COMPARATIVE STUDY ANALYSIS BETWEEN COMMAND-AND-CONTROL AND MARKET-BASED METHODS OF CONTROLLING ENVIRONMENTAL POLLUTION IN MBEYA CITY, TANZANIA

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Abstract: The study investigates on the comparison in effectiveness of the two methods employed in controlling environment pollution that are command-and-control and market-based methods. Thus three objectives were formulated to address the issues over effectiveness of the two methods that is i) to examine the public bad characters of a pollution needing an effective control technique ii) to determine the operating mechanisms of command-and-control method of controlling pollution and iii) to explore the operating mechanisms of market based method of controlling pollution. It is through the use of quantitative research approach and systematic sampling technique from which views of the environmentalists, researchers and specialists in environmental issues and management in Mbeya City regarding the topic underhand were revealed. The data were collected by using questionnaires. The collected and processed data were analyzed inferentially by using the rotated component matrix, ordinary least squares and ANOVA in which the results were that the market-based method was more effective than command-and-control method with F- value = 10 at a significance level of 0.01. Thus the study recommend policy makers and other environmental protectionists to be used to market based technology intervening mechanism in protecting environment from pollution.

1.0 Introduction

Pollution control has been a global agenda which has attracted attention of most of environmentalists, researchers, geographers and development stakeholders in coming up with a single agreed way of controlling it. Pollution is a public bad in which its effects has no boundary (Páez-Osuna, 2001).The effects brought by pollution are non-divisible meaning that effects due to pollution affect the whole World. Being additional of unwanted materials (wastes) to the environment, pollution do deplete environment. Air pollution being emission of pollutants from industries, mining centers, moving vehicles and machinery increases wastes in air inform of green house gases such as carbon tetra fluoride (CF_4), carbon monoxide (CO), nitrogen monoxide (NO), nitrogen dioxide (NO_2), sulphur dioxide (SO_2) destroy the ozone layer (O_3) (Krup & Kickert, 1989).Ozone layer being a blanket of air is made up of three atoms of oxygen (O3) which prevent a direct penetration of heat from the sun to the Earth. But with addition of these pollutant gases, they tend to add impurities and thus changing O_3 from its translucent property to

transparent. The changed transparent Ozone layer allows large amount of heat from the sun to penetrate towards the Earth, the 6000 ^{0}C (Seinfeld and Pandis, 2016) being the amount of heat produced by the sun thus with the disturbed ozone layer therefore more than 37^{0}C of temperature is reflected on the Earth. The high the temperature reflected on the Earth's surface   cause increase of temperature on the earth's planet. The first layer of the atmosphere where increase in temperature is detected and experienced is the thermosphere. Increase in temperature on thermosphere part of atmosphere is the result of the so called global warming (Taha, 1997). Global warming in turn has been a source of many disasters over climatic change in recent years such as melting of ice, heavy rainfall unexpected floods, desertification and more other social costs (Ichinose, Shimodozono & Hanaki,1999).

It is from the effects of pollution which prove that pollution is a public bad to be a global debatable agenda (Harada,1995).Water pollutants indeed has found to be the main root cause of loss of biodiversity and unsafe water for human being uses, industries, navigation and irrigation (Goel, 2006). Increase in water pollutants in rivers has been a cause of growth of weeds which shallows the depth of the rivers, lakes and sea to be not used for navigation (Agarwal, 2005). Addition of unwanted materials in the rivers, has resulted into increase in salt called salinity and thus changing the P^H scale of river and lake water (Jha & Verma,2000) and thus causing movement of aquatic organisms (loss of biodiversity) as now those organism cannot survive in that acidic or alkaline water.

