EFFICACY OF ANTI-SMOKE BELCHING ORDINANCE IN 1st DISTRICT OF DAVAO CITY

A Thesis Presented to the Faculty of the
College of Criminal Justice Education
University of Mindanao
Davao City

In Partial Fulfilment of the Requirements for the Degree of
Bachelor of Science in Criminology

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March 2018

ACKNOWLEDGMENT

The researchers would like to thank God Almighty who gives them strength when they are weak, when they feel the feeling of uncertainty He comfort them, when they are out of their league He guides them His righteousness. There is no words that is suitable to describe His grace and mercy with an undeniable love for us.

To Prof. Stella Karen M. Branzuela Ph.D. their adviser, and the one who authorized them to conduct this study. They would like to broaden their gratitude to her for guiding them from the beginning of this research up to the end. For the patience and knowledge. She is the best at this field and that is why she is their adviser.

To the respondents, the emission testing center costumer and drivers, for supporting them in their study by heedfully answering our questionnaire.

To Carmelita B. Chavez, Ph.D., the Dean of College of Criminal Justice Education, for her moral support and encouragement she extended to them for the completion of our research.

Finally, to their family who are very supportive strengthening them through love and nurtured their will to finish this research financially and morally.

ABSTRACT

The study was made to determine the anti-smoke belching ordinance in 1st District of Davao City which was then used to be the basis for intervention. Specially, this study sought to answer the anti-smoke belching ordinance in 1st district of Davao City in terms of age, and gender. This study evaluated the anti-smoke belching ordinance wherein descriptive method research design was used. The researchers requested a survey to the emission testing centers costumers and also to the drivers regarding about the anti-smoke belching ordinanceand subject for interpretation. The survey gathered was treated using the percentage and frequency count. As the survey has already interpreted there are 90.5 percent male and 9.5 percent of female. The result of the study revealed that the anti-smoke belching ordinance in Davao City is high. It also aimed to explore the significant difference of this anti-smoke belching ordinance. It was revealed that there is no significant difference when analyzed with three indicators namely: emission standard, emission testing procedure, and testing equipment and testing materials. The program uses formulated and recommended in this study with the aim to inform the public about the provision of this ordinance.

Keywords: Belching, Ordinance, intervention

A.R.S

E.J.R.E

R.M.C

DEDICATION

This research is gratefully dedicated to our beloved parents,

They are the benefactor, without them we are not

Able to reach the status we have.

To them we will be forever

Grateful.

A.R.S

E.J.E

R.M.C

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THE PROBLEM AND ITS SETTING

Background of the Study

According to Layne (1993) Emission control, twenty years ago, automobiles were a major source of pollution. Today, automobile emissions are greatly reduced because of government regulations and the engineering efforts of carmakers. Air pollution is the presence of enough contamination in the atmosphere to injure human, animal, or plant life. Pollution is either natural or manmade. Natural air pollution comes from dust storms, volcanic eruptions, forest fires, and the cycles of plant and animal life. Manmade pollution comes from industrial plants, synthetic chemicals, transportation systems and automobiles.

According to LAWPH*i*L Project (2017). TheEmission Charge System, in case of vehicle dischargers, and factory pollution as part of the emission permitting system. The vehicle registration renewal system and also base on the environmental techniques. The Department of Transportation and Communication (DOTC) impose and collect regular fees from the said dischargers. These systems encourage the industries and motor vehicle to abate, reduce, or prevent pollution. The basis of these fees include it is the limited volume and toxicity of any emitted pollutant. Industries, which shall install pollution control devices or retrofit their existing facilities with mechanisms that reduce pollution shall be entitled to tax incentives such as, limited total credits and/or accelerated depreciation deductions.

Ordinance No. 0280-06 or the Anti-Smoke Belching Ordinance in Davao City enacted in 2006 is all set for implementation on June 25, 2013, Rule VI (Emission Standards for in-use vehicles) the emission standards for in-use motor vehicles equipped with comprehension ignition (diesel) engines shall be measured in terms of light absorption coefficient of the exhaust from the tailpipe, the value of which shall not Exceed 2.5m-1." "Emission standards for in-use motor vehicle equipped with spark ignition (gasoline) engines, excluding 2-stoke motorcycles shall be measured in terms of percentage by volume of carbon monoxide (CO) and parts of per million Hydrocarbon as hexane (HE) using gas analyzer." Deloso, K.L. (2013).

