IJISET - International Journal of Innovative Science, Engineering & Technology, Vol. 12 Issue 05, May 2025
ISSN (Online) 2348 – 7968 | Impact Factor – 6.72
www.ijiset.com

Analysis of the Dynamics of Air Humidity and Air Temperature in the Coastal Marina Plaza Manado City

Marianus[1], Kenny Setiawan Lahope[2]

[1] Environmental Programs, Faculty Mathematics, Science, and Earth., Manado State University, Tondano, Indonesia
[2] Faculty Mathematics, Science, and Earth., Manado State University, Tondano, Indonesia

Abstract

Manado city, the capital of North Sulawesi province, is a coastal region rich in natural diversity. Unstable climate and weather have an impact on humidity and temperature in the city, affecting the survival of local communities. The purpose of this study was to determine the relationship between humidity and temperature changes along the coastal Marina Plaza Manado Beach as influenced by different distances and elevations. Humidity and temperature data were measured at different locations and distances from the coastline as well as at different elevations. Data were collected using a Digital Instrument Four in One measuring instrument. At various altitudes a significant relationship between humidity and air temperature at different distances and heights was shown. This study is important for understanding climate and adaptation in coastal areas. This information can be used to develop future mitigation and adaptation strategies.

Keywords: *Humidity, air temperature, manado city, distance, heights*

1. Introduction

Coastal areas are unique and dynamic, with complex interactions between the atmosphere, ocean and land. Manado City, as one of the coastal cities in Indonesia, has great potential in the development of coastal areas, including Marina Plaza Beach. However, global climate change and human activities can affect environmental conditions in coastal areas, including the dynamics of humidity and air temperature. Air humidity is the concentration of water vapor in the air. [1]. Air temperature indicates how hot or cold a place is at a certain time, and can affect the magnitude of other parameters such as air humidity [2]. In theory, the higher the air temperature in a place will make the air humidity decrease. If the air temperature is low, the humidity will increase.

Humidity and temperature are the two main parameters that play a role in shaping regional atmospheric conditions. Humidity and temperature are important parameters in determining environmental quality and comfort in coastal areas. Changes in air humidity and temperature can affect various aspects, such as human health, comfort, and economic activities. The relationship between air humidity and air temperature is very important in shaping the world's weather and climate [3]. One form of the relationship between air humidity and air temperature is dew point. The dew point is the temperature at which the air becomes completely saturated with water vapor and fog begins to form. When the temperature drops to the dew point, the air becomes saturated with water vapor and the condensation process begins. This leads to the formation of clouds, rain and dew on the surface of colder objects [4].

Indonesia is astronomically located between 6° north latitude and 11° south latitude and between 95° east longitude and 141° east longitude. When viewed from the astronomical position, Indonesia is located in a tropical climate and is located in the eastern hemisphere. Indonesia is located in Southeast Asia in a tropical climate area, making Indonesia always exposed to sunlight throughout the year. Indonesia only experiences seasonal changes twice a year, namely the dry season and the rainy season. Climate change in Indonesia is currently experiencing irregular changes so that rainfall and drought are unstable [5].

In North Sulawesi, especially in the city of Manado, low rainfall causes changes in air humidity and temperature as a result of the tropical climate in Indonesia as well as global warming factors [6]. Rainfall in the Marina Plaza Manado area is very low due to the long dry season so that the humidity and temperature in that place have different variations than during the rainy season [7]. Variations in humidity and air temperature can be seen at certain heights and distances from the coast [8]. Based on previous research from Mufti (2014) explained that surface air humidity in Manado is influenced by changes in wind and upper layer atmospheric humidity in Manado. But it was not able to explain in detail other influences that could or might affect air humidity in Manado. Because of this, a question arises that wants to be discussed, namely, how does the air temperature change on the coast of Marina Plaza Manado at different distances and heights? And how does the humidity change on the coast of Marina Plaza Manado at different distances and altitudes?

Therefore, this study aims to determine the changes in air temperature on the coast of Marina Plaza Manado at different distances and heights and to determine the air humidity on the coast of Marina Plaza Manado at different distances and heights.

