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**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
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**Department of Engineering Science
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**JABATAN SAINS KEJURUTERAAN
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**PENGAKUAN DAN PENGESAHAN LAPORAN
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

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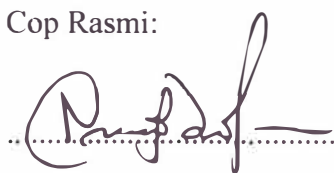
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TABLE OF CONTENT

	Pages
TITLE PAGE	i
BORANG KELULUSAN DAN PENGESAHAN	ii
ACKNOWLEDGEMENT	iii
TABLE OF CONTENT	iv
LIST OF TABLE	ix
LIST OF FIGURE	xii
LIST OF ABBREVIATION / SYMBOLS	xiv
LIST OF APPENDICES	xvi
ABSTRACT	xvii
ABSTRAK	xviii
CHAPTER I	INTRODUCTION AND OBJECTIVES
	1.1 Problem Statement 3
	1.2 Objectives 3
	1.3 Scope of study 4
CHAPTER II	LITERATURE REVIEW
	2.1 Air Pollution 5
	2.1.1 Definition 5
	2.1.2 Source of air pollution 6

2.2	Motor vehicles as source of air pollutant	9
2.3	The effect of air pollution	12
	2.3.1 <i>Effects to human</i>	13
	2.3.2 <i>Effects to environment</i>	13
	2.3.3 <i>Material damage.</i>	13
	2.3.4 <i>Effects of Carbon Monoxide</i>	14
	2.3.5 <i>Effects of Nitrogen Dioxide</i>	14
	2.3.6 <i>Effects of Particulate Matter</i>	15
2.4	Emission	16
	2.4.1 <i>Emission rate</i>	16
	2.4.2 <i>Emission Inventory</i>	18
	2.4.3 <i>DOE Inventory</i>	20
	2.4.4 <i>SEI Inventory</i>	20
	2.4.5 <i>Emission regulation</i>	23

CHAPTER III METHODOLOGY

3.1	Site Determination	24
	3.1.1 <i>Jalan Ampang</i>	28
	3.1.2 <i>Jalan Tan Cheng Lock</i>	30
	3.1.3 <i>Jalan Tunku Abdul Rahman</i>	31
	3.1.4 <i>Kuala Terengganu Inventory</i>	32
3.2	Traffic Count	35
3.3	Hypothesis Statement	36
	3.3.1 <i>Hypothesis Testing</i>	36
3.4	Parameters	36

3.4.1	<i>DOE Inventory</i>	37
3.4.2	<i>SEI Inventory</i>	40
3.5	Number of sampling	43
3.6	Analysis Method	43
3.6.1	<i>Microsoft Excel</i>	43
3.6.2	<i>Statistic Package for Social Science (SPSS) Base 10.</i>	44

CHAPTER IV RESULT AND DISCUSSION

4.1	Traffic Flow Monitoring	46
4.1.1	<i>Urban Area</i>	46
4.1.1	<i>Suburban Area</i>	47
4.2	Calculation emission inventories	48
4.2.1	<i>Jalan Ampang (Idling)</i>	48
4.2.2	<i>Jalan Ampang (Acceleration)</i>	59
4.2.3	<i>Jalan Tun Tan Cheng Lock</i>	65
4.2.4	<i>Jalan Tunku Abdul Rahman</i>	72
4.3	Kuala Terengganu Inventory	79
4.3.1	<i>Jalan Bukit Kecil</i>	79
4.3.2	<i>Jalan Sultan Ismail</i>	83
4.3.3	<i>Jalan Hiliran</i>	86
4.4	Comparison between Urban and Suburban Area	89

