

SUFFOCATING UNDER FOSSIL FUELS

THE CLIMATE CRISIS
AND THE THREAT TO HEALTH AND WELL-BEING



A
Guidance Document

**on Climate Change & Health Impacts
for Health Professionals in South Africa**

Endorsed by



ACKNOWLEDGEMENTS

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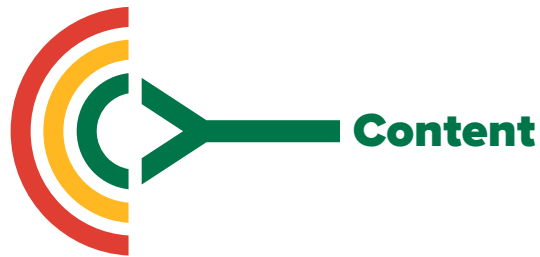
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FOREWORD

Climate change is no longer a distant threat; it is a current reality of crisis proportion and demands immediate attention and action. Rising global temperatures, the increase in extreme weather events, and the related destruction and degradation of various ecosystems; all pose significant direct and indirect risks to physical, mental, and social health. From heat-related illnesses and infectious diseases to food and water insecurity, the effects of the climate crisis have far-reaching consequences for people and societies around the world.

South African populations are especially vulnerable to the effects of the climate crisis on health, due to worsening environmental and economic consequences, the direct and indirect effects on health, and acute and chronic impacts that increase and perpetuate poverty, infectious diseases, and forced migration. The country has adopted a comprehensive approach for addressing climate change and for the country to reach the goal of net-zero emissions by the year 2050. This plan also includes vulnerability assessments to inform targeted adaptation actions, as well as health considerations. It is led from the highest level by the Presidential Climate Commission but will require the voices and actions of all stakeholders for successful implementation.

Health care workers are central to mitigation and adaptation efforts and advocacy; thus it is imperative that they be prepared to respond from both the individual and systematic levels. This report provides valuable information on the background to the climate crisis, the impacts on human health, and suggestions for mitigation and adaptation. The Public Health Association of South Africa (PHASA) is committed to advocating for and supporting actions that address the climate crisis, and it is my sincere hope that this report inspires urgent reflection and dialogue, fosters widespread collaboration, and ignites the collective action needed to confront the climate crisis and protect human health.

Dr Harsha Somaroo

PHASA President



FOREWORD

South Africa is a significant contributor to global heating from its high consumption of fossil fuels, and also extremely vulnerable to adverse climate-health impacts due to high levels of ill health, malnutrition, water scarcity, and deep-rooted inequity and poverty. The need for urgent action is well recognised in its climate policies and plans, but strong champions are required to give effect to these.

Healthcare workers are generally trusted by the public to speak and act with authority and credibility in their multiple roles as individuals, patient care providers, public health practitioners, community leaders and advocates, healthcare managers, and policy advisors. The growing climate and health crisis offers them an opportunity to join the chorus of advocates for climate-resilient and low-carbon healthcare towards a healthy climate future.

As a founding member of the PHASA Climate, Energy and Health Group that advocates for healthy energy policy and practice, I am pleased to commend this publication. It is a timely and important guide to assist our health professionals in understanding how climate is impacting public health, what they can do to protect and adapt society to its impacts, and how they can help to mitigate the considerable contribution of the health sector to climate change.

James Irlam

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MESSAGE

The One Health approach acknowledges that the environment, humans and other animals co-exist; and that disturbances in the health of one of these has an effect on the health of the others. This guidance document highlights the environmental changes brought on by human-induced climate change, and the knock-on effects that this disturbance causes to the health of humans.

The links between climate change and the negative impact on health has been widely documented. In addition to an increase in the burden of weather-related diseases like heat-stress and injury, climate change threatens the stability of the basic determinants of health such as food and water, and safe land for shelter. This will lead to increased malnutrition and an increased incidence of water-borne diseases; forced-migration from conflict over limited land as extreme weather events decimate our homes; and a general reduction in our mental health. The ecological effects of climate change will enable a redistribution of animal-related disease like malaria, a vector-borne disease, which may re-emerge in areas not currently endemic.

It is an unpleasant thought to realise that healthcare workers, through workplace activities, are actually contributing to the extent of human-induced climate change which, in turn, affects the health of their patients negatively. This goes against the frameworks of the human rights to health and a healthy environment, and the non-maleficence pillar of medical ethics. Healthcare workers cannot turn a blind eye to the healthcare system's contribution to climate change.

The guide ends with a call to action. Healthcare workers must make personal changes to reduce the amount of greenhouse gases and other pollutants that we produce within our workplaces and outside of it. We must capacitate ourselves to care for patients with the numerous ill-health effects of climate change, and offer care in emergency situations of extreme weather events.

As trusted leaders, healthcare workers, in pursuit of preventing poor health from climate change, have a duty to use our influence and platforms to advocate amongst our communities for changes to address climate change and its effects. We should gather support towards developing a critical mass of community members who are active in the fight against climate change.

Within the systems of our democracy, we healthcare workers must involve ourselves in the broader policy formation processes to ensure that consideration to climate change features in relevant laws, regulations, policies and plans. Furthermore, holding government, business and other key stakeholders to account through monitoring compliance to good policy and advocating for continuously improving our approach in this battle against climate change.

At the risk of sounding dramatic, climate change is a risk to our very existence on this planet. Without drastic, deliberate, whole-of-society improvements, the health effects of the recent pandemic, which claimed over 7-million people worldwide, will make our descendants laugh when they compare it to the devastating health effects of climate change.

Amilcar Juggernath

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A GUIDANCE DOCUMENT



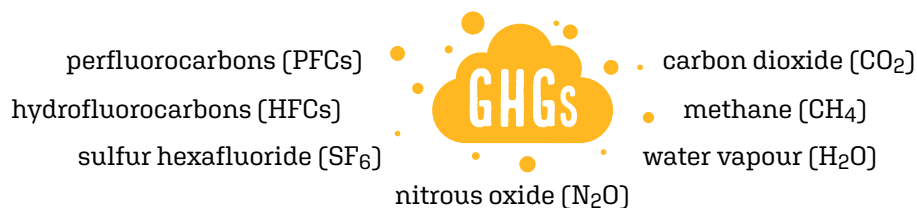
on Climate Change & Health Impacts
for Health Professionals in South Africa



1 INTRODUCTION

The planet and humanity are facing a triple planetary crisis: climate change, biodiversity loss¹ and pollution². They are all interlinked, with their own causes (and effects), requiring urgent attention to safeguard the future of the planet³ and its inhabitants. These challenges are further compounded by the prevalence of communicable⁴ and noncommunicable diseases⁵ which also affects the health and well-being of the natural environment and its people. At the centre of these challenges are the most vulnerable: women and children, the elderly, people with disabilities, those living in poverty, indigenous people, members of the LGBTQIA+ community and the generation which will be inheriting a planet suffocating under fossil fuels.

While the climate varies from one year, decade, century, or millennium to the next⁶, climate change — which is directly or indirectly caused by human activity, alters the way in which the global atmosphere is composed. Climate change has been ongoing due to the rise in concentration of human-induced greenhouse gases (GHGs) in the atmosphere⁷. “The atmosphere and oceans have warmed, the quantity of snow and ice have diminished, and sea levels are rising”⁸. GHGs are produced through the exploitation of natural resources in the energy, transport, industry, agriculture, forestry, and land use sectors⁹. These GHGs are:

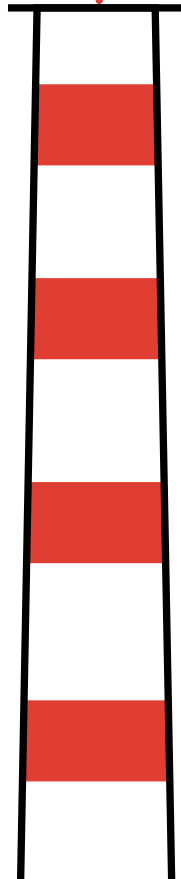


- 1 United Nations ‘Biodiversity - our strongest natural defence against climate change’ (date unknown) available at <https://www.un.org/en/climatechange/science/climate-issues/biodiversity> accessed on 18 July 2023 and J Watts ‘Stop Biodiversity loss or we could face our own extinction, warns UN’ 6 November 2018 available at <https://www.theguardian.com/environment/2018/nov/03/stop-biodiversity-loss-or-we-could-face-our-own-extinction-warns-un> accessed on 18 July 2023.
- 2 M R Behera et al ‘Planetary Health and the role of Community Health Workers’ (2020) 9 Journal of Family Medicine and Primary Care 3183-8 at 3183.
- 3 United Nations Climate Change ‘What is the Triple Planetary Crisis’ 13 April 2020 available at <https://unfccc.int/blog/what-is-the-triple-planetary-crisis> accessed on 10 July 2023.
- 4 I Andersen ‘The Triple Planetary Crisis and Public Health’ United Nations (UN) Environmental Programme 5 September 2021 available at <https://www.unep.org/news-and-stories/speech/triple-planetary-crisis-and-public-health> accessed on 18 July 2023.
- 5 Centre for Disease Control and Prevention ‘About Global NCDs’ 17 December 2021 available at [https://www.cdc.gov/globalhealth/healthprotection/ncd/global-ncd-overview.html#:~:text=Noncommunicable%20diseases%20\(NCDs\)%2C%20such,all%20communicable%20disease%20deaths%20combined.](https://www.cdc.gov/globalhealth/healthprotection/ncd/global-ncd-overview.html#:~:text=Noncommunicable%20diseases%20(NCDs)%2C%20such,all%20communicable%20disease%20deaths%20combined.) accessed on 18 July 2023.
- 6 M Ghil ‘Natural Climate Variability’ (2002) 1 *Encyclopaedia of Global Environmental Change* 544-549 at 544.
- 7 *Ibid.*
- 8 International Council of Nurses ‘Nurses, Climate Change and Health’ 27 September 2018 available at <https://www.icn.ch/news/international-council-nurses-calls-increased-nursing-leadership-combat-effects-climate-change> accessed on 10 July 2023.
- 9 *Ibid.*

Every day, GHGs are released into our atmosphere threatening our physical and mental health and well-being, and causing (increased) rates of infectious disease transmission, food and water shortages, global migration, political conflict, and financial loss¹⁰. The African continent is the lowest contributor of human-induced GHG emissions¹¹, yet it is the most vulnerable continent to the impacts of climate change¹².

