

# WASTED AIR IMPACT OF LANDFILL FIRES ON AIR POLLUTION AND PEOPLE'S HEALTH IN SERBIA

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# Introduction

Insufficient handling of municipal waste in the Republic of Serbia results in severe repercussions for both public health and overall well-being.

Fires are the primary source of landfill air pollution in Serbia and landfill gas contributes to landfill fires.

Due to climate change and the increase in the amount of inadequately disposed waste, the trend of increasing the number of landfill fires can be expected to continue in the coming period.

The increase in use of lithium batteries is also a cause for increasing fire risk.

# Waste management in

## Serbia

The system of municipal waste management in Serbia is underdeveloped. According to National Waste Management Program for period 2022. – 2031. only 20% of the collected waste ends up in sanitary landfills.

### Illegal landfills (dumpsites)

the average coverage of municipal waste collection in 2020 is 86.4%

The total number of recorded illegal landfills according to data from the Environmental Protection Agency was 3,319 in 2020.

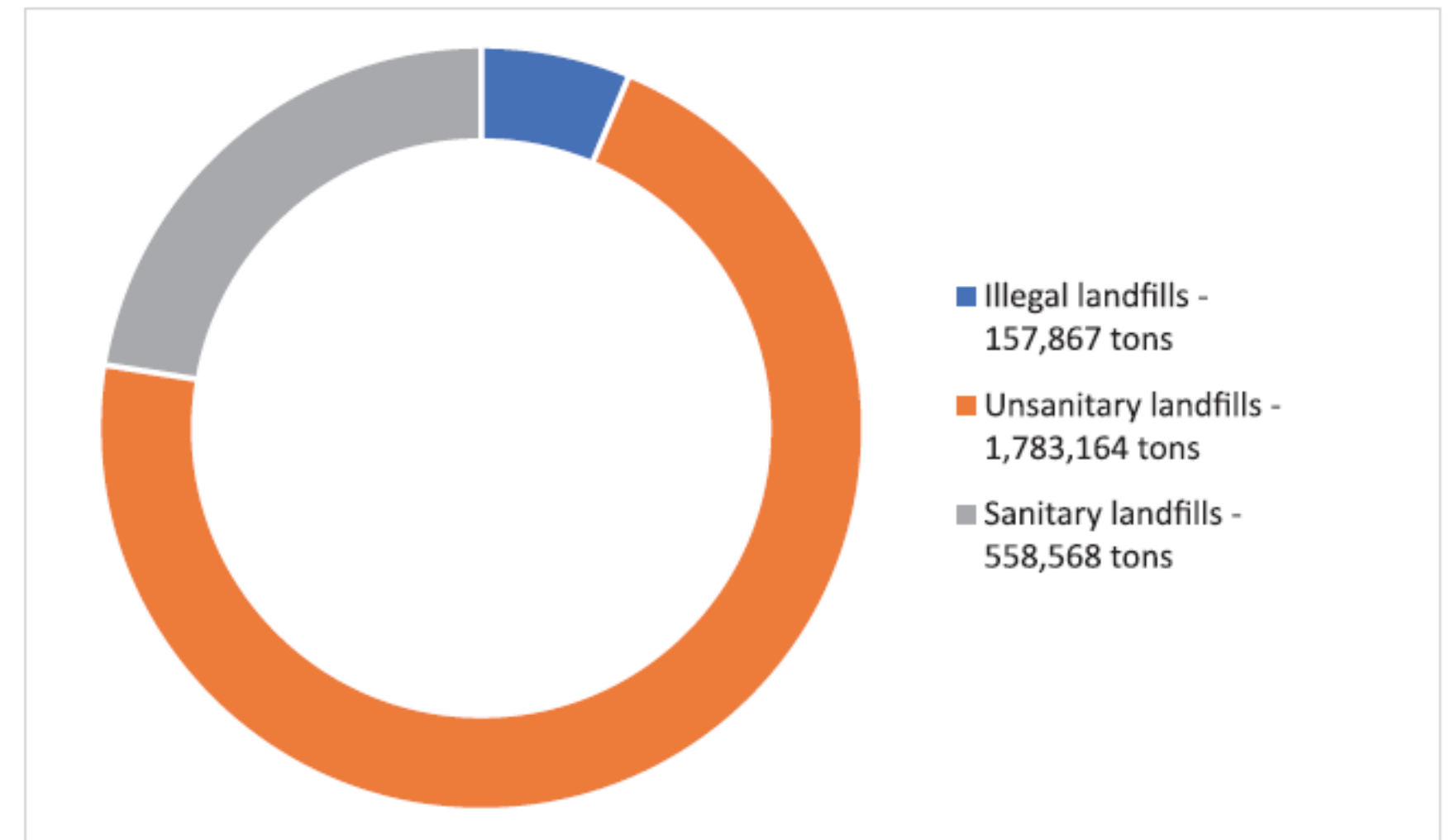


Figure 1. Disposed municipal waste, in tons (SEPA, 2021a)

# Waste management in Serbia

In the morphological composition of waste dominant biodegradable waste.

