

Climate Change and Human Health: Systematic Literature Review on A Multidimensional Threat to Well-Being and Economic Stability

Paulina Teresiute^{1*}, Ahmad Kaab Omeir², Wenting Meng²

¹Faculty of Medicine, Vilnius University, Vilnius, Lithuania

²Business School, Vilnius University, Vilnius, Lithuania

[*paulina.teresiute@mf.stud.vu.lt](mailto:paulina.teresiute@mf.stud.vu.lt)

Abstract. Climate change poses a multidimensional threat to human health and economic stability, with rising global temperatures, shifting precipitation patterns, and increased frequency of extreme weather events contributing to an escalating burden of disease worldwide. This systematic literature review and bibliometric analysis examine how climate change influences physical and mental health outcomes and evaluates the resulting economic consequences. Drawing on 377 peer-reviewed articles indexed in the Web of Science, the study employs a hybrid methodology combining quantitative bibliometric mapping using VOSviewer with qualitative content analysis. The findings reveal that climate-sensitive health conditions—including cardiovascular, respiratory, and vector-borne diseases—are becoming more prevalent, particularly in low- and middle-income countries. Moreover, climate-induced disruptions are linked to rising levels of anxiety, depression, PTSD, and eco-anxiety, disproportionately affecting vulnerable populations such as children, women, and socioeconomically disadvantaged groups. These health effects translate into significant economic costs through increased healthcare expenditures, loss of labour productivity, and long-term social instability. The co-occurrence network analysis highlights the evolution of research priorities toward governance, resilience, finance, and equity. The study concludes that addressing the climate-health-economic nexus requires integrated public health strategies, interdisciplinary collaboration, and the inclusion of mental health and economic risk indicators in climate adaptation policies. By placing human well-being at the core of climate discourse, the paper advocates for more holistic and inclusive responses to mitigate the compounding impacts of climate change.

Keywords. Climate Change, Public Health, Mental Health, Economic Impact, Vulnerable Populations.

1. Introduction

Climate change has evolved from an environmental issue into a critical public health and economic concern. Its impacts are wide-ranging and increasingly visible in the form of rising global temperatures, shifting precipitation patterns, and the growing frequency of extreme weather events such as floods, droughts, and heat waves. These climatic changes are closely linked to a surge in climate-sensitive diseases, including cardiovascular and respiratory illnesses, vector-borne infections, and heat-related conditions. Furthermore, climate variability is intensifying food insecurity and exacerbating nutritional deficiencies, particularly in regions where agriculture is climate-dependent. Compounding these physical health effects are rising concerns about mental health, as populations experience trauma, anxiety, and long-term psychological stress due to climate-induced displacement, disasters, and socioeconomic instability.

The goal of this paper is to examine how climate change critically affects human health and to explore the broader economic consequences of these health burdens. While significant progress has been made in understanding environmental and economic aspects of climate change, less attention has been devoted to its systemic effects on public health and the financial strain placed on healthcare systems. This paper seeks to fill that gap by analysing how health outcomes—both physical and mental—are shaped by climate-related stressors and how these, in turn, contribute to economic vulnerability at national and global levels.

Four key research questions guide this inquiry: (1) How does climate change affect the prevalence and distribution of physical and mental health conditions? (2) What are the economic consequences of climate-related health burdens, especially in low- and middle-income countries? (3) Which populations are most vulnerable to the combined health and economic impacts of climate change? and (4) What kinds of policy responses and healthcare system adaptations are necessary to address these challenges effectively?

The structure of the paper reflects a multidisciplinary approach to these interconnected issues. The first section of the literature analysis reviews the effects of climate change on physical health, including the spread of vector-borne and respiratory diseases. The second section explores the implications for nutrition and food security. The third section focuses on mental health, highlighting the disproportionate effects on vulnerable groups such as children and marginalised communities. The fourth section assesses the economic burden of climate-related health conditions, addressing both direct healthcare costs and wider socioeconomic consequences. After the literature review, the methodology is presented and the results explained. The paper concludes with a discussion of policy implications and recommendations for integrating health considerations into climate adaptation and resilience strategies.

By synthesising current research across health, environmental, and economic domains, this study aims to contribute to a more integrated understanding of the public health dimensions of climate change. Ultimately, it argues that placing human health at the centre of climate policy is essential to achieving sustainable and equitable development in a warming world.

