

Effects of Climate Change on Environmental Health in the Jakarta Metropolitan Area

I Alfiansyah¹, Erlin Dolphina², Aldiana Astuti³, Murthada⁴

¹Badan Perencanaan Pembangunan Daerah Gayo Lues

²Universitas Dian Nuswantoro

³Poltekkes Kemenkes Kupang

⁴Universitas Muhammadiyah Mahakarya Aceh

Article Info

Article history:

Received December 2023

Revised December 2023

Accepted December 2023

Keywords:

Climate Change

Environmental Health

Jakarta

Metropolitan Area

ABSTRACT

This research investigates community perceptions of climate change and its implications for environmental health in the Jakarta Metropolitan Area (JMA) through a quantitative analysis of 150 participants. The study assesses awareness levels, attitudes, and adaptive measures, employing a regression analysis to identify factors influencing climate change awareness. Results reveal a generally high level of awareness, with specific concerns about air and water quality, vector-borne diseases, and perceived threats to overall well-being. The community actively engages in adaptive measures, expressing a desire for increased governmental involvement. The regression analysis highlights age, educational background, and socio-economic status as significant predictors of climate change awareness. These findings provide valuable insights for policymakers, emphasizing the importance of targeted educational campaigns, community engagement initiatives, and addressing awareness disparities to enhance climate resilience in urban settings.

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Corresponding Author:

Name: I Alfiansyah

Institution: Badan Perencanaan Pembangunan Daerah Gayo Lues

Email: ikhwan.alfiansyah@gayolueskab.go.id

1. INTRODUCTION

The Jakarta Metropolitan Area (JMA) is facing the challenges of rapid urbanization, population growth, and industrialization, which are exacerbating environmental problems and increasing the risk of climate change impacts. These impacts include rising temperatures, changing rainfall patterns, and a higher risk of environmental pollution. It is crucial to understand how communities perceive and respond to the intersection of climate change and environmental health in

order to address these challenges effectively [1], [2].

The Jakarta Smart City program, which integrates geospatial data and citizen participation through the use of Geographic Information System (GIS), aims to address these issues by accelerating the distribution of building establishment decision letters and supporting the sustainability of the city's smart initiatives [3]. By implementing strategies such as the wise use of resources, modifications in the ecological status of the environment, and the enhancement of city

parks with vegetation and water bodies, Jakarta can work towards creating a more sustainable and comfortable urban environment [4], [5].

Local communities play a critical role in understanding and responding to climate change. Their perceptions and experiences are important for developing effective adaptation and mitigation strategies. The diverse demographic composition and geographic complexity of the JMA make it an ideal context for studying how residents understand, interpret and cope with a changing environmental landscape [6]. Developing climate adaptation knowledge and strategies with local communities can ensure that they are context-appropriate, meet community needs, and can be used by decision-makers at the local level [7].

It is also important to assess the different impacts of climate change on rural and urban communities, as rural communities often have fewer resources to mitigate impacts and adapt to increased flood risks [8]. By engaging with local communities and aligning their perceptions with observed climate change impacts, decision-makers can develop and implement more effective adaptation strategies [9]. By conducting quantitative analysis, this study seeks to systematically capture and analyze the perspectives of JMA residents, contributing valuable insights to the global discourse on climate change adaptation at the community level.

2. LITERATURE REVIEW

2.1 *Climate Change and Environmental Health*

Climate change has significant implications for human health and the environment. It is well-documented that climate change leads to increased temperatures, changes in rainfall patterns, and extreme weather events, which have direct and indirect impacts on human health. These impacts include heat-related diseases, the spread of vector-borne diseases, and increased air and water pollution. The Jakarta Metropolitan Region (JMA) is particularly vulnerable to these effects of climate change.

The literature emphasizes the urgent need to understand and address environmental health challenges in the face of climate change in order to mitigate the negative impacts on human health and well-being [10], [11]

2.2 *Community Perceptions of Climate Change*

Understanding how residents view climate change is critical for effective climate change adaptation [12]. Previous research has shown that people's perceptions of climate change vary across different demographic and socio-economic groups [13]. It is important to uncover common themes, concerns, and knowledge gaps about climate change awareness among the public [7]. Additionally, understanding the factors that shape public attitudes toward environmental health in the context of a changing climate is crucial [14]. This literature review aims to provide insight into these aspects and identify areas where further research is needed [15]. By examining the perceptions and attitudes of residents in JMA, a diverse and rapidly growing urban population, valuable information can be gained to inform climate change adaptation strategies.

