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The Climate-Health Nexus

PUTTING HEALTH AND WELLBEING AT THE CENTRE OF CLIMATE ACTION

Trinity College Dublin's Health Working Group for the 30th United Nations Climate Change Conference (COP30)
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A position paper prepared by researchers from Trinity College Dublin's **Health Working Group** for the 30th United Nations Climate Change Conference (COP30).

Trinity College Dublin is an observer at COP30, and has had observer status at The United Nation's annual Climate Change Conferences since 2023.

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Climate change is not a distant threat - it is here, and it is already reshaping the conditions that sustain human life and wellbeing. It poses a critical risk to human health by compounding vulnerabilities linked to poverty, systemic inequities, geopolitical tensions, energy insecurity, and cost of living crises. It has been recognised as one of the greatest challenges to public health.

This position paper highlights four urgent and interconnected domains where these effects are most pronounced: sexual and reproductive health, mental health and wellbeing, antimicrobial resistance, and the immune system.

Sexual and Reproductive Health

Sexual and Reproductive Health and Rights (SRHR) refers to the right of every individual to informed decision-making about their sexual and reproductive life (8). Access is a human right; however, climate change severely impacts this, which further exacerbates social inequalities, especially in low- and middle-income countries (4, 9-12). Climate shocks can reduce or cut off access to essential SRHR services, such as contraception, maternal health care and HIV prevention (13, 9). Pregnant and postpartum people are especially vulnerable to climate risks, with susceptibility to climate-sensitive infectious diseases (1, 6). Research finds that higher temperatures are associated with increased rates of preterm birth and low birth weight, with higher rates of eclampsia, preeclampsia, and pregnancy-related hypertension (14). Underscoring climate change as a fundamentally gendered issue, women are more likely than men to die during climate-related disasters (15) and at higher risk of inter-partner violence, child marriage and exploitation, which tend to increase in climate-disaster settings (1, 16, 8). Additional challenges include restricted access to essential HIV medications (17) and menstrual health issues like period poverty (12, 18). These are not abstract hypotheses; they represent real women and families whose choices and dignity are stripped away by climate disruption.

Trinity College Dublin is advancing work at the intersection of climate change and health through major research grants on the impacts of heat on maternal and child health, adolescent climate engagement, and teaching that integrates sexual and reproductive health with climate issues. While this research aligns with the UN call for action to urgently accelerate SRHR and climate change research (9, 19), we advocate for further interventions such as building resilient healthcare systems to withstand climate change and to foster global solidarity and accountability. Additionally, to advance gender equality and education while embedding SRHR in any considerations on gender in climate policy. Above all, we implore researchers to include the seldom-heard voices of marginalised groups in conversations, policies, or research on climate change and SRHR.

The health of humanity is inseparable from the health of our planet.
The choice before us is between denial and survival.

Mental Health and Wellbeing

Climate change impacts mental health through direct, indirect, and anticipatory pathways (20). Extreme weather events cause loss, displacement, and trauma, while disrupted routines, livelihoods, and education systems undermine psychological wellbeing, and create chronic uncertainty about the future. However, mental health remains one of the least addressed issues in climate policy: nearly 60% of national adaptation plans ignore it, and even when included, it is rarely accompanied by concrete actions (21). Children and adolescents are disproportionately affected by climate change because their brains, identities, and coping capacities are still developing, and their wellbeing relies on stable environments, caregivers, and education systems, all of which are disrupted by climate impacts (22-25). Early and repeated exposure to disasters can lead to anxiety, depression, and cognitive and social difficulties that persist into adulthood (26-31). This means that each disaster leaves lasting scars on children and families, and essentially reshapes how they will continue to think, feel, and hope. These cumulative effects translate into substantial burdens on health systems and communities (7).

