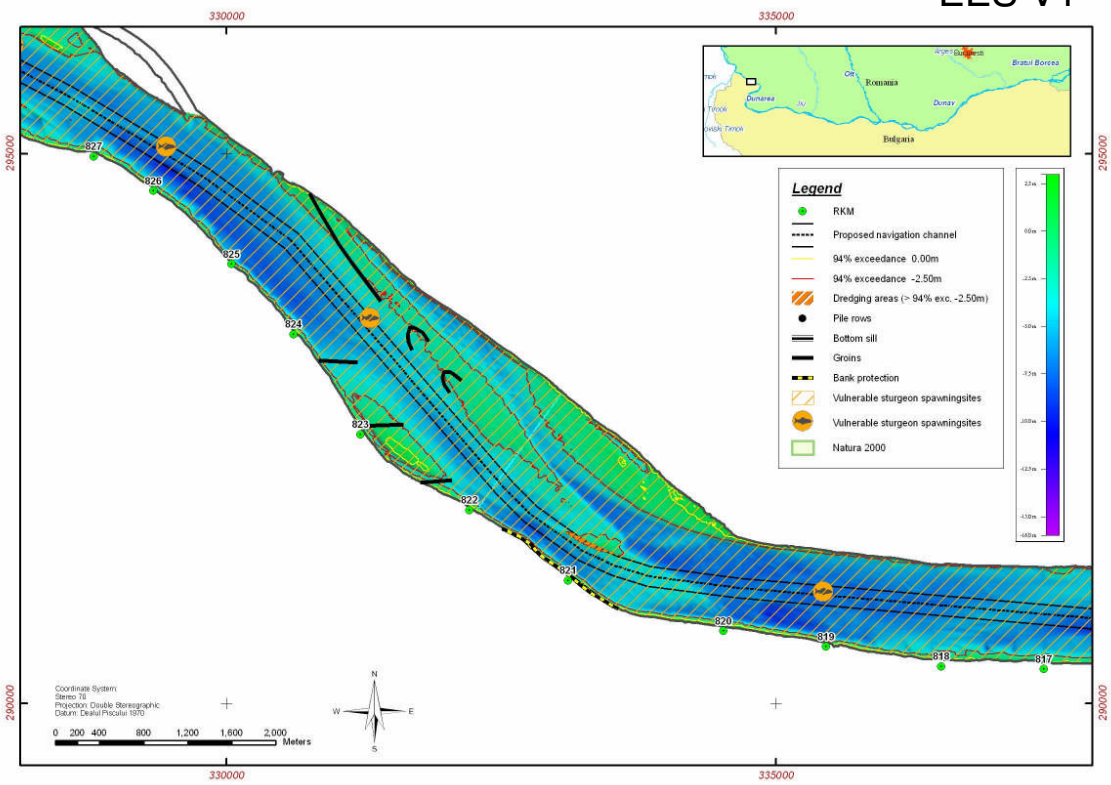
EES variants

- Variant 1:
  - Larger river structures avoided
  - optimise for reduction of maintenance dredging
  - potential for lateral reconnection (eg wetlands, side branches,...)