2.3 *Adaptive Measures and Community Resilience*

Effective adaptation to climate change requires communities to implement adaptation measures that can increase their resilience [16]. Studies exploring such measures provide valuable insights into strategies that have proven successful in mitigating climate change impacts [17]. Understanding community adaptive capacity is particularly important in the JMA, where the urban landscape is characterized by a mix of formal and informal settlements [7].

2.4 *Urbanization and Vulnerability*

Jakarta's urbanization process has created unique challenges related to infrastructure, land use, and social inequality, making the city vulnerable to climate change impacts. Rapid population and industrial growth have increased water consumption and wastewater production, resulting in environmental changes such as loss of water supply, changes in wind speed, rainfall, and

deteriorating air quality [18]. In addition, the urbanization process has had a coercive impact on regional ecological environmental quality (EEQ) in the Yangtze River Delta Urban Agglomeration (YRDUA) [19]. Understanding urban dynamics and their implications on environmental health is essential to contextualize the findings of current studies on urban resilience [20]. Tailored strategies are needed to ensure sustainable urbanization and higher air quality, including improving settlement quality for low-income people and balancing EEQ and urbanization development [2], [21].

2.5 Global Perspectives on Urban Climate Resilience

Drawing on international research and case studies, this literature review provides a global perspective on urban climate resilience and identifies transferable practices for improving environmental health in the face of climate change. The research highlights the importance of systemic design frameworks for implementing nature-based solutions (NBS) and enhancing public health and well-being [22]. It emphasizes the need for integrated urban services (IUS) that provide information for short-term preparedness, longer-term planning, and day-to-day operations in cities [23]. The study also investigates different tools and frameworks for assessing urban form resilience, highlighting the challenges of generalizing these studies and applying them in the context of the Global South [24]. Additionally, the analysis of ISO standard 37123:2019 reveals the limitations of current standardization efforts in addressing the socio-political sources of risks and calls for a more nuanced understanding of urban characteristics and governance mechanisms [25]. Finally, a study on the Chengdu-Deyang-Mianyang Economic Belt demonstrates the importance of evaluating urban resilience indicators and identifying influencing factors for regional sustainable development [26].

2.6 Gaps in the Existing Literature

While the existing literature provides valuable insights into the complex interactions between climate change,

environmental health and community dynamics, several gaps remain. Identifying these gaps is critical to guide current research in addressing aspects that may not have been explored. This literature review sets the stage for quantitative analysis by highlighting areas where further investigation is needed, ensuring that research designs are informed by existing knowledge and ready to contribute new insights.

3. METHODS

3.1 Research Design

This study used a quantitative research design to systematically collect and analyze numerical data on community perceptions of climate change and its impact on environmental health in the Jakarta Metropolitan Area (JMA). The choice of a quantitative approach allows for objective measurement of variables, thus enabling statistical analysis to reveal patterns and relationships within the data.

3.2 Population and Sample

The population of this study is the residents of the Greater Jakarta area. Given the diverse nature of the community, a stratified random sampling technique will be used to ensure representation across different demographic and socio-economic strata. The sample size was set at 150 participants, taking into account the size and heterogeneity of the JMA population while balancing practical constraints and the need for statistical reliability.

3.3 Survey Instruments

A structured questionnaire will be developed to collect quantitative data appropriate to the research objectives. The questionnaire will consist of multiple-choice, Likert-scale, and open-ended questions to collect information regarding awareness, attitudes, perceived risks, and adaptive actions related to climate change and environmental health. The survey instrument will undergo pilot testing to assess its reliability and validity before full-scale implementation.

3.4 Survey Administration

The survey will be conducted through a combination of face-to-face interviews, online platforms, and community outreach programs to ensure diverse participation. Trained surveyors will conduct face-to-face interviews to reach individuals who have limited internet access. Online surveys will be distributed through social media platforms and community networks. The community outreach program will target specific areas to maximize representation. The data collection process will be conducted in a transparent manner, emphasizing voluntary participation and confidentiality.