This study on anti-smoke belching ordinance in 1st District of Davao City is an attempt by the researcher to help build people by analyzing and understanding about the effect of smoke belching, to help their future career path like the respondents of this study, who was become successful and active participants in the task of nation building.

Statement of the Problem

This research study was conducted to determine the efficacy of anti-smoke belching ordinance in 1st District of Davao City. Specially, it sought answer to the following questions:

1. What is the efficacy of anti-smoke belching ordinance in 1st district of Davao City

   1.1 Emission Standard

   1.2 Emission Testing Procedure

   1.3 Testing Equipment, and Testing Materials

2. Is there a significant on the extent of anti-smoke belching ordinance in 1st district of Davao City when respondents are grouped according to their profile?

Hypothesis

There is no significant difference on the extent of anti-smoke belching ordinance in 1st district of Davao City.

Review of Related Literature

Regarding and other pertinent information are presented in this section. This is to establish a clear framework of the concept and principles of the variable under study and it is further divided to its indicators respectively.

In the United States about 10% of the population, 35 million people, live within 100 meters of a high traffic road. High-traffic roads are commonly identified as being host to more than 50,000 vehicles per day, which is a source of toxic vehicle pollutants. Previous studies have found correlation between exposure to vehicle pollutants and certain diseases such as asthma, lung and heart disease, and cancer among others. Car pollutants include carbon monoxide, nitrogen oxide, particulate matter (fine dusts and soot), and toxic air pollutants. While these pollutants affect the general health of pollutions, they are known to also have specific adverse effects on expectant mothers and their fetuses. Lavin (2012).

Emission factors or test the emission rate of a pollutant from an activity, we require its flow rate and concentration. While estimation may be easy for a simple, well defined source such as a power plant, it may be difficult for a

poorly defined source such as CO from forest fire or dust from an unpaved village road. These test are possible only for an existing facility. More often, are also called upon to estimate the emission from a new facility before it built. To meet these needs, however, emission factor document are available. Mahajan (2006).

The increase in the number of motorcycles in large Brazilian cities is due to several factors such as traffic, low cost, mobility, few parking lots and the low efficiency of public transportation, becoming an important factor in air quality deterioration. In this context, vehicle emissions monitoring is essential to understand the contribution to air pollution as a whole.. Emission from motorcycles using commercial gasoline (with 22% of ethanol) were used in a combination with meteorological data and ambient air pollutants for Rio de Janeiro City (Brazil) the increase in ozone connection occurs due to high emission of reactive volatile organic compounds in an atmosphere with high levels of Nitrogen Oxide (NOx). Given this scenario, additional measures are necessary to manage emissions from mobile sources in the future.Braz, J. (2013).

The auto industry produces a significant amount of air pollution the world over, and thereby contributes to climate change. As a major component within the auto industry, the motorcycle industry has a great responsibility to minimize its emissions. This study examines Powered Two Wheelers (PTWs) in the European Union to assess the impact made by the motorcycle industry, and the potential for improvement. Reduction of air pollution would be possible by intensifying emission regulation which are much less stringent for PTWs than for light-duty vehicles such as passenger cars. However, a more

comprehensive strategy to limit the motorcycle industry's air pollution lies in the deployment of electric Powered Two Wheelers (PTWs). Upon concluding that electric Powered Two Wheelers (PTW) are viable and may soon become widely used, this study develops a framework to model the total air pollution created by the motorcycle industry, accounting for varying levels of electric Powered Two Wheelers (PTW) deploymentRedman (2015).

According to Sample (2005), motorbikes are churning out more pollution than cars, even though they make up only a small fraction of vehicles on the roads, according to a report. Tests on a selection of modern motorbikes and private cars revealed that rather than being more environmentally-friendly, motorbikes emit 16 time the amount of hydrocarbons, including greenhouse gases, three time the carbon monoxide and a "disproportionately high" amount of other pollutants, compared to cars. Ana-MarijaVasic at the Swiss Federal Laboratories for Materials Testing and Research, who led the research, said the need to legislate on emissions from motorbike has been overlooked because there are so few on the roads In Britain, there are 1,060,000 motorbikes on the roads but more than 25m private cars. Dr. Vasic's when motorcyclists frequently accelerated quickly, motorbike engines burned fuel inefficiently, giving a sharp peak in emissions. The yearly hydrocarbon emissions of the average two-wheeler in urban traffic measured up to 49 times higher than that of the average car, according to the study, due to be published in the journal Environmental Science and Technology.

Lack of enforcers and equipment still challenge government officials in their efforts to curb smoke-belching vehicles that are still on the road. Land Transportation Office-National Capital Region (LTO-NCR) director Atty.

