

1. Daytime Temperature Trend Analysis in the City of Jakarta, Indonesia

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Summary	
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Urban heat island phenomenon is symptomatic of urbanization and increase in population to the When depicted in cross section, the form of UHI increasing impact of anthropogenic activities such as the phenomenon is like an island in the middle of the growth of various industries to meet the needs of highest temperature compared to surrounding areas [8]. households in urban areas or rural areas. Increased Meanwhile, the phenomenon described in cross-sectional anthropogenic activities have an impact on the UHI from rural through downtown to the suburbs and development of the city as fast as supermarket building, rural areas will then be shaped like a mountain slope and highway, department without regard to environmental plain. Case is shown in Figure 1. sustainability. Therefore, this situation can give to the Figure 1 shows the general profile of UHI in calm society's loss terumanya aspects of thermal comfort, weather conditions [9]. Profile UHI phenomenon began in health and energy consumption [1]. the rural areas that are characterized by a lot of greenery. Environmental quality of the less well every year This should give effect to the reduction in temperature in [2]. One of the urban heat effect is increased and thus the the area. Then, through a suburban area characterized by temperature in the city [3]. Temperature changes in little dense trees and buildings. This condition affects an different urban areas in the surrounding region forming a increase in temperature, thus resulting in slope in this "heat island" or "heat island" [4, 5]. area. Furthermore, UHI profile across the center of the area is characterized by high buildings and close to an until March 2012. A total of 26 stations were selected impact on the occurrence of hot peak in the CBD. Next, go along the north-south and 20 stations along the east-west back to the suburbs with lower temperature gradients traverses. menyebabkan formation. Eventually reach rural areas with lower temperatures. RESULTS AND DISCUSSION

This phenomenon is very important and has become a phenomenon that needs serious attention, because it The North-South Temperature Traverse: The study could have an impact on society discomfort [10]. Found that the monthly average daytime temperature Intergovernmental Panel on Climate Change (IPCC) and the traverse in Jakarta City for the north-south direction is United Nations Environment Programme (UNEP) is an 34.9°C with the CV (coefficient of variance) of 2.4, where institution set up by the World Meteorological the average highest temperature of 36.2°C was recorded at Organization (WMO) in 1988. Both the board explained the Samantabadra STAB station, while the lowest that one factor that is very climate impact on community temperature of 32.5°C was recorded at Castle Hill station like experienced increased significantly as temperature. Mention. The average monthly temperature in November Currently estimated surface temperature increase is was the lowest at 33.4°C, while the highest of 36.2°C was around 2-3°C per / year. Accordingly, the description in observed in October. However, the temperature for this paper is the month the temperature trend during the December showed a small variation across all stations. day in the city of Jakarta. This is illustrated by the small value of CV (coefficient of Method of Study: temperature traverse measurement is a between the highest and lowest temperature therefore the technique that is carried out while on the move. By using UHII was only 3.3°C. The temperature traverse by month motorcycles were carried out manually and move from the varied is the month of January with the CV equal to 4.8. first station to the last station in Jakarta for two traverses During this month temperatures recorded as low as 31.3°C i.e. north-south and east-west, hidoranemometer and at the Castle Hill Marina Ancol station and as high as global positioning system (GPS). Measurements were 37.4°C in Samantabadra STAB station. Therefore, the carried out by using the study was conducted during the temperature difference was recorded rather large which day at 11.00 until 13.00 West Indonesian Time (WIB). was 5.6°C. For the other months, the temperature According to Iswanto [12] 11:00 - 13:00 hours is the measurements showed a moderately high rate with the CV hottest hours during the City in Jakarta. In detail, this of between 3.0 to 4.0. The average monthly temperature study was conducted on holidays (HC) and weekdays traverses illustrated in Figure 2, while temperature (HK) for six months, which was started in October 2011 traverses by month illustrated in Figure 3.

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explains that average maximum temperatures difference is November was not much different according to all relatively small cross section which was only 3.8°C stations. This is illustrated by the small value of CV of 1.5 (average temperature between the lowest and highest). smaller by 0.4 as compared with north-south temperature While the average minimum temperature of 32.9°C with the traverse. Based on the difference between the highest and However, their distribution according to the stations were Based on monthly temperature variations, it was found not much different which was only 3.8°C. January was the month with the most varied temperature East-West Temperature Traverse: The study found that recorded for this month was 31.9°C at the station of as measured the monthly average daytime temperature Bintaro Housing, while the highest temperature of 35.5°C measurement for the east-west traverse across the city of was recorded at the station of Cawang Carrefour and Jakarta was 34.4°C with the CV of 1.6, where the average there the temperature difference was calculated for maximum temperature of 35.6°C was recorded at the about 3.6°C. For the other months, the temperature cross Carrefour Cawang station, while the minimum temperature section shows a moderately high rate with the CV of 33.1°C was recorded the Keranji Fields Bridge station. between 2.0 to 3.0 only. The average monthly temperature Monthly average temperature for October was the cross section illustrated in Figure 4, while the temperature highest 37.7°C, while February was the lowest at 32.5°C. of the month at the crossing of Figure 5. In addition, the results showed an average maximum in February that was 33.7°C, while the highest in October temperature of 37.7°C with the CV of 3.1. This value of about 37.0°C. However, it was found that the indicated that the recorded maximum temperature temperature distribution was not much

