

## Environmental Diseases in the Context of Climate Change: A Systematic Review

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### Abstract

**Introduction:** Climate change exerts a significant impact on human life and health globally. As a preeminent global health issue of the 21st century, climate change alters ecosystems, environmental conditions, and disease transmission patterns. These impacts represent a profound challenge to global public health infrastructure. **Objective:** This study aims to systematically review the relationship between climate change and environmentally mediated diseases. **Method:** This research employs the Systematic Literature Review (SLR) approach, adhering to the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines. Data were retrieved from six scientific databases: Google Scholar, PubMed, ScienceDirect, Scopus, Semantic Scholar. **Results and Discussion:** The findings indicate that climate variability including extreme temperatures, high humidity, flooding, drought, and air pollution plays a pivotal role in elevating the risk of various environmentally mediated diseases. The most frequently reported conditions include diarrhea, dengue fever, respiratory tract infections, scabies, cholera, and leptospirosis. **Conclusion:** Integrated climate change mitigation and adaptation strategies are essential. These must be coupled with the strengthening of public health systems, improved sanitation, and the development of community-based disaster preparedness to protect high-risk groups from the health-related consequences of climate change.

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## **Introduction**

Climate Change as a Global Health Imperative Climate change impacts human life and health through diverse and complex pathways (WHO 2025). As a preeminent global health challenge of the 21st century, climate change significantly alters ecosystems and environmental conditions, making it a vital public health concern (Dianati Tilaki et al., 2021). The hazards posed by these shifts are globally recognized as a severe threat to human existence, necessitating an immediate and coordinated response (Asfian et al., 2025).

**Inequality and Vulnerability** The adverse effects of climate change are not distributed equally across the global population. Vulnerable groups including underprivileged and marginalized communities, as well as those lacking adequate access to healthcare services are disproportionately affected (Golden et al., 2025). This environmental injustice exacerbates existing health disparities, particularly in regions with limited infrastructure.

**Meteorological Drivers and Disease Prevalence** Global climate shifts have led to substantial changes in the distribution and prevalence of infectious diseases, particularly in tropical and subtropical regions. These changes are driven by variations in precipitation patterns, humidity levels, temperature extremes (both heat and cold), wind speed, and the increasing frequency and intensity of floods (Baharom et al., 2021). Consequently, there is a rising trend in climate-sensitive injuries, illnesses, and mortality rates (Ebi & Hess, 2020). While natural cycles play a role, contemporary scientific evidence underscores that human activities are the primary drivers of modern climate change (Fakana, 2020). Despite long-standing consensus on its long-term impacts on human, animal, and environmental health, skepticism regarding the severity of climate change persists in various parts of the world (Matlack et al., 2024). **Environmental Transmission Pathways** Climate change accelerates the proliferation of various diseases through several key pathways:

1. **Vector-borne Diseases:** Environmental shifts facilitate the availability of pathogens and vectors, enhancing transmission cycles between humans and the environment (Semenza & Suk, 2018).
2. **Water-borne Diseases:** The degradation of environmental quality and water safety due to climatic shifts has made water-borne illnesses increasingly prevalent (Jung et al., 2023).
3. **Food-borne Pathogens:** Accelerated microbial growth linked to rising temperatures increases the risks associated with food-borne infections (Awad et al., 2024).

**Air Quality and Respiratory Health:** Ambient air pollution remains a critical environmental hazard. Meteorological changes can exacerbate poor air quality by altering the toxicity, composition, and dispersion of pollutants (Andersen et al., 2023). **Specific Health Impacts and Clinical Evidence** The synergy between climate change and air pollution triggers respiratory allergies through complex processes, such as the direct impact of extreme weather on the respiratory system. Droughts, in particular, significantly compromise respiratory health. Clinical data indicates that children aged 4 to 7 are particularly susceptible to fluctuations in temperature and wind speed, showing higher hospitalization rates compared to other age groups (Deng et al., 2020) ; (Gwon et al., 2023) ; (Wenfang et al., 2020).