In 2022, South Africa ranked 96 out of 182 in terms of climate change vulnerability, which means that it is highly vulnerable to climate change¹³. It is projected that the country will experience a monthly mean temperature increase of 2°C by 2050, resulting in an increase in the incidence of extreme weather events such as floods and droughts¹⁴, events the country is all too familiar with¹⁵. South Africans must contend with high rates of unemployment affecting 7.8 million citizens¹⁶, a planet in crisis, poverty, inequality, violence, issues around access to education¹⁷, and healthcare¹⁸, and now climate change. Worryingly, climate change does not appear to be receiving the necessary level of attention from policymakers in South Africa. According to the Climate Change Performance Index (CCPI) for 2023¹⁹, an instrument seeking to enable transparency in national and international climate politics which measures the climate performance and extent of GHG emissions of individual countries, South Africa ranked 44th out of 59 countries and the European Union, having dropped from the 39th rank in the previous index²⁰. The index scores countries on GHGs Emissions (40% of the overall ranking), Renewable Energy (20%), Energy Use (20%) and Climate Policy (20%), with the most favourable rating being “Very High”²¹. South Africa received mixed ratings across the four main CCPI categories: very low in Renewable Energy, low in GHGs Emissions and Climate Policy, but high in Energy²². It was also ranked the 12th largest emitter of GHGs globally²³ with the country highlighted as one of the biggest global producers of oil, gas, and coal²⁴, which are the biggest contributors to climate change²⁵. Suffice to say, these figures paint a very grim outlook for South Africa’s climate change mitigation efforts.

- 10 H K Ghazy, D M Fathy ‘Effect of Awareness Program Regarding Climate Change on Knowledge, Attitudes and Practices of University Students’ (2023) 3(2) *International Egyptian Journal of Nursing Science and Research* 186-203 at 187
- 11 C H Trisos et al ‘2022: Africa. In: Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change’ Cambridge University Press, Cambridge, UK and New York 1285–1455.
- 12 African Development Bank Group (date unknown) available at [https://www.afdb.org/en/cop25/climate-change-africa#:~:text=Seven%20of%20the%2010%20countries,Madagascar%20\(joint%208th%20position\)](https://www.afdb.org/en/cop25/climate-change-africa#:~:text=Seven%20of%20the%2010%20countries,Madagascar%20(joint%208th%20position)) accessed on 7 July 2023.
- 13 D Charitar ‘South Africa is ranked 96 out of 182 Countries in terms of Climate Change Vulnerability and its Preparedness to Enhance Resilience’ Climate Scorecard 9 October 2022 available at <https://www.climatescorecard.org/2022/10/south-africa-is-ranked-96-out-of-182-countries-in-terms-of-climate-change-vulnerability-and-its-preparedness-to-enhance-resilience/#:~:text=and%20Action%20Alert-,South%20Africa%20is%20Ranked%2096%20out%20of%20182%20Countries%20in,Its%20Preparedness%20to%20Enhance%20Resilience&text=Droughts%2C%20floods%2C%20storms%2C%20landslides,globe%20due%20to%20climate%20change> accessed on 10 July 2023.
- 14 *Ibid.*
- 15 A Tandon ‘Climate change made extreme rains in 2022 South Africa floods ‘twice as likely’ 13 May 2022 CarbonBrief available at <https://www.carbonbrief.org/climate-change-made-extreme-rains-in-2022-south-africa-floods-twice-as-likely/> accessed on 18 July 2023.
- 16 Statistics South Africa (Stats SA) ‘Incident of long-term unemployment amongst women is higher than the national average’ 28 January 2023 available at <https://www.statssa.gov.za/?p=16113> accessed on 10 July 2023.
- 17 N De Wet-Billings ‘Climate change is not what South Africans see as their main problem’ 13 December 2022 University of the Witwatersrand, Johannesburg available at <https://www.wits.ac.za/news/latest-news/opinion/2022/2022-12/climate-change-is-not-what-south-africans-see-as-their-main-problem.html#:~:text=Analysis%20of%20responses%20revealed%20that,change%20will%20intensify%20those%20challenges>. Accessed on 10 July 2023.
- 18 K De Villiers ‘Bridging the health equity gap: An examination of South Africa’s social innovation in health landscape’ (2021) 10(19) *Infectious Disease of Poverty* 1-7.
- 19 J Burck et al ‘The Climate Change Performance Index 2023’ GermanWatch 11 November 2022 available at <https://www.germanwatch.org/en/87632> accessed on 18 July 2023.
- 20 *Ibid*; South Africa - Climate Performance Rating available at <https://ccpi.org/country/zaf/> accessed on 18 July 2023.
- 21 J Burck et al op cit (n19).
- 22 J Burck et al op cit (n19).
- 23 Africa Check “ South Africa the 12th biggest source of greenhouse gases? Yes, but that’s not the only measure that matters” available at <https://m.polity.org.za/article/south-africa-the-12th-biggest-source-of-greenhouse-gases-yes-but-thats-not-the-only-measure-that-matters-2021-04-19> Accessed 11 July 2023
- 24 J Burck et al op cit (n19).
- 25 United Nations ‘Causes and Effects of Climate Change’ (date unknown) available at <https://www.un.org/en/climatechange/science/causes-effects-climate-change> accessed on 18 July 2023.



The state of climate change globally is indicative of the increase in climate change-related health emergencies in the past two decades. 2,121 public health events were recorded in Africa during the 2001 to 2021 period, 56% of which were climate change-related²⁶. Climate change is the greatest health challenge of the 21st century threatening the very basics that human life depends on: air, food, water, shelter, and security. The effects on [air quality](#), [food and water security](#), climate change-induced [heat waves](#), [floods](#), [storms](#), [wildfires](#), [infectious diseases](#), [migration](#), [conflict](#) and [mental health](#) exacerbate existing health threats and also create new ones²⁷.

The mitigation of climate change, considering its associated burden of disease²⁸, is considered a public health opportunity with health co-benefits associated with mitigation²⁹. Considering that reducing GHG emissions will benefit public health³⁰ and the fact that the healthcare industry and health systems account for over 5% of GHG emissions on a global level with a carbon footprint equalling 514 coal-fired power plants³¹, the healthcare system has a major role to play in climate change mitigation and adaptation. As more communities experience the adverse effects of climate change alongside injuries, illnesses, and mental health impacts and as climate change continues to disrupt healthcare delivery, access and supply chains, the healthcare system must be involved in driving solutions in accordance with the principle of “first, do no harm”³².

- 26 World Health Organization (WHO) ‘Africa faces rising climate-linked health emergencies’ 6 April 2022 available at <https://www.afro.who.int/news/africa-faces-rising-climate-linked-health-emergencies> accessed on 10 July 2023.
- 27 Healthy Energy Initiative India ‘No Vaccine for Climate Change: a Guidance Document on Climate Change and Health Impacts for Healthcare Professionals in India’ 29 June 2021 available at <https://rri-tools.eu/-/no-vaccine-for-climate-change-a-communication-guide-on-climate-and-health-for-the-healthcare-professionals-in-india> accessed on 18 July 2023.
- 28 M F Chersich et al ‘Impacts of Climate Change on Health and Well-being in South Africa’ (2018) 15:9 *Int J Environ Res Public Health*. 2-14 at 1.
- 29 E C Ryan et al ‘Medical, nursing, and physician assistant student knowledge and attitudes toward climate change, pollution, and resource conservation in health care’ (2020) 20 *BMC Medical Education* 1-14 at 2.
- 30 S Wynes ‘Guidance for health professionals seeking climate action’ (2022) 7 *Journal of Climate Change and Health* 1-3 at 2.
- 31 S Andreae ‘Climate change and global health: What actions are healthcare leaders taking’ 8 November 2022 World Economic Forum available at <https://www.weforum.org/agenda/2022/11/climate-change-global-health-actions-healthcare-leaders/> accessed on 23 July 2023 and L Smith ‘The nexus between climate change and healthcare’ 19 January 2022 The Health Policy Partnership available at <https://www.healthpolicypartnership.com/the-nexus-between-climate-change-and-healthcare/> accessed on 6 August 2023.
- 32 R Metzke ‘Here’s how healthcare can reduce its carbon footprint’ 24 October 2022 World Economic Forum available at <https://www.weforum.org/agenda/2022/10/cop27-how-healthcare-can-reduce-carbon-footprint/> accessed on 23 July 2023.
- 33 *Ibid.*
- 34 J Kotcher et al ‘Views of health professionals on climate change and health: a multinational survey study’ (2021) 5 *Lancet Planet Health* 316-23 at 316.
- 35 Healthy Energy Initiative India op it (n27) at 6.
- 36 *Ibid.*

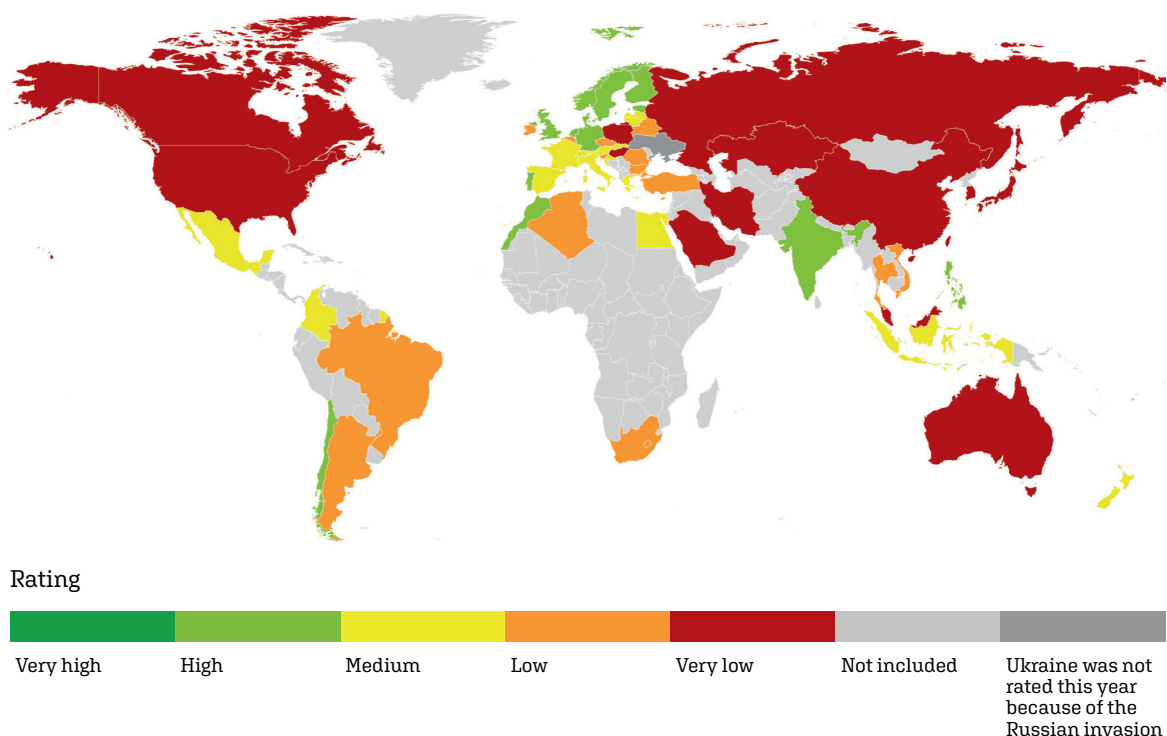
Healthcare professionals hold leverage over the decisions of society, determine whether climate change targets will be reached³³ and the threat averted, and their voices are trusted in supporting the global reduction of emissions protecting people from the threats of climate change³⁴. Globally, healthcare professionals are considered a credible source of health information³⁵ and so are essential in carrying health messages to the public.