Pollutants on land (soil) change it into unproductive land and loss of biodiversity being the fauna, flora and other micro- organisms living on the soil (Economopoulos & World Health Organization, 1993).The acidic rain due to contaminated rainwater and the accumulated toxic green house gases such as sulphur dioxide (SO2), nitrogen monoxide has been a cause of change in soil P^H of which plants which survive in alkaline (basic) soil cannot longer survive and thus (Economopoulos, 1996). The effect is not to flora but also fauna which means that micro-organisms which cannot survive in acidic soil condition do shift. But it should be known some organisms such as nitrosomonous bacteria, scavenger add nitrogen to the soil and make the soil spongy or productive for the growth of plants and thus with pollution, the ecosystem (balance of nature) is disturbed. Moreover food chain and food webs are disrupted as the resulted of increasingly pollutants (Grimm, 2008).

The use of market based methods of controlling pollution has proved success to some countries like China where the 10% (Qu and Fan, 2010) is charged from the profit made as a compensation for the worse group over the emissions resulted from production. Consumptions of which the benefiting group is a production firm and not a third party   (society).With this market-based –method the emissions are traded, quantified to determine the actual volume of pollutants emitted for 10% to be charged equally and more (additional) units of emissions are charged fines (penalties). This method in China and

other industrialized countries has not only helped to reduce production of pollutants but also firms have came with new discoveries (ways).These methods do not pollute environment, decreases emissions, make wastes harmless or re-utilize the by-products (Stone,2011). They include wastes recycling; wastes re-use; use of water and light gases (such as helium, He; hydrogen, H_2; Methane, CH_4) as a combustible source of power in moving machinery which do not emit more toxic gases as it with fuels such as petrol, kerosene. More other techniques which absorb pollutant gases is that of afforestation and green house (that absorb the direct heat coming from the sun due to disrupted ozone Layer). Afforestation mechanism does tend to reduce carbon dioxide (CO_2) as to plants CO_2 is used as raw materials during the process of manufacturing food called photosynthesis.

Recycling has a common and popular method in Kenya of controlling environmental pollution especially for non-degradable wastes. Non degradable wastes are solid wastes which cannot rotten (Were, Moturi, Gottesfeld, Wafula, Kamau & Shiundu, 2014). They are not decomposed by micro-organisms in which once left on land uncontrolled they cause land pollution and once drained into water sources they add poisonous pollutant materials (Amemba, 2013). Addition of these non-degradable materials into water sources lead into loss of biodiversity (Oyake-Ombis, Van Vliet & Mol, 2015).

Despite of the efforts the government of Tanzania and other environmental management stakeholders has been taking (Mbuligwe & Kaseva, 2005) to find the problem of environmental pollution is reduced or stopped still its effects is rarely felt in a manner that the discrepancy is continuing. Use of forces and restrictive laws in controlling environmental pollution has found to perpetuate the problem, more government failure and ceasing of the production operations. This was then a knowledge gap this study intended to uncover which is therefore a driving force why the study was conducted.

This study investigation was confined to three research objectives which were to i) determine the public badness of pollution that has attracted attention on what effective method is to be chosen to control it between the command-and-control and market-based methods ii) to examine the operating mechanisms of command-and-control method and its appropriateness in controlling pollution and iii) to investigate the operating mechanisms of market based method and its effectiveness in controlling pollution.

2.0 Literature Review

2.1 Theoretical studies

The theory/model guided the study was Stochastic non linear programming model found by McGuinn (1992). The model postulated on the substitution effects over inputs used in production of air pollutants. The model is stochastic non-linear programming which post lays on the use of non-polluting inputs (materials) as a substitute of carbon-toxic emitting

inputs. The Model dictated on the use of environmental friendly source of energy which does not emit green house (toxic) gases. The model suggested that instead of using diesel , bitumen as a power source in moving mechanical engines then the none–toxic gases emitting materials such as helium, water and other inert gases might be used instead what was also proposed (Chamber lain 2016).

