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Climate Change, Environmental Components And Media, Climate Village Program (PROKLIM) And Covid-19

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ABSTRACT

Background: In early January 2020, the COVID-19 pandemic affected all countries globally. The resulting reduction in vehicular mobility during the pandemic period temporarily eased pressure on the environment by lowering greenhouse gas emissions. Consequently, attention to environmental components-particularly the physical and biological aspects of water and air media-has become increasingly important.**Methods: This** study employed a quantitative approach, gathering data through surveys distributed to participants of a webinar attended by 500 individuals. The survey was disseminated via a Google Form shared through the Zoom chat feature. Data were analyzed using SMART PLS Version 4 to determine the relationship between environmental components and environmental media.**Results:** Analysis of responses from 500 participants indicated that the majority prioritized water and air environmental media. This was supported by high loading factor values for the water environment (0.782) and air environment (0.760). The Structural Equation Modeling (SEM) analysis revealed that environmental components significantly influence environmental media, with a T-statistic value of 64.119 and a p-value of 0.000 ($T > 1.96$, $p < 0.05$).**Conclusion: Environmental** components have a significant effect on environmental media, underscoring the importance of environmental management. The Climate Village Program (*Program Kampung Iklim*) emerges as a potential community-based initiative to mitigate climate-related diseases, including airborne transmission of COVID-19.

Keywords: Climate Change, Environmental Components, Environmental Media, Proklim (Climate Village Program), Covid -19

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INTRODUCTION

Climate change is a crucial global issue that has a significant impact on human life and the balance of nature. This phenomenon not only affects the increase in global temperatures but also influences extreme weather patterns, water availability, and food security. Furthermore, climate change contributes to the emergence of new diseases due to the disruption of ecosystem balance [(1)]. In the environmental context, the main components of concern are the physical-chemical and biological components, which affect the quality of environmental media such as water, air, soil, food, and building facilities [(2)].

The Coronavirus Disease 2019 (COVID-19) pandemic, which began to spread in late 2019 in China and quickly spread worldwide, including to Indonesia, has had a significant impact on social, economic, and governmental activities. This pandemic has crippled various sectors and indirectly provided a "breather" for the environment, particularly regarding the reduction in greenhouse gas emissions due to decreased human and industrial mobility [(3)].

Responding to this challenge, the Indonesian Government, through the Ministry of Environment and Forestry (KLHK), initiated the Climate Village Program (ProKlim). This program aims to encourage active community and stakeholder involvement in enhancing adaptation capacity to climate change and reducing greenhouse gas emissions at the local level [(4)]. This initiative is in line with the provision requiring every individual or family residing in a residential environment to maintain the quality of environmental media-water, air, soil, food, facilities, and buildings to ensure they meet the Environmental Health Quality Standard (EHQS) and other health requirements [(5)]. The EHQS is a standardized threshold value or technical specification to ensure the environment remains suitable and does not negatively impact public health.

Besides the pandemic, environmental threats such as erosion and landslides are also increasing due to land conversion, uncontrolled development, and population growth. To address this, soil conservation and sustainable land management are crucial strategies for slope stabilization and degradation prevention [(6)]. Awareness of the importance of the environment has increased during the pandemic, which has forced society to reconsider the relationship between human behavior and environmental sustainability.

As a global response to these multidimensional challenges, the international community agreed on 17 Sustainable Development Goals (SDGs). This agenda includes targets to address poverty, inequality, environmental degradation, and climate change as steps toward a more just and sustainable future [(6)]. However, the COVID-19 pandemic has disrupted the achievement of the SDGs, with significant implications for the global development agenda, particularly in the health and environment sectors.

A study by Manzanedo and Manning (2020) suggests an indirect relationship between climate change and the spread of infectious diseases, including COVID-19. They explained that global warming is causing animal species to move to new regions, creating opportunities for pathogens to infect different hosts, including humans [(7)]. This data shows that environmental quality is closely linked to public health.

The quality of environmental media such as water and air is crucial in determining the risk of disease spread. Contaminated water can cause diseases like diarrhea, while air contaminated with dust, smoke, and industrial pollutants can trigger respiratory problems and worsen the spread of viruses. Additionally, unsafe food and weak vector control also contribute to the emergence of environmentally related diseases. Therefore,

the sustainable and health-standardized management of the five main media water, air, soil, food, and buildings is a vital first step in creating a healthy environment and preventing disease.