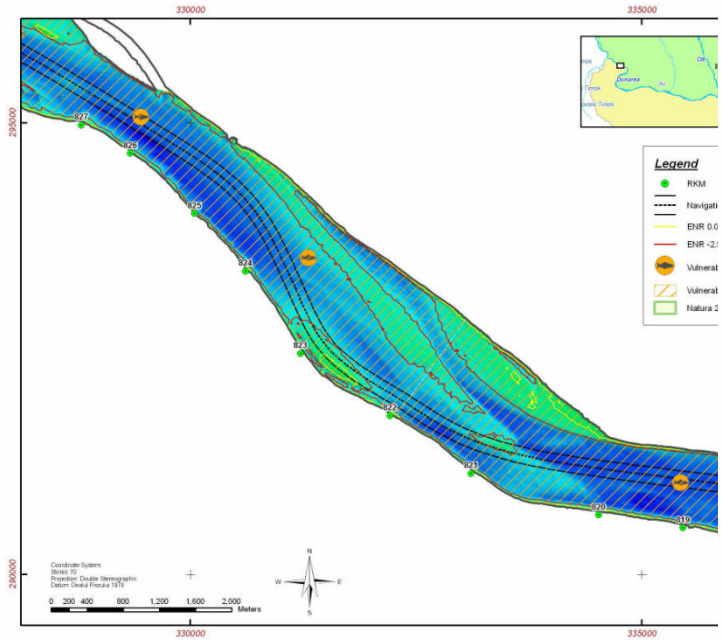
Present conditions

EES V1



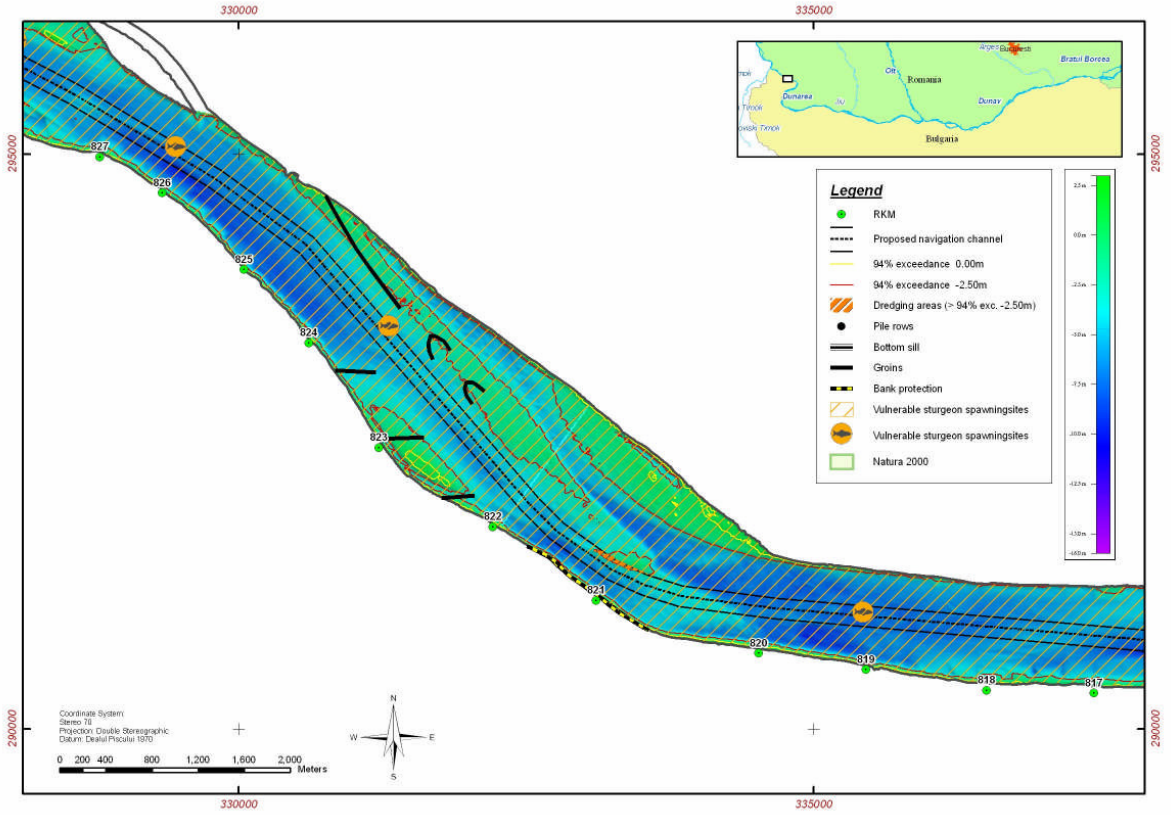
EES variants

- Variant 2:
  - River structures at lower levels
  - Focus on reduction of bottom footprint and impact