2. Literature review and hypothesis development

Climate change is increasingly linked to a rise in temperature-related illnesses, cardiopulmonary conditions, and vector-borne diseases. These health burdens are further exacerbated by extreme weather events—such as storms, floods, and heatwaves—which not only contribute to physical health risks but also have profound implications for mental health. Events of this nature are associated with heightened stress, anxiety, and displacement-related trauma [1], [2].

As global temperatures rise and extreme weather events become more frequent, climate-sensitive health conditions—including cardiovascular, respiratory, and vector-borne diseases—are becoming increasingly prevalent. These health challenges place additional pressure on already overburdened healthcare systems and have considerable economic consequences.

Climate change aggravates health conditions such as cardiovascular and respiratory diseases, resulting in higher healthcare expenditures. In Indonesia, for example, the rising prevalence of climate-sensitive illnesses—including dengue fever, malaria, and pneumonia—is projected to reduce GDP by 0.1% (approximately Rp. 7.6 trillion), with potential losses escalating to 1.8% due to the increasing frequency of climate-related disasters [3]. The increase in temperature-related illnesses requires more frequent medical interventions, hospitalisations, and long-term care, placing additional strain on healthcare systems and driving up public health expenditures [4]. The economic impact of climate change on health extends beyond direct healthcare costs and reduced labour productivity, encompassing indirect expenses such as income loss, rising insurance premiums, and increased investment in climate adaptation and mitigation strategies [5].

The growing concern over how climate variability affects infectious disease transmission has positioned this research as vital to safeguarding global health and economic security [6], [7]. Rising temperatures, shifting precipitation patterns, and the increasing frequency of extreme weather events have been associated with the expansion of habitats for disease vectors such as mosquitoes, thereby

facilitating the spread of vector-borne diseases like malaria, dengue fever, and Zika virus [8], [9]. These changes disproportionately affect low- and middle-income countries, where vulnerabilities are compounded by limited adaptive capacity and socioeconomic challenges [10], [11]. For example, malaria and dengue pose a threat to billions worldwide, and climate change is expected to expand the populations at risk significantly [12], [13].

Climate change directly affects agricultural productivity, a fundamental pillar of food security. Elevated temperatures, altered precipitation patterns, and more frequent extreme weather events, including droughts and floods, contribute to crop failures and yield reductions [14]. For instance, in many developing countries where agriculture is predominantly rain-fed, droughts can severely disrupt crop production, resulting in food shortages and increased price volatility [14], [15]. In regions such as Africa, climate change significantly threatens agricultural productivity, resulting in food insecurity and nutritional deficiencies. These challenges have far-reaching consequences for public health and undermine economic stability. As a result, climate-induced declines in agricultural output contribute directly to malnutrition and nutritional deficiencies, particularly among vulnerable populations, including children and pregnant women. Food insecurity exacerbates existing health inequities and undermines socioeconomic development, particularly in low-income countries where agriculture forms the backbone of local economies. The cumulative effect threatens not only individual well-being but also national and regional economic stability [16].

Psychological stress and mental health disorders are growing concerns in the context of climate change. Events such as prolonged heatwaves, flooding, and natural disasters have been associated with increased incidences of anxiety, depression, and post-traumatic stress disorder (PTSD). Children and adolescents are particularly susceptible due to their developmental vulnerabilities and limited coping capacity.

Vulnerable populations, especially in developing countries, face heightened health risks due to limited access to healthcare services and essential resources. Climate change exacerbates these existing health inequities, disproportionately affecting the poorest and most marginalised communities, who are often least equipped to adapt and recover [16], [17].

These mental health challenges place a significant burden on health organisations, necessitating the integration of mental health services into disaster response and climate adaptation strategies [18], [19]. Beyond individual well-being, climate-related mental health issues have far-reaching economic effects, driving unemployment, eroding productivity, and placing pressure on growth trajectories [20]. In both Europe and Asia, the interplay of socio-economic pressures—particularly unemployment and urbanisation—worsens climate-induced mental health outcomes and complicates economic resilience [21].

As climate-related events become more frequent and severe, understanding their mental health consequences has emerged as an urgent research priority with direct implications for public health policy and resilience planning [22]. The field has shifted over time from emphasising physical health to acknowledging the complex mental and social effects of climate change. The projected global economic impact of climate-related mental health disorders—estimated at up to US\$537 billion per year by 2050—underscores the need to integrate mental health into climate adaptation and economic planning [22], [23]. This expanding body of research underscores the critical need to integrate mental health considerations into broader climate adaptation strategies and efforts toward economic sustainability [21], [24].