This study hypothesizes that environmental components (physicochemical and biological) significantly influence the quality of environmental media (water, air, soil, food, and buildings), particularly in the context of the COVID-19 pandemic. It is also hypothesized that increased public awareness during the pandemic prioritizes the quality of water and air media, and that involvement in the Climate Village Program (ProKlim) and the implementation of SBMKL contribute to strengthening adaptive capacity and environmental disease prevention.

The novelty of this research lies in the integration of climate change and COVID-19 pandemic issues in assessing the public's perception of environmental media quality using a quantitative approach based on participatory data from 500 respondents. The model of relationships between variables was analyzed using SMART PLS 4, and the effectiveness of ProKlim as a community-based adaptive strategy in maintaining environmental quality during the global health crisis was tested.

METHOD

This research uses a quantitative approach with a survey method to collect primary data from participants. The respondents in this study were participants in a community service webinar held on September 28, 2021, with the theme "Raising Awareness About Climate Change, Proklim, and Socializing Covid-19 Prevention to Support the Achievement of SDGs." This event was attended by 500 participants and broadcast on the YouTube platform (link: https://www.youtube.com/watch?v=9HkGOqjZoZI&t=31s). The survey was distributed using Google Forms sent through the Zoom Meeting chat feature during the activity.
The data collected from Google Forms was downloaded and first processed in Microsoft Excel software, then saved in .csv(comma-delimited) for further analysis using the SMART PLS version 4 application. This analysis is used to model the relationship between environmental components and environmental media through a Partial Least Squares-based Structural Equation Modeling (SEM) approach.

RESULTS AND DISCUSSIONS

Respondent Characteristics

Analysis of the characteristics of the 500 respondents who participated in the webinar activity shows a fairly diverse demographic distribution. Based on gender, the respondents were predominantly male at 69%, while females accounted for 31%. This composition reflects a fairly balanced participation, although with a tendency toward male dominance.

From an educational level perspective, the majority of respondents are bachelor's degree (S1) graduates at 49%, followed by master's degree (S2) graduates at 31%, high school (SMA) graduates at 14%, and respondents with doctoral (S3) level education at 6%. Meanwhile, based on work background, respondents come from various backgrounds, with the largest proportion coming from the "other" category (including professionals, civil servants, and the general public) at 49%, followed by students at 26% and lecturers at 25%. This composition indicates the diversity of respondents' social and academic backgrounds, which has the

potential to provide valuable contributions to their perceptions and understanding of climate change issues, the Climate Village Program (ProKlim), and environmental health.

Environmental and Media Components

Respondent perception analysis was conducted to obtain a general overview of response trends for each variable studied. The purpose of this analysis is to understand how webinar participants prioritize environmental media in the context of climate change and the COVID-19 pandemic. The assessment was conducted on four types of environmental media: water, air, soil, and food.

Table 1. Results of the Environmental Media Description

Question	Priority 1		Priority 2		Priority 3		Priority 4		Average
	n	%	n	%	n	%	n	%	
Water Environment Media	259	51.8	119	23.8	70	14	52	10.4	1.83
Air Environment Media	227	45.4	128	25.6	80	16	65	13	1.966
Soil Environment Media	109	21.8	91	18.2	191	38.2	109	21.8	2.6
Food Environment Media	139	27.8	63	12.6	120	24	178	35.6	2.674

Based on the calculation results in Table 1, it is known that out of a total of 500 respondents, the majority placed water and air environmental media as their top priority in the context of environmental management. This indicates that both media are perceived as having the highest urgency in maintaining environmental quality, especially during a pandemic. Respondents typically rank soil environmental media as the third priority, acknowledging its significant yet relatively lesser role in comparison to water and air. Food environmental media tends to be the fourth priority, indicating that although the food aspect is still considered, its level of urgency is deemed lower than other environmental media by the majority of respondents.