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Furthermore, leptospirosis remains prevalent in tropical and subtropical rural and urban areas, with evidence strongly linking outbreaks to climate-induced heavy rainfall and flooding (Dhewantara et al., 2022). Vector-Borne and Water-Borne Pathogens Dengue fever, a significant arboviral infection transmitted by mosquitoes, is highly sensitive to climatic variables. Factors such as temperature, humidity, wind speed, and precipitation levels directly influence transmission dynamics. Anthropogenic climate change is altering these variables, which is projected to further increase the global prevalence of dengue (Fernando & Nayani Umesha Rajapaksha, 2023). Similarly, cholera incidence shows a strong positive correlation with both extreme precipitation (high and low) and temperature fluctuations (minimum and maximum). This underscores how climatic shifts facilitate the spread of infectious diseases via food, water, and biological vectors (Ebi & Hess, 2020).

Pediatric Morbidity and Environmental Factors Diarrheal diseases remain a leading cause of morbidity and mortality among children in Low- and Middle-Income Countries (LMICs). The risk of transmission is significantly exacerbated by climate change factors, particularly rising temperatures and altered rainfall patterns (Geremew et al., 2024). Furthermore, cases of infectious diarrhea show a marked increase during periods of high relative humidity, with varying degrees of susceptibility depending on the child's age and geographic location (Dhewantara et al., 2022).

Parasitic Infections and Meteorological Correlations Scabies, a parasitic skin infestation caused by the mite *Sarcoptes scabiei* var. *hominis*, primarily spreads through human-to-human contact. While outbreaks are common in congregate settings such as nursing homes, hospitals, and military facilities, national population-based studies have identified a distinct environmental link: scabies incidence is negatively correlated with average temperature but positively correlated with relative humidity (Liu et al., 2016).

Social Determinants of Health and Inequality The impacts of climate change are not experienced uniformly. Children from low-income, underprivileged families and those from marginalized or indigenous communities face higher health risks (Arpin et al., 2021). These multifaceted inequalities are intensified by climate change, worsening the public health outcomes for vulnerable populations (Khine & Langkulsen, 2023). Consequently, health hazards are escalating disproportionately; the socioeconomically disadvantaged including women, children, the elderly, refugees, and individuals with pre-existing medical conditions bear the heaviest burden of the climate crisis (World Economic Forum, 2025).

### **Methods**

This study employs a Systematic Literature Review (SLR) approach following the PRISMA guidelines. A comprehensive search was conducted across six major databases Google Scholar, PubMed, ScienceDirect, Scopus, Semantic Scholar, and Taylor & Francis using the keywords "climate change" and "environmentally based diseases." The search was restricted to peer-reviewed articles published within the last decade (2015–2025) to ensure the inclusion of contemporary and relevant evidence. From the 60 initially identified articles, studies were selected based on a structured PICO framework, focusing on public health mitigation, adaptation strategies, and evidence-based findings regarding climate-sensitive diseases. The inclusion criteria prioritized systematic reviews and original research that logically align with environmental health themes. This rigorous

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screening process ensured that only the most high-quality and pertinent studies were synthesized in the final analysis

**Inclusive and Exclusive Criteria**

The population studied is: the title is systematic; intervention refers to public health mitigation and adaptation; comparative refers to intervention approaches; outcomes are findings from previous research that adhere to a logical theme; the study design is a systematic review.

