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Effecting Factors to Increasing Diarrheal Disease among Children 5 Years: A Medical Geography Perspective

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Abstract

This research discusses the impact of climate change on among 5 years of children's health using a medical geography approach. The incidence of diarrhea, a leading cause of morbidity and mortality in low-income countries such as India, is temperature-sensitive, suggesting, changing patterns of infectious disease and intensification of natural disasters; it could be associated with climate change. A medical geography perspective provides insight into how geographical factors such as climate, topography and population distribution affect vulnerability to these impacts. The importance of understanding medical geography in meeting these challenges and the need for global cooperation to address the effects of climate change on human health are emphasized. The article underscores the need for appropriate mitigation measures to protect future human health in the face of increasingly apparent climate change.

Keywords

Climate Change, Human Health, Medical Geography.

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Introduction

Climate change has become one of the global issues that dominate conversations in various parts of the world (Amponsah et al., 2023) [1]. Factors such as an increase in global average temperature, rising sea levels and intensification of natural disasters have further worsened our environmental situation (Rakuasa, 2022; Liwan & Latue, 2023; Letedara et al., 2023; Latue & Rakuasa, 2023; Hehanussa et al., 2023) [2]. However, what often goes unnoticed is the serious impact this climate change has on human health (Rakuasa, 2023) [3]. This research will discuss the phenomenon of climate change and how it affects human health, using a medical geography approach. First of all, climate change has triggered an extreme increase in global temperatures (Rakuasa & Pertuack, 2023) [4]. In some areas, extremely high temperatures can also trigger spikes in air pollution, which can damage the human respiratory tract (Philia & Rakuasa, 2023) [5]. Climate change is an emerging public health crisis that can impact individuals across the globe. The direct impacts of climate change associated with increases in the frequency and intensity of heat waves, extreme precipitation events, floods, droughts, and fires receive considerable attention. Less attention has been paid to indirect impacts related to ecological disruptions such as crop failures, shifting patterns of disease vectors, and increases in the burden of diarrheal disease [6]. It is estimated that ongoing climate change will have a considerable impact on the burden of diarrheal diseases [7], a leading cause of childhood morbidity and mortality in low- and middle-income countries (LMICs) such as India, and Nepal [8]. The impact of climate change is already being experienced across different sectors, including public health. A recent report by the Department of Health Service suggests that rising temperatures are contributing to a higher incidence of water and food-borne diseases such as diarrhea, dysentery, and typhoid [9]. This is in agreement with other studies that have reported a similar association between diarrheal disease and meteorological variables including relative humidity [10], temperature [11] and precipitation [12]. Given that diarrheal diseases rank among the top five causes of death in India, there is a high likelihood that the burden of diarrheal disease could increase under future climate change scenarios [13].

Data Sources and Methods

2.1. Data Sources

The study design was analyzed among 5-year diarrheal disease cases from Meerut City of India. Data sources are based on secondary collection. Data was collected through the health management information system of India, Lala Lajpat Roy Medical College Hospital and the District Hospital of Meerut city.

2.2. Methods

The method used in this review is a comparative descriptive study with a qualitative approach using secondary data from relevant sources, such as articles (national and international), news portals and related institutions.

Literature of Review

Climate change has become an increasingly urgent global phenomenon and has an increasingly pronounced impact on human health (P. C. Latue & Rakuasa, 2023).

One of the most obvious impacts is the increase in global temperatures resulting in extreme heat waves. These heat waves can cause serious health problems, such as diarrhea, dehydration and even death, especially in vulnerable groups such as children, the elderly and individuals with chronic diseases. In addition, climate change can also affect the spread patterns of infectious diseases, such as malaria and dengue fever, by creating a more suitable environment for disease vectors such as mosquitoes. In this context, medical geography provides an important analytical tool to identify areas that are more vulnerable to the impacts of climate change, enabling more effective adaptation and mitigation planning to protect human health in the future (Rakuasa, 2023). These disasters not only result in major physical damage, but also have serious impacts on human health (Latue et al., 2023). Floods, for example, can result in contamination of drinking water, which can lead to the spread of waterborne diseases and serious health problems (Rakuasa & Somae, 2023). The impacts of climate change are also seen in a series of increasingly frequent and severe natural disasters, such as floods, storms and droughts (BNPB, 2022). From a medical geography perspective, understanding the relationship between climate change and human health is key to meeting this challenge (Martin, 2022).

