

Assessment of Air Quality and Health Risks from Particulate Matter in Chiang Mai, Thailand

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Abstract : Air pollution is a huge problem in Chiang Mai, which is located in the north of Thailand. Every dry season, Chiang Mai faces terrible air quality due to weather conditions and human activity, particularly biomass burning during the harvest season, together with vehicle exhaust as a main source of pollution, which increases the amount of particulate matter (PM) in the atmosphere. So, the purpose of this study is to investigate the health risk assessments present in the atmosphere of Chiang Mai during the entire month of December 2024. These assessments were based on the different sizes of PM, including PM₁₀, PM_{2.5}, PM₁, PM_{0.5}, and PM_{0.1}. A cascade impactor (Nanosampler II Model 3182 Specifications) was employed, containing quartz filters and a flow rate of 40 L min⁻¹. Samples were collected over a duration of 120 hours. After that, they were preserved appropriately on separate petri slide plates before refrigeration. To ensure the preservation of the chemical composition of the samples until further examination was required. According to the idea that the main goal of the study is to evaluate the dangerous chemical that consists of PM, polycyclic aromatic hydrocarbons (PAHs) have been used to identify it. From the previous research, PAHs have been found in PM, and they cause cancer and respiratory diseases, making them important to address. So, the identification and quantification of these compounds can help us understand their effects and propose mitigating solutions. The Soxhlet extraction technique was employed for analyzing PAHs. At first, an internal standard was added to the sample. Dichloromethane (DCM) served as the solvent for the 8-hour extraction process. We used column chromatography to eliminate the PAHs from the solution. In the last step, in-port thermal desorption and gas chromatography/mass spectrometry (GC/MS) were combined. The analysis from the previous study regarding the toxic equivalency quotient (TEQ) and the incremental lifetime cancer risk (ILCR) indicates that individuals primarily encounter PM through ingestion, inhalation, and dermal exposure. This approach includes adding the toxic equivalency quotient values to assess the potential cancer risk associated with exposure to PM. The outcome contributes to a clearer understanding of how various exposure pathways influence the overall carcinogenic risk. Based on the findings of the study, it can be determined that the health risk assessment indicates that the ambient air in Chiang Mai has a "safe level" of PAH exposure for children as well as adults. Even though health risk assessment indicates stable public health, this should not lead to complacency. So, ongoing monitoring remains essential. In the future trend, PAH levels must be monitored regularly to find patterns and respond quickly to protect the surrounding area, including maintaining community well-being and public safety, which requires proactive environmental health.

Keywords : air quality, health risk assessment, particulate matter, polycyclic aromatic hydrocarbons

Conference Title : ICEBESE 2025 : International Conference on Environmental, Biological, Ecological Sciences and Engineering

Conference Location : Ottawa, Canada

Conference Dates : March 24-25, 2025