Present conditions

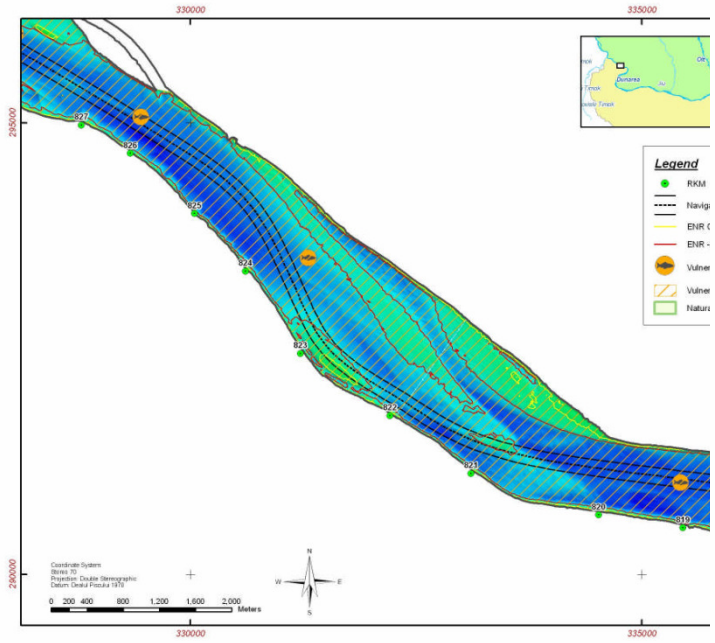
EES V2



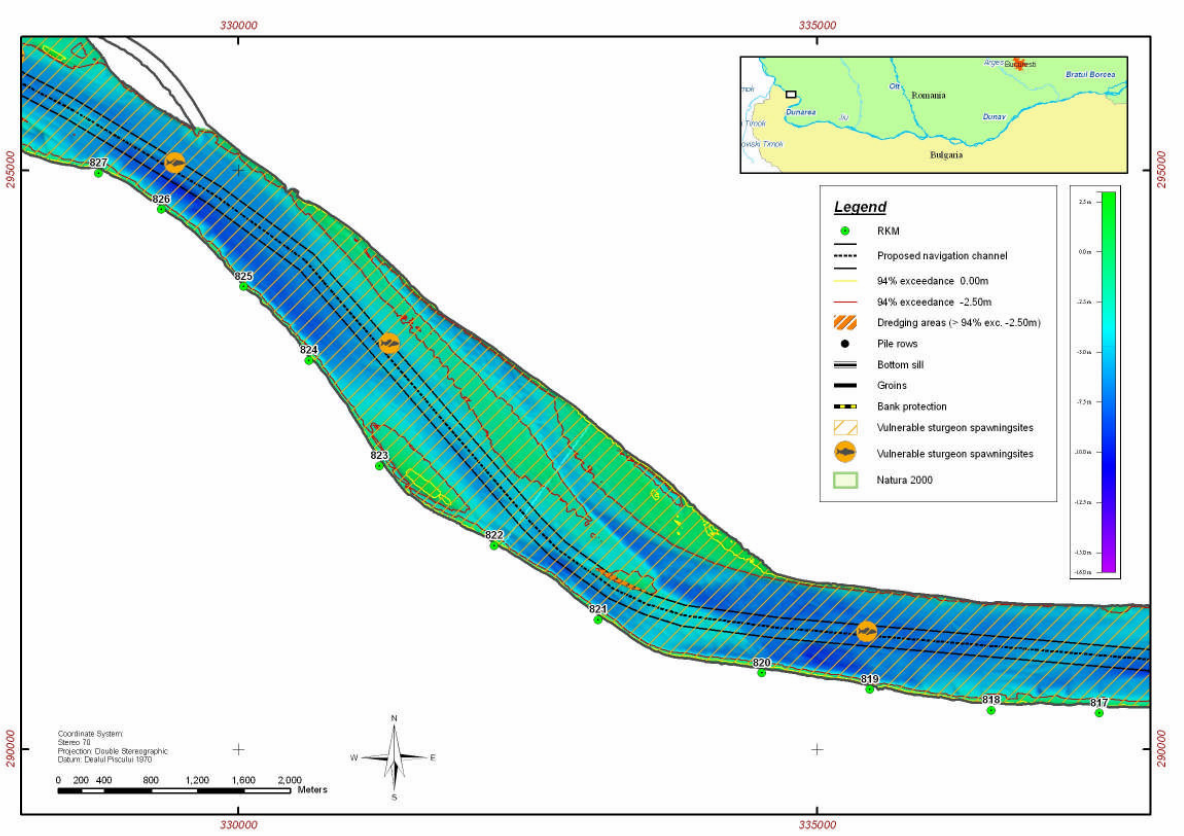
EES variants

- Variant 3:
  - Alternative structures
  - Focus on increase of habitat diversity and lateral reconnection

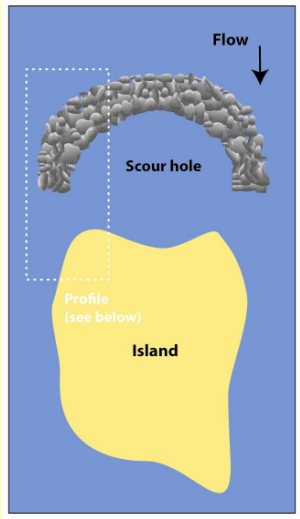
EES V3

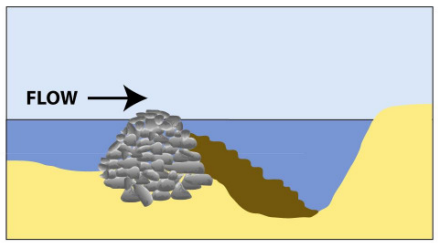


Present conditions



Chevrons





(Source: US Army Corps of Engineers)

Groins

- Alternative L-shaped groins

(L-shaped groins with island creation St. Louis, USA)

Phasing and timing

- Fish migration
- Fish spawning
- Bird nesting
- Overwintering birds
- Other temporarily aspects

Techniques

- Off bank groins and guiding walls
- Shorter and lower groins with reduced impact on high water levels and optimisation of impact on lower water levels
- Chevrons in combination with increase of habitat diversity
- Submersed partial bottom sill with optimisation of water velocity and no closure of side river branches
- Feasible Options to replace submersed bottom sills with groins
- Reduce length of bank protection and alternative techniques and materials

Smart dredging

- Reduce dredging volumes as much as possible (realignment navigation channel)
- Optimal dredging technique for Lower Danube
- Timing of activities
- Useful application of volumes of dredged material
- Environmentally-approved River Disposal sites
