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STUDY OF COMFORT LEVEL OF GREEN OPEN SPACES IN GEDONG TATAAN SUB-DISTRICT, LAMPUNG PROVINCE

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ABSTRACT

The conversion of land in urban areas, especially Green Open Space (GOS) into development land, causes green land to decrease, coupled with the increasing volume of vehicles. The rapid activity of manufacturing plants and excessive energy consumption are contributing factors to the increase in CO2 in the air and the quantity and quality of O2 is declining. Green Open Space or city park is an open space that has ecological benefits, the space is filled by trees that form vegetation, socio-cultural benefits as a forum for interaction between visitors, architectural and aesthetic benefits for the beauty of the city that can provide benefits in the form of recreational and tourist spaces for the community. The existence of RTH will improve air quality and comfort in densely populated areas. The method used is to calculate the Temperature Humidity Index (THI). The aim of the research is *to analyze the temperature and humidity that affect the comfort level of GOS in Gedong Tataan. Data is taken in October 2023. The results showed that the highest temperature was found in Gedong Tataan Park which was 34.4 ^{o}C and the lowest temperature was found in Jejama Sidototo Park which was 25.8 ^{o}C. The difference in temperature and air humidity in the two RTHs in Gedong Tataan District is caused by differences in the composition of vegetation types. The diversity of vegetation types can reduce air temperature and increase humidity so as to provide comfort in both GOSs.*

Keywords: *Comfort Level; Green Open Spaces; Temperature and Humidity*

INTRODUCTION

Urban areas in Indonesia have typical and recurring problems identical, namely rapid level urbanization and growth residents who do not under control cause management and arrangement land place stay specifically room city more and more heavy (Ministry of PUPR, 2008). The conversion land in the area urban especially GOS becomes land development cause land green the more reduced, increased Again increasing volume of vehicles, rapid activity factory manufacturing and usage excessive energy is factor reason increasing CO2 in the air and the quantity and quality of O2 is decreasing decreased. One of the steps for press change climate and reduce global warming due to a number of activities the that is with method creating green open space. Greening efforts through GOS with method planting tree become things to do be noticed use add vegetation and repair ecology in the area congested resident in form procurement more Lots Park city by government with consider area green in the form of management park city, area green yard, path green in proportion roads and so on (Zubair, 2016).

Fulfillment of the stipulated GOS Regulation of the Minister of Agrarian Affairs and Spatial Planning/ Head of the National Defense Agency of the Republic of Indonesia Number 14 of

2022, namely 30% of the total area of a region, with the division of 20% is public green open space and 10% private green open space. In Lampung Province itself availability of green open space in category Already sufficient. Data recorded in the System Information Management National Waste Ministry of Environment and Forestry In 2022, the percentage wide the entire GOS from eleven regencies/cities in Lampung Province are 31.24%. This is also emphasized by the government Lampung Province in Lampung Province Regional Regulation Number 1 of 2010 Concerning Lampung Province Spatial Planning Plan 2009 to 2010 with Article 126 (b) of 2029, mandates that area settlement must equipped with facility social economy including Green Open Space (GOS) in accordance regulation applicable laws.

According to Dwiyanto (2009) GOS or park city is a room open (*open space*) which has benefit ecology Where room the filled with trees that form vegetation, benefits socio - cultural as receptacle interaction between visitors, benefits architectural and aesthetic for beauty city that can give benefit in the form of room recreation and tourism for community. GOS in which filled with trees play a role as regulator climate micro that can reduce hot consequence radiation the sun which is direct influential to temperature air and moisture that can create feeling comfortable for life society (Ahmad et al., 2012).

Comfort trend got from closed canopy by trees so that give effect cool (Irwan and Kharuddin, 2012). As supported by Annisa et al. (2015), the function ecology existence vegetation functioning dampens ray sun, set temperature, humidity, and speed wind. Based on research by Yanti et al. (2018), function ecology including in support factor comfort in space open green. Because, the ideal condition of a room open green public is factor determinant comfort, safety and convenience utilization room public.

