SURFACE WATER MONITORING IN BANAT REGION
(REPUBLIC OF SERBIA)

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ENVIROBANAT CONFERENCE
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In the frame of the project

Sustainable development of an research center in Banat region and Danube flow area through scientific research and environmental simulation tools to asses and evaluate potential threats

www.envirobanat.ro
Monitoring programme

1. Review of pollution sources
   - Difusse sources
   - Point sources

2. Review of current monitoring results
   - RHMZS
     (National Meteorological Service)
   - Other relevant institutions
Locating Banat

Hungary
Croatia
BiH
Romaina
Bulgary
Montenegro
FYR Macedonia
Total length 966 km

In Serbia 160 km
Pollution sources and sampling points

1. Cross border profile

2. After cardboard industry

3. After yeast and sugar industry

4. Before inflow to Danube

Ceramic industry
‘POTISJE KANJIŽA’ A.D.

Yeast production
“Fermin”, Senta

Sugar production
Senta

Cardboard production
Lepenka, Novi Kneževac

Gas and oil terminals

Sintetetic rubber production
HIP Petrohemija - Fabrika sintetičkog kaučuka, Elemir

LPG production
NIS AD Novi Sad
Tisza

Bega channel

Total length 254 km

In Serbia 76 km
Pollution sources and sampling points

Sloughtery “Agroživ” Žitište
Shipyard “Begej”
Dairy “Mlekoprodukt”
Edible oil “Dijamant”
Starch production “Ipok”
Chemical industry “Luxol”
Sewage waste water
Tanning “DAFAR”
Waste animal recycling “Precon”
Power plant Panonske lektrane
Chemical industry “Beohemija-inhem”
Shipyard “Bomex”

1. Cross borfer profile
2. After the slaughtery
Five sampling points in Zrenjanin city
5 sampling points in Zrenjanin city
“Begej in test tube”
1. Cross border profile

2. After the slaughterery

5. Sampling points in Zrenjanin city

6. Before inflow to Tisza

Pollution sources and sampling points:

- Sloughtery “Agroživ” Žitište
- Shipyard “Begej”
- Dairy “Mlekoprodukt”
- Edible oil “Dijamant”
- Starch production “Ipok”
- Chemical industry “Luxol”
- Sewage waste water
- Tanning “DAFAR”
- Waste animal recycling “Precon”
- Power plant Panonske lektrane
- Chemical industry “Beohemija-inhem”
- Shipyard “Bomex”
Total length 359 km
In Serbia 118 km
Diffuse sources

- More than 30 wild dumps
- 6 sewage canals
- 6 fishponds
- Gas and oil exploitation field

Point sources

- Brick production
- 2 Slaughterhouses
- 2 farms
- Dairy
- Chemical industry “Panonija”
Pollution sources and sampling points

1. After Kovacica settlement
2. After starch production

Pig farm
Kovačica settlement
Dairy
Pančevo city
Starch production
Food processing industry
Car wash service
Agricultural complex
Foundry
Shoe factory
Karas and Nera

Sampling points

1. Karas-cross border profile

3. Before Nera inflows to Danube
2. After Pančevo city
Sumary
sampling point map
22 locations
Parameters /methods

**ORGANOLEPTIC ANALYSIS**

- Water smell

**CHEMICAL ANALYSIS**

**Elektrochemical methods**

- Water temperature
- pH
- Dissolved oxygen

**Sectrophotometry**

- Nutrients (Nitrate, Nitrite, Total phosphorus)
- Suspended matter
- COD
- BOD5

**ESTABLISHING THE PRESENCE OF VISIBLE MATTER**
According to **Bylaw on limit values of pollutants in surface and ground waters and sediments, and the deadlines for their achievement** ("Official gazette RS" No 50/2012), Banat rivers are classified in following groups:

- **Type 1** - large lowland rivers, the dominance of fine sediment (Bega, Tisza, Timis, Danube)
- **Type 2** - the great river, the dominance of the middle sediments (Nera)
- **Type 5** - streams of the Pannonia basin (Karas)
Limit values for measured parameters prescribed with Rulebook on parameters of ecological chemical status of surface waters and parameters of ecological, chemical and quantitative status of ground waters ("Official gazette RS" No 74/2011) are shown in Table.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Unit</th>
<th>I class*</th>
<th>II class*</th>
<th>III class*</th>
<th>IV class*</th>
<th>V class*</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH (Type I, II and V)</td>
<td></td>
<td>6,5-8,5</td>
<td>6,5</td>
<td>8,5</td>
<td>6,5</td>
<td>&gt;6,5 or &gt;8,</td>
</tr>
<tr>
<td>Dissolved oxygen (Type I, II)</td>
<td>mgO₂/l</td>
<td>8,5</td>
<td>7</td>
<td>5</td>
<td>4</td>
<td>&gt;4</td>
</tr>
<tr>
<td>(Type V)</td>
<td></td>
<td>8</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>&gt;4</td>
</tr>
<tr>
<td>Suspended matter (Type I, II and V)</td>
<td>mg/l</td>
<td>25</td>
<td>25</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Nitrates (Type I)</td>
<td>mg/l</td>
<td>1</td>
<td>3</td>
<td>6</td>
<td>15</td>
<td>&gt;15</td>
</tr>
<tr>
<td>(Type II and V)</td>
<td></td>
<td>1,5</td>
<td>3</td>
<td>6</td>
<td>15</td>
<td>&gt;15</td>
</tr>
<tr>
<td>Nitrites</td>
<td>mg/l</td>
<td>0,01</td>
<td>0,03</td>
<td>0,12</td>
<td>0,3</td>
<td>&gt;0,3</td>
</tr>
<tr>
<td>Total phosphorus (Type I and II)</td>
<td>mg/l</td>
<td>0,05</td>
<td>0,2</td>
<td>0,4</td>
<td>1</td>
<td>&gt;1</td>
</tr>
<tr>
<td>(Type V)</td>
<td></td>
<td>0,15</td>
<td>0,3</td>
<td>0,4</td>
<td>1</td>
<td>&gt;1</td>
</tr>
<tr>
<td>BOD5 (Type I)</td>
<td>mgO₂/l</td>
<td>2</td>
<td>5</td>
<td>7</td>
<td>25</td>
<td>&gt;25</td>
</tr>
<tr>
<td>(Type II)</td>
<td></td>
<td>1,8</td>
<td>4,5</td>
<td>7</td>
<td>25</td>
<td>&gt;25</td>
</tr>
<tr>
<td>(Type V)</td>
<td></td>
<td>2,5</td>
<td>5</td>
<td>7</td>
<td>25</td>
<td>&gt;25</td>
</tr>
<tr>
<td>COD</td>
<td>mgO₂/l</td>
<td>10</td>
<td>15</td>
<td>30</td>
<td>125</td>
<td>&gt;125</td>
</tr>
</tbody>
</table>
SURFACE WATER MONITORING RESULTS
Visual analysis

Waters' turbidity
Organoleptic analysis

The smell

Samples which were taken from the Banat watercourses had no smells.
Chemical analysis
pH

Range 7.3-8.4
Suspended matter

Suspended matter

Concentration (mg/l)

I and II Class
Conductivity

Conductivity values for various locations:

- Srpski Itebej
- Žitište
- Zrenjanin-before city
- Zrenjanin-after dairy
- Zrenjanin-after edible oil
- Zrenjanin-after Aleks. C
- Titel
- Kanjiža-Krstur ulazni profil
- Novi Knezevac
- Senta
- Knjičanin
- Jaša Tomić
- Sečanj
- Boka
- Botoš
- Pančevo
- Kovačica
- Pančevo
- Pančevo
- Bega
- Tisza
- Tamis
- Nadela
- Danube

Classifications:
- II Class
- III Class
Nutrients
Total P

Phosphorus

Concentration (mg/l)

