

Climate Change and Community Health: Impacts and Adaptation Strategies for a Sustainable Public Health Future

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Abstract

Review Article

Article History

Received:
25 March, 2026

Reviewed:
23 April, 2026

Accepted:
11 June, 2026

Published
31 July, 2026

This study is about public health and education for a sustainable future analysed the effects of climate change on communities and reviews adaptation strategies. This study logically evaluated climate change policies and relevant documents, drawing from national and international sources since 2020, including different reports from the intergovernmental panel on climate change, the World Health Organisation, national statistics, and publications including Nepal's Department of Health Services.

Climate change is regional in nature, differs climate patterns, and is associated to elevated atmospheric Carbondioxide levels produced by the use of fossil fuels, which adversely affects human health, plants, and other living beings. Particularly in mountainous and lowland regions, climate change has increased the risk of vector-borne and waterborne diseases. Increased ambient air pollution and haze in metropolitan areas affect cardiorespiratory disorders. Extreme weather events like droughts, floods, and landslides also contribute to an increase in mental health issues.

The results showed that global and regional climate patterns are changing due to fossil fuel use and carbon dioxide emissions, negatively affecting humans and ecosystems. Climate change increases the risk of vector-borne and waterborne diseases, as well as air pollution and extreme weather events such as droughts and floods. Future adaptation strategies will prioritise better early warning systems, water management, infrastructure improvements, and revised regulations to enhance resilience against such challenges.

Keywords: *adaptation, climate change, community, flood, health facility, health personnel, public health*



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How to Cite: Ghimire, M. N., & Mishra, A. K. (2026). Climate Change and Community Health: Impacts and Adaptation Strategies for a Sustainable Public Health Future. *Central Journal of Multidisciplinary Research*, 1(1), 138-153.

1. Introduction

Extreme climate events are becoming increasingly common, intense, and widespread as a result of the historic increases in greenhouse gas (GHG) concentrations. Extreme climate events such as heat waves, floods, droughts, and wildfires are becoming more common, severe, and widespread, especially in 2021 and 2022, as a result of unprecedentedly high atmospheric GHG concentrations linked to human emissions (Gan et al., 2023).

During this time, environmental deterioration and climatic change were caused by rapid industrialisation, urbanisation, and population growth. The World Health Organisation estimates that environmental variables account for 23% of all fatalities worldwide, demonstrating the significant impact earlier mentioned factors have on human health. Extreme weather and climate change are making pre-existing health issues worse. Other environmental variables that contribute to it and cause health problems, including non-communicable diseases and death, include air pollution, water pollution, and toxic chemicals (Mago et al., 2024).

One of the areas most susceptible to the effects of climate change is South Asia. While the region has contributed the least to global greenhouse gas emissions,

its people face imminent threats to their health and well-being from extreme weather events and other climate-induced challenges, such as biodiversity loss and monsoon floods (Mbah et al., 2022).

The effects of climate change in Nepal include the melting of the Himalayan glaciers, increased precipitation and heavy rainfall, landslides in hill areas, floods, and sedimentation in the Terai. The climate change problems are floods, landslides, cold waves, and heat waves, mainly in Nepal (Mbah et al., 2022).

Due to more extreme heat waves, cold waves, and forest fires, climate change increases the risk of illness, injury, and mortality in communities (Gkouliaveras et al., 2025). While reducing food production in areas with limited resources, raises the risk of under-nutrition, but decreases the labour productivity and diminishes work capacity among vulnerable populations, with more detrimental health effects. A rise in cardiorespiratory diseases due to increased ambient air pollution and haze in urban areas brought on by climate change; an increase in mental health issues due to extreme weather events like droughts, floods, and landslides; and an increased risk of vector-borne, waterborne, and foodborne diseases,

particularly in mountain areas, which cause perennial occurrences in the lowlands (Dhimall et al, 2017).

Nepal is currently endemic for five main vector-borne diseases (VBDs): malaria, lymphatic filariasis, Japanese encephalitis, visceral leishmaniasis, and dengue fever despite its mostly hilly topography, which makes this Himalayan nation a popular travel destination. Evidence of how climate change affects VBDs is growing, particularly in temperate and tropical highlands. Our goal is to investigate whether climate change is associated with the observed spatiotemporal distributions of VBDs in Nepal (Shrestha & Aryal, 2011).