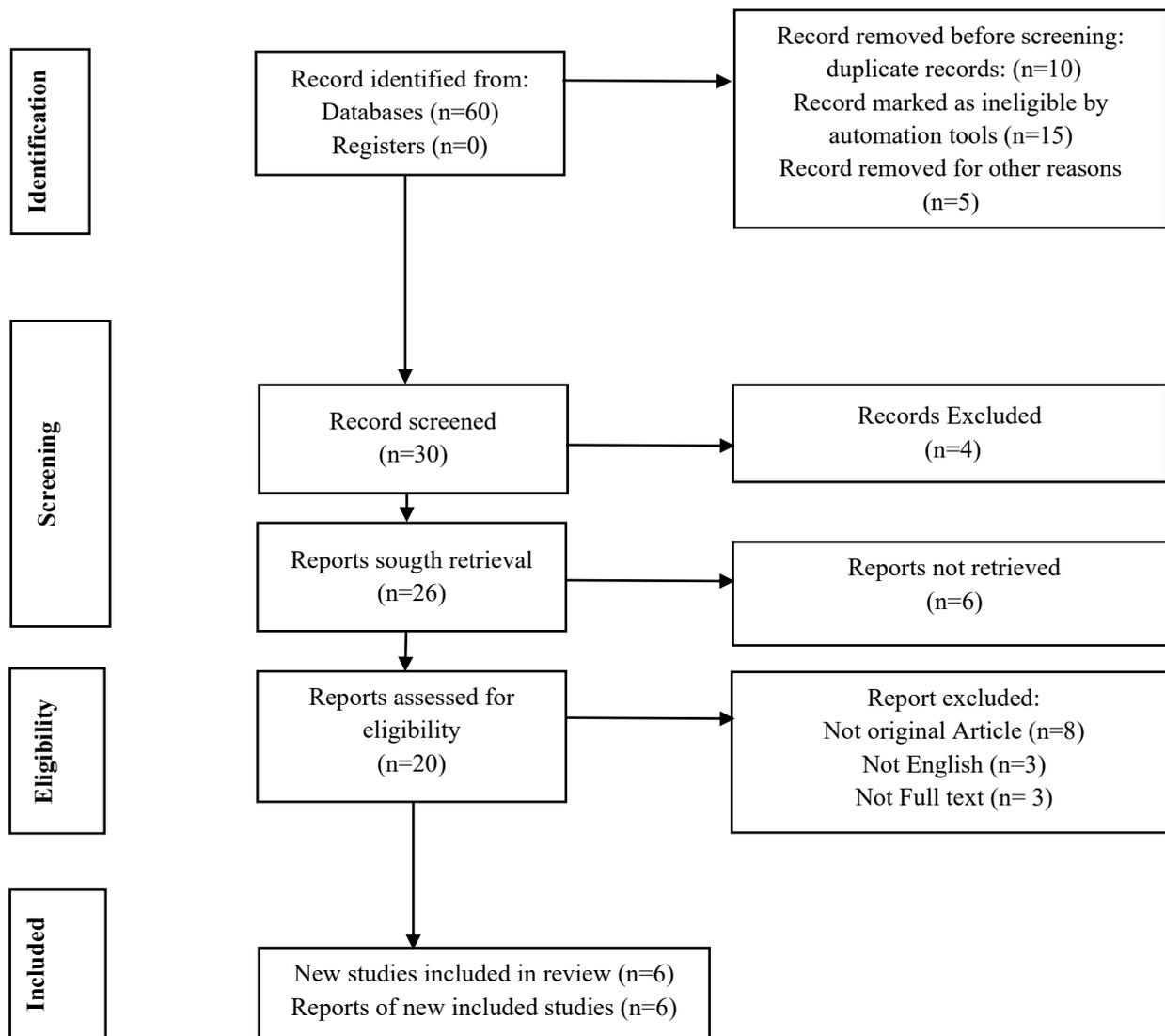
**Table 1**  
Inclusion and Exclusion Criteria

<b>Criterion</b>	<b>Inclusion Criteria</b>	<b>Exclusion Criteria</b>
<b>Population</b>	Human populations in tropical/subtropical regions experiencing climate-related disasters linked to environmentally mediated diseases.	Animal populations (e.g., rodents or insect vectors) studied without direct correlation to human health impacts.
<b>Environmental Diseases</b>	Acute Respiratory Infections (ARI), leptospirosis, dengue, cholera, scabies, and diarrhea.	Non-environmentally mediated diseases or conditions unrelated to climatic factors.
<b>Outcomes</b>	Research focusing on the occurrence and prevalence of environmental diseases driven by climate change.	Laboratory-based or animal studies with no applicable findings for human population health.
<b>Study Design</b>	Open Access research articles and all peer-reviewed publication types.	Non-open access articles, unpublished manuscripts, and grey literature.
<b>Publication Year</b>	2015 – 2025	Prior to 2014
<b>Language</b>	English	Languages other than English

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**Article Extraction Process**

PRISMA was used in the data extraction process to methodically select and extract articles from the literature review through identification, screening, eligibility, and inclusion, then proceed to the next phase.