Clarence Guinto admitted that the agency is confronted with the lack of personnel and carbon emission testing equipment to apprehend smoke belchers. The number of personnel made only four teams, because Guinto said that they were "only able to collate four equipment." While he did not disclose how many smoke meters the LTO has, Guinto cited the need to procure machines for their anti-smoke belching driveTerrazola (2017).

According to the study done by Gilaga B, et al. (2012), among the 212 nations in the world, the Philippine is ranked 48th in terms of carbon emission in the transportation sector. The study sought to determine and estimate the amount of gaseous pollutants emitted by the vehicles in Dipolog City in relation to the overall gaseous pollutants of the Philippines. Result revealed an annual gaseous pollutant contribution of 1,072929.597% V for carbon monoxide and 501,282,073.1 ppm for hydrocarbon emission which, together, roughly explain 6% of the country's overall GHG (Greenhouse gases) output per year. Considering that there are 122 cities in the Philippines, the 6% GHG contribution of Dipolog City is considered well beyond the normal threshold.

In addition, See (2017), Baguio City Council approved on first reading a proposed ordinance amending Ordinance No. 61, series of 2008 by including a provision where accounts of offenses of polluting vehicles shall be reset annually and not counted accumulatively in consideration of the fact that the normal wear and tear of vehicle is already beyond the control of the motorists. The implementation of the city's anti-smoke belching ordinance is part of the overall efforts of the local government to significantly reduce the pollutants in the city's air due to emissions from motor vehicles plying the various roads in the city daily and that it is the local version on how to effectively and efficiently

implement the provisions of the Clean Air Act. The proposal was referred to the City Council Committee on Ecology, Environmental Preservation and Health and Sanitation for the conduct of appropriate study and recommendation in future deliberations of the local legislative body.

According to the article of Barriunevo (2003), in Metro Manila alone, there are 55,596 jeepneys, utility vehicles and FX taxis; 52,932 motorcycles and tricycles; 11,086 commuter buses; 5,000 taxis; 6,619 "for hire" trucks; and an estimated 883,699 cars and vans. A separate study revealed that Filipino spend at least P2,000 every year on medical checkups and medications to cure diseases caused by the dirty air. Tuberculosis, lung cancer and other respiratory diseases are often attributed to air pollution.At 80 million Filipinos, this means that at least P160 billion is being spent annually (on the diseases), Mendoza said, pointing out the lost opportunities and low productivity of those who fail to work due to illness.

The major pollutants emitted from compression ignition engine with diesel as fuel are smoke and Nitrogen Oxide (NOx). When alcohols are both methanol and ethanol) are used as alternate fuels, the pollutants are to be checked for aldehydes also. The drawbacks associated with the use of alcohols in diesel engine are their low cetane number and high latent heat of vaporization, call for hot combustion chamber, which is provided by Low Heat Rejection (LHR) diesel engine. In the present study, the pollution levels of aldehydes are reported with the use of alcohols as alternate fuels. The Low Heat Rejection(LHR) engine has shown the reduction of pollutants levels when compared to conventional engine Kumar (2006).

A new study by researchers at the University of Toronto found that 25% of cars and trucks are causing about 90% of pollutions from the vehicle fleet. The scientists made on the spot measurements of 100,000 vehicles that drove past air-sample probes including a for the first time a proton transfer reaction time-of-flight mass spectrometer. It provided the time resolution required for the plume capture technique used in the study on College Street one of Toronto's many major roadways, says Evans. "As we looked at the exhaust coming out of individual vehicles, we saw so many variations. How you drive, hard acceleration, age of the vehicle, how the car is maintained, these are things we can influence that can all have an effect on pollution" (Richard, 2015).

Netwon, K. (1996) early measure for controlling emission is a basic essential for spark ignition engine emission control is a carburetor of injection system capable of extreme accuracy in meeting the fuel supply relative to the air entering the engine. Irregular combustion must be avoided during idling and on the overrun the mixture must either be totally combustion or the fuel supply totally cut off. Idling speed are typically, 750 rev/min with automatic and 550 rev/min with manual transmission.

The review of related literatures identify and studies presented above provided present overview on the global, national and local anti-smoke belching. Lastly, the related literature also provided basis for the interpretation of the result.