These impacts remind us that mental health is fundamental for climate resilience. There is an urgent need for policies and interventions that address mental health and wellbeing in the aftermath of climate disasters in vulnerable settings. Importantly, climate mental health is not only about mitigating distress but also promoting agency and engagement. Integrating mental health into climate resilience requires moving beyond economic and capitalistic framings of adaptation to approaches that centre wellbeing and the lived experiences, and treat people not as economic units or statistics but as human beings with rights and needs.

Embedding mental wellbeing within adaptation strategies can enhance individual and collective capacity to respond to climate threats, reduce long-term social costs, and promote inclusive forms of resilience (32). Without such action, the goals of SDG 3 and SDG 13 cannot be meaningfully achieved. Trinity College Dublin is advancing this agenda through research on child and adolescent mental health and wellbeing, especially in highly climate-vulnerable countries such as Bangladesh, Madagascar, and Pakistan (33-39).

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Antimicrobial Resistance

Climate change is expected to intensify antimicrobial resistance (AMR) risks in Ireland by amplifying environmental pathways that favour resistant bacteria. Rising temperatures accelerate bacterial growth, mutation, and horizontal gene transfer, promoting the persistence of resistance genes (40). The EPA-funded AREST project has already detected carbapenemase-producing *Enterobacterales* and plasmid-mediated colistin resistance in Irish catchments classified as 'good quality' (41).

Heavier rainfall and flooding further heighten risks by overwhelming wastewater and stormwater systems, flushing antimicrobial residues and resistant organisms from hospitals, farmland, and slurry-treated soils into rivers and coastal waters. Genomic evidence has linked resistant isolates from hospital sewage to nearby water bodies, a pathway likely to worsen with extreme precipitation (42). Increased antimicrobial use in agriculture also contributes, as climate-driven runoff carries residues into surface waters. Antibiotic use in livestock heightens climate-related AMR risks, as heavier rainfall and flooding spread resistant bacteria and residues into the environment (43).

Ireland's Gap Analysis Report (2025) notes limited modelling of climate-AMR interactions, and Ireland's second National Action Plan on AMR (iNAP2) addresses environmental pathways. Still, it does not yet fully account for climate change. To address this, national AMR policy should integrate climate resilience by strengthening wastewater infrastructure, expanding surveillance in flood-prone and warming-sensitive catchments, and adopting nature-based solutions such as wetlands to buffer runoff. Embedding these measures into iNAP3 would align Ireland's One Health strategy with the challenges posed by a warming, wetter climate.

Global policy must embed AMR within climate-resilient One Health frameworks, enforce a binding international AMR treaty, and establish an AMR–Climate Fund to support sustainable health, agriculture, and water systems. Regulatory oversight of antibiotic use, industrial effluents, and livestock practices, combined with green pharmaceutical innovation, standardised surveillance, and targeted public-health interventions, is critical to mitigate AMR under climate stress (44-45).

Facing climate change is not just an environmental or economic issue, as it's often portrayed; it's a critical public health issue for everyone. All the money in the world will not undo the damage when our air, water, and bodies are poisoned by inaction and complacence.

Immune Health

Climate change doesn't just mean a warmer climate; it fundamentally alters the environment that our immune system has evolved to handle over the course of millions of years. Rapid temperature changes, air quality, pollen levels, and loss of biodiversity create increased stress on our immune system (46). Over the course of our early lives, our immune systems learn what and what not to tolerate through exposure to a vast variety of microbes, teaching tolerance (47). Increases in global temperatures, levels of air pollution and longer pollen seasons are leading to more severe allergic responses in susceptible individuals and a more wide-spread occurrence of these associated diseases across populations (48).

Our immune system normally avoids attacking our own cells, but in some cases, this tolerance can break down. While genetics play a role, environmental factors such as pollution, heat stress, dietary changes and certain infections are known triggers for various autoimmune diseases. Extreme heat and air pollutants disrupt the body's natural barrier defences and trigger chronic inflammation, increasing the risk of autoimmune and chronic inflammatory diseases (46, 49). Worse air quality and long-term exposure to polluted air have been tied to new cases of autoimmune conditions such as lupus and rheumatoid arthritis (50). Overall, autoimmune diseases are complex and involve different factors. Climate change is one such piece, and one that we have the ability to control.