On the other hand, droughts can threaten clean water supplies that are essential for human health. From a medical geography perspective, understanding the geographical distribution of these disasters and their impact on populations can help in planning efficient health responses. Thus, climate change is not only an environmental issue, but also a public health issue that must be taken seriously, with the application of relevant medical geography principles to protect human health in this increasingly hot and volatile era (Ismail et al., 2020).

Impact of Factors to Increasing Diarrhea Disease

- **Climate Change:**

Climate change is an emerging public health crisis that can impact individuals across the globe. It is important to understand that the impacts of climate change are

uneven across the globe. Regions with limited health resources and infrastructure are more vulnerable to these impacts. It also creates greater health inequalities between rich and poor countries. Diarrheal disease is a major cause of morbidity and mortality, particularly among children under 5 years of age in developing countries and climate change-related health consequences of diarrheal diseases are projected to pose significant risks to future populations. Overall, climate change is a real threat to human health that must be addressed immediately. At a more macro level, climate change can also affect human migration. Population displacement due to environmental changes can create pressure on health systems in receiving areas, increase the risk of disease spread, and create social conflicts that negatively impact health (Manakane et al., 2023). In addition to direct impacts, climate change also impacts mental health. Climate change is expected to have major health impacts in increasing malnutrition and related health disorders such as child stunting - with the poor likely to be affected most severely. Natural disasters and drastic changes in the environment can create stress, anxiety and depression in affected individuals. In the context of medical geography, a medical geography approach helps us understand how these impacts may vary geographically and how we can take preventive and adaptation measures that fit the local context. With concerted efforts, we can protect human health from the increasingly real threat of climate change. Based on the description above, this study aims to determine the influence of climate change and its impact on human health: from a medical geography perspective.

- **Heat-Waves:**

Diarrhea cases to various factors exacerbated by the summer climate. The summer season in India is from the month of March and lasts up to June. Loo is a strong, gusty, hot, and dry wind that blows during daytime over north and north-western India. These winds raise the temperature of the region. Currently, India is experiencing heat waves and the temperature in some places is crossing even 45 degrees. **Loo winds** are a common occurrence in India. They blow at noon time and continue till evening. It not only gets unbearable; it also increases the risk of heat stroke and other health issues. Climate change increasing heat waves and its effect on children's health. Heat can be dangerous for our bodies; it can especially affect children, elderly people, and people with health concerns. It makes us fall ill, and causes muscle cramps, dehydration, dizziness, confusion, nausea, diarrhea, headache, and fatigue. The rapid deterioration of food in warmer temperatures leads to an increased consumption of spoiled food and unsafe water, paving the way for harmful bacteria to enter the body and trigger bouts of diarrhea. The condition can quickly

lead to dehydration as the body loses vital fluids and electrolytes at an accelerated rate, potentially resulting in severe complications and even death, if left untreated.

Table-1: Monthly temperature year-wise table.

Months	Max. Temperature			Avg. Temperature			Min. Temperature		
	2017	2018	2019	2017	2018	2019	2017	2018	2019
January	22.35°C	22.19°C	21.16°C	17.42°C	17.65°C	16.87°C	11.19°C	11.26°C	11.19°C
February	26.89°C	26.04°C	22.21°C	21.43°C	21.46°C	18.43°C	13.14°C	14.04°C	12.61°C
March	32.42°C	33.71°C	29.0°C	27.68°C	29.23°C	24.9°C	17.35°C	19.13°C	16.65°C
April	40.77°C	38.83°C	38.97°C	36.43°C	34.9°C	35.37°C	26.03°C	25.53°C	26.57°C
May	42.35°C	42.9°C	41.55°C	38.9°C	39.58°C	38.68°C	29.84°C	30.84°C	30.26°C
June	41.53°C	41.93°C	44.23°C	38.53°C	39.37°C	40.7°C	31.0°C	32.43°C	31.57°C
July	37.19°C	36.68°C	37.77°C	34.68°C	34.42°C	35.0°C	28.84°C	28.84°C	28.84°C
August	35.74°C	34.35°C	35.0°C	33.23°C	32.03°C	32.39°C	28.0°C	27.0°C	26.9°C
September	34.43°C	32.93°C	33.4°C	31.93°C	30.37°C	30.83°C	26.5°C	25.53°C	25.7°C
October	34.94°C	33.42°C	32.45°C	31.19°C	29.55°C	28.87°C	24.84°C	23.26°C	22.77°C
November	29.07°C	29.2°C	29.0°C	25.37°C	25.33°C	25.07°C	19.37°C	19.53°C	19.43°C
December	25.19°C	22.9°C	21.32°C	20.81°C	19.19°C	17.84°C	15.42°C	13.58°C	13.13°C