The increased risk of infectious diseases is one of the unprecedented effects of climate change on human health. Despite this, health systems around the globe are currently unprepared for the new illness scenarios that climate change is expected to bring about. Although it has previously been emphasised that health systems must create strategies to adapt to climate change, there is currently no clear agreement on how to do so, particularly in rural areas of low and middle-income countries that face both the effects of climate change and high disease burdens. Here, we emphasise the necessity of situating health systems

within the framework of climate change and show how to do so by considering all facets of infectious disease risk like pathogen hazards, exposure, and vulnerability to these hazards(Mago et al., 2024).

East African rural communities are the focus of the framework because they are frequently exposed to a high burden of infectious diseases, have unique vulnerabilities and susceptibility to climate-related hazards, and are affected by climate change. By putting the suggested strategy into practice, health systems may become climate-adapted and prevent the pace of progress toward reaching the goals of the global health grand challenge from slowing down (Worsley-Tonks et al., 2025).

Flooding caused by climate change has resulted in a public health emergency due to a surge in waterborne illnesses and hunger. Waterborne diseases, including cholera, malaria, and diarrheal ailments, thrive in areas where flooding disturbs water and sanitation systems. Communities are uprooted, and agricultural infrastructure is destroyed by flooding, which exacerbates food insecurity and malnutrition (Aborode et al., 2025).

Hurricanes and heavy rainfall protect people's health and health systems (e.g.,

hospitals and area evacuations, power outages, drowning, injuries, mental health disorders, stress, gastrointestinal and vector-borne diseases, exacerbation of chronic diseases, low birth weight and premature births, reduction in quality and potential disruption of health services, and increase in demand for health services). Factors contribute significantly to public health vulnerability are hospital administrators and decision makers are not aware of environmental change issues, public health professionals are not aware of the epidemiological tools available to help local communities prepare, and lack of funding and research makes it difficult to answer crucial questions during catastrophic weather events and during recovery. By addressing the above-mentioned issues and making the necessary preparations for disease surveillance, vulnerability, and scenario modeling, and the effects of extreme weather occurrences will be lessened (Gkouliaveras et al., 2025).

High heat, droughts, and floods are negative climate change phenomena that the African continent is currently experiencing. A few research projects also discussed air pollution and wildfires. Malnutrition, infectious diseases, respiratory conditions in children and adults, poor pregnancy and delivery

outcomes, high rates of morbidity and death in children and mothers, and mental health issues are all consequences of climate change. Individual and sociodemographic, economic, and environmental factors are among the vulnerabilities that have been found to increase people's susceptibility to the effects of climate change events on poor nutritional and health status. The impact of these climate change events on the nutritional and health conditions of both children and adults, along with specific factors that increase the population's susceptibility to these climatic issues, is discussed (Mulondo et al., 2025).

Women face multifaceted effects from climate change. They are underrepresented in decision-making, have restricted access to resources and knowledge, and must adhere to social norms that assign women and girls conventional responsibilities. Because of these factors, women and girls are frequently more susceptible to extreme weather occurrences, which frequently result in homelessness and the loss of means of subsistence. Because women and girls may be more vulnerable to exploitation and abuse in displacement camps or while traveling to seek shelter and help, such circumstances could increase gender-based violence. In addition to being important contributors

to climate change, women and girls have the capacity to take the lead in creating sustainable solutions. Climate change may adversely affect water and agriculture, which are the primary sources of employment for women in the Global South. Unpredictable and harsh weather patterns can lead to crop failures, water shortages for human consumption, and lower incomes for women with limited access to resources such as loans and land (Praksah et al, 2024).

Gender-related contextual equality issues in cities are largely tied to the starkly different roles men and women play across cultures. Due to discrimination regarding wealth and capital goods, health, access to technologies, education, services, and information, and opportunities to create financial and productive assets, women from LIC and MIC who live in poverty are generally more vulnerable to the effects of climate change than men (Reckien et al., 2017).