In this research there are two green open spaces were taken in Gedong Tataan sub-district as location study namely Jejama Sidototo Park and Gedong Tataan Park (Bridal Monument). Gedong Tataan sub-district is in the Regency Offerings has own percentage of green open space that has been in accordance with provision proportion availability of green open space as stated in Regulation Regent Offerings Number 53 of 2022 Article 19, namely meet the target of 20 (twenty) percent from wide area woke up after reduced with Water Body Zone, Protection Zone Local and Agricultural Zone. This Green Open Space is place recreation and sports and social activities of the community local needs under review because located in the center area and borders directly with the main road which is road connector between potential cities/districts increase temperature air consequence the large volume of vehicles passing through road said. A location located on the border city/district naturally will prone to on change policies in the two regions (Wulandari, 2021).

The others environment life problem that appears is pollution air by vehicle motorized (Tursilowati, 2007). Based on data from the Lampung Regional Police in 2023, when this is the average vehicle motorized crossing Regency Offerings is 127,438 vehicles or 3.10% of the total vehicles operating in Lampung Province. According to Head of Transportation Service Lampung Province through Khoiriah (2022), Volume Capacity Ratio (VCR) of vehicles crossing an area is tolerated at 0.85 % of total vehicles motorized operating every day. The existence of proper regulations from Relevant Head of Department expected can increase optimization the presence of green open space (Wulandari et al., 2019).

In line with Livesley et al., (2016), vegetation in the form of trees can reduce impact pollution air and is also storage backup carbon (Farisi et al. 2017). This means that green open space in an area is certainly will daat minimize impact pollution air. Therefore, it is necessary done study about importance policy for sustainability a development program (Wulandari, 2018) and the level comfort in both GOSs based on index temperature and humidity to see the role of GOS in create comfort use support development urban (Taufiq et al., 2022).

METHODS

This study carried out in two green open spaces in the sub-district of Gedong Tataan Regency Offerings namely Jejama Sidototo Park and Gedong Tataan Park (Bridal Monument) in October 2023. The data presented in this article that is inventory type of tree, air temperature, and humidity presentation. Measurement done in 5 days with three repetitions on each location namely in the morning day 07.00 – 08.00 AM, afternoon day 12.00 – 13.00 PM and afternoon at 17.00 – 18.00 PM (Sapariyanto, 2016). Then identification type tree done with identify all over trees on both location research. Identification results the Then analyzed with studies literature about ability in support convenience on site research (Taufiq et al., 2022).

