



Urban Air Pollution Control Caused by Exhaust Gas Emissions in Developing Country Cities in Public Policy Law Perspective

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ABSTRACT

The increase in air pollution in cities generally comes from motor vehicle emissions. The purpose of this paper is to analyze the regulation and role of the city government through public policy to control air pollution. The regulation of air pollution control with legislation has regulated fuel standards, air capacity, negative impacts on the environment due to the use of space, and the exhaust emission threshold. Interrelated planning and regulatory actions can lead to significant reductions in pollutants that change the climate. Public policy regarding air pollution control by the city government is accommodated by the application of the principle of decentralization through regulation. The city government formulates public policies to improve the ability of the community to avoid air pollution and reduce damage to public health caused by air pollution, as well as carry out activities in planning, and controlling air environmental policy programs that lead to achieving environmental quality.

Keywords: Air Pollution, Public Policy, Pollution Control, Urban Management

JEL Classifications: Q52, Q53, K32

1. INTRODUCTION

Air pollution in several big cities, such as Jakarta, Surabaya, Semarang and Medan has been very alarming. Several studies on air pollution with all the risks have been published, including the risk of blood cancer and asthma (Brunekreef and Holgate, 2002). But, it is rarely realized, how many thousands of city residents die indirectly from air pollution, which is a reported respiratory tract infection. In the next ten years, it is estimated that there will be a significant increase in pulmonary and respiratory disease sufferers. Not only acute respiratory infections which now rank first in disease patterns in various major cities, but also increase the number of people with asthma and lung cancer. The high risk targets for air pollution are mainly school children who are exposed to air pollution every morning and afternoon due to the activities of leaving and returning to school, as well as workers, passengers and drivers of public transportation and other public road users. The main culprit for the increase in air pollution is motor vehicle emissions. So far, many people suspect, that

the biggest contribution of urban air pollution is from industry. Rarely is it realized that those who have a large share are gas and particles emitted by motorized vehicles. Ironically, the number of motor vehicles is increasing, as with the increasing number of motorized vehicles, the more advanced and prosperous the community lives. Data on the number of motorized vehicles in Indonesia from 2010 to 2014 are seen in Table 1 show data on the number of motorized vehicles in Indonesia from 2010 to 2014. Furthermore, in municipal case of Surabaya, the number of land transportation in Surabaya city was rapidly increasing from 2009 to 2015 (Table 2).

New model vehicles are produced in large quantities in line with market demand, while old vehicles are difficult to destroy because of their affection and needs. The increase in the number of motorized vehicles follows the calculation series, while pollution prevention efforts still follow a series of measures, and even then it is not maximized. In large cities, the contribution of motor vehicle exhaust gas as a source of air pollution reaches 60-70%, while the

Table 1: Number and type of motorized vehicles

Types	Quantity (units)				
	2010	2011	2012	2013	2014
Passenger car	8.891.041	9.548.866	10.432.259	11.484.514	12.599.138
Bus	2.250.109	2.254.406	2.273.821	2.286.309	2.398.846
Freight cars	4.687.789	4.958.738	5.286.061	5.615.494	6.235.136
Motorcycle	61.078.188	68.839.341	76.381.183	84.732.652	92.976.240
Total	76.907.127	85.601.351	94.373.324	104.118.969	114.209.266

Source: BPS, 2015

Table 2: Data on the number of motorized vehicles in Surabaya city by type

Types	Quantity (units)						
	2009	2010	2011	2012	2013	2014	2015
Sedan and the like	51.610	50.555	48.258	47.459	50.164	53.024	56.046
Jeep and the like	29.022	29.601	28.312	29.635	31.324	33.110	34.997
Station wagon and the like	183.645	198.960	199.360	217.686	230.094	243.209	257.072
Bus and the like	2.064	2.279	2.304	2.486	2.628	2.777	2.936
Trucks and the like	86.987	89.530	92.238	100.809	106.555	112.629	119.049
Motorcycle and the like	1.129.870	1.213.457	1.274.660	1.402.190	1.482.115	1.566.595	1.655.891
Heavy equipment and the like	73	71	80	150	159	168	177
Total	1.483.271	1.584.453	1.645.212	1800,415	1.903.039	2.011.512	2.126.168

