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3rd ICETD 2014

28, 29 October 2014, Bandar Lampung, Indonesia

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Bandar Lampung University, Indonesia

In coorporation with :

THE UNIVERSITY OF KITAKYUSHU

3rd ICETD 2014

The Third International Conference On Engineering And Technology Development

28 -29 October2014
Bandar Lampung University (UBL)
Lampung, Indonesia

PROCEEDINGS

Organized by:

Faculty of Computer Science and Faculty of Engineering
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PREFACE

The Activities of the International Conference is in line and very appropriate with the vision and mission of Bandar Lampung University (UBL) to promote training and education as well as research in these areas.

On behalf of the Second International Conference on Engineering and Technology Development (3rd ICETD 2014) organizing committee, we are very pleased with the very good response especially from the keynote speaker and from the participans. It is noteworthy to point out that about 80 technical papers were received for this conference.

The participants of the conference come from many well known universities, among others : University Kebangsaan Malaysia – Malaysia, IEEE – Indonesia, Institut Teknologi sepuluh November – Indonesia, Surya Institute – Indonesia, International Islamic University – Malaysia, STMIK Mitra Lampung – lampung, Bandung Institut of Technology – Bandung, Lecture of The Malahayati University, B2TP – BPPT Researcher – lampung, University of Kitakyushu – Japan, Gadjah Mada University – Indonesia, Universitas Malahayati – Lampung, Lampung University – lampung,

I would like to express my deepest gratitude to the International Advisory Board members, sponsor and also to all keynote speakers and all participants. I am also gratefull to all organizing committee and all of the reviewers who contribute to the high standard of the conference. Also I would like to express my deepest gratitude to the Rector of Bandar Lampung University (UBL) who give us endless support to these activities, so that the conference can be administrated on time

Bandar Lampung, 22 October 2014

Mustofa Usman, Ph.D
3rd ICETD Chairman

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IMPACT OF MOTOR VEHICLE EMISSIONS ON AIR QUALITY IN URBAN AND SUB URBAN AREA (CASE STUDY: BANDARLAMPUNG CITY)

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ABSTRAK

One of the effects of development and growth in urban areas is the increasing number of vehicles from year to year . Improved transportation needs to support the activities of the community , the problems faced by large cities today . Along with these problems , the most crucial in the presence of the number of vehicles is the problem of congestion .

Vehicle congestion and concentrated on a spot will cause air pollution . Air pollution comes from motor vehicle exhaust emissions contain toxic substances that are harmful to human health , among others , CO, HC, CO2, SOx, NOx, PM10 .

JICA study said 70 % of air pollution occurs in urban contributed from motor vehicles , and the remaining 30% are caused by industrial and household activities .

Based on these facts , the government sought to continue to make prevention of air pollution in accordance with the mandate of Law No. 32/2009 about Protection and Management of the Environment and Government Regulation No. 41/1999 about Air Pollution Control. In addition , more specific regulation No.5/MENLH/2006 , regulates the Threshold Motor Vehicle Exhaust Emissions that can be used as a legal basis so that exhaust emissions from motor vehicles do not pollute the air . Air pollution control efforts are primarily aimed at improving air quality for human life.

Referring to the importance of the above issues , this study will examine the effect of vehicle emissions on air quality in Urban and Sub- Urban areas in the city of Bandar Lampung.

This study uses primary and secondary data , which begins with a review of the concept of the development of Bandar Lampung city transport system , then analysis the influence of motor vehicle exhaust emissions , especially gas CO , SO2 and NO2 air quality in urban and sub-urban aras.

The results of this study will show how much influence the motor vehicle exhaust emissions on ambient air quality in urban and sub-urban areas . It is expected Bandar Lampung city government can adopt policies to reduce air pollution from transportation Activities.

INTRODUCTION

Each motor vehicle will be issued a number of emissions among others depending on the year of vehicle , type of fuel used . Vehicles with the year of manufacture longer will emit more than new vehicles . Similarly, vehicles with gasoline fuel will issue different types of emissions by diesel vehicles (Morlok, 1991).

Speed will also affect the amount of emissions released by a vehicle . According Morlok (1992) who conduct emissions testing in the United States , the higher speed is used on a vehicle , the amount of CO released will be smaller . It is inversely proportional to the NO2 where the higher speed used then issued NO2 will be even greater.

Based on the results of the JICA study said 70 % of air pollution occurs in urban contributed from motor vehicles and the remaining 30% are caused by industrial and household activities .

Based on these facts , the government sought to continue to make prevention of air pollution in accordance with the mandate of Law - Law No. 32 of 2009 on Protection and Management of the Environment and Government Regulation No. 41/1999 on Control of Air Pollution . In addition , more specific regulation No. 5/MENLH/2006 , regulates the Threshold Motor Vehicle Exhaust Emissions that can be used as a legal basis so that exhaust emissions from motor vehicles do not pollute the air . Air pollution control efforts are primarily aimed at improving air quality for human life .

