INFLUENCE OF SOCIO - DEMOGRAPHIC FACTORS ON EROSION PROCESSES IN THE RURAL PART OF THE MUNICIPALITY OF VOŽDOVAC

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Introduction

- Soil is a non-renewable resource and a national treasure that the whole community must take care of.
- Due to the world population growth, erosion control must take an adequate place in land management.
- Soil degradation by accelerated erosion is a chronic problem since the beginning of agriculture, due to inadequate land use on hilly mountainous terrains.
The subject of this research is the influence of anthropogenic factors on the state of erosion in the rural part of the municipality of Voždovac (9216 ha).

The aim of the research is the analysis of the influence of the local population on land resources, based on the past and present state of erosion and sediment production, the usage of land resources, as well as natural and mechanical population movements.
Figure 1. Geological map of the rural part of the municipality of Voždovac
Source: Military Geographical Institute

Figure 2. Soil map of the rural part of the municipality Voždovac
Source: Institute of Soil Science
Figure 3. Slope Map for the rural part of the municipality of Voždovac

Source: Author

Figure 4. Land use according to the Corine Land Cover database for 2012

Source: CLC
Socio-demographic characteristics


Table 1. Forecast of the population number in 2020

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Voždovac</td>
<td>134206</td>
<td>159364</td>
<td>161376</td>
</tr>
<tr>
<td>Rural part</td>
<td>12199</td>
<td>12234</td>
<td>12565</td>
</tr>
<tr>
<td>Agricultural population</td>
<td>5137</td>
<td>3187</td>
<td>1276</td>
</tr>
</tbody>
</table>

Table 6. The average age of the population for the period 1971-2011

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<tbody>
<tr>
<td>Voždovac</td>
<td>32,03</td>
<td>34,13</td>
<td>36,27</td>
<td>40,76</td>
<td>42,4</td>
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<tr>
<td>Urban part</td>
<td>32,06</td>
<td>32,02</td>
<td>36,33</td>
<td>40,81</td>
<td>42,4</td>
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<tr>
<td>Rural part</td>
<td>29,27</td>
<td>34,38</td>
<td>35,35</td>
<td>39,59</td>
<td>42,1</td>
</tr>
</tbody>
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Table 7. Coefficient of age for the period 1971-2011

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<tbody>
<tr>
<td>Voždovac</td>
<td>9,99</td>
<td>16,35</td>
<td>16,67</td>
<td>23,42</td>
<td>24,79</td>
</tr>
<tr>
<td>Urban part</td>
<td>9,92</td>
<td>16,15</td>
<td>16,63</td>
<td>23,58</td>
<td>24,78</td>
</tr>
<tr>
<td>Rural part</td>
<td>10,82</td>
<td>18,73</td>
<td>17,06</td>
<td>21,72</td>
<td>24,94</td>
</tr>
</tbody>
</table>

Source: Author
Condition of livestock

- The number of cattle had been constantly declining from 1972 to 2011, i.e. compared to 1972, the number of cattle was reduced to 83.33% in 2011.
Analysis of erosion processes

- We compared erosion intensity for:

1971 Erosion Potential Method (EPM) (Gavrilović)

\[ Z = Y \times Xa \times \left( \varphi + \sqrt{I_{sr}} \right) \]

- Coefficient of the soil resistance to erosion
- \( X \cdot a \) – The land use coefficient,
- \( \varphi \) – Coefficient of the observed erosion process (takes visible erosion processes),
- \( I_{sr} \) – Mean slope of terrain
- \( Z \) – Coefficient of erosion

1988 "Program for erosion protection and proposal to declare erosion areas with the regulation of anti-erosion measures in the municipality of Voždovac"

Present state Software ArcMap 10
Figure 5. Erosion Map, 1971.

\[ Z_{SR} = 0.61 \]

Source: S. Gavrilović

Figure 6. Erosion Map, the present state

\[ Z_{SR} = 0.42 \]

\[ Z_{SR} = 0.24 \]


Source: Author
Sediment yield

Sediment yield (total and specific), in the rural part of the municipality of Voždovac is calculated by the method of S. Gavrilović.

\[ W_{god} = T \times H_{god} \times \pi \times \sqrt{z^3} \times F \quad [m^3/\text{year}] \]

\[ T = \frac{t}{\sqrt{10}} + 1 \]

\[ W_{SP} = \frac{W_{god}}{F} \quad [m^3 \text{km}^{-2}\text{year}^{-1}] \]

\( W_{god} \) – total production of erosion sediment (gross erosion), in \( m^3\text{year}^{-1} \)

\( H_{god} \) – average annual amounts of precipitation (in the watershed), in mm

\( T \) – temperature coefficient of watershed or region

\( t \) – mean annual air temperature of the watershed, in degrees Celsius

\( \pi = 3.14 \) (Number of Ludolph)

\( z \) – coefficient of erosion (average value for the watershed based on erosion map of the watershed), according to Gavrilović

\( F \) – watershed area, in \( \text{km}^2 \)

\( W_{SP} \) – specific production of erosion sediment in \( m^3\text{km}^{-2}\text{year}^{-1} \)
• The specific sediment yield in 2012 (384.77 m³km⁻²god⁻¹) decreased by **4.05** times compared to the specific yield from 1971, when it was 1559.11 m³km⁻²god⁻¹.
Conclusion

- The process of deagrarization caused migrations, rural population to urban places, reduction of the number of agricultural population, and the phenomenon of old and empty rural households, which along with the livestock reduction, contributed together to land pressure reduction.
- All these factors have led to a significant reduction in intensity of erosion processes in the rural part of the territory of the municipality of Voždovac.
- The very demographic changes, which have been observed, give relevant and more comparable data on the relationship between population and agricultural areas, that is to say, the causal connection between the anthropogenic factor and the erosion intensity.
Thank you for your attention