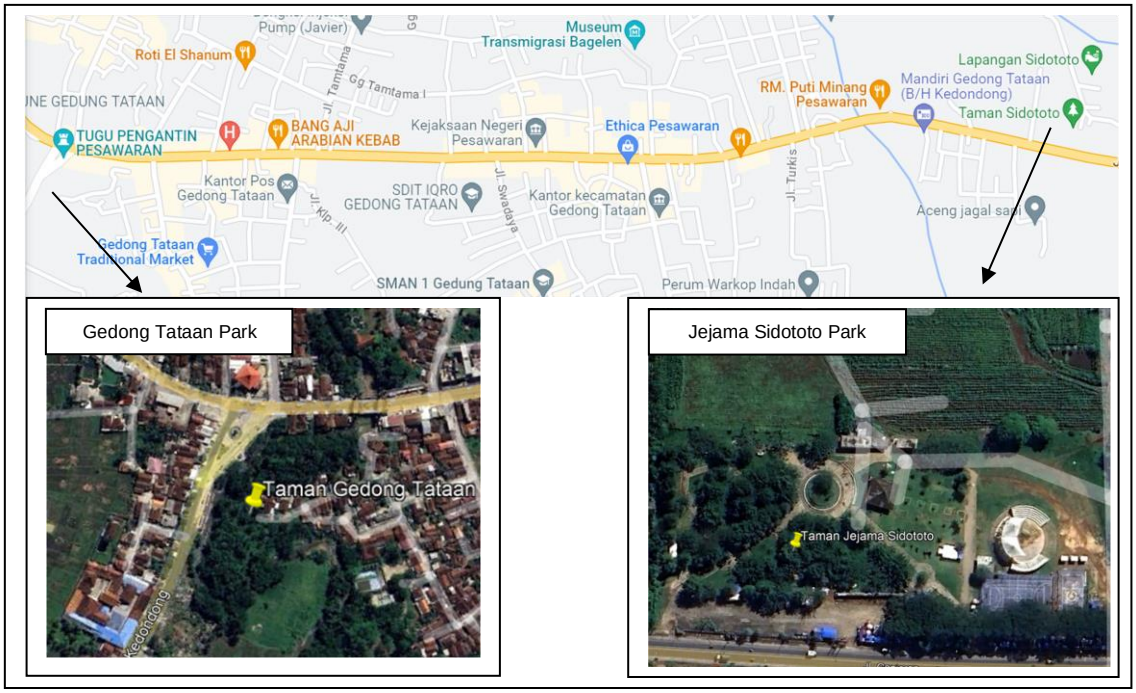

Figure 1. Location of Parks in the Gedong Tataan District

Temperature and humidity values analyzed use subsequent calculation of the Temperature Humidity Index (THI) used for know of comfort level (Choirunnisa et al., 2017). Formula the calculation is THI = 0.8T+(RHxT)/500. Description: T= air temperature, RH= air humidity. Criteria level comfort based on Temperature Humidity Index (THI) is classified become three, namely category comfortable if THI value is 21 – 24, category currently if THI value is 25 – 26, and categories No comfortable if THI value > 26. In addition to testing on condition comfort, a study was also conducted through *desk study* above policies that regulate the existence of green open spaces both at the national level and in Lampung Province.

RESULTS AND DISCUSSION

Gedong Tataan Park Jejama Sidototo park is sub-district park as stated in Regulation of the Minister of Agrarian Affairs and Spatial Planning/Head of the National Defense Agency of the Republic of Indonesia Number 14 of 2022 Article 2 Paragraph (4) functions as place growth various type plants and diversity life, area water absorption and control climate influential micro direct to comfort level. Green Open Space (GOS) policy is very important for ensure that the existing GOS can functioning in a way sustainable. Some reason why GOS is important namely GOS can functioning as effort conservation environment and resources power nature, improvement quality air and water, overcome change climate and health community. Good GOS policy is step important for ensure that room open green can give benefit term long for environment and society, while maintain sustainability function ecological and social.

This study considers air temperature and humidity relatively for guard comfort in both GOS (Taufiq et al., 2022). Temperature air is condition air heat caused by the heat ray sun. Condition temperature air determined by factors vegetation and buildings that become composition a place (Mannan, 2007). Humidity is amounting moisture contained in the air. More water Lots evaporate to air during the day day Where tend hotter compared to afternoon and evening day. Humidity figures air range between 0% – 100% (Choirunnisa et al., 2017). Comfort thermal, as defined in ISO (*International Standard Organization)* standard 7730, is mutual association continuous between temperature, humidity, and speed rate of wind, supported with activity, type of clothes and burning calories level residents representing expression feeling to condition climate in an environment. Comfort thermal is statement subjective about satisfaction everyone who depend on their respective activities and factors others. Conditions comfortable also means as neutrality thermal, meaning somebody No feel too cold or too heat (Rahim et al., 2016).

Availability and structure vegetation can influential to level comfort (Zovanca et al., 2021). Open space green has vegetation similar trees that have various function, one of which is as retainer intensity ray sun and regulator climate micro (humidity, temperature, and wind) (Ramadhani et al., 2019).

Table 1. Inventory Tree

Jejama Sidototo Park			
No.	**Local Name**	**Scientific Name**	**Amount Tree**
1	Trembesi	*Samanea saman*	9
2	Ketapang Kencana	*Terminalia mantaly*	62
3	Tabebuya	*Tabebuia chrysantha*	3
4	Sengon Buto	*Enterolobium cyclocarpum*	6
5	Karsen	*Munting calabura*	1
	Total		**81**
Gedong Tataan Park (Bridal Monument)			
No.	**Local Name**	**Scientific Name**	**Amount Tree**
1	Ketapang Kencana	*Terminalia mantaly*	2
2	Sengon Buto	*Enterolobium cyclocarpum*	11
3	Kendal	*Cordia dichotoma*	2
	Total		**15**