As such, this communications guide is prepared to support healthcare professionals to continue to think about conversations around climate change and health impacts amongst themselves, with their patients and communities. It seeks to highlight information that can be considered in preparing for media interviews, meetings with legislators or policymakers, as well as to create news articles or professional presentations. It is adapted from a Guidance Document on Climate Change & Health Impacts for Health Professionals in India published in May 2021 as a contribution to the conversation around climate change and health, aptly titled ‘No Vaccine for Climate Change’.



The voices of healthcare workers are critical in promoting actions that address climate change and its impacts on health. They make a big difference, whether it's with patients in private practice, in the public health sector, in communities or through their contributions to the policy arena. They have a unique opportunity to help people understand that the same pollution that compromises respiratory health also drives climate change and, more importantly, spread the word to promote carbon-neutral practices and climate infrastructure in the health sector³⁶.

Figure 1 | This global map illustrates various countries' CCPI ratings. South Africa is rated "Low".



Source: GermanWatch 'Climate Performance index' (2023) available at <https://ccpi.org/download/climate-change-performance-index-2023/> accessed on 17 July 2023.



“ The planet
has limited
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for what it can accommodate in terms of human activities, after which it will undergo possibly catastrophic changes due to feedback loops in the earth's system - and we are reaching those limits. These boundaries include a variety of dimensions across the earth system, including **climate change, biodiversity loss, chemical pollution, air pollution, ocean acidification, ozone layer depletion, deforestation and other land-use changes, freshwater use, and other novel entities.** ”

UNICEF 'The Climate Crisis is a Child Rights Crisis: Introducing the Children's Climate Risk Index' (2021) New York: United Nations Children's Fund



2 BASICS OF CLIMATE CHANGE



2.1 WHAT YOU NEED TO KNOW

The world's leading scientists unanimously agree that:

- The earth's average temperature is rising at an unprecedented rate
- Human activities, namely the use of fossil fuels — coal, oil, and natural gas — are the primary drivers of this rapid warming of the earth and climate change
- Continued warming is expected to have harmful effects worldwide.

fast facts

What is the difference between weather, climate, and climate variability?

- **Weather** is the temperature, humidity, precipitation, cloudiness, and wind that we experience in the atmosphere at a given time in a specific location
- **Climate** is the average weather over a long period (30–50 years) in a region
- **Climate variability** refers to the natural variation in climate that occurs over months or decades. El Niño, which changes temperature, rain, and wind patterns in many regions over about 2–7 years, is a good example of natural climate variability, also called natural variability

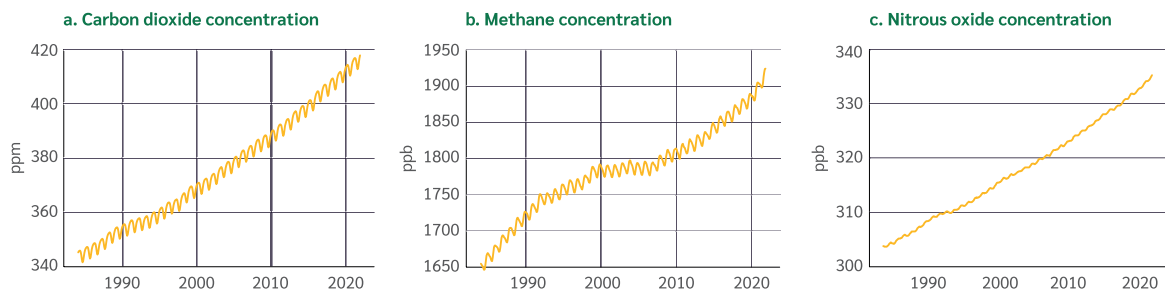
Data taken from ice cores shows that the earth’s average temperature is rising more now than it has in 800,000 years because of human activities over the last 150 years (e.g.: burning of fossil fuels and deforestation). These activities have dramatically increased the amount of heat trapping GHGs in the atmosphere, causing the planet to warm. There are many GHGs, each with a different ability to trap heat (known as its “global warming potential”). GHGs are sometimes called “climate active pollutants” because most have additional effects, most notably on human health. These GHGs act like a “greenhouse/blanket/windshield”, trapping the sun’s energy and heat, rather than letting it reflect into space. When the concentration of GHGs is too high, too much heat is trapped, and the earth’s temperature rises outside the range of natural variability.

THE PROBLEM

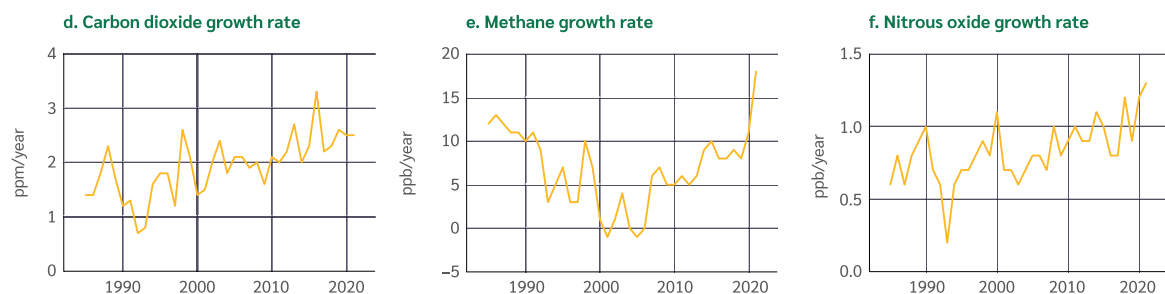
Rising carbon dioxide in the atmosphere

The level of carbon dioxide (CO₂) has been rising since the industrial revolution and is now at the highest it’s been in about 4 million years. The rate of the rise has been the fastest for 66 million years — with scientists saying that we are in “uncharted territory.” Carbon dioxide (CO₂) is the GHG responsible for the greatest amount of warming to date. The majority of CO₂ is released from the incomplete combustion of fossil fuels — coal, oil, and gas — used for electricity production, transportation, and industrial processes. Together, these three activities account for more than 80% of the CO₂ released into the atmosphere. Although the other GHGs are emitted in smaller quantities than CO₂, they trap more heat in the atmosphere than CO₂ does.

Figure 2 | Top row: Monthly globally averaged mole fraction (measure of atmospheric concentration), from 1984 to 2021, of (a) CO₂ in parts per million, (b) CH₄ in parts per billion and (c) N₂O in parts per billion.

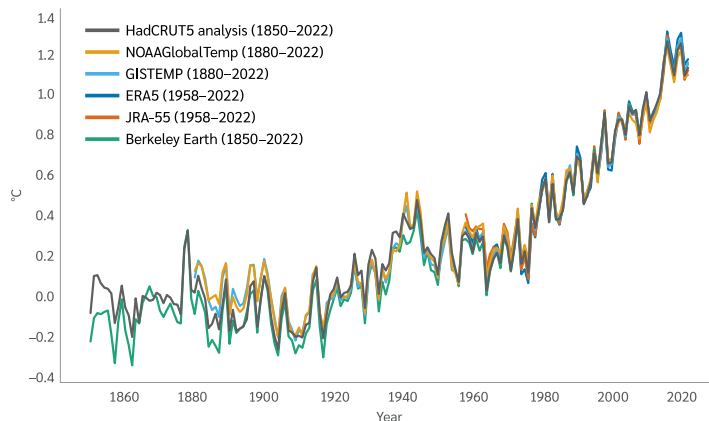


Bottom row: the growth rates representing increases in successive annual means of mole fractions for (d) CO₂ in parts per million per year, (e) CH₄ in parts per billion per year and (f) N₂O in parts per billion per year.



Source: World Meteorological Organization ‘The State of Global Climate, 2022’ (2022) No. 1316 1-55 at 2.

Figure 3 | Global mean temperatures between 1850 and 2022.



Source: World Meteorological Organization ‘The State of Global Climate, 2022’ (2022) No. 1316 1-55 at 3.

Incidentally, global warming refers only to the earth’s rising surface temperature, while climate change includes warming and the “side effects” of warming — like melting glaciers, heavier rainstorms, or more frequent drought. Global warming is one symptom of the much larger problem of human-caused climate change. The planet is set to warm by 3°C (5.4°F) above pre-industrial levels between 2023–2027.

There is a 66% chance of the annual average near surface global temperature being 1.5°C above pre-industrial levels for the duration of a year with a 98% chance that the next 5 years will be the warmest periods on record³⁷.

6 CRITICAL GLOBAL ENVIRONMENTAL CHANGES

- **Warming the temperature of the earth’s surface and the oceans:** The earth has warmed at a rate of 0.13°C per decade since 1957, almost twice as fast as its rate of warming during the previous century. The global mean temperature (near-surface temperature measurements over land and ocean) in 2022 was 1.15°C above the 1850–1900 pre-industrial average³⁸. Between 2023 and 2027, the global mean temperature is predicted to be between 1.1°C and 1.8°C higher than the average between 1950 and 1990 with a 98% chance that between 2023 and 2027, one year will exceed the warmest year on record (2016)³⁹.
- **Changes in the global water cycle (‘hydrologic’ cycle):** Over the past century there have been distinct geographical changes in total annual precipitation, with some areas experiencing severe and long-term drought and others experiencing increased annual precipitation. The frequency and intensity of storms increases as the atmosphere warms and can hold more water vapor.
- **Melting glaciers and snowpack:** Across the globe, nearly all glaciers are decreasing in area, volume, and mass. One billion people living in river watersheds fed by glaciers and snowmelt are thus impacted.
- **Sea level rise:** Warmer water expands. So, as oceans warm, the increased volume of water is causing sea levels to rise. Melting glaciers and snowpack also contribute to rising sea levels.
- **Marine heatwaves (MHW) and cold spells (MCS):** MHW and MCS are the prolonged periods of extreme cold or heat in the oceans and seas. In 2022, 58% of the ocean surface experienced one MHW and 25% experienced one MCS which had consequences on marine life and communities that depended on it.
- **Ocean acidification and warming:** Oceans absorbed about 25% of the CO₂ emitted into the atmosphere between 1960 and 2021, leading to the acidification of seawater. Ocean warming rates were higher in the last two decades.

³⁷ World Meteorological Organization (WMO) ‘Global Temperatures set to reach new records in next 5 years’ 17 May 2023 available at <https://public.wmo.int/en/media/press-release/global-temperatures-set-reach-new-records-next-five-years> accessed on 9 August 2023.

³⁸ World Meteorological Organization (WMO) ‘WMO Global Annual to Decadal Climate Update 2023-2027’ (2023) WMO 1-24 at 1.

