
New Approach to River Engineering: Case of the Juzna Morava River in Serbia



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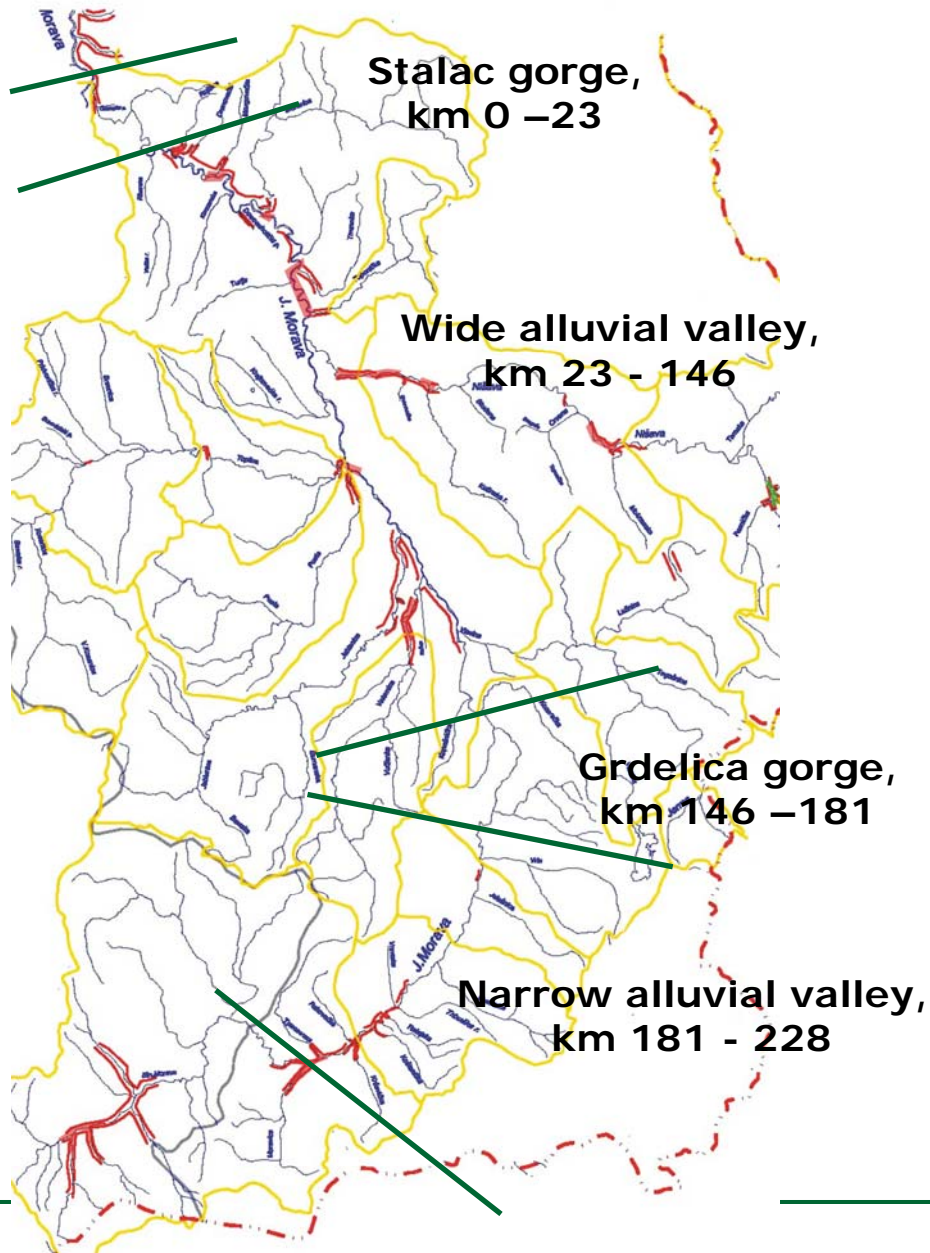
River management and environmental objectives

