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Estimation on the increasing value of CO based on the vehicle growth in Surabaya

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Abstract

This study focuses on one of the emissions emitted by motor vehicles, namely Carbon Monoxide (CO) which is one of the parameters of air pollutants that has highest percentage of pollution generated from transportation activities. In order to meet the target of national movement in reducing the volume of CO, this study attempts to estimate the volume CO in Surabaya City. The secondary data collected are used for preliminary analysis in estimating the volume of the CO. The results are expected to give general picture of the severity level of air quality in Surabaya.

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1. Introduction

Surabaya is the capital of East Java, Surabaya Central Bureau of Statistics recorded the population of the city of Surabaya amounted to 2.9 million inhabitants at night and reach 5-6 million during the daytime. Based on the classification of the population, Surabaya is included as Metropolitan City which ranged between 1,000,000-5,000,000 people. The transport sector is one sector which gives a considerable impact on the environment; mainly due to the use of fossil fuels is the main cause of air pollution, especially in urban areas. Air pollution due to traffic

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exhaust gas is influenced by traffic volume, the proportion of heavy vehicles, speed, and distance between the axis of the road to the point in the review.

Dense city of Surabaya cannot be separated from the growth of vehicles per year, reaching up to 15 thousand units per month, meaning the number of vehicles in Surabaya will increase to 1.8 million units within the next 10 years (Jawa Pos, 2010). This certainly would give impact towards traffic congestion and vehicle emissions.

Currently, Indonesia has a National Action Plan for Reducing Emissions Greenhouse Gas (RAN-GRK) which is a working document provided by foundation for the various Ministries/Agencies and Local Government for the implementation of the various activities that are directly and indirectly will reduce greenhouse gas emissions within the framework to decrease the rate of global climate change. Greenhouse gas emissions (GHG) itself are produced from natural and development activities primarily from activities in the field of forestry, peat, waste, agriculture, transport, industry and energy.

The government had issued rules on the reduction of GHG emissions as stated in Presidential Decree No. 61 of 2011 on the National Action Plan to reduce emissions of greenhouse gases (RAN-GRK). Indonesian government committed to reduce GHG emissions by 26% by their own efforts or 41% with international assistance in 2020 (Centre for Data and Information of Energy, 2012). At the provincial level, regional action plan of GHG emission reduction (RAD-GRK) which refers to the RAN-GRK, and tailored to local priorities made by the governor no later than 12 months from the published Presidential Decree.

The combustion process and fuel quality determines the amount of emissions released into the environment. Nitrogen Dioxide (NO₂), sulphur dioxide (SO₂), carbon dioxide (CO₂), Monoxide (CO), hydrocarbons (HC), particulate dust / Total Suspended Particulate (TSP) and Lead (Pb) is an important emissions produced from burning automotive fuel (Ahmad, 2004). This study focuses on one of the emissions produced by motor vehicles, namely CO, CO is one of the parameters of air pollutants that have the highest percentage of pollution generated from transportation activities in Surabaya. Below is a table that contains a large percentage of air pollution:

Table 1 . CO Huge Contribution of Various Activities (Soedomo, 2001)

| Activity | % CO |
|----------------|------|
| Transportation | 96,8 |
| Settlements | 0,3 |
| Solid Waste | 2,6 |
| Industry | 0,3 |

Based on East Java Governor Regulation No. 67 of 2012 on the RAD-GRK for East Java, the emission reduction target was 5.22%. The target was based on the parameters stated in East Java Governor Regulation No. 10 of 2009 on Ambient Air Quality Standards and Emission of Fixed Sources for East Java. At the current traffic conditions, the vehicle will accelerate with very low speed; fuel consumption becomes wasteful and premature wear on the machine. Therefore, the exhaust emissions, such as the exhaust fumes of the various types of vehicles, will increase.

The component mentioned in Presidential Decree No. 61 of 2011 for the city of Surabaya is a set of plan of action to decrease the emissions from transportation sector. The plan is designed in the form of ITS (Intelligent Transport System). The expected target of emission reduction from this plan is 0.79 Million Ton CO₂e. Another plan of action is an implementation of parking management that is expected to reduce 1.07 Million Ton CO₂e. Implementation Congestion Charging and Road Pricing is additional program that will reduce 0.41 Million Ton CO₂e. The transit system - Bus Rapid Transit (BRT) / semi BRT also needs to be reformed within the time period of 2010-2020.

Some background, such as the high percentage contribution of CO from transportation activities in Surabaya, the uncontrollable growth of vehicle and the plan of emission reductions in Surabaya, drives this study to determine the influence of the vehicle speed to the emissions produced at the exhaust exit. The parameter used to control this relationship is the fuel consumed. This study is a preliminary study to see the sensitivity of the CO level to the growth of vehicles. The expected outcome of this study is to obtain a relationship between the characteristics of the traffic in the form of the estimated number and speed of vehicles with ambient due to vehicle emissions.

2. Research Related to Correlation between Vehicle Characteristics and Emission Produced

According to Morlok (1991), the presence of gas in air pollutants resulting from transportation activities is

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