LOCALLY CHARACTERISED REPETITIVE ILLEGAL LANDFILLS CLASSIFICATION

Tihomir Knežiček¹, Dean Osmanović², Sabina Sinanović Ćatibušić³

SUMMARY

Illegal dumping of waste material is present in almost all local communities in Bosnia and Herzegovina, including in the areas of urban and rural local communities of the City of Tuzla. Uncontrolled waste dumping at the landfields, as the illegal dumping, are created by dumping different types of waste material in areas that are not intended for waste material disposal. These are areas that are usually next to roads with less traffic, or in the immediate vicinity of roads where access is possible for motor vehicles with a lower load capacity. Illegal landfills have a direct negative impact on the living environment from several aspects. Primarily, watercourses and soil are polluted, the ambient space is disturbed, and by attracting animals, there is the possibility of infections that are dangerous for the population. Waste materials in illegal landfills are often deliberately set on fire, which causes additional problems of air pollution with smoke and gases resulting from combustion, as well as the possibility of fire outbreaks, especially in forest areas. In the current practice, illegal waste landfills did not have scientific and professional interest because they are often of a temporary nature and were not considered interesting from the aspect of the scientific approach to defining landfills by different classifications. This paper defines the classification of illegal landfills in the spheres of data processing possibilities of interest for the treatment of illegal waste landfills, and the experimental definition of the classification was confirmed on the example of the recording and analysis of illegal waste landfills in the local community of Kiseljak, City of Tuzla in the phase of implementing the project „Inclusive development of Kiseljak community for improvement of social and economic aspect of citizens, emphasizing Roma population“, financed by the Foundation of Tuzla community, Tuzla. The basis of the classification is made up of repetitive local waste landfills, while permanent regional waste landfills are not the subject of research and classification since there are already known classifications for permanent waste material landfills.

Consent for the publication of the paper was given by the Tuzla Community Foundation, which financed the referral research within the project „Inclusive development of the Kiseljak community, for the improvement of the social and economic aspects of the citizens’ life, especially the Roma“, implemented by the Tuzla Community Foundation in partnership and financial support of the Freudenberg Foundation and the German Federal Ministry for External Development (BMZ).

1. INTRODUCTION

The analysis of the ambient and the conditions for the generation of illegal dumping of waste material landfields in the Kiseljak community resulted, on scientific grounds, in the classification of illegal landfills according to several criteria. In the earlier practices of the illegal landfills analyses, the scientific and professional aspects of illegal landfills are not adequately defined, so the research and analysis are of particular importance not only for a practical systemic solution to the reduction or removal of illegal

¹ PdD, University of Tuzla, Faculty of mining, geology and civil eng., Univerzitetska 2, Tuzla, Bosnia and Herzegovina, knezicsek@bih.net.ba
² PhD student, Salonit Anhovo d.d., Anhovo 1, Deskle, Slovenia, dean.osmanovic@gmail.com
³ BA, The Tuzla Community Foundation, Pozorišna 13, Tuzla, Bosnia and Herzegovina, sabina@fondacijatz.org
landfills, but also for contributing to the scientific overview of the problems related to locally generated illegal landfills. Categorization facilitates the monitoring of the creation, development and removal of illegal landfills using landfill databases and GIS. The composition of locally generated landfills of waste material are mainly based on:

- unsorted household waste (mixed organic and inorganic waste, solid waste),
- construction waste and car tires (building material, glass, car tires),
- biological waste (plant remains, branches, animal remains) and
- waste material remains after recycling selection (material of useless disassembled devices, machines and vehicles and separating material that has no market value).

With regard to the various aspects of the generation and development of illegal or legal landfills at the local (community) level, i.e. the disposal of different types of materials, and the already established methodology and categorization of waste material, the classification does not include the following types of landfills and types of waste material:

- regional or local communal / sanitary landfills;
- industrial waste landfills (sludge, lubricants, slag or tailings landfills, waste generated by production processes);
- hazardous waste landfills (medical, slaughterhouse, pesticides, oils, lubricants);
- landfills containing liquid waste (water and additives in technological processes, chemical reagents, detergents).

It is expected that local illegal landfills do not contain industrial, hazardous waste and waste in a liquid state, and even if it is present, its localization is an isolated case and there is no systemic negative impact on the environment.

2. GROUPING ILLEGAL LANDFILLS

Illegal landfills of municipal waste, household waste and other types of locally generated waste are divided into permanent regional landfills and repetitive local landfills based on their origin and volume.

i. Permanent regional landfills

Permanent regional landfills are used for unselected depositing of all types of waste, including potentially dangerous materials for the environment.