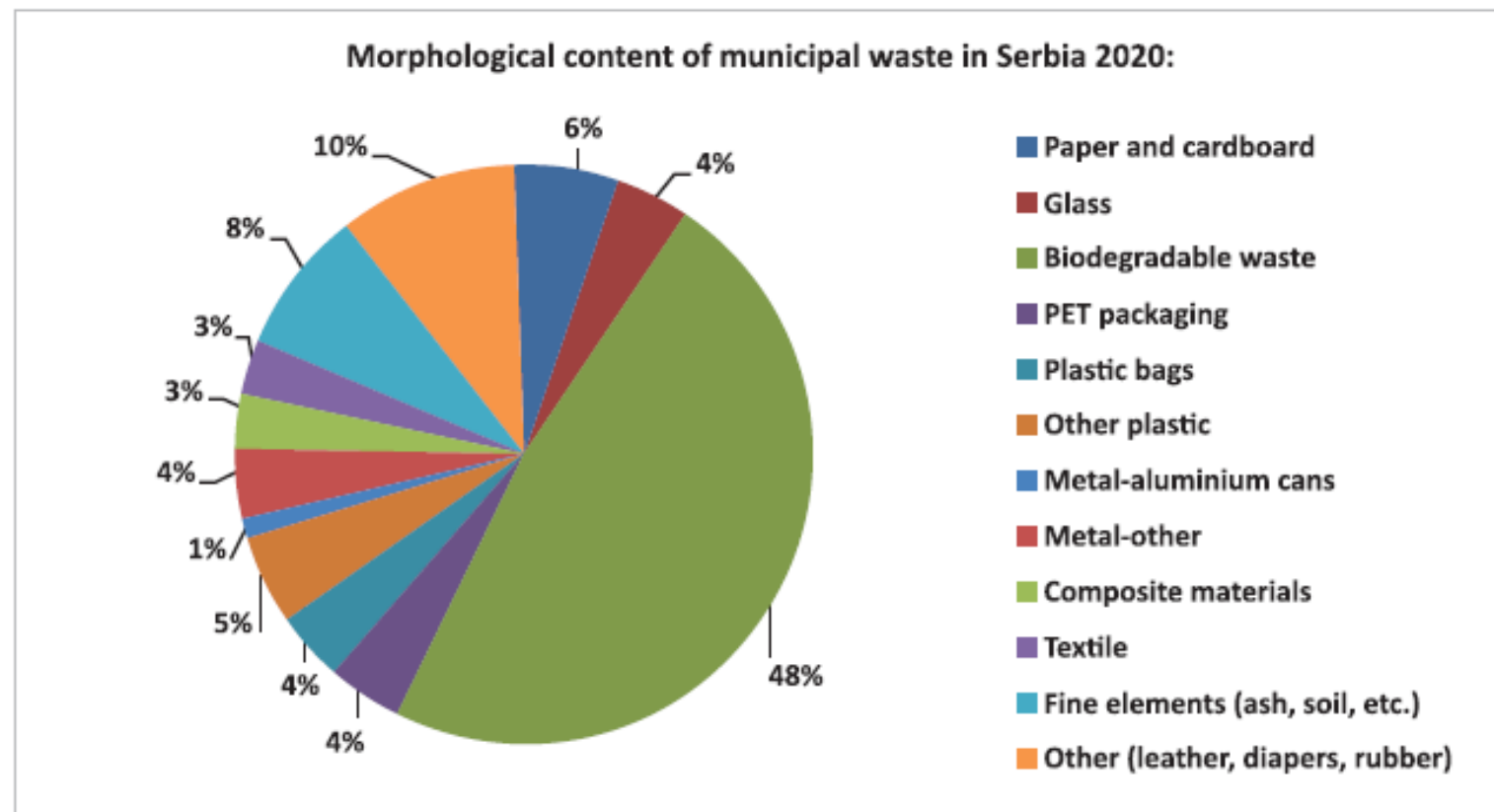


Figure 2. Morphological composition of municipal waste in 2020 (SEPA, 2021a)

## Biodegradable waste

Special attention should be paid to reducing the disposal of biodegradable waste, since it is the main cause of landfill gas as well as plastics which is a major fuel for landfill fire.

# Waste management in

## Serbia

According to the data of the Ministry of Internal Affairs of the Republic of Serbia - Sector for Emergency Situations (MIA, 2022), the number of registered fires at landfills is constantly increasing.

*Table 2. Number of landfill fires in Serbia*

Year	2016	2017	2018	2019	2020	2021
Number of fires	584	1,296	950	1244	1205	1715

Depending upon the source of the fire, **the fire emission plume** will comprise a complex mixture of gaseous airborne toxicants and PM, including:

- **asphyxiants**, such as carbon monoxide (CO), hydrogen cyanide (HCN), and carbon dioxide (CO<sub>2</sub>)
- **irritants**, including sulfur dioxide (SO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>), phosphorus pentoxide (P<sub>2</sub>O<sub>5</sub>), hydrogen chloride (HCl), hydrogen fluoride (HF), hydrogen bromide (HBr), acrolein and formaldehyde
- a range of **complex organic contaminants** including polycyclic aromatic hydrocarbons (PAHs), PCDD/PCDFs and other unintentionally produced POPs
- **PM** is also produced, and these may contain **adsorbed metals** and organic contaminants.“

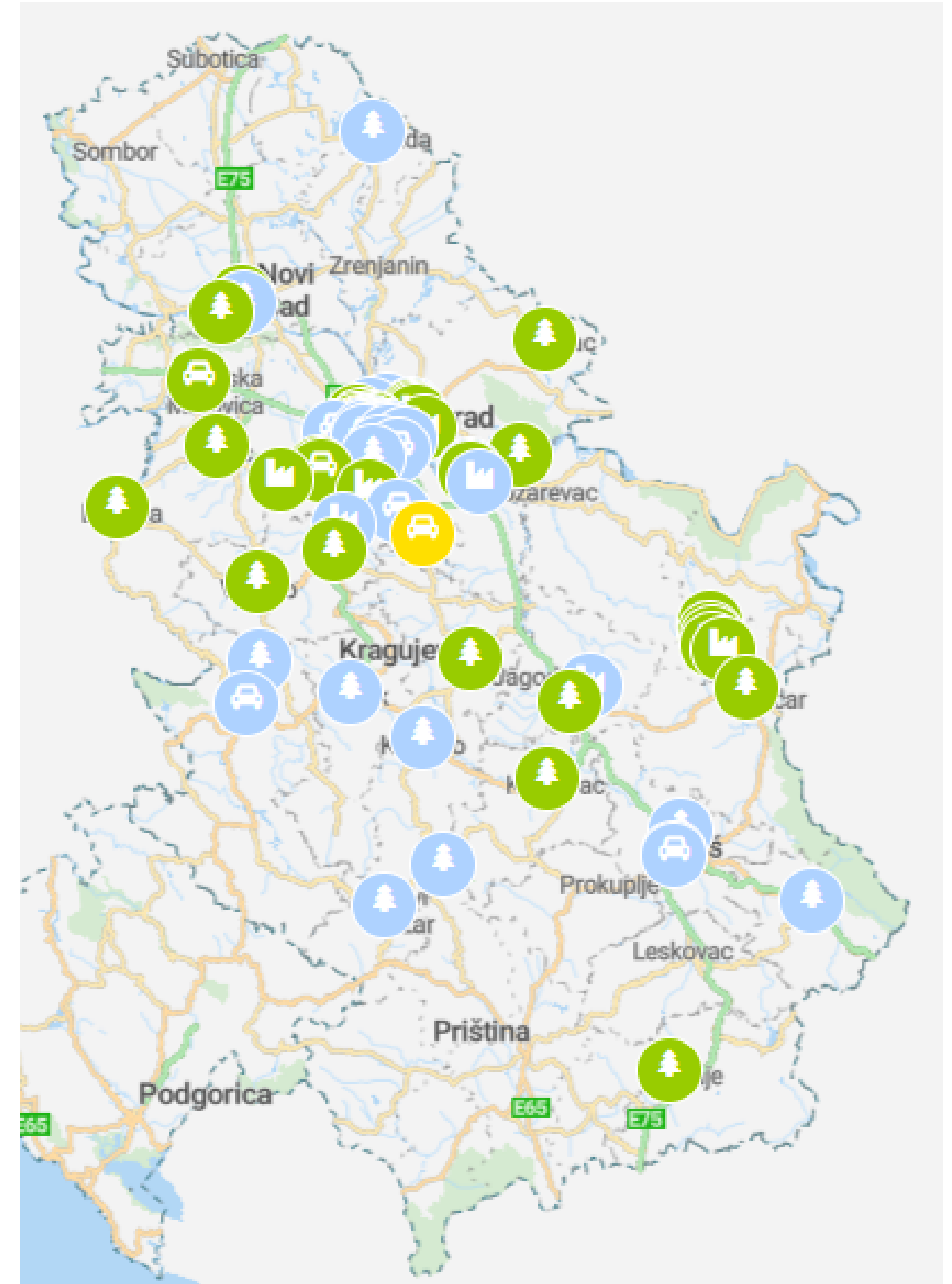
Special emphasis is placed on POPs, due to their properties, i.e. the long-term impact they have on human health and the environment, as well as through accumulation in the food chain.