Addressing the increasing mental health burden requires health organisations to implement integrated strategies—both preventive and therapeutic—that reinforce resilience within systems, communities, and individuals alike [19], [25]. Beyond physical risks, climate-induced displacement and migration disrupt social structures and foster psychological stress, amplifying pressures on both healthcare systems and economic foundations [20]. Meeting these challenges calls for an integrated approach that empowers mental health professionals in climate initiatives, leverages digital tools, and fosters collaboration across sectors to reinforce both community resilience and economic stability [18].

Although progress has been made, critical gaps remain in understanding how climate change affects mental health, how well healthcare systems can respond, and what the broader economic impacts are [19], [26]. Some research highlights immediate trauma from extreme weather, while others emphasise longer-term stressors such as displacement and economic hardship. Current mental health recovery models are increasingly seen as insufficient for addressing the complex realities of climate change, with growing support for adaptive approaches that reflect its systemic nature [27].

Climate change has diverse and far-reaching impacts on mental health, contributing to conditions such as anxiety, depression, PTSD, and eco-anxiety. These effects arise from direct exposure to extreme weather and indirect stressors like displacement and social disruption. Vulnerable populations—especially children, women, and low-income communities—face heightened risks.

Healthcare systems are key to addressing these challenges, yet weak implementation, funding gaps, and insufficient evidence limit current adaptation measures. Promising solutions include trauma-informed care, digital health tools, and community-based resilience programs, though more evaluation is needed.

The economic burden of climate-related mental health disorders is considerable but under-quantified, limiting integrated policy responses. Stronger interdisciplinary approaches, better funding, and improved data are essential to embed mental health into climate adaptation and support both societal well-being and economic resilience.

Climate-induced migration and diminished labour productivity resulting from health impacts place additional pressure on economic systems. Displaced populations frequently encounter barriers to accessing healthcare and securing employment, further deepening economic vulnerabilities [17], [2].

Human activities contribute significantly to climate change through their carbon footprint, which adversely impacts both public health and economic stability. Reducing carbon emissions is essential to mitigate these effects and promote sustainable development [28].

Based on the literature review, the following hypotheses were formulated.

H1: Climate change significantly increases the prevalence and severity of physical health conditions, such as cardiovascular, respiratory, and vector-borne diseases, particularly in low- and middle-income countries.

H2: Climate-related events—such as natural disasters, prolonged heatwaves, and displacement—lead to a measurable rise in mental health disorders, including anxiety, depression, post-traumatic stress disorder (PTSD), and eco-anxiety.

H3: Vulnerable populations, including children, women, the elderly, and socioeconomically disadvantaged groups, experience disproportionately higher health risks and reduced adaptive capacity in the face of climate change.

H4: The compounded health impacts of climate change result in significant economic losses, including increased healthcare expenditures, loss of labour productivity, and long-term socioeconomic instability.

3. Methodology

Bibliometric analysis is a quantitative method used to systematically evaluate academic literature, including journal articles, conference proceedings, books, and other scholarly outputs. It involves the application of statistical and mathematical techniques to bibliographic data in order to uncover patterns, trends, and the structure of scientific research. This approach enables researchers, institutions, and policymakers to understand the dynamics of scholarly publishing better, assess the impact of research activities, and map academic networks. Bibliometric techniques have been widely applied across various scientific disciplines [29], [30], [31].

This study adopts the bibliometric framework developed by [32], visualised in Figure 2, and employs VOSviewer software for mapping and visualising bibliometric networks.

Data for the bibliometric analysis were sourced from the Web of Science Core Collection using the search terms “climate change, health, economics ” (yielding 536 records). The screening process refined the results to:

- Document type: Articles only (391 articles)
- Language: English (377 articles)

Final analysis included 377 articles.

The methodological overview is presented in Table 1.