Source: BPS, 2015

contribution of exhaust gases from industrial chimneys ranges from only 10 to 15%, the rest comes from other combustion sources, such as households, waste burning, fires forest and others. Actually there are many air pollutants that need to be watched out, but the WHO (World Health Organization [WHO]) specifies several types of pollutants that are taken seriously. Air pollutants that are harmful to human health, animals and easily damage property are particulates that contain particles of hydrocarbons, sulfur dioxide, nitrogen oxides. All of this is emitted by motorized vehicles passing by on the highway. Outdoor air pollution is one of the most significant environmental threats to human health. According to WHO, air pollution contributes 3.7 million premature deaths every year. The current world population is around 7.3 billion people, with only more than half in urban areas. As more people move to cities around the world, deaths from urban air pollution will increase substantially. By 2050, the world population is expected to grow to more than 9 billion, and the share of the population living in cities is projected from 50 to 70% - up to 6.3 billion people. The rapid growth of urban population, the demand for energy and transportation will increase. As a result, the OECD projects that if there are no policy changes, deaths from outside air pollution will double from current levels in 2050 (IGU, 2015. p. 4). Urban growth has caused many environmental problems, especially urbanization which leads to the loss of green open space and increased traffic and energy consumption. Air pollution is one of the main environmental problems associated with urbanization. This has led researchers to ask whether cities are densely populated or do not contribute to reducing air pollution (Cho and Choi, 2014). The data from Yudha (2017) revealed that Indonesia is 4th largest emitter in the world with land transportation accounts for around 12% of total national CO₂ emissions, and almost 90% of urban air pollution (CO, HC, NO_x, SO_x, PM, O₃) (Table 3 and Figure 1).

The most serious impact on other urban pollution is the impact on the ozone earth (global warning/greenhouse effect). Damage to the ozone layer of the earth has an impact on climate change, so natural

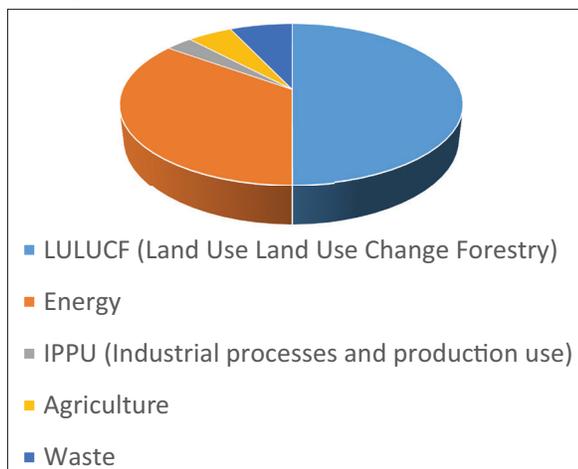
disasters often occur. Analysis of the relationship between natural disasters and air pollution is indeed rather complicated, because the link is not very transparent, in contrast to the relationship between natural disasters and soil pollution, land reclamation, deforestation, water police or the breakdown of a giant reservoir. However, many facts show that air pollution can be an indicator of the ongoing disruption of atmospheric harmonica as a result of exceeding the limits of ecological tolerance of air by various types of contaminants, which ultimately lead to natural disasters. Air pollution which has the potential to cause a global environmental crisis, namely depletion of the ozone layer, global warming and decreased atmospheric oxidation capacity. The three threats have a mutually supportive relationship, the existence of one threat strengthens the presence of other threats, causing the atmosphere to suffer damage that continues to worsen. Air pollution causes a decrease in health and the environment. The health problems range from respiratory, nerve, cancer, heart disease and IQ decline, while environmental disorders are visibility damage, acid rain, crop and building damage, and weather changes (Boediningsih, 2011. p. 120). The impact of traffic density in the city of Surabaya raises air pollution, besides that it also causes noise pollution by exhausting emissions from motor vehicles which are chemical elements in free air that exceed the longer natural content can reduce free air quality (Boediningsih, 2011. p. 124). The purpose of this paper is to analyze air pollution control arrangements and the role of city government in regulating air pollution control as public policy. Therefore, formulated legal issues and public policies are what can be done by the city government in regulating air pollution control as public policy.

