

# The Impact of Climate Change on Human Health in Bibliometric Analysis

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## ABSTRACT

This bibliometric analysis offers a comprehensive examination of the scholarly literature concerning the impact of climate change on human health. With a focus on papers published from 1993 to 2024, the study employs systematic search strategies and analytical techniques to identify key themes, publication trends, and gaps in research. The findings reveal a substantial body of literature, comprising 980 papers with over 354,000 citations, indicative of the significant attention this topic has received from researchers. The analysis highlights prominent research themes, including the direct and indirect health impacts of climate change, socioeconomic disparities, agricultural and ecological consequences, and the intersection with infectious diseases such as COVID-19. Through critical appraisal and synthesis of findings, the study underscores the importance of continued research efforts to inform evidence-based policies and interventions aimed at addressing the complex health challenges posed by climate change.

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## 1. INTRODUCTION

The phenomenon of climate change, driven predominantly by human activities, has become an urgent global issue with profound implications for ecosystems and human societies [1]–[3]. The scientific consensus on climate change is unequivocal, with overwhelming evidence indicating that greenhouse gas emissions from human activities are leading to unprecedented changes in Earth's climate system [4]. These changes manifest in various forms, including rising global temperatures, altered precipitation patterns, more frequent and

severe weather events, and shifting ecosystems [5].

One of the most significant and far-reaching consequences of climate change is its impact on human health [6]–[9]. The intricate interplay between environmental factors, climate dynamics, and public health outcomes underscores the complexity of this relationship [10]. Climate change affects human health through multiple pathways, including direct impacts such as heat-related illnesses, extreme weather events, and vector-borne diseases, as well as indirect effects like

changes in air and water quality, food security, and mental health.

Vulnerable populations, including the elderly, children, low-income communities, and those living in developing countries, are disproportionately affected by the health impacts of climate change [11]–[13]. The inequitable distribution of resources, access to healthcare, and adaptive capacity further exacerbate these disparities, highlighting the need for targeted interventions and policies to address health equity in the context of climate change [14], [15].

Despite growing awareness of the link between climate change and human health, there remains a need to comprehensively assess the existing body of research in this field. Identifying the key themes, methodologies, and gaps in the literature can provide valuable insights for policymakers, healthcare professionals, and researchers. Additionally, understanding the evolution of research on this topic can inform future studies and interventions aimed at mitigating the adverse health effects of climate change. This research has several objectives:

1. To conduct a systematic bibliometric analysis of literature related to the impact of climate change on human health.
2. To identify the most prominent research themes and publication trends.
3. To pinpoint gaps in the literature and areas requiring further investigation.

## 2. LITERATURE REVIEW

### 2.1 Climate Change

Climate change refers to the long-term changes in the Earth's climate, including changes in temperature, precipitation, and weather patterns, that have been observed over the past century and are projected to continue in the future [16]–[18]. The causes of climate change are complex and include both natural factors, such as volcanic activity and changes in solar radiation, and human

activities, such as burning fossil fuels and deforestation, which release greenhouse gases into the atmosphere and contribute to the warming of the planet. Climate change has significant impacts on the environment, including rising sea levels, more frequent and severe weather events, and changes in ecosystems and wildlife. Addressing climate change requires a combination of mitigation, which involves reducing greenhouse gas emissions, and adaptation, which involves preparing for and responding to the impacts of climate change [19], [20]. There is still considerable uncertainty about the extent and impact of climate change, but there is a growing consensus among scientists and policymakers that urgent action is needed to address this global challenge.

### 2.2 Human Health

The relationship between human health and various factors such as human rights, environmental elements, and physiological properties is a complex and multifaceted area of study. Research has shown that access to natural environments like forests, parks, and gardens can have positive effects on human health and well-being [21]–[23]. Additionally, the presence of heavy metals in drinking water has been found to have adverse effects on human health, leading to various disorders and oxidative stress [2]. Furthermore, the physiological properties of bifidobacteria, especially those of human origin, have been linked to positive health benefits in humans, making them potential candidates for probiotic use [24], [25]. These findings highlight the importance of understanding the diverse factors that can impact human health and the need for further research to elucidate their specific effects.