The priority scale is determined by calculating the loading factor value. An indicator is considered a priority based on the highest loading factor value in the CFA analysis. The results of the Priority Scale testing are explained as follows:

Table 2. Results of Environmental Media Priority Scale Testing

code	indicator	Loading Factor
ML.1	Water Environment Media	0,782
ML.2	Air Environment Media	0,760
ML.3	Soil Environment Media	0,717
ML.4	Food Environment Media	0,700

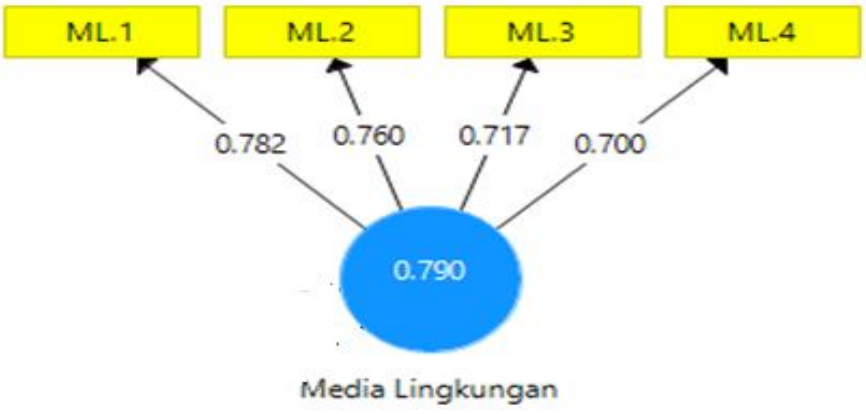

Figure 1. Loading factor values for environmental media

Based on the analysis results, it can be seen that indicators ML.1 and ML.2 have the highest loading factor values. This indicates that water and air are prioritized as environmental media indicators.

Construct Reliability

Calculations that can be used to test the reliability of a construct are Cronbach's alpha and composite reliability. The testing criteria state that if the composite reliability value is greater than 0.7 and the Cronbach's alpha value is greater than 0.6, then the construct is declared reliable. The results of the composite reliability and Cronbach's alpha calculations can be seen through the summary presented in the following table:

Table 3. Results of Construct Reliability Testing

Variable	Cronbach's Alpha	Composite Reliability
Environmental Components	0,806	0,867
Environmental Media	0,725	0,829

Based on Table 3 above, it can be seen that only one value of Cronbach's alpha exceeds 0.6, or the composite reliability value exceeds 0.7 for each variable. Therefore, based on the calculation of Cronbach's alpha or composite reliability values, all indicators are declared reliable in measuring their respective variables.

Table 4. Hypothesis Testing Results

Impact	coefficient	T Statistics (|O/STDEV|)	P Values
Environmental Components -> Environmental Media	0,889	64,119	0,000

Based on Table 4, the following can be explained:The Influence of Environmental Components on Environmental Media The test of the influence of environmental components on environmental media yielded a T-statistic value of 64.119 with a p-value of 0.000. The results of this test indicate that the T-statistic value is > 1.96 and the p-value is < 0.05. This means there is a significant influence of environmental components on environmental media. The resulting coefficient value is positive, at 0.889. So, the more important the environmental component, the more likely it is to raise the priority of the environmental media.

Climate Change and the Covid-19 Pandemic

Based on several articles that have been reviewed, it was found that there is a suspected link between climate change and the occurrence of Covid-19. Research by Chen et al. (2020) revealed that the ideal air conditions for the coronavirus are temperatures around 8-10°C and humidity between 60 and 90% (8). This indicates that open environments with high temperatures and humidity are not ideal for the spread of COVID-19 cases. These researchers concluded that the combination of temperature and relative humidity has a significant impact on COVID-19 transmission. Furthermore, research conducted by Bannister-Tyrrell et al. (2020) also found a negative relationship between temperature (above 1° C) and the number of suspected COVID-19 cases per day. They showed that the spread of COVID-19 peaked at very low temperatures (1-9°C). This means that the higher the temperature, the lower the likelihood of daily COVID-19 cases (9).

Additionally, Wang et al. (2020) explained that, similar to influenza viruses, coronaviruses tend to be more stable in cold and dry air conditions. These cold and dry air conditions can also weaken a person's "host immunity," making them more susceptible to viruses, as revealed in the study by Wang et al. (2020) (10). Similarly, Alodia, A (2020) predicts that climate change may be the cause of the emergence of new viruses, including COVID-19 (11). This hypothesis is rooted in the fact that climate change is altering the way we interact with other species on Earth, impacting our health and the risk of infection. However, on the other hand, there are also positive aspects of the impact of the COVID-19 pandemic on the climate change sector. Since the government implemented a new policy encouraging people to work from home during the pandemic, there has been a significant decrease in carbon emissions. This trend is evident from the drastic reduction in industrial activity during the COVID-19 pandemic, which resulted in lower carbon dioxide (CO_2) emissions and human mobility, leading to improved air quality.

