

The Effects of CO₂ Exposure to The Workers at Tanjung 12 Sanitary Landfill

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Structured Abstract

Background: Landfilling is the predominant waste management method in many developing nations, including Malaysia that approximately, 80-90% of municipal solid waste is landfilled with most of it being open dumping. This practice poses a significant environmental concern due to the emission of carbon dioxide (CO₂), presenting potential risks to both the environment and workers in proximity to these emissions. Despite this, there is limited information on the relationship between CO₂ exposures and the health of landfill workers. This study aims to evaluate CO₂ concentrations at the Tanjung 12 sanitary landfill in Selangor, Peninsular Malaysia. The findings will provide crucial insights into the health effects of emissions, enabling the development of practical mitigation strategies for the safety and well-being of landfill workers.

Methods: The gas sampling and questionnaire approaches were used. For gas sampling at Tanjung 12 Sanitary Landfill, personalised static chamber was used to extract the gas. Constructed from impermeable stainless steel to prevent soil impact, the gas samples were extracted from an inactive landfill section. Simultaneously, a questionnaire was distributed to the landfill workers to assess their exposure experiences and health perceptions. The analysis involved the Gas Chromatography Thermal Conductivity Detection (GC-TCD) in the laboratory and statistical software – SPSS to observe the variability and the relationship among the variables of meteorological characteristics and concentration of CO₂. The results from the questionnaire were subjected to evaluate symptoms experienced by the workers, attempting to establish correlations with potential CO₂ exposure.

Results: The concentration of CO₂ at Tanjung 12 Sanitary Landfill is in the average of 1730 ppm. The analysis on the relationships between meteorological parameters and CO₂ concentration at Tanjung 12 Sanitary Landfill shows that Spearman correlation indicates weak associations between CO₂ and humidity, temperature, rainfall, and a significant inverse correlation with windspeed. Regression analysis, while lacking statistical significance, identifies rainfall as a potential influential variable.

Conclusion: CO₂ concentration at Tanjung 12 Sanitary Landfill is within OSHA's Permissible Exposure Limit (PEL) of 5,000 ppm. Despite this, reported worker symptoms indicate potential health effects, warranting further investigation. Caution is urged in drawing conclusions, emphasizing the necessity for comprehensive modelling and considering additional factors in future analyses.

Keywords: CO₂ Exposure, Static Chamber, Landfill, Occupational Safety, Health Effects

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