LITERATURE REVIEW

1. Evaluation of Vehicle Emission Testing

Parameters contaminants regulated in Environtment Ministry is CO and HC for gasoline engines and opacity for diesel engines. Parameters that meet contaminants (below) stated threshold whereas Pass meets the threshold when expressed Disqualified . Threshold of pollutant parameters are distinguished by category and year of manufacture of motor vehicles . Technically , the evaluation of the emission test result data can be explained as follows :

a. For vehicle category M , N & O and the gasoline produced before 2007 declared " pass " , if the value of CO test results ≤ 4.5 % and HC values ≤ 1200 ppm test results , and declared " do not pass " if the value of CO results test > 4.5 % or the value of HC test results > 1200 ppm .
b. For vehicle category M , N & O and the gasoline was produced from 2007 onward declared " Passed " , if the value of CO ≤ 1.5 % of test results and test results HC values ≤ 200 ppm , and stated " Not Passed " if the value of CO ≤ 4.5 % of test results and test results HC value > 200 ppm .
c. For vehicle categories M , N , and O diesel fuel with ≤ 3.5 tonnes GVW and produced before the year 2010 declared " Passed " , if the value of Opacity Test results ≤ 70 % and stated " Not Passed " if the value of Opacity test results > 70 % .
d. For vehicle category M , N & O diesel fuel with ≤ 3.5 tonnes GVW and produced starting in 2010 and thereafter declared " Passed " , if the value opasitasnya test results ≤ 40 % and stated " Not Passed " if the value of Opacity Test results > 40 % .
e. For vehicle category M , N & O diesel with GVW > 3.5 tonnes and produced before the year 2010 declared " Passed " , if the value of Opacity Test results ≤ 70 % and stated " Not Passed " if the value of Opacity test results > 70 % .
f. For vehicle category M , N & O diesel with GVW > 3.5 tonnes and was produced starting in 2010 and thereafter declared " Passed " , if the value of Opacity test results ≤ 50 % and stated " Not Passed " if the value of Opacity test results > 50 % .

The value of the result of motor vehicle exhaust emissions is valid when the measurements were performed in accordance with test methods set forth in the SNI, including engine temperature when the measurement must reach operating temperature (800C)

2. Gasoline Fueled Vehicle Test

This test is intended to get an idea about the performance of the engine and determine the appropriate solution known if there is a problem with the engine . In analyzing the performance of the engine based on emission test results can be explained based on the knowledge of the principles of combustion and combustion process in a gasoline engine.

3. Vehicle Diesel Fuel Test

This test is intended to Yamada got a picture of a diesel engine performance yangs edang tested and determine the appropriate solution if it becomes a problem in the engine . In analyzing the performance of the engine based on emission test results can be explained based on the knowledge of the principles of combustion and combustion processes in Diesel engines,

4. Classified Traffic Volume Survey

Enumeration classified traffic is one of the simplest methods to obtain traffic data but also can provide useful information . Different types have different operated vehicle dimensions, weight , turning radius , propulsion , engine type, etc. . To simplify the analysis , vehicles are grouped into classes . Enumeration manual traffic volume can be easily done by counting the number of vehicles per unit time based on the classes .

The volume of traffic on a road will vary depending on the total volume of two-way , traffic direction , the volume of daily , monthly and yearly , also on the composition of a moving vehicle (very) slow and moving (very slowly) . Large vehicles such as buses and trucks require wider track , the radius of curvature at the bend greater and greater vertical freedom . For designing roads with sufficient capacity , the volume of traffic expected to use the road should be determined in advance .

In this survey conducted survey technique is to calculate the level of service to calculate the volume of vehicles per hour according to the

classification of the vehicle and then multiplied by a factor of passenger car units with the provisions as contained in the Passenger Car Unit Factors table

No.	Jenis kendaraan	Kelas	SMP	
			Ruas	Simpang
1	Mobil penumpang (sedan/jeep, pick Up)	LV	1,00	1,00
2	Truk / bis	HV	1,20	1,30
3	Sepeda motor	MC	0,25	0,40
4	Becak, sepeda, dll	UM	0,80	1,00

Sumber : IHCM

5. Traffic Speed

Traffic speed is the distance a vehicle in a unit of time, usually expressed in units of km / h . Speed of a vehicle is influenced by human factors , vehicle , infrastructure and also influenced by the flow of traffic , and weather conditions in the surrounding natural environment .

There are four (4) major classifications are often used in studying the speed of traffic flow , namely :

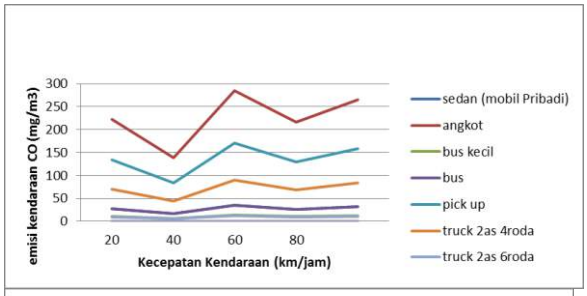
a. Spot Speed si the instantaneous speed of the vehicle at the time the vehicle crosses a certain fixed point on the street.
b. Journey speed) is the average speed of vehicles effectively between two specific points on the road , which can be determined from the distance traveled divided by the total time of the trip.
c. Running Seed is the average speed of vehicles to traverse a certain distance in the running condition of the vehicle , ie after deducting condition by time constraints occur