- **River valleys** are very important for social and economic development - settlements, industry and agriculture, road and railroad routes.
- The river **engineering approach** depends on riparian conditions, primarily the value and the uses of the protected area
- **River management objectives:**
 - flood protection
 - stabilize the river course and prevent fluvial erosion
- **Environmental objectives:**
 - Preserve/enhance riparian lands as important ecological resource

New approach to river engineering

- Harmonized economic, river management and environmental objectives
- **General guidelines:**
 - **Extensive evaluation of several river engineering options** using economic, social and environmental criteria
 - **Max. river corridor width**, taking into account site-specific conditions
 - **Maintain floodplain biotope** within the river corridor as complex as possible, with a variety of diverse habitats
 - **Preserve variation in hydraulic and morphological conditions** of the river course - eliminate only extremes if needed
 - **Prevent fluvial erosion** with the use of biological support structures or a combination of natural materials (rock and gravel) and biological components (trees and bushes) to

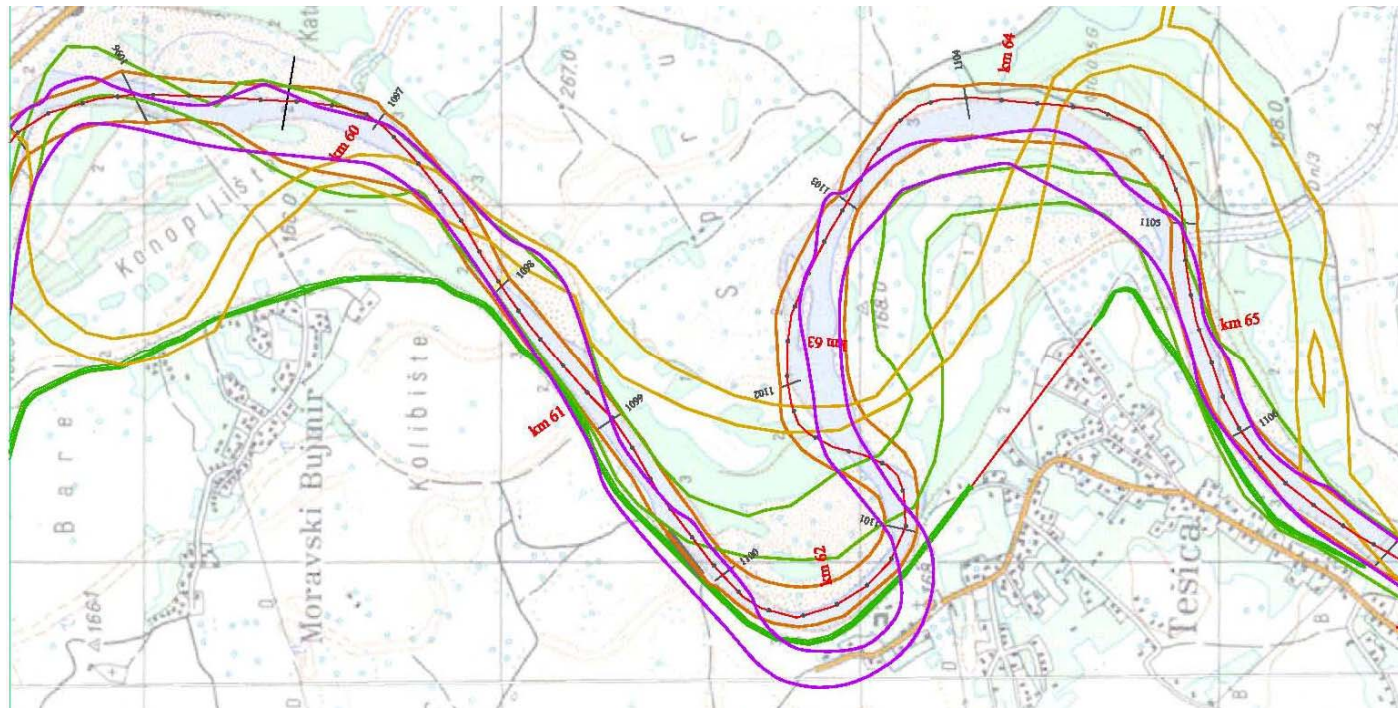
Juzna Morava river



Detailed study km 23 – km 146

■ Scope:

