

Air temperature analysis in Kalijodo green open space (study in penjaringan, North Jakarta)

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Abstract. Green open space is a public space created with the aim of carrying out one of the ecological functions as a climate regulator to create an air temperature that matches thermal comfort. Regarding the function of Kalijodo's green open space in regulating microclimate, a study was conducted to measure air temperature using Thermo-hygrometer in 5 (five) monitoring location points (TP1, TP2, TP3, TP4, TP5) at different times. The measurement results show that the air temperature in the green open space of Kalijodo has a mean value of 33.22°C and exceeds the specified threshold (20.5-27.1°C). This is influenced by the physical conditions of the environment such as damaged and arid soil conditions and vegetation density. So that it is necessary to arrange green open space in accordance with applicable provisions so that functions in green open space can run ideally and sustainably.

1. Introduction

Green open space is an urban area with vegetation (endemic, introduction) that can support ecosystems and urban aesthetics. The minimum percentage of vegetation area is about 70-80% of the total area of green open space (Regulation of Indonesian Public Work number 5, 2008). According to Government law of the Republic of Indonesia, number 26 (2007), one of the functions of the ecology of green open space, namely as a regulator of the microclimate and elements of the microclimate in question is air temperature.

Generally, the availability of green open space in DKI Jakarta Province is only 9.98% (Forestry Service of DKI Jakarta Province, 2018), while the minimum requirement for green open space is 30% of the total city area (Regulation of Indonesian Public Work Minister number 5, 2008). Kalijodo green open space is one of the parks inaugurated by the DKI Jakarta Provincial Government in 2017 with the aim of providing benefits such as lowering air temperature, reducing urban heat effects, and increasing physical activity (Chow and Bakar, 2019; Rajput et al. 2019). In relation to ecological functions, Irawan (2005) explained that vegetation has a role to be able to improve the temperature of the city through the process of evapotranspiration. Good ecological conditions can provide significant benefits for urban ecosystems, so green open spaces contribute to creating urban ecology and recreational facilities (Esbah, 2006; Doygun & Ilter, 2007; Doygun, 2009; Cengiz, 2012).

The fact that occurred in RTH kalijodo, there was damage to vegetation and the dry land in several areas in the Kalijodo green open space. This problem has the potential to affect the quality of the environment and has the activity of surrounding communities. Therefore, this study was conducted to determine the value of air temperature and analyze the causes of the temperature value of air produced in Kalijodo green open space.

2. Method

2.1 Location

The study was conducted in the Kalijodo green open space located on the scouting road II, Pejagalan Village, Penjaringan District, North Jakarta Administrative City which is an area of land conversion from previously as a place of prostitution, as a means of community activities that need to be studied and analyzed.

2.2 Source of Data

In this study, the data used were observation data obtained from direct measurements using a Thermo-hygrometer for 1 (one) day, on May 25, 2019. Referring to Sapariyanto et al. (2016), the time period of monitoring in this study was carried out at 08.00 - 09.00 AM (morning), 12.00 - 13.00 PM (afternoon), and 16.00 - 17.00 PM (afternoon) which is the peak time of community activities. The monitoring location is in 5 (five) points along the Kalijodo green open space area, with details that can be seen in table 1.

Table 1.Monitoring Points for Air Temperature in the Kalijodo Green Open Space

MONITORING POINT	LOCATION COORDINATE
TP1	06 ⁰ 8' 17,59" LS 106 ⁰ 47' 14,92" BT
TP2	06 ⁰ 8' 21,96" LS 106 ⁰ 47' 17,15" BT
TP3	06 ⁰ 8' 26,07" LS 106 ⁰ 47' 19,09" BT
TP4	06 ⁰ 8' 29,72" LS 106 ⁰ 47' 21,32" BT
TP5	06 ⁰ 8' 32,14" LS 106 ⁰ 47' 24,37" BT

Data Analysis Technique

The descriptive analysis is used for analysis technique (Sugiyono, 2017), by comparing the value of air temperature in 5 (five) points measured during the specified time in the Kalijodo green open space with a thermal comfort value standard of the Indonesian national standard with code number 03 -6572-2001 (Gunawan and Ananda, 2017), then concluded based on real conditions at the location.