Resources: Albarkati, 2023

In this research, both GOSs own composition different vegetation. This is influence convenience on the comfort site that arises with existence room open green have role vegetation that can lower temperature. Temperature or temperature is degrees hot from activity molecular in the atmosphere (Surmi et al., 2016). This supported by Choirunnisa, et al. (2016) in his statement that temperature the air inside and outside the GOS will different because influenced existence tree or vegetation in it. This is because of the comfort caused by plants associated with role plants that are capable reduce sun radiation until provide climate micro (Sanger et al., 2016).

1. Air Temperature

Analysis results temperature air based on time observation that is morning, afternoon and evening can see in the image below.

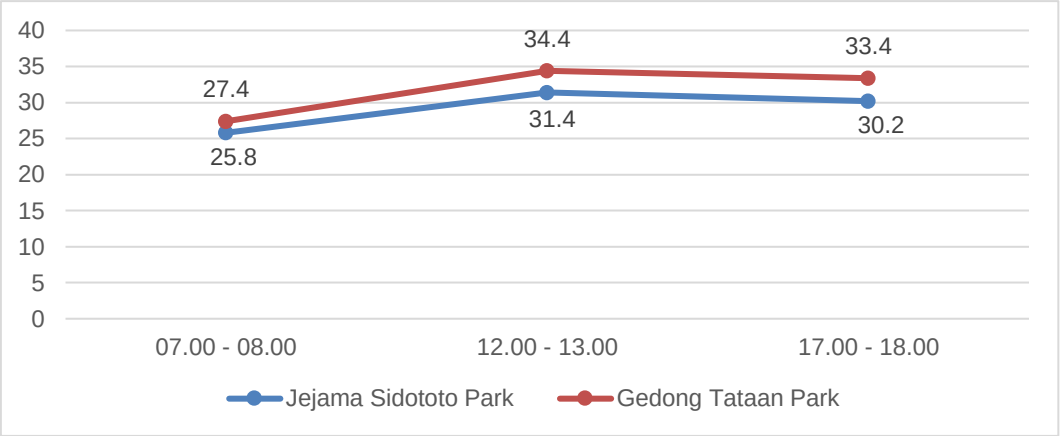

Figure 2. Average Temperature Chart in Both Parks in the District Gedong Tataan

Can be seen that in Jejama Sidototo Park own temperature air lower compared to Gedong Tataan Park. This is due to role vegetation in Jejama Sidototo Park bigger compared to Gedong Tataan Park. Observation results show that temperature air at all three-time intervals in both the location of the GOS is different. This is means condition vegetation and density canopy tree as well as existence the location in both GOS has influence different in control temperature air (Sapariyanto, 2016). The air temperature above surface land without shade will taller compared to with temperature in a place that has cover functional vegetation as shade, because radiation sun will hold back by existence tree in place (Lakitan, 2002).

Temperature highest located in Gedong Tataan Park which is 34.4^{o}C. The height temperature in Gedong Tataan Park caused by not existence canopy that can absorb ray sun because the most effective leaves absorb ray sun. Canopy in a way slowly can lower temperature through the process of evapotranspiration plants (Taufiq et al., 2022).

2. Air Humidity

Research results in Figure 3 show humidity air in both GOS in the morning day own mark highest and lowest happened during the day day. In Jejama Sidototo Park at 07.00 – 08.00 AM has mark humidity highest which is 84.2% while humidity lowest there is i in Gedong Park The arrangement that occurred at 12.00 – 13.00 PM was 23.8%.

