



Strengthening Capacities in the Western Balkans Countries to Address Environmental Problems through Remediation of High Priority Hot Spots



Environmental Hot Spot Serbia Remediation of the Grand Backa Canal

Monitoring of surface water and sediments quality in the Grand Backa Canal

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Background



- Location: Vrbas, AP Vojvodina
- Project title: Remediation of the Grand Backa Canal
- Environmental assessment of the canal in the Vrbas and Kula municipalities: the canal is filled with polluted sediments due to industrial and sewerage waste water discharge
- It is one of the three most polluted locations in Serbia

Background

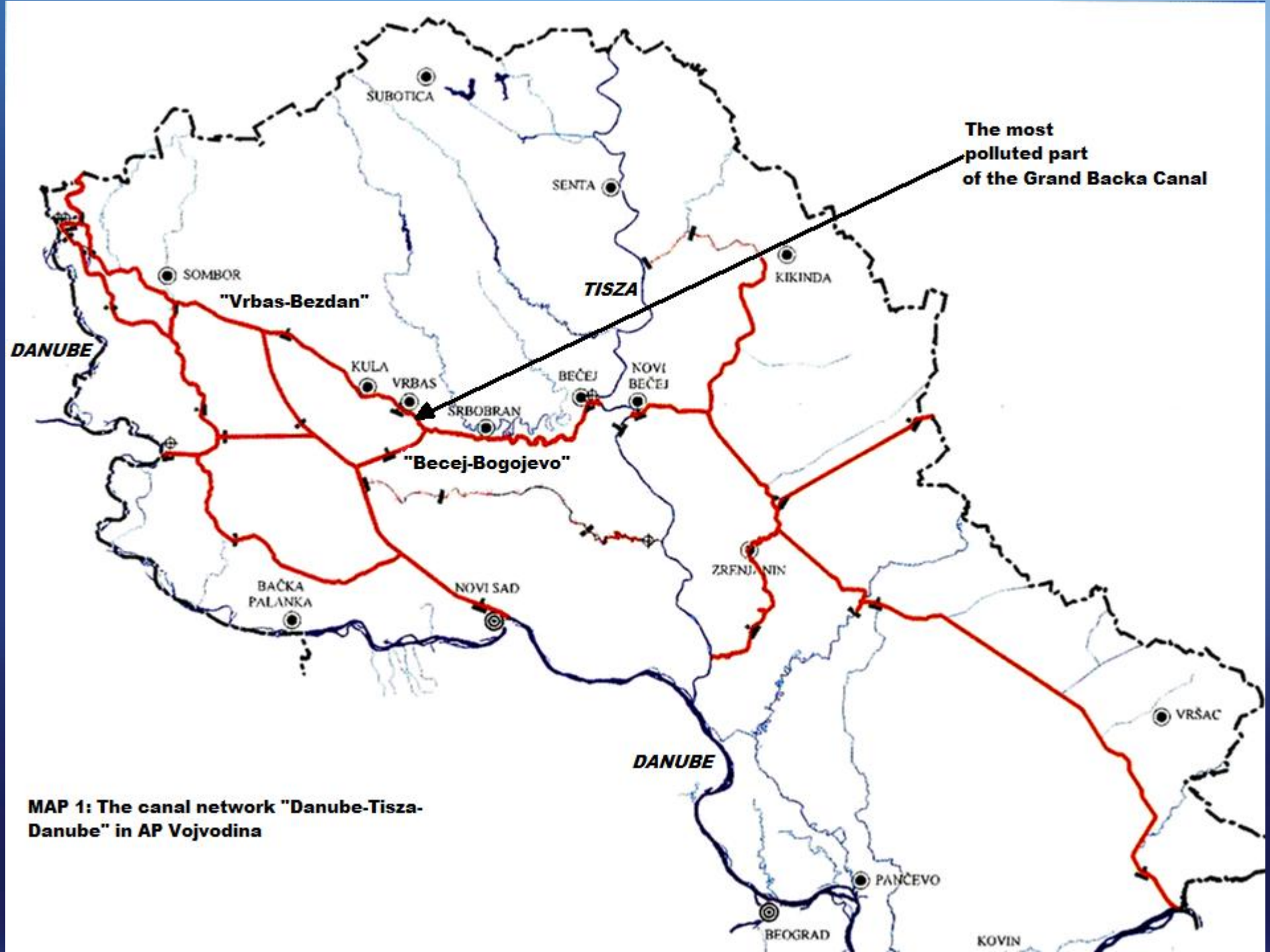


- The Project of remediation was initiated by the Vrbas municipality and AP Vojvodina
- It consists of three sub-projects:
 1. Construction of a new part of the waste water collector
 2. CWWTP for the municipalities of Vrbas and Kula
 3. Remediation of the Grand Backa Canal