3. Result and Discussion

3.1 Air Temperature in the Kalijodo Green Open Space

The results of air temperature monitoring in Kalijodo green open space that has been done in the morning can be seen in table 2.

Table 2.Value of Air Temperature in Kalijodo Green Open Room in the Morning

Table 2: Value of Air Temperature in Rangjod Green Open Room in the Morning						
MONITORING POINT	TEMPERATURE (°C)					CONFORTABLE TRESHOLD (°C)
	TIME					
	08:00	08:15	08:30	08:45	09:00	
TP1	29.5	30.1	30.7	31.3	32.2	20.5–27.1

TP2	32.4	32.0	32.6	32.6	33.0	20.5–27.1
TP3	32.0	32.8	32.9	33.0	33.1	20.5–27.1
TP4	32.3	32.5	33.4	33.6	33.6	20.5–27.1
TP5	32.0	32.4	32.6	32.8	33.4	20.5–27.1

of the 5 (five) morning air temperature monitoring points in the Kalijodo green open space, the first monitoring point (TP1) had an average temperature of 30.76°C and was the lowest temperature. The fourth monitoring point (TP4) has the highest average temperature, with a value of 33.08°C. Monitoring air temperature during the day can be seen in table 3.

Table 3.Value of Air Temperature in Kalijodo Green Open Room in the Afternoon

MONITORING POINT	TEMPERATURE (°C)					CONFORTABLE TRESHOLD (°C)
	TIME					
	12:00	12:15	12:30	12:45	13:00	
TP1	33.3	33.4	33.5	33.7	33.5	20.5–27.1
TP2	33.1	34.0	33.9	34.3	34.2	20.5–27.1
TP3	36.9	35.8	36.6	35.8	36.0	20.5–27.1
TP4	36.5	36.1	37.3	37.0	37.3	20.5–27.1
TP5	35.5	34.3	35.3	35.6	36.8	20.5–27.1

Air temperature monitoring in 5 (five) points during the day in the Kalijodo green open space, the first monitoring point (TP1) has an average temperature of 33.48°C and is the lowest temperature. The fourth monitoring point (TP4) has the highest average temperature, with a value of 36.84°C. Monitoring the air temperature in the evening can be seen in table 4.

Table 4.Value of Air Temperature in Kalijodo Green Open Room in the Evening

MONITORING POINT	TEMPERATURE (°C)					CONFORTABLE TRESHOLD (°C)
	time					
	16:00	16:15	16:30	16:45	17:00	
TP1	32.2	31.8	31.5	31.1	30.9	20.5–27.1
TP2	33.6	32.5	32.1	31.5	31.1	20.5–27.1
TP3	33.6	33.0	32.6	32.1	31.1	20.5–27.1
TP4	32.7	32.1	32.2	31.3	30.6	20.5–27.1
TP5	33.6	33.1	32.6	32.5	31.8	20.5–27.1

Monitoring the air temperature in the afternoon at 5 (five) points in the Kalijodo green open space shows that the average air temperature at the first monitoring point (TP1) is 31.5°C and is the lowest. The highest average temperature is at the fifth monitoring point (TP5) with a value of 32.72°C.

3.2 The Relation of Air Temperature to Kalijodo Green Open Space Conditions

The results of air temperature analysis in the Kalijodo green open space indicate that the air temperature in 5 (five) monitoring points is above the threshold. This is caused by several factors, such as the length of the sun's radiation, the height of the location, the state of the Earth's surface, and many fewer clouds (Herdyanto, 2015).

The weather conditions when monitoring is carried out in the morning and afternoon in cloudy sunny conditions with sunlight. The air temperature at the first monitoring point (TP1) was the lowest among the four other monitoring points (TP2, TP3, TP4, and TP5). The surface conditions around the first monitoring point (TP1) are grassy and surrounded by trees from medium to large categories, forming a canopy that blocks sunlight. The fourth monitoring point (TP4) has the highest average air temperature. The surface conditions around the fourth monitoring point (TP4) tend to be dry and arid because of many kinds of grass, from small to medium size trees, are dead. There are also booths for selling and skateboarding arenas made of cement (waterproof) that can absorb heat from the sun, thus increasing the surrounding air temperature (can be seen in figure 1).

