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Review

# Climate Change and the Global Public Health Emergency: Advancing SDG 3 in Light of COP30

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## Highlights

### What are the main findings?

- Climate change is undermining progress across multiple SDG 3 targets through heat stress, infectious disease expansion, food and water insecurity, displacement, and health system disruption.
- COP30 and the Belém Health Action Plan signal a stronger integration of health into climate governance, but implementation remains constrained by weak accountability and financing gaps.
- **What are the implications of the main findings?**
- Achieving SDG 3 now requires climate adaptation and mitigation to be embedded within health policy and health system planning.
- Equity-driven and climate-resilient health systems should become a central priority in global and national climate action.

## Abstract

Climate change represents the defining global health challenge of the 21st century, with far-reaching implications for population health, health systems, and health equity. The acceleration of environmental change, evidenced by record-breaking global temperatures, extreme weather events, and ecological degradation, poses a direct threat to achieving Sustainable Development Goal 3 (SDG 3), which aims to ensure healthy lives and promote well-being for all. This manuscript examines the intersection of climate change and global public health in light of the outcomes of the 2025 United Nations Climate Change Conference (COP30) in Belém, Brazil. Drawing on recent global reports and emerging evidence, we explore how climate change exacerbates communicable and non-communicable diseases, undermines health system resilience, and disproportionately affects vulnerable populations worldwide. Particular attention is given to heat-related morbidity, infectious disease expansion, air pollution, food and water insecurity, displacement, gender inequities, antimicrobial resistance, and mental health impacts. The paper highlights the significance of the Belém Health Action Plan (BHAP), which places health more centrally within climate policy. However, major challenges remain, including voluntary implementation, financing gaps, and insufficient accountability mechanisms. We argue that achieving SDG 3 is no longer feasible without integrating climate adaptation and mitigation into health systems and policies.

**Keywords:** climate change; public health; SDG 3; COP30; health systems; climate justice; global health; environmental health

## 1. Introduction

The World Meteorological Organization confirms that global temperatures in 2024 exceeded 1.55 °C above pre-industrial averages, the first calendar year on record to cross that threshold [1]. The implications run well beyond the climate system. Heat exposure, extreme weather, biodiversity loss, and ecological degradation are now producing measurable, distributed effects on population health, and the trajectory points to acceleration rather than stabilization..

Public health has not always been treated as central to the climate conversation. Climate policy has been dominated for two decades by debates over emissions trajectories, energy transitions, and economic costs, with health framed as a downstream consequence rather than a primary outcome. That framing has shifted. Climate-driven changes in disease patterns, healthcare delivery, infrastructure resilience, and equity of access are now visible at scale in the published literature and in operational data from health systems [2].

Sustainable Development Goal 3 (SDG 3) is particularly exposed including its sub-targets such as maternal and child mortality, communicable disease control, non-communicable disease management, and universal health coverage. These areas are all sensitive to climate stress, meaning that gains accumulated over the past two decades can be reversed quickly when climate shocks coincide with weak health system capacity [3]. Universal health coverage, the structural target underpinning the rest, is at greatest risk because it depends on health system capacity that climate disruption directly erodes.

The 2025 United Nations Climate Change Conference (COP30) in Belém placed health at the center of the climate negotiation in a way previous COPs had not. The principal out-put, the Belém Health Action Plan (BHAP), set out three pillars: climate-informed health surveillance, evidence-based governance, and sustainable, low-carbon health systems [4]. Whether it produces operational change will depend on financing and accountability mechanisms that the Plan itself does not specify.

This paper examines the climate-health intersection in light of COP30, with attention to where the BHAP advances the agenda, where it does not, and what is required for SDG 3 to remain achievable.

## 2. Materials and Methods

This paper adopts a narrative review and policy analysis approach. It synthesizes evidence from peer-reviewed literature, international organizational reports, and policy documents related to climate change and health.

Key sources include:

- Reports from the World Meteorological Organization (WMO)
- Publications from the World Health Organization (WHO)
- The Lancet Countdown on Health and Climate Change
- United Nations agencies (UNICEF, UNFCCC, OCHA)
- The Belém Health Action Plan (BHAP)
- Relevant peer-reviewed journal articles

The analysis focuses on identifying major pathways through which climate change impacts health outcomes and evaluating how recent global policy developments, particularly COP30, address these challenges. The study emphasizes equity, system resilience, and alignment with SDG 3 targets.