They are divided into flat terrain landfills (depositing waste at the level of material dumping) and slope landfills (dumping material below the ground level i.e. down the slopes, mostly near roads).

Slope landfills generated down the slopes where at the bottom are waterflows or watersheds are a direct source of water and soil pollution. They are characterized by large volumes of waste material (regularly shaped with the volume of more than 100 m³ of waste material), with a significant impact on waterflows and soil, and with a significant presence of animal species that are potential carriers of diseases (birds, rodents, dogs, foxes, wild pigs and others animals that look for food and find it in illegal landfills). Their elimination requires significant financial sources for the removal and transportation of waste material to another location that must be a legal/sanitary waste dump. The possibility of regenerating permanent regional landfills is great, and to eliminate the process of generating illegal landfills, it is necessary to either apply restrictive measures that would affect the reduction of the amount of waste material in illegal landfills, or provide containers in which waste material that would otherwise be dumped on illegal landfill locality.

Permanent regional landfills are not the subject of locally characterised illegal landfills classification.

ii. Repetitive local illegal landfills

Repetitive local landfills are temporary landfills. These are landfills that are generated at one time, and after a certain time, the landfills are removed by the competent municipal services or citizens through
environmental cleaning actions. In a large number of cases, in the same localities, illegal landfills are repeatedly generated and the cycle repeats itself. The possibility of regenerating illegal landfills tends to decrease with the achievement of the prerequisites for systematic waste management.

They are characterized by medium volumes of waste material (10 m$^3$ to 100 m$^3$) or small volumes of waste material (0.5 m$^3$ to 10 m$^3$), without significant impact on waterflows and soil, unless the landfills are in the immediate vicinity of the water source. Repetitive local landfills do not have a significant presence of animal species that are potential carriers of diseases, which are mainly dogs and rodents. Their disposal does not require significant financial resources for the removal and transportation of waste material to another location, that must be a legal waste dump.

An important characteristic of repetitive local landfills is the negative impact on the visual environment within the local community, especially if the local community bases its strategies on the tourist potentials or recreational facilities and infrastructure, such as the example of the suburban local community of Kiseljak, Tuzla, which has quality prerequisites for community development by offering tourist and recreational facilities.

3. **LOCALLY CHARACTERISED REPETITIVE ILLEGAL LANDFILLS CLASSIFICATION**

i. **Compact illegal landfills** occupy one compact area with clearly defined spatial boundaries, in which there is only one landfill with dimensions up to 50 X 50 m. The space of the landfill is of regular or irregular shape. The height of the deposited waste material is in the range of 0.5 m to 1 m, formed in shallow piles. The composition of waste material is extremely diverse and unselected. Waste material is dumped by trucks, tractor’s trailers, motor cultivator’s trailers or vans. Landfills has adequate access from official roads (paved or unpaved), at least 2 km away from the human settlements.

![Figure 1. An example of a compact illegal landfill in Kiseljak community, Tuzla](image)

ii. **Linear scattered illegal landfills** occupy area mainly along the length of the line, with possible smaller gaps between the dumped waste material, length 2 m to 50 m, depth of dumping usually up to 2 m, contains different waste material, mainly household or construction waste (tiles, bricks, mortar, glass). The height of the dumped material is up to 0.5 m. The material is dumped from cars, tractor trailers or vans. They are located right next to the official road (paved or unpaved), at least 100 m away from the human settlement, although there are cases where it is located in the settlement itself.
iii. **Lenticular illegal landfills** occupy an irregular formation, often in the shape of lenses, characterized by individual shallow piles of waste material. The height of the deposited material is up to 0.5 m, the volume is up to 0.5 m$^3$, and they are 5 to 10 m apart from each other, making usually one spatially dispersed landfill. The composition of the waste material is different and partly selective, and it consists household waste, construction waste material or other types of waste. They are mostly located in the forest area, and the material is brought in by handcarts or cars if there is a possibility for cars to approach.
iv. **Infrastructural illegal landfills** take a mostly regular shape that closely matches the dimensions of the infrastructural object that has been demolished, devastated and is not in use. The composition of the waste material is in the category of construction waste (mainly concrete elements, siporex solid blocks, bricks, tiles, salonit panels). The landfill is not generated because it represents the rest of the former infrastructure facility. They are located outside urban areas or near urban areas, often in the settlement itself or in the immediate vicinity.

