

Analysis of the Causes of the Formation of Illegal Landfills in the Bosnian-Podrinje Canton and Recommendations for Their Reduction

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ABSTRACT

The problem of illegal (wild) landfills in the Bosnian-Podrinje Canton represents a serious environmental and public health issue. Such landfills are predominantly located near forest and aquatic ecosystems, as well as in close proximity to residential areas, thereby increasing the risk of fires, flooding, and environmental contamination, which may also endanger the health of the local population of the Canton.

The aim of this paper is to analyze the key reasons for the formation of illegal landfills in the Bosnian-Podrinje Canton. The results indicate that the most common causes of their emergence are primarily the lack of adequate infrastructure, particularly in rural areas of the Canton. In addition, the absence of recycling facilities, insufficient control and shortcomings in legislation, as well as a low level of public awareness, significantly contribute to this problem.

The conducted analysis revealed that approximately two-thirds of illegal landfills are located along the course of the Drina River and its tributaries, as well as within water protection zones, which substantially increases the risk of water pollution and degradation of aquatic and forest ecosystems. Around 60% of these landfills are situated on steep terrain, which further complicates access and remediation efforts.

Risks such as fires (68%), flooding (23%), and potential threats to public health due to infectious diseases make this situation even more serious. The identified and analyzed illegal landfills in the Canton are mostly over two decades old, with the oldest existing for more than 30 years, indicating long-term environmental degradation.

The proposed solutions include the establishment of a regional sanitary landfill and the introduction of a more efficient waste management system, encompassing improvements in communal infrastructure, enhanced cooperation between public utility companies and inspection authorities in the municipalities of Foča-Ustikolina, Goražde, and Pale-Prača, as well as continuous education of citizens and primary school students on proper waste management practices.

The implementation of these measures could significantly reduce the number of illegal landfills and improve environmental conditions in the area, thereby reducing the risks of pollution and threats to the health of the local population.

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Introduction

According to the Waste Management Law in Bosnia and Herzegovina, waste is defined as any substance or object that the owner discards, intends to discard, or is required to discard in accordance with the provisions listed in Annex I and included on the Waste List, adopted through specific legal regulations. This law also prescribes priority guidelines for waste management, whose primary objective is the timely prevention of pollution and the reduction of negative impacts on human health and the environment (water, soil, air).

One of the fundamental priorities is the environmentally acceptable disposal of waste in landfills, and only for types of waste that are not subject to recovery of useful components, reuse, or energy production. Waste management encompasses a range of political, scientific, and technical measures aimed at reducing the amount of waste, processing it, and reusing it, while maintaining the existing levels of production and consumption. The composition of waste, which refers to the proportion of different types of waste in the total mass of waste expressed as a percentage, is dynamic and subject to constant changes depending on various factors, including the size of the collection area, season, social structure of the population, and type of economic activity. Determination of waste composition is carried out through sample analysis, which is used to form an average representative sample. A special category is hazardous waste, which, if improperly disposed of, can cause serious environmental pollution, including of water, soil, and air. Hazardous substances are particularly harmful to human health and ecosystems, and their management requires stricter regulations compared to municipal and industrial waste, in accordance with international conventions such as the Basel Convention. The largest amounts of hazardous waste are generated by industry, while smaller quantities occur in households in the form of problematic waste, including oils, paints, varnishes, batteries, accumulators, acids, medicines, solvents, and similar materials.

There are many reasons why landfilling is considered the least rational method of waste management. Waste can only be landfilled for a limited period, while the remediation of landfills can last up to hundreds of years. Nevertheless, landfilling remains a widely accepted and commonly used method of final disposal for municipal solid waste (MSW) due to its economic advantages. Landfilling of municipal waste is one of the oldest methods of waste disposal, both in Bosnia and Herzegovina and in European countries. In Western Europe, organized disposal of waste in regulated landfills began in the mid-1960s, when the first legal regulations on landfill construction and management were enacted. In contrast, in Bosnia and Herzegovina, waste is still predominantly disposed of in unregulated landfills or dumpsites. Unregulated landfills represent a serious environmental problem due to the emission of harmful substances, landfill gas, and leachate, which can negatively affect water, soil, air, and human health. The main difference between a dumpsite and a sanitary landfill is that at a dumpsite, no attempt is made to separate the waste from the soil, allowing direct contamination of groundwater. Comparative studies of different waste management methods (landfilling, incineration, composting, etc.) show that among technological options for treatment and disposal of mixed municipal waste, landfilling—whether in sanitary landfills or