2. METHOD

This paper is legal research. As legal research, it uses a statutory approach. The statute approach is a research activity by examining all forms of legislation and regulations relating to legal issues (Marzuki, 2016. p. 133). To solve this problem using references from primary legal material, namely legal material that is

Table 3: Emission contributions by sector in 2010 (millions tons of CO₂ emissions)

Contributors	Quantity (millions tons of CO ₂ emissions)	Percentage	Percentage of energy emission
LULUCF (Land Use Land Use Change Forestry)	647	50	
Energy	453	35	
Power generation			42
Transportation			30
Industry			22
housing			7
Waste	88	7	
IPPU (Industrial processes and production use)	36	3	
Agriculture	66	5	

Figure 1: Emission contributions by sector in 2010

Source: Yudha (2017)

authoritative means that has the authority in the form of legislation. In addition, references are taken from publications relating to public policy studies.

3. ENVIRONMENTAL POLLUTION

Environment as a resource is an asset that can be needed for the welfare of society (Supriadi, 2010). According to the world an average of 49% of air pollution is produced by transportation, 28% of fuel is fueled by factories and electric planes, 13% of volatile evaporation, 3% of solid waste disposal, and 7% of various sources others (Veetil, 2012. p. 5). According to Satya Widya Yudha that “land transportation contributes around 12% of the total national CO₂ emissions, and almost 90% of urban air pollution (CO, HC, NO_x, SO_x, PM, O₃), 90% of transportation emissions comes from road transportation, 70% of city pollution comes from the transportation sector (Yudha, 2017).” Government policy settings in creating environmental balance are actualized by the promulgation of the first regulation governing the environment, namely Law Number 4 of 1982 concerning Basic Provisions for Environmental Management, which was then replaced with Law No. 23 of 1997 concerning Environmental Management Life, which was subsequently replaced with Law Number 32 of 2009 concerning Environmental Protection and Management. The Environmental Law functions as a framework law to protect the environment and does not specifically regulate the prevention of air pollution (Husein, 2009. p. 44). The Environmental Law affirms

that everyone has equal rights to a good and healthy environment. This means that every Indonesian citizen, both men and women, adults and children, poor and rich, are all entitled to good and healthy air. Therefore, clean and healthy air is absolutely necessary.

Even the importance of a good and healthy environment for the welfare of Indonesian citizens is further strengthened by the inclusion of these provisions in the second amendment to Article 28 of the 1945 Constitution. Air is always available cleanly and healthily, emissions from the road transportation sector which is one source of air pollutants need to be controlled. Air is an environmental medium which is a basic human need so it needs to get serious attention. Based on Article 1 number 14 of Act Number 32 of 2009, environmental pollution is the entry or inclusion of living things, substances, energy, and/or other components into the environment by human activities so as to exceed the prescribed environmental quality standards. Growth in urban development such as industry, transportation, offices and housing also has a negative impact, one of which is air pollution and increased ambient air pollution in various areas or environment. Ambient air in Government Regulation Number 41 of 1999 concerning Air Pollution Control is defined as free air on the surface of the earth in the troposphere which is within the jurisdiction of the Republic of Indonesia that is needed and affects the health of humans, living things and other environmental elements.

According to Government Regulation No. 41 of 1999 pollutant sources are defined as every business and/or activity that emits pollutants into the air which causes air to function improperly), among others: Sources of emissions that are moving or not fixed somewhere that come from motorized vehicles. Specific mobile sources come from trains, airplanes, ships and other heavy vehicles, sources of emissions that remain at a place, immovable sources originating from forest fires and burning of waste, pollutant sources that use air or solid media for distribution. From various sectors that have the potential to pollute the air in urban areas, the transportation sector generally plays a very large role compared to other sectors. Anticipating the impact of air pollution in accordance with the application of Government Regulation Number 41 of 1999 concerning Air Pollution Control related to the Blue Sky Program. The consideration of the stipulation of Government Regulation Number 41 of 1999 is 1. That air as a natural resource that affects the lives of humans and other living creatures must be maintained and maintained for the preservation of its function for the maintenance of human health and welfare and protection of

other living beings; and 2. That in order for air to be as beneficial as possible for the preservation of environmental functions, air must be maintained, maintained and guaranteed quality through air pollution control.