- **Contaminated Water:**

By 2050, it's thought that the global population will reach around 10 billion. That increase will precipitate not only a demand for more resources, but also the production of more waste. Unfortunately, the latter is likely to impact upon the former, as water supplies could become contaminated by chemical, microbial and sewage waste. Fecal contaminated drinking water, or **insufficient wastewater treatment processes** are the leading cause of bacterial diseases. The most common among these include:

Loose stool, Abdominal pains, fever, nausea and headaches are the most common symptoms of diarrhea, although it can cause premature death in especially vulnerable individuals.

Results and Discussion

1. Basics of Climate Change:

Climate change is one of the most important environmental issues facing humanity in the modern era (Rakuasa & Latue, 2023). To understand climate change, we must look at its scientific underpinnings. First of all, climate change refers to long-term changes in the Earth's weather and climate patterns. This includes changes in global average temperatures, precipitation patterns, and the intensity and frequency of natural disasters such as storms and floods. The main cause of climate change is human activity, mainly in the form of greenhouse gas emissions. These gases, such as carbon dioxide (CO2), methane (CH4), and nitrous oxide (N2O), trap heat from the sun in the Earth's atmosphere, creating the greenhouse effect (Kanga et al.,

2022). As a result, the global average temperature increases, changing the planet's climate. The main sources of greenhouse gas emissions are the burning of fossil fuels such as coal, petroleum and natural gas, and land use changes such as deforestation (Chen et al., 2023). The impacts of climate change are wide-ranging and varied. Rising global temperatures can result in ecosystem changes, including species migration and changes in seasonal patterns (Ermida et al., 2020). In addition, sea level rise caused by melting polar ice could threaten coastal and small islands. Furthermore, climate change could also affect agriculture and food production, with the potential for increased global hunger. We are also witnessing an intensification of natural disasters, such as stronger storms and more frequent wildfire seasons. It is important to understand the basics of climate change so that we can take the necessary actions to reduce greenhouse gas emissions and adapt to its impacts. Global Efforts to Address Climate Change and its Impact on Human Health: A Medical Geography Perspective Climate change involves international agreements such as the Paris Agreement, which aims to limit the rise in global average temperature to below 2 degrees Celsius above pre-industrial levels. Through a solid understanding of the fundamentals of climate change, we can work together to protect the planet and future generations from increasingly serious impacts (Gustavo & Rakuasa, 2023).

2. Climate Change and Human Health:

Climate change is an increasingly visible and profound global phenomenon, with impacts that are not only limited to the environment, but also have a significant impact on human health (Salakory & Rakuasa, 2022). In recent decades, climate change has become one of the biggest health issues facing the world (Li et al., 2023). As a result of human activities that emit greenhouse gasses such as carbon dioxide, methane and nitrous oxide into the atmosphere, the global average temperature continues to rise (Latue et al., 2023). The direct impact of this climate change is an increase in extreme temperatures that cause serious health problems, such as heat exhaustion, dehydration and even death, especially in vulnerable groups such as children, the elderly and individuals with chronic diseases. In addition, climate change also affects the spread patterns of infectious diseases. Warmer and more humid environments can create ideal conditions for disease vectors such as mosquitoes to breed. As a result, diseases such as malaria, dengue fever, and COVID-19 are increasingly spreading to areas previously protected from these threats (Rakuasa et al., 2021). In addition, climate change is also triggering more frequent and severe natural disasters, such as floods, storms and droughts. These disasters not only result in major physical damage, but also have serious impacts on human health (Huwae et al., 2023). Flooding, for example, can

result in contamination of drinking water, which can lead to the spread of waterborne diseases and serious health problems (Rakuasa & Rinaldi, 2023). Human health is also threatened by the economic and social instability that climate change can bring. Food shortages caused by climate change can result in hunger and malnutrition, especially in communities that depend on agriculture for their main livelihood. In addition, population displacement due to environmental change can create pressure on health systems in receiving areas, increase the risk of disease spread, and create social conflicts that negatively impact health. Meeting these complex challenges requires concerted and sustainable action. Mitigation measures, such as reducing greenhouse gas emissions and transitioning to clean energy sources, are an important part of reducing the impact of climate change on human health. In addition, adaptation efforts, such as building disaster-resistant infrastructure, improving early warning systems and educating the public about the health risks associated with climate change, are also indispensable. With a better understanding of the complex relationship between climate change and human health, we can work together to protect human well-being and create a safer and healthier world for future generations.

