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Analysis of Green Open Space in Jember with Sample Is the Regency of Puri Bunga Nirwana Based on Vehicle's Emission Waste

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Abstract. Puri Bunga Nirwana Regency is one of the regencies with the densest regency in Jember. The factor of the number of occupants is followed by the high usage of vehicles, so that it has the potential to cause large exhaust emissions. Lack of concern for regency developers for the impact of exhaust emissions poses a health hazard for the population. This research aims is design green open space (RTH) based on vehicle exhaust emissions. This design is based on the results of the analysis of vehicle exhaust emissions in Puri Bunga Nirwana Regency. Kinds of plants used in this design are based on the ability of plants to absorb carbon dioxide gas (CO2). The method used in this study is a field survey by counting the number of vehicles passing 200 m from the gate of the Menteng Cluster Puri Bunga Nirwana Regency. The results of vehicle exhaust emissions in Puri Bunga Nirwana Regency are 1030.2 kg / year. Based on the analysis of emissions results, the CO2 absorption of tree was 1559 kg / ha. day so that the number of trees needed was one trees / ha. While the CO2 absorption of soursop trees was 75.29 kg / tree / year, so that 13 soursop trees were needed and the CO2 absorption of kecik sapodilla was 36.19 kg / tree / year, so that 28 kecik sapodilla trees were needed.

INTRODUCTION

One way to neutralize gas emissions by motorized vehicles is greening. This needs to be considered by Housing Developers to pay attention to Green Open Space (RTH). Open space can be made in the Housing Center and in each neighborhood and community association respectively. Based on the Minister of Public Works Regulation Number 05 / PRT / M / 2008 Guidelines for Provision and Utilization of Green Open Space in Urban Areas. Green open space Puri Bunga Nirwana regency is one of the fastest growing settlements in the region about 5 km from the University of Jember. Housing area of 15 hectares in Karang Rejo Sub-district, Sumbersari District, Jember City, East Java. The housing consists of five Clusters (Menteng, Pondok Indah, Tebet, Kelapa Gading and Bintaro). The development of the number of inhabitants who has increased since 2009 until now, is proportional to the increase in motor vehicle ownership. This has caused motor vehicle gas emissions, especially carbon dioxide (CO_2) and monoxide (CO) to increase throughout the year. It is feared that the amount of pollutants is far above the tolerance threshold for human health, as required by WHO, which is less than 40 µg / m^3 for NO and 20 µg / m^3 for SO_2 [1]. Green open space in urban areas consists of public green open space and private open green space. The proportion of green open space in urban areas is at least 30% which consists of 20% public green open space and 10% consists of private green open space. Based on the Minister of Public Works Regulation No. 05 / PRT / M / 2008 neighborhood/community association private, garden area 1 m^2 / population minimum area of 250 m2 with 300 m, planted area 70% of the park area.

The provisions green spaces for small house yards are as follows: 1) A category that includes small houses is houses with an area of land under 200 m_2; 2) The minimum required green open space is the land area (m2) minus the building base area (m2) according to local regulations; 3) the number of protective trees that must be provided at least one protective tree plus shrubs and shrubs, as well as ground cover and / or grass. The limited area of the yard with a

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narrow environmental road, did not rule out the possibility to realize green space through planting using pots or other growing media [2].

The aim of this study is to predict the number of plants and area of RTH Private Neighborhoods level required based on carbon dioxide and monoxide emissions due to motor vehicles in the neighborhood level of Menteng Cluster, Puri Bunga Nirwana City, Jember, East Java.

METHOD

The objects are in this research is Menteng Cluster Security Post (Block A) along 200 meters. Data collection time is four days (Monday, Thursday, Saturday and Sunday) in March 2019. To obtain the data, the field survey was conducted. The surveys were done by calculating the type and number of vehicles that pass. Emission factors for motor vehicles are obtained from the literature. Retrieval of vehicle ownership data and the average amount of fuel consumed each week is obtained door-to-door observations to residents' homes in the neighborhood level. Data collection of carbon dioxide absorbent plants for green space is taken from the Minister of Public Works Regulation Number 05 / PRT / M / 2008 Private Green Open Space [2].