Source: Researcher

**Figure 1.** PRISMA Analysis Diagram, Climate Change on Environmentally Based Diseases

After going through the identification, screening, eligibility, and inclusion stages of the PRISMA (Preferred Reporting Items for Systematic Reviews and MetaAnalyses) method process, 6 articles were used to proceed to the article discussion stage.

**Research Relevance**

Research review, which includes database-based searches of papers to improve the quality of output, is a systematic process of collecting, evaluating, integrating, and

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presenting data from multiple studies on a specific research topic to generate a more comprehensive and accurate understanding.

**Study Quality**

Using Google Scholar, PubMed, Science Direct, Scopus, Semantic Scholar, and Taylor & Francis databases, 60 English-language scientific publications from 2014 to 2025 were collected. To ensure the retrieved articles met the inclusion and exclusion requirements, they were screened. Following the screening procedure, additional analysis was conducted using the PRISMA flowchart.

**Analysis Methodology**

A review of articles meeting the inclusion criteria (2015–2025) was conducted to draw conclusions.

**Article Data Extraction**

The final results will proceed to the data extraction stage in the table below for methodological analysis of the articles after completing the meta-analysis stage using PRISMA.

**Table 2**  
Data Extraction

No.	Author (Year)	Topic/Study Title	Key Outcomes & Effect Estimates
1.	Wibawa (2023)	Effects of Ambient Temperature, Humidity, and Precipitation on Diarrhea in Surabaya, Indonesia.	Extreme temperatures (high/low) were associated with increased diarrhea risk (RR=5.39; 95% CI: 4.61–6.17). Low humidity (RR=2.13) and extreme precipitation (RR=3.05) also significantly elevated risk at 0–1-month lags.
2.	Xu et al. (2024)	Long-term effects of climate factors on dengue fever over 40 years.	Climate variability significantly influenced dengue incidence and extended the transmission season length, with observed lag effects of 1.5–3.5 months.
3.	Li et al. (2023)	Interactive effects between drought and air pollutants on pediatric Upper Respiratory Tract Infection (URTI).	Time-series analysis confirmed a significant interactive effect between drought conditions and air pollutants (PM, etc.) on increased pediatric URTI outpatient visits.
4.	Rahman et al. (2024)	Prevalence of scabies and associated environmental risk factors in Cox’s Bazar, Bangladesh.	Scabies prevalence was significantly linked to the winter season (OR=3.33; 95% CI: 1.89–5.87) and contact with street animals (OR=2.16). Family history and prior skin infections were primary predictors.
5.	Asadgol et al. (2019)	The effect of climate change on cholera disease: Projections using artificial neural networks.	Established a significant positive relationship between temperature/rainfall fluctuations and cholera incidence, validated through predictive modeling.
6.	Dhewantara et al. (2020)	Effect of climate change on the geographical distribution of leptospirosis risk in Western Java, Indonesia.	Annual mean temperature and precipitation (specifically during the wettest quarter) were identified as the most significant drivers of leptospirosis emergence and spatial distribution.

### **Results and Discussion**

Climate change has become a major determinant of the dynamics of environmentally-based diseases in various parts of the world. A study of six disease groups: diarrhea, dengue fever, respiratory tract infections (ARI), scabies, cholera, and leptospirosis showed that changing meteorological patterns (extreme temperatures, high rainfall, drought) significantly influence the spread, intensity, and duration of these diseases. This cross-country and time-series analysis shows that the most vulnerable groups are children, the elderly, and low-income communities living in densely populated areas with poor sanitation.