- Aim for reduction of frequency of maintenance dredging
- Good field monitoring and reporting
  - Effects on fish, birds, turbidity, water levels, maintenance dredging
  - Evaluation and adaptation

Contents of the EIA Report

- General Information
- Technological processes
- Waste
- Potential impact, including transboundary
- Analysis of the alternatives
- Monitoring
- Risk cases
- Description of the difficulties
- Non technical summary
- Annexes

General Information

- Description of the project
- Project stages
- Duration of the construction
- Pollutants
- Description of the main alternatives studied
- Description of the methodology for EIA
- Other relevant general information

Technological processes

- Proposed technological process
  - Energy consumption
  - Water consumption
  - Emissions of atmospheric pollutants
- Equipments
- Installations
- Facilities

Waste

- Production
- Management
- Discharge
- Recycling

Potential impact

- During and after construction
- Each sector, proposed Alternative
- Direct/Indirect
- Cumulative
- Spatial
- Permanent/Temporary
- Reversible/ irreversible
- Positive/ negative

Potential impact

- Transboundary impacts
  - Serbia
  - Bulgaria
  - Ukraine
  - Moldavia

Potential impacts

- Water
  - Water supply
  - Waste water management
  - Impact prognosis
  - Mitigation measures
  - Integrated Basin Management, along Lower Danube