Description of the site



- The two canals connecting the Danube and Tisza Rivers (Map 1) are commonly known as the “Grand Backa Canal” (GBC). These are: “Vrbas-Bezdan” (up to the “triangle” in Vrbas) and “Becej-Bogojevo” (from the “triangle” to Becej).
- The worst situation is in the part between the “triangle” (0 km) and Vrbas Lock (6 km).
- Parallel to the “Vrbas-Bezdan” canal, there are two smaller “lateral” canals: I-64 (with KCIII) and I-61. Both laterals flow into the GBC in Vrbas (6 km), downstream of the Vrbas lock.



The most polluted part of the Grand Backa Canal

MAP 1: The canal network "Danube-Tisza-Danube" in AP Vojvodina

Hot spot pollution sources



- Cadastre of polluters registers 22 polluters
- Most of the polluters discharge untreated waste water into lateral canal I-64 and subsequently into the GBC
- The biggest polluters are: meat industry “Carnex” with its “Farmacoop” pig farm in Vrbas, sugar refineries in Vrbas and Crvenka, communal waste water from Vrbas and Kula, cooking oil factory “Vital” in Vrbas, metal and leather processing factories in Kula and others.



Photos 1-4: UNDP Serbia

Extent of water pollution in 2005



NIVA's (Norwegian Institute for Water Research) monitoring of communal and industrial waste waters (2003-2005) in the GBC:

- **Organic matter** (from the meat industry and sugar refineries)
- **Suspended matters** (from meat industry, sugar refineries and leather processing factory)
- **Nitrogen and Phosphorus compounds** (from the meat industry, sugar refineries, leather and metal processing factories)
- **Heavy metals** (leather and metal processing factories)
- **Mineral oils** (unidentified source)

Extent of sediment pollution in 2005



Dekonta (2004) monitored the GBC sediment quality along the 6 kms of the GBC between the Triangle and Vrbas Lock:

- Estimated volume of contaminated sludge is approx. 403,000 m³
- Sludge sediment was highly contaminated with: Coliform bacteria, heavy metals (Cr, As, Cd, Ni) and petroleum hydrocarbons in the upper part of the canal, as well as minor contamination with PCB was identified.

UNDP Hot Spot Environmental Monitoring in 2008



Objectives to provide:

- Continuity of hot spot environmental monitoring for the needs of the Ministry of Environment and Spatial Planning (MoE&SP) and other institutions
- Guidance data regarding the quality of water for the CWWTP design.
- Data on the canal sediments' quality in the early phase of developing technical documentation for the remediation of the GBC in Vrbas.
- Public information on the quality of surface waters and sediment.

Monitoring Programme



- Monitoring programme is prepared in cooperation with the ME&SP's, department for water and soil protection.
- Sampling, analyses and assessment are performed by the Institute of Public Health – Belgrade, laboratory accredited by the Serbian accreditation board.
- Monitoring of water and sediment quality was undertaken during one hydrological season: October – December 2008 (working season for collection and refining of sugar beat).
- The final draft report was submitted in April 2009.

Monitoring Profiles



Selection of the profiles included:

- The most polluted area of the canal (upstream and downstream),
- Contribution to the pollution of lateral canals I-64 (including also KCIII) and I-61,
- Influence of industries and settlements (Kula and Vrbas)
- Influence of the “Becej-Bogojevo” canal waters

Ten macrolocations (Fig. 1) were selected.

Danube

Monitoring Profiles "Grand Backa Canal"



Figure 1: Monitoring profiles

Performed analyses:

1. Physical – chemical analysis in surface waters (for 38 parameters),
2. Microbiological analysis (7 parameters),
3. Physical – chemical analysis in sediments (25 parameters),
4. Biological analysis (4 parameters)



Photo 5: Sampling, IoPH BG

Criteria for comparison of results



- Decree on Water Classification (Official Journal of the Republic of Serbia, No. 5/68 and 33/75); for water quality assessment.
- Decree on water courses categorization (Official Journal of the Republic of Serbia, NO. 5/68 and 33/75);
- Regulation on dangerous substances in waters (Official Journal of the Republic of Serbia, NO. 31/82).); for water quality assessment.
- Regulation on quantities of pesticides, metals and metaloides and other substances in food (Official Gazzette of the SRJ, NO 5/92) for bioaccumulation.
- ICPRD “Water Quality in the Danube River Basin”, TNMN Yearbook 2001, (2002), Wien; for water quality (for parameters not defined by Serbian criteria) and sediments.