Despite of the constructive proposals by the theory regarding control of environmental pollution but none of the issues explicitly revealed by this study has touched, if not little being accommodated. While this study under discussion has uncovered the comparative study analysis of the two environment pollution control methods i.e. command-and-control and market based ones, none has been said by stochastic non linear programming economic model. Moreover   while Stochastic non linear programming model has been more proactive regarding air pollution, this study under discussion has been both proactive and reactive over the three main types of environmental pollution which are land, water and air pollution which was also little said Kolstad (2010).
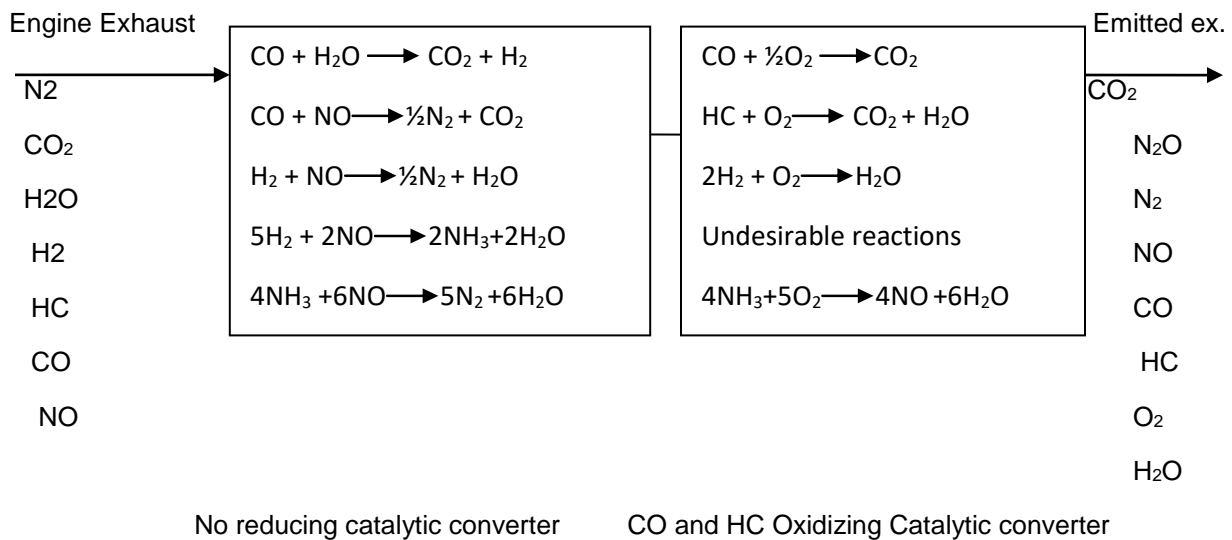
2.2 Empirical studies

Robinson and Shaheen (2006) on the study "environmental pollution control" revealed the significance of controlling pollution as it was reported that every species of organism produces wastes that are incompatible with its own existence. As human living on an over-more crowded planet, our main reason for abating pollution is self-preservation. It was further found that observing nature tells that someday, if we don't control it, our own waste will kill us. This study underhand has tried to reveal the comparison of effectiveness of command-and-control and market-based methods of controlling pollution different from the study by Robinson and Shabeen which has stipulated on the importance of managing wastes.

The study on the critical review of "The application of white rot fungus to environmental pollution control" narrates on the biological approach of disinfecting wastes (Du *et al.*, 2010) .Research on white rot fungi for environmental biotechnology has been conducted for more than 20 years. The biotechnology involved processes for cell growth and enzyme production including the factors influencing enzyme productivity and the methods for enhancement of enzyme production. The significant progress was achieved in molecular biology related to white rot fungi especially related to the extraction of genetic material (RNA and DNA) gene cloning and the construction of genetically engineered microorganisms. The development of biotechnologies using white rot fungi for environmental pollution control has been implemented to treat various refractory wastes and to bio-remediate contaminated soils. This study which is comparative in nature has discussed on the strengths and weaknesses of the two mechanical methods that is command-and- control and Market based methods of controlling environmental pollution in which the modifier method was suggested that is, mixed approach which dictates over

not using much forces and laws but also not allowing the market operate freely un-intervened different from the study by Du *et al.,* (2010) which was descriptive and reactive operational mechanism of the biotechnology-use of white rot fungus in making wastes harmless.