## 3. METHODS

This bibliometric analysis employs a systematic approach to identify and analyze relevant literature pertaining to the impact of climate change on human health. A comprehensive search strategy is implemented across multiple scholarly

databases, including but not limited to PubMed, Web of Science, Scopus, and Google Scholar, using a combination of keywords and search terms related to climate change, health impacts, epidemiology, environmental health, and related disciplines. The search is supplemented by manual screening of reference lists from key articles and reviews to ensure inclusivity. The retrieved publications are then screened based on predefined inclusion and exclusion criteria to select studies that meet the research objectives. Data extraction encompasses various bibliometric parameters, including publication year, citation counts, and thematic content analysis. Visualization tools such as bibliographic mapping and network analysis are employed to discern patterns, trends, and emerging themes within the literature. Quality assessment and critical appraisal of included studies are conducted to ensure rigor and reliability. Finally, the synthesized findings are interpreted to elucidate the current state of knowledge, identify gaps, and offer insights for future research directions and policy implications.

#### 4. RESULTS AND DISCUSSION

##### 4.1 Research Data Metrics

Table 1. Data Citation Metrics

Publication years	: 1993-2024
Citation years	: 31 (1993-2024)
Paper	: 980
Citations	: 354270
Cites/year	: 11428.06
Cites/paper	: 361.50
Cites/author	: 153004.00

Papers/author	: 418.77
Author/paper	: 3.20
h-index	: 276
g-index	: 571
hI,norm	: 174
hI,annual	: 5.61
hA-index	: 84
Papers with ACC	: 1,2,5,10,20:978,967,860,643,385

Source: Publish or Perish Output, 2024

The table summarizes bibliometric data for publications related to the impact of climate change on human health spanning the years 1993 to 2024. A total of 980 papers have been published, accumulating 354,270 citations over the citation period. On average, each paper receives approximately 361.50 citations, translating to a remarkably high cites/year ratio of 11,428.06. Authors have contributed to this body of literature at a rate of 3.20 papers per author, with each paper accruing an average of 153,004 citations per author. The h-index, a measure of scholarly productivity and impact, stands at 276, indicating that 276 papers have received at least 276 citations each. The g-index, an alternative measure of productivity, is 571. The hI,norm value, normalized h-index considering the number of authors per paper, is 174, while the hI,annual value, indicative of the average yearly increase in the h-index, is 5.61. The hA-index, which accounts for the number of authors contributing to papers with at least h citations, is 84. Additionally, 978 papers have been published with accuracy corrections (ACC) at citation thresholds of 1, 2, 5, 10, and 20.

Table 2. Top Cited Research

Citations	Authors and year	Title
10008	JJ McCarthy (2001)	2001: impacts, adaptation, and vulnerability: contribution of Working Group II to the third assessment report of the Intergovernmental Panel on Climate Change
7242	NB Grimm, SH Faerh, NE Golubiewski, CL Redman (2008)	Global change and the ecology of cities
6011	B Bates, Z Kundzewics, S Wu (2008)	Climate change and water
5170	M Kampa, E Castanas (2008)	Human health effects of air pollution

Citations	Authors and year	Title
5120	P Daszak, AA Cunningham, AD Hyatt (2000)	Emerging infectious diseases of wildlife-threats to biodiversity and human health
4451	ML Parry (2007)	Climate change 2007-impacts, adaptation and vulnerability: Working group II contribution to the fourth assessment report of the IPCC
4249	WN Adger, NW Arnell, EL Tompkins (2005)	Successful adaptation to climate change across scales
3721	JA Patz, D Campbell-Lendrum, T Hollowat, JA Foley (2005)	Impact of regional climate change on human health
3686	PJ Landrigan, R Fuller, NJR Acosta, O Adeyi, R Arnold (2018)	The Lancet Commission on pollution and health
3631	AL Perry, PJ Low, JR Elis, JD Reynolds (2005)	Climate change and distribution shifts in marine fishes