#### **The Effect of Climate Change on Diarrheal Diseases**

Based on the results of a synthesis of three studies (Wibawa et al., 2023); (Geremew et al., 2024); (P. Wang et al., 2022), climate change has been shown to directly contribute to the increase in diarrhea cases, particularly in areas with poor sanitation. (Wibawa et al., 2023) found that extreme temperatures and high rainfall in Surabaya increased the risk of diarrhea by up to threefold, especially in densely populated areas prone to flooding. Geremew et al. (2024) conducted a meta-analysis showing a similar pattern across various developing countries: increasing temperatures and extreme rainfall correlated with a surge in diarrhea cases in children, particularly in areas without drainage systems and clean water.

Meanwhile, Wang et al. (2022) confirmed that prolonged drought increases the risk of diarrhea in children under five by 5–8% in lower-middle-income countries due to limited access to clean water and increased use of contaminated surface water. Thus, climate change influences through two main mechanisms:

- 1) Direct impacts extreme temperatures and flooding accelerate the spread of pathogens through contaminated drinking water and food.
- 2) Indirect impacts drought reduces clean water supplies and increases risky behaviors (e.g., conserving water for hygiene).

The populations most vulnerable to these impacts are children and low-income communities in dense urban areas and rural areas without adequate WASH infrastructure.

#### **The Effect of Climate Change on Dengue Fever**

Three major studies (Xu et al., 2024), (Y. Wang et al., 2022), and (Sugeno et al., 2023) show that climate change modifies dengue transmission patterns at various time scales. A long-term study by Xu et al. (2024) identified shifts in the transmission season and increased lag effects due to changes in temperature and rainfall patterns over four decades. (Y. Wang et al., 2022) examined the effects of short-term extreme weather in 35 Asian cities and found that heat waves and heavy rainfall significantly increased dengue infections in the same week or the following week.

(Sugeno et al., 2023) in Laos used a Distributed Lag Nonlinear Model (DLNM) to confirm that high temperature and moderate humidity are the optimal combination for the growth of the *Aedes aegypti* vector. Conceptually, climate change affects dengue through three pathways:

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- 1) Lengthening of the transmission season due to increasing global average temperatures.
- 2) Increased extreme events (floods and heat) that accelerate the vector life cycle.
- 3) Nonlinear interactions between temperature and rainfall that increase cumulative risk.

Densely populated tropical regions with poor drainage and weak health systems are the most vulnerable. This increased risk suggests that climate change is not only increasing cases but also expanding dengue endemic areas.

### **Impact of Drought on Respiratory Diseases**

Three studies (Li et al., 2023) in China, (Gwon et al., 2023) in the United States, and (Machado-Silva et al., 2020) in the Amazon consistently show that drought is a significant driver of increased respiratory disease. Li et al. found that the combination of drought and air pollution in Gansu sharply increased cases of acute respiratory infections (ARI) in children. Gwon et al. showed that mortality from respiratory diseases increased by up to 15.9% in the US Upper Midwest during severe drought. Machado-Silva et al. added evidence from the Amazon that drought exacerbates wildfires, increases smoke exposure, and leads to a surge in hospitalizations, especially among the elderly. The mechanism of this relationship can be explained as follows:

- 1) Drought reduces air humidity and increases particulate matter and pollutants (PM<sub>2.5</sub>).
- 2) The combination of drought and pollution causes a synergistic effect that exacerbates respiratory disorders.
- 3) More frequent forest fires during drought increase long-term smoke exposure.

Vulnerable populations include children, the elderly, and communities in areas with high pollution and limited health infrastructure. Climate change, through intensified drought, has been shown to significantly increase morbidity and mortality from respiratory diseases.