I Class
II Class
III Class
IV Class

Spski Itebej
Žitište
Zrenjanin-before dairy
Zrenjanin-after edible oil
Zrenjanin-after Aleks. C
Titel
Kanjiža ulazni profil
Novi Knezevac
Senta
Knjačin
Jaša Tomić
Sečanj
Boka
Botoš
Pančevo
Kovačica
Pančevo
Pančevo

Bega
Tisza
Tamis
Nadela
Danube
Nitrites (NO₂⁻)

<table>
<thead>
<tr>
<th>Location</th>
<th>Concentration mg/l</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bega</td>
<td>0.1</td>
</tr>
<tr>
<td>Tisza</td>
<td>0.1</td>
</tr>
<tr>
<td>Pancevo</td>
<td>0.05</td>
</tr>
<tr>
<td>Novi Knezevac</td>
<td>0.1</td>
</tr>
<tr>
<td>Senta</td>
<td>0.1</td>
</tr>
<tr>
<td>Kaniža-Krstur ulazni profil</td>
<td>0.05</td>
</tr>
<tr>
<td>Titel</td>
<td>0.05</td>
</tr>
<tr>
<td>Kničanin</td>
<td>0.05</td>
</tr>
<tr>
<td>Jaša Tomić</td>
<td>0.05</td>
</tr>
<tr>
<td>Sečanj</td>
<td>0.05</td>
</tr>
<tr>
<td>Boka</td>
<td>0.05</td>
</tr>
<tr>
<td>Botoš</td>
<td>0.05</td>
</tr>
<tr>
<td>Kovačica</td>
<td>0.05</td>
</tr>
<tr>
<td>Bega</td>
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<tr>
<td>Boka</td>
<td>0.05</td>
</tr>
<tr>
<td>Botoš</td>
<td>0.05</td>
</tr>
<tr>
<td>Kovačica</td>
<td>0.05</td>
</tr>
</tbody>
</table>

Nitrites (NO₂⁻)
Biological Oxigen Demand

BOD5

Concentration (mgO2/l)


Axis Title

I Class II Class
Chemical Oxigen Demand
Disolved oxigen

Oxygen (ppm)

<table>
<thead>
<tr>
<th>Location</th>
<th>Concentration (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Srpski ltebej</td>
<td></td>
</tr>
<tr>
<td>Žitište</td>
<td></td>
</tr>
<tr>
<td>Zrenjanin-before dairy</td>
<td></td>
</tr>
<tr>
<td>Zrenjanin-after edible oil</td>
<td></td>
</tr>
<tr>
<td>Zrenjanin-after Aleks. C</td>
<td></td>
</tr>
<tr>
<td>Zrenjanin-after Aleks. C</td>
<td></td>
</tr>
<tr>
<td>Titel</td>
<td></td>
</tr>
<tr>
<td>Kaniža-Krstur ulazi profl</td>
<td></td>
</tr>
<tr>
<td>Novi Knezevac</td>
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</tr>
<tr>
<td>Senta</td>
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<tr>
<td>Jaša Tomić</td>
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<td>Sečanji</td>
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<tr>
<td>Pančevo</td>
<td></td>
</tr>
<tr>
<td>Pančevo</td>
<td></td>
</tr>
</tbody>
</table>

Concentration (ppm)

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

Bega
Tisza
Tamis
Nadela
Danube
Conclusion

• Analysis of water generally showed that water from selected localities at watercourses of Banat are loaded with nutrients, especially nitrites and phosphorus, which causes relatively low concentrations of dissolved oxygen.
• The most loaded watercourse, according to the analyzed parameters, is HS Nadela and Tamis near Pančevo.

Further work

• With the aim of comprehensive understanding of surface water in Banat, it is necessary to implement analysis of water and sediment at more localities with the expand the scope of parameters that, beside chemical analysis, would include biological analysis of representative and sensitive species.
• Also, one of the measures which is very important for improvement of water quality in rivers is treatment of industrial wastewater, stricter control of diffuse sources, such as landfills, agricultural areas, farms, but also raising of the public awareness about the importance of water ecosystems.
Thank you