Theoretical and Conceptual Framework

The study is anchored to Rodelas, N. (2016) Smoke belching is the vigorous discharge of smoke from the vehicle's pipe and considered as number one contributor to air pollution. Public and private smoke analyzers are used to measure the number of air pollutants of a particular vehicle engine into the air. The analyzers measures diesel and gas-fueled vehicles with different particles and chemicals such as carbon monoxide, carbon dioxide, hydrocarbon that could affect or destroy the respiratory system, vehicles that emit more amount of gases and pollutions are those containing disturbed valve and injection timing. This result to an incomplete combustion and therefore produce more amounts of pollutants and gases that produces black smoke.

Figure 1 Shows the Conceptual Paradigm of the Study the potential benefit of anti-smoke belching ordinance. Much evidence already exists to suggest that the anti-smoke belching ordinance program is beneficial as previously suggested. Also, most of the case studies published have demonstrated the progression of the anti-smoke belching ordinance program from the time of its inception to its current state, thereby documenting the evolution of anti-smoke belching ordinance program. Thus, it is clear that anti-smoke belching ordinance program is important aspect in improving the ecological and environmental state of a country. If more cities or government were to implement effective anti-smoke belching ordinance programs, not only the ecological benefits, but also the environmental benefits would be substantial.

Main Variable

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┌─────────────────────────────────────────────┐
│ Efficacy of Anti-Smoke Belching Ordinance    │
│ in 1st district of Davao City                │
│                                              │
│   • Emission Standard                        │
│                                              │
│   • Emission Testing Procedures              │
│                                              │
│   • Testing Equipment, and Testing Materials │
│                                              │
└─────────────────────────────────────────────┘
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⬆
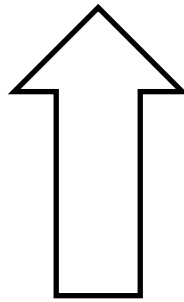
Moderator Variable

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┌─────────────────────────────────────────────┐
│           Profile of the Respondents         │
│                                              │
│             • Age                            │
│                                              │
│             • Gender                         │
│                                              │
└─────────────────────────────────────────────┘
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Figure 1 Shows the Conceptual Paradigm of the Study

Significance of the Study

The findings of the study used to beneficial of the following:

Davao City Local Government Unit. This study was used to show the implementation of Ordinance No. 0280 also known as the Anti-Smoke Belching Ordinance in 1st District of Davao City. To this, the Local Government Unit (LGU) was established programs, and seminars to the community and also to the drivers to further understand the ordinance.

The Land Transportation Office. This study was used to help the (LTO) to develop more policies and implementation that help to improve the Anti-Smoke Belching Ordinance in 1st District of Davao City in coordination with other agencies.

University of Mindanao. The findings of this study can be used by the University in promoting awareness of the Anti-Smoke Belching Ordinance to the students. Also, the university must serve as a front-line for teaching students how to become responsible stewards of the environment.

Community. The findings of this study would serve as their relevant information and awareness in Anti-Smoke Belching Ordinance in 1st District of Davao City.

Future Researchers. The findings of the study was use to benefit the future researchers by having the opportunity to used it as their reference conducting a research on Anti-Smoke Belching Ordinance in 1st District of Davao City.

Definition of Terms

The terms used in the study are operationally defined.

Enforcement. This refers to the process of determining whether concerned local government units and agencies in Davao City are imposing anti-smoke belching ordinance and obliging the compliance of prohibited acts as provided by Ant-Smoke Belching Ordinance No. 0280-06 in 1st district of Davao City.

Anti-Smoke Belching Ordinance in 1st District of Davao City. This refers to the law that provides for the systematic administration of activities which provide for standard emission testing, penalizing polluters improve air quality, and healthy environment and all other anti-smoke belching ordinance which do not harm the environment.

Efficacy. The ability to produce desired or intended result. Measure of the overall ability to accomplish a mission when used by representative personnel in the environment planned or expected for operational system considering organization, supportability and vulnerability.

Chapter 2

METHOD

This chapter presents the research design, research subject, research instruments, data gathering procedure and statistical treatment of data.

Research Design

This research was used the descriptive survey method which determines the prevailing condition and relationship required to better assess to status. Furthermore, it gives adequate and more accurate understanding of the findings from which the researcher based his analysis and interpretation.

Descriptive and one is interested in knowing the different conditions obtain among these subjects. (Good and Scates, 1972) the word survey signifies the gathering of data regarding present conditions. In this study, descriptive survey will be used in order to determine the efficacy of Anti-Smoke Belching Ordinance in 1st District of Davao City.