Warmer and changing weather patterns are radically reshaping how infections spread, the range of diseases and where they can appear. The WHO warns that temperature and precipitation changes are enhancing the spread of vector-borne diseases (disease spread by mosquitoes, ticks, fleas and other insects) (51). For example, in the U.S., these illnesses have doubled in the last 20 years, with warmer winters allowing ticks to survive further north, increasing the number of cases of vector-borne disease (52). Climate change also worsens water-borne illnesses as heavy rainfalls and floods can overwhelm sanitation systems, contaminating drinking water. The WHO reported nearly 472,700 cholera cases in 2022, roughly double the number reported in 2021 (53). Extreme weather and human activity can also cause habitat loss, forcing wildlife into closer proximity with humans, creating opportunities for zoonotic transmission which can lead to pandemics like COVID-19 (54), which exposed our lack of preparedness to emerging infectious diseases. Global policies must aim to enhance collaboration and surveillance for emerging immunological threats.

Because these impacts attack our health at every level, from the societal and psychological to the cellular and microbial, a fragmented, siloed response is destined to fail.

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OUR CALL TO ACTION

The evidence is clear: climate change is an escalating public health emergency. The erosion of sexual and reproductive rights, the growing burden on mental wellbeing, the rise of antimicrobial resistance, and the disruption of immune systems are deeply interconnected. When healthcare access collapses, when families are displaced, and when ecosystems degrade, the result is a cascade of physical, psychological, and social harms no community can afford to ignore.

Without embedding SRHR, mental health, AMR, and immune resilience into adaptation and mitigation, neither Ireland nor the global community can meaningfully achieve the Sustainable Development Goals.

To safeguard human health, we must urgently move beyond treating the symptoms and address the cause by embedding a health and equity lens into the core of all climate policy and action. This demands building climate-resilient health systems, interdisciplinary collaborations, and championing policies that recognise a stable climate as the fundamental foundation of global public health.

The health of humanity is inextricably linked to the health of our planet; securing a liveable future requires a resolute commitment to protecting both. As an observer at COP30, Trinity calls for climate action that recognises health as a frontline issue and a driver of resilience, equity, and justice.

Protecting health from climate change is not only about survival: it is about safeguarding dignity, rights, and futures.

RECOMMENDED POLICY ACTIONS

To achieve health-centred climate resilience, the following evidence-supported actions are urgently recommended:

- Embed gender equality, youth leadership, and equity in all climate-health strategies.
- Invest in interdisciplinary research that links climate, health, and socioeconomic data to inform evidence-based adaptation
- Safeguard continuous access to contraception, maternal care, and HIV prevention in disaster and displacement contexts.
- Address gender-based violence, child marriage, and menstrual inequities (including period poverty) within climate resilience policies.
- Eliminate age limits on national free contraception policies and champion universal, rights-based access globally.
- Integrate mental health and psychosocial wellbeing into all national climate adaptation strategies and disaster response plans.
- Support youth-led and community-driven mental health initiatives as part of national adaptation and education policies.
- Develop safe community spaces for youth, caregivers, and children to foster resilience and social connection.
- Encourage and support youth-led initiatives to transform climate anxiety into collective action and advocacy.
- Strengthen wastewater and stormwater infrastructure to prevent the spread of resistant pathogens.
- Embed climate resilience into national AMR strategies, including surveillance of wastewater and flood-prone systems.
- Ensure that future national AMR action plans explicitly address the intersection between climate change and resistance dynamics.
- Expand monitoring of pollution, biodiversity loss, and disease vectors as key indicators of immune health.
- Enhance global surveillance and early warning systems for vector- and water-borne diseases in changing climate zones.

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