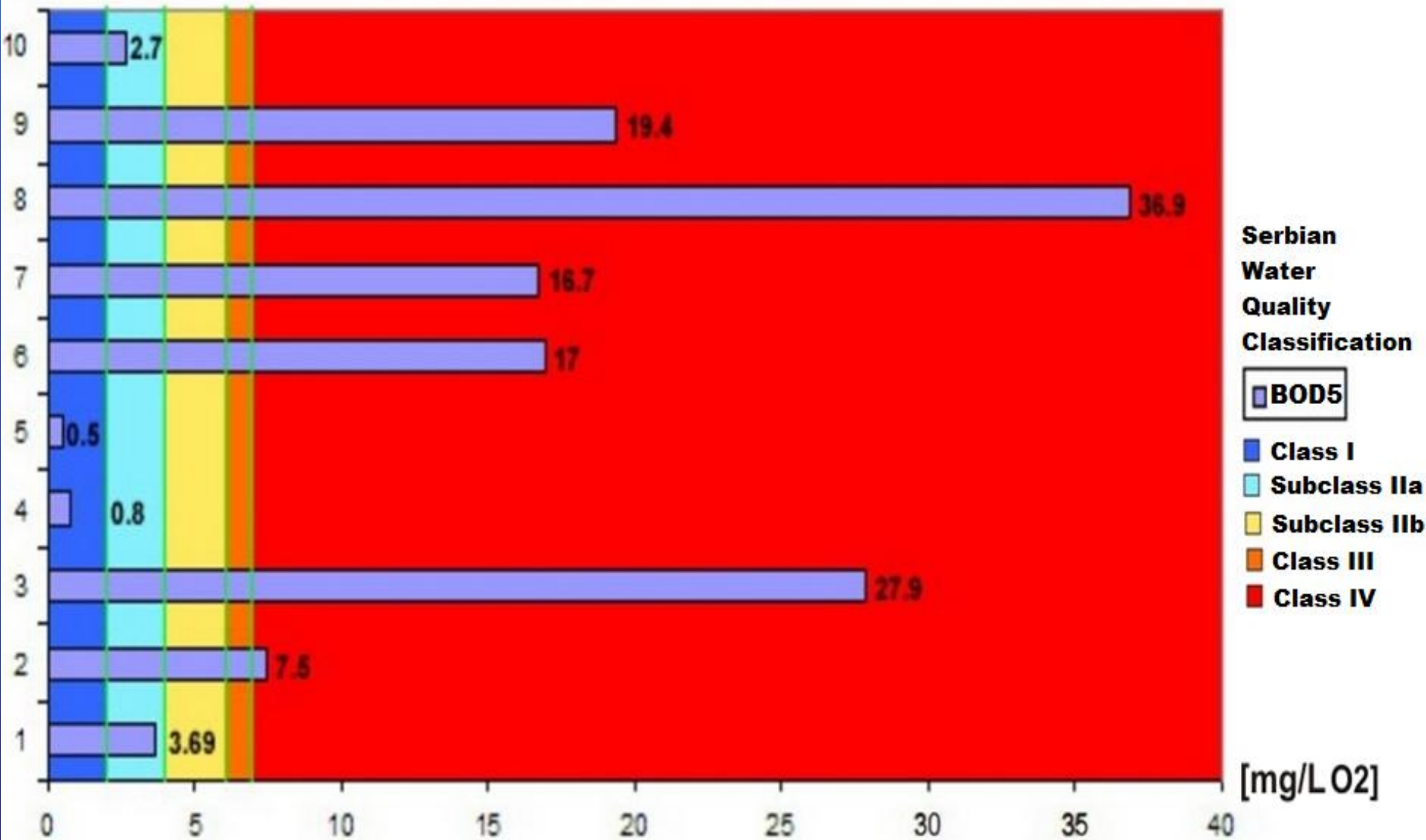
Results 2008



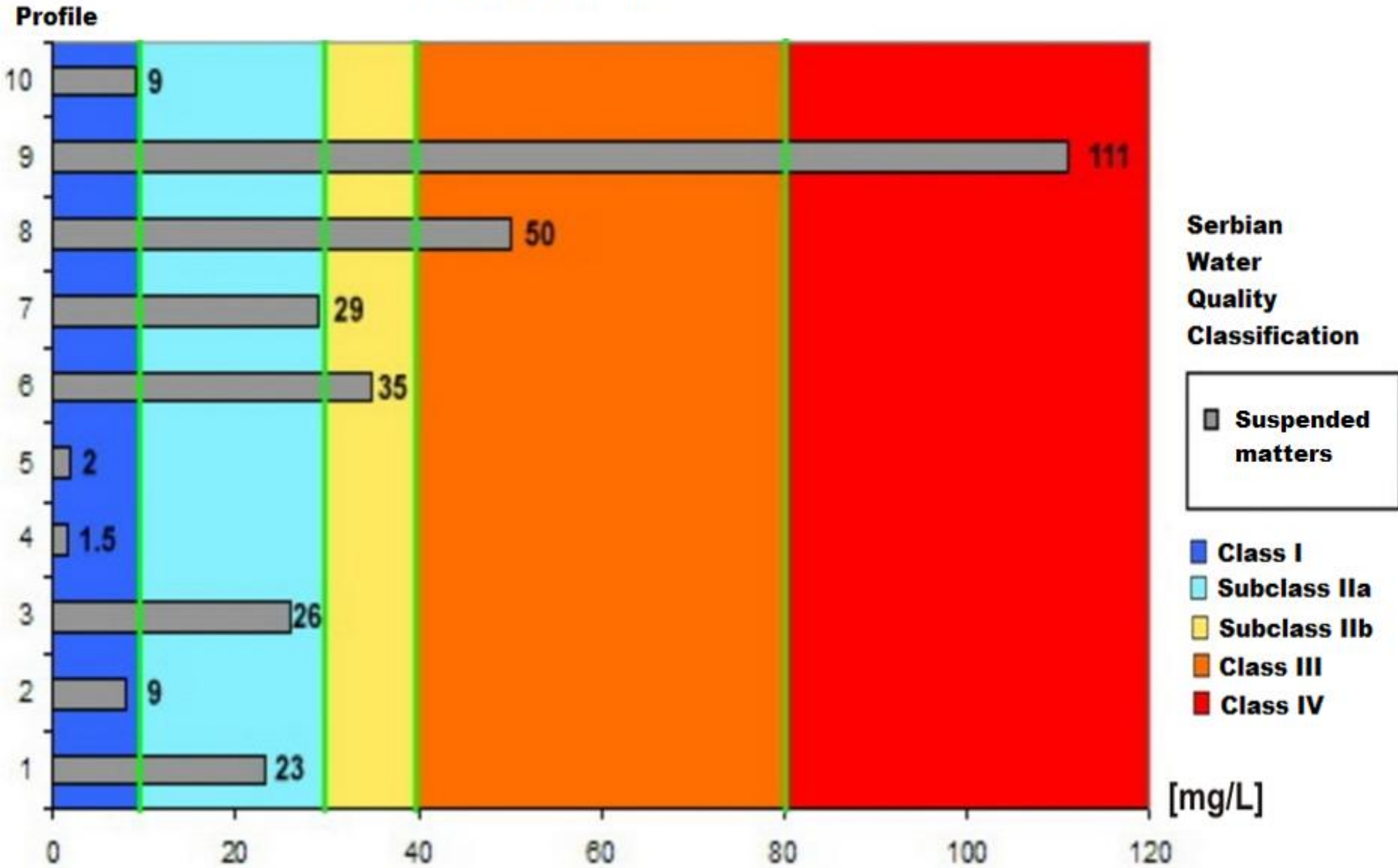
- Waste waters and limited water that flows in the GBC network cause sedimentation of suspended matters, heavy metals, biodegradable organic matters, mineral oils and fecal microorganisms in extremely high concentrations.
- Water Quality: profiles 3, 8 and 9 are extremely polluted as shown by microbiological, physical-chemical and chemical parameters that are equal to sewerage water values (Figure 2).
- Examples on slides 17-20