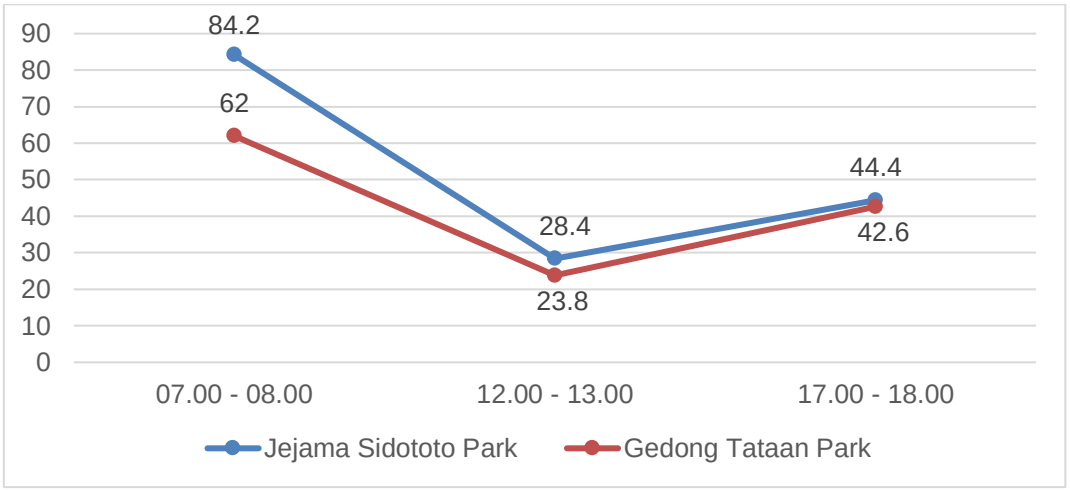

Figure 3. Average Humidity Chart in Both Parks in the District Gedong Tataan

Humidity is composition content level water vapor in the air (Zubair, 2016). Humidity dip influenced radiation the sun, where at the time sun sunk until rise so temperature will decrease and humidity increased (Sanger et al., 2016). This is happened Because exposure ray sun will

increase during the day day and then decrease back in time sun dimmed and sank. Besides, activity resident will the more intense in the morning until the afternoon. Activities industry and transportation as well as routine human trigger increase temperature air, then decrease afternoon activities trigger decline temperature air and humidity (Prasetya, et al. 2017).

Indriyanto (2006) stated that vegetation is element nature that can influence climate through control instability or change component air. Elements the nature that surrounds it like temperature, humidity air, speed wind, and rainfall Rain so that determine condition climate local or normal called climate micro. In Jejama Sidototo Park own vegetation tree with wide canopy with more amount Lots compared to with Gedong Tataan Park. So more and more wide title tree so will increase density canopy so that ray sun the more difficult penetrate surface land. This is capable lower temperature air on the surface the land that causes humidity air increased (Prasetya, et al. 2017).

3. Index Air Temperature and Humidity

Temperature air is measure measuring a climate that can direct felt by humans as indicator comfort in a place. Comfort will the more reduce if air hot exceeding the limits specified by the indication temperature (Hidayat, 2010). The increase comfort can see with indication temperature the air is descending, namely perceived temperature tend cool. More and more low temperature so air will the colder (Mahabella, et al. 2020).

THI calculation can be giving benefit as consideration for plan spatial and urban development, space open *(open space*) will more considered its construction from aspect environment and the benefits obtained (Trinah et al., 2017). Comfort level This identified with know degrees average temperature (^oC) and percentage humidity relative (%). Calculated data in the form of periodic data according to time interval observation, with results mark adjusted index with criteria that have been determined (Mahabella, et al. 2020). Take Index Humidity Temperature (THI) for determine level comfort a place daily for help support development of comfortable and friendly city planning environment (Taufiq et al., 2022).

Table 2. Index Temperature and Humidity

THI (Temperature Humidity Index) value			
Observation Location	**Observation Time**		
	07.00 - 08.00	**12.00 -13.00**	**17.00 - 18.00**
Jejama Sidototo Park	Comfortable	Currently	Currently
Gedong Tataan Park	Currently	Uncomfortable	Uncomfortable

Resources: Albarkati, 2023

Based on results research, Gedong Tataan Park own mark index No comfortable found twice, namely at 12.00 – 13.00 PM and at 17.00 – 18.00 PM, as well as at Jejama Sidototo Park who has index at moderate level twice at 12.00 – 13.00 PM and at 17.00 – 18.00 WIB. While at 07.00 – 08.00 AM Jejama Sidototo Park show index comfortable, this thing continuous with vegetation planted on site the based-on Table 1. Where the planting done with structure dense vegetation and wide canopy.

