Environmental Engineering and Management Journal

July 2024, Vol. 23, No. 7, 1325-1335
http://www.eemj.icpm.tuiasi.ro/; http://www.eemj.eu
http://doi.org/10.30638/eemj.2024.107

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A BAYESIAN NETWORK MODEL FOR ASSESSING URBAN TRAFFIC IMPACT ON AIR POLLUTION USING TRIANGULAR FUZZY NUMBERS

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Abstract

This paper presents a Bayesian network model for assessing the impact of urban traffic on air pollution using triangular fuzzy numbers. The model considers 19 factors categorized into four aspects: road congestion, transportation infrastructure, traffic management level, and transportation road network planning level. The conditional probabilities of the network are quantified using expert knowledge and triangular fuzzy numbers. The model is implemented using GeNIe software, and the simulation results reveal that traffic congestion, insufficient traffic road network planning, backward transportation infrastructure, and poor traffic management are the main influencing paths for urban traffic's impact on air pollution. The largest causal chain is identified as insufficient road capacity leading to excessive vehicles, causing traffic congestion and increasing air pollution. The proposed Bayesian network approach offers a novel and comprehensive framework for analyzing the complex relationships between urban traffic and air pollution, considering the uncertainty and subjectivity inherent in expert knowledge. These findings can provide recommendations for decision-makers and practitioners in urban traffic management and air pollution control, validate the model with empirical data, and extend it to other urban environments.

Key words: air pollution, bayesian network, triangular fuzzy numbers, urban traffic

Received: April, 2024; Revised final: June, 2024; Accepted: June, 2024; Published in final edited form: July, 2024

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