The Influence of The Distribution of Public Green Space on The Health of The Residential Environment in Balikpapan City

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Abstract. The population of Balikpapan City has increased along with economic growth. The increasing population has resulted in the densification of the population and settlements which are fast and uncontrolled in parts of the city. The increasing demand for space, especially for settlements and built-up land, has an impact on the deterioration of the quality of the environment, especially the public green space. Balikpapan is one of the cities that despite extensive protected forests but still has problems providing public green open spaces. One of the impacts of the lack of green space in urban areas is that the community has a limited place to socialize with the surrounding environment. Furthermore, the limited green open space in urban areas can cause pollution. This has resulted in decreasing public health. The analytical method used is path analysis technique. The type of data used in this path analysis is cross section data. The results show the contribution of green space distribution in disease is 2.9% with the highest proportion of being diarrhoea. In addition, the distribution of green space affects the number of infant mortality rate is 5.5% while the rest are contributions from other variables not included in the study.

Keywords: environmental health, green space, green open space, path analysis, public health

1. Introduction
The population of Balikpapan City has constantly increased, in 2010, Balikpapan had 560,781 people, and in 2015, it increased to 615,574 people [2]. This causes a large space requirement for cities. The increasing demand for space, especially for settlements and built-up land, has an impact on the deterioration of the quality of the environment, especially the public green open space. Spatial plans (RTRW) that have been made are not able to prevent land conversion in urban areas so that the Green Open Space (RTH) is increasingly threatening and cities are not comfortable to move [4]. Balikpapan City is one of the cities that despite extensive protected forests but still has problems providing public green open spaces. This is because the function of protected forests is not for the conservation of the local environment of the city of Balikpapan but rather the buffer function in the wider surrounding area [9]. Thus, protected forests are not part of the provision of RTH in Balikpapan City.

The existence of open green space aims to make land available as water absorbing area. In the urban aspect, green space can keep the balance between natural environment and man-made environment for people’s needs. There are many functions which green space provides, such as ecology, social, and aesthetic that can give amenities [4]. One of the impacts of the lack of availability of green open space in urban areas is that the community has a limited place to socialize with the surrounding environment.
Furthermore, limited RTH in urban areas can cause pollution so that it can result in decreasing public health. Therefore, the function of public green space has a positive influence on the environmental health of the surrounding community, especially those with access to adequate public green space that tends to be healthier physically than those who do not [16].

With an inadequate area and distribution of open green space, the city of Balikpapan has a tendency to have a poor health level compared to the surrounding area. Based on the health profile data of East Borneo Province in 2015, Balikpapan City had a high morbidity rate among other cities / regencies in East Borneo including TB morbidity of 409 (the second highest), the highest number of dengue cases, highest pneumonia cases and diarrhoea cases around 133 cases. Many studies have proven that public green open space can affect the health of surrounding communities.

The city of Balikpapan is the most populous city in the province of East Borneo. This of course makes the need for green open space bigger than other cities / districts in the province of East Borneo. Seeing the importance and magnitude of the impact of the availability of public green space in urban areas, the availability of public green open space is still limited in Balikpapan City. There needs to be a strategy to fulfill public green open space that fits the needs of the people of Balikpapan, especially in improving environmental health. Based on the background described previously, it is necessary to study the influence of the distribution of public green space on the level of health of the residential environment in Balikpapan City.

2. Methods
This type of research is quantitative descriptive. According to [12] descriptive quantitative research methods are used to describe or explain events or events that occur at this time in the form of meaningful numbers. In this study, this trait was used to analyse the influence of the distribution of public green space on the quality of environmental health with statistical analysis techniques. The analysis used is path analysis. The type of data used in this path analysis is cross section data.

3. Results and Discussions

3.1 Overview Public Green Space and Distribution of Public Green Open Space in Balikpapan City
The existence of a Green Public Open Space in Balikpapan City is still very varied, such as urban forests, city parks, green lanes, cemeteries, protected forests, and others. One of the green open spaces currently maintained is the Wain River Protected Forest (HLSW) in which this area is a River Watershed (River Watershed) with Bugis Sub Watershed. This area is maintained with the aim of protecting the Wain River and Bugis Bay, as well as for the preservation of clean water sources for the people of Balikpapan City. Based on the survey results, the results of the distribution of public green open spaces in Balikpapan City are as follows:

| Sub District     | Area (m²) | Park | City Forest | Green Lane | Cementery |
|------------------|-----------|------|-------------|------------|-----------|
| East Balikpapan  | 0         | 545000 | 0           | 0          | 50492     |
| South Balikpapan | 18906     | 63240 | 182000      | 62000      |
| Balikpapan City  | 19068     | 305805| 73200       | 8000       |
| Balikpapan Centre| 4183      | 534172| 12000       | 17500      |
| West Balikpapan  | 0         | 0     | 5000        | 41900      |
| North Balikpapan | 675       | 34172 | 7060        | 90450      |
| Total            | 42832     | 1482389| 279260      | 270342     |