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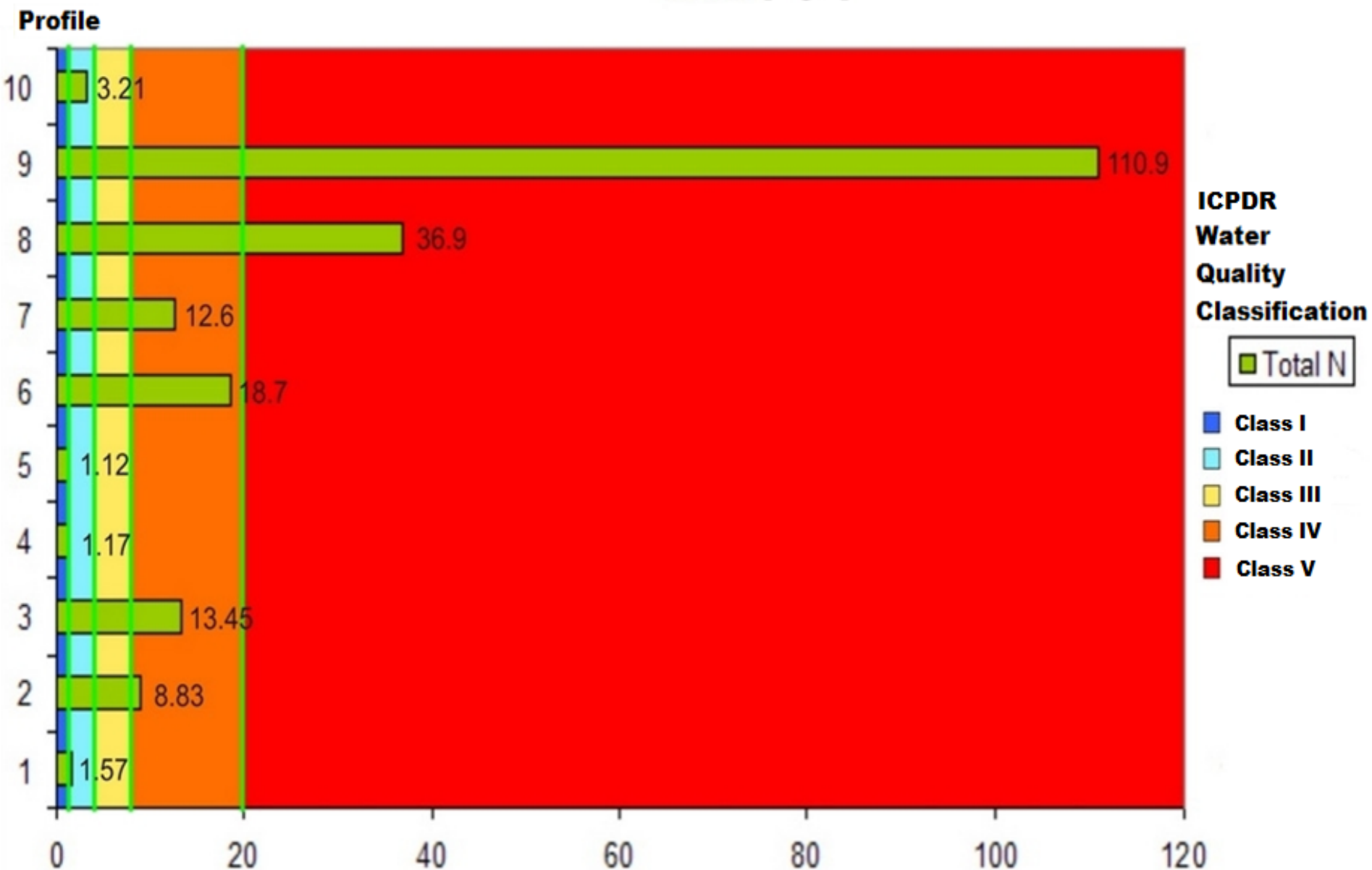
Profile



