

Title : Forecasting Carbon Dioxide Emissions in the Transportation Sector

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ABSTRACT

To achieve Carbon Neutrality by 2050, Thailand requires precise insights into the transport sector a major and complex contributor to national emissions. This study develops and evaluates eight forecasting models for CO₂ emissions using time-series data: SARIMA, Holt-Winters (Multiplicative and Additive), RNN, LSTM, XGBoost, LightGBM, and Transformer. The models were trained using monthly CO₂ emission data from the transport sector from January 2014 to December 2024 (132 months) and validated against a test set from January 2025 to December 2025 (12 months).The evaluation criteria for forecasting error included the Mean Absolute Percentage Error (MAPE).The results showed that the Recurrent Neural Network (RNN) model was the most suitable forecasting model, as it achieved the lowest MAPE on the training set of 1.18% and the lowest MAPE on the test set of 1.57%. These findings suggest that neural networks are highly effective at capturing complex patterns in emission data.