3. Medical Geography as a Foundation Journal of Health Science and Medical Therapy:

Medical geography is a branch of geography that examines the relationship between geographic factors and human health (E. A. & A., 2019). It is an important discipline for understanding how geographic and spatial environments can affect human health, whether in the context of climate change, disease epidemiology or public health crisis management (Eriksson, 2011). As an important cornerstone in these studies, medical geography provides deep insights into how geographic variables such as climate, topography and population distribution can impact health risks and healthcare systems. One important aspect of medical geography is the understanding of how climate can affect human health. In the context of climate change, changes in temperature, precipitation patterns and the intensity of natural disasters are increasingly affecting health risks (Planey et al., 2022). For example, a warmer climate can create more suitable conditions for vector-borne infectious diseases such as mosquitoes. Medical geography helps us identify areas that are more vulnerable to these changes and design mitigation strategies accordingly (Planey et al., 2022). In addition, medical geography also helps in the analysis of disease epidemiology. Through maps and spatial analysis, we can see how diseases spread within communities. This can help in the identification of disease clusters, tracing sources of transmission, and planning more effective health responses (DeVerteuil,

2015). By analyzing geography, we can understand why certain diseases are more common in some regions than others and take appropriate preventive measures (Arden & Leitner, 2008). Finally, medical geography is an important cornerstone of public health crisis management. In emergencies such as pandemics, an understanding of the geographic distribution of cases, the level of community vulnerability, and access to health facilities can help in the proper allocation of resources. Medical geography helps in planning and response to crises, which in turn can save lives and limit the spread of disease. In an era of climate change and global health challenges, medical geography is an important tool that helps us understand the complexity of the relationship between the geographic environment and human health (Oliveira et al., 2013). It provides a solid basis for better decision-making in efforts to protect and improve the health of people around the world.

4. Climate Change and Disease Distribution:

Climate change has taken center stage in global discussions, and its growing impact is not only felt on the environment, but also has a significant impact on disease distribution worldwide. Factors such as increasing global average temperatures, changing rainfall patterns and shifting ecosystems are substantially affecting the distribution of infectious and non-communicable diseases (Xu et al., 2020). These changes are shaking the foundations of global health and require deep understanding and strong adaptation and mitigation measures to protect human health. In addition to infectious diseases, climate change also impacts the distribution of non-communicable diseases such as cardiovascular diseases, respiratory diseases and autoimmune diseases. Increased temperatures and air pollution caused by climate change can affect air quality, which in turn contributes to increased cases of respiratory diseases and heart diseases Climate Change and its Impact on Human Health; A Medical Geography Perspective 85 (Eriksson, 2011). This is becoming an urgent public health issue, given its impact on more vulnerable populations such as children and the elderly (Haryanto, 2020). In addition, climate change is also triggering changes in diets and instability in the food supply. Food shortages and changes in nutrient composition can increase the risk of health problems such as malnutrition and obesity. These are global health challenges that require serious attention (Nuraini et al., 2021). To address the impact of climate change on disease distribution, coordinated global action is needed. This includes efforts to reduce greenhouse gas emissions to slow climate change, as well as improved public health preparedness and response to changes that are already occurring (Kjellstrom et al., 2016). In addition, prevention approaches and public education about the health risks associated with climate change are also critical. In an era of increasingly

pronounced climate change, attention to disease distribution is an important step in protecting future human health.

