SPATIAL ANALYSIS ON CARBON DIOXIDE DISPERSION OF THE TALANGAGUNG LANDFILL BY APPLYING THE GAUSSIAN MODEL AND GEOGRAPHIC INFORMATION SYSTEM

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ABSTRACT

One of anthropogenic sources causing global warming is greenhouse gases (GHG) that emitted from landfill areas. The greenhouse gases compositions are dominated by methane and carbon dioxide. Carbon dioxide is not only naturally emitted; the conversion process from methane to energy also produces carbon dioxide. Based on SNI 03-3241-1994 and Permen PU No 19/PRT/M/2012, on the outer part of landfill must have greenbelt. The greenbelt area is a part of the buffer area, for carbon dioxide reduction. The emission absorption rate by greenbelt at every landfill is different. An appropriate dispersion model for CO$_2$ gas, which also able to analyze greenbelt, absorption is required.

A gas dispersion model in the air is influenced by meteorological conditions. The source of emission and its dispersion are related, spatially. Geographic Information System (GIS) analysis is required, in order to determine the greenbelt absorption ability of CO$_2$ gas. This research is aimed to analyze CO$_2$ dispersion in the Talangagung Landfill by combining a Gaussian model and GIS applications. A spatial dispersion model is analyzed using Natural Neighbour interpolation method, by reviewing occurred meteorological condition. The greenbelt absorption rate is analyzed by using an Overlay method.

Measurements and LandGEM analyses on a 3 year old dumping area give the emission rate of existed CO$_2$ is 2.72 g/s, while CO$_2$ emission rate from CH$_4$ conversion is 4.08 g/s. Based on verification results, the Gaussian dispersion formulation on the Talangagung Landfill is categorized as the Brigg classification formulation for a rural area. The analysis shows that the greenbelt absorption has a bigger capacity than the emission rate. Combination of the Gaussian model and GIS can visualize and analyze spatially for the greenbelt absorption capacity.

Keywords: Carbon dioxide, Gaussian, GIS, Greenbelt, Landfill, Natural Neighbour