# Waste disposal – a Source of Air Pollutant Emissions

About three million citizens of Serbia were officially breathing in excessively polluted air during 2020.

One of the important factors affecting air quality is the way municipal waste is managed.

In Serbia, there is no dedicated ambient air quality monitoring within national or local ambient air networks close to landfills, except in Belgrade.



# Mobile ecotoxicological unit

Until 2014, Serbia formally had mobile ecotoxicological units available to provide professional assistance as part of the emergency management system in cases of major chemical accidents, primarily at SEVESO plants, but also during landfill fires.

2014

Since the Ministry of Environmental Protection cut funding after 2014, these units are officially no longer operational. Only two active units which can provide professional assistance remain; one at the Institute for Public Health Belgrade (IPHB), and the other at the Public Health Institute “Pomoravlje” from Čuprija.

2021

There is no additional information on protocols for engaging ecotoxicological units on the websites of the IPHB Beograd or the Public Health Institute Čuprija, nor is there any information on their work, i.e. the results of any measurements taken during accidents..

# Detecting PCDD/PCDFs and dioxin-lik PCBs

The WHO Air Quality Guidelines for Europe (WHO, 2000a) provide clear conclusions regarding human exposure to PCDD/PCDFs, stating that "food is the main source of human intake, and intake through drinking water is negligible".

5 % - 95 %

Human exposure to PCDD/PCDFs by inhalation is generally low, less than 5% of daily intake, while more than 95% of intake is up the food chain.

In the case of large landfill fires, PCDD/PCDFs concentrations in the air during fires can be up to 4000 times higher than concentrations in the post-fire period.

## NO LABORATORY

According to data from the Accreditation Authority of Serbia today, there is no laboratory in the Republic of Serbia that is accredited to determine the mass concentration of PCDD/PCDFs and dioxin-like PCBs in ambient air which is of high importance for assessing the influence of fire episodes on landfill sites and their vicinity.

Six laboratories are accredited to conduct sampling from stationary sources to determine the mass concentration of PCDD/PCDFs and dioxin-like PCBs.

The only option is to sample the air from a stationary source and then test it at one of the accredited laboratories abroad.



# Impact of Air Pollution from Landfill Fires on Human Health

Deterioration of ambient air quality is among the most significant indirect consequences of landfill fires, which occurs due to the emission of various pollutants released during combustion at relatively low temperatures.