Potential impacts

- Air
  - Sources and produced pollutants
  - Pollutants groups
  - Cumulative effect
  - Air pollution prognosis
  - Mitigation measures

Potential impacts

- Soil, subsoil
  - Characteristics
  - Chemical conditions in soil
  - Vulnerability and resistance
  - Existing pollution
  - Pollution sources
  - Impact prognosis
  - Mitigation measures

Potential impacts

- Biodiversity
  - Biotopes – forests, wetlands, surface water, sands
  - Local flora – age and type of forest, composition of species; Habitats of plant species included in the Red Book, local and acclimatized species, plant species, etc.

Potential impacts

- Biodiversity
  - Local fauna – habitats for animal species included in the Red Book, species of birds, mammals, fish, amphibians, reptiles, nonvertebrates, etc.
  - Migration routes
  - Shelters for rearing, feeding, resting, reproducing, hibernating, etc.

Potential impacts

- Impact prognosis
  - Forest
  - Swamp
  - Wetlands
  - Flora and fauna, etc.
- Measures for reducing the impacts
  - Protection
  - Reconstruction
  - Re-plantation
  - Repopulation, etc.

Potential impacts

- Landscape
  - Framing within region, diversity, geomorphology, etc.
- Impact prognosis
  - Patterns, land use, protected areas
- Mitigation measures
  - Avoiding the impact
  - Re-cultivation
  - Re-naturalization, etc.

Potential impacts

- Social and economical environment
  - Demographic local population
  - Characteristics of the local population
  - Local labor market
  - Local investment and their dynamics
  - Living conditions
- Mitigation measures
- Cultural and ethnical conditions, cultural heritage

Analysis of the alternatives

- Alternative
  - site
  - technical/technological solutions
  - Mitigation measures, etc.
- Comparing methods
  - checklists
  - maps
  - mathematical modeling, etc.

Monitoring

- Components
- Parameters
- Methods
- Sites
- Periodicity
- Stages
- Estimation of costs

Risk cases

- Natural risks
- Potential accidents (during construction, during operation)
- Measures to prevent accidents
- Comparison

Description of the difficulties

Met by the developer during the carrying out of the EIA

Flora

Left bank, degraded - the presence of adventitious species (Xanthium italicum, Amorpha fruticosa) (May 2009)

Advantages

- Fish and macroinvertebrate diversity higher with off-bank groins
- Improve continuity of sediment transport
- Maintaining longitudinal connectivity of water
- Maintaining routes for ichthyofauna migration
- Chevrons increase habitat diversity and create possibilities for island and deep sites
- L-shape is lower so less visible and has good effect during low water periods
- Stepped-up profile needs less building material and can be optimised for low discharge
- Submersed partial bottom sills allow permanent water flow

Environmental balance

- Restoration might require more material and can cost more
- Lower and L-shape groins might require deeper positioning in river and thus more material
- Less technical measures might cause increase in maintenance dredging
- More dynamics require more monitoring and surveys
- Adaptive measures can require more maintenance and control
- Flexible disposal of dredged material might require more transport and higher costs
- Limitations on timing might cause extra costs
- Limitations on navigation might cause extra environmental and economic cost

Conclusions

- A technical study has been made using the updated information (bathymetry 2008) and the state-of-the-art techniques (numerical modeling, GIS).
- 38 critical sectors analyzed:
  - 5 sectors need no measures
  - 5 sectors need realignment of the navigation channel
  - 17 sectors need realignment + dredging
  - 11 sectors need realignment + dredging + measures
- The effect of the measures during high water levels periods is being studied a the moment taking into account the effect on other studies (i.e. study of floodplains/ Ministry of Environment).
- Several alternative development strategies are considered for the improvement of the navigation conditions.
- Environmental friendly engineering measures are proposed.
- **The FS and EIA studies are ongoing at present.**

Thank you for your attention!

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