## 3. Results

Rising global temperatures have led to a marked increase in heat-related illnesses, representing one of the most immediate and visible pathways through which climate change affects human health. Heatwaves are becoming more frequent, prolonged, and intense, resulting in a surge of conditions such as heatstroke, dehydration, cardiovascular complications, and acute kidney injury. Beyond acute effects, chronic exposure to extreme heat has significant long-term consequences, particularly

for individuals with pre-existing non-communicable diseases (NCDs) [3]. Cardiovascular disease, chronic respiratory conditions, and metabolic disorders are all exacerbated by sustained heat stress, while emerging evidence also links extreme heat to worsening mental health outcomes, including increased anxiety, sleep disturbances, and psychological strain.

The burden of heat exposure is not evenly distributed. Vulnerable populations, including older adults, young children, outdoor laborers, individuals with chronic illnesses, and socioeconomically disadvantaged groups, face disproportionately higher risks due to a combination of biological susceptibility, occupational exposure, and limited access to adaptive resources such as cooling systems and healthcare services. These disparities highlight the intersection of climate change with social determinants of health and underscore its role in widening existing health inequities. Consequently, the increasing prevalence of heat-related morbidity and mortality poses a direct threat to achieving SDG 3.4, which aims to reduce premature mortality from NCDs.

In parallel, climate change is fundamentally reshaping global epidemiological patterns. Changes in temperature, humidity, and precipitation are altering the distribution and behavior of disease vectors, particularly mosquitoes. As a result, vector-borne diseases such as malaria, dengue, chikungunya, and Zika virus are expanding into new geographic regions, including areas that were previously unsuitable for transmission [5]. This geographic expansion increases population exposure and places additional strain on health systems that may lack the capacity or experience to manage these diseases effectively.

Furthermore, extreme weather events, including floods, hurricanes, and droughts, are contributing to the increased incidence of waterborne diseases. Flooding can contaminate drinking water supplies with pathogens, while drought conditions often force reliance on unsafe water sources, both of which elevate the risk of diseases such as cholera and diarrheal infections. These developments undermine progress toward SDG 3.3, which focuses on ending epidemics of major communicable diseases, and highlight the complex interplay between environmental change and infectious disease dynamics [6].

Climate-related hazards also pose significant challenges to the functioning and resilience of health systems [7]. Increasingly frequent and severe weather events damage healthcare infrastructure, disrupt energy and water supplies, and interrupt critical supply chains for medicines and medical equipment. Health facilities in vulnerable regions are often not designed to withstand such shocks, leaving them susceptible to service interruptions at times when demand is highest [8]. In addition, extreme heat and disaster conditions can overwhelm emergency services and healthcare personnel, further compromising the delivery of essential care. Estimates suggest that a substantial proportion of global health facilities are already at risk of climate-related disruption, threatening the continuity of services and weakening progress toward universal health coverage (SDG 3.8) [9].

Air pollution represents another major pathway through which climate change affects health. It remains one of the leading causes of premature mortality worldwide, contributing to millions of deaths annually from respiratory diseases, cardiovascular conditions, and cancers [10]. Climate change exacerbates air pollution through multiple mechanisms, including increased frequency and intensity of wildfires, higher temperatures that accelerate the formation of ground-level ozone, and changes in atmospheric circulation patterns. Urban populations are particularly exposed due to high concentrations of pollutants and dense living conditions, making air quality a critical area for intervention within climate and health policies.

The impacts of climate change extend beyond direct health outcomes to include disruptions in food systems and water resources. Changes in temperature, precipitation, and extreme weather events negatively affect agricultural productivity, reducing crop yields and compromising food quality. These disruptions increase the risk of food insecurity, malnutrition, and stunting, particularly in low- and middle-income countries. Children are especially vulnerable, as malnutrition during early life has long-term consequences for physical and cognitive development, as well as increased susceptibility to disease. These trends directly threaten progress toward SDG 3.2, which aims to end preventable deaths among newborns and children under five [11].

Climate-induced displacement is another growing concern, driven by sea-level rise, environmental degradation, and extreme weather events. Displaced populations often face precarious living conditions characterized by overcrowding, inadequate sanitation, and limited access to healthcare services. These conditions increase the risk of infectious disease transmission and exacerbate existing health vulnerabilities. Moreover, climate-related migration contributes to rapid urbanization, placing additional strain on infrastructure and health systems, particularly in resource-constrained settings.

Gender disparities further amplify the health impacts of climate change [12]. Women and girls often bear a disproportionate burden due to their social roles, including caregiving responsibilities and reliance on natural resources for livelihoods. During climate-related crises, they may face increased exposure to gender-based violence, reduced access to reproductive health services, and heightened nutritional risks. These challenges hinder progress toward SDG 3.1 and broader gender equality objectives, emphasizing the need for gender-responsive climate and health strategies.