2. Methods

This research is a case study activity to determine changes in air humidity affected by temperature on the coast of Marina Plaza Manado Beach at a certain distance and height. The research started at the time interval of 10:00 am - 15:00pm WITA. The instrument used to measure humidity and air temperature is the *Four In One* Digital Instrument. measurements were taken at time intervals of every 30 minutes. Observation data is a type of primary data, where data is obtained directly from measurements in the field. data collection using the observation format as in table 1.

Table 1: observation format for changes in humidity and air temperature

Distance		100 cm	200 cm	100 cm	200 cm
Time	Height from Ground Level (cm)	Air Temperature (°C)		Air Humidity (%Rh)	
10:00	50				
	100				
10:30	50				
	100				
11:00	50				
	100				
11:30	50				
	100				
12:00	50				
	100				
12:30	50				
	100				
13:00	50				
	100				
13:30	50				
	100				
14:00	50				
	100				
14:30	50				
	100				
15:00	50				
	100				

3. Result and Discussion

3.1 Relationship between changes in air humidity and air temperature at a distance of 100 cm and a height of 50 cm

The following is a line diagram of the change in air humidity as affected by changes in temperature at a distance of 100 cm and a height of 50 cm.

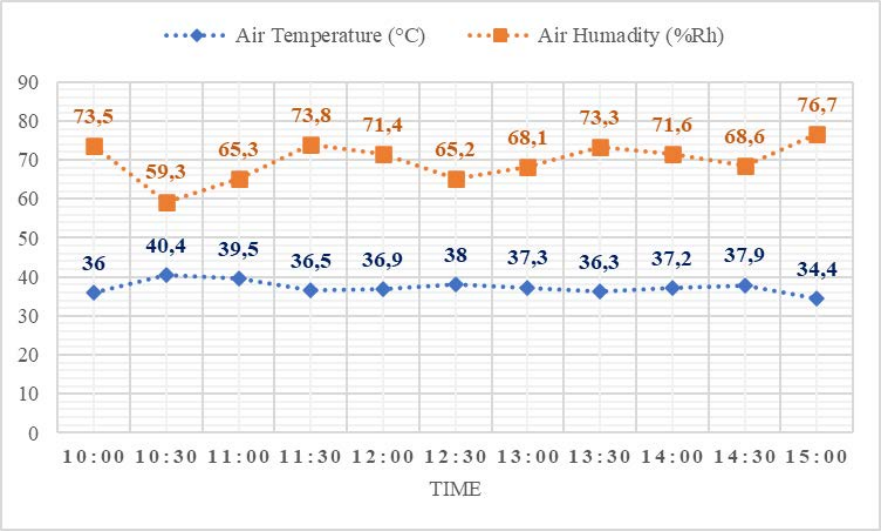

Figure 1 Change in Air Humidity to Temperature at 100 cm Distance & 50 cm Height

In the line diagram in Figure 1, if you look at the time range of 10:00 - 15:00, it can be seen that overall when the temperature increases, the air humidity will decrease. Conversely, if the temperature decreases, the air humidity will increase. It can also be seen in the graph that time plays a role in changes in air humidity, the maximum air humidity is located in the morning at 10:00 and in the afternoon at 15:00, this is due to the condition of the sun that has just risen and is almost set. So the sun position factor can affect air humidity & air temperature [10].

3.2 Relationship between changes in air humidity and air temperature at a distance of 100 cm and a height of 100 cm

The following is a line diagram of the change in air humidity as affected by changes in temperature at a distance of 100 cm and a height of 100 cm.