5. Vulnerability:

Climate change is an increasingly pressing global issue and one of the key concepts associated with it is "vulnerability." Vulnerability refers to the degree to which a region or population is susceptible to the impacts of climate change (DeVerteuil, 2015). It can be influenced by a variety of factors, including existing economic, social and environmental conditions. Understanding and measuring the level of vulnerability is an important first step in developing effective adaptation strategies. Regions with high levels of vulnerability to climate change may experience more severe impacts and have more difficult adaptation responses. For example, countries with low economies may have limited access to the resources and technologies needed to cope with climate change, making them more vulnerable to natural disasters and the resulting health crises. Likewise, communities living in coastal areas may be more vulnerable to sea level rise and tropical storms. Adaptation is the effort made to reduce vulnerability to climate change and cope with its impacts. This can include a range of actions, from improvements to disaster resistant infrastructure to public education about the health risks associated with climate change. It is important to remember that adaptation is not just technical measures, but also involves changes in community policies, practices and behaviors. Adaptation efforts can also draw on local knowledge and community experiences in dealing with climate change. Communities living in vulnerable areas often have a deep understanding of the risks and effective strategies for dealing with them (Puspandari et al., 2021). Combining this local knowledge with scientific research and broader resources is an effective approach to developing relevant adaptation solutions. In a world increasingly exposed to climate change, understanding vulnerability and adaptation is key to protecting future human health and wellbeing (Rahmanti, Annisa Ristya, 2012). Appropriate adaptation measures, based on a comprehensive analysis of vulnerability, will play a key role in reducing the impacts of climate change on global society and creating a world that is more resilient to the challenges of climate change. Journal of Health Science and Medical Therapy 86.

6. Mitigation Policies and Measures:

Climate change is an increasingly urgent global crisis, and dealing with it requires strong mitigation policies and actions (Intergovernmental Panel on Climate Change, 2023). Mitigation refers to efforts to reduce greenhouse gas emissions and slow the rate of climate change. Mitigation policies are an important cornerstone in

maintaining global environmental balance and protecting human health in the future (Abbass et al., 2022). One of the main aspects of mitigation policies is to reduce dependence on fossil fuels. Burning coal, oil and natural gas is a major source of greenhouse gas emissions. Therefore, the transition towards clean and sustainable energy sources such as solar, wind and hydro energy is a critical step (Gernaat et al., 2021). Many countries have adopted targets to reduce their carbon emissions and improve energy efficiency in an effort to achieve mitigation goals. In addition, mitigation policies also include forest protection and preservation of natural ecosystems. Forests serve as natural carbon sinks, and continued deforestation is a large contributor to greenhouse gas emissions. Protecting forests and maintaining healthy ecosystems is an important part of mitigation strategies (Abbass et al., 2022). In addition, sustainable agricultural practices and waste reduction can also reduce emissions of methane and nitrous oxide, which are potent greenhouse gases (Gernaat et al., 2021). Mitigation efforts also require strong global cooperation. International agreements such as the Paris Agreement have brought many countries together to commit to concrete mitigation actions (Gernaat et al., 2021). However, achieving ambitious mitigation targets requires further collaboration between countries and stakeholders. In addition, public education and awareness of climate change are also critical components in supporting mitigation actions. In a world that is getting hotter and more unstable due to climate change, mitigation policies and actions are one of the main pillars in maintaining the balance of the planet (Abbass et al., 2022). Creating clean energy sources, protecting ecosystems, and reducing greenhouse gas emissions are crucial steps in maintaining the health of the earth and its people. These mitigation efforts are also an investment in a more sustainable future, where humans and nature can live together. Conclusion From a medical geography perspective, it has been revealed that climate change is a global health issue that requires serious attention. This article has illustrated how climate change can increase the risk of human health disorders, alter patterns of disease spread and trigger natural disasters that threaten human well-being. Through an in-depth understanding of medical geography, we can identify areas that are more vulnerable and design effective adaptation measures. When it comes to protecting human health and combating climate change, global cooperation and strong mitigation efforts are key to creating a healthier and more sustainable future for future generations.