- field investigations (detailed site inspection, survey of cross sections and sediment sampling)
- hydrological, hydraulic and sediment analyses
- assessment of the bank erosion based on the analysis of the river alignment changes between 1924 and 2005



Bank erosion and river meandering



- ❑ Frequent and significant changes of the alignment
- ❑ Bank erosion intensity is related to the river alignment curvature
- ❑ Total annual contribution of bank erosion to river sediment budget ~ 1 million m^3
- ❑ Sediment input from the bank erosion exceeds the transport capacity of the river - sediment accumulation in the vicinity of eroded riverbanks



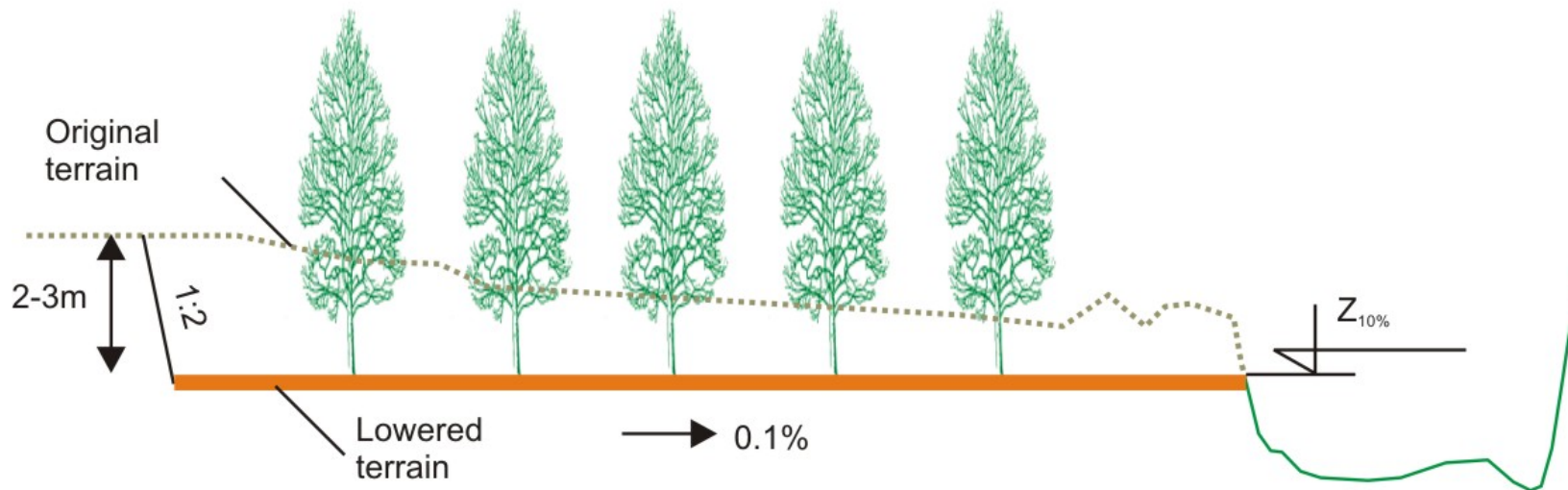
Main river management and environmental objectives

- **River management objectives**
 - **Protection of roads and bridges** - EU corridor X, regional and local roads are exposed to floods and fluvial erosion
 - **Flood protection of settlements**
 - **Flood protection of agricultural land**
 - **Controlled exploitation of gravel** - extraction of alluvial sand and gravel deposits is a major economic activity in the region
- **Environmental objectives**
 - Re-naturalization of 500-1000 m wide river corridor (abandoned land and degraded soil)