Engine modifications are directed toward improved control over the combustion cycle. These modification include electronic fuel injection, quick-heating intake manifolds, new ignition systems that do not use spark plugs, and cylinder-head modifications to reduce quenching zones and improve combustion. Exhaust system reactors, both thermal and catalytic are now being used to reduce CO and Hydrocarbon emissions. Another possible solution to curb the carbon monoxide effect is that which involve changing the fuel either by mixing petrol with other substances or by substituting another fuel for petrol. Alternative fuels are now being explored, particularly because of shortage of petroleum products and this approach could be successful in the near future. The three possible substance often mentioned as petrol substitutes are methane or natural gas (CH_4), hydrogen (H_2) and methanol (CH_3OH) (Rao, 2007) .All of three have been successfully tested as fuels in slightly modified forms of the existing internal combustion engines. In each case, the pollutant/ emissions were found to be reduced. Addition of alcohol to petrol has been found to decrease pollutant emissions. Efforts are being made to develop other similar non-polluting fuel systems. Replacement of the internal combustion engine with other types of engine like steam, electric and gas turbine engines is a potential solution to the emissions control problem. The gas turbine engine has half as many moving parts as a piston engine and low hydrocarbon and CO emissions levels. The major problems in using turbine engines in cars are poor fuel economy at light loads and city traffics speeds and acceleration lag the intricate series of interdependent reactions that go on in a dual catalyst exhaust emissions control system.

Engine Exhaust

N2

CO₂

H2O

H2

HC

CO

NO

$$CO + H_2O \longrightarrow CO_2 + H_2$$
$$CO + NO \longrightarrow \tfrac{1}{2}N_2 + CO_2$$
$$H_2 + NO \longrightarrow \tfrac{1}{2}N_2 + H_2O$$
$$5H_2 + 2NO \longrightarrow 2NH_3 + 2H_2O$$
$$4NH_3 + 6NO \longrightarrow 5N_2 + 6H_2O$$

$$CO + \tfrac{1}{2}O_2 \longrightarrow CO_2$$
$$HC + O_2 \longrightarrow CO_2 + H_2O$$
$$2H_2 + O_2 \longrightarrow H_2O$$

Undesirable reactions

$$4NH_3 + 5O_2 \longrightarrow 4NO + 6H_2O$$

Emitted ex.

CO₂

N₂O

N₂

NO

CO

HC

O₂

H₂O

No reducing catalytic converter   CO and HC Oxidizing Catalytic converter

The study by Rao (2007) was a reactive –preventive measure over air pollution different from the study under examination which has explained the strengths and weaknesses of the two pro-active methods of pollution control that is command –and-control and market-based methods.

3.0 Methodology

The study used a quantitative research approach in a linkage with a cross sectional survey design. This cross-sectional study was conducted in Mbeya City following an employment of a market-based method of controlling pollution in place. One of the large market based method is that executed by CICO Company in recycling the solid and liquid pollutants/wastes reproduced in the City. Mbeya is nowadays growing and large number of people is coming for commercial activities and settlement and therefore this has also resulted into wastes accumulation. Thus the management and control of waste pollutants is becoming complicated to call for innovative and effective method of handling them. It is with this more produced pollutants in which other scholars have been suggesting on the use of restrictive laws, forces and ambush by even closing the production firm or/ and charging polluters fines which are then baseless. But for a long time now use of command-and-control method of controlling pollution has continue leading into government failures, complicated administration and more other malpractices. Thus it is in the same line why a researcher decided to come up with this study in which the unit of analysis was systematically obtained. And it is through the use of questionnaires in which the factual perceptions from the target group including 80 environmentalists, 30 researchers from Universities and 40 specialists in environmental issues and management found in Mbeya City were involved. To arrive to 150 sample of respondents the study employed confidence level of 95%, maximum error of estimate of 10% and the p-value was 50%. Moreover the study used a rotated component matrix analysis test; linear regression and ANOVA test data analysis tools with the aid of SPSS version 24.

