

Student Perception of Thermal Comfort of Outdoor Space in Nusa Nipa University, Maumere, East Nusa Tenggara

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Abstract Nusa Nipa University is one of a number of universities in Maumere City, Sikka Regency, East Nusa Tenggara. Based on the Koppen climate classification, the City of Maumere is included in the savanna. The savanna climate is different from the tropical rain climate in terms of temperature, air humidity and wind speed. The high temperature in this city influences the perception of thermal comfort. Thermal comfort is a necessity for people performing activities in both outside and inside of building, one of those are students at Nusa Nipa University. This research was conducted by distributing questionnaire to 50 students occupying in 2 (two) different spots in the outdoor space. The result showed that 58% students felt comfortable in the grassy area with shade compared to other off-campus areas. This perception of comfort is influenced by comfort factors namely hardscape or softscape that exist in the outdoor space of the Nusa Nipa University.

Index Terms—Perception, Thermal Comfort, Outdoor space, and Nusa Nipa University .

I. INTRODUCTION

Humans need comfortable environment in performing their activities. Comfort is a perceived humans comprehensive assessment towards the environment that includes space comfort, visual comfort, hearing comfort and thermal comfort [1].

ASHRAE Standard 55-1992 defines thermal comfort as the state of mind that expresses satisfaction with the thermal environment. This standard also states that the accepted thermal condition requires 90% of occupants feel satisfied. McIntyre [2] notes that a person considered feeling thermal comfort is when they neither feel hot nor cold in their environment. Sangkertadi [3] states that outdoor comfort is harder to assess compared to indoor comfort. One of the assessable environment in terms of thermal comfort is outdoor space in university area.

Nusa Nipa University (UNIPA) is a university in Maumere City, Sikka Regency, East Nusa Tenggara, Indonesia. Based on Koppen climate classification, Maumere is categorized as savannah/dry city. The high temperature in

Maumere city influences people's perception of comfort, particularly thermal comfort.

Thermal comfort is a necessity for people performing outdoor activities. As a space for activities, outdoor space in UNIPA should be able to achieve thermal comfort level. Hence, identification and study on comfortable or uncomfortable outdoor space in terms of thermal comfort is needed.

A. Thermal Comfort

Thermal comfort is a process that involves physical, physiological and psychological assessment. Therefore, thermal comfort is the perceived condition of mind that expresses satisfaction on the thermal environment [4].

B. Thermal Comfort in Outdoor Space

According to Istiawan and Kencana [5]. Outdoor space is space constructed by limiting nature on flooring and wall, whereas ceiling (overhead cover) is unlimited. Thus, in outdoor space planning, flooring and wall elements become crucial.

Outdoor space is a generic term that consists of open space. Open space is one part of outdoor space comprises of certain limits, along with function, purpose and human

will. Those limits are marked by frame that transform into a positive space [6]. Further, park is a part of outdoor space.

According to Sangkertadi [3], one of a contributing factors that greatly influences outdoor space comfort is air temperature. The existence of parks in an area could increase air humidity at night and lower the rising temperature at day time [7]. Parks are not only useful in ecological, social, cultural economy and aestical aspects, but also in micro climate in the area.

A comfortable outdoor space tends to have colorful buildings, wide setback, lots of shady trees, paved floorings, plenty sets of street furnitures, and enclosed sky view factor [8]. Further, micro climate condition could also influence comfort sensation experienced by visitors in that area [7].

C. Outdoor Space Elements in Improving Thermal Comfort

Visitor comfort serves as a prerequisite to supporting activities in parks [9]. Additionally, the necessary comfort required in parks include physical and psychological comfort. Physical comfort is the freedom to use facilities without interference. Moreover, psychological comfort is a feeling of being safe and protected from disturbing weather [10].

Trees or greenery is the most significant element perceived as a visual aspect. Greenery acts as a supporting facility that gives calmness in planning a lively and comfortable outdoor space in terms of thermal comfort [11]. According to [1], planting greenery in front of buildings could provide a sense of comfort and cool.

D. Thermal Comfort Perception on Outdoor Space

According to [12], the process of perception requires individuals to provide an assessment of an object that has meaning to them. Respondents' perception of outdoor space can be indicated by noticing changes in air temperature and humidity felt when either the outdoor space is covered with canopy or only with pavement [13].

II. METHOD

This research was conducted in the outdoor space of Nusa Nipa University. The outdoor space was divided into 2 (two) areas: one space with pavement and no shade, the other has grass (grassy) with shade covering 50% of the space.

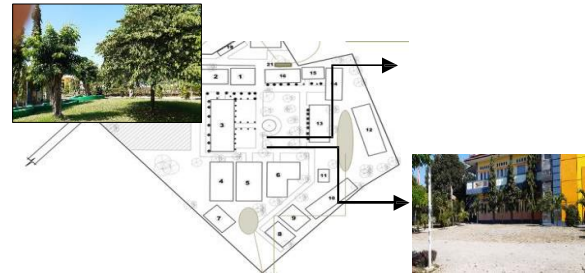


Fig 1. Research Area
Source: Personal Documentation, 2019

This research surveyed 50 students/respondents studying or having discussion in each outdoor space area, making a total of 100 respondents. Whereas 50 students in the grassy area with shade and another 50 students in the pavement area without shade.