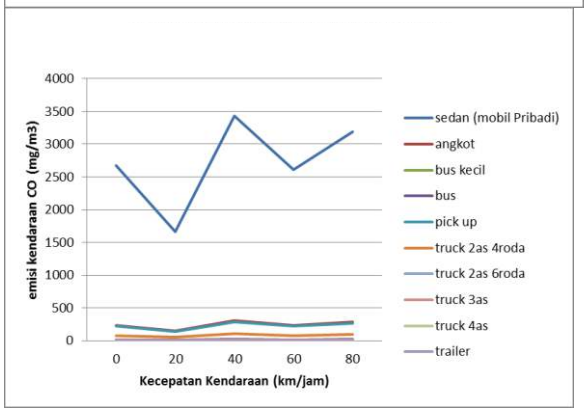
DATA AND ANALYSIS

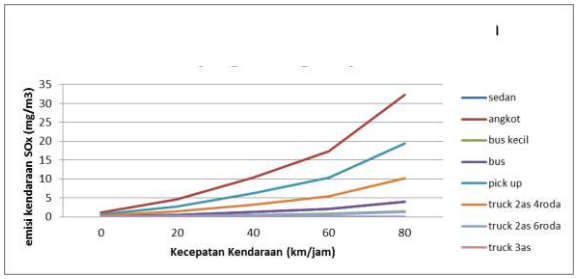
A. **The amount given emissions from motor vehicles in urban and sub-urban areas**

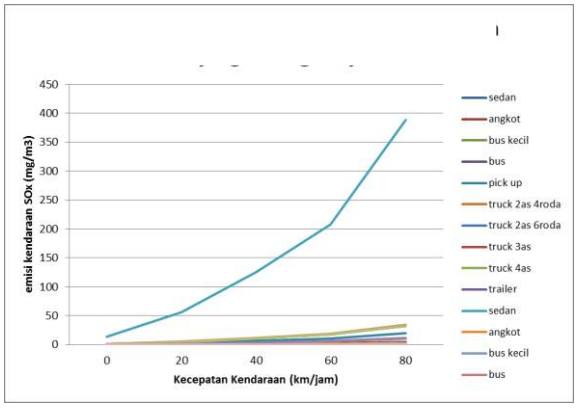
Number of exhaust emissions CO , NOx , and SOx were given from transport on urban and sub-urban areas, cam be calculated by multiplying the number of vehicles entering the urban and sub-urban areas assuming emitted by each vehicle gasoline and diesel is same , as in the picture below .

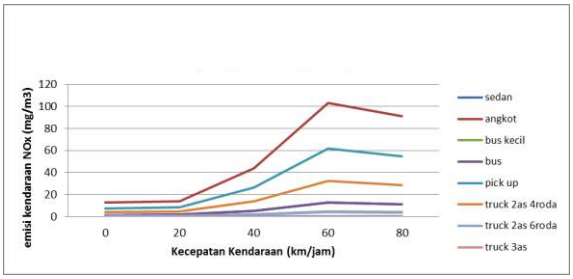
a) Total emissions in Urban areas











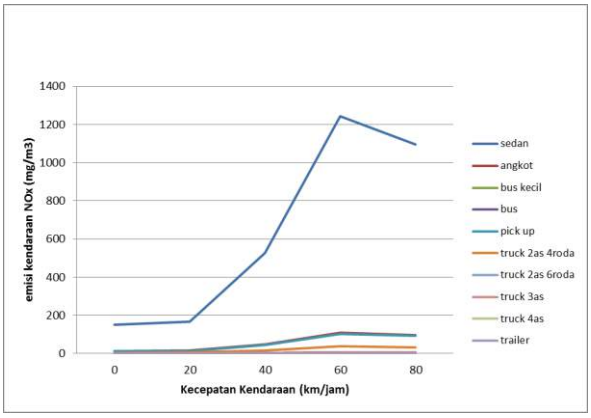
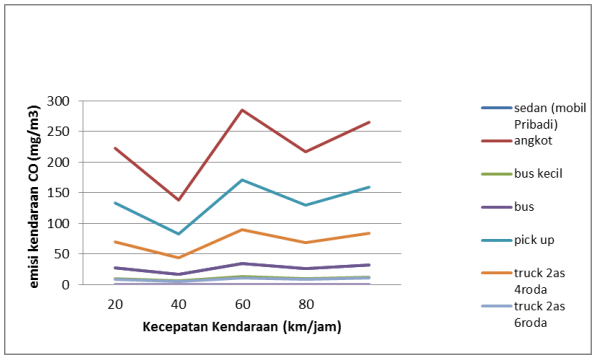
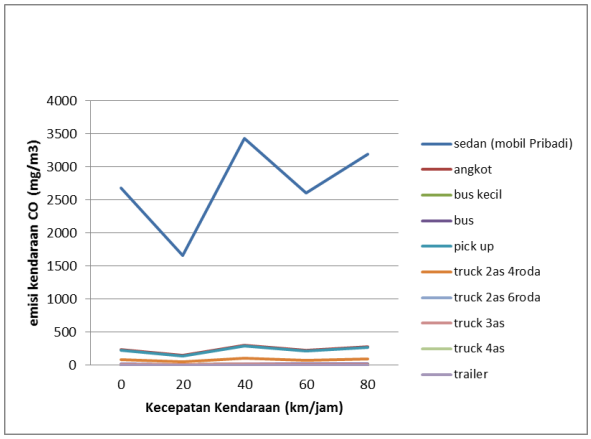