4.0 Findings and Discussion

4.1 Pollution as a public bad

Since pollution does not affect one person or one area/ region/country/continent then its control attract attention of many people or stakeholders across the world. Thus controlling pollution should not be taken as the work to fullfilled by one individual or Institutions say NEMC in Tanzania through using restrictive laws but a collaborative juncture. As it has noted above the collaboration can be country, regional or continent wise.

The pollution as other negative externalities (0.61) it affect the environment in that large extent in which if an innovative effective method will not be employed then this environment will deplete. With air pollution for instance by being not limited (See Table 1) then the effects of it say global warming is global (0.72) and that is why on the study by United Nations Convention on Environment and Development (2002) suggested that the

issues relating to environmental destruction and management should be a global agenda. This will then help the developing countries like Tanzania which is facing challenges over employing new and effective commercial and technological ways of controlling pollution.

The Kyoto Protocol   international agenda is addressing on controlling global warming by stopping emissions of green house gases from industries, and moving vehicles by opting over the use of water, light gases (such as helium, *He*) generating power for moving machines (Sankar, 2000).The global warming which results due to destruction of Ozone layer is a deadly discrepancy leading into i) melting of ice ii)flooding iii) drought iv) desertification v) shallowing of the depth of sea due to excessive evaporation. These effects are not divisible or un-excludable (0.66) and they have no limit.

Table 1: Pollution as a public bad

S/N	Predictors	Component matrix				
		1	2	3	4	5
1	Pollution is a negative externality				0.61	
2	Effects of pollution has no boundary		0.72			
3	Pollution in not divisible	0.66				

Source: Authors' computations (2018)

For a significance level measured between 1%- 5% from Table 1 above it shows that pollution is a negative externality that need an effective method for thorough doing away with it following its rotated component matrix=0.61 at a significance level of 4. Though the strength of contribution with predictor 1 was not as it was with predictors 2 and 3 but all three predictors has shown to be the characteristics of public badness of the pollution. Thus an effective method of handling of this problem to be employed will ensure that it is curbed.

Furthermore if the human remains from homes which are collected and recycled at Kalobe in Mbeya City Council was to be disposed to the water sources, catchment areas such as to Meta and Nzonwe river streams they could actually causing disappearance of   the organisms living in and thus disturbing an ecosystem.

Moreover if the solid and liquid wastes from homes at Mbeya City Council could not be recycled by CICO Company at Nsalaga-Uyole, this could be a disaster to say the city could be polluted in a manner of becoming unhealthy and non-safe area to live. It is therefore from this study therefore policy makers, environment regulators and community in general will be aware over the best method of controlling pollutants. As it has revealed by other scholar such as over the use of forces, strictly laws and regulations leading to further government failure, its administration being cumbersome then that is why this study has been conducted.

It is with the same discrepancy to the command-and-control method of controlling pollution that is why more innovative , new discoveries which are market based method such as green house, use of light-noble gases (helium, hydrogen) and water (H_2O) moving vehicles engine power sources. These moving vehicle sources of energy do not emit toxic pollutants called green house gases such as carbon monoxide (Co), carbon tetra fluoride (CF_4), sulphur dioxide (SO_2).

By putting market based method of controlling pollution in implementation, China (Lei, Zhang, & Streets, 2011) used to trading of pollution or emissions. In which about 10% of the profit is made over a minimum acceptable volume of emissions produced from industries is the one which is paid as emissions charge. With heterogeneity abatement and appropriate quantification of the negative externalities brought by pollution, then any excess unit of emissions are charged, hurt fines, penalties to discourage the practice. This therefore because the producers, consumers invert in new other methods which emit less wastes to the environment and that is how this special market-based method used by China is operating. Thus the method does not uses much forces, a costing administration to observe the polluters become aware and undertake a discovery of the new environmental free polluting technologies.