³⁹ *Ibid.*

These large-scale global changes result in what we experience as variations in our local weather and climate:

- Higher average temperatures
- Greater climate variability, with “wetter wets”, “drier dries” and “hotter hots”
- More frequent and severe extreme weather events, like intense precipitation and heatwaves
- Natural disasters, like cyclones, droughts, floods and wildfires.
- Worsening air quality, with increased smog and pollen⁴⁰.

SOLUTIONS?

In general, climate solutions fall into two big buckets: “**mitigation**” and “**adaptation**”; and increasingly, government and community organizations are talking about measures to increase climate “**resilience**.” These concepts are not distinct and are all interrelated.

Mitigation refers to “measures to reduce the amount and speed of future climate change by reducing emissions of heat-trapping gases or removing carbon dioxide from the atmosphere.” There are many mitigation strategies that offer feasible and cost-effective ways to reduce greenhouse gas emissions. These include:

- A rapid, just, and equitable transition away from fossil fuels (coal, oil, and gas)
- the use of clean, renewable, and healthy energy for electricity production
- walking, cycling and using low-carbon or zero-emission vehicles
- reducing meat consumption
- less flying
- changing agricultural practices
- limiting deforestation and
- planting trees

Adaptation refers to measures taken to reduce the harmful impacts of climate change or taking advantage of any beneficial opportunities through “adjustments in natural or human systems.” Because GHGs persist in the atmosphere for a long time, more serious climate impacts would be experienced even if we halted all GHGs emissions today. Adaptation strategies are needed to reduce the harmful impacts of climate change and allow communities to thrive in the face of climate change.

Resilience means the “capability to anticipate, prepare for, respond to, and recover from significant climate threats with minimum damage to social well-being, the economy, and the environment.” Climate vulnerability is the degree to which people or communities are at risk of experiencing the negative impacts of climate change⁴¹. The flip side of climate vulnerability is climate resilience, which is the capacity to anticipate, plan for, and reduce the dangers of the environmental and social changes brought about by climate change, and to seize any opportunities associated with these changes⁴².

40 C K Uejio, C.K et al ‘Primer on climate science’ in Global Climate Change and Human Health: From Science to practice (2015) 1 Wiley Publishing San Francisco, CA 12-18.

41 International Panel on Climate Change (IPCC) ‘Climate Change 2014: Impacts, Adaptation, and Vulnerability Part A: Global and Sectoral Aspects’ (2014) Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. University Press, Cambridge, United Kingdom and New York, NY, USA.

42 The Kresge Foundation ‘Bounce forward, urban resilience in the era of climate change’ 4 May 2015 available at <https://kresge.org/resource/bounce-forward-urban-resilience-in-the-era-of-climate-change/> accessed on 17 July 2023.

2.2. SOUTH AFRICAN LEGISLATION AND INTERNATIONAL AGREEMENTS

2.2.1. International Agreements



Montreal Protocol, 1987

The Montreal Protocol was a historic environmental accord that became a model for future diplomacy on climate change. Every country in the world eventually ratified the treaty, which required them to stop producing substances that damage the ozone layer, such as chlorofluorocarbons (CFCs). The protocol has succeeded in eliminating nearly 99% of these ozone depleting substances. In 2016, parties agreed via the Kigali Amendment to also reduce their production of hydrofluorocarbons (HFCs), powerful GHGs that contribute to climate change.



Paris Agreement, 2015

PARIS2015
UN CLIMATE CHANGE CONFERENCE
COP21·CMP11

The Paris Agreement requires all countries to set

emissions-reduction pledges. Governments set targets, known as nationally determined contributions, with the goal of preventing the global average temperature from rising 2°C above pre-industrial levels and to keep it below 1.5°C. It also aims to reach global net-zero emissions, where the amount of GHGs emitted equals the amount removed from the atmosphere, in the second half of the century (also known as being climate neutral or carbon neutral). Countries are supposed to assess their progress towards implementing the agreement through a process known as the global stock-take every five years, the first of which is planned for 2023. To stay below the 1.5°C rise requires that from now on, total global emissions do not exceed 240 billion tons of carbon into the earth's atmosphere. This is referred to as our "carbon budget." At current emissions rates, this carbon budget will be used up within the next 6 to 11 years.



African Climate Change and Resilient Development Strategy and Action Plan (2022–2032)

The plan is a 10-year strategic planning document and the continent's first collective climate response framework. It was endorsed on 6 February 2022 at the African Union (AU) Heads of State Summit and seeks to:

- enhance the adaptive capacities of Member States;
- promote low-emission growth pathways aligned with the 1.5°C Paris Agreement goal; and
- orient governance, knowledge systems, planning, and national/regional/international structures to addressing climate change as a development imperative.



United Nations
Climate Change

UN Framework Convention on Climate Change (UNFCCC), 1992

Ratified by 197 countries, this landmark accord was the first global treaty to explicitly address climate change. It established an annual forum, known as the Conference of the Parties (COP), for international discussions aimed at stabilizing the concentration of GHGs in the atmosphere. These meetings produced the Kyoto Protocol and the Paris Agreement.



Kyoto Protocol, 2005

The Kyoto Protocol, adopted in 1997 and entered into force in 2005, was the first legally binding climate treaty. It required developed countries to reduce emissions by an average of 5% below 1990 levels and established a system to monitor the progress of the countries. The treaty does not compel developing countries to act.

2.2.2. South African Legislation

Table 1 | A guide to South African legislative and policy responses to climate change

Acts and Bills	Policies	Regulations	Case Law
<p>National Climate Change Bill, 2018 Provides for coordinated response, effective management of impacts making a fair contribution to global stability of GHGs emission.</p>	<p>National Waste Management Strategy, 2020 Aims to reduce the waste sector’s carbon footprint and make use of biogas.</p>	<p>National Climate Change Response White Paper Seeks to build the climate resilience of the country, its economy, and its people, and manage the transition to a climate-resilient, equitable and internationally competitive lower-carbon economy and society.</p>	<p><i>South Durban Community Environmental Alliance and Another v Minister of Forestry, Fisheries and The Environment and Others</i> (17554/2021) [2022] ZAGPPHC 741 (6 October 2022)</p>
<p>Disaster Management Act, 2002 Provides a framework for response to natural or human-caused disasters and regulates disaster management at the provincial and local levels.</p>	<p>Economic Reconstruction and Recovery Plan, 2020 Seeks to increase the use of green infrastructure bonds and green climate finance, and pursue green industrialisation and other green economy interventions.</p>	<p>National Climate Change and Health Adaptation Plan, 2014–2019 Outlines the broad approach of the health sector in tackling adaptation to climate change and refers to other national sector adaptation plans to ensure a comprehensive, integrated approach at a national level.</p>	<p><i>Sustaining the Wild Coast NPC and Others v Minister of Mineral Resources and Energy and Others</i> (3491/2021) [2022] ZAECMKHC 55; 2022 (6) SA 589 (ECMk) (1 September 2022)</p>
<p>National Environmental Management: Air Quality Act 39 of 2004 Seeks to reform the law regulating air quality; protect the environment; promote justifiable economic and social development; and provide for national norms and standards regulating air quality monitoring, and management.</p>	<p>National Strategy for Climate Change Adaptation, 2020 Provides guidance across levels of government, sectors, and stakeholders affected by climate variability and change, serving as the National Adaptation Plan and fulfilling the countries commitment to its international obligations under the Paris Agreement.</p>	<p>Drought Management Plan, 2005 Proposes several specific actions and gives technical assistance to provincial agricultural departments’ drought assessments.</p>	<p><i>Trustees for the time being of Groundwork Trust and Another v Minister of Environmental Affairs and Others</i> (39724/2019) [2022] ZAGPPHC 208 (18 March 2022)</p>
<p>Carbon Tax Act 15 of 2019 Aims to provide for the imposition of a tax on the carbon dioxide equivalent of GHG emissions.</p>	<p>South Africa’s low carbon emission development strategy 2050 Aims to enable a low-carbon growth trajectory, make a fair contribution to the global effort to limit the average temperature increase and ensure a just transition and the building of the country’s resilience to climate change</p>	<p>National Greenhouse emission reporting regulations, 2016 Introduces a single national reporting system for the transparent reporting of GHG emissions</p>	

2.2.3. The Just Transition Framework for South Africa

The Just Transition Framework, 2022

The Just Transition Framework is a framework which was designed and adopted by the Presidential Climate Commission (PCC) on the 27th May 2022. The Framework seeks to guide the coordination and coherence of the just transition planning in the country setting out the vision, principles and interventions that will give effect to the transition⁴³. The framework is created to guide social partners, across all sectors, “design their own policies and programmes in line with their specific conditions, responsibilities, and realms of influence, based on the vision, principles, and interventions articulated in the framework”⁴⁴.

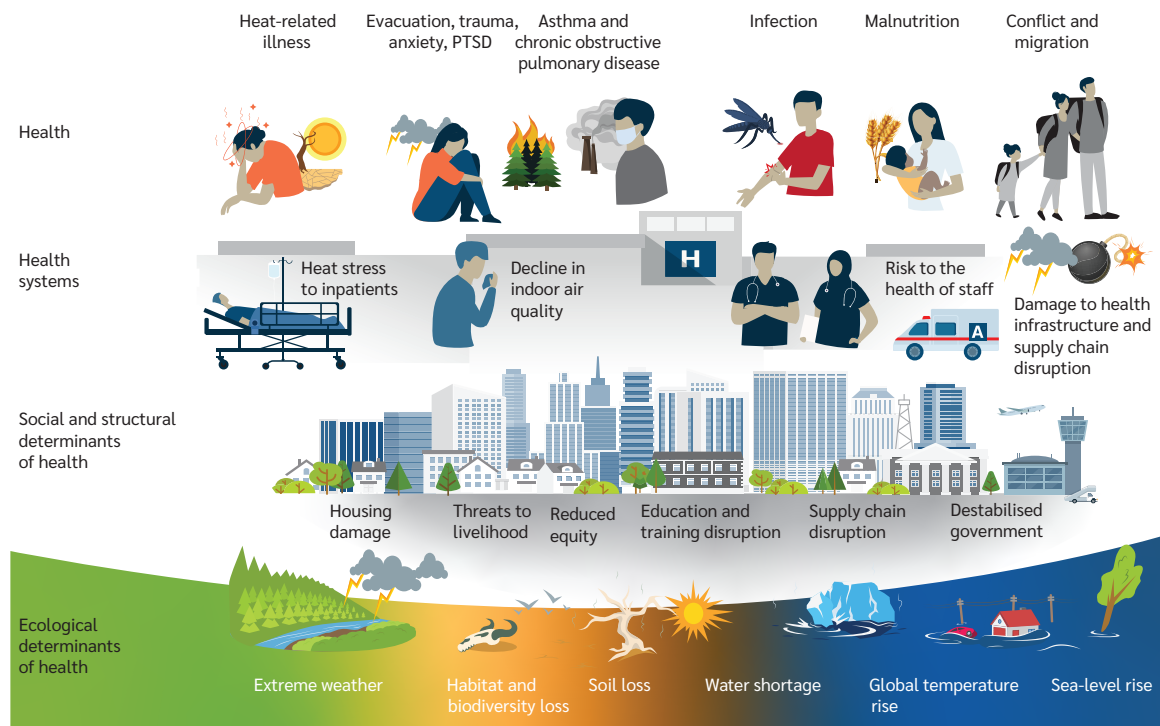
⁴³ The Presidential Climate Commission (PCC) ‘A Framework for a Just Transition in South Africa’ June 2022 available at <https://pcccommissionflow.imgix.net/uploads/images/A-Just-Transition-Framework-for-South-Africa-2022.pdf> accessed on 6 August 2023 1-33 at at 3 and 5.