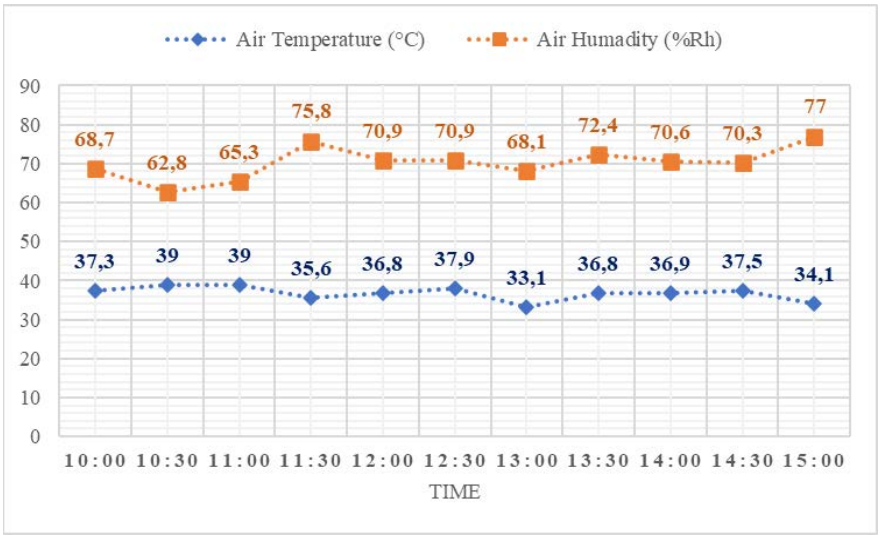

Figure 2 Change in Air Humidity to Temperature at 100 cm Distance & 100 cm Height

The relationship between air humidity as affected by temperature at a distance of 100 meters and a height of 50 cm. At a distance of 100 m with a height of 100 cm at 10:00 am to 11:00 am the humidity increases and the temperature is constant, then at 11:30 am the humidity increases and the temperature starts to decrease the next 30 minutes the humidity decreases followed by an increase in temperature, at 1:00 pm the humidity and temperature decrease and in the next 30 minutes the humidity and temperature both rise and when 2:00 pm to 2:30 pm the humidity starts to decrease but not too drastically and the temperature starts to increase and in the next 30 minutes at 3:00 pm the humidity increases and the temperature decreases. And from the graph, it can be seen that the temperature does not have a prominent change but the humidity has a prominent change. If there is a slight increase in temperature, it will cause the humidity to decrease significantly and drastically. However, when there is a slight decrease in temperature, the air humidity will increase significantly [11]

3.3 Relationship between changes in air humidity and air temperature at a distance of 200 cm and a height of 50 cm

The following is a line diagram of the change in air humidity as affected by changes in temperature at a distance of 200 cm and a height of 50 cm.