 As a public bad, pollution carries this model MPB<MSC or MPB>MSB where MPB means marginal private benefits; MSC is the marginal social cost and MSB=marginal social benefits. The effects of pollution to be termed as a public bad which need effective control measures for the optimal model MR=MC where MR means marginal revenue and MC means marginal cost or MSC= MPC or MPB=MSB to be achieved as shown in subtitle 4.2, 4.3 and 4.4.

4.2 Command-and-control-method of controlling pollution

This method involves the use of forces, rules and regulations in combating pollution. With these methods the polluting firm is subjected to payment of fines and penalties if happen to pollute environment. Fines and penalties charged reflect violation of terms and condition over environmental conservation. It has mostly reviewed policy makers, environmental conservation and Management Councils and authorities have been charging heavy penalties to cause the producing firm to cease its operations. And sometimes it has observed the problem to be rampart. That means command- and-control method has mostly proved failure called government failure due to complications of administering it. Command-and-control is subjected to homogeneous abatement in which there is no proper quantification of the units of pollutants emitted and thus charging fines is baseless against the volume of emissions. After all it should be noted that any manufacturing process is associated with emissions, but the problem is how much volume become harmful to the environment and indeed how properly the emissions are to be handled not

to cause problem to third party for sustainable developments. The same what was revealed from the field as shown in Table 2.

Table 2: Ordinary Least Square Analysis

Predictors	Criterion: Command-and-Control method
1. Uses forces, and laws (Non diplomatic method)	0.456(0.234)**
2. Fines and penalties charged are base-less	0.561(0.410)*
3. Heterogeneous abatement	-0.056(-0.321)
4.Complication in administration	0.467(0.210)***
5.Effective method of controlling pollution	-0.554(-0.225)
Nagelkerke R^2	0.062
X^2-Value	14.277**

Note: *** Significant at 1%; **significant at 5%; *significant at 10%
Source: Authors' computations (2018)

3 out of 5 predictors showed a positive relationship and statistical significance over a criterion-command-and-control method of controlling pollution. Uses of forces and laws (R= 0.56, β =0.234) at a significance level of 5% indicated that the command and control method is a non-diplomatic method of controlling pollution. The same results has been shown with other two predictors despite of the revealed minor difference in the strength of association between that is fines and penalties charged are base-less (R = 0.561,β=0.410); and complication in administering the Command and control method ,(R = 0.467, β =0.210).The two predictors, heterogeneity (R= -0.056; β= -0.321) and effectiveness (R= -0.554;β= -0.225) showed a negative relationship and statistically non-significant to the criterion command-and-control method of controlling environmental pollution. The result over heterogeneity above in using command-and-control method for controlling pollution is consistent with what was also suggested by Austin and Dinan (2005) on the study "Clearing the air: The costs and consequences of higher CAFE standards and increased gasoline taxes" in which it was revealed heavy tax charged for polluting firm is the result of ceasing of supply. But in general the variables comprehend to the model by Nagelkerke R^2 =0.062 with Chi-square value = 14.277 at a significance level of 5%.

4.3 Market based method of controlling pollution

This involves trading emissions. With these methods the minimum threshold level of volume of pollutants to be emitted is determined from which price is charged basing on the quantity of emissions. This concept is similar to what was said by Goddard (1997) on the study "Using Tradable Permits to Achieve Sustainability". Surplus units of pollutants emitted are what is now charged as a penalty or fines. It is with this method where manufacturing or consumption firm become part and parcel of the cost of the pollution. Indeed it is with this method in which the heterogeneity abatement is attained. In-order not to incur more costs and fines to be paid, the polluting firm think of coming with new

