

Abstract

The present study analyzed and evaluated the variability of particulate matter concentrations in 4 measurement series, divided into summer and winter seasons, taking into account the fractional distribution of PM, its chemical composition, as well as the relationship between outdoor and indoor air pollution.

The primary objective of the research was to analyze air pollution by particulate matter, characterize the variability of particulate matter concentrations, and to identify the sources of particulate matter in the Szczawno-Zdrój health resort. This location is particularly significant as it hosts individuals with heightened sensitivity and susceptibility to inhaled air pollution.

The scope of the study included a literature review, sample collection at the selected health resort, chemical analysis of the collected material, and data analysis using statistical methods and models. As part of the study, sources of particulate matter in both indoor and outdoor environments were characterized based on concentration levels and chemical composition.

Meteorological factors examined in this research demonstrated a direct or indirect correlation with particulate matter concentration levels in both indoor and outdoor air. These factors also determined the seasonal variability in the sources of particulate matter in the examined health resort.

Analyses using selected statistical methods and models such as the I/O coefficient, OC/EC ratio, enrichment factor (EF), principal component analysis (PCA), and positive matrix factorization (PMF) allowed for the identification of particulate matter emissions in both outdoor and indoor air.

In outdoor air, identified sources included emissions from fuel combustion in the municipal and residential sectors, transport-related emissions (both direct combustion and non-combustion emissions), pollution influx from combustion processes (SIA, Saharan dust), as well as road and mineral dust.

In indoor air, sources of particulate matter included emissions related to healing waters, saunas, hand disinfectants, surface cleaning agents, and the resuspension of dust.