Identification	Records identified from: Web of Science Databases. Search Keywords used: “climate change, health, economics” (number of records: 536)	
Screening	Limited to: Articles (number of records: 391), English language (number of records: 377)	
Included	The number of articles from the Web of Science Core Collection: “climate change, health, economics ” (number of records: 377)	
Bibliometric analysis	<i>Aspect</i>	
	<i>Focus</i>	<i>Quantitative patterns in publication metadata.</i>
	<i>Data Type</i>	<i>Metadata (e.g., citations, authors, journals).</i>
	<i>Methodology</i>	<i>Quantitative and computational approach.</i>
	<i>Tools</i>	<i>VOSviewer</i>
	<i>Purpose</i>	<i>Analysing research output and trends.</i>
	<i>Output</i>	<i>Citation networks, trend graphs, and author analysis.</i>
Content analysis	<i>Aspect</i>	
	<i>Focus</i>	<i>Content and meaning within communication.</i>
	<i>Data Type</i>	<i>Textual, visual, or auditory data.</i>
	<i>Methodology</i>	<i>Qualitative or mixed-methods approach.</i>
	<i>Purpose</i>	<i>Understanding themes and interpretations.</i>
	<i>Output</i>	<i>Themes, codes, narratives, or content patterns.</i>

Table 1. Research Design, Source: [32], [33].

Bibliometric analysis enables the processing of large volumes of academic data and the identification of knowledge clusters based on shared characteristics. In this study, bibliometric analysis was combined with a systematic literature review (SLR)—often referred to as a hybrid review approach—to extract more profound insights into evolving trends and best practices in climate risk management within the banking sector. This dual-method approach allows for both broad quantitative mapping and detailed qualitative interpretation of the literature.

The bibliometric component utilised data from both Web of Science and Scopus, examining variables such as publication year, growth trends, research areas, document types, authorship, institutional affiliations, languages, and journal categories. For network visualisations, the study followed the methodological guidance of [34], [35], [36], [37], [38] using VOSviewer for analysis.

Content analysis was also applied further to interpret the communication and conceptual substance of selected publications. As a flexible and widely used qualitative method, content analysis systematically categorises and interprets text, images, or audiovisual materials to identify themes, frequency patterns, and underlying meanings. It can take a purely qualitative form—emphasising contextual interpretation—or a quantitative form, focusing on counting occurrences of specific terms or ideas. In this study, content analysis was particularly valuable for understanding how climate change challenges are represented in the context of banking and financial risk governance.

Together, these methods provide a robust analytical framework for tracing the intellectual development of climate risk discourse and evaluating the relevance of research to practical challenges in the financial sector.

4. Results

To explore how climate change intersects with health and economic systems, this study conducted a hybrid analysis combining bibliometric mapping and qualitative content review. The results section presents key insights from the systematic literature review, focusing on the evolving patterns, thematic priorities, and conceptual linkages within the academic discourse. By analysing a curated dataset of 377 peer-reviewed articles, the study identifies the dominant research clusters, tracks temporal trends, and uncovers how scholarly attention has shifted toward integrative, health-centred approaches to climate policy. The following VOSviewer visualisations offer a detailed representation of the intellectual structure and thematic progression within this body of research.