An emerging but critical dimension of the climate-health nexus is its relationship with antimicrobial resistance (AMR) [13]. Environmental changes, including rising temperatures and water scarcity, can influence the survival, reproduction, and transmission of pathogens, potentially accelerating the development and spread of resistant strains. At the same time, disruptions to health systems during climate-related emergencies may lead to the inappropriate use of antibiotics, further exacerbating the problem. Despite increasing recognition of this issue, policy responses remain limited and fragmented.

In addition to physical health impacts, climate change is increasingly associated with a range of mental health challenges [14]. Psychological distress resulting from extreme weather events, displacement, and uncertainty about the future is becoming more prevalent, particularly among young people. The concept of “climate anxiety” has gained prominence, reflecting widespread concern about environmental degradation and its long-term implications. However, mental health systems remain under-resourced and are often not integrated into climate adaptation strategies, leaving significant gaps in care.

In response to these multifaceted challenges, the BHAP, introduced at COP30, represents a significant advancement in integrating health into climate policy. The plan is structured around three core pillars: climate-informed health surveillance, evidence-based governance, and the development of sustainable, low-carbon health systems. These pillars aim to strengthen the capacity of health systems to anticipate, respond to, and mitigate climate-related risks while promoting long-term sustainability.

Despite its promise, the implementation of the BHAP faces several challenges. Funding gaps remain a major barrier, particularly for low- and middle-income countries that require substantial resources to build climate-resilient health systems. Additionally, the voluntary nature of the plan raises concerns about accountability and the consistency of implementation across different contexts. Without robust monitoring mechanisms and sustained political commitment, there is a risk that the plan’s objectives may not be fully realized. Addressing these challenges will be critical to ensuring that the BHAP translates into meaningful improvements in global health outcomes.

#### 4. Discussion

The health impacts of climate change are usually catalogued as if they were independent: heat illness here, vector expansion there, displacement somewhere else. The pattern in the field data tells a different story. Heat stress, food and water insecurity, infectious disease redistribution, and forced migration converge on the same populations in the same places at the same time, and the resulting compound exposure is what makes SDG 3 trajectories difficult to recover under current policy. A pastoralist household in the Horn of Africa loses water access and crop yield, then moves, then arrives in an over-crowded settlement during a heat anomaly with cholera circulating. None of these is a separate problem. Treating them as a single problem with multiple faces is a precondition for

designing useful interventions, and it is what most national climate-health plans, including several reviewed in the Lancet Countdown, still fail to do [3].

This compounding logic also clarifies why incremental progress on single SDG 3 targets will not produce aggregate progress. Gains on SDG 3.4 (premature NCD mortality) can be erased by a single heat season. Gains on SDG 3.3 (communicable disease) can be reversed by one displacement wave that pushes a previously stable population into transmission ecologies they had not encountered. SDG 3 indicators should be read as joint distributions rather than as a column of separate metrics, and climate resilience belongs in the denominator of every health indicator rather than in a parallel reporting stream.

Against this analytic backdrop, the BHAP is both more and less than its framing suggests. More, in that it is the first COP outcome to install health as a structural pillar of climate governance, with named pillars for surveillance, governance, and low-carbon health systems [4]. Less, in that the architecture beneath those pillars is closer to the WHO 2008 climate-health workplan and the COP26/COP28 health declarations than to a binding instrument. It is voluntary, does not allocate finance, and does not specify accountability beyond a commitment to report. The gap that has separated Paris ambition from NDC delivery for a decade is reproduced at the health level: the political consensus is real, the implementation infrastructure is not.

What would close that gap is reasonably well established in operational guidance that already exists. The WHO operational framework for building climate-resilient and low-carbon health systems sets out ten components including leadership and governance, workforce, vulnerability assessment, integrated risk monitoring, climate-informed health programmes, emergency preparedness, sustainable infrastructure, water and energy, sustainable procurement, and health financing. These components have to move together rather than in sequence [15]. The BHAP can be read as a political mandate for that framework, but unless ministries of health are funded and staffed to operationalize all ten components in parallel, climate resilience will be assembled piecemeal and fail in the gaps. The IPCC AR6 Working Group II health chapter reaches a similar conclusion from a different direction: adaptation that is not implemented at the speed of the climate signal becomes maladaptation [16].