different in
difference between stations was relatively small which was February with the CV 2.6. Based on this, therefore the only 4.7°C (average temperature between the lowest and temperature difference between the highest and lowest the highest). Meanwhile, the average minimum temperature was only 4.0°C. Moreover, the temperature temperature was calculated for about 32.2°C with the CV variation by month showed that the month of November of 1.6 which was lower by 1.5 as compared with the varied significantly with the CV of 6.7. This lowest maximum temperature. However, it distributed according temperatures was recorded at 29.6°C at the Sahid to all stations were not much different which was only University station and the highest was 39.3°C at the 1.8°C. Triloka Complex station. Therefore, the different in Furthermore, the results showed that the north-south temperature was recorded relatively large that was 9.7°C. temperature traverse on weekdays during the day in the For the other months, the temperature displayed a city of Jakarta was 35.3°C with the CV of 3.0, where the moderately high rate with the CV of between 3.0 to 5.0. highest temperature of 36.9°C recorded at the Further study showed an average maximum Samantabadra STAB station, while the lowest temperature temperature of 37.6°C with the CV of 3.4. This value of 32.4°C recorded at The Castle Hill Manton Ancol. indicated that the maximum temperature difference On a monthly basis, the lowest temperature was observed recorded between stations was relatively small that was

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only 4.9°C. Meanwhile the average minimum temperature lowest at 30.4°C, while October was the greatest month of 33.1°C with the CV of 3.2 at a value higher than the 36.0°C. Further analysis was found that the November maximum temperature. However, temperature variation temperature distribution was not different significantly as according to all stations was not significant, which was shown by the CV value of 2.1. Temperature difference comparable with the maximum temperature difference of between the highest and lowest temperature was only 4.9°C. about 3.1°C. However, December showed a larger The study found that the daytime temperature difference as shown by the CV of 4.4. The traverse on holidays for the north-south traverse in lowest temperature in December was 32.1°C as recorded at Jakarta City was 34.4°C with the CV of 3.8, where the the Paddy Keranji Bridge station and up to 38.4°C as average highest temperature was recorded around 35.6°C recorded at the Kalimantan Sower School. Based on this at the Samantabadra STAB station, while the average low finding, there are large temperature difference was temperature of 32.3°C was recorded at the station of calculated that was 6.3°C or it was greater it 3.2°C from the Castle Hill Mantion Ancol. On a monthly basis, the lowest November temperature difference.. For the other months average temperature was in November that was 35.5°C, it showed a moderately low temperature differences with meanwhile the average temperature in October was the the CV values between 2.2 to 2.9 only. highest that was 35.5°C. However, the temperature The main reason of the low temperature in the area is distribution in November and December was not much due to rain during the measurements taken at the fruit different as shown by the CV of only 2.7. This showed Handyman station. Furthermore, the area was located near that the temperature difference between the highest and the river and there are the

CV 5.4. In the lowest recorded temperature was found at temperature of 36.4°C with the CV of 2.3. As a about 30.7°C at the station of Castle Hill Manton Ancol consequent, the temperature difference between the and up to 38.6°C as recorded at the Western Cape Road stations was recorded only about 3.1°C. Meanwhile the station. Therefore, the temperature difference was quite average minimum temperature was calculated for about large, 7.9°C. For the other months temperature different 30.4°C with the CV 2.1. Thus, the calculated temperature were recorded moderately with CV values between 3.0 to difference was only about 3.1°C. 5.0 only. Generally, the weekdays and weekends average In addition, the study found an average maximum temperature was calculated at the same strength. The temperature of 36.6°C with the CV of 3.2. This value highest average maximum temperature was observed in indicated that the difference in average maximum October and March. As we know, both October and temperatures recorded between stations was relatively March are the period of transition from the two seasons, small, different by only 4.0°C. Meanwhile the average rainy and dry season in Indonesia. The month of October minimum temperature was calculated at 31.3°C with the CV is a time of transition from the dry season to rainy season. of 2.7 and this value was lower by 0.5 as compared with Meanwhile the month of March is a time of transition from the CV of the maximum temperature. Therefore, the the rainy season to the dry season. Thus, it has an impact distribution was not very different which was only 3.2°C. on the occurrence of high temperatures in the study area. Furthermore, the temperature traverse on holidays Based on this study, it showed that the value of the (HC) during the day for the east-west traverse (October urban heat island intensity for the north-south 2011 - March 2012) in Jakarta City was also studied. distribution on holidays for the east-west traverse in about 0.7°C. The observed temperature of more than 36°C Jakarta City was 33.9°C with the CV of 1.2, where the is considered very high, particularly in the HK to give an average highest temperature of 34.4°C was recorded at the impact on the discomfort feeling among dwellers in the Cawang and Pancoran Carrefour station, while the lowest Jakarta City. According to Givoni [13] the UHI in the average temperature of 33.1°C was recorded at the subtropical reach 3°C to 5°C in the

daytime. Therefore, the stations of Cratsman Kalimalang, the average temperature of November was the reasonably high. The present finding was accordance

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temperature was observed in the months of October and dengan urban heat island wilayah Jabotabek.

March. This is due to the fact that both October and Disertasi. Sekolah Pascasarjana Institut Pertanian

March are the time of transition from the two seasons, Bogor. (Bahan tidak terbit).

rainy and dry season in Indonesia. Meanwhile, the 9. Giridaran, R., S. Ganesan and S.S.Y. Lau, 2004.

average urban heat island intensity for the north-south Daytime urban heat island effect in high-rise and

temperature traverse was only 2.0°C while the east-west high-density residential developments in Hong

temperature traverse was equal to 0.7°C. UHI values in Kong. Journal of Energy Build, 36: 525-534.

the study area increased from time to time. Therefore, it 10. Intergovernmental Panel on Climate Change (IPCC),

must be an effort to address an increase urban 2007, Climate Change 2007: Impact, Adaptation and

temperature in order to reduce the UHI phenomenon in Vulnerability, Summary for Policy Makers, 4

the City of Jakarta.