Environmental Components with Environmental Media Environmental

Quality is an important factor influencing public health. To diagnose the environmental health status, various indicators are used. These indicators are applied to various environmental media, such as water, air, food, and vectors. In addition, poor food hygiene and safety, as well as inadequate disease vector control, also have significant potential to create conditions unfavorable to human health. Therefore, it is important to study these five environmental media as a first step in preventing environmentally related diseases.

The Climate Village Program Against Covid-19 Pandemic

Environmental change refers to changes that occur as a direct result of human activities. Key indicators such as rainfall, humidity, wind, cloud cover, and evaporation rate can reflect this. Both humans and ecosystems are affected by climate change. Environmental changes have significant implications for human well-being, food security, and monetary events. Therefore, the Climate Village Program (Proklim) provides concrete action to enhance community resilience to climate change impacts. Known as the Climate Village Program, this nationally scoped initiative is managed by the Ministry of Environment and Forestry (KLHK). The purpose of this program is to increase the participation of the community and other stakeholders in strengthening adaptive capacity to the impacts of climate change, while also reducing Greenhouse Gas (GHG) emissions.

ProKlim is implemented through two main program components: the adaptation component and the mitigation component. The adaptation component has programs including 1. Drought, flood, and landslide control; 2. Enhancing food security; 3. Addressing sea level rise, coastal flooding, and abrasion; and 4. Controlling climate-related diseases. Meanwhile, the mitigation component has programs including 1. Waste management, as well as solid and liquid waste; 2. Using new and renewable energy; 3. Low-emission agricultural cultivation; 4. Increasing vegetation cover; and 4. Preventing and controlling forest and land fires. Research by Wahyuningsih et al. (2024) explains that the implementation of a smart environment in the Kampung Iklim Randakari program in Ciwandan District, Cilegon City, is running well but is hampered by specific conditions, especially the Covid-19 pandemic, resulting in not many activities being able to be carried

out according to plan. The concept of a smart environment is one approach that can be developed to address the environmental problems existing in Cilegon City itself (12).

The results of the structural model analysis confirm the empirical and statistical answers to the study's hypotheses. Testing the relationship between environmental components and environmental media showed a significant effect, as indicated by a coefficient value of 0.889, a T-statistic of 64.119, and a p-value of 0.000. These values meet the established significance criteria ($T > 1.96$; $p < 0.05$), thus supporting the statement that environmental components significantly influence environmental media. Thus, the hypothesis proposed in this study can be accepted and proven, providing a strong scientific basis for the importance of environmental component management as part of efforts to maintain the sustainability of environmental media quality, particularly in the context of climate change and the COVID-19 pandemic.

Research Novelty

This research offers scientific novelty by integrating climate change issues, the quality of environmental components and media, and the COVID-19 pandemic within a single quantitative analysis framework based on Structural Equation Modeling (SEM-PLS). This approach uses perceptual data from 500 webinar respondents, representing community engagement across professions. Additionally, this research empirically assesses the effectiveness of the Climate Village Program (ProKlim) as a community adaptive strategy for maintaining environmental quality and public health amidst the climate crisis and pandemic.

State of the Art

Previous studies have generally discussed climate change and its impacts sectorally, and few have directly combined public perception with comprehensive quantitative modeling. Evaluation of ProKlim in the context of the pandemic is also still limited. This research fills that gap by using a data-driven participatory approach and SEM-PLS analysis to evaluate the relationship between environmental components, environmental media, and community-based adaptation programs to achieve the Sustainable Development Goals (SDGs).

CONCLUSION

The results of this study indicate that the majority of respondents prioritize water and air environmental media as the main aspects of environmental management, which is supported by loading factor values of 0.782 and 0.760, respectively. Structural model analysis using SEM-PLS confirms that environmental components, including physical, chemical, and biological aspects, have a significant influence on the environmental medium, with a coefficient of 0.889, a T-statistic of 64.119, and a p-value of 0.000. This data indicates that improving the quality of environmental components will have a direct impact on improving the quality of environmental media, particularly in aspects closely related to public health, such as water and air. Therefore, meeting environmental quality standards according to regulations is an important element in preventing environmental diseases, including COVID-19. In this regard, the Climate Village Program (ProKlim) has strategic potential as a community-based approach to climate change adaptation and mitigation to create a healthy, resilient, and sustainable environment for COVID-19, one of the transmissions of which is through the air environment.

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