Estimations of Flood Waste from Rural Dumpsites Located on Floodplains from Neamț County, Romania

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Abstract. Waste dumping is a serious environmental threat to major rivers from extra-Carpathian Region of Neamț county in the proximity of villages because the lack of waste collection services. In this context, floodplains are frequently susceptible to such bad practices, these areas being also exposed to stronger floods. The paper aims to calculate the potential waste taken from these areas in order to assess a quantitative impact of these bad practices.

Keywords: dumpsite, floodplain, rural waste, floods, quantitative assessments.

Introduction. Dumpsites are frequently located on floodplains of major rivers in the proximity of built-up areas. These susceptible areas from extra-Carpathian region of Neamț county are most exposed to illegal dumping (Mihai et al., 2013). In this context, the paper outlines the role played by floods on this environmental issue for the main catchments.

Aims and objectives. The paper proposes a quantitative assessment method of flood waste generated from uncontrolled waste disposed on floodplains from extra-Carpathian region of Neamț county.

Material and Method. The proposed method completes and follows others quantitative assessments methods of illegal dumping (Mihai, 2012, 2013, Mihai et al., 2012) which estimates the household waste disposed by communes and villages into surroundings. Q_{df} and Q_{wr} indicators (calculated at the village scale in the previous studies) are essential in calculating the amounts of flood waste (Q_{fw}) according to the relation:

\[ Q_{fw} = Q_{wr\, tot} \times A_P \quad \text{or} \quad Q_{fw} = Q_{df\, tot} \times A_P, \]

where:

- Q_{fw\, tot} – amounts of waste taken over by floods from several localities (Q_{wr\, 1}+..+Q_{wr\, n+1}),
- A_P - the accumulation (storage) period of the waste, expressed in number of days (frequently the period between two floods, especially in the extra-Carpathian sector).

Determination of PET amounts uncontrolled disposed is achieved by following relation:

\[ Q_{fw\, PET} = Q_{wr\, day} \times Sp(\%) \times A_P, \]

where:

- Q_{wr\, day} – total waste disposed by selected localities along a riverbed or creek bank (in the proximity of built-up area),
- Q_{df\, tot} – total waste disposed (by selected localities) in the alluvial plain of a river in the Subcarpathian sector (Ozana /Crăciu /Bistrița) and corridor valley (Moldova / Siret).

In this context, the accumulation periods taken into account for this analysis are: January 1, 2003 - June 30th 2005 (546 days) and July 1, 2008 – June 18, 2010 (352 days).
**Results and Discussions.** Estimated amounts of flood waste from such disposal sites (located on floodplains) are significant for all rivers in 2003-2005, about 4000 t in 546 days including 60 tons of PET according to table 1. In both periods, Bistrița and Siret valleys generated the most of flood waste from study area. Strong floods from last decade often cleaned the wastes dumped in floodplains which amplified the destructive effects in downstream. Some of this waste is accumulating behind dams or hydropower plants or are scattered on surrounding lands, particularly floatable fractions like wood (agricultural source) or PET bottles (domestic & commercial sources).

The progress on the expansion of waste collection services in rural territory was insignificant between 2003-2008, however, there has been an upward trend since the closure of old dumpsites in 2009, according to EU acquis.

<table>
<thead>
<tr>
<th>Rivers</th>
<th>(Q_{fw}) (t/546 days)</th>
<th>(Q_{fw}_PET) (t/546 day)</th>
<th>(Q_{fw}) (t/352 days)</th>
<th>(Q_{fw}_PET) (t/352 days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moldova (total)</td>
<td>637.3579</td>
<td>41.428</td>
<td>410.8974</td>
<td>46.02</td>
</tr>
<tr>
<td>Siret (total)</td>
<td>708.72</td>
<td>46.066</td>
<td>456.903</td>
<td>51.17</td>
</tr>
<tr>
<td>Ozana (Nemțisor)</td>
<td>562.56</td>
<td>36.566</td>
<td>362.676</td>
<td>40.619</td>
</tr>
<tr>
<td>Cracău (total)</td>
<td>600.5817</td>
<td>39.037</td>
<td>387.188</td>
<td>43.365</td>
</tr>
<tr>
<td>Bistrița</td>
<td>1485.044</td>
<td>96.527</td>
<td>957.3915</td>
<td>107.227</td>
</tr>
<tr>
<td>Total</td>
<td>3994.2636</td>
<td>259.624</td>
<td>2575.0559</td>
<td>288.401</td>
</tr>
</tbody>
</table>

**Conclusion** Strong floods from Moldova, Bistrița and Siret catchments often cleaned the wastes dumped in floodplains which amplified the destructive effects in downstream. Despite these issues, just these floods favored this convenient and inadequate practice of local residents as well as in the mountainous region. The paper performs for the first time a quantitative analysis of flood waste generated by these local dumpsites.

**REFERENCES**