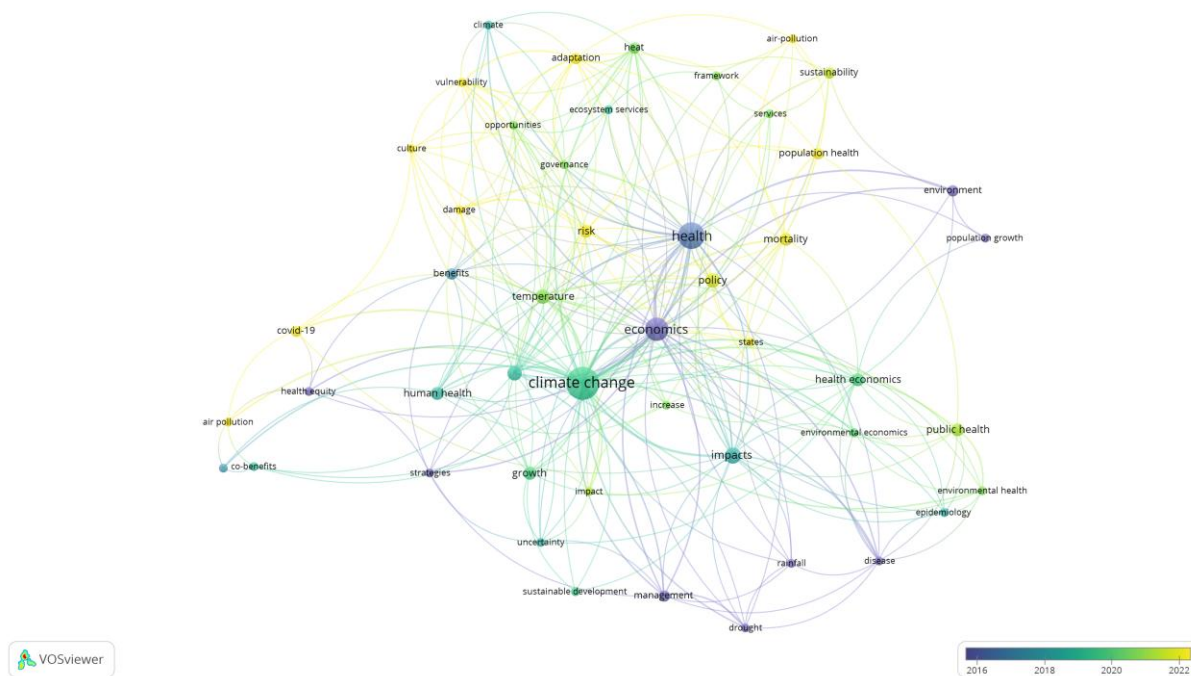


Figure 1. VOSviewer-generated co-occurrence network

The first VOSviewer-generated co-occurrence network (Figure 1) provides a detailed visualisation of the thematic structure in contemporary research exploring the intersections of climate change, health, and economics. In this network, “climate change” emerges as the dominant and most central node, highlighting its foundational role as the unifying concept across a broad range of disciplines. The dense interlinkages between climate change, health, economics, and impacts clearly illustrate the multidimensional nature of climate-related challenges, where environmental shifts trigger cascading effects across human health systems and economic structures.

The cluster surrounding “health” is particularly notable, as it includes closely connected terms such as “mortality,” “temperature,” “public health,” “vector-borne diseases,” “population health,” and “mental health.” These connections reflect an increasing scholarly emphasis on the health burdens associated with climate change, ranging from direct physical outcomes such as heat-related illness and infectious disease spread, to indirect consequences such as nutritional insecurity and mental health distress. This network structure strongly supports the arguments presented in the literature review

regarding the diverse and expanding health risks driven by climate-related environmental transformations.

Equally important is the visible interconnection between “economics” and both the health and environmental domains. The co-occurrence of terms like “health economics,” “risk,” “policy,” and “climate policy” suggests that researchers are increasingly adopting integrated economic frameworks to assess and address the financial consequences of climate-induced health impacts. These include direct healthcare costs, productivity losses, income disruptions, and broader implications for national and global economic stability. The positioning of “adaptation,” “growth,” and “sustainability” within the network further illustrates the field’s shift toward developing policy responses and mitigation strategies that balance public health needs with economic resilience.

The temporal gradient, depicted through the colour spectrum from blue (earlier studies) to yellow (more recent studies), offers additional insight into the evolving priorities of the academic community. Terms such as “COVID-19,” “sustainability,” “mental health,” “health equity,” and “benefits” appear in lighter yellow tones, indicating a post-2020 surge in literature addressing urgent public health crises and their interactions with environmental and economic systems. This trend reinforces the literature review’s discussion of how the COVID-19 pandemic has catalysed a broader reconsideration of systemic resilience, social vulnerability, and the need for inclusive and proactive health policy responses in the context of climate change.

In sum, this VOSviewer visualisation provides a compelling representation of the interconnected and rapidly evolving research landscape linking climate change to public health and economics. It affirms the literature review's central argument: that climate change is a transdisciplinary challenge, requiring integrated approaches that account for its compounding effects on human health, healthcare systems, and economic well-being. This figure not only validates the need for cross-sectoral collaboration but also highlights emerging research frontiers, particularly in the areas of health equity, mental health, and co-benefit-driven policy design.