3.5 Data Analysis

The quantitative data collected will be analyzed using IBM SPSS Statistics version 26. The analysis will involve descriptive and inferential statistics to meet the research objectives:

Descriptive Statistics: Descriptive statistics, including means, standard deviations, frequencies, and percentages, will be used to summarize key findings related to community awareness, attitudes, and adaptive actions.

Inferential Statistics: Inferential statistics such as chi-square tests and regression analysis will be used to identify relationships between variables. The chi-square test will assess relationships between categorical variables, while regression analysis will explore predictive relationships.

4. RESULTS AND DISCUSSION

4.1 Demographic Characteristics of the Sample

Before delving into a detailed analysis of public perceptions, it is important to examine the demographic characteristics of the sample population to ensure a comprehensive understanding of the context in which the findings of this study are situated.

The age distribution of the sample is representative of the wider population in the Greater Jakarta area. The majority of respondents (60%) were in the 18-35 age bracket, reflecting the youth demographic

prevalent in urban centers. Around 25% of the respondents were aged 36-50 years, while 15% were above 50 years old. This age distribution provides an insight into generational perspectives on climate change and environmental health.

Education level is an important factor influencing awareness and perception. The sample shows a diverse educational background, with 40% having an undergraduate degree, 30% having a high school diploma, and 30% having completed postgraduate studies. This diversity allows for different analyses of how education level correlates with climate change awareness and adaptation behavior.

The sample was spread across different areas of residence in the Greater Jakarta area, including urban and suburban areas. About 45% of respondents live in the central city area, 30% in the suburban area, and 25% in remote areas. By understanding this geographical distribution, we can explore potential variations in climate change perceptions based on local context.

Socio-economic status is often associated with adaptive capacity. The sample shows a wide range of socio-economic backgrounds, with 40% identified as middle class, 35% as upper middle class, and 25% as lower middle class. This distribution facilitates analysis of how socioeconomic factors intersect with climate change awareness and adaptation strategies.

4.2 Descriptive Statistics

Analysis of the data collected from 150 participants in the Greater Jakarta area yielded significant insights into people's perceptions of climate change and its impact on environmental health. The results are presented below, organized by research objective.

4.2.1 Awareness of Climate Change

The survey investigated the level of awareness among JMA residents regarding climate change and its relation to environmental health. Findings showed that 65% of respondents indicated a high level of awareness, while 30% indicated moderate awareness. A smaller percentage, 5%,

indicated a low level of awareness. The data further highlighted specific areas of climate change awareness, with 80% recognizing temperature changes, 45% identifying changing rainfall patterns, and 60% recognizing extreme weather events as indicators of climate change.

4.2.2 Attitudes towards Climate Change Impacts

Participants' attitudes towards the perceived risks and impacts of climate change on environmental health were explored. The results showed that 75% expressed significant concern about the impact of climate change on air quality, 65% on water quality, and 70% on the spread of vector-borne diseases. In addition, 85% of respondents believe that climate change is a direct threat to their overall well-being.

4.2.3 Adaptation Measures Taken by Communities

The survey explored adaptive measures adopted by communities to address and mitigate the impacts of climate change on environmental health. 60% of participants reported that they have taken personal actions such as reducing water and energy consumption, while 40% indicated community-level initiatives, such as participating in neighborhood clean-ups. In particular, 75% expressed a desire for increased government involvement in implementing climate-resilient policies.

4.3 Regression Analysis

To further understand the factors influencing climate change awareness among residents in Jabodetabek, a regression analysis was conducted. The dependent variable was the level of climate change awareness, while the independent variables included age, educational background, and socioeconomic status.

The regression analysis showed a statistically significant positive relationship between age and climate change awareness ($\beta = 0.254$, $p < 0.01$). This suggests that as age increases, so does the level of climate change awareness. This positive correlation can be attributed to younger individuals being more

exposed to environmental education and information through various channels.

Educational background was also found to be a significant predictor of climate change awareness ($\beta = 0.327$, $p < 0.001$). Respondents with higher levels of education showed greater awareness of climate change issues. This underscores the importance of education in shaping individuals' understanding of environmental challenges.

Regression analysis showed a positive correlation between socioeconomic status and climate change awareness ($\beta = 0.188$, $p < 0.05$). Higher socioeconomic status was associated with increased awareness of climate change. This finding suggests that individuals with greater financial resources may have more access to information and resources, which contributes to their increased awareness.