⁴⁴ *Ibid* at 5.



3 CLIMATE CHANGE AND HEALTH

Figure 4 | The relationship between climate change and health outcomes.

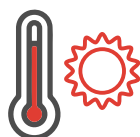


Source: C Howard et al 'Learning to treat the climate emergency together: social tipping interventions by the health community' (2023) 7 *Lancet Planet Health* 251-64.

As climate conditions change, the world will witness more frequent and intensified weather and climate events including:



storms



extreme heat



floods



droughts



wildfires⁴⁵

⁴⁵ World Health Organization (WHO) 'World Health Statistics 2023 Monitoring Health for the Sustainable Development Goals (SDGs)' (2023) Geneva 2-119 at 24.

As a result of the climate and weather hazards, the health of populations is affected both directly and indirectly⁴⁶.

Directly through:	Indirectly through:
<ul style="list-style-type: none">● death● bodily injury● displacement● poor mental health● heat stroke	<ul style="list-style-type: none">● infectious and chronic disease● violence and injury● poor outcomes for mental health, women’s health, children’s health, and occupational health⁴⁷● changes in the distribution of disease vectors (e.g., mosquitoes) and water-borne pathogens● decreased water and air quality● malnutrition from a reduction in food availability and quality⁴⁸.

Due to the direct and indirect effects of climate change on human health, our health professionals, who are our human resources for health, and health infrastructure will be negatively impacted⁴⁹. As climate shocks and stresses (changing temperatures and precipitation patterns) continue, droughts, floods and rising sea levels will continue to eat away at the environmental and social determinants of physical and mental health⁵⁰.

In South Africa, the loss and damage to natural and societal systems has already been felt by the country and climate change has brought about warmer mean annual surface temperatures of 1.2°C⁵¹. In addition to increases in the number of extremely hot days, including an increase in marine heat waves across the coastline, the country has also witnessed a reduction in rainfall, increase in multi-year droughts and an increase in the number and intensity of precipitation events (floods in Kwa-Zulu Natal and the Eastern Cape)⁵². When climate and weather events/disasters occur, it is the most vulnerable people, due to factors such as age, gender⁵³, and disabilities that are disproportionately affected. Due to less resilient health infrastructure as well as unequal access to healthcare, and financial resources⁵⁴ within those communities, they struggle to meaningfully address these events/hazards⁵⁵.

46 World Health Organization (WHO) op cit (n45).

47 J E Meyers, H A Rother ‘Public Health Impacts of and Response to Climate Change in South Africa’ (2013/13) SAHR 127-138 at 131.

48 C K Uejio, C.K et al op cit (n40).

49 World Health Organization op cit (n45).

50 *Ibid.*

51 G Ziervogal et al ‘Climate change in South Africa: Risks and opportunities for climate-resilient development in the IPCC Sixth Assessment WGII Report’ (2022) 118 (9/10) *S Afr J Sci.* 1-5 at 1.

52 *Ibid.*

53 C H Trisos et al op cit (n11) at 1372.

54 A Manga et al ‘Healthcare and Climate Change: A South African Health Professionals Perspective’ (2022) 4(3) *Wits Journal of Clinical Medicine* 173-180 at 173.

55 C H Trisos et al op cit (n11).

South Africa is especially vulnerable to climate change and its impacts on health because of:

- numerous rural and informal⁵⁶ communities
- high endemic poverty levels with 13.8 million people living below the food poverty line⁵⁷
- unequal and/or poor access to healthcare services
- high rates of non-communicable diseases such as cardiovascular disease, respiratory disease and cancers that have the potential to worsen with climate change⁵⁸
- considerable burdens on the healthcare system as it struggles with a quadruple burden of disease: maternal, new-born, and child health, HIV/AIDS, tuberculosis (TB), non-communicable diseases and violence and injury⁵⁹.



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Ultimately, the existing inequalities amongst the vulnerable populations that interact with social factors, some of which are mentioned above, will be aggravated by the direct and indirect impacts of climate change⁶⁰.

South Africa has taken steps towards achieving equitable access to health through the introduction of the National Health Insurance Bill (NHI) and focus on achieving Sustainable Development Goals (SDG) 3 targets⁶¹. However, climate change is a significant threat to the strides taken thus far. Climate change will continue to impact health systems by increasing the demand for services, affecting infrastructure and supply chains, and endangering the health workforce due to hazardous and strained personal and professional circumstances⁶².

- ⁵⁶ International Budget Partnership (IBP) 'Asivikelane: Helping South Africa's informal settlement residents' voices be heard' 27 October 2021 available at <https://internationalbudget.org/asivikelane-helping-south-africas-informal-settlement-residents-voices-be-heard/#:~:text=Background,running%20water%20and%20refuse%20removal>. accessed on 12 July 2023.
- ⁵⁷ BusinessTech 'Rough start to 2023 for hungry South Africans' 5 January 2023 available at <https://businesstech.co.za/news/lifestyle/653981/rough-start-to-2023-for-hungry-south-africans/> accessed on 10 July 2023.
- ⁵⁸ A Manga et al op cit (n54).
- ⁵⁹ Parliamentary Monitoring Group (PMG) 'Burden of Health and Disease in South Africa: Medical Research Council Briefing' 15 March 2015 National Council of Provinces Health and Social Services available at <https://pmg.org.za/committee-meeting/22198/#:~:text=The%20quadruple%20burden%20of%20disease,diseases%3B%20and%20violence%20and%20injury>. Accessed on 10 July 2023.
- ⁶⁰ M M Khine, U Langkulsen 'The Implications of Climate Change on Health among Vulnerable Populations in South Africa: A Systematic Review' (2023) 20 *Int. J. Environ.Res. Public Health* 1-19 at 4.
- ⁶¹ T H Mathew et al 'Climate change impacts and effects on health system: A challenge towards the achievement of sustainable development goal 3 in South Africa' (2020) 26 *Technium Social Sciences Journal* 950-967 at 954-956.
- ⁶² C Howard et al 'Learning to treat the climate emergency together: social tipping interventions by the health community' (2023) 7 *Lancet Planet Health* 251-64 at 251

CLIMATE CHANGE



AND ITS HEALTH IMPACTS

WEATHER EVENTS

- Flood
- Drought
- Cyclone
- Hurricane
- Heatwave
- El Nino/La Lino
- Others

DISEASE

- Malaria**
Vector borne
- Dengue**
Water borne
- Lyme Disease**
Food borne
- Hamorrhagic Fever**
Rodent borne
- Yellow Fever**
Vector borne
- West Nile Fever**
Vector borne
- Others**

HUMAN RESPONSE

- Education
- Social response
- Public Health
- Human Adaptation
- Forecast
- Social development

Source: M D Khan et al 'Aggravation of human disease and climate change nexus' (2019) 16 Int. J. Environ. Res. Public Health 1-26 at 2.



4 CLIMATE CHANGE AND ITS HEALTH IMPACT

4.1. CLIMATE CHANGE AND COMMUNICABLE DISEASE (VECTOR, FOOD, WATER BORNE) AND HUMAN TO HUMAN TRANSMITTED DISEASES (HIV/AIDS AND TUBERCULOSIS (TB))

Climate change influences the physical environment, ecosystems, human health, and societies⁶³ — it also has a significant impact on infectious diseases, contributing to their changing ecology and the dynamics of their transmission⁶⁴. The kinds of diseases influenced by climate change are those where the pathogens spend more time outside the human body and in the environment; for example, those diseases that are spread by vectors, water, aerosols, fomites, and food⁶⁵. Pathogens are the agents that cause the disease, and include bacteria, viruses, fungi, microorganisms, and parasites⁶⁶. When being transferred to their host, the transmission itself and the life cycle of the pathogen is impacted by temperature. Excessive temperature rises are ideal for the reproduction of pathogens — temperatures of 38°C to 39°C minimize the growth of parasites, and extreme hot weather results in the rise of microorganisms⁶⁷.

The Intergovernmental Panel on Climate Change (IPCC) predicted a 1.5°C to 5.8°C rise in global mean temperature in the 21st century which would bring about severe weather events⁶⁸. When climate change occurs, the patterns in infectious disease are also shifted, for the worst in most cases⁶⁹, putting human health at risk through the emergence of infectious disease⁷⁰. Human health is affected through the emergence and re-emergence of pathogen disease, vectors and through favourable conditions for the transmission and outbreak of infectious diseases, after the weather event has occurred⁷¹.

63 J Nel, L Richards 'Climate Change and impact on infectious disease' (2022) 4(3) *Wits Journal of Clinical Medicine* 129-134 at 129.

64 C McMichael 'Climate change-related migration and infectious disease (2015) 6(6) *Virulence* 548-553 at 548.

65 J Nel, L Richards op cit (n63).

66 M D Khan et al 'Aggravation of Human Disease and Climate Change Nexus' (2019) 16 *International Journal of Environmental Research and Public Health* 1-26 at 7.

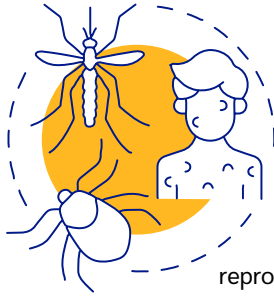
67 *Ibid.*

68 M D Khan et al op cit (n66) at 1.

69 J Nel, L Richards op cit (n63).

70 *Ibid.*

71 *Ibid* at 2.



4.1.1. Vector-borne disease

Vectors, such as certain ticks and mosquitoes⁷², are living organisms that carry pathogens causing diseases from one infected host to another⁷³, which can be a human or an animal⁷⁴. Climate change controls the seasonal and geographic distribution of vector-borne diseases, and the weather influences how severe and how long the outbreaks will last⁷⁵. Most vectors are sensitive to whatever climate exists at any given time — warmer temperatures will result in higher reproduction and survival of mosquitos and increased rainfall creates stagnant water pools and opportunities for mosquitoes to lay eggs⁷⁶. According to WHO, one-sixth of illnesses and disabilities globally result from vector-borne diseases with one billion-plus people infected and one million people dying from vector-borne diseases like malaria, dengue, Chagas’ disease, schistosomiasis, leishmaniasis and African trypanosomiasis⁷⁷.