Weather conditions during monitoring in the afternoon in the Kalijodo green open space in bright conditions with sunlight. The fourth monitoring point (TP4) actually has an average air temperature value that tends to almost resemble the average air temperature at the first monitoring point (TP1). The results of the analysis explain that sunlight is blocked by buildings such as booths for selling, thus helping to reduce the air temperature in that location.

The air temperature at the first monitoring point (TP1) was consistently rated lowest among the four monitoring points (TP2, TP3, TP4, TP5) both in the morning, afternoon, and evening, although it did not meet the prevailing thermal comfort standards. This is due to the condition of the soil surface at the first monitoring point (TP1) which is surrounded by medium to large trees, and grows thick green grass compared to the location of other monitoring points. This condition can be seen in Figure 1.

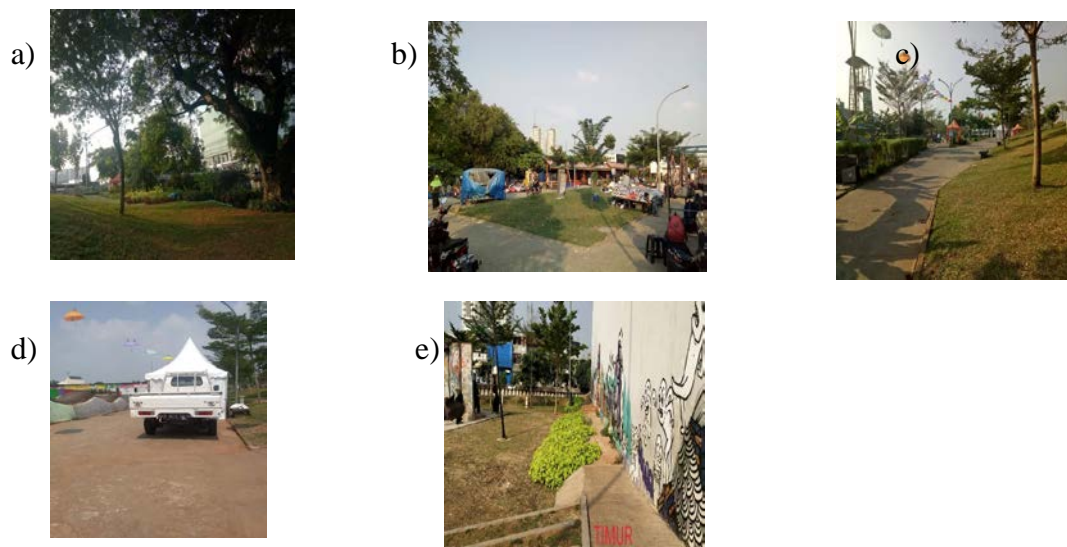


Figure 1.a) First Monitoring Point (TP1); b) Second Monitoring Point (TP2); c) Third Monitoring Point (TP3); d) Monitoring Points (TP4); e) Fifth Monitoring Point (TP5)

Figure 1 shows that Kalijodo's green open space conditions have uneven vegetation composition between points and tend to be dominated by buildings (roads, sports arenas, stands for selling) so that they do not have a significant effect on decreasing the air temperature. According to Sevik and Cetin (2015), Vegetation plays an important role in storing and trapping carbon, absorbing solar radiation, and reducing energy use in urban ecosystems (Suryantini et.al, 2018).

4. Conclusion

The air temperature in the Kalijodo green open space is above the threshold ($>27.1^{\circ}\text{C}$). The air temperature that exceeds thermal comfort standards, due to the condition of dry and arid green open spaces, so that the arrangement of vegetation and other supporting infrastructure must be carried out in accordance with applicable regulations. The correct arrangement can make functions in green open space run ideal and sustainable.

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