FAKULTI SAINS DAN TEKNOLOGI

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Lihat sebelah

A STUDY OF POLLUTANTS EMISSION RATE LOAD FROM MOTOR VEHICLES USING DEPARTMENT OF ENVIRONMENT (DOE) AND STOCKHOLM ENVIRONMENT INSTITUTE (SEI) INVENTORIES

By

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Research Report submitted in partial fulfillment of the requirements for the degree of Bachelor of Science (Environmental Technology)

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JABATAN SAINS KEJURUTERAAN
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PROJEK PENYELIDIKAN I DAN II

Adalah ini diakui dan disahkan bahawa laporan bertajuk:

The Study of Pollutants Emission Rate Load from Motor Vehicles using Department of Environment and Stockholm Environment Institute Inventories

oleh Azham Afrina binti Hamzah No. Matrik UK 8050 telah diperiksa dan semua pembetulan yang disarankan telah dilakukan. Laporan ini dikemukakan kepada Jabatan Sains Kejuruteraan sebagai mematuhi sebahagian daripada keperluan memperolehi Ijazah Sarjana Muda Teknologi (Alam Sekitar), Fakulti Sains dan Teknologi, Universiti Malaysia Terengganu.

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TABLE OF CONTENT

LIST OF TABLE

LIST OF FIGURES

LIST OF ABBERIVATION / SYMBOLS

a	-	Number of vehicles
AAQ	-	Ambient air quality
c	-	type of fuel employed (gasohol or alcohol)
CO	-	Carbon Monoxide
d	-	Pollutant emission according to type of vehicles rate in kg/l.
DOE	-	Department of Environment
E	-	vehicle emission of a pollutant p in year
$E_{p,t}$	-	vehicle emission of a pollutant p in year t
EF	-	emission factor for each pollutant
EQA	-	Environment Quality Act, 1974
FE	-	average emission rate of new vehicles of model-year i,
$F_{c,i,t}$	-	F is the number of vehicles of a particular model-year i on the road during year t;
Fc	-	Average Fuel consumption per vehicles per day
Fe	-	average fuel consumption (km/l)
Ftc	-	Fuel Consumption
Fc	-	Average Fuel consumption per vehicles per day, (kg/day).
H_O	-	Hypothesis Null
H_1	-	Hypothesis Alternative

HNO_3	-	Acid Nitric
i	-	Series of number (1,2….7..)
K	-	average distance in kilometers traveled by vehicles of model-year i in year t
L	-	Emission load for selected gases and pollutant
$\mu g/m^3$	-	micrograms per cubic meter
MPV	-	Multi purpose vehicles
USEPA	-	United State Environment Protection Agency
SEI	-	Stockholm Environment Institute
NH_3	-	Ammonia
NMVOC	-	Non-Methane Volatile Organic Compound
NOx	-	Nitro dioxide
O_3	-	Ozone
PAJ	-	Petroleum Association of Japan
PAN	-	Poly Acetyl nitrate
PC	-	Passenger Car
ppm	-	part per million
r	-	Emission rate in g $km^{-1}veh^{-1}$, modeling coefficients
SO_2	-	Sulfur dioxide
t	-	share of the vehicle population manufactured every year (model-year)
Td	-	Average mileage for each type of vehicles (km/yr)

VOC	-	Volatile Organic Compound
V	-	vehicle driving speed in km h^{-1}
WHO	-	World Health Organization

LIST OF APPENDICES

Appendices

ABSTRACT

A research on DOE and SEI inventory has been done in two cities which were Kuala Lumpur and Kuala Terengganu. Both of these cities represent urban and suburban area. To accomplish this study, traffic count on those roads has been taken manually by using traffic count form guide by JKR. DOE inventory used a total number of registered vehicles to determine the emission rate per year, the result can be doubtful because not all registered vehicle used on road. Meanwhile SEI inventory was based on average of total mileage for each type vehicles. The objectives of this study are to determine the emission load for all available pollutant in each inventory and compared those inventories and obtained a new inventory to replace DOE inventory which is currently use in Malaysia. There will only three pollutants which can be compared in those inventories which is PM_{10}, NO_X and CO. The raw data for this research was traffic data for each road which determined the emission rate for each pollutant. Both inventories have their own calculation table in Microsoft excel format. Analysis data for this research used SPSS (Statistical Package for Social Science) software to obtained T-test, correlation, regression value, and ANOVA post-hoc. Emission rate for CO was higher in all site sampling either in Kuala Lumpur or Kuala Terengganu which was contributed by both fuel consumption vehicles. Both inventories have significant differences for all site based from T-test and Anova post-Hoc test. Emission factor for PM_{10} in DOE inventory for petrol vehicles should be changed to get the exact emission rate. Emission rate in urban area using SEI inventory was higher than emission rate in sub urban area.

ABSTRAK

Kajian tentang inventori DOE dan inventori SEI telah dijalankan di dua buah bandar iaitu Kuala Lumpur dan Kuala Terengganu. Kedua-dua bandar ini mewakili kawasan bandar dan kawasan sub urban. Untuk menyelesaikan kajian ini, pengiraan trafik telah dijalankan dengan menggunakan borang data trafik yang digaris pandukan oleh JKR. Inventori DOE menggunakan jumlah kenderaan berdaftar untuk menentukan kadar emisi dalam setahun. Keputusan diragui kerana tidak semua kenderaan berdaftar digunakan di jalan raya. Manakala SEI invetory pula dikira berdasrkan purata jumlah jarak yang dilalui mengikut jenis kenderaan. Objektif kajian ini adalah untuk menentukan kadar emisi bagi setiap jenis bahan pencemar yang boleh dikira dengan menggunakan kedua-dua jenis inventori, membezakan setiap satunya dan mengubahsuai inventori DOE yang sedia ada untuk digunakan di Malaysia. Hanya tiga jenis bahan pencemar yang boleh dibezakan iaitu PM_{10}, NO_X dan CO. Data mentah bagi kajian ini adalah data trafik bagi setiap lokasi kajian yang boleh menentukan kadar emisi setiap bahan pencemar. Kedua-dua inventori mempunyai jadual pengiraan yang berbeza di dalam format Microsoft Excel. Analisis data bagi kajian ini menggunakan perisisan SPSS (Pakej Statistikal untuk Sains Sosial) untuk mendapatkan keputusan ujian-T, pekali korelasi dan regrasi, dan keputusan Ujian ANOVA *Post-Hoc*. Kadar emisi bagi CO adalah tinggi disetiap lokasi kajian sama ada di Kuala Lumpur ataupun di Kuala Terengganu kerana ia disumbangkan oleh kedua-dua jenis kenderaan yang mengunakan bahan api berbeza. Kedua-dua inventori mempunyai perbezaan yang signifikan berdasarkan keputusan ujian-T dan ANOVA *Post-Hoc*. Faktor emisi bagi PM_{10} yang digunakan di dalam inventori DOE bagi kenderaan petrol sepatutnya diubah untuk mendapatakn kadar emisi yang lebih tepat. Kadar emisi dikawasan bandar yang dikira dengan menggunakan inventori SEI adalah lebih tinggi berbanding dengan kawasan sub-urban.