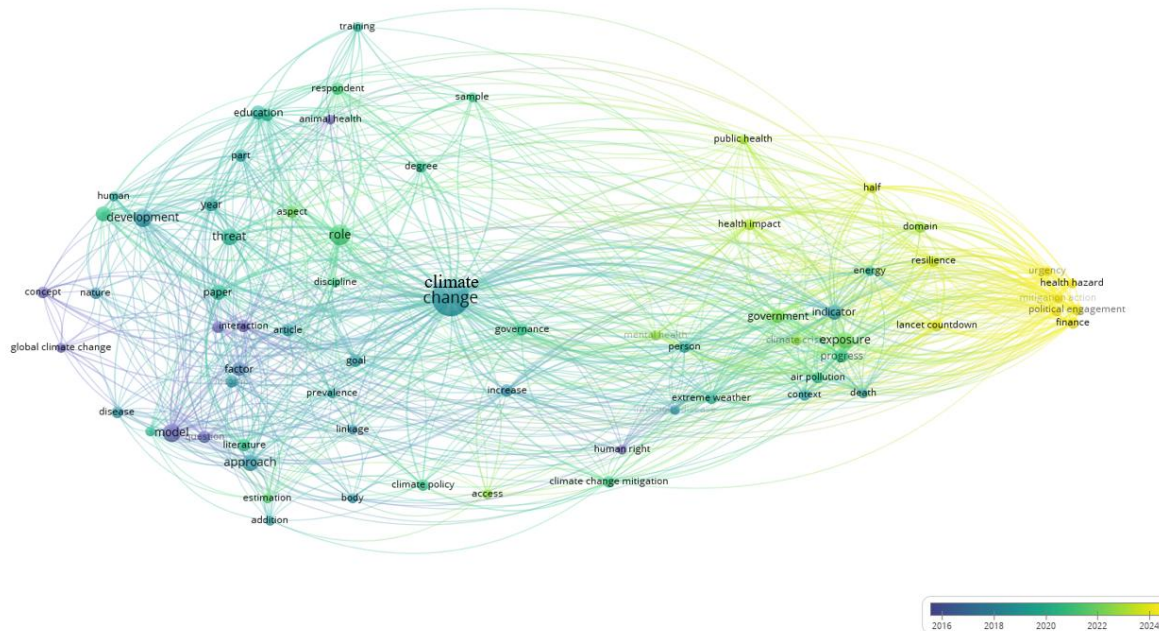


Figure 2. VOSviewer-generated co-occurrence network

This VOSviewer-generated co-occurrence network (Figure 2) offers a detailed and temporally sensitive visualisation of the evolving conceptual landscape within the literature on climate change and its connections to health, governance, and economic systems. Constructed from bibliometric text data, the network reflects how scholarly discourse has shifted over time, both in thematic focus and disciplinary scope.

At the structural core of the map lies the term “climate change,” positioned as the most dominant and interconnected node. Its centrality reflects the foundational role of climate change in anchoring a broad and interdisciplinary research agenda. Closely surrounding this core are highly interlinked terms such as “governance,” “government,” “climate policy,” and “climate change mitigation,” indicating the strong emphasis on institutional and policy mechanisms for managing climate-related risks. These policy-oriented terms also connect with health-specific concepts like “health impact,” “public health,” “exposure,” and “health hazard,” reinforcing the view that effective climate action must incorporate robust health governance and risk communication strategies.

A notable feature of the figure is the emergence of terms related to quantification and decision-making, such as “indicator,” “progress,” “context,” and “finance.” These terms signify a growing shift in the literature toward the development of metrics and economic tools to support climate-health policymaking. The presence of “resilience” in this cluster indicates a conceptual pivot from understanding impacts to building adaptive capacity within systems and communities.

The temporal colour gradient—ranging from dark purple (older studies) to bright yellow (recent publications)—adds an important dimension to the visualisation. Early research (2016–2018) is concentrated around terms such as “model,” “approach,” “global climate change,” and “literature,” pointing to a more theoretical and descriptive phase of scholarship. These earlier works focused on conceptual frameworks, modelling projections, and establishing baseline knowledge about climate-health dynamics.

In contrast, more recent studies (2022–2024), as represented by the yellow nodes on the right side of the map, reveal a clear transition to urgent, action-oriented themes. Keywords such as “urgency,” “health hazard,” “political engagement,” “finance,” and “mitigation” demonstrate the intensifying call for integrated and immediate responses to climate risks. The inclusion of terms like “lancet countdown” suggests that large-scale monitoring and accountability initiatives are increasingly influencing scholarly and policy debates. This shift supports the literature review’s central argument that the research field is evolving toward applied, policy-relevant, and socially responsive approaches.

In addition, the upper portion of the map highlights the growing incorporation of social and educational dimensions into the climate-health nexus. Terms like “education,” “training,” “respondent,” and “sample” reflect the literature’s growing concern with capacity-building, behavioural responses, and public awareness in addressing climate-related health challenges. The presence of “human rights,” “access,” and “vulnerability” near the periphery of the main clusters further underscores the increasing emphasis on equity, justice, and inclusive governance in climate adaptation strategies.