CHAPTER V CONCLUSION AND RECOMMENDATION

5.1	Conclusion	92
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5.1.1	<i>The Contribution of this Study</i>	92
5.1.2	<i>Inventory</i>	93
5.1.3	<i>Comparison between Urban and Suburban area.</i>	93
5.1.4	<i>Comparison between both Inventories</i>	93
5.2	<i>Recommendation</i>	94
5.2.1	<i>Emission Factor</i>	94
5.2.2	<i>Sampling</i>	94
5.2.3	<i>SIM air Inventory</i>	94
5.2.4	<i>Automotive emission controls</i>	95
5.2.5	<i>The alternative fuel</i>	96
5.2.6	<i>Other method</i>	97
	REFERENCES	98
	APPENDICES	104
	CURRICULUM VITAE	116

LIST OF TABLE

No. of Table		Pages
2.1	Total vehicles registration by type in Malaysia for the Year 1980 to Sep 2006	12
2.2	The effect of NO _x according to its concentration	14
2.3	Total annual pollution emitted and fuel consumption for passenger car which represent petrol vehicles	19
2.4	Total annual pollution emitted and fuel consumption for light truck which represent diesel vehicles	20
2.5	Standard level for clean air, polluted air promoted by agencies to urban resident.	24
3.1	The example of calculation using DOE Inventory for PM ₁₀ in Jalan Ampang	39
3.2	The example of calculation for Jalan Ampang using SEI Inventory	42
4.1	Total emission for all pollutant available in DOE inventory	49
4.2	Example of calculation using DOE method	51
4.3	Summary of all available pollutant in SEI inventory	52
4.4	Example of calculation of emission load by using SEI inventory	53
4.5	Comparison for both inventories by using T-test	54
4.6	Summarization of the maximum and minimum value of pollutants in Jalan Ampang (idling).	56
4.7	Total emission for each pollutant according to fuel type	57
4.8	Correlations between pollutants and number of vehicles for both inventories	58

4.9	DOE inventory calculation for all pollutant in Jalan Ampang (Acceleration)	60
4.10	SEI inventory's emission load for all pollutants in Jalan Ampang (Acceleration)	60
4.11	Summary of the total emission rate for NO _x , PM ₁₀ , and CO in both inventories	63
4.12	T-test result for each pollutant	63
4.13	The emission value for each pollutant using both inventories	64
4.14	Summary of correlation between pollutant and number of vehicles	65
4.15	Complete DOE emission inventory	66
4.16	Complete SEI emission inventory	67
4.17	T-Test result for each pollutant in both inventories	69
4.18	Summary of comparison by using both inventories emission rate	71
4.19	Total emission of each pollutant for Jalan Tun Tan Cheng Lock in both inventories	72
4.20	Complete calculation for DOE inventory in Jalan Tunku Abdul Rahman	73
4.21	Complete calculation using SEI inventory in Jalan Tunku Abdul Rahman	75
4.22	T-test result for NO _x , PM ₁₀ and CO in both inventories	76
4.23	Oneway ANOVA result for two sites sampling for NO _x	77
4.24	Correlation value for NO _x , CO and PM ₁₀ in both inventories and number of vehicles	78
4.25	Summary of total emission for DOE inventory in Jln Bukit Kecil	80
4.26	Summary of SEI inventory for all pollutant in Jalan Bukit Kecil	81
4.27	Summary of DOE inventory for Jalan Tun Tan Cheng Lock	84
4.28	Complete calculation in DOE inventory for Jalan Hiliran sampling site according to vehicle type	87

4.29	Complete calculation for all type of pollutant available at Jalan Hiliran	88
4.30	Summary of emission rate in urban area using both inventories	90
4.31	Summary of pollutant's emission rate in suburban area	90