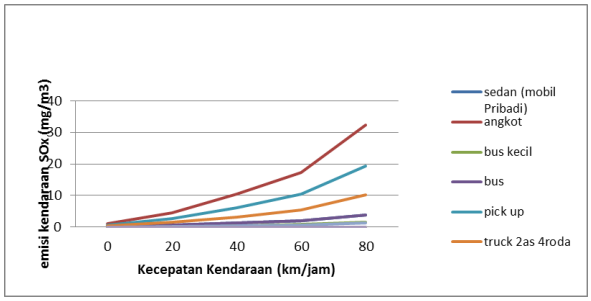
Figure 1

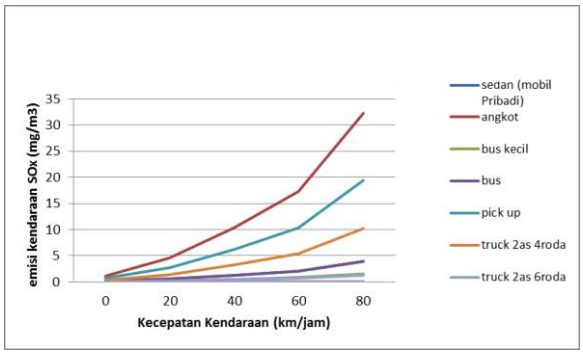
Total emissions of gasoline-fueled vehicles

From the graph above it can be concluded that the amount of emissions of gasoline -fueled vehicles , in the direction of Tanjung Karang - Raja Basa largest emission vehicles donated by public transport , while the direction of the Raja Basa - Tanjung Karang NOx and SOx emissions released by vehicles would amount to a very large , especially private cars, this happens due to the largest number of vehicles in the direction of Tanjung Karang - Rajabasa is public transport, while the direction Rajabasa - Tanjung Karang ari private car, so that when multiplied by the emissions released by vehicles at speeds of 20 , 40 and 80 km/h, the obtained amount of NOx and SOx emissions released by vehicles will be higher , and when viewed from the speed of the vehicle, the higher the vehicle speed , the greater the NOx emissions were issued . It is inversely proportional to the CO exhaust emissions from vehicles , here the higher speed of the vehicle CO emissions are released will be smaller .









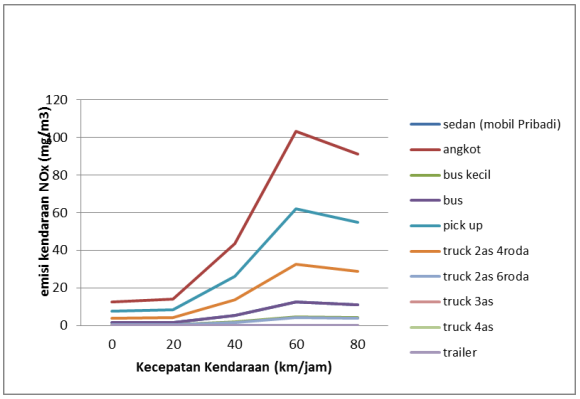
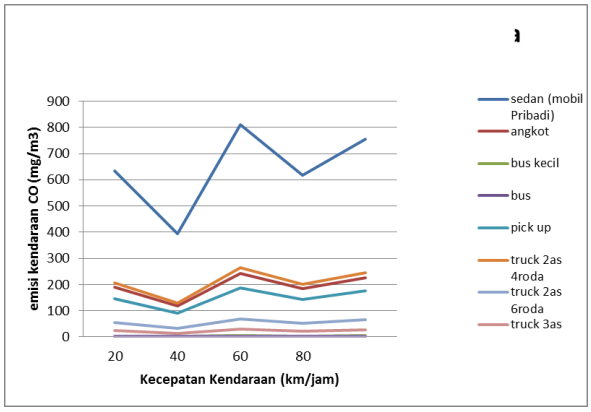


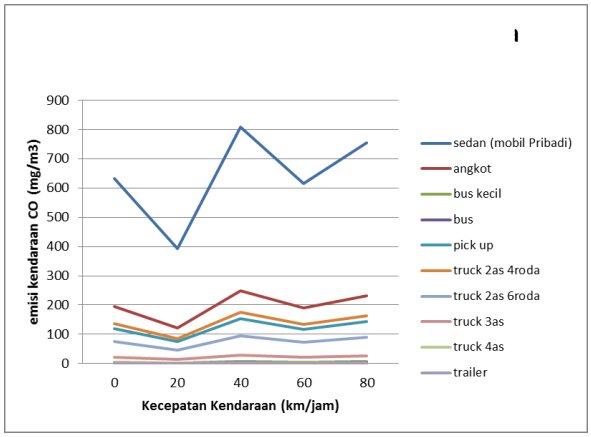
Figure 2
The number of diesel-fueled vehicle emissions

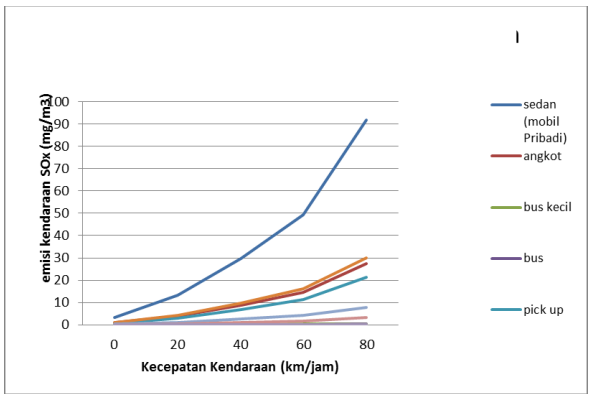
From the graph above it can be concluded that the number of diesel fueled vehicle emissions on Jalan Zainal Abidin Pagar Alam, in the direction of the Tanjungkarang - largest emission given by public transport vehicles , while the direction of Rajabasa – Tanjungkarang NOx and SOx emissions released by vehicles would amount to a very large , especially private cars , this happens due to the largest number of vehicles on the road Zainal Abidin Pagar Alam from Tanjung Karang direction - Rajabasa is public transport, while the direction Rajabasa - Cape Coral adalanh private cars , so that when multiplied by the emissions released by vehicle at speeds of 0 , 20 , 40 and 80 km / h , the obtained amount of NOx and SOx emissions released by vehicles will be higher , and when viewed from the speed of the vehicle, the higher the vehicle speed , the greater the emissions of NOx and SOx are issued . It is inversely proportional to the CO exhaust emissions from vehicles, here the higher speed of the vehicle CO emissions are released will be smaller .