open dumps (illegal landfills)—is popular in most countries due to relatively low costs and technical requirements. One of the by-products of biological processes occurring in municipal waste landfills is biogas or landfill gas (LFG). Biogas is produced by the decomposition of biodegradable organic matter, and its rate of production and composition change over the landfill's lifetime. Many studies have demonstrated that leachate from landfills represents a significant source of pollution due to the washing out of hazardous substances.

Illegal (wild) landfills are unregulated sites where waste is improperly disposed of, including household waste, construction waste, hazardous waste, electrical and electronic waste, or other types of waste. Waste is dumped in piles on flat terrain or in pits and gullies. These landfills typically emerge in unregulated, illegal, or abandoned locations, often along watercourses or near residential areas, which can result in uncontrolled leaching of wastewater into the ground, the spread of infections and pathogenic organisms, spontaneous combustion of waste, and dispersal of waste by wild animals. Consequently, they pose a serious threat to the environment, human health, and biodiversity. Fires at landfills can significantly harm the environment due to the emission of toxins into the air, soil, and water. Risk factors depend on the type of waste ignited, the landfill's geographical location, and the type of fire. Smoke generated during landfill fires can contain hazardous toxic gases such as CO, H₂S, CH₄, as well as carcinogenic substances like dioxins. Unpleasant odors and smoke emitted during fires disturb the surrounding population and may endanger human health, particularly among sensitive groups, such as the elderly, children, pregnant women, and/or individuals with pre-existing chronic respiratory conditions. It should also be emphasized that there are no controls regarding the type or quantity of waste disposed of at such sites, which ultimately causes not only aesthetic issues but also serious consequences for ecosystems.

Causes of Illegal Landfills Formation

Regarding the causes of illegal landfills, they usually arise due to the lack of adequate waste management systems, which can result from poor infrastructure for waste collection and disposal, low public awareness, as well as insufficient legal and inspection mechanisms. In the Bosnian-Podrinje Canton (BPK), as well as in other cities in Bosnia and Herzegovina, the presence of illegal landfills is common and represents a serious problem. Since these landfills are not legally regulated, there is no strategy for their removal, and the costs of their remediation are often high, further complicating effective solutions to this issue.

In the BPK Goražde area, three municipal landfills have been officially registered. These are open-type landfills that do not meet the principles of sanitary waste disposal and therefore require remediation.

In the Bosnian-Podrinje Canton, 29 illegal landfills have been identified in addition to the three officially registered ones. Every year, dozens of new illegal landfills emerge. Although municipal utility companies occasionally remediate them, documenting these sites remains a challenge, as a new landfill often appears in a different location shortly after one has been removed.

Conclusion

Based on the previous analysis, it can be concluded that landfilling remains the dominant method of municipal waste management in many countries. Although landfills are one of the most commonly used methods for waste disposal, they simultaneously carry a high risk of environmental pollution. Illegal landfills are sites where waste is disposed of illegally and uncontrollably, without proper permits, protective measures, or supervision.

One of the main reasons for their formation is an inadequately organized waste collection and transport system, including an insufficient number of containers and their improper distribution, as well as a collection frequency that does not correspond to the amount of waste generated. Additionally, low environmental awareness among the population regarding the negative impacts of improper waste disposal on the environment and human health contributes significantly to the problem.

The presence of illegal landfills not only highlights the need for enhanced environmental awareness, but also represents a serious ecological risk, primarily through soil and groundwater pollution, as well as an increased risk of disease spread due to the proliferation of rodents and other pests. Remediation and closure of these illegal sites are essential to reduce negative environmental impacts, protect public health, and improve the visual and ecological quality of the area.

This literature analysis indicates the need to identify existing knowledge gaps and to lay the foundation for the development of a more comprehensive framework for assessing risks associated with illegal waste disposal sites.