Financing is where this becomes concrete. The USD 300 million philanthropic announcement at COP30 was the most visible health-finance moment of the conference [9], and it is a useful seed for a research agenda. It is not a system strengthening instrument. The order of magnitude required to make health systems in low- and middle-income countries climate-resilient runs in the tens of billions per year, and the available pool inside multilateral climate funds is currently directed almost entirely at mitigation and at non-health adaptation sectors. The question for the next twelve months is whether any portion of NDC-aligned adaptation finance, Loss and Damage Fund disbursement, or reformed multilateral development bank lending can be tagged for health system strengthening with measurable outputs. Without this, the BHAP will read in 2030 the way the COP26 health declarations read now: well-cited, widely endorsed, and substantively un-implemented.

The equity dimension is not a separate consideration to be appended at the end. Climate exposure tracks the same gradients that already determine health outcomes such as income, geography, gender, migration status, and informality of housing and labour. Within that set, displacement is not one impact among many; it is the population dynamic that determines who is exposed to all the others. A person who would have faced heat stress in their village faces heat stress, water insecurity, and outbreak risk simultaneously after they move, and the health system they arrive in is rarely planned for them [17,18]. The 2022 World Report on the Health of Refugees and Migrants set out concrete entry points for the inclusion of mobile populations in national health systems [19], and those entry points map directly onto the BHAP's surveillance and governance pillars. That mapping has not been made explicit in the COP30 outputs, and it should be.

Climate-resilient health systems built around static catchment populations will underperform precisely in the settings where climate stress is highest, because those are the settings where catchment populations are most mobile. National health information systems that cannot follow people across district or border lines lose visibility on the climate-displaced population at the moment

that visibility matters most. Designing for mobility from the start through interoperable records, portable entitlements, and inclusion of host-community capacity in adaptation funding is a design choice that the BHAP's voluntary structure permits but does not require. It is also the choice that will most clearly distinguish countries that meet SDG 3 targets from those that do not.

Two further points warrant brief flagging. Mental health, particularly among adolescents and young adults, has been treated in COP outputs as a soft secondary concern [14]. However, the magnitude and trajectory of climate distress in cohorts who will live through the next four decades suggest it should be treated as a primary one, with surveillance, workforce, and service delivery investment to match. Furthermore, the climate-AMR linkage [13] sits in a regulatory space between environmental and health policy that no current instrument addresses well; surveillance integration across the One Health spectrum is a near-term priority that the BHAP could enable but does not yet specify.

Climate change is not an additional stressor on health systems. It is the operating environment those systems will function in for the foreseeable future. The question is no longer whether they will adapt but how quickly, on whose terms, and with what financing, and the answers to those three questions, more than any technical pathway, will determine whether SDG 3 is recoverable.

## 5. Conclusions

Climate change is producing health effects across the full range of SDG 3 targets, from heat-related mortality and infectious disease redistribution to malnutrition, mental health distress, and health system disruption. These effects compound rather than accumulate, and the resulting trajectory is incompatible with current SDG 3 ambitions on pre-sent policy.

COP30 and the BHAP represent the first sustained attempt to install health within the climate negotiation as a structural rather than peripheral concern. The framing is correct. The architecture beneath it such as voluntary commitments, no dedicated financing, limited accountability, is not yet adequate to translate that framing into measurable change.

Closing the gap requires three concurrent moves. First, climate-resilient health system planning has to be treated as a financing question, not a guidance question, and the available climate finance pool has to be opened to health sector adaptation at meaningful scale. Second, equity has to enter the design rather than the closing paragraphs of policy: the populations most exposed to compounding climate risk are mobile, marginalized, and underrepresented in health information systems, and adaptation that does not plan for them will fail in the settings where it is most needed. Third, accountability has to be built into the BHAP's monitoring architecture before the next COP, with measurable outputs that can be tracked at country level.

None of this is a matter of additional knowledge. The technical pathways, including climate-resilient health systems, integrated surveillance, low-carbon care delivery, are documented. The question is whether ministries of health, finance ministries, and the climate-finance institutions move at the speed the climate signal requires. Whether SDG 3 remains recoverable will be decided by that question more than by any other.

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## Abbreviations

The following abbreviations are used in this manuscript:

AMR Antimicrobial resistance

BHAP Belém Health Action Plan

COP30 2025 United Nations Climate Change Conference

NCDs Non-communicable diseases

OCHA United Nations Office for the Coordination of Humanitarian Affairs

SDG 3 Sustainable Development Goal 3

UHC Universal health coverage

UNFCCC United Nations Framework Convention on Climate Change

UNICEF United Nations Children's Fund

WHO World Health Organization

WMO World Meteorological Organization

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