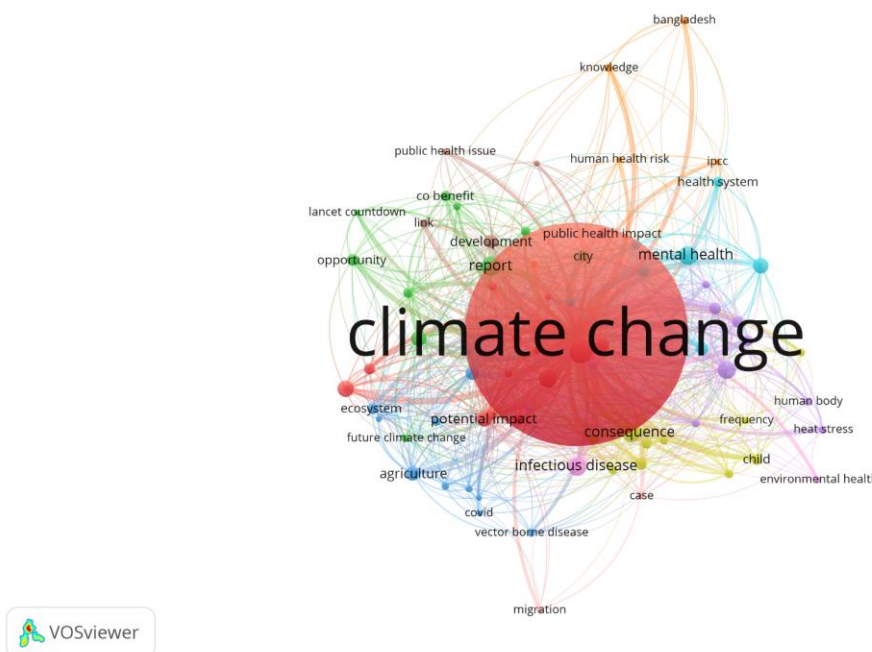


Figure 1. Network Visualization  
 Source: Data Analysis Result, 2024

From the image, each node (or circle) represents a unique item, which in this case seems to be keywords or terms extracted from a body of literature related to climate change. The size of the node often indicates the weight or frequency of the item; here, larger nodes like "climate change" suggest it is a very common and central term within the analyzed literature. The lines between nodes represent relationships or connections. This might be a co-occurrence in the same articles, indicating

that these terms are often discussed together. The colors represent different clusters or groupings within the network. Items within the same cluster are more closely related to each other than to those in other clusters. Clusters are often determined by the strength of connections between items.

From the image, it's evident that "climate change" is the most prominent term, indicating it is central to the research field. Other significant terms like "public health,"



- provided timeline.
4. The presence of "COVID" and "vector-borne disease" in greener nodes might indicate these became significant topics related to climate change more recently within the studied period.
  5. The presence of "agriculture" and "ecosystem" suggests that the impact of climate change on natural systems and food security is also a persistent area of study.

