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The Challenge and the Impact of Green Belt as an Air Pollution Control

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The purpose of this research is to investigate the challenges and the impacts of Green Belt as an air pollution control. The procurement of Green Belt is certainly intended to control various existing environmental problems such as air pollution. Urban areas that have become an area of industrialization so that the air quality that is owned decreases due to many things, one of which is the density of fuelled vehicles that cause air pollution. But each procurement of Green Belt certainly has many challenges, namely the lack of land for the construction of Green Belt, as a result of green open space land that functions as settlement, industrial areas, etc. Another challenge is the selection of vegetation that sometimes is not appropriate, so that the work of Green Belt is less than optimal.

Key words: *Green Belts, Challenges, Impacts, Vegetation, Air Pollution.*

Introduction

The development of traffic volume has always been the main cause of decreasing air quality in an area. The higher the use of motor vehicles, the worse the air quality produced. Decline in air quality is experienced by urban areas that have undergone many changes in physical development, such as the presence of factories, buildings, and paved roads. This will decrease the actual area of green, open land which would otherwise cool the city and potentially maintain the quality of comfort and freshness of the air.

Green Belt is needed to overcome all problems of air pollution contained in the urban area. The Green Belt itself is the physical separation of urban and rural areas, in the form of free zones or green open buildings or spaces that surround the outlying urban areas (Basri, 2009).



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Green Belt has many benefits, such as being one form of city forest that can maintain the survival of the earth. The Green Belt is able to clean dust, chemical substances that have fused in the air, as well as carbon dioxide or CO₂, trees and other vegetation that will maintain the health of the air by absorbing particles; in addition Green Belt can also be a heat absorber in urban areas (Jieqing et al., 2017).

The lack of Green Belt in an urban area that has undergone air pollution will greatly affect the quality of human life, especially the community whose residence is adjacent directly to the main causes of pollution areas such as factories and roads.

Green Belt procurement should be thoroughly calculated regarding the location or the vegetation to be planted, because of the effectiveness of vegetation in reducing air pollution determined by the type of the plant and the leaf structure. If applying Green Belt means using a tree that has a wide leaf shape and a tight pattern, this has a higher effectiveness in reducing air pollution because of motor vehicles and industries. The Green Belt development must be located in a place in need of improvement in the air quality or other pollution problems. In addition to the area, it must have sufficient land for Green Belt development, to maximise its function. When the Green Belts are wider, the planted trees will give a more tight cover, so as to maximise the absorption of particles and dirty substances that have fused in the air.

Literature Study

Air Pollution

Indonesia's urban traffic volume reaches 15% per year. Transportation in major cities is the largest source of air pollution, of which 70% is caused by the activity of motor vehicles. Also, parameters of air pollution from motor vehicles such as carbon monoxide (CO), nitrogen oxide (NO_x), methane, non-methane gases, sulfur dioxide (SO_x), and particles can affect global warming.

Air pollution, especially in urban areas, is a serious problem that needs to be considered by the government. Some of the problems that led to the decline in air quality are the increased use of motor vehicles and energy consumption in cities. If not controlled, it will worsen air pollution, congestion, and the impacts of climate change with health, productivity, and economic losses for the country. The number of vehicles in Indonesia in 2016 reached 124,215 million units. The number of vehicles increases by six million units annually. Fardiaz (1992) states that the main source of air pollution comes from transportation, especially motor vehicles that use fuels containing pollutants. Of the pollutants 60% consist of carbon monoxide and about 15% consist of hydrocarbons.



Green Belt

Green Belt is the physical separation of urban and rural areas, in the form of free zones of building or green open space that surrounds the outer urban area or the central area of activities that cause pollution (Anggraeni (2005) in Fakhrian et al. (2015). In the Guidelines for the Provision and Utilization of Green Open Spaces in the City (Samsuodin, 2010), it is mentioned that Green Belt is a green open space that serves as a buffer area, restricting the development of land use and other activities; a city boundary or region separator restricting activity to one region and not another which do not interfere with each other, and the safety of the surrounding environmental factors.