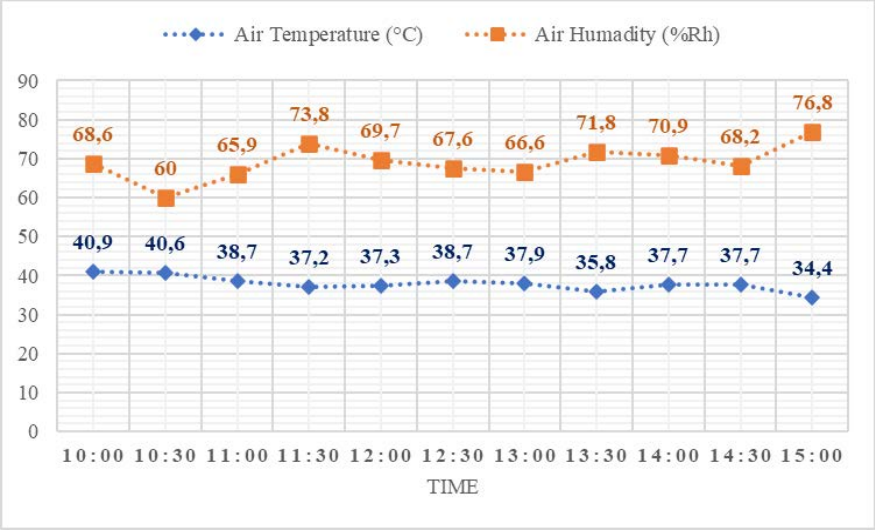

Figure 3 Change in Air Humidity to Temperature at 200 cm Distance & 50 cm Height

The relationship between air humidity as influenced by temperature at a distance of 200 meters and a height of 50 cm. Furthermore, at a distance of 200 m with a height of 50 cm on the graph it can be seen at 10:00 the humidity rises and the temperature drops and 30 minutes or at 10:30 then the humidity decreases and the temperature still remains constant, then at 11:00 the humidity begins to increase slowly until 11:30 while the temperature slowly decreases, when at 12:00 to 13. 00 the humidity slowly decreases and the temperature decreases and increases which are not too prominent, 30 minutes (13.30) then the humidity increases and the temperature decreases 30 minutes (14.00) then the humidity decreases and conversely the temperature increases and at 14.30 the humidity decreases and the temperature remains constant (no change) and at 15.00 the humidity increases dramatically and the temperature also decreases [12]. So in the 200 meter distance graph at a height of 50 cm, it can be seen that the temperature does not change too much compared to the humidity that occurs on the coast of Marina Plaza Manado.

3.4 Relationship between changes in air humidity and air temperature at a distance of 200 cm and a height of 100 cm

The following is a line diagram of the change in air humidity as affected by changes in temperature at a distance of 200 cm and a height of 100 cm.

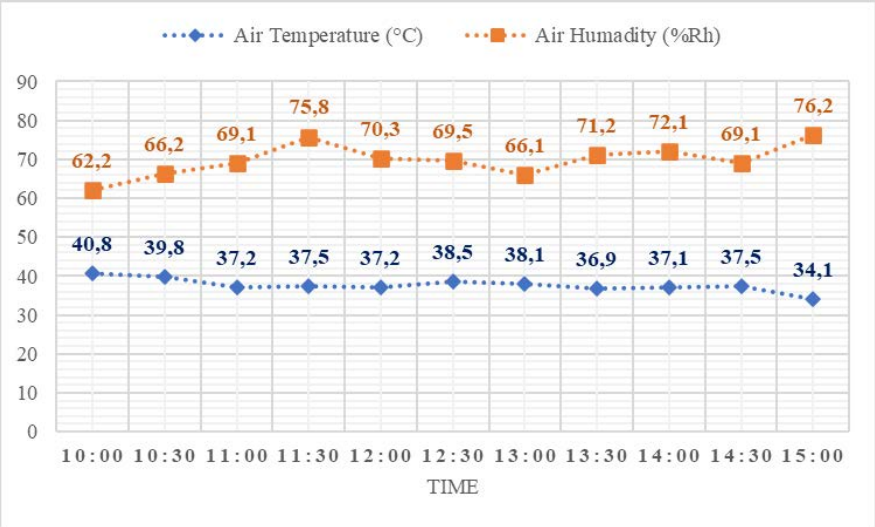

Figure 4 Change in Air Humidity to Temperature at 200 cm Distance & 100 cm Height

In the line diagram above at a distance of 200 cm and a height of 100 cm in the time range 10:00-14:30 the temperature only experienced a slight increase and decrease but at 15:00 the temperature dropped while the humidity at 11:30 experienced an increase in air humidity then in the time range 12.30-13.00 there was a decrease in humidity then rose again at 13.30-14.00 and in the 14.30-15.00 hour range there was an increase in humidity.

when looking at the indoor air humidity level which is at 40% - 60% Rh and the room temperature is 27°C-29°C then looking at the results of the measurement of air humidity temperature it is found that the temperature and humidity have exceeded the ideal temperature and humidity level for the room [13], [14]. the factor causing the increase in air temperature and humidity in the coastal marina plaza of manado city is the behaviour of human activities such as cutting down trees on the coast for the reconstruction of the construction of shops. therefore looking further, the coastal area of the marina plaza of manado city needs tree planting to maintain the increase in air temperature and humidity in order to create a more comfortable environmental atmosphere for the community. Increased air temperature and humidity also affect public health where high or low humidity can aggravate respiratory symptoms, allergies, asthma, and increase the likelihood of catching a cold or flu. In addition, air that is too dry or humid is generally uncomfortable to live in [13].