Data collection in the form of the number and type of vehicle is carried out by four sampling officers. Selection of the length of the road, with straight conditions and strived to be free of obstacles, so it can easily calculate the average speed of the vehicle. The data collection at the three locations of the research object for four days (Monday, Thursday, Saturday and Sunday). For each day, we assumed that Monday is busy, Thursday is not too busy, and Saturday and Sunday are weekends. Retrieval of data with a time span of six hours, starting at 6:00 to 8:00 (morning), 9:00 to 12:00 (noon), 14:00 - 17:00 (afternoon), and 22:00 - 00:00 (early morning). The location of this research object shown in Fig. 1. The data was calculated by using materials and tools such as stopwatch, carbon emission sensor, stationary and fabric. To obtain the emission intensity each segment, we calculate by using Equation 1[3].

$$Ep = \sum_{i=1}^{n} L \times Ni \times Fpi \tag{1}$$

where L, Ni, Fpi, I, Ep and P are length of road under study, number of type I motorized vehicles that cross the road (vehicles / hour), emission factor of motor vehicle type i (g / km), and type of pollutant respectively. While, the green space needed conducted by comparing remaining CO_2 emissions and ability of tress to absorb CO_2.

$$needforgreenspace = remainingCO_2emission \Big/ abilityoftressforabsorbdCO_2 \tag{2}$$

$$remainingCO_2emission = A - B \tag{3}$$

where A and B are total actual CO_2 emission and total CO_2 emission , respectively. The ability of trees to absorb CO_2 in units of [4], while green space needs in ha. The total actual CO_2 emissions are obtained from Equation 1, the remaining emissions are obtained from the reading of the CO_2 meter.

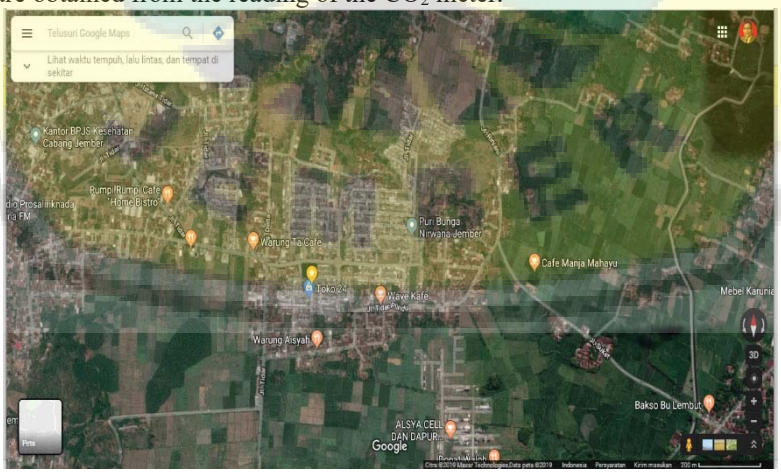

FIGURE 1. Location

RESULTS AND DISCUSSION

The first, we calculate the emission total for motorcycles and cars and also the ability of tress for absorption the gas emission. The validation of to determine the levels of emission to air from road traffic on Puri Bunga Nirwana Cluster and to predict their impacts to air pollution. The general approach taken was to compare air quality measurements obtained in the vicinity of sources with model results.

TABLE 1. Observation Results of the Number of Vehicles Passing in the Menteng Cluster Guard Post of Puri Bunga Nirwana Jember Regency

No	Time	transportation type	Day			
			Monday	Thursday	Saturday	Sunday
1	06.00 - 08.00 AM	Motorcycle	157	149	96	89
		Car	23	25	17	18
2	09.00 - 11.59 AM	Motorcycle	53	61	68	86
		Car	5	4	5	8
3	02.00 - 05.00 PM	Motorcycle	164	150	87	137
		Car	13	15	6	20
4	07.00 - 09.00 PM	Motorcycle	81	114	93	103
		Car	10	12	13	8
5	10.00 - 11.59 PM	Motorcycle	18	13	22	16
		Car	3	2	4	3
	SUM	Motorcycle	473	487	366	431
		Car	54	58	45	57