Green Belt is a significant element for urban areas, as both a pollution control and to maintain the quality of life of urban communities. The main element of Green Belt is the vegetation that naturally serves as an atmospheric cleanser by absorbing pollutants in the form of gases and particles through the leaves. Vegetation serves as a life filter that lowers the level of pollution that absorbs, detoxifies, accumulates and or regulates metabolism in the air, so that air quality can increase with the release of oxygen in the air (Shannigrahi et al., 2003).

The benefit of the title of vegetation in the Green Belt area is to make the air cleaner and healthier. High-sensitivity plant species are useful for early warning of the presence of pollution material in the air, while plant species with a high tolerance level will reduce the level of pollution in the air thoroughly. Here is the role of Green Belt for urban public health, especially as a pollution control or an air pollution.

Research Method

The method used is a qualitative method. According to Moleong (2017), a qualitative research method is a study that intends to understand the phenomenon of what is experienced by the subject of research such as behaviour, perception, motivation, action and others holistically and in a way a description of words and languages, in a natural context and by utilizing various scientific methods. In qualitative research, the use of various relevant literatures (Burns & Grove, (1993) in Afiyanti (2005). The authors conduct library research by collecting literature data from various sources. The technique can help to explain the impacts and challenges in Green Belt development, and the impact of Green Belt on the surrounding community.



Discussion

Relationships between Green Belt Areas, Pollution Control and Quality of Life of Urban Communities

Urban places are a centre of human activity whose density tends to be higher than other regions and which functions other than as a place of life, to also be a place to produce goods and services (Anggraeni, 2005, in Fakhrian et al., 2015). Even the smallest human activity will produce environmental impacts. The issue of urban activity that exists today is high levels of urbanization, high transportation needs and the high level of waste produced by the city due to these activities. One of the most complex environmental impacts, with broad implications for urban activities is air pollution as experienced in almost every major city.

Challenges in Green Belt Development

Green Belt is a solution to various problems relating to the environment, such as air pollution caused by the smoke of motor vehicles and industrial garbage. The concept of Green Belt also offers a solution to problems caused by natural activities such as sea water waves touching the coastal lips too strongly, causing beach abrasion. The majority of predominant cities in Indonesia have procured the Green Belt as a solution to address various environmental issues.

But the development of Green Belt is always accompanied by a variety of challenges that can become an obstacle for it to work optimally. Major cities in Indonesia are widely used as an industrialization area. The more tightly the industrial buildings, the more they will be accompanied by various growths such as settlements, motor vehicles, and other things that can make the city become dense. Dense areas have a small possibility for Green Belt due to the lack of land. Green Belt development requires extensive land for vegetation planting which will be useful to absorb air pollution or other environmental problems. The causes of the lack of Green Belt areas in major cities in general are (Bae and Jun, 2003); (Basri, 2009):

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1. Industrialization;
2. Urbanization;
3. Economic development that is not planned well;
4. The absence of a good control mechanism to maintain the Green Belt area, and;
5. Reduced environmental capacity worsening urban conditions.

Precise selection of vegetation is very important for the success of Green Belt, making it less effective in reducing pollutants (Sulistiyantara et al., 2016). In the form of green open space, mangrove forest can be a type of Green Belt that is a solution for beach erosion. Yet it also has its own challenges. Dense settlements in the coastal area also lack vegetation. In this case,



crop vegetation is also very influential to whether the construction of a Green Belt is optimally built or not. If a Green Belt uses a tree that has a wide leaf shape and a tight pattern, it has a higher effectiveness in reducing air pollution from motor vehicles and industries. In general, the factors that need to be considered in choosing a tree for Green Belt include (Susanto and Komarawidjaja, 2018):

- a. Roots that are deep, strong, not easily tumbled and not easily detached from branches and leaves;
- b. Able to grow in the open in various soil types;
- c. Rapid growth and resistance to physical disorders;
- d. Does not require intensive care, long-life, resistant to water shortages;
- e. Rare trees and local featured trees; and
- f. Trees that produce flower/fruit/seeds that are economically valuable.

Another challenge was the construction of greenbelts, which is quite complex, given that it should be done systematically taking into account water level controls, vehicle density levels, recreational factors, aesthetics, and control of air pollution (Sheng et al., 2019).