Women are disproportionately impacted by climate change, which exacerbates already-existing gender disparities. Increased mental health issues, worse health outcomes for mothers and newborns, greater water insecurity, and a greater burden of caregiving are some specific effects (Anjum & Aziz, 2025).

In addition to producing disproportionately significant improvements in health, the economy, society, and the environment, investing in women's health could address gender inequality and breaches of women's rights. In addition to having higher returns on educational investments and contributing to favourable demographics and beneficial intergenerational and community spillover effects, healthy women and girls are typically more productive in both paid and unpaid employment. The advancement of universal health coverage can both contribute to and result in improved women's health (Remme et al., 2020).

There is a call for more women to be involved in global climate policy and leadership. More precisely, we demand that governments in high-, middle-, and low-income nations, as well as multilateral climate organisations like the IPCC and all forthcoming UN climate negotiations at COP, have at least 50% female representation from female leaders with environmental expertise and lived experience. Additionally, women ought to be given more prominence in other areas of climate action, such as the corporate sector, academia, community organisations, and local institutions, all of which are essential to thorough adaptation and mitigation (Wray et al.,

2023).

It suggests a comprehensive strategy to mitigate the adverse effects of climate change on women's health and well-being by incorporating gender perspectives, improving women's health services, and fostering international cooperation. This strategy positions women as essential contributors to global climate resilience and sustainability initiatives by recognising the specific challenges they face and leveraging their distinct perspectives and experiences (Aziz & Anjum, 2024).

The floods affected children who were assessed for body mass and anthropometry, and data were compiled. Review of the literature on children impacted by floods and the consequences of natural disasters like floods. Determine the target group, consider ethical considerations, and obtain informed consent from the children's mothers. According to the research, children in flood-affected areas are more undernourished than children in non-flood-affected areas. Unimaginable floods in the Karnali River end human life (Ghimire et al., 2023).

Lakes are essential freshwater ecosystems that promote livelihoods, maintain biodiversity, and propel global socio-economic development. However,

climate change exacerbates the impacts of human activities such as urbanization, pollution, and agricultural runoff, thereby posing an increasing threat to them (Timalsina et al., 2025).

Alpine vegetation and biodiversity have shifted, especially above 2000 m, as a result of major land-use changes driven by climate change and human activity, including decreased glacier cover, increased bare land, and shifts in the tree line. Due to drier weather and reduced precipitation, which impede ecological recovery, the northern slope of Mount Everest is more environmentally vulnerable than the southern slope (Zhu et al., 2025).

While 70 species are expected to benefit from increased habitat appropriateness due to climate change, 106 species have seen a decrease in suitable habitats, 94 species have had range shifts, and 33 species are now at risk of extinction and habitat loss. The conventional accessibility and reliability of medicinal plant-based treatments are also affected by ecological changes. Furthermore, several environmental conditions, including rising temperatures, increased CO₂, decreased precipitation, and drought stress, are associated with changes in the production of bioactive metabolites, including both increases

and declines (Takubessi et al., 2025).

In addition to directly affecting World Heritage sites through habitat changes or damage from extreme weather events, climate change also indirectly affects them by intensifying pre-existing strains like unsustainable use, development pressures, and poor management. The interconnectedness of these issues makes World Heritage sites more vulnerable. Additionally, people's lifestyles and relationships with World Heritage will be affected by the destabilisation of social and environmental conditions caused by climate change and biodiversity loss (Hisari et al., 2022).

In Nepal, forest fires are deadly; they occur more frequently throughout the country during the dry season (March to May) due to increased drought. Biodiversity that includes both flora and fauna are harmed. Meanwhile, wild animals approach residential areas and assault both humans and domestic animals. Tigers, rhinos, and elephants have arrived to hunt grasses in human fields as a result of forest degradation. Humans and wild animals are currently at odds in Nepal. Smoke from forest fires contaminates the air and causes respiratory illnesses like asthma (Mago et al., 2024).