On Mondays, Thursdays, Saturdays, and Sundays the observations are carried out with an average time of 12 hours, so that if accumulated into days, the total observation is two days. The averages of motorbike and cars are 1757 vehicles and 214 vehicles, respectively. According to these results, estimation for number of vehicles for a year is 320652 for motorcycle and 39055 for cars. By using Equation 1, total CO emission per year for motorcycle and cars respectively are 898 kg/year and 313 kg/year. While the total CO_2 emission per year for motorcycle and cars respectively are 652.6 kg/year and 48.336 kg/year. According to these results, emission in this area is 1030.2 kg/year. The validation standard of CO emission is from Ministry of Environmental Indonesia no 12 year 2012 which explains about Quality Standards for Motor Vehicle Exhaust Emissions by Testing Methods UN Regulation 40 and EU Directive 2002/51 / EC and Quality Standards for Motor Vehicle Exhaust Emissions using the Test Method WMTC [4]. Table 2 shows the capability of each tree for absorption of gas emission.

TABLE 2. CO2 Gas Absorption Power Types of Vegetation Cover [5]

No.	Name of trees	Absorption power of CO_2	The amount needed for green open space
1.	Tree	569,07 ton/ha.year	1 tree/ha
2.	soursop	75,29 kg/tree.year	13 tree soursop
3.	tanned kecik	36,19 kg/tree.year	28 tree tanned Kecik

According the total of gas emission and the capability of trees for absorption its needed 1 tree/ha for tree type, 13 tree/ha for soursop and 28 tree/ha for tanned kecik.

CONCLUSIONS

The number of residents of neighborhood 03 Menteng Cluster consists of 80 families and 15 empty houses. 28 houses have Pertalite type fueled cars and 80 houses have 160 Pertalite type fueled motorbikes. Type of house 36 with a land area of 84 m^2. Menteng Cluster Area is 15,000 m^2 (1.5 ha). Emission factors for motor vehicles and gasoline-powered cars (pertalite) amounted to 3180 g/kg of fuel. Fuel consumption of cars is 10 km/liter, while motorcycles are 48 km / liter, and pertalite specific gravity is 0.76 kg/liter.

Based on the agreement of the residents through neigborhood meetings in the context of greening, for the purpose of green open space (RTH) in the yard. Each house was given a Soursop or Sawo Kecik tree, and on the main road was given an Accuser Tree. Based on literature Soursop trees have the ability to absorb CO2 by 75.29 kg/tree.year, Sawo Kecik tree is 36.19 kg/tree.year, while the accuser tree is 569.07 tons / ha.year. Based on the results of monitoring

for 4 days (Monday, We, Saturday, Sunday), every day for 12 hours consisting of 6.00 - 8.00 for 2 hours, 9.00 - 12.00 for 3 hours, 14.00 - 17.00 for 3 hours, 19.00 - 21.00 for 2 hours and at 22:00 to 24.00 for 2 hours. Monitoring at the Menteng Cluster Guard Post with a monitoring path length of 200 meters. The number of cars that pass an average of 214 vehicles/day and motorcycles that pass an average of 1757 vehicles/day.

The calculation of carbon dioxide emissions with Equation 1 in the Menteng Guard Post area is 1030.2 kg/year. Based on the suction power of protective plants, Soursop and Sawo Kecik trees, with a path length of 200 m, 13 Soursop trees or 28 keco palm trees or 1 protective tree (241 shade trees / ha) are required.

Based on the carbon dioxide suction power of the Soursop and Sawo Kecik trees in each Menteng Cluster Block. In Block A (Guard Post) with a flow of 200 m, 13 Soursop or 28 Sawo Kecik trees were planted. In Blocks B, C and D with a 400 m track each planted 26 soursop or 56 Sawo Kecik trees. In Block E with a 400 m track, 26 soursop or 56 Sawo Kecik trees were planted. In Block E with a path of 300 m, 20 Soursop or 42 Sawo Kecik trees were planted. In Block F, the track length of 500 m was planted by 33 soursop or 70 sapodilla trees. The need for a protective tree with a Menteng 15 Ha Cluster area of 10 trees.

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