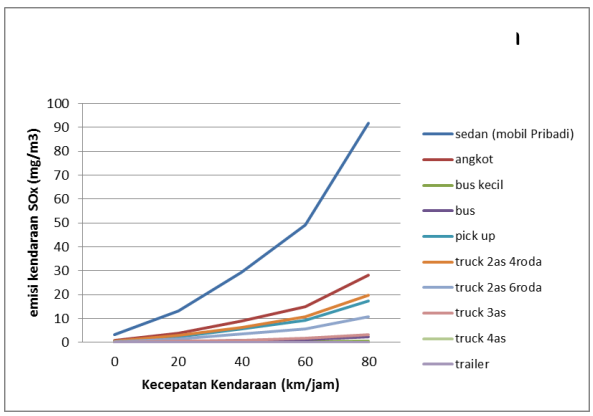
From the description above, if we want the vehicle emissions in urban areas is small then, we have to restrict the speed of vehicles entering an urban area with a maximum speed limit is 40 Km/h.

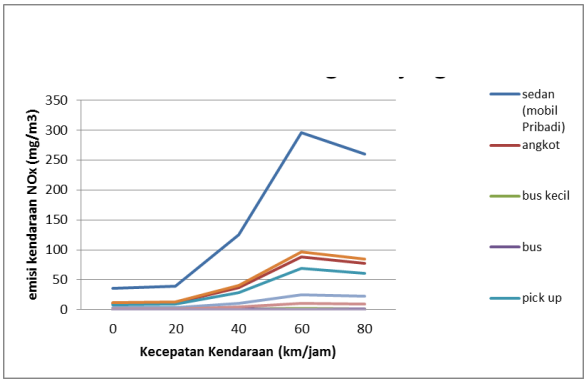
b) Total emissions in Sub Urban Areas











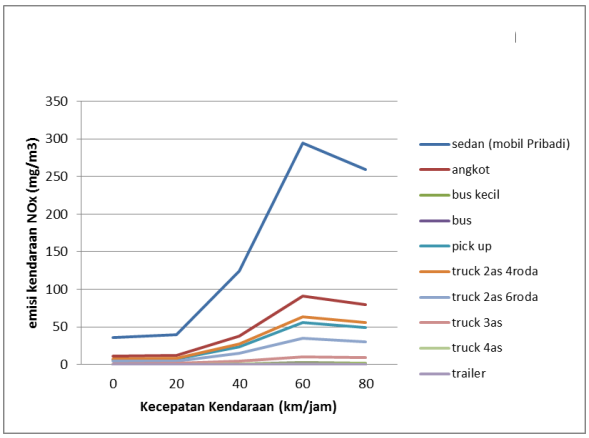
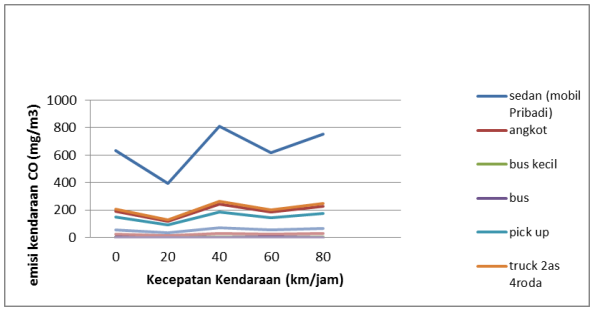
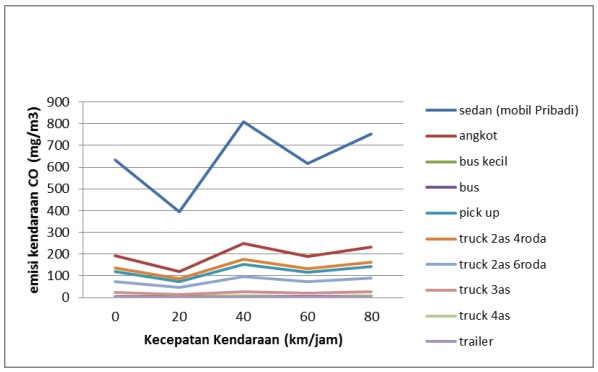
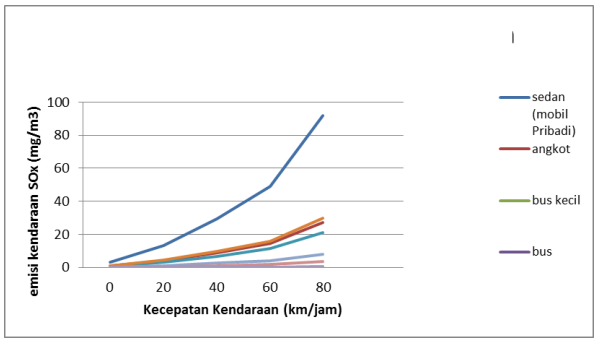