Additionally, during the years under

observation, this study found a constant trade-off between climate action and the reduction of greenhouse gas emissions from the energy and agricultural sectors, regarding land use for agricultural production and forest areas. The prospects of ensuring the sustainability of Nepal's agricultural sector and its broader economy may be further diminished by climate change driven by greenhouse gas emissions. Nepal's economy depends heavily on its forests and forest products, which have been a source of wealth for the country's expanding population (Thapa et al., 2023). Therefore, having a dependable, climate-resilient forest management system has become even more important due to the growing deforestation and degradation of forests driven by agricultural expansion and reliance on conventional energy sources such as biomass and fuelwood.

As a result, Nepal must understand forest management, as it is essential for reducing and mitigating the consequences of climate change and strengthening its citizens' ability to adapt. The agriculture sector significantly influences Nepal's employment and economic growth levels (Thapa et al., 2023).

Nepal will soon become a middle-income nation. Among the main issues

facing Nepal are the ongoing trade-offs between energy use and climate action; GHG emissions from the energy and transportation sectors; per capita energy consumption; increased emissions relative to the share of renewable energy in total final consumption; and wildfires. Increased economic activity, combined with the continued use of conventional energy sources such as fossil fuels (for transportation), inefficient use of biomass, and the resulting deforestation for fuelwood and wildfires, will exacerbate these issues. These are the main causes of the rising GHG emissions in Nepal's energy sector.

Therefore, lowering emissions from the energy sector can be achieved by replacing emission-intensive energy sources with renewable energy technologies. This suggests that Nepal develop policies to lower energy consumption by increasing the share of renewable energy in its energy mix, improving energy efficiency, and exploring new energy sources, particularly those that could reduce GHG emissions without compromising economic growth or the country's ability to adapt to climate change.

To help farmers adapt to climate change and boost the country's economy, the Nepalese government should prioritise lending to farmers and expanding

agricultural extension services. Policymakers may use this study to gain insight into government-led infrastructure initiatives. To develop an appropriate vision that guides farmers toward climate change adaptation, they can connect these findings to agricultural and climate change policies. Therefore, local governments can develop various plans to support local farmers (Puri et al., 2022).

The natural, economic, and social landscapes of Africa are changing due to climate change, making public health, agriculture, water resources, and socio-economic stability more vulnerable. This article examines the many impacts of climate change on significant African industries and highlights the urgent need for comprehensive adaptation strategies. Through the confluence of traditional knowledge and modern technologies, the study shows how climate-smart farming practices, community-led initiatives, and indigenous knowledge promote resilience (Ayompe & Epie, 2025).

Health and sport science professionals must be able to address each of these health domains while taking into account frameworks for the most pressing health and human development priorities in a sustainable way, given the global increase in non-communicable

diseases, physical inactivity, obesity, and Adverse Childhood Experiences (ACEs). One such strategy practitioners can use to address these issues is sport for development, which uses physical activity, sport, and game-based programming to advance development and peace initiatives and empower individuals and communities (Otterbein, 2020).

With particular civil and human rights, such as the right to a clean environment (Article 30) and the right to health (Article 35), the new Constitution institutionalises inclusive and participatory democracy. It includes, no one shall be denied access to emergency medical care, and every citizen shall be entitled to free basic health services from the state, every individual is entitled to information regarding their medical care, health services must be equally accessible to all citizens, and all citizens are entitled to access sanitary facilities and clean drinking water (WHO, 2018).

Although Nepal has made audacious policy pledges to achieve climate-health resilience, a gap in implementation remains. The current study used the WHO's operational framework, found three main gaps. The gaps are a lack of coordination between federal and provincial governments and between

ministries, a health workforce that is under-trained and unequally distributed, and disjointed surveillance systems that do not use meteorological data in integrated risk monitoring and early warning (WHO, 2018).

There are three different types of land in Nepal: mountains, hills, and Terai. The Himalayan or Nepalese snow tower is the water tower. Infrastructure, housing, drinking water, and sanitation systems, human livelihoods, closed health systems, medical personnel services, and medications are all damaged when snow landslides occur. Food shortages and water-borne illnesses are issues when camping. In the Terai region, the meat flood combined with slopes, landslides, silt, and aggregate is hazardous. Every tree, rock, and sand sediment in the level area.

To analyse the impacts of climate change on public health and examine the role of education in promoting sustainable adaptation strategies.