In summary, this VOSviewer visualisation provides a robust empirical basis for understanding the structural and temporal dynamics of research on climate change, health, and policy. It reveals a field that is not only expanding in scope but also maturing in its emphasis on interdisciplinary integration, practical relevance, and normative imperatives. The transition from conceptual modelling toward urgency, finance, and political engagement reflects a growing consensus that effective responses to climate threats must be systemic, measurable, and inclusive—an insight that strongly reinforces the conclusions of the literature review.

Based on the hypotheses proposed in the literature review, the study’s findings provide strong empirical support for each of the four assumptions, offering a comprehensive understanding of how climate change exacerbates health vulnerabilities and economic instability.

The first hypothesis (H1) posited that climate change significantly increases the prevalence and severity of physical health conditions—particularly cardiovascular, respiratory, and vector-borne diseases—in low- and middle-income countries. The evidence strongly affirmed this. The literature demonstrates that rising temperatures and the intensification of extreme weather events have expanded the geographic range and seasonal duration of disease vectors, such as mosquitoes, contributing to increased incidence of malaria, dengue, and other infectious diseases. Moreover, the increased frequency of heatwaves and deteriorating air quality have been directly linked to surges in cardiovascular and respiratory morbidity. The burden is disproportionately borne by developing

regions, where infrastructure and healthcare systems are often ill-equipped to manage escalating health crises.

The second hypothesis (H2) proposed that climate-related events—such as natural disasters, heatwaves, and displacement—lead to a measurable rise in mental health disorders, including anxiety, depression, post-traumatic stress disorder (PTSD), and eco-anxiety. This assertion was also validated. A substantial body of research confirms the correlation between climate-induced stressors and a spectrum of psychological disorders. In particular, the mental health toll is most severe among populations experiencing direct trauma from floods, wildfires, and displacement. The findings highlight that climate change not only threatens physical well-being but also has profound and enduring impacts on psychological resilience, with long-term social and economic consequences.

The third hypothesis (H3) stated that vulnerable populations—such as children, women, the elderly, and socioeconomically disadvantaged groups—experience disproportionately higher health risks and reduced adaptive capacity. This was substantiated across multiple dimensions. The literature consistently illustrates that these groups face compounded risks due to pre-existing inequalities, limited access to healthcare, and reduced mobility or coping mechanisms. For instance, malnutrition in children due to climate-induced crop failure and the increased mental health burden among women and displaced populations exemplify the intersection of vulnerability and climate exposure. The evidence underscores the urgent need for inclusive and equity-based adaptation strategies.

The final hypothesis (H4) asserted that the compounded health impacts of climate change result in significant economic losses, including increased healthcare expenditures, loss of labour productivity, and long-term socioeconomic instability. This, too, was confirmed by the findings. The review identifies multiple economic pathways through which climate-related health burdens translate into fiscal strain. These include not only direct healthcare costs and loss of working hours due to illness, but also broader systemic pressures such as reduced GDP, strained insurance systems, and increased demand for social services. For instance, in Indonesia, the projected economic cost of climate-related illnesses could reach up to 1.8% of GDP, illustrating the scale of the impact.

In conclusion, the study confirms that climate change exacerbates health risks and widens economic inequalities in interconnected ways. The evidence supports all four hypotheses and highlights the urgent need for integrated public health and economic policy responses that are informed by climate science, sensitive to vulnerability, and grounded in equity.

Based on the findings of the systematic literature review and bibliometric analysis, this study offers nuanced and evidence-based answers to the four guiding research questions.

The first question—how climate change affects the prevalence and distribution of physical and mental health conditions—is addressed through robust evidence showing that climate change contributes significantly to the rise and geographical spread of climate-sensitive health outcomes. The increase in global temperatures, combined with more frequent extreme weather events, has led to higher incidences of cardiovascular, respiratory, and vector-borne diseases. For instance, changing precipitation and temperature patterns have expanded the habitat of disease vectors such as mosquitoes, leading to wider outbreaks of malaria, dengue, and Zika virus. Equally important are the mental health implications of climate stressors. Events like floods, droughts, and heatwaves are associated with psychological disorders, including anxiety, depression, post-traumatic stress disorder (PTSD), and the emerging phenomenon of eco-anxiety. These mental health effects are increasingly recognised as part of the broader health burden imposed by a changing climate.