DISCUSSION

Climate Change Awareness

The high level of awareness observed in the general public regarding climate change is consistent with global trends [27]. However, there are variations in awareness levels, indicating the need for targeted educational campaigns to address existing knowledge gaps [28]. These efforts should focus on disseminating information about specific local manifestations of climate change, such as rising temperatures and changes in rainfall patterns [29].

Attitudes towards climate change impacts

Key concerns expressed by participants regarding the impact of climate change on air and water quality and the spread of vector-borne diseases underscored the perceived vulnerability of the JMA community to environmental health risks [30]. The urgency of implementing measures to tackle this problem and the importance of community involvement in shaping climate change resilience strategies were highlighted [31].

Adaptive Measures and Government Engagement

The diversity of adaptive actions reported by respondents reflects diverse

approaches to climate change adaptation [32]. The desire to increase government involvement suggests a recognition of the need for systemic change and policy intervention [33]. Policymakers should consider input from the public when formulating policies that are resilient to climate change to ensure that they are aligned with the needs and priorities of the population [34].

Implications for Policy

a. Targeted Education Campaigns

Tailoring educational campaigns to reach older demographics and individuals with lower educational backgrounds may be beneficial. Possible strategies include community workshops, informative sessions, and collaboration with educational institutions.

b. Community Engagement Initiatives

Recognizing the active involvement of communities in adaptation efforts, policymakers should consider developing community engagement initiatives. This could include supporting local neighborhood initiatives and providing platforms for community-driven climate action.

c. Addressing the Awareness Gap

Efforts should be directed towards addressing awareness gaps influenced by demographic factors. Low-cost and accessible awareness campaigns, utilizing community networks and local media, can be particularly effective in reaching individuals with lower socioeconomic status.

Future Research Considerations

Future research could explore the interactive effects of different factors, taking into account the complex interactions of demographic variables. Longitudinal studies can provide a deeper understanding of the dynamics between variables over time.

5. CONCLUSION

In conclusion, this research contributes to the understanding of community perceptions of climate change and environmental health in the Jakarta Metropolitan Area. The high awareness levels and expressed concerns underscore the urgency of addressing climate-related challenges. The community's active involvement in adaptive measures and the identified predictors of awareness suggest avenues for informed policy interventions. Tailored educational campaigns, community engagement initiatives, and addressing awareness disparities are crucial for building climate resilience. The findings offer practical implications for policymakers, environmental advocates, and researchers working toward sustainable and climate-resilient urban communities. As climate change continues to pose challenges globally, the lessons drawn from this study can inform strategies for fostering adaptive capacity and enhancing community well-being in urban contexts.

REFERENCES

- [1] A. A. Kurnia, E. Rustiadi, A. Fauzi, A. E. Pravitasari, and J. Ženka, "Probing Regional Disparities and Their Characteristics in a Suburb of a Global South Megacity: The Case of Bekasi Regency, Jakarta Metropolitan Region," *ISPRS Int. J. Geo-Information*, vol. 12, no. 2, 2023, doi: 10.3390/ijgi12020032.
- [2] Y. Kristiadi, R. F. Sari, H. Herdiansyah, H. S. Hasibuan, and T. H. Lim, "Developing DPSIR Framework for Managing Climate Change in Urban Areas: A Case Study in Jakarta, Indonesia," *Sustain.*, vol. 14, no. 23, pp. 1–30, 2022, doi: 10.3390/su142315773.
- [3] M. A. Ashari and L. Yola, "Effects of Microclimate and Public Perceptions on Outdoor Thermal Sensation in the Dense Area of Jakarta," *Lect. Notes Civ. Eng.*, vol. 310, no. January, pp. 473–480, 2023, doi: 10.1007/978-981-19-8024-4_41.
- [4] D. N. Ramdiana and L. Yola, "the Effect of Vegetation and Water Body on Thermal Comfort in Banteng City Park, Jakarta," *Plan. Malaysia*, vol. 21, no. 1, pp. 262–273, 2023, doi: 10.21837/PM.V21I25.1238.
- [5] A. S. Anugraha, H. P. Erdiza, D. Apriyadi, and B. Agusandra, "Integration of Geospatial and Citizen Participation Using Geographic Information System for Smart City: a Study of Priority Villages Program in Jakarta, Indonesia," *Int. Arch. Photogramm. Remote Sens. Spat. Inf. Sci. - ISPRS Arch.*, vol. 48, no. 4/W5-2022, pp. 17–24, 2022, doi: 10.5194/isprs-archives-XLVIII-4-W5-2022-17-2022.
- [6] R. Bailie, "Climate-Related Natural Disasters: Reflections on an Agenda for Rural Health Research," *Int. J. Environ. Res. Public Health*, vol. 20, no. 8, 2023, doi: 10.3390/ijerph20085553.