Green Belt as an Effort to Reduce Pollution Levels and Improve the Quality of Life of Urban Communities

Green Belt efforts seek to reduce pollution levels and improve the quality of life of the community. Green belt development is the right solution because it is economical and technically feasible. This effort is divided into two solutions, based on biophysical and socio-economic parameters. The biophysical parameters referred to here are how to develop an ideal and useful, optimal green belt for a city, in terms of plant species, plant height, green belt width and green belt distance from the polluting centre. Green belt, as a form of urban forest, has a function to maintain the survival of the earth, namely as a medium that has the ability to reduce air pollutants including carbon dioxide (CO₂) which floats in the air and produces oxygen (O₂). Forests also absorb heat. They can cool the earth and urban forests in which there are various kinds of vegetation, when in need of sunlight, CO₂, and other elements, so that the presence of urban forests can reduce the CO₂ concentration in the air and hence the temperature (Rowntree, 1978). The high or low ability of vegetation or plants to absorb air or capture pollutants in the air varies greatly, including in urban forests. The level of density and shade of vegetation in urban forests provide a direct or indirect influence on the temperature and microclimate conditions of the city.

Socio-economic parameters involve consideration of the effectiveness of costs incurred, long-term usability, sustainability, technological feasibility, interaction and participation



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community in the development of green belts; this is summarized in the strategic management of green belt areas (Shannigrahi et al., 2003); (Shannigrahi et al., 2004).

Green Belt Impacts on the Surroundings

Procurement of a Green Belt area is surely intended to address an environmental problem. Green Belt development does not necessarily positively impact the surroundings, but it does have a slight negative impact, as in one city in Indonesia. Green Belt planted on the road side of Bogor City was infected by a wild plant strangler that when it grows up, has enlarged roots resulting in damage to the road and the surrounding properties (Danniswari and Nasrullah, 2017). But this problem is not very serious if the parties are concerned and the existing community is able to take care of the Green Belt together.

However, Green Belt certainly has more positive impacts than negative impacts. Primarily it offers air pollution control, which with a variety of planted vegetations, will absorb CO₂ to perform photosynthesis and emit oxygen for the surrounding areas. Building Green Belt regions aesthetically makes industrial areas comfortable, and simultaneously reduces air pollution in the surrounding areas, especially residential areas adjacent to industrial areas (Susanto and Komarawidjaja, 2018). In this case, the Green Belt can neutralize the impact of the remaining smoke-shaped waste that comes from industrial activities.

Green Belt, in addition to air pollution control, also affects the natural balance. Greenbelt constructed in Jatibarang Reservoir area and the sand dune area around Yogyakarta International Airport are used for the conservation of flora and fauna, whose numbers are declining. Green Belt in the area of Jatibarang Reservoir is for long-tailed monkey conservation. The Yogyakarta Green Belt is for porcupine conservation. The plants that are made for Green Belt varies, ranging from medicinal plants to local fruits which can be utilized by the local residents. This is one of the impacts of the selection of vegetation that suits the livelihoods of people around the environment. This also happens in the area of Semarang and the village of Glagah Yogyakarta where the planting of Green Belt can also increase public income (Murtini et al., 2017).

Greenbelt can be utilized in areas that are vulnerable to natural disasters including tsunami. Planting crops around the coast can be beneficial as a deduction of the strength of a surge of waves, to reduce casualties and economic losses (Zaitunah and Samsuri, 2018).

Conclusion

Green Belt is a solution that controls environmental damage, especially in air pollution. With many problems, challenges often arise, in this case the lack of land for the construction of



greenbelt areas and also the limitations of vegetation suitable for an environment. The more densely packed a city is, the more difficult it is to determine which plants are suitable for planting on minimal land, because plant vegetation will greatly affect the effectiveness of Green Belt work.

Green Belt has many impacts to overcome environmental damage, such as being able to neutralize the air pollution in urban areas from motorized vehicles and factory waste. In addition, the development of Green Belt directly impacts people's livelihoods if the vegetation planted is in accordance with the livelihoods of the majority of the community in the Green Belt area.

The role of government is also very influential in the development of Green Belt. The Government should be very concerned with the problems of air pollution and create a Green Belt policy especially in urban areas.



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