methods (new discoveries) which do not emit more pollutants. The producing firm in this way becomes accountable and responsible in environmental conservation and management as it was also said by Chiang, Tsai, Yao *et al.*, (2008) on his study over discarding the use of gasoline combustible fuels which emit toxic green houses and adopt over the over the use of light fuel such as use of water, helium gas. In here the motor vehicle engines are made to be used to these sources of power. It is with market – based method, the ambiguities in collection of the charges (eg tax), penalties and fines become not a case and administration in process of controlling pollution becomes not a complicated juncture that could further led into corruption and other malpractices. More results were shown in Table 3 and 4 below:-

Table 3*: Linear regression testing*

Independent variables	Dependent variable: Market based methods
1. Emissions are traded (priced)	0.456(0.112)*
2. The minimum threshold volume of emissions is known	0.032(0.213)**
3. Heterogeneity abatement	0.056(0.321)*
4. Discoveries of new methods which do not much pollute environ.	0.434(0.215)***
5.Firm's responsibility and accountability	0.554(0.265)*
6. Firm's become part and parcel of the social cost	0.102 (0.501)
7.Effective administration of the pollution control	0.062(0.001)*
8. Does not attract for corruption and other dishonest practices	0.210(0.035)**
R^2	0.509
F-Value	39.935**
UNDUMMY	**YES**
Observations	150

 Note: *** Significant at $P<0.01$; **significant at $P<0.05$; *significant at $P<0.10$

Source: Authors' computations (2018)

From Table 3 above all 8 independent variables show a positive relationship and statistical significance with dependent variable though the positivism and significance was at different strengths and level respectively. Trading of emissions 0.456(0.112) at a significance level of $p<0.10$; quantification of the minimum threshold level of units of emissions 0.032 (0.213) at $p<0.05$; heterogeneous abatement 0.056(0.321) at $p<0.10$ indicate the variables to fit the model. Moreover discoveries of the new methods 0.434(0.215) at $p<0.01$ comprehend with what was said by Bauner, Laestadius & Iida

(2008) on the study Evolving technological systems for diesel engine emission control: balancing GHG and local emissions: Clean Technologies and Environmental Policy; firms' responsibility and accountability 0.534(0.265) at p<0.10; firm accommodating social cost 0.102(0.501) at p<0.10 are other features showing how appropriate the market-based method of controlling pollution 0.062 (0.01) at P<0.1 is .This prove that market based method is an effective method of curbing the problem of pollution which indeed do not attract for corruption and other dishonest practices 0.210(0.035) at a significance level of P<0.05.Similar to what was reported by Montero, Sanchez and Katz (2000) on efficiency over the use market-based method of controlling environmental from being polluted. The facts pertaining the variables to fit the model was further proved by R^2= 0.509 and F-value = 39.935 at p<0.1 given that UNDUMMY effects was allowed at observations (X- values) = 150

Table 4: ANOVA analysis test

Source	Sum of Square	df	Mean square	F	Sig.
The C-A.C & M-B	240	3	80	10	0.01
Residual	96	12	8		

a. C-A-C: Command and control method of controlling pollution
b. M-B: Market based method of controlling pollution
c. Significant at p<1%
Source: Authors' computations (2018)

From Table 4 above with F=10 at significance level of 1% of the two variables command-and- control and market-based methods of controlling pollution shows a unique distinction that exist between the variables. The F =10 indicate a great difference in effectiveness and appropriateness in controlling pollution between the two methods of which the reality over its effectiveness has been explicitly shown in Table 1 and 2 above. A clear distinction in appropriateness between the two methods of controlling environmental pollution is from the facts that the command-and-control method led into government failure. The market-based method of controlling pollution is a diplomatic method in which as more social cost is incurred is the great fines to be paid for compensations of the worse- third party. The more social cost to be incurred by the polluting firm is because of polluting environment excessively more than what is accepted by the policy to be a minimum threshold volume of emissions to be traded.