The Blue Sky Program is regulated by the Decree of the Minister of Environment No. KEP-15/MENLH/4/1996, which in Article 3 stated that the objective of the Blue Sky Program is: 1. The creation of a working mechanism in the control of air pollution that is efficient and effective; 2. control of air pollution; 3. achieving ambient air quality that is needed by the health of humans and other living things; and 4. the realization of environmentally conscious human behavior. The Blue Sky program at the central level is coordinated by the Minister and as the person in charge of the activities of the Blue Sky Program is the Head of Bapedal (Article 4). Article 5 states that: 1. The blue sky program is carried out in the Level II District/Municipality in each Province; 2. The Province of the Blue Sky Program is determined by the Minister, and 3. The procedure for proposing the Blue Sky Program Province to Ministers is determined by the Head of the Environmental Impact Management Agency.

4. ENVIRONMENTAL PUBLIC POLICY

The regulation of air pollution control is not only regulated in laws and regulations relating to the environment, but is regulated by some Laws. First, Law No. 22 of 2001 concerning Oil and Gas, which is regulated concerning fuel oil and certain processed products that are marketed domestically to meet the needs of the community must meet the standards and quality set by the government (Sihombing, 2018). Second, Law No. 25 of 2004 concerning the National Development Planning System, which regulates in Article 1, affirms that planning is a process for determining appropriate future actions, through a sequence of choices, taking into account available resources, Article 2(4) stated that the objectives of the national development planning system are to support coordination between development actors; guarantee the creation of integration, synchronization and synergy between regions, between spaces, between times, between government functions and between the Central and Regional Governments; guarantee the linkages and consistency between planning, budgeting, implementing and monitoring; optimize community participation; and guarantee the achievement of efficient, effective, equitable and sustainable use of resources. While the definition of planning and objectives of the national development planning system above, there is actually an opportunity to direct the national development plan to take into account the capacity of air.

Third, Law No. 26 of 2007 concerning Spatial Planning, which regulates in Article 3 states, that the implementation of spatial planning aims to create a safe, comfortable, productive, and sustainable national territorial space based on national resilience by the realization of harmony between the natural environment and the artificial environment; the realization of integration in the use of natural resources and artificial resources by paying attention to human resources; and the realization of protection of space functions and prevention of negative impacts on the environment due to the use of space (Lisdiyono, (2017); Lisdiyono, 2018).

While the purpose of spatial planning as above, there is an opportunity to control pollution through spatial planning. Law No. 22 of 2009 concerning Road Traffic and Transportation, which regulates in Article 48 requires that every motorized vehicle operating on the road to meet technical requirements and roadworthiness. One of the roadworthiness requirements is the measurement of exhaust emissions. Meanwhile, the exhaust emission threshold is determined by the Minister of Environment as stipulated in Article 127 of Government Regulation Number 44 of 1993 concerning Vehicles and Drivers, Article 8 Government Regulation Number 41 of 1999, and Article 7 paragraph (3) Decree of the Minister of Industry and Trade No: 275/MPP/Kep/6/1999.

Dye (2001) states that public policy is whatever the government chooses to do or not to do. The definition is included in the classification of policies as a decision because the definition focuses on the government as an actor who has the authority to make decisions, whether the decision to do something or not do something. Public policy definitions like this have the following implications. Public policy is in the form of a choice of government actions, and Government actions are allocated to the entire community so that they are binding. The actions of the government have certain objectives, and Government actions are always oriented towards fulfilling public interests (Susilo, 2015). The focus of the study on public policy is the public interest. Therefore, in this context "public policy and its policy makers (bureaucrats) must have an orientation on strong public interests or Islamy (2003) call it with the spirit of the public." In a democratic legal state, the administration of government is always carried out through public policy. Good government performance must begin with good policy, and good policy can only be achieved through a good policy process.