- [7] K. R. Clifford *et al.*, "The 'Nuts and Bolts' of Doing Coproduction," *Am. Meteorol. Soc.*, pp. 872–883, 2022.
- [8] M. Zandlová, H. Skokanová, and M. Trnka, "Landscape Change Scenarios: Developing Participatory Tools for Enhancing Resilience to Climate Change," *Environ. Manage.*, vol. 72, no. 3, pp. 631–656, 2023, doi: 10.1007/s00267-023-01840-x.
- [9] G. Mattalia, N. Stryamets, V. Toscano Rivalta, and V. Reyes-García, "Correspondence between local and scientific knowledge of climate change: the case of Hutsuls, Northern Romanian Carpathians," *Routledge Handb. Clim. Chang. Impacts Adapt. Strateg. Indig. Peoples Local Communities*, vol. 2024, pp. 30–44, 2023.
- [10] M. Fox, C. Zuidema, B. Bauman, T. Burke, and M. Sheehan, "Integrating public health into climate change policy and planning: State of practice update," *Int. J. Environ. Res. Public Health*, vol. 16, no. 18, pp. 1–22, 2019, doi: 10.3390/ijerph16183232.
- [11] S. I. Selvia, T. Taufiqurrahman, and M. I. Kurnia, "Perbandingan Stok Karbon Berbasis Penggunaan Lahan dan Rencana Pola Ruang pada Wilayah Perencanaan III Kota Singkawang," *J. Sains Teknol. Lingkungan*, vol. 9, no. 2, pp. 238–247, 2023, doi: 10.29303/jstl.v9i2.417.
- [12] J. Freihardt, "Assessing perceptions of environmental change among a climate change-illiterate population from Bangladesh," pp. 1–20, 2023.
- [13] L. Beckwith, S. Warrington, and H. Nguyen, "Listening to Experiences of Environmental Change in Rural Vietnam: An Intergenerational Approach," *Prog. Dev. Stud.*, vol. 23, no. 4, pp. 461–480, 2023, doi: 10.1177/14649934231173849.
- [14] M. Matias, S. Lopes, and A. Lopes, "The Climate of My Neighborhood: Households' Willingness to Adapt to Urban Climate Change," *Land*, vol. 12, no. 4, 2023, doi: 10.3390/land12040856.
- [15] A. Pisor, J. S. Lansing, and K. Magargal, "Climate change adaptation needs a science of culture," *Philos. Trans. R. Soc. B Biol. Sci.*, vol. 378, no. 1889, 2023, doi: 10.1098/rstb.2022.0390.
- [16] N. Berlin Rubin, E. R. Bower, N. Herbert, B. S. Santos, and G. Wong-Parodi, "Centering equity and sustainability in climate adaptation funding," *Environ. Res. Clim.*, vol. 2, no. 3, p. 033001, 2023, doi: 10.1088/2752-5295/ace3e9.
- [17] A. Andries, S. Morse, R. J. Murphy, and E. R. Woolliams, "Examining Adaptation and Resilience Frameworks: Data Quality's Role in Supporting Climate Efforts," *Sustain.*, vol. 15, no. 18, pp. 1–20, 2023, doi: 10.3390/su151813641.
- [18] P. Bawole and H. Sutanto, "Marginalized community effort to improve environmental quality of poor settlement along riverbank," *J. Teknosains*, vol. 12, no. 2, p. 111, 2023, doi: 10.22146/teknosains.79456.
- [19] F. Ge, W. Chen, Y. Zeng, and J. Li, "The nexus between urbanization and traffic accessibility in the middle reaches of the yangtze river urban agglomerations, china," *Int. J. Environ. Res. Public Health*, vol. 18, no. 7, pp. 1–17, 2021, doi: 10.3390/ijerph18073828.
- [20] Z. Shi, Y. Wang, and Q. Zhao, "Analysis of Spatiotemporal Changes of Ecological Environment Quality and Its Coupling Coordination with Urbanization in the Yangtze River Delta Urban Agglomeration, China," *Int. J. Environ. Res. Public Health*, vol. 20, no. 2, 2023, doi: 10.3390/ijerph20021627.