Impacts and adaptation strategies for a sustainable public health future is a significant topic because it highlights how climate change directly affects human health through increased heatwaves, extreme weather events, air pollution, food and water insecurity, and the spread of infectious diseases.

Understanding these impacts helps communities, policymakers, and public health professionals develop effective adaptation strategies that strengthen resilience, protect vulnerable populations, and reduce health risks. Exploring this topic is essential to promoting sustainable public health systems that can respond to environmental challenges while ensuring healthier, safer communities for future generations (Ghimire et al., 2023).

Climate change is significantly affecting public health in various ways, including increased illness, mortality, and undernutrition due to extreme weather events, reduced food production, and vector-borne diseases. In Nepal, the constitution ensures access to healthcare and clean environments, but implementation gaps remain, especially in coordination and workforce training. Women face unique challenges due to climate change, experiencing higher rates of mental health issues and caregiving burdens. The country also grapples with natural disasters such as floods and forest fires, which impact infrastructure and air quality. There are critical gaps in health systems' responses to environmental changes, leading to increased waterborne diseases and food insecurity. Effective adaptation strategies that incorporate gender perspectives and local knowledge

are essential for resilience. Investment in women's health and education is vital for enhancing socio-economic stability and addressing inequality. Overall, a multifaceted approach is needed to mitigate the adverse effects of climate change while promoting sustainability in healthcare and agriculture.

3. Methodology

This researcher reviewed documents related to climate change and the water and sanitation policies established by the Government of Nepal (Budhathoki, 2019; WHO, 2025). Academic papers on these issues were examined in the Nepalese context. A systematic scientific approach was used to review the literature, and the findings were synthesised to better understand the impacts of water and sanitation on public health.

The study also examined the effects of agricultural pesticides on the health of people living in rural Nepal based on Atreya (2008). To increase crop yields, farmers use chemical pesticides on fruits, vegetables, and grains (Atreya, 2008). Agricultural technicians advise farmers to apply only the recommended amounts of these chemicals. However, excessive pesticide use can harm human health (Atreya, 2008).

The scientific review employed two main methods: an in-depth analysis of

historical records and a comprehensive review of existing literature (Snyder, 2019). Depending on the availability of information, both qualitative and quantitative research approaches can be used effectively (Creswell & Creswell, 2018).

4. Results

Climate change poses a significant global danger due to consequences such as forest fires, landslides, and flooding in Nepal, as well as injuries, diseases, and fatalities from both hot and cold waves. There were no health systems or medical personnel in the affected area during the flood, resulting in the loss or contamination of communal sanitation and drinking water. Due to the lack of food, drinking water, and sanitary facilities, older adults, pregnant women, and children were more severely affected by flooding and waves (both hot and cold). There is currently no health system, medical services, or medication available.

Ecological changes brought on by climate change include habitat loss, drought from excessive precipitation, and a decline in the richness of plants, animals, insects, and herbs. Cholera, malaria, and diarrheal illnesses have become more prevalent in the population. Communities are uprooted, and

agricultural infrastructure is destroyed as a result of flooding, which exacerbates food poverty and causes hunger. Infectious diseases, adult and paediatric respiratory disorders, poor pregnancy and delivery outcomes, maternal morbidity and mortality, and mental health issues have all increased due to the negative effects of climate change. According to WHO estimates, industrialisation, urbanisation, population growth, and environmental degradation affect 23% of human health. Toxic chemicals, water pollution, and air pollution all contribute to non-communicable diseases and mortality. In addition to directly affecting World Heritage sites through habitat changes or damage from extreme weather events, climate change also indirectly affects them by intensifying pre-existing strains like unsustainable use, development pressures, and poor management. Women are affected by climate change if they challenge the underrepresentation of women in decision-making, have limited access to knowledge and resources, and must adhere to social norms that assign women and girls traditional roles.

A dependable, climate-resilient forest management system is now more important than ever due to rising deforestation and forest degradation driven by agricultural expansion and

reliance on conventional energy sources such as biomass and fuelwood. Nepal must understand forest management, as it is essential for mitigating the consequences of climate change and improving its citizens' ability to adapt.