4. Comfort Level

According to Karyono (2005) a satisfaction that can be felt man related with the existence of GOS, namely comfort. The level of comfort in humans to an area has reflected based on measure measuring climate in the form of cool temperature, humidity relative air high and low radiation sun. Comfort can arise because the role of GOS in providing shade in the form of vegetation in reduce exposure radiation the sun, produces air clean, filter air pollution, and others due to existence the tree that forms vegetation and create climate micro (Ochoa and

Marincic, 2005). One of the source pollutions and increasing temperature air in the environment man originate from emission vehicle motorized, where road raya is place move man in do his activities use vehicles that cause pollution (Tondi, 2023).

Vegetation in the form of trees capable absorb pollutant air and particles dust (Chaudhry and Panwar, 2016). Criteria free pollution based on facts that pollutant like dust can lower-level comfort because harm human. Impact negative effects caused by pollutants particle dust is disturbance function lungs (Hamidi et al., 2013). By general plants that have green leaves (*chlorophyll*), in the process of photosynthesis need help light sun for change carbon dioxide (CO2) and water compounds (H2O) from air or environment the surrounding area which then changed become Oxygen (O2) (Tondi, 2023).

Table 1 shows that the most abundant vegetation located in Jejama Sidototo Park as many as 81 trees while in Gedong Tataan Park only there are 15 trees. At Gedong Tataan Park Actually there is more from 15 plants However Still including classification stake. Garden Garden Jejama Sidototo have higher THI value Good compared to Gedong Tataan Park. Because, in Gedong Tataan type of planted vegetation is dense vegetation the title more a little compared to Jejama Sidototo Park. Difference temperature and humidity between Jejama Sidototo Park and Gedong Tataan Park is very visible in the measurements in 12.00 PM. Average temperature in Jejama Sidototo Park is 25.8^{o}C, while in Taman Gedong Setting 34.4^{o}C. The more meeting canopy plants on an area, then environment the the more stable (Erly et al., 2019). According to Irwan and Kaharuddin (2010), the width canopy from title tree will to form shade green that can give comfort in the GOS area.

Different as it is with vegetation in Gedong Tataan Park, location park the be on the border adjacent road direct with road as well as development park with paving blocks added with surface asphalt the road which is become reason height temperature during the day day. Average temperature in the morning day of 27.4^{o}C up to 34.4^{o}C during the day day. Materials that are not sheltered have higher temperature tall compared to the shaded material vegetation and buildings others (Rusyda et al., 2017).