4.4 Government Intervention in controlling pollution

In controlling pollution, the government is recommended to come in between the benefiting group (producing firm) and third party (society)-worse group by enforcing rules and regulations to harmonize the gap. It with government intervention (Government of India (Ministry of Environment and Forests) (2004) in which instead of the government using more forces, restrictions and rules which may harm either of the party between the benefiting and worse ones then compensation should be used to smear the complains existing .Compensation of the worse-group should be efficient and effective through better

quantification of effects and losses incurred by a worse group. Infact the government should not cause ceasing of firms' operations because by doing that led into market supply inefficiency. Shortage in supply of goods artificially created by ceasing in operation of a particular firm is harmful as this cause excessive demand of that particular product unsupplied of which in a long run the effects extend to imperfect market. The government therefore should create favorable environment for steady supply (production) and/or consumption but each firm should be environmental considerate by not polluting it for sustainable development (Montero, Sanchez & Katz, 2000). Sometimes it is recommended that the emissions is(are) to be traded but if it happen that the purpose of trading pollutants to observe pollutants (emissions) is reduced then strictly rules and regulations are to be in-acted. The process of controlling pollution should not too much of use of forces (Huber and Seroa da-Motta , 2012) but at least improvement is to be observed now and then because after all there is no production or consumption process which do not emit pollutants at all. But how much emissions is to be produced for effective handling was the focus of this study. That is to say the mixed method is the best method of controlling pollution, the method which involves government interventions, the method which was also recommended by Bartle and Vass (2007).

5.0 Conclusion and Recommendations

Pollution is a public bad which affect land, water and air thus effective control is to be in-acted. There are two major categories of the methods of controlling pollution which are command- and-control and market–based methods. While command-and-control revealed to be used to restrictions, policies, forces and laws the market–based methods found to be used to be diplomatic ways which are more commercial oriented. While command-and-control method found to be difficult to administer, the market based method was revealed to be user-friend and simple to administer. Simplicity in administration was due to the fact the more volume a firm has produce, the more tax say carbon tax levy is to be paid. This either was the abatement said to be met from which the more a firm pollute the environment the more cost of production and compensation is to b incurred. It is from this then most of firms revealed to be optimal not to cause pollution become public bad.

Due to government failure over use of command-and- control then scholars such as Glenn & Ranjit (1992) as it is with this study is recommending on the use of intervened market – based methods which entails a pollution control to be conducted or administered in commercial ways. With this market-based method, the philosophy is that firm should continue producing to continue sustaining market efficiency but at optimal manner not deplete environment and other species in side. Rules and regulations are used in this market based method but not destructive to cause shortage or stoppage of supply which happen to reverse market equilibrium Market-based-method of controlling to be put into

action should not be taken for guaranteed that producers pollute environment unlimitedly and no one to question for worse-off created.

6.0 Significance to the Study

This study will be a lesson to polluting firms on adapting to the better ways of handling pollutants. The better ways talked about are those which are environmental friend as the polluted environment become unsafe to leave. It is expected that the community will be used to appropriate methods of disposing wastes and thus make the planet Earth prestigious to leave in.

By recommending the intervened market based method of controlling environmental pollution then the government and more other individuals and private firms will capitalize on it as a commercial activity (a business opportunity to be created) by undertaking recycling, re-using, investing on the use of light moving vehicles power sources. This therefore will make wastes and other pollutants as a commodity and not as by-products

It is with this study in which the policy makers, regulators and other environmental management stakeholders will be acquainted with the effective ways of controlling pollution as a public bad. As it is used and still being used by most of regulators in developing countries like Tanzania where use of these new technologies of handling wastes is lagging behind to found that much forces and very strictly laws are used as the only solutions of curbing the problem of pollution. Thus by opting on the recommended market based method of controlling pollution then intervening the process will not be much costing and complicated to perpetuate the market failure as now the pollutants will be commodities.

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