LIST OF FIGURES

No. of Figure	Pages	
3.1	The location for each site sampling around Kuala Lumpur City centre	27
3.2	Site sampling locations in Kuala Terengganu	28
3.3	The location of sampling in Jalan Ampang as open idling mode	29
3.4	The layout for open acceleration site sampling in Jalan Ampang.	29
3.5	The layout of enclosed idling sampling location in Jalan Tun Cheng Lock	31
3.6	The layout of site sampling in Jalan Tunku Abdul Rahman for open idling and enclosed acceleration	32
3.7	The sampling location in Jalan Hiliran	33
3.8	The layout location of sampling in Jalan Bukit Kecil	34
3.9	Location of monitoring site in Jalan Sultan Ismail	35
4.1	Summary of traffic flow according to sampling site in urban area	47
4.2	Traffic flow in sub-urban area with 15 minutes interval	47
4.3	The composition of traffic flow according to vehicle type in Jalan Ampang	49
4.4	NO _x calculations using both inventories in Jalan Ampang	55
4.5	CO's emission rate using both inventories with 15 minutes interval	55
4.6	Emission rate for PM ₁₀ using both inventories	56
4.7	Traffic composition at Jalan Ampang (Acceleration)	59

4.8	NO _x calculation for SEI inventory and DOE inventory in Jalan Ampang	61
4.9	CO emission rate using both inventories	62
4.10	PM ₁₀ Emission rate for both inventories for PM ₁₀	62
4.11	Percentage of vehicle for Jalan Tun Tan Cheng Lock	66
4.12	Emission rate for NO _x , CO and PM ₁₀ in SEI Inventory	68
4.13	Emission rate for NO _x , CO and PM ₁₀ in DOE Inventory	68
4.14	NO _x emission rate both inventories in Jln Tun Tan Cheng Lock	69
4.15	CO emission rate for both inventories in Jln Tun Tan Cheng Lock	70
4.16	PM ₁₀ emission rate for both inventories in Jln Tun Tan Cheng Lock	71
4.17	Traffic composition for Jalan Tunku Abdul Rahman	73
4.18	DOE inventory calculation for each type of pollutant according to number of vehicles	74
4.19	Trend for emission rate for SEI calculation in Jln TAR	75
4.20	Mean plot for both inventories in two locations	77
4.21	Traffic composition for Jalan Bukit Kecil, Terengganu	79
4.22	Overall calculation in SEI inventory for NO _x , CO and PM ₁₀	81
4.23	NO _x calculation for both inventories for Jalan Bukit Kecil	82
4.24	CO emission rate for both inventories in open acceleration in Jalan Bukit Kecil	82
4.25	PM ₁₀ calculation for Jalan Bukit Kecil using both inventories	83
4.26	Traffic composition for Jalan Sultan Ismail site sampling	84
4.27	Emission rate for all pollutant in SEI inventory	85
4.28	Comparison between both inventories for NO _x , PM ₁₀ and CO	86
4.29	Traffic composition for Jalan Hiliran	86
4.30	DOE inventory calculation for all type of vehicle	87

4.31	Comparison between for both inventory for NO _x , CO and PM ₁₀	88
4.32	Comparison between urban and suburban areas	91
4.33	Comparison between both areas using SEI Inventory	92

LIST OF ABBERRIVATION / 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 ₀	-	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
µg/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
NO _x	-	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

- A Traffic Count Form
- B Raw Data
- C Example of full calculation emission load using SEI
Inventory, Enclosed Acceleration mode
- D Example of calculation emission load using
DOE approach, Enclosed Acceleration Mode
- E Example of calculation emission load using SIM-AIR Inventory
- F SPSS Output
- G Sampling Location

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 panduan 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 inventory pula dikira berdasarkan 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 perisian SPSS (Pakej Statistik untuk Sains Sosial) untuk mendapatkan keputusan ujian-T, pekali korelasi dan regrasi, dan keputusan Ujian ANOVA *Post-Hoc*. Kadar emisi bagi CO adalah tinggi di setiap lokasi kajian sama ada di Kuala Lumpur ataupun di Kuala Terengganu kerana ia disumbangkan oleh kedua-dua jenis kenderaan yang menggunakan 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 mendapatkan kadar emisi yang lebih tepat. Kadar emisi dikawasan bandar yang dikira dengan menggunakan inventori SEI adalah lebih tinggi berbanding dengan kawasan sub-urban.