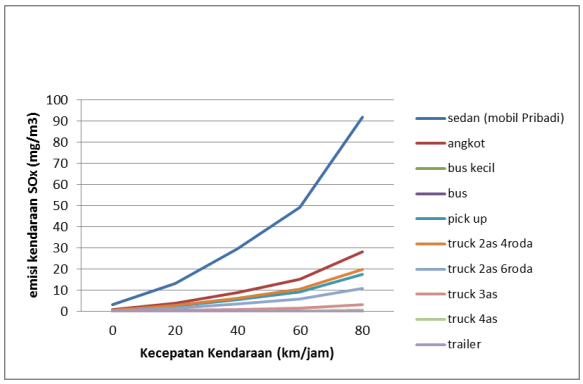
Figure 3
Total emissions of gasoline -fueled vehicles in the sub-urban aras

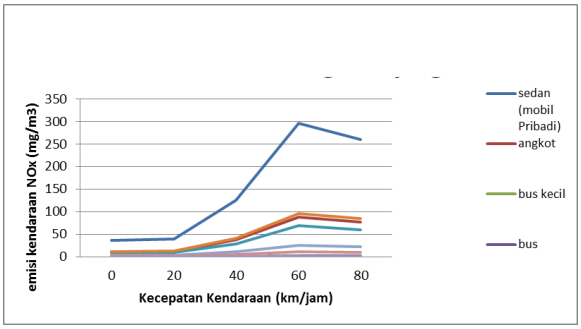
From the graph above it can be concluded that the amount of emissions of gasoline -fueled vehicles on Jalan Yos Sudarso , in the direction of Teluk Betung - Panjang and Panjang - Teluk Betung largest NOx and SOx emissions contributed by private vehicle , this happens due to the largest number of vehicles on the road Yos Sudarso of direction of Teluk Betung - the opposite of the direction of Panjang and Panjang - Teluk Betung is dominated by private vehicle , so that when multiplied by the emissions released by vehicles at speeds of 0 , 20, 40 and 80 km/h, the obtained amount of NOx and SOx emissions released vehicles will be higher , and when viewed from the speed of the vehicle , the higher the vehicle speed, the greater the emissions of NOx and SOx are issued . It is inversely proportional to the CO exhaust emissions from vehicles, here the higher speed of the vehicle CO emissions are released will be smaller .











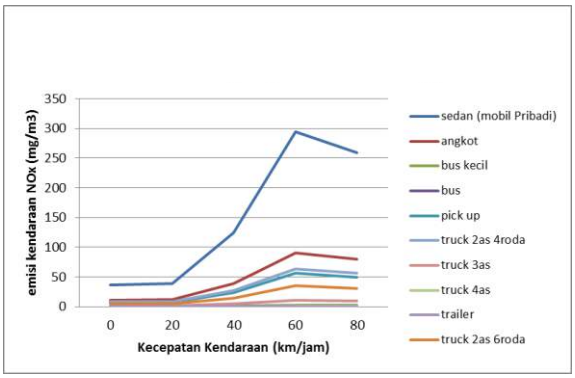


Figure 4
The number of diesel-fueled vehicle emissions in sub-urban areas

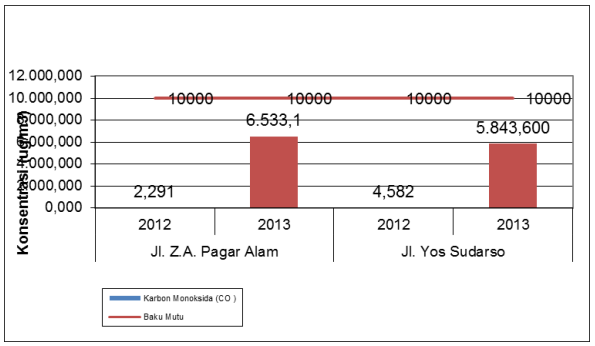
From the graph above it can be concluded that the amount of emissions diesel vehicles at Jalan Yos Sudarso , in the direction of Teluk Betung - Panjang and Panjang - Teluk Betung largest NOx and SOx emissions contributed by private vehicle , this happens due to the largest number of vehicles on the road Yos Sudarso of direction of Teluk Betung - the opposite of the direction of Panjang and Panjang - Teluk Betung is dominated by private vehicle, so that when multiplied by the emissions released by vehicles at speeds of 0 , 20 , 40 and 80 km/h, the obtained amount of NOx and SOx emissions released vehicles will be higher, and when viewed from the speed of the vehicle, the higher the vehicle speed , the greater the emissions of NOx and SOx are issued. It is inversely proportional to the CO exhaust emissions from vehicles , here the higher speed of the vehicle CO emissions are released will be smaller .

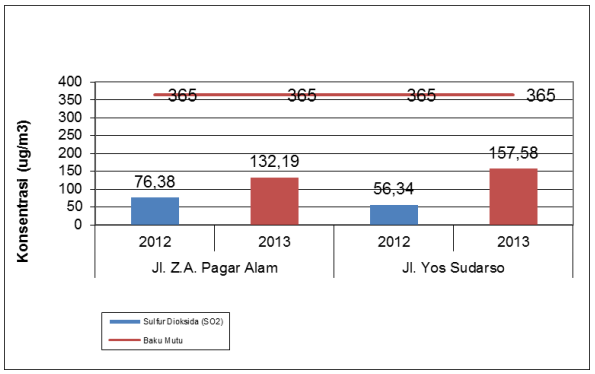
From the description above, if we want the vehicle emissions in urban areas is small then , we have to restrict the speed of vehicles entering the sub- urban areas with the maximum speed limit is 60 Km/h .