Suspended matters

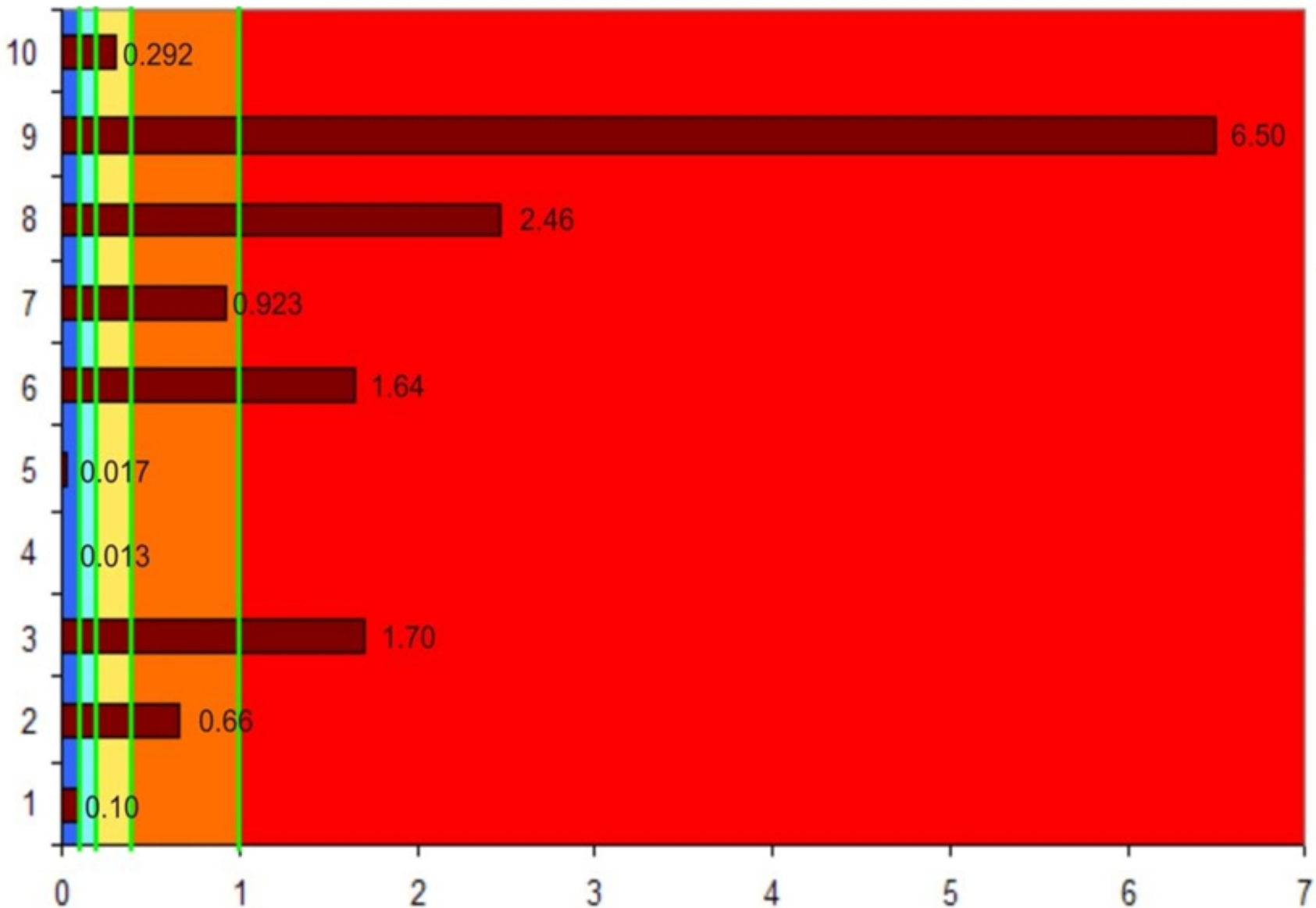


Total N [mg/L]



Total P [mg/L]

Profile



ICPDR
Water
Quality
Classification

Total P

- Class I
- Class II
- Class III
- Class IV
- Class V

Danube

Monitoring Profiles "Grand Backa Canal"