Source: Primary Survey, 2018
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A. Number Of Occurrences Of Disease

Based on the data obtained, the number of the occurrences of diarrhoea is the highest among other diseases. The number of diarrheal diseases is the highest in all sub-districts with the highest number of occurrences Balikpapan City Sub District (2444 people) with a population of 625,968 people. Whereas
the number of dengue cases is still low in all sub-districts. The following is a detailed description of the number of disease occurrence in all sub-districts:

**Figure 3.** Number of Events and Distribution of DHF, Diarrhea, Pneumonia, and TB in 2017

**B. The Number of Infant Mortality Rates**

The number of infant mortality rates is one indicator that can be used to measure the level of health of the community. The high rate of infant mortality rates can be assumed that the health condition of the community is low. The following is a description of the existing condition of the number of babies who die in Balikpapan:

**Figure 4.** Number of Babies Died

Based on data on the number of diseases, the number of infant mortality rate, and ambient temperature, it can be seen that these data are dependent variables, while the distribution of RTH is an independent variable. The distribution of green space is a variable (x) while the number of diseases, infant mortality rate are variable (y).

**Table 2. Disease Variable Regression Results**

| Model Summary |
|----------------|
| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|-------|---|----------|--------------------|---------------------------|
|       |   |          |                    |                           |
Based on the value of the regression output in the Coefficients table, it is known that the significance value of the disease variable is 0.748. The magnitude of the R square value found in the Model Summary table is 0.029. This shows that the contribution of the influence of green space distribution to the type of disease is 2.9% while the rest is the contribution of other variables not included in the study. Then to find out which types of diseases are affected by the distribution of RTH, a regression analysis is carried out again with the following results.

**Table 3. The results of SPS analysis of Sub Disease Variables**

| No | Diseases | R square | Standardized Coefficients | Signifikansi |
|----|----------|----------|---------------------------|--------------|
| 1. | DBD      | 0.15     | 0.121                     | 0.819        |
| 2. | Diarrhea | 0.00     | 0.016                     | 0.976        |
| 3. | Pneumonia| 0.263    | 0.513                     | 0.298        |
| 4. | TB       | 0.338    | 0.581                     | 0.226        |

Source: analysis results, 2018

From the table above, it is known that the most significant disease affected by the spread of green space is diarrheal disease, then dengue disease, followed by pneumonia and finally TB. It is also known from the R square value that the contribution of the influence of green space distribution to TB disease is 33.8% and the pneumonia disease is 26.3% followed by DHF is 15%.

**Table 4. Influence of RTH Distribution to Number of Babies Died**

| Model Summary |
|---------------|
| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|-------|---|----------|-------------------|---------------------------|
| 1     | .236* | .055 | -.181          | 1.316                     |

a. Predictors: (Constant), Sebaran RTH

Based on the value of the regression output in the Coefficients table, it is known that the significance value of the variable number of infants dying is 0.653. The value of the R square found in the Model Summary table is 0.055. This indicates that the contribution of the influence of green space...
distribution to the type of disease is 5.5% while the remainder is the contribution of other variables not included in the study.

Figure 5. Path Coefficient

4. Conclusions
The existence of a Green Public Open Space in Balikpapan City is still varied, such as urban forests, city parks, green lanes, cemeteries, protected forests, and others. The variable of the influence of the distribution of public green space on the level of the health of the settlement environment of Balikpapan is “The number of Occurrences Of Disease” and “number of infant mortality rate”. The number of disease includes DBD, diarrhoea, pneumonia, and TB. The study shows that the contribution of the influence of green space distribution to the type of disease is 2.9%. In addition, this research indicates that the contribution of the influence of green space distribution to the type of disease is 5.5% while the remainder is the contribution of other variables not included in the study.

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