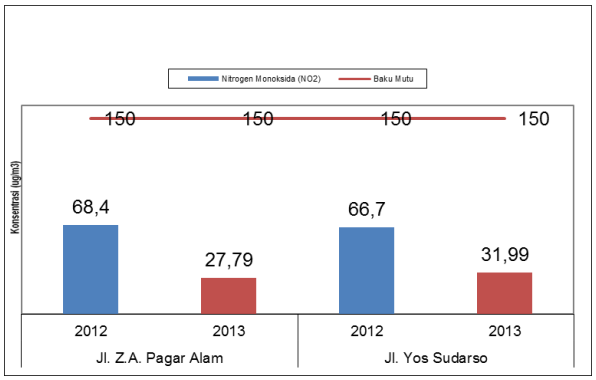
B. The air quality in urban and sub-urban areas .

To determine the condition of the air quality in urban and sub-urban areas , the data collection is done on both the environmental conditions of the area so that we can compare how great the contribution of transportation emissions to the ambient air quality in both areas.

Ambient air quality measurements conducted by a laboratory accredited by the National Accreditation Committee (KAN) , which laboratory PT . Anugerah Analisis Sempurna with lab code LP - 565 - IDN , so that the results obtained will be accountable. Measurement data on Zainal Abidin road and the road Yos Sudarso like Figure below







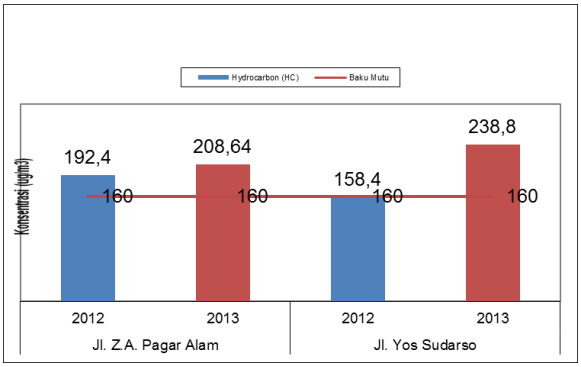


Figure 5
Results of the analysis of ambient air in urban and sub urban areas

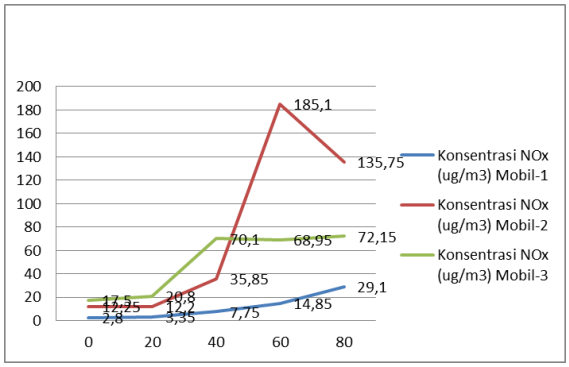
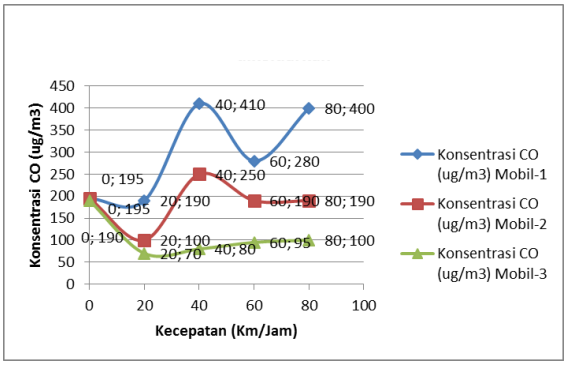
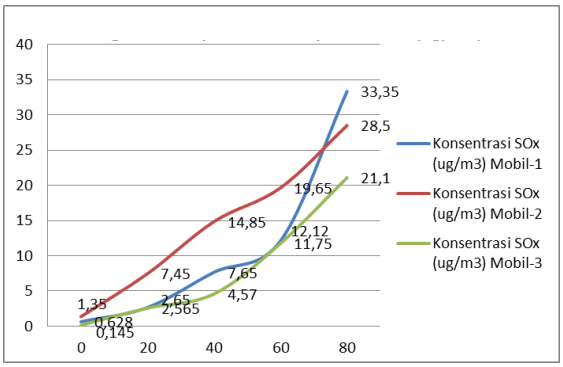


Figure 6
The result of motor vehicle exhaust emissions (gasoline) with the combustion system Carburetor and EFI ..

C. Comparison between Vehicle Emissions quality cars with combustion systems and EFI

Motor vehicle emissions are always influenced by the combustion system used by motor vehicles, in Indonesia, motor vehicles still use two motorized combustion system, for years <2007 motor combustion system still uses carburetors. Whereas for the manufacture of >2007 vehicles already using elektrical Full Injection (EFI). Below is a comparison of exhaust emissions from vehicles using combustion system carburetor and EFI.





D. Comparison of Emission Vehicles in Bandar Lampung with EURO emission standards.

Exhaust emission standards in Indonesia will enter the Euro3 standards, this has been supported by the availability of fuel oil (BBM) as an environmentally friendly like Pertadex and Pertamax Plus , expected future fuel oil (BBM) can meet euro standard 4, 5 euro and euro 6.
In the city of Bandar Lampung road vehicles not meet the standards of the euro, this was due to the uneven gas station in the city of Bandar Lampung Provides Fuel (BBM) as an environmentally friendly like Pertadex and Pertamax Plus
Results of tests conducted on 1500 quotes either diesel-fueled vehicles and gasoline on Urban and sub-urban areas of CO emission values issued by the vehicle is equal to 10 g / km, while the euro-1 standard was 2.72 g/km.