Key:
ICPDR Water Quality Classification

- I Excellent
- II Good
- III Moderate
- IV Bad
- V Very bad

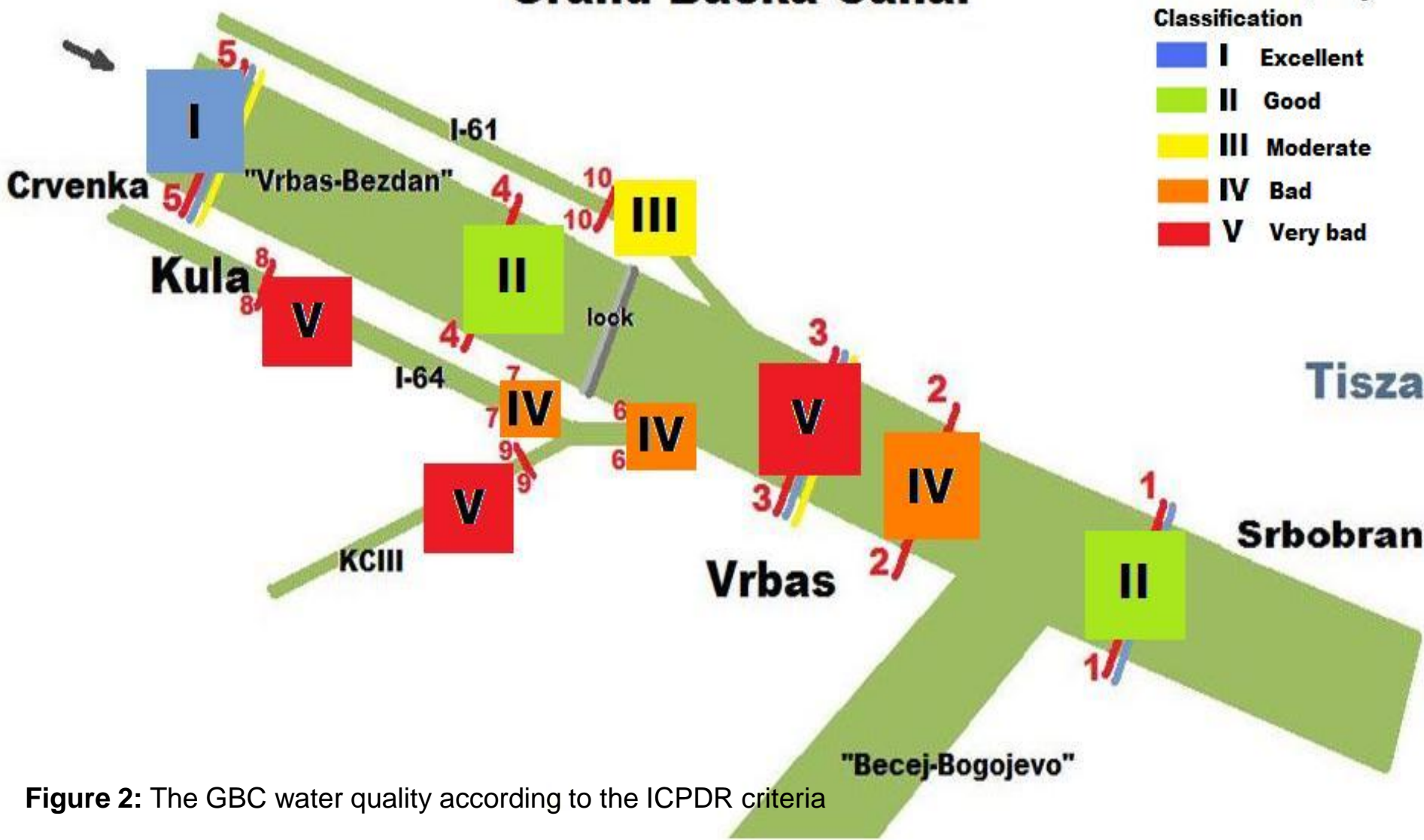


Figure 2: The GBC water quality according to the ICPDR criteria

Sediment Quality Results 2008



- Assessed at profiles 3, 5 and 6, as shown in Figure 3.
- Profile 3 is the most polluted, with pollution mainly represented by a composite of soil and organic matter with a high heavy metals content (especially Zn, Cu and Cr in deeper layers of sediment), mineral oils and nutrients. Anaerobic conditions for decomposition of organic matters cause high content of sulphides.

Danube

Monitoring Profiles "Grand Backa Canal"