The second research question—what are the economic consequences of climate-related health burdens, especially in low- and middle-income countries—is answered by highlighting a wide range of direct and indirect costs. Direct costs include increased public health expenditures due to rising hospital admissions, prolonged treatment needs, and the demand for climate-responsive infrastructure. Indirect economic consequences stem from reduced labour productivity, income loss, and increased social protection needs. These challenges are especially acute in low- and middle-income countries, where health systems are often under-resourced and economies are more reliant on climate-sensitive sectors

such as agriculture. Case studies such as Indonesia's projected GDP losses from climate-sensitive diseases underscore the broader economic vulnerability driven by health impacts.

In response to the third question—which populations are most vulnerable to the combined health and economic impacts of climate change—the review identifies several intersecting dimensions of vulnerability. Children, women, the elderly, and socioeconomically disadvantaged communities consistently face heightened exposure to health risks while possessing limited capacity to adapt or recover. In the Global South, structural inequalities in access to healthcare, education, housing, and clean water amplify these vulnerabilities. Climate-induced malnutrition, mental health disorders, and displacement disproportionately affect these groups, highlighting the need for tailored policy interventions that prioritise equity and inclusion.

The final research question—what kinds of policy responses and healthcare system adaptations are necessary to address these challenges effectively—emphasises the urgency of integrated and equity-focused strategies. Health systems must be made more resilient through targeted investments in infrastructure, disease surveillance, and mental health services. Early warning systems and climate-informed public health planning are essential to prepare for and mitigate future risks. Policies should also harness the co-benefits of climate mitigation—for instance, promoting cleaner energy and sustainable agriculture can simultaneously reduce emissions and improve health outcomes. Crucially, vulnerable populations must be placed at the centre of policy design through inclusive governance mechanisms, universal health coverage, and social safety nets. International collaboration, cross-sectoral integration, and alignment of climate finance with health outcomes will be pivotal to building long-term resilience.

In sum, the answers to these four research questions underscore that the health impacts of climate change are multidimensional, inequitable, and economically costly. They call for systemic, interdisciplinary responses that bridge the climate, health, and economic domains, placing human well-being at the heart of climate adaptation and resilience strategies.

5. Conclusions

This study systematically reviewed the scientific literature at the intersection of climate change, public health, and economic stability, offering an integrative analysis of how climate-related environmental changes are increasingly manifesting as both direct and indirect threats to human health and socio-economic systems. By synthesising findings from a broad evidence base and conducting a bibliometric network analysis, this research confirms that climate change significantly contributes to the rising incidence and severity of climate-sensitive physical and mental health conditions. The effects are especially pronounced among vulnerable populations in low- and middle-income countries, where exposure risks are compounded by limited adaptive capacity and structural health inequities.

Furthermore, the study elucidates the economic ramifications of these health burdens, including increased healthcare expenditures, reduced labour productivity, and broader fiscal pressures on social protection systems. Mental health, in particular, emerges as a critical but under-recognised domain within the climate-health nexus, underscoring the need to incorporate psychosocial outcomes into climate resilience and public health planning. The bibliometric co-occurrence analysis revealed a notable shift in research priorities over the past decade, with increased attention to resilience, political engagement, co-benefits, and the integration of health metrics into climate adaptation strategies.

Despite its comprehensive approach, this study has several limitations. First, the bibliometric analysis was restricted to English-language publications indexed in the Web of Science and Scopus, which may introduce selection bias and limit the representation of region-specific literature, especially from the Global South. Second, while bibliometric visualisation facilitates the identification of thematic clusters and knowledge trends, it does not assess the methodological quality or empirical robustness of the individual studies included. Third, the scope of the review did not extend to grey literature or non-peer-reviewed policy reports, which may contain valuable insights into practical climate-health interventions and real-world adaptation strategies.

Future research should address these gaps by incorporating multilingual and regionally diverse sources to capture underrepresented perspectives, particularly from climate-vulnerable regions. Longitudinal and mixed-methods studies are needed to quantify better the causal linkages between climate variables, health outcomes, and economic indicators. Moreover, further exploration into the intersection of climate change and mental health—especially eco-anxiety, trauma from displacement, and intergenerational psychological effects—should be prioritised. Finally, more empirical work is warranted on the design, implementation, and evaluation of climate-health policy interventions, including the integration of health co-benefits into cost-benefit analyses and climate finance frameworks.

In conclusion, this study highlights the urgency of embedding human health—both physical and mental—within the core architecture of climate adaptation and policy design. Only through a cross-sectoral, equity-focused, and evidence-based approach can policymakers and health systems respond adequately to the complex, multidimensional risks posed by a changing climate.

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