Research Subjects

This study was conducted in random emission testing centers in Davao City. The selection of the emission testing centers was based on the consideration that these emission testing centers are within the urban parts of Davao City while the remaining emission testing centers are located in the rural areas of the city. Also, the enforcement of the Ordinance No. 0280-06 in the urban areas is more evident than in the rural places. The emission testing centers costumers and drivers was the respondents of the study using the

random sampling technique. The emission testing costumer and drivers was chosen as the respondents because of the have direct knowledge and observation concerning the enforcement of the Anti-Smoke Belching Ordinance.There were two hundred (200) respondents who were randomly selected by the researchers and were given a set of questionnaires.

Research Instruments

The researchers was constructed a questionnaire to determine the level of Efficacy of Anti-Smoke Belching Ordinance in 1st District of Davao City. It was constructed based on selected provision of the said law. The questionnaire was composed of twoparts. Based on the results in Table 1, it can be seen that in terms of sex majority of the respondents are male with equivalent to 90.5 percent, and female with equivalent to 9.5 percent.

As to age resident respondents ages from 18 to 20 years old obtained a 3.0 percent, followed by the ages 21 to 30 years old with 30.5 percent, 31 to 40 years old with 45.0 percent, 41 to 50 years old and above with 21.5 percent.

The preliminary draft was submitted to the adviser for corrections and then a panel of experts was consulted to ensure its reliability and validity. The questionnaire was validated by Eduardo C. Berco, MS Crim., Ivy Q. Malibiran, MS Crim., and Agnes R. Capili, MS Crim.

Scaling of the variable for the Efficacy of Anti-Smoke Belching Ordinance in 1st District of Davao City is as follows:

Range of Means	Verbal Meaning	Descriptive Interpretation
4.20-5.00	Very High	if the anti-smoke belching ordinance is is always enforced
3.40-4.19	High	if the anti-smoke belching ordinance is often enforced
2.60-3.39	Moderate	if the anti-smoke belching ordinance is sometime enforced
1.80-2.59	Low	if the anti-smoke belching ordinance is seldom enforced
1.00-1.79	Very Low	if the anti-smoke belching ordinance is never enforced

Data Gathering Procedures

The following step was observed in conducting this research study:

1. The researcher was forward the letters to the random emission testing centers in 1st district of Davao City for their approval to conduct the study.

2. Upon securing the approval, the researchers proceeded in administering the prepared questionnaires to the respondents.

3. The answered questionnaires was retrieved and subjected for analysis and interpretation.

Statistical Treatment of Data

The following statistical tools used in the treatment of the data.

Frequency Count. This statistical tool was used in determining the actual numbers of the respondents.

Percentage. This was used in determining the ratio of the respondents on their demographic profile.

Mean. This was used to determine Efficacy of Ant-Smoke Belching Ordinance in 1st District of Davao City.

Analysis of Variance (ANOVA) This was used to determine the significant difference of Efficacy on Anti-Smoke Belching Ordinance in 1st District of Davao City when analyzed by age, gender.

Chapter 3

PRESENTATION AND ANALYSIS OF FINDINGS

This chapter presents the findings of the study in textual and tabular forms. The analysis and interpretations of findings are based on the statistical test used.

Efficacy of Anti-Smoke Belching Ordinance in 1st District of Davao City based on their Emission Standard, Emission Testing Procedure, Testing Equipment and Testing Materials,

Presented in Table 1 is the level of anti-smoke belching ordinance in Davao City.

The indication presented above is that it shows the total mean score of 4.03. The overall result showed that the Anti-Smoke Belching Ordinance in 1st District of Davao City is high and it is often enforced. In terms of Emission Testing Procedure, with the mean score rage from 4.09 (SD=0.400), Testing Equipment and Testing Materials, the mean score rage from 4.01 (SD=0.466), and Emission Standard, the mean scores range from 4.00 (SD=0.527).

Table 1. Level of efficacy of anti-smoke belching ordinance in1st district of Davao City.

Indicators	Mean ($\bar{x}$)	Std. Deviation (SD)
Emission Standard	4.00	0.527
Emission Testing Procedure	4.09	0.400
Testing Equipment and Testing Materials	4.01	0.466
Overall	**4.03**	**0.464**

According to Jamin, M. (2013)Republic Act No. 8749 (Philippine Clean Air Act of 1999) requires all motor vehicles to pass the mandatory emission test before the Land Transportation Office (LTO), it sets emission standards for all motor vehicles and issues pollutant limitations. Emission limit values are laid down by the Department of Environment and Natural Resources. These rules and regulation shall apply to all emission testing centers and other industrial establishments. The anti-smoke belching ordinance in 1st District of Davao City is effective due to the emission standards set by the emission testing centers and the implementation of the ordinance no. 0280-06.