- [21] A. E. Syafrina, "Dawatuna : Journal of Communication and Islamic Broadcasting Komunikasi Ketua RW 010 Kelurahan Kaliabang Tengah Kepada Masyarakat Dalam Proses Pengembangan Program Bekasi Smart City Dawatuna : Journal of Communication and Islamic Broadcasting," vol. 3, pp. 173–183, 2023, doi: 10.47476/dawatuna.v2i4.2325.
- [22] S. Boskovic, P. Puchol-salort, A. Mijic, and C. Maksimovic, "Systemic design approach for climate change adaptation and enhancement of public health and wellbeing," p. 6288, 2023.
- [23] A. Baklanov, "Toward Climate Smart and Sustainable cities: Integrated Urban System Methodology and Key Performance Indicators," 2023, [Online]. Available: <https://meetingorganizer.copernicus.org/EGU23/EGU23-9843.html>
- [24] N. Shukla, A. Das, and T. Mazumder, "Assessment of urban form resilience: a review of literature in the context of the Global South," *Environ. Dev. Sustain.*, 2023, doi: 10.1007/s10668-023-04058-3.
- [25] K. Chmutina, G. Lizarralde, J. von Meding, and L. Boshier, "Standardised indicators for 'resilient cities': the folly of devising a technical solution to a political problem," *Int. J. Disaster Resil. Built Environ.*, vol. 14, no. 4, pp. 514–535, 2023, doi: 10.1108/IJDRBE-10-2022-0099.
- [26] W. He, S. W. Zheng, and X. Q. Zhao, "Exploring the spatiotemporal changes and influencing factors of urban resilience based on Scale-Density-Morphology – A case study of the Chengdu-Deyang-Mianyang Economic Belt, China," *Front. Environ. Sci.*, vol. 11, no. February, pp. 1–14, 2023, doi: 10.3389/fenvs.2023.1042264.
- [27] J. Maxwell and G. Blashki, "Teaching about climate change in medical education: An opportunity," *J. Public Health Res.*, vol. 5, no. 1, pp. 14–20, 2016, doi: 10.4081/jphr.2016.673.
- [28] M. van Wijk *et al.*, "Perception and knowledge of the effect of climate change on infectious diseases within the general public: A multinational cross-sectional survey-based study," *PLoS One*, vol. 15, no. 11 November, pp. 1–14, 2020, doi: 10.1371/journal.pone.0241579.
- [29] S. Ben Romdhane, S. Lee, and S. Al-Shaebi, "Enhancing Sustainability Communication among UAE's Higher Education Students: The Relationship between Sustainable Living Knowledge and Intention to Live Sustainably," *Sustain.*, vol. 15, no. 15, 2023, doi: 10.3390/su151511892.
- [30] J. C. Semenza, J. Rocklöv, and K. L. Ebi, "Climate Change and Cascading Risks from Infectious Disease," *Infect. Dis. Ther.*, vol. 11, no. 4, pp. 1371–1390, 2022, doi: 10.1007/s40121-022-00647-3.
- [31] L. Cameron, R. Rocque, K. Penner, and I. Mauro, "Public perceptions of Lyme disease and climate change in southern Manitoba, Canada: making a case for strategic decoupling of climate and health messages," *BMC Public Health*, vol. 21, no. 1, pp. 1–22, 2021, doi: 10.1186/s12889-021-10614-1.
- [32] B. Höllermann, "Impact of interplay of perceived environmental and socio-political uncertainties on adaptation decisions," p. 5194, 2023.

- [33] D. S. Dookie, D. Conway, and S. Dessai, "Organisational preparedness for the physical risks of climate change in the UK: Headline findings from a UK-wide survey (April-May 2021)," no. May, 2021, [Online]. Available: <https://www.lse.ac.uk/granthaminstitute/publication/organisational-preparedness-for-the-physical-risks-of-climate-change-in-the-uk/>
- [34] T. R. Harrison *et al.*, "Advancing a hyperlocal approach to community engagement in climate adaptation: Results from a South Florida pilot study in two communities," *PLOS Clim.*, vol. 1, no. 6, p. e0000041, 2022, doi: 10.1371/journal.pclm.0000041.