PCDD/PCDFs released into the air during a fire are deposited on vegetation and soil, entering the food chain. Due to the severity of the long-term consequences that may develop after exposure to these compounds and much later, rapid implementation of prevention measures to reduce exposure is a priority.

When landfill fires occur, appropriate environmental, as well as public health surveillance must be established in line with precisely defined parameters within the procedure for reacting in such cases.

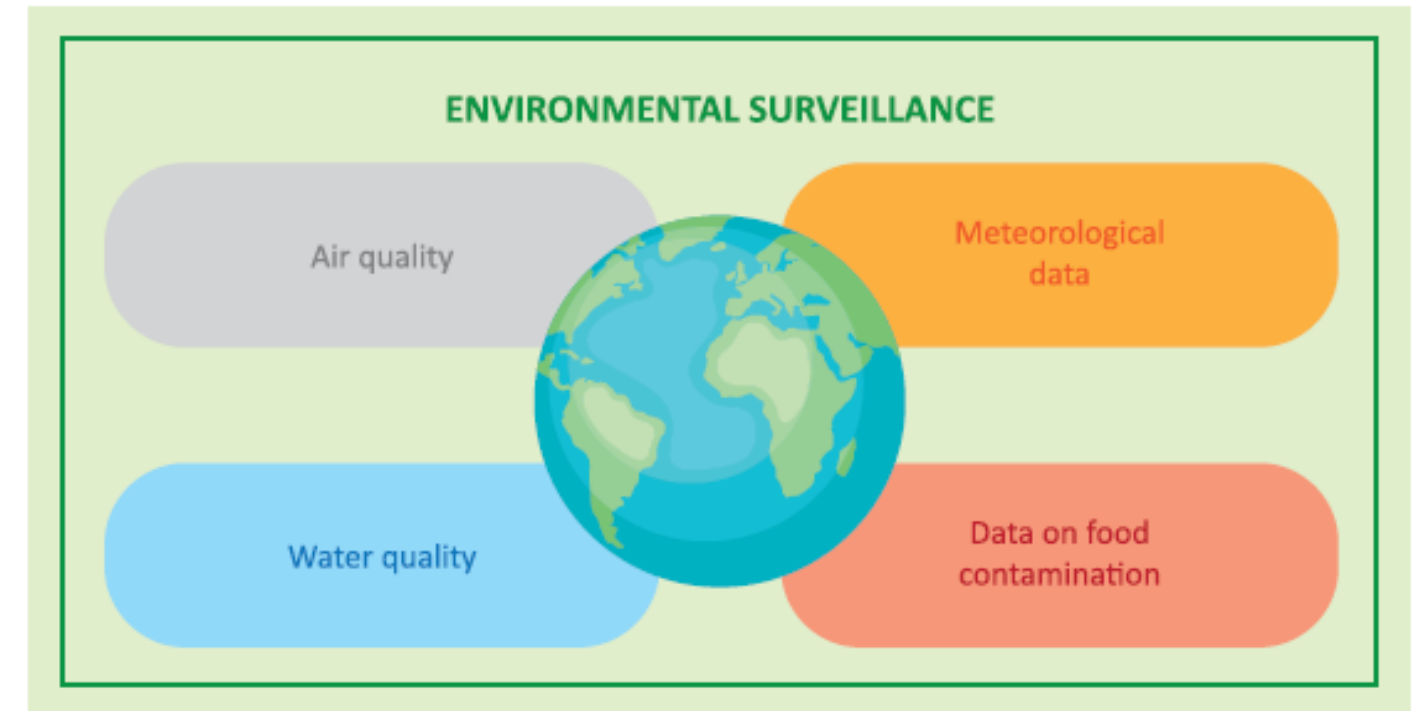


Figure 4. Environmental surveillance during landfill fires

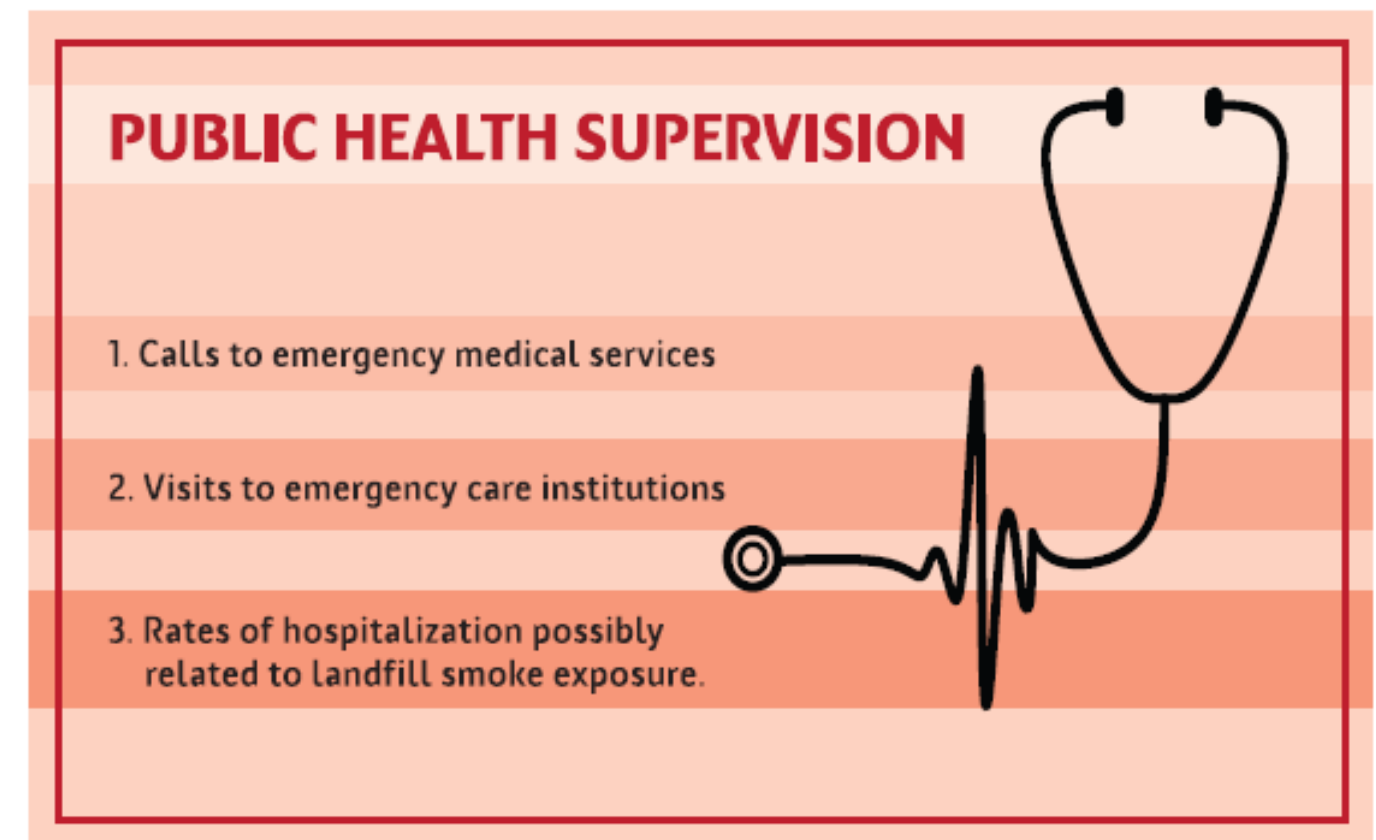


Figure 5. Public health surveillance during landfill fires

# Conclusions and Recommendations

The emergence of illegal landfills in Serbia is a burning issue both literally and figuratively. To start with, it must be prevented by providing 100% coverage with the system of municipal waste collection. In order to manage waste properly Serbia must conduct a detailed risk assessment of unsanitary landfills/dump sites for human health and fire risk assessment. Current availability and accuracy of data on waste quantity and composition is insufficient.

01 - Prevent landfill fires

02 - Minimize the consequences of Landfill fires

03 - Improve the monitoring System in order to Assess the Impact of Landfill Fires on Air pollution in Serbia

04 - Reduce the risk to public health during and after fires

# THANK

FOR YOUR ATTENTION AND COOPERATION

# YOU

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