![Image of an infrastructural illegal landfill in Kiseljak community, Tuzla](image1)

**Figure 4.** An example of an infrastructural illegal landfill in Kiseljak community, Tuzla

Often, in addition to the infrastructural landfill, lenticular landfills located next to the demolished building or in the building itself are also generated, and the composition of the waste material is different and partly selective, consisting of household waste, construction material waste, solid plastics, textiles, dead animals or other types of waste. The material is brought in by handcart.

![Image of a hillside illegal landfill in Kiseljak community, Tuzla](image2)

**Figure 5.** An example of a hillside illegal landfill in Kiseljak community, Tuzla
v. **Hillside illegal landfills**, occupy a fairly regular shape that is formed by the generation process of the landfill. The shape is a trapezoid where the width of the landfill is greater in the upper part (up to 15 m), the landfill stretches down the slope towards the valley and ends with a width of up to 3 m. The length of the slope is variable and ranges from 3 m to 20 m, and the height of the dumped material is up to 1 m, including bulky waste. It contains various waste materials, mainly bulky waste (solid plastics, household appliances, furniture parts) and construction material waste, very rarely household waste. The material is dumped from a van, from a tractor trailer, a motor cultivator trailer or from a handcart. They are located next to official road communications (paved or unpaved), at least 100 m away from the human settlement. They represent the most risky type of landfill, given that it is generated in hillside parts that make up watersheds or waterflows, and which are difficult to remove due to the hillside characteristics of the landscape.

vi. **Covered illegal landfills** are landfills that have been generated, not removed, and covered with soil or other material for the purpose of remediation, or they were created by backfilling, i.e. by covering with soil, sand or gravel that has no use value. They contain mainly unsorted household waste from the household, biological waste or other types of non-bulky waste material.

![Image](image_url)

**Figure 6.** An example of a cover illegal landfill in Kiseljak community, Tuzla

vii. **Private illegal landfills** are landfills that are generated and located on the private properties of local residents. Private landfills contain construction waste or waste from the processing of selecting secondary raw materials. Landfills are created by depositing construction material waste as a result of demolition or remodelling private infrastructure, located on private property. Often, after a certain time, the deposited material is removed by the owner of the property. Another type of private illegal landfills is created as a result of the collecting secondary raw materials, so that families engaged in collecting and selling secondary raw materials in their own yard generate small heaps landfills of material that has no use value. The treatment of these landfills depends solely on the owner of the property, and the waste material mainly consists of solid plastic, electronic or construction waste. Private landfills have a negative impact
on the visual environment in the community, since they are often located in urban areas of the local community.

Figure 7. An example of a private illegal landfill in Kiseljak community, Tuzla

4. CONCLUSIONS

In the context of the need to preserve the environment, it is necessary to establish the treatment of illegal landfills that are created by depositing waste material, of different composition, in the wider area of local communities. From a scientific and professional point of view, illegal landfields of a regional character are analysed, which generally contain more than 100 m$^3$ of different mixed waste material. The need for analyses is based on the significant negative impact on the environment - on soil, water and air, as well as the consequences arising from the impact of illegal waste deposing at landfields. On the other hand, locally formed illegal landfields are not the subject of scientific and professional research, since they are repetitive in nature, they are not considered as threats for the environment and can be removed in a short period of time and without large costs for removing the deposited waste material. Local landfields and waste material content are categorized into seven occurrence groups: compact landfields, linearly scattered landfields, lenticular landfields, infrastructural landfields, hillside landfields, covered landfields, and private landfields. The classification of repetitive illegal waste landfields locally characterised was researched and confirmed on the example of illegal landfields in the area of the local community Kiseljak, Tuzla. The classification of local waste landfields enables systematic monitoring of the generating, development and removal of illegal landfields using information technologies and Internet tools.
Annex 1. The example of database for repetitive illegal landfills in Kiseljak community.

REFERENCE

1. Analiza sektora upravljanja čvrstim komunalnim otpadom - Strateški pravci i planiranje investicija do 2025.g. Tehnička pomoć za izgradnju dugoročne održivosti integriranog upravljanja čvrstim otpadom u Bosni i Hercegovini, WB, SIDA, 2018.
   http://www.cci.ba/focus/1/41/65.html.
9. Ministarstvo prostornog uređenja i okoliša, Zbornik radova, Održivi razvoj i upravljanje otpadom, Sarajevo, 1996.