### **The Relationship Between Climate Change and Scabies**

Studies in Bangladesh (Rahman et al., 2024), Nigeria (Umegbolu, 2021), and Taiwan (Liu et al., 2016) show that scabies incidence increases due to interconnected social and climatic factors. In Cox's Bazar, Bangladesh, prevalence reached 66.42%, with a significant increase in winter (OR 3.33). Dominant factors included refugee overcrowding, poor sanitation, and relocation due to climate disasters. In Nigeria, a 16-fold increase in cases from 2016–2019 was linked to population migration due to socioeconomic and environmental pressures. Meanwhile, in Taiwan, a 14-year national analysis demonstrated a quantitative relationship between climate factors and scabies incidence: high temperature decreased the risk ( $\gamma = -0.152$ ;  $p < 0.001$ ), while high humidity increased the risk ( $\gamma = 0.192$ ;  $p < 0.001$ ). Climate change has an impact:

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- 1) Directly, through fluctuations in temperature and humidity that affect the survival of the scabies-causing mites.
- 2) Indirectly, through displacement, poverty, and reduced sanitation due to climate disasters.
- 3) The most vulnerable groups are children, low-income communities, and refugees living in crowded environments with limited WASH facilities.

### **Climate Change and Cholera**

Two major publications (studies in Qom, Iran, and in Ifakara, Tanzania) confirm that climate change has a direct impact on cholera transmission dynamics. In Iran, Artificial Neural Network (ANN)-based research shows that rising temperatures and rainfall variability increase the replication of *Vibrio cholerae* and increase the potential for future outbreaks (2050 projections, RCP2.6–RCP8.5 scenarios). Meanwhile, in Tanzania, environmental and social conditions such as limited access to clean water, river bathing practices, and poor sanitation increase the risk of infection during periods of extreme rainfall and drought. Both studies confirmed that high temperatures and extreme rainfall create ideal conditions for bacterial persistence in water, while flooding contaminates drinking water sources.

Rural populations with low socioeconomic status are the most vulnerable. Thus, climate change amplifies existing socioeconomic factors, increasing the risk and severity of cholera outbreaks.

### **Climate Impact on Leptospirosis**

Three studies (Dhewantara et al., 2022); (Chadsuthi et al., 2021); and (Cunha et al., 2022) confirmed that climate change contributes to an increased risk of leptospirosis in tropical regions. Modeling in West Java showed that changes in rainfall and temperature patterns expanded the risk area, particularly in lowlands and coastal areas. In Thailand, heavy flooding increased human contact with contaminated water, while in Brazil (Cunha et al., 2022), a 20 mm fluctuation in weekly rainfall increased the risk of leptospirosis by 12% after a 1–2-week interval. The main mechanisms include:

- 1) Increased habitat for *Leptospira* bacteria due to flooding and stagnant water.
- 2) Increased human exposure through activities in polluted environments.
- 3) Geographical shifts in risk areas, from certain areas to previously non-endemic areas.

The most vulnerable populations are farmers, field laborers, and coastal communities with poor drainage systems. Climate change not only increases the number of cases but also expands the areas of disease transmission.

### **General Synthesis and Public Health Implications**

Based on the six disease groups studied, it can be concluded that climate change systemically increases the risk of environmentally-based diseases through meteorological, ecological, and social mechanisms. Extreme temperatures, erratic rainfall, and prolonged droughts have been shown to influence the dynamics of infectious diseases such as diarrhea, dengue, cholera, leptospirosis, scabies, and acute respiratory infections (ARI).

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In addition to direct effects on disease agents or vectors, climate change also exacerbates socioeconomic factors (poverty, migration, and lack of clean water), which increase population vulnerability.

#### **Conclusion**

Based on this literature review, it appears that the patterns and incidence of environmentally-based diseases such as cholera, leptospirosis, respiratory infections, scabies, diarrhea, and dengue fever are significantly affected by climate change. Extreme weather conditions, such as high temperatures, rainfall, humidity, flooding, air pollution, drought, and wind speed, can extend the transmission season, increase the likelihood of unexpected outbreaks, and increase the overall disease burden. Tropical and subtropical locations, densely populated areas, areas with inadequate sanitation, and those without access to clean water and medical care are among the most vulnerable. These impacts are exacerbated by human activities and social inequities, therefore, climate change mitigation and strengthening public health systems are necessary to protect vulnerable populations.

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