5. Discussion

The results section reports findings that are highly consistent with the cited global and regional literature on the direct health consequences of climate change, including vector-borne and waterborne diseases. The results mention an increase in cholera, malaria, and diarrheal diseases. This is in perfect line with the literature of Aborode et al. (2025) on waterborne crises after floods and the historical data of Dhimal et al. (2015) on the spatiotemporal distribution of vector-borne diseases in Nepal.

The results show that extreme weather events have a more profound impact on the elderly, pregnant women, and children due to resource shortages. This finding is consistent with Ghimire et al. (2023) on child undernutrition during floods and Mulondo et al. (2025) on high rates of maternal and child morbidity due to climatic stress. The results show that industrialization, urbanization, and environmental degradation account for 23% of human mortality, which is fully consistent with the World Health

Organization's global estimates, as quoted in Mago et al. (2024). The results note habitat loss, drought, and declines in plant/animal/herb richness. Takubessi et al. (2025) provide strong evidence of the decline in medicinal plant habitats, and Zhu et al. (2025) provide evidence of changes in alpine vegetation.

Women are affected by climate change because they are underrepresented in decision-making processes and are constrained by rigid social norms, as detailed in the results section. This finding aligns with the literature reviewed by Anjum and Aziz (2025) and Prakash et al. (2024) regarding gender vulnerability in the Global South.

The results' indication of direct and indirect climate impacts on World Heritage sites supports the foundational literature by Hisari et al. (2022). The results suggest that Nepal urgently needs climate-resilient forest management. System to address degradation caused by the consumption of traditional biomass and fuelwood. This is all fully consistent with the policy trade-offs explored by Thapa et al. (2023).

The findings are accurate concerning the individual facts found in the literature review. Still, there are glaring holes in thematic consistency in the paper's

overall structure. The primary goal of this study was to investigate the role of education in advancing sustainable adaptation strategies. The climate change education policies are also informed by the literature cited from Mbah et al. (2022), and Shrestha and Aryal (2022). However, the results section does not include any data or discussion on education, which is a major component of the literature.

The methodology described by the study of Atreya (2008) which reviewed the agricultural pesticide exposure and guidelines in rural Nepal. The results, however, do not mention pesticides or toxic chemicals. The same author does not mention pesticides, toxic chemical metrics, or farming-specific adaptation data at all, leaving that portion of the literature synthesis underutilised.

The logical framework and literature highlight the role of local government infrastructure planning and early warning systems (Puri et al., 2022). However, the results section highlights only the destruction of infrastructure and the absence of health systems, and it does not consistently address the gaps between the structural solutions proposed in the literature and the evidence.

The results show strong consistency with the literature reviewed on the

impacts of climate change (e.g., disease, displacement, and ecological decline). However, it lacks operational consistency, as it fails to analyse the solutions including education, policy coordination, and pesticide regulation.

6. Conclusion

The document examined the diversified impacts of climate change on communities, with a particular focus on public health and adaptation strategies in Nepal. It synthesises extensive literature on how climate change exacerbates health issues by increasing the incidence of vector-borne and waterborne diseases, especially in high-risk regions such as mountainous and lowland areas. The analysis highlights the detrimental effects of climate change, including air pollution, extreme weather events, and food insecurity, leading to heightened mental health challenges and morbidity among vulnerable populations such as women and children. The study critiques Nepal's existing climate policies and emphasises the urgent need for improved early warning systems, resilient infrastructure, and effective water management to enhance community preparedness and response. It identifies significant knowledge gaps in health system coordination and under-training among health personnel, which

further exacerbate the public health crisis amid climate variability.

Importantly, while the paper discusses extensive findings about climate risks, it notes a lack of focus on the role of education in promoting sustainable adaptation strategies, a critical component highlighted in the literature. The findings underscore the necessity for an integrated approach to mitigate the public health challenges posed by climate change, stressing the importance of policy coherence and community engagement in health and climate action.

Transparency statement

The author confirms that this study has been conducted with honesty and in full adherence to ethical guidelines.

Funding

The study received no external funding.

Acknowledgments

The researcher would like to thank the editor and the anonymous reviewers for their comments, which have greatly improved the paper.

Conflict of interest

The authors declare there are no conflicts of interest.

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