Significant Difference on the Anti-Smoke Belching Ordinance in 1st District Davao City when the respondents are grouped According to Gender

Table 2. Shows the one-way ANOVA result in determining the difference of Anti-Smoke Belching Ordinance in 1st District of Davao City. Based on their emission standard, emission testing procedure, and testing equipment and testing materials when respondents are grouped according to gender. As revealed in the table, the anti-smoke belching ordinance in 1st District of Davao City based on their Emission Procedure was found have no significant difference among respondents regardless of gender group, based on the computed F-value of 6.697, $p = 0.404$ which is greater than $p < 0.05$.

Also, as revealed in the table, Anti-Smoke Belching Ordinance in 1st District of Davao City based on emission testing procedure was found have no significant difference among respondents regardless of gender group, based on the computed F- value of 6.697, $p = 0.993$ which is greater than $p < 0.05$.

Moreover, as revealed in the table, Anti-Smoke Belching Ordinance in 1st District of Davao City based on emission testing equipment and testing materials was found have no significant difference among respondents regardless of gender group, based on the computed F- value of 6.697, p = 0.351 which is greater than p < 0.05.

Table 2. Independent samples *t-test* results showing the differences on the extent of anti-smoke belching ordinance in 1st district of Davao City when analyzed by gender.

Variables	Group	N	$\bar{x}$	SD	T	P
Emission Standard	Male	181	3.99	0.529	-0.837	0.404
	Female	19	4.11	0.514		
Emission Testing Procedure	Male	181	4.09	0.409	0.009	0.993
	Female	19	4.08	0.315		
Testing Equipment and Testing Materials	Male	181	4.02	0.459	0.935	0.351
	Female	19	3.92	0.539		

*p<0.05

3. 2 Age

Thus, the null hypothesis stating no significant difference on the Anti-Smoke Belching Ordinance in 1st District of Davao City based on their emission standard, emission testing procedure, emission testing equipment and testing materials when analyzed by age was found true, thus failing to reject the null hypothesis. This mean that the difference of the mean score of emission testing costumers and drivers are not far enough to qualify for significance of the difference, thus concluding that the Anti-Smoke Belching Ordinance in 1st District of Davao City based on emission standard, emission

procedure, and emission testing equipment and testing materials is not vary in terms of age.

Chapter 4

SUMMARY CONCLUSION AND RECOMMENDATIONS

This chapter presents a recapitulation of the study including the summary of findings, the conclusion drawn from the findings and the researcher's recommendations.

Summary

The findings are summarized as follows:

1. The Anti-Smoke Belching Ordinance in 1st District of Davao City with an overall mean score of 4.03 described as high. In terms of (Emission Procedure), the mean scores range from 4.09 described as high. In terms of (Emission Testing Equipment and Testing Materials), the mean scores range from 4.01 describe as high.In terms of (Emission Standard), the mean scores range from 4.00 described also as high.

2. There is no significant difference in the Anti-Smoke Belching Ordinance in 1st District of Davao City when respondents are analyzed according to profile.

Conclusions

Based on the findings of the study, conclusions are drawn as follows:

1. Higher emphasis was noted on the Anti-Smoke Belching Ordinance in 1st District of Davao City in terms of its variables namely; Emission Standard, Emission Testing Procedure, and Emission Testing Equipment and Testing Materials.

2. There is no significant difference on the Anti-Smoke Belching Ordinance in 1st District of Davao City when analyzed by their profile.

Recommendation

Based on the findings and conclusions of the study, the following recommendations were presented by the researchers:

1. The Land Transportation Office pursued more vigorously the policies and implementation of anti-smoke belching ordinance, the Land Transportation Office (LTO) should coordinatewith the Ant-Smoke Belching Ordinance Unit (ASBU) to further enhance their communication to apprehend the violators.

2. Davao City Local Government Unit should continue to establish programs, seminars to the community and to the driver's about the implementation of Ordinance No. 0280 also known as the Anti-Smoke Belching Ordinance in 1st District of Davao City to sustain their connection to their daily duties and responsibilities.

3. University of Mindanao should continue promoting awarenessto the studentsto enhance their knowledgeabout the Anti-Smoke Belching Ordinance in 1st District of Davao City. and their responsibilities to the community and to the environment.

4. Future researchers may conduct another study, particularly the Anti-Smoke Belching Ordinance in 1st District of Davao City.

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