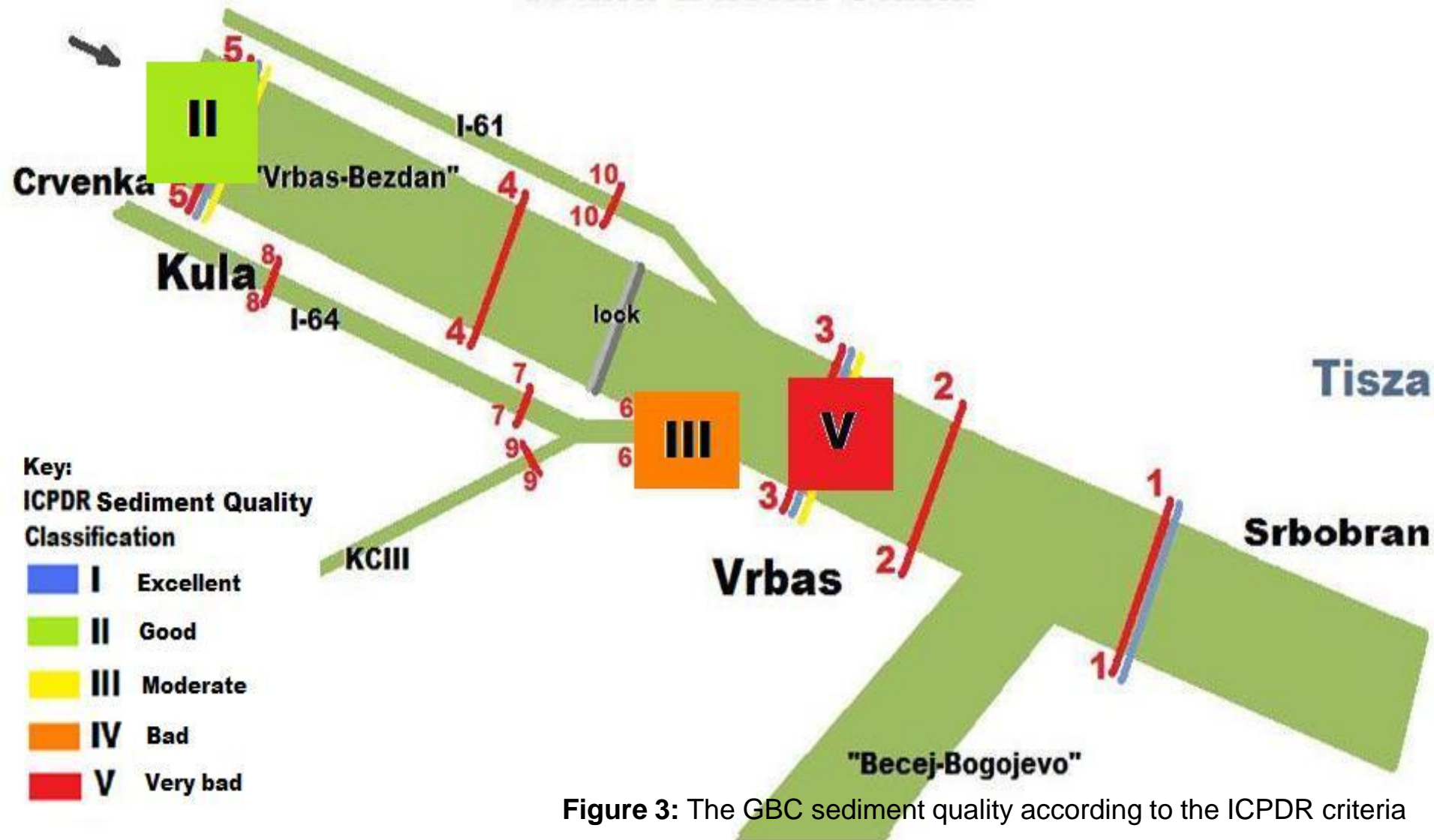
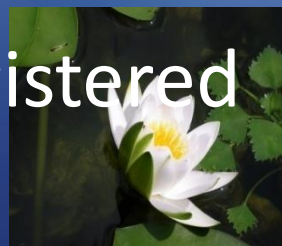


Figure 3: The GBC sediment quality according to the ICPDR criteria

Assessment of Hydro-biota 2008



- Assessed at profiles 1, 3 and 5
- Bioaccumulation: Reeds' (*Typha latifolia*) roots accumulated heavy metals (Al, Cr, Fe, Ni and Zn) especially at profile 3.
- Absence of Water lilies (*Nymphaea alba*) registered at profiles 1 and 3.
- Absence of fish on the canal part downstream of the Vrbas lock to the triangle.
- Concentration of heavy metals in muscles of fish is below MAC.



Next steps



- UNDP, the MoE&SP and the RS Ekofond provided for the continuation of monitoring for the next three and half years (7 seasons).
- This will be financed in part by the MoE&SP and in part by the RS Ekofond.
- The Institute of Public Health – Belgrade, based on the monitoring results, recommended smaller modifications regarding profile locations and parameters, it is incorporated in the programme for the next seasons. The institute is in the phase of signing contracts for this

assignment

Strengths and weaknesses



- Strengths: monitoring 2008 - 2012 will ensure continuity of the monitoring of the GBC; the first results about bioaccumulation in hydro-biota of the GBC.
- Weaknesses: the lack of a regular budget for environmental hot spots' monitoring; the division of competencies in the water protection sector between two ministries (the MoE&SP and the MoAF&WM); obsolete and unharmonized regulations with the EU Water Framework Directive (WFD), weak implementation of existing laws; etc.



Thank you!

www.westernbalkansenvironment.net/Serbia