Questionnaire and quick interview were conducted to collect perception data from respondents. Digital thermometer and digital Anemometer were used to measure external environmental factors that affect the comfort felt externally by respondents. Both measurements were conducted simultaneously.

Each student was asked to fill in the questionnaire provided with regard to perception using the Bedford Scale. Questionnaires were filled out from morning until noon (08.00 AM – 02.00 PM).

The distributed questionnaires contained questions about respondents' data and perception of weather comfort felt in the particular point of place. Data obtained were then analyzed by simple statistics to determine scores of comfort, acceptance and preferences.

III. RESULT AND DISCUSSION

A. General Description of research Area

Nusa Nipa University (UNIPA) is a university located in Maumere City, Flores, Nusa Tenggara Timur. In addition to collage buildings, UNIPA also has outdoor space consisting of green open space and parks. Some of the trees planted are: Palem Putri/Pasific Palm (*Veitchia merillii*), Kersen/Jamaica Cherry (*Muntingia calabura*) and Glodokan Tiang/False Ashoka (*Polyalthia longifolia*)



Fig 2. Few Trees in UNIPA Outdoor Space
Source: Personal Documentation, 2019

These trees are used for students to socialize and study.



Fig 3. Outdoor Space For Student Activities
Source: Personal Documentation, 2019

The majority of students/respondents interviewed in the UNIPA outdoor space were students who had lived in Maumere for more than 2 years and were between 19-22 years of age.

B. Student Perception of Comfort Towards UNIPA Outdoor Space

Based on measurement from thermometer and anemometer, it was then discovered that the highest temperature in pavement area without shade was 35.4°C and the highest was 28.6°C. While in grassy area with shade, the highest temperature was 30.50°C and the lowest was 27.6°C.

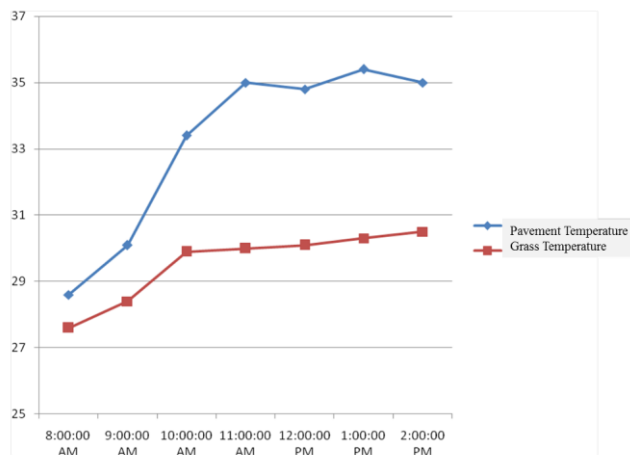


Fig 4. Temperature Graph of UNIPA Outdoor Space
Source: Personal Analysis, 2019

This research found that temperature in grassy area with shade was lower of approximately 3.18°C compared to pavement area without shade. According to [13], grass material can absorb heat better when compared to pavement area.

Data obtained from questionnaires noted that in the pavement area without shade, students felt **comfortably hot** in the temperature range of 28.6°-30.1°C; and felt **extremely hot** in the temperature range of 33.4°C-35.4°C. While in the grassy area with shade, it was discovered that 58% students felt **comfortable** in the temperature range of

27.6°C-29.9°C and felt **hot** in 30°C.

Pavement area without shade had a lower score of humidity when compared with its higher temperature. The humidity score of this area ranged from 37.6%-48.9%, (and when the air temperature reached intense heat) caused students to feel uncomfortable.

The high temperature and the low humidity in the area are influenced by several factors such as softscape and hardscape.

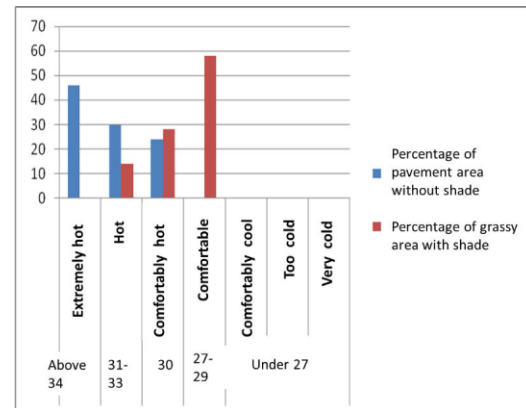


Fig 5. Percentage of Student Comfort Towards UNIPA Outdoor Space
Source: Personal Analysis, 2019

C. Students Adaptation Towards UNIPA Outdoor space

Data obtained from questionnaires handed out to respondents, it was then discovered that there were several actions taken in order to get the sense of comfort when being in outdoor space. As high as 68% of respondents chose to drink cold beverages when they felt hot, 17.8% chose to move from their previous spot, and 14.2% chose to do nothing from the discomfort felt.

IV. CONCLUSION

Based on analysis, this research concluded that temperature had influence on students comfort. The high and low degrees of temperature and scores of air humidity were determined by elements in the areas. Students felt more comfortable in the grassy area with shade (softscape) compared to pavement area without shade (hardscape).

This result is line with the statement from [9], that the higher the air temperature, the lower the air humidity score. Several factors that influence air humidity score are, among others: the availability of vaporizer, air temperature and solar radiation [14].

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