Zoonotic diseases, similar to vector-borne diseases, are infectious and are passed on to human beings from vertebrate animals (wildlife and domestic animals⁷⁸) — these diseases are acquired when pathogens are transmitted between vertebrate animals and human beings⁷⁹. Although zoonotic diseases are transmitted between vertebrate animals and humans, these diseases can be vector-borne (transmitted by a vertebrate) and nonvector-borne (transmitted by a direct or indirect contact with a vertebrate host)⁸⁰. As our biodiversity declines (due to wildlife hunting and trade⁸¹) and our ecosystem continues to be destroyed, the spread of zoonotic diseases will increase⁸². As temperatures rise, so will the spread of zoonotic hosts to higher latitudes and elevations, increasing human exposure⁸³. The pathogens from zoonotics can be transmitted directly (contact with living or dead animals), via vectors or indirectly from the environment (air, water and soil) with the degradation of the environment influencing the pathways through which they are spread⁸⁴.

The WHO has recorded an increase in the emergence of infectious diseases (EID) with zoonotic diseases accounting for 60% of EID and 71% of these EID coming from wildlife⁸⁵.



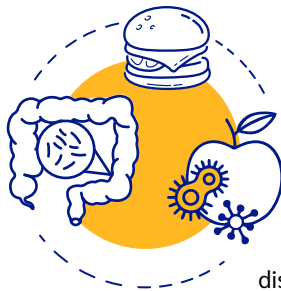
4.1.2. Water-borne disease

This category of disease develops in the human digestive system from the consumption of water or water-related foods (such as fish and shellfish)⁸⁶. With changes in precipitation patterns, rising sea levels, and the altering of seawater salinity, the temperature of surface water will be impacted along with the reproduction and survival of viruses and bacteria in water bodies⁸⁷. For example, floods will impact sanitation systems, causing the contamination of

- 72 *Ibid.*
 73 M D Khan et al op cit (n66) at 8.
 74 *Ibid.*
 75 J Nel, L Richards op cit (n63).
 76 *Ibid* at 130.
 77 D Campbell-Lendrum et al ‘Climate Change and vector-borne disease: what are the implications for public health research and policy?’ (2015) *Phil. Trans. R. Soc. B* 1-8 at 1.
 78 The World Health Organization WHO (Europe) ‘A health perspective on the role of the environment in One Health’ (2022) Copenhagen: WHO Regional Office for Europe 1-60 at 5.
 79 J N Mills, K L Cage, A S Khan ‘Potential impacts of climate change on Vector-borne and Zoonotic Disease: A Review and Proposed Research Plan’ (2010) *Environmental Health Perspectives (EHP)* 118(11) 1507-1514 at 1507.
 80 *Ibid.*
 81 The World Health Organization WHO (Europe) op cit (n78) at viii.
 82 The Lancet ‘Twin threats: climate change and zoonoses’ (2023) *The Lancet Infectious Disease* 23 (1).
 83 The World Health Organization WHO (Europe) op cit (n78).
 84 *Ibid* at 5.
 85 *Ibid.*
 86 Y-Ju Yong et al ‘Impact of Climate Change on Water-Borne Disease: Directions towards Sustainability’ (2023) *15 Water* 1-11 at 2.
 87 *Ibid.*

water sources and the environment. Droughts, on the other hand, reduce the size of stagnant water gathering all the water-borne pathogens in one area while diminishing the availability of water for purposes of hygiene⁸⁸. Cholera and typhoid are examples of water/food-borne diseases that are associated with temperature rises. The incidence of salmonella, which is a bacterial infection, is projected to increase with every 1°C increase in temperature⁸⁹.

According to WHO, 1.1 billion people worldwide consume water that has been polluted by faeces each year⁹⁰. In South Africa, the cholera outbreak in 2023 resulted in the reported deaths of 31 persons⁹¹.

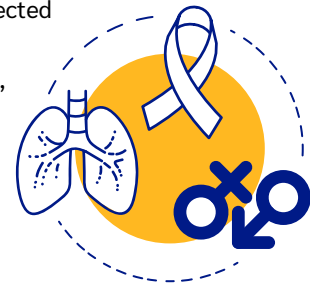


4.1.3. Food-borne disease

Food-borne diseases come about because of the ingestion of food that is contaminated by pathogens that may have low infection rates and can survive in the environment, even during extreme weather conditions⁹². Heavy rainfall, flooding and increased temperatures increase bacteria like salmonella and campylobacter infections, and as temperatures rise, the reproductive capabilities of these bacteria rise with it⁹³. Food-borne diseases, like vector and water-borne diseases, impact human health — in Africa alone, food-borne diseases are estimated to cause 24 million illnesses and 125,000 deaths each year due to lack of access to nutritious food, bad hygiene and sanitation practices and limited surveillance of food safety⁹⁴. This number is bound to increase with the occurrence of extreme weather.

4.1.4. Human to Human Transmitted Diseases (HIV/AIDS and Tuberculosis (TB))

While diseases that are transmitted from human to human may not be directly affected by climate change, they are indirectly affected due to factors like migration and human displacement, and the state of health and living conditions⁹⁵. For example, internal and international migration will change how infectious diseases are distributed, and the occurrence of the disease, as migrants may serve as carriers for infectious diseases (malaria, tuberculosis (TB), hepatitis B and sexually transmissible infections (STIs) etc)⁹⁶. Migrants are also at risk of being exposed to new infection from their new locations and stand to reintroduce infectious agents because of return migration⁹⁷.



Like climate change, infectious diseases pose a greater risk to persons subject to poorer environmental and social conditions due to lack of access to preventive and curative health interventions and services. This in turn impacts individuals, household and health systems, and increases disease burden, and health inequality, ultimately straining healthcare services and delaying socioeconomic development.

88 J Nel, L Richards op cit (n63) at 130.

89 Y-Ju Yong et al op cit (n86) at 2.

90 *Ibid* at 3.

91 D Naidoo 'SA cholera outbreak: governance failures bode ill for climate catastrophe' 19 June 2023 Institute for Security Studies available at <https://issafrica.org/iss-today/sa-cholera-outbreak-governance-failures-bode-ill-for-climate-catastrophes> accessed on 20 July 2023.

92 J Nel, L Richards op cit (n63) at 131.

93 *Ibid*.

94 H Onyeaka et al 'Impact of COVID-19 on food-borne illness in Africa – A perspective piece' (2023) 16 *Journal of Infection and Public Health* 651-659 at 655.

95 *Ibid*.

96 C McMichael op cit (n64).

97 *Ibid*.

WHAT HEALTH SYSTEMS DO

to address climate and vector-borne diseases

1. Hospital systems should have:

- an established mechanism for developing and implementing a Hospital Emergency Risk Management/Preparedness Programme designed to ensure the effective management of the risks of internal and external emergencies, including epidemics.
- an established mechanism for developing and implementing a Hospital Emergency Response Plan, which includes an Epidemic Sub-plan for responding to the specific risks of an imminent or ongoing epidemic.

2. Hospital personnel should:

- be fully aware of their roles in preparing for, and responding to, an emergency.
- have been trained to perform the necessary actions.
- be able to provide day-to-day hospital services or have arrangements in place when deciding to suspend these services or refer patients to other health facilities in an emergency. The lines of communication needed to facilitate the coordination of the overall response to an emergency will function effectively within and between the different departments of a hospital; between hospital managers, staff and policy makers in public health authorities and between different hospitals; between hospitals, public health authorities and other healthcare entities; and between hospitals and the local health workforce, the communities they serve, hospitals and emergency services, and local providers of water, power, waste management, transport and communication services, and medical supplies.

3. Health systems should be able to adapt to the specific challenges of an epidemic, whatever the nature of the disease and the resources needed, and even in the event of a concurrent emergency.

4. Appropriate resources should be available in sufficient quantities to be used effectively despite problems associated with an epidemic, such as the potentially large number of people affected, community anxieties, misinformation, etc.

5. Due attention should be paid to the physical, mental, emotional, and social needs of hospital/healthcare facility staff, their families, and the communities they serve during an epidemic.

6. The emergency response should build on existing knowledge, practice, capabilities and capacities within the hospital, the health system, and the community⁹⁸.

98 World Health Organization (WHO) 'Hospital Preparedness for Epidemics' 4 April 2014 available at <https://www.who.int/publications/i/item/hospital-preparedness-for-epidemics> accessed on 25 July 2023.



CLIMATE CHANGE AND HEAT STRESS

Image Courtesy: Reuters

fast facts

Temperature in Southern Africa⁹⁹

Observations

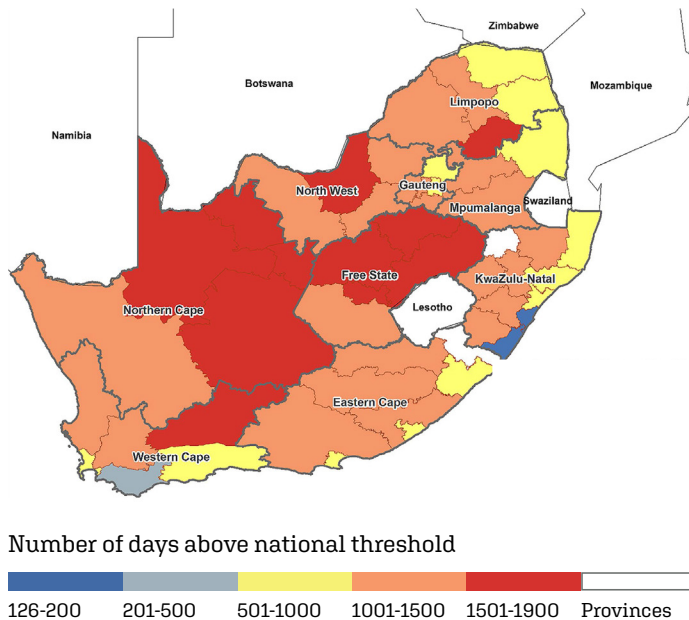
- Mean annual temperatures over the region increased by between 1.04°C and 1.44°C from 1961 to 2015.
- Annual number of hot days have increased with heat stress affecting health and agriculture.
- Occurrence of cold extremes has decreased.

Projections

- At 1.5°C, 2°C and 3°C of global warming above pre-industrial levels, mean annual temperatures in Southern Africa are projected to be on average 1.2°C, 2.3°C and 3.3°C warmer than the period from 1994 to 2005.
- Number of heatwaves annually is projected to increase from 2 to 4 (GWL 1.5°C), 4 to 8 (GWL 2°C) and 8 to 12 (GWL 3°C).
- Children born in 2020 under a 1.5°C compatible scenario will be exposed to 3-4 times more heatwaves than those born in 1960.

4.2. CLIMATE CHANGE AND HEAT STRESS

Figure 5 | This picture shows the spatial distribution of the number of days in districts in South Africa that are above the diurnal temperature range (DTR) threshold of 12.8°C from 2014-2019.



Source: T Kapwata et al 'An analysis of past and future heat waves based on a heat-associated mortality threshold: towards a heat health warning system' (2022) 21 (112) BMC 1-12.