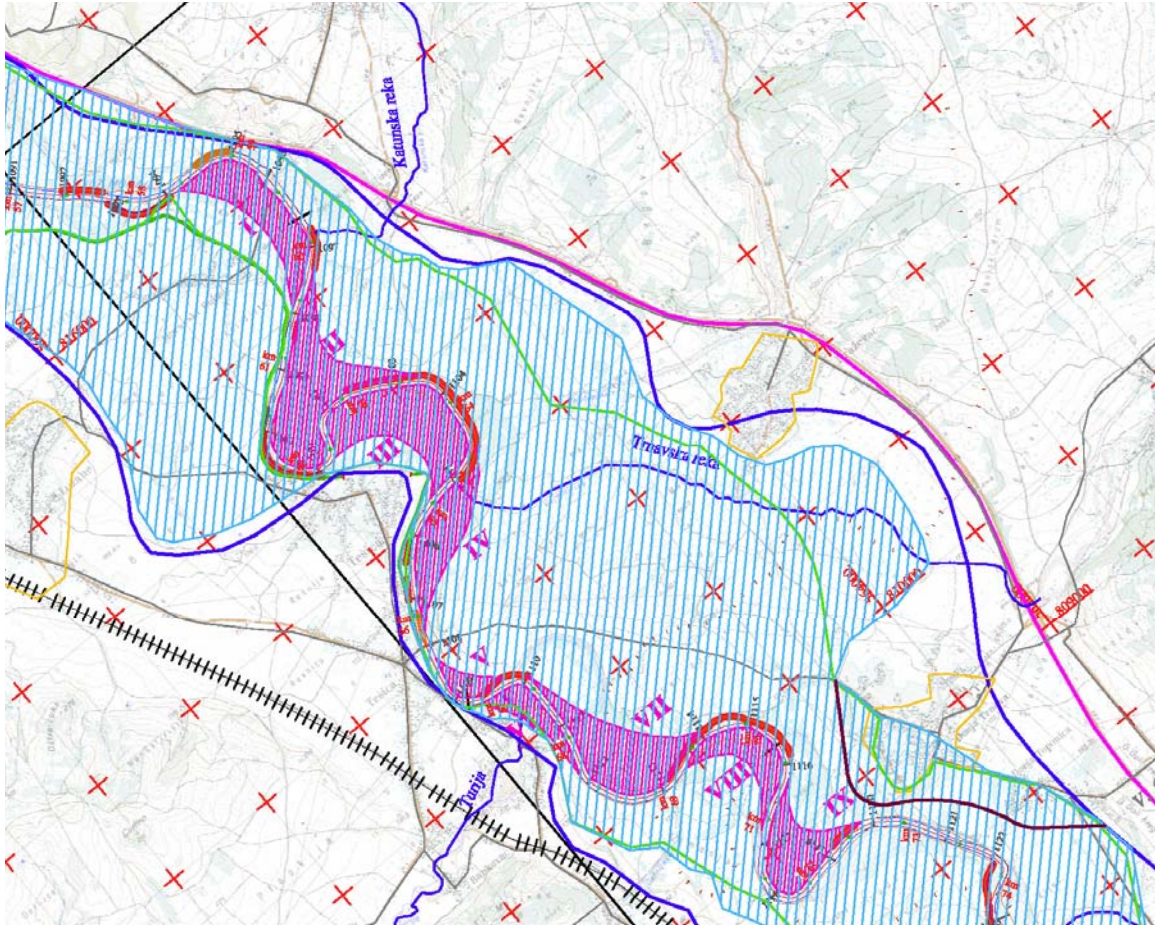


River engineering measures

- Planned **only** on river sections characterized very unstable river course, significant fluvial erosion, and settlements endangered by floods
- **New approach** - alter the morphology of the major river channel, through the extraction of alluvial sediments
- If concave river bank is inclined to collapse + wide degraded riverside belt along the convex riverbank = **lowering of floodplain along the convex riverbank** (roughly to $1/2 H$, or 2-3 m) by large-scale excavation of a 100-200 m wide belt



River engineering measures



- **Hydraulic effects:**
 - Increased flow capacity
 - Re-distribution of flow pattern
 - Weakening of the main-stream impact on the threatened concave bank
- **Economic benefit:** gravel and sand
- **Environmental benefit:** Degraded riparian is replaced with eye-pleasing river corridor with environmental function



Thank you for kind attention!