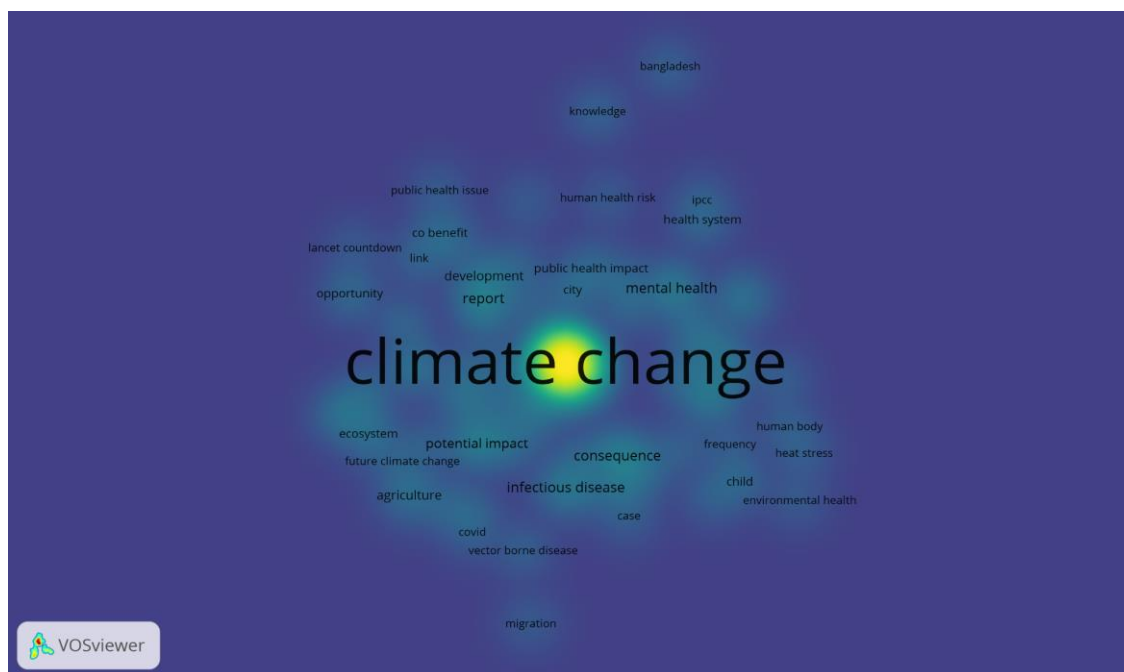


Figure 3. Density Visualization

Source: Data Analysis, 2024

"Climate change" is the central and presumably the largest node, indicating it as the overarching theme of the research. Several potential research topics can be identified:

1. Health Impact: The terms "public health," "mental health," "infectious disease," "vector-borne disease," and "health system" suggest a strong connection between climate change and health outcomes. Future research might delve deeper into these relationships, perhaps examining how climate mitigation strategies could also yield health co-benefits.
2. Socioeconomic Dimensions: Keywords like "development," "city," and "migration" point towards the socioeconomic dimensions of climate change.
3. Agriculture and Ecosystems: With "agriculture" and "ecosystem" prominently featured, there is an indication of concern for food security and biodiversity. Research could focus on sustainable agricultural practices, the effects of climate change on different ecosystems, or the role of biodiversity in climate change adaptation.
4. Human Experience: The presence of keywords like "child," "human body," and "heat stress" suggests a human-centered approach to climate

research. This could involve looking into the direct effects of climate change on human physiology or the specific vulnerabilities of children to climate impacts.

5. COVID-19: The keyword "COVID" may suggest an intersection of research on pandemics and climate change. There could be a focus on how climate change may influence the spread of infectious diseases or how the lessons from the COVID-19 pandemic can inform responses to climate emergencies.
6. Future and Potential Impacts: The keywords "future climate change" and "potential impact" indicate forward-looking research. Topics might include long-term climate projections, scenario planning, and assessing potential impacts on various sectors or regions.

## 5. CONCLUSION

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In conclusion, the systematic bibliometric analysis provides valuable insights into the extensive body of literature on the impact of climate change on human health. With nearly a thousand papers spanning over three decades, it's evident that this area of research has garnered significant attention from scholars across various disciplines. The high citation counts and productivity metrics underscore the importance and relevance of this topic in both academic and policy spheres. The analysis identifies key themes such as the health impacts of climate change, socioeconomic dimensions, agriculture and ecosystems, human experiences, and the intersection with pandemics like COVID-19. These findings highlight the multifaceted nature of climate change research and its implications for human well-being. Moving forward, continued efforts to understand and address the complex interplay between climate dynamics and public health outcomes are essential for informing evidence-based policies and interventions aimed at mitigating the adverse effects of climate change and promoting health equity on a global scale.

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