Policy issues are important to observe with some considerations. First, that the process of making public policy in any political system usually departs from the existence of a certain level of awareness of a particular problem or issue. Second, the degree of openness, namely the relatively democratic level or not of a political system, among which can be measured by the way the mechanism of the issue of issues becomes a government policy agenda, and ultimately becomes public policy. An issue will tend to get a response from policy makers, to be a public policy agenda if it meets certain criteria as stated by Cobb and Elder (1972), there are three prerequisites for the policy issue)to be included in the systemic agenda, namely: 1. The issue gain broad attention or at least foster public awareness; 2. there is a perception or view of the community that some actions need to be taken to solve the problem; 3. there is a common perception from the public that the problem is a legitimate obligation and responsibility of the government to solve it. Anderson (1976) put forward some characteristics of the policy. First, Public policy is purposive, goal-oriented behavior rather than random or change behavior. Every policy must have a purpose. That is, the making of a policy may not only be of origin or because there is an opportunity to make it. If there is no purpose, there is no need for policy. Second, public policy consists of course of action - rather than separate, discrete decision or actions - performed by government officials. That is, a policy does not stand alone, separate from other policies,

but is related to various policies in society, and is oriented to the implementation, interpretation and enforcement of law.

Third, the policy is what the government does - not what they say will do or what they intend to do. Policy is what the government does, not what the government wants or intends to do. Fourth, the public policy may be either negative or positive. Policies can take the form of negative or prohibit and can also be directed to implement or advocate. Fifth, the public policy is based on law and is authoritative. Policy is based on law, because it has the authority to force the community to obey it (Sitompul, 2006).

Public policy is an action taken by the Government in controlling its government. In the implementation of regional government, public policy and law have an important role. The discussion of the law can cover two aspects, namely: First, the aspect of justice concerns the needs of the community for fairness in the midst of many dynamics and conflicts in the community. Second, this legal aspect involves what is called positive law, namely a rule stipulated by a state power that is legitimate and in its enforcement can be imposed in the name of law. Therefore, public policy generally must be legalized in the form of law, and basically a law is the result of public policy.

5. POLICY ON AIR POLLUTION CONTROL

The issue of air pollution control policies in the regions was also carried out by Law No. 23 of 2014 concerning Regional Government as amended by Law No. 2 of 2015 concerning the Establishment of Government Regulations in lieu of Law No. 2 of 2014 concerning Amendments to Law No. 23 of 2014 concerning Regional Government into Law and amended by Act Number 9 of 2015 concerning the Second Amendment to Law No. 23 of 2014 concerning Government, that the authority to control the environment as a compulsory government matter is not related to basic services based on the principle of decentralization to regional governments (Article 12 paragraph (2)). The division of concurrent government affairs between the central government and the provincial and regency/city regions in the environmental field relating to pollution control as stipulated in the Attachment to Law No. 23 of 2014 concerning Regional Government as seen in Table 4.

The first step to controlling the problem of air pollution is to identify the source of pollution. Monitoring of large pollutants

and small pollutants must be established in all regions. Once problems are identified, reducing pollutant emissions can be done through the use of cleaner fuels and installation of pollution reduction technologies. The development of new technologies must contain innovations in reducing emissions from power plants, industries, and motor vehicles. One emission technology found in all modern cars in the United States is a catalytic converter, which is used to reduce and oxidize three pollutants: CO, NO_x, and VOC (Veetil, 2012. p. 6). Private vehicle emissions are the biggest contributors to carbon monoxide (CO) and volatile organic compounds (VOC), and the main contributors to nitrogen oxides (NO_x) (Kahn and Schwartz, 2008. p. 776).