References

1 Abbass, K., Qasim, M.Z., Song, H., Murshed, M., Mahmood, H., Younis, I. (2022).

2. Amponsah, A., Latue, P., Rakuasa, H. (2023). A Climate Change and its Impact on Human Health: A Medical Geography Perspective 87 review of the global climate change impacts, adaptation, and sustainable mitigation measures. *Environmental Science and Pollution Research*. 29(28). Pg. **42539–42559.** https://doi.org/10.1007/s11356-022-19718-6
3. Medical Geography in Public Health and Tropical Medicine: Case Studies from Brazil. In Department of Geography & Anthropology: Vol. Doctor of (Issue December). BNPB. (2022).
4 Chen, Y., Yang, J., Yu, W., Ren, J., Xiao, X., Xia, J.C. (2023). Indeks Risiko Bencana Indonesia (RBI) Tahun 2022. Pusat Data, Informasi dan Komunikasi Kebencanaan Badan Nasional Penanggulangan Bencana.
5 DeVerteuil, G. (2015). Relationship between urban spatial form and seasonal land surface temperature under different grid scales. *Sustainable Cities and Society*. 89. 104374. https://doi.org/10.1016/j.scs.2022.104374.
6 E.A., V., A.,R. (2019). Conceptualizing violence for health and medical geography. *Social Science & Medicine*. 133. Pg. **216–222.** https://doi.org/10.1016/j.socscimed.2015.01.018.
7 Eriksson, S. (2011). Historical study of medical geography in Russia. *Problems of Social Hygiene Public Health and History of Medicine*. 27(5). https://doi.org/10.32687/0869- 866X-2019-27-5-924-929.
8 Ermida, S.L., Soares, P., Mantas, V., Göttsche, F.-M., Trigo, I.F. (2020). Medical geography views on snakebites in Southeast Asia: a case study from Vietnam. Asian Geographer. 28(2). Pg. **123–134.** https://doi.org/10.1080/10225706.2011.623415.
9 Huwae, Ferol., Sihasale, Daniel Anthoni., Letedara, Reindino., Philia C Latue, H.R. (2023). Google Earth Engine Open-Source Code for Land Surface Temperature Estimation from the Landsat Series. Remote Sensing, 12(9). Pg. **1471.** https://doi.org/10.3390/rs12091471
10 Gernaat, D.E.H.J., de Boer, H.S., Daioglou, V., Yalew, S.G., Müller, C., van Vuuren, D.P. (2021). Analisis Spasial Daerah Potensi Longsor Di Desa Allang, Pulau Ambon Berdasarkan Slope Morphology. *Larisa Penelitian Multidisiplin*. 1(1). Pg. **43–49.**
11 Gustavo, G.J.P., Rakuasa, H. (2023). Climate change impacts on renewable energy supply. *Nature Climate Change*. 11(2). Pg. **119–125.** https://doi.org/10.1038/s41558-020-00949-9

12 Haryanto, B. (2020). Disaster Education and the Role of Geographers: A Step Toward a Disaster Resilient Ambon City. *A Review. Journal of Education Method and Learning Strategy*. 1(03). Pg. **183–192.** https://doi.org/10.59653/jemls.v1i03.238

13 Hehanussa, F.S., Sumunar, D.R.S., Rakuasa, H. (2023). Indonesia: country report on children's environmental health. *Reviews on Environmental Health*. 35(1). Pg. **41–48.** https://doi.org/10.1515/reveh-2019-0088.

14 Rakuasa, Heinrich., Sihasale, Daniel., A Marhelin C Mehdila, A.P.W. (2022). Pemanfaatan Geogle Earth Engine Untuk Identifikasi Perubahan Suhu Permukaan Daratan Kabupaten Buru Selatan Berbasis Cloud Computing. *Gudang Jurnal Multidisiplin Ilmu*. 1(1). Pg. **37–45.**

15 Rakuasa, Heinrich., Glendy Somae, P. C. L. (2023). Analisis Spasial Tingkat Kerawanan Banjir di Kecamatan Teluk Ambon Baguala, Kota Ambon. *Jurnal Geosains Dan Remote Sensing (JGRS)*. 3(2). Pg. **60–69.** https://doi.org/ https://doi.org/10.23960/jgrs.2022.v3i2.80

16 (2023). Pemetaan Daerah Rawan Banjir di Desa Batumerah Kecamatan Sirimau Kota Ambon Menggunakan Sistim Informasi Geografis. ULIL ALBAB/ : *Jurnal Ilmiah Multidisiplin*. 2(4). Pg. **1642–1653.** https://doi.org/ https://doi.org/10.56799/jim.v2i4.1475 Intergovernmental Panel on Climate Change.

17 Ismail, A., Dede, M., Widiawaty, M. . (2020). Climate Change 2021 – The Physical Science Basis. Cambridge University Press. https://doi.org/10.1017/9781009157896

18 Kanga, S., Meraj, G., Johnson, B.A., Singh, S.K., PV, M.N., Farooq, M., Kumar, P., Marazi, A., Sahu, N. (2022). Urbanisasi Dan HIV di Kota Bandung Journal of Health Science and Medical Therapy 88 (Perspektif Geografi Kesehatan). *Buletin Penelitian Kesehatan*. 48(2). Pg. **139–146.** https://doi.org/10.22435/bpk.v48i2.2921.

19 Kjellstrom, T., Briggs, D., Freyberg, C., Lemke, B., Otto, M., Hyatt, O. (2016). Understanding the Linkage between Urban Growth and Land Surface Temperature—A Case Study of Bangalore City, India. Remote Sensing. 14(17). https://doi.org/10.3390/rs14174241