E. The quality of fuel oil (BBM) in Bandar Lampung.

The quality of fuel oil (BBM) that circulate in the city of Bandar Lampung still meet the standards set by the Director General of Oil and Gas No. 3675 K / 24 / DJM / 2006 dated March 17, 2006 So the influence of the quality of vehicle emissions by type of fuel oil (BBM) used a very real , if the type of fuel the vehicle uses Pertadex and pertamax plus the quality of the emissions that would meet the standards issued Euro 4 , and if the vehicle use premium (gasoline 88) and diesel fuel (bio-diesel) , then the standard euro will not be achieved , so that the quality of the emitted will not meet the standards set by the

government . and environmentally friendly transportation program ultimately will not be achieved.

CONCLUSION

Number of vehicles with emissions released by vehicles at some speed , the higher the speed of the vehicle is obtained , the greater the exhaust emissions of NOx and SOx generated , when multiplied by the number of vehicles that pass through urban and sub-urban areas then the emission obtained a very large , it is inversely proportional to the CO gas emissions resulting from the vehicle , if the vehicle speed the faster the CO gas produced will be smaller .

To maintain air quality in urban and sub-urban areas it is necessary to enter the vehicle speed restriction urban areas is restricted with the speed of 40 km/h and sub-urban areas with a speed limit of 60 km/h .

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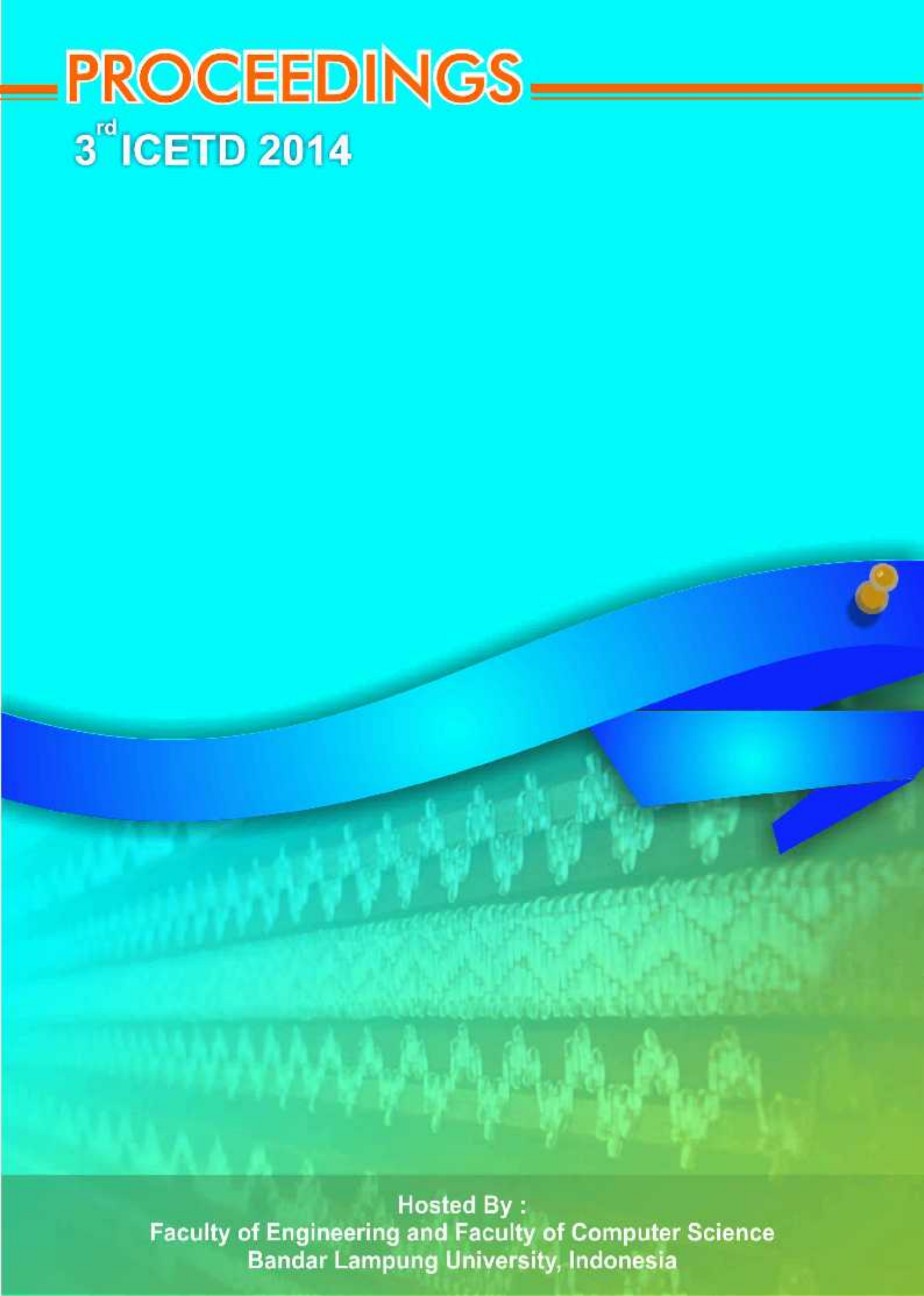

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