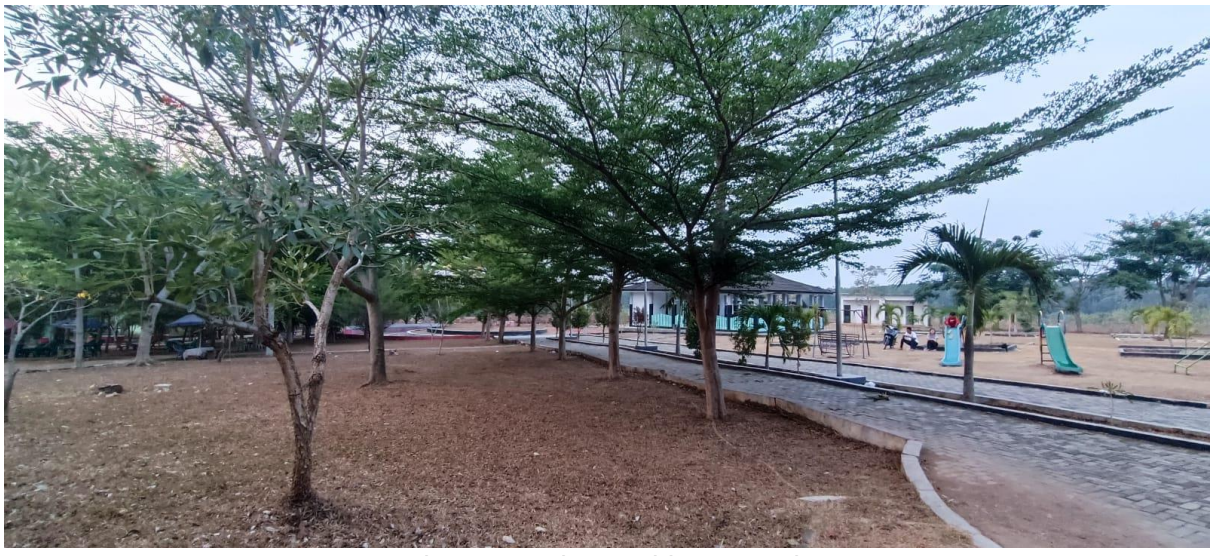

Figure 4. Jejama Sidototo Park

Figure 5. Gedong Tataan Park

According to Tondi research (2023) a group the tree that fills ecosystem can functioning for mitigate climate and as absorber pollutants. Trees that function absorb pollutant own characteristic features morphology trees that have a large diameter, have tall more from 3 meters, and has texture leaf uneven or hairy. One of them is tree Trembesi (*Samanea saman*). Tree type This was found in Jejama Sidototo Park. Then The golden Ketapang tree has characteristic features similar in the form of tall stem exceed 3 meters with large diameter, branching dense, and wide canopy functioning absorb pollutants. Types of trees This can found in both park location study.

Apart from being able to absorb pollutant air, planting vegetation trees are also capable give air clean (Ramadhani et al., 2019). Supported by Siringoringo (2000), plants can absorb and accumulate material pollutants determined by characteristics morphology leaves. Leaves whose surface rough and prone hairy or textured have power absorb to more pollution tall compared to leaves that have more surface smooth and regular (Hendrasarie, 2007).

5. Policy Sustainability of Green Open Space

Now the regulation of green open space in Lampung Province refers to the Regulation of the Minister of Agrarian Affairs and Spatial Planning/ Head of the National Defense Agency of the Republic of Indonesia Number 14 of 2022. In the regulation the mentioned that GOS must covering at least 30% of the total area of a region and consists of over 10% private green open space and the rest namely 20% is public green open space. Although the area of green open space in Lampung Province is included category done enough, but government area still must to uphold policy about GOS to remain guaranteed its sustainability. Based on data on the System Information Management National Waste of the Ministry of Environment and Forestry issued year 2022 wrote that presentation the area of green open space is 31.24% of the total green open space in 11 (eleven) districts /cities in Lampung Province.

As for the policies that guarantee the existence of GOS is mentioned more detailed in Lampung Province Regional Regulation Number 1 of 2010 concerning Lampung Province Spatial Planning Plan 2009 to 2010 with 2029 Article 126 (b), area settlement must be equipped with facility social economy including Green Open Space (GOS) in accordance regulation applicable laws.

CONCLUSION AND SUGGESTIONS

Highest average temperature recorded at 12.00 – 13.00 PM at Taman Gedong Arrangement with temperature 34.4°C and temperature lowest recorded at 07.00 – 08.00 AM at Jejama Sidototo Park with temperature 25.8°C. Humidity highest located in the Park Jejama Sidototo by 84.2% and the lowest in Taman Gedong Arrangement by 23.8%. Based on Index Humidity Temperature (THI), Gedong Tataan Park have marked No comfortable at 12.00 to at 18.00 PM, while Sidototo Park have THI value is comfortable at 07.00 – 08.00 WIB and moderate at 12.00 to 18.00 PM. Difference temperature and humidity air in both green open spaces in the sub-district Gedong Tataan caused by differences type vegetation as composition of GOS that is capable of lower temperature air and improve humidity so that give comfort. Good GOS policy is step important for ensure that room open green can give benefit term long for environment and society, while maintain sustainability function ecological and social. Relevant policies will can ensure sustainability the function and existence of green open spaces in an area.

Need done addition plants in Gedong Tataan Park specifically plant with the type that is preferred by the community and functions optimally. In addition, own density more canopy large and dense header for press increase temperature and can add humidity air for increase comfort.

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