When GHGs build up in the atmosphere, the radiative balance of the atmosphere is altered¹⁰⁰. The GHGs absorb some of the heat radiation from the earth and radiate it back towards the earth's surface. This warms the earth's surface and the lower atmosphere¹⁰¹, increasing heat waves which have been considered the deadliest of natural disasters¹⁰². When referring to heat waves, the reference is to the period of hot days over a given time with temperatures being above a given threshold¹⁰³.

Southern Africa is experiencing 1.5 to 2 times more temperature increases than the global average¹⁰⁴. Heat stress is the combination of air temperature, radiation, air movements and moisture content which, combined with the amount of clothes worn, makes the body unable to maintain its temperature between the tolerated limit of 35°C to 37°C, affecting the individual psychologically¹⁰⁵. When temperatures are higher than normal, the human impacts of heatwaves may be mild, leading only to a feeling of discomfort for those who are subject

to the heat stress¹⁰⁶. More severe effects of exposure to extreme heatwaves¹⁰⁷ include increased morbidity and mortality. Should global temperatures continue to rise as projected, by 2030 the world will have lost 2.2% of total working hours and 880,000 work life years because of occupational heat stress¹⁰⁸.

100 M C Herbst 'Fact Sheet on Climate Change, Heatwaves, and its Effect on the Incidence of Skin Cancer' February 2019 Cancer Association of South Africa available at https://www.researchgate.net/publication/331319819_Fact_Sheet_on_Climate_Change_Heatwaves_and_its_Effect_on_the_Incidence_of_Skin_Cancer accessed on 12 July 2023.

101 *Ibid.*

102 N Seltnerich 'Between extremes: Health effects of heat and cold' (2015) 123(11) *Environ Health Perspect* 276-280 at 276.

103 T Kapwata et al 'An analysis of past and future heatwaves based on a heat-associated mortality threshold: towards a heat health warning system' (2022) 21 (112) *BMC* 1-12 at 1.

104 J M Hugo 'Heat stress: Adaptation measures in South African informal settlements' (2023) 4(1) *Buildings and Cities* 55-73 at 57.

105 *Ibid.*

106 K P Ncongwane et al 'Characteristics and Long-Term trends of Heat Stress for South Africa' (2021) 13 *Sustainability* 1-20 at 1.

107 T Kapwata et al op cit (n103) at 2.

108 M Amoadu et al 'Impact of climate change and heat stress on workers' health and productivity: A scoping review' (2023) 12 *The Journal of Climate Change and Health* 1-15 at 1.

South Africa is projected to experience 20 to 80 more heat waves from 2017 to 2100 with **Cape Town, Durban and Johannesburg** experiencing apparent or real-feel temperature thresholds of **18.6°C, 18.7°C, and 24.8°C**, which would increase the risk of mortality in those cities¹⁰⁹.



What this means for communities residing in these cities is:

- Increased incidences of heat strokes¹¹⁰, oedema, rash, cramps, exhaustion, and
- The exacerbation of underlying and pre-existing medical conditions like asthma, cardiovascular disease, hypertensive disease, chronic renal failure, mental disorder, dementia, and diabetes mellitus¹¹¹.

The ability of people to adapt to heat stress by changing their environment depends on their psychological, technological, and economic options. However, due to national power constraints, those able to afford luxuries like cooling systems may find themselves no better than those without¹¹².

Ultimately, people working outdoors¹¹³, the impoverished, the elderly, those residing in densely populated urban areas¹¹⁴ and informal settlements¹¹⁵, as well as women¹¹⁶ and children will bear the brunt of increases to temperature in the country and its associated impacts. Additionally, there is evidence to suggest that mosquitos that adapt to polluted water sources are more tolerant of high temperatures than those that aren't. Accordingly, high temperatures may directly put already vulnerable groups of people at increased risk of exposure to malaria vectors¹¹⁷.

¹⁰⁹ *Ibid.*

¹¹⁰ N Seltnerich op cit (n102) at 277.

¹¹¹ K P Ngongwane et al op cit (n106) at 2.

¹¹² B Parks et al 'Heat stress in Africa under high intensity climate change' (2022) 66 *International Journal of Biometeorology* 1531-1545 at 1531 and 2.

¹¹³ S Roffe et al, 'Heat is rising in Southern Africa' 26 January 2023 University of the Witwatersrand, Johannesburg available at <https://www.wits.ac.za/news/latest-news/opinion/2023/2023-01/heat-stress-is-rising-in-southern-africa.html> accessed on 12 July 2023.

¹¹⁴ K P Ngongwane et al op cit (n106) at 16 and N Jones et al 'Beating the Heat in South African Cities: Lessons from citizen science assessments' 17 November 2022 World Bank Blogs available at <https://blogs.worldbank.org/sustainablecities/ beating-heat-south-african-cities-lessons-citizen-science-assessment> accessed on 12 July 2023.

¹¹⁵ International Budget Partnership (IBP) op cit (n56).

¹¹⁶ M Amodu et al op cit (n108) at 9.

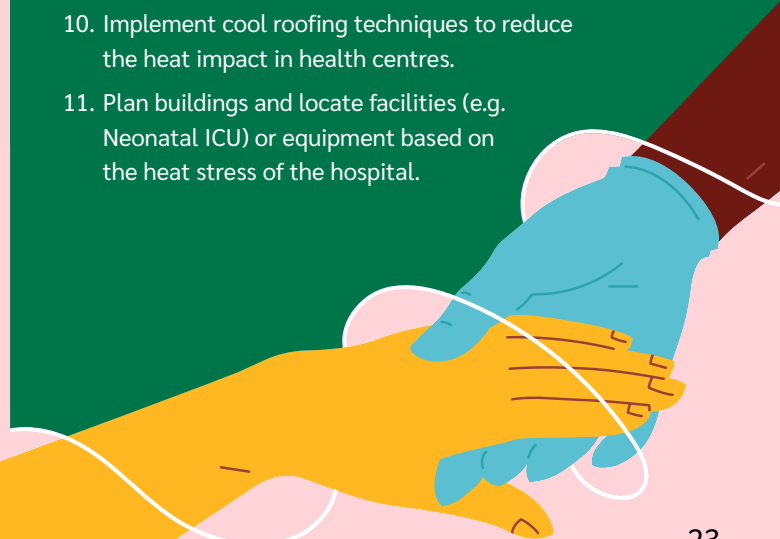
¹¹⁷ National Institute for Communicable Diseases 'How higher temperatures and pollution are affecting mosquitos' 24 April 2019 available at <https://www.nicd.ac.za/how-higher-temperatures-and-pollution-are-affecting-mosquitos/> accessed on 12 July 2023.



WHAT HEALTH PROFESSIONALS CAN DO to address climate and extreme heat

1. Make sure your hospital and local health department have an extreme heat emergency preparedness contingency plan.
2. Talk to patients about the risks and dangers of extreme heat, and how to prevent heat related health impacts by:
 - Avoiding strenuous activity in hot weather, drinking fluids and resting frequently in a cool spot.
 - Trying to schedule exercise or physical labor for cooler parts of the day, such as early morning or evening.
 - Wearing loose fitting, lightweight clothing to allow your body to cool properly.
3. Taking extra precautions with certain medications that can affect the body's ability to stay hydrated and dissipate heat.
4. Encourage the development of a neighbourhood response network to check in on vulnerable individuals during extreme heat events. Advise patients with pre-existing respiratory illness (asthma, COPD) to check air quality levels during extreme heat events and to limit outdoor air exposure when air quality is poor.
5. Advocate for “urban greening” — planting trees and building green infrastructure — in neighbourhoods that are lacking in trees and parks, to increase shade and cooling.
6. Support policies that increase energy efficiency and the use of clean, renewable energy. These limit global warming and reduce local impacts like the creation of urban heat islands which often result from increased energy use at the local level.
7. Find out if your city has a heat action plan and disseminate the plan among the patients. If there is no plan, develop appropriate guidance in your region.

WHAT HEALTH SYSTEMS CAN DO to address climate and extreme heat

1. Hospitals should have a designated area to attend to heat related illness.
 2. Health systems should have advisories for hospital preparedness, surveillance, and weekly meetings, including capacity building.
 3. Standard Operating Procedures to tackle all levels of heat related illness. Capacity Building for all health workers is important.
 4. Identify surge capacities, mark the beds dedicated to treat heat stroke victims, and enhance emergency department preparedness to handle more patients.
 5. Identify Rapid Response Teams (RRTs) to work alongside Community Health Workers (CHWs) in responding to any emergency calls outside the hospital.
 6. Ensure adequate arrangement of staff, beds, IV fluids, ORS, essential medicine, and equipment to cater to management of volume depletion and electrolyte imbalance.
 7. Try to establish outreach clinics at various locations easily accessible to the vulnerable population to reduce the number of cases affected. Health centres must undertake awareness campaigns for neighbourhood communities using different means of information dissemination.
 8. Primary health centres must refer the patients to a higher facility only after ensuring adequate stabilization and basic definitive care (cooling and hydration).
 9. Hospitals must ensure proper networking with nearby facilities and medical centres to share the patients load which exceed their surge capacities.
 10. Implement cool roofing techniques to reduce the heat impact in health centres.
 11. Plan buildings and locate facilities (e.g. Neonatal ICU) or equipment based on the heat stress of the hospital.
- 

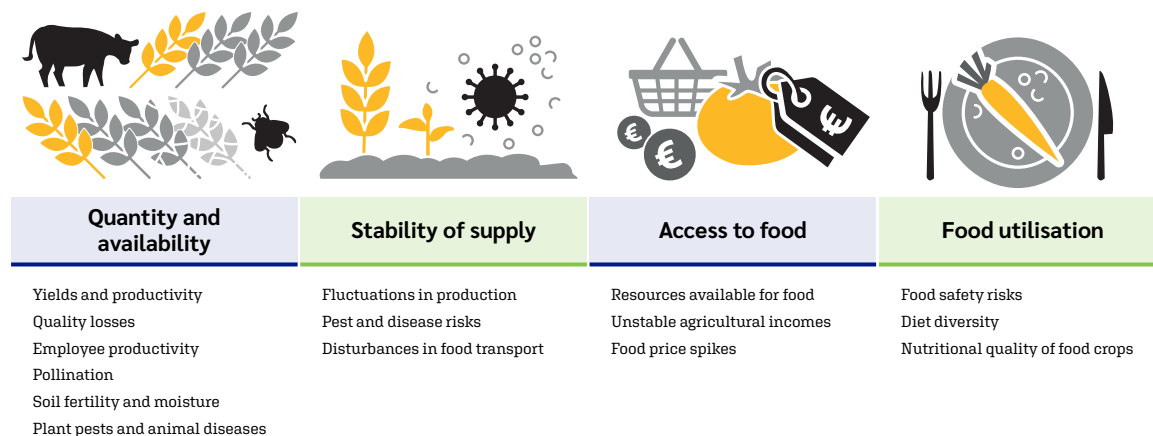
**CLIMATE
CHANGE**



**FOOD INSECURITY,
HUNGER, AND
MALNUTRITION**

4.3. CLIMATE CHANGE AND MALNUTRITION

Figure 6 | This picture shows that climate change impacts food security by affecting the food production chain in several ways.



Source: Climateguide.fi 'Infographics based on the IPCC's 6th Assessment report part 2 illustrates the impacts of and adaptation to climate change' 25 April 2022 available at <https://www.climateguide.fi/articles/infographics-based-on-the-ipccs-6th-assessment-report-part-2-illustrate-the--the-impacts-of-and-adaptation-to-climate-change> accessed on 14 July 2023.

The idea of food security is always grounded in the notion that people have physical and economic access to sufficient, safe, and nutritious quantities of food to meet their daily dietary requirements¹¹⁸. As such, the right to access food becomes central to a just food system¹¹⁹. Food is a central component of the climate crisis standing at the centre of the ecological, financial, and social crisis, and highlights how one affects the other¹²⁰. Food insecurity occurs when diets are not nutritious, have excess calories and when food is not free of harmful substances¹²¹. At the heart of food insecurity is malnourishment and then malnutrition — the deficiencies, excesses or imbalances in the nutrients and energy that we ingest¹²².

In sub-Saharan Africa (SSA), it is projected that an estimated 1.3 million people will suffer from acute food insecurity and high malnutrition. Climate change is set to worsen food insecurity, affecting child nutrition, educational attainment (malnourished and hungry children cannot learn to the best of their abilities) and any gains in health and education outcomes that SSA has attained thus far¹²³. What does this mean for South Africa, one of the most unequal countries in the world¹²⁴?

118 B Moyo 'Fulfilling the Right to Food in South: Justice, Security, Sovereignty and the Politics of Malnutrition' (2020) 11(3) *World Nutrition* 112-152 at 127.

119 *Ibid.*

120 A Bennie, A Satgoor 'Deepening the Just transition through food sovereignty and the solidarity economy' (2018) 293-313 at 293.

121 C Mbow et al '2019: Food Security. In: Climate Change and Land: an IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems' (2019) 437-550 available at <https://www.ipcc.ch/srccl/chapter/chapter-5/> accessed on 14 July 2023 at 442.

122 *Ibid.*

123 D M S Batista et al 'Climate Change and Chronic Food Insecurity in Sub-Saharan Africa' International Monetary Fund (IMF) 15 September 2022 available at <https://www.imf.org/en/Publications/Departmental-Papers-Policy-Papers/Issues/2022/09/13/Climate-Change-and-Chronic-Food-Insecurity-in-Sub-Saharan-Africa-522211> accessed on 14 July 2023 at 1.

124 A Mtinstilana 'Hunger in South Africa: study shows one in five are at risk' 15 February 2023 *The Conversation* available at <https://theconversation.com/hunger-in-south-africa-study-shows-one-in-five-are-at-risk-199133> accessed on 14 July 2023.



WHAT THE HEALTH SECTOR SHOULD DO to address climate and food insecurity, hunger, and malnutrition

- Educate your colleagues and community on the links between climate change, food insecurity, hunger, malnutrition, and health, and what can be done to prevent adverse health impacts
- Adopt the planetary health diet
- Encourage patients, colleagues, and communities to reduce meat consumption
- Incorporate sustainability in food based dietary guidelines
- Promote food sustainability in healthcare and public health
- Revisit and promote the option of indigenous diets to patients, communities, and colleagues
- Advocate around policies aimed at promoting sustainable food diets and food systems¹³⁶

According to Statistics South Africa (Stats SA), in 2021, 2.6 million South Africans reported inadequate access to food, while 1.1 million people reported severe inadequate access to food¹²⁵. Even without climate change, South Africans are facing food insecurity and hunger resulting from high unemployment and poverty¹²⁶. Climate change will worsen food insecurity and malnutrition in the country.

Climate change interacts with food systems in a complex manner¹²⁷. Notably, it will negatively impact the pillars of food security: availability, access, utilization, and stability¹²⁸. Climate drivers that are relevant to the production of food and availability are categorized as modal climate changes, seasonal changes, extreme events, atmospheric conditions, and dust¹²⁹. As a result of the effects of climate change on precipitation, hydrological systems, water quality and groundwater recharge are also affected¹³⁰. When climate unpredictability in rainfall and temperature occurs across South African provinces, this will impact food insecurity more so in the rural areas of the country where agriculture is considered the principal source of subsistence for these communities¹³¹. This will in turn result in a reduction in crop yields and livestock production for an already water deficient country¹³². As climate change persists and temperatures increase, the number of days suitable for plant growth will reduce. When combined with heat stress, this will further

result in crop and livestock production decreasing, affecting the income of those living in rural areas¹³³. As food production costs rise due to these deficiencies, consumer prices will go up¹³⁴, affecting communities struggling with unemployment and poverty. Consequently, the prevalence and number of undernourished communities will increase¹³⁵.

- 125 Statistics South Africa (Stats SA) 'Focus on food inadequacy and hunger in South Africa in 2021' 11 April 2023 available at <https://www.statssa.gov.za/?p=16235#:~:text=In%202021%2C%20about%20%2C1,and%20rising%20costs%20of%20living>. accessed on 14 July 2023.
- 126 B Moyo et al op cit (n118).
- 127 C Mbow et al op cit (n121).
- 128 *Ibid.*
- 129 *Ibid* at 451.
- 130 D M S Batista op cit (n123) at 2.
- 131 L Leonard 'Climate Change Impacts and Challenges of Combating Food Insecurity in Rural Somkhele, KwaZulu-Natal, South Africa' (2022) 14 *Sustainability* 1-17 at 1 and 2.
- 132 *Ibid.*
- 133 *Ibid.*
- 134 *Ibid.*
- 135 R B Pickson, E Boateng 'Climate change: a friend or foe to food security in Africa' (2022) 24 *Environmental, Development, Sustainability* 4387-4412 at 4390.
- 136 R R Guinto et al 'Health sector solutions for promoting sustainable and nutritious diets' (2022) *BMJ* 1-15.



**CLIMATE
CHANGE**

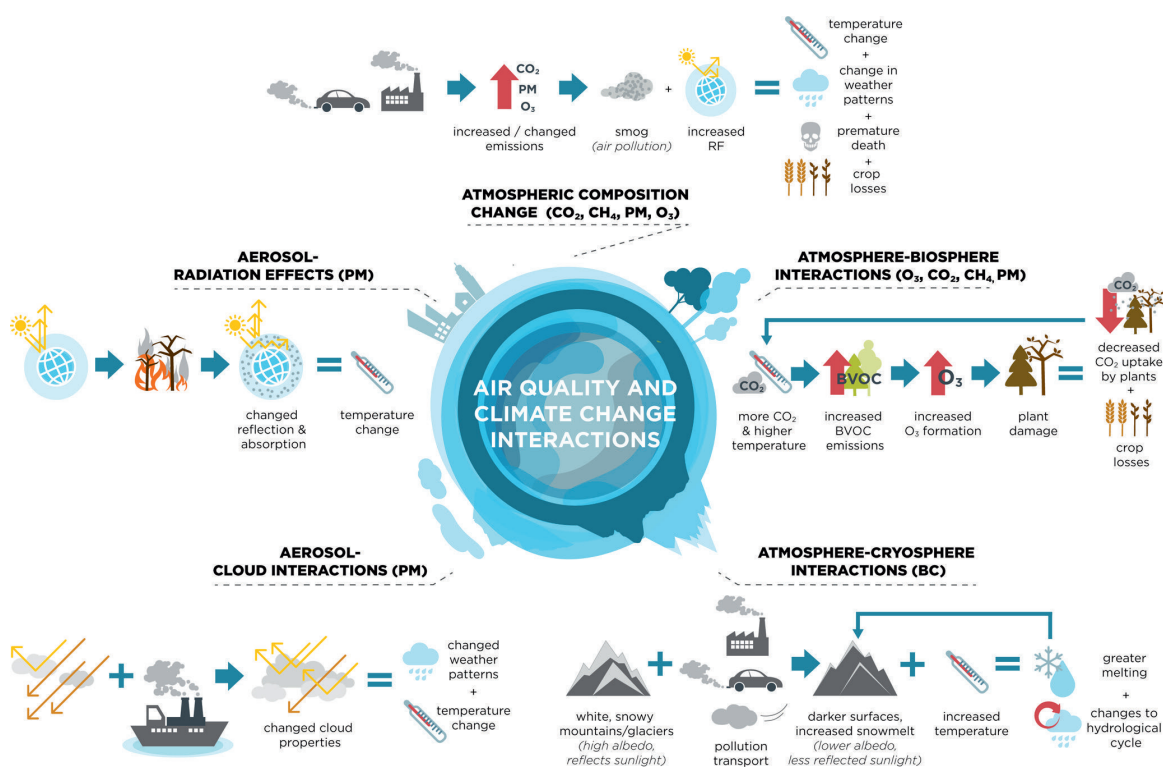
AND

AIR POLLUTION

4.4. CLIMATE CHANGE AND AIR POLLUTION

Climate change and air pollution intersect and influence each other¹³⁷ and are linked through emissions, atmospheric properties, processes, chemistry, and mitigation options¹³⁸. Additionally, it is worth noting that some sources emit both GHGs and air pollutants¹³⁹. Emissions from vehicles (causing ambient or outdoor air pollution) include particulate matter, nitrogen oxides, carbon monoxides and carbon dioxide. Once emissions are released, excess radiation from the sun is trapped in the atmosphere causing global warming, climate change and negative health outcomes¹⁴⁰.

Figure 7 | This picture shows air quality and climate change interactions.



Source: E von Schneidmesser et al 'Chemistry and Linkages between Air Quality and Climate Change' (2015) 115 *Chem Rev* 3856-3897 at 3857.

Air pollution is projected to be the largest environmental cause for premature death by 2050¹⁴¹ and is considered an environmental factor for ill health, worldwide¹⁴². Globally 91% of the population live in places where the concentration of air pollutants exceeds WHO's recommended guidelines¹⁴³. In Africa, emissions of

¹³⁷ C Y Wright et al 'Major climate change- induced risks to human health in South Africa' (2021) 196(1) *Environ Res* 1-36 at 16 and United Nations Environment Programme 'Air Pollution and Climate Change: two sides of the same coin' 23 April 2019 available at <https://www.unep.org/news-and-stories/story/air-pollution-and-climate-change-two-sides-same-coin> accessed on 14 July 2023.

¹³⁸ E von Schneidmesser et al 'Chemistry and Linkages between Air Quality and Climate Change' (2015) 115 *Chem Rev* 3856-3897 at 3856 and 3857

¹³⁹ *Ibid.*

¹⁴⁰ *Ibid* at 3857.

¹⁴¹ *Ibid* at 3856.

¹⁴² A Abera et al 'Air quality in Africa: Public Health Implication' (2021) 42 *Annu. Rev. Public Health* 193-210 at 194.

¹⁴³ D A Miller et al 'Respiratory Health amongst adolescents living in the Highveld