It is interesting to see Chinese research on health status and air pollution related to socio-economic problems in urban China conducted by Kaishan Jiao, Mengjia Xu and Meng Liu have concluded that air pollution has the greatest impact on the health of lower socio-economic groups. With the increase in socio-economic status, the effects of air pollution on health declined. Therefore, it is very important for the government to immediately formulate public policies to improve the ability of lower socio-economic groups to avoid air pollution and reduce health damage caused by air pollution (Jiao et al., 2018. p. 10). The formation of urban forests is very good for getting clean air as research conducted by Matzarakis et al. (1999) in Germany, concluded that the average level of O₃ which concentrates higher near city forests can be considered an indication of clean air. Providing greater green space has the potential to reduce mortality due to beneficial effects on exercise and stress, better air quality, and reduce urban heat (Salmond et al., 2018. p. 2).

Various planning actions and interrelated arrangements, when handled together, can lead to significant reductions in climate change pollutants (Oliveira et al., 2015. p. 29). Some policies to reduce air pollution can be done, among others, by regulating motorized vehicles, for example by making areas free of motorized vehicles within a certain radius in crowded areas such as schools, market centers etc. Passenger vehicles are not permitted to enter the ban area so that the passengers are forced to walk several tens of meters to leave the vehicle to go to the school or the market/crowd. In addition to reducing the density of vehicles, congestion can force the passengers to exercise on foot. In addition, it is also to expand the road by prohibiting parking vehicles on the roadside, but parking in places that have been provided specifically and opening alternative roads to reduce congestion. Prohibit certain

Table 4: Strategy for pollution control and/or environmental damage

Sub division	Central government	Provincial government	Regency/City government
Environmental planning	National environmental protection and management plan	Plan for protection and management of the provincial environment	Plans for protection and management of the regency/city living environment of the regency/city
Strategic environmental assessment	Strategic environmental assessment for national policies, plans and/or programs	Strategic environmental assessment for provincial policies, plans and/or programs	Strategic environmental assessment for district/city policies, plans and/or programs
Pollution control and/or environmental damage	Prevention and recovery of pollution and/or environmental damage across provinces and/or across national borders	Prevention and recovery of pollution and/or environmental damage across regencies/cities in 1 (one) province	Prevention, prevention and recovery of pollution and/or environmental damage in the district/city area

types of vehicles such as trucks/cars for passing a road at certain hours which are only for private cars.

Use of private cars by distinguishing police plate numbers, for example odd dates for odd number plates, even dates for even number plates. Indeed this is rather annoying but it turns out to be quite effective in reducing the number of private vehicles operating on the highway. In Jakarta, there had been an idea of prohibiting driving a car with a certain year entering the city, for example, the age of more than 10 years had to go through the periphery, but many were protested, which eventually failed. What needs to be done correctly is the vehicle emission test, the period every year in the implementation of the vehicle for public transportation. The solution to overcome air pollution is not only aimed at improving the traffic control system, the feasibility of vehicles also by promoting reforestation, especially in areas that are crowded with vehicles, including by some strategies such as (a) a tree must be planted along the road that is not easily broken but leaves are dense. (b) Granting permits for small types of public transport vehicles is more limited, while mass transit vehicles such as buses, trains are multiplied. (c) Limit the age of vehicles, especially public transport vehicles, because the older the vehicle is, the more untreated the potential for producing air pollution emissions is greater. (d) Traffic regulation by reducing congestion or congestion of vehicles that accumulate by regulating the spread of vehicles through the creation of alternative roads and providing special parking lots. (e) Carry out periodic emission tests for public and private vehicles. (f) Dismantling buildings made on improper roads which slow down the vehicle so that the vehicle's smoke emissions become high in that location.

6. CONCLUSION

Increasing urban development activities will reduce the carrying capacity of the environment. Efforts to prevent a decrease in environmental carrying capacity in the form of air pollution have been regulated by the Environmental Law and other related laws. Public policy for improving air quality in urban areas through regional government through activities of planning, controlling, and controlling and making air environmental policy programs that lead to the achievement of environmental quality is a mandatory regional affairs. Recommendations that can be given are a. legislation regarding the control of air pollution is felt to be sufficient, but what needs to be strengthened is the aspect of law enforcement and b. the need for increased regulation by local governments in the framework of making air environmental policy programs that lead to achieving environmental quality.

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