4. Conclusions

The conclusion that can be drawn from p that air humidity and air temperature in the city of Manado, especially in the marina plaza manado area, are in the high category which exceeds the ideal temperature and humidity in the room. therefore this is a concern for the city government of manado to improve to make arrangements for the environment in the city of manado.

References

[1] G. A. Negara, “Analisis Monitoring Temperatur dan Kelembaban Udara Alami Berbasis Teknologi Mikrokontroler,” *J. Inov. Tek. dan Edukasi Teknol.*, vol. 3, no. 1, pp. 32–39, 2023, doi: 10.17977/um068v3i12023p32-39.

[2] H. W. Isramadhanti, “Gambaran Kualitas Udara di Kota Yogyakarta Berdasarkan Pemantauan Air Quality Monitoring System tahun 2019-2020,” 2019.

[3] B. Li, C. Du, M. Tan, H. Liu, E. Essah, and R. Yao, “A modified method of evaluating the impact of air humidity on human acceptable air temperatures in hot-humid environments,” *Energy Build.*, vol. 158, pp. 393–405, Jan. 2018, doi: 10.1016/J.ENBUILD.2017.09.062.

[4] A. Suryanto, W., & Luthfian, *Pengantar Meteorologi.* UGM Press, 2019.

[5] Julismin, “Dampak dan Perubahan Iklim Indonesia,” *J. Geogr.*, vol. 5, no. 1, pp. 40–46, 2013.

[6] J. E. Pinontoan, I. O. R., Sumampouw, O. J., Pi, S., & Nelwan, *Perubahan Iklim dan Pemanasan Global*. Deepublish, 2022. [Online]. Available: https://bintangpusnas.perpusnas.go.id/konten/BK47780/perubahan-iklim-dan-pemanasan-global

[7] K. Suryanti, D. Fitriyani, R. Muharsyah, and M. Marzuki, “Analisis Variasi Diurnal Curah Hujan di Sumatera Barat Menggunakan

Data Rain Gauge dan IMERG," *POSITRON*, vol. 10, no. 2, p. 1, 2020, doi: 10.26418/positron.v10i2.38469.

[8] H. Hermawan, "Studi lapangan variabel iklim rumah vernakular pantai dan gunung dalam menciptakan kenyamanan termal adaptif," *J. Arsit. Zo.*, vol. 1, no. 2, p. 96, 2018, doi: 10.17509/jaz.v1i2.12467.

[9] F. Mufti and . A., "Pengaruh Angin Dan Kelembapan Atmosfer Lapisan Atas Terhadap Lapisan Permukaan Di Manado," *J. MIPA*, vol. 3, no. 1, p. 58, 2014, doi: 10.35799/jm.3.1.2014.3909.

[10] D. Sandy Ari, "Pengaruh Intensitas Cahaya Matahari Terhadap Perubahan Suhu, Kelembaban Udara dan Tekanan Udara," Universitas Jember, Jember, 2017.

[11] M. I. Hidayati, R., Ramalis, T. R., & Mujtahiddin, "Analysis Of Hailstone At Territorial Bandung Bases Atmospheric Condition And Satellite Image," *Fibusi (Jurnal Online Fis.*, vol. 3, no. 1, 2015.

[12] M. N. Dalengkade, "Fluktuasi Temporal Kelembapan Udara Di Dalam dan Luar Ekosistem Magrove," *BAREKENG J. Ilmu Mat. dan Terap.*, vol. 14, no. 2, pp. 159–166, 2020.

[13] C. Grubbs, "Indoor Humidity Level: Why Is the 40–60% Range Ideal?," iaq.works. [Online]. Available: https://iaq.works/humidity/indoor-humidity-level-why-is-the-40-60-range-ideal/

[14] A. S. Rohman, U. Nurbaiti, and Fianti, "Analisis Kenyamanan Suhu Ruangan," *J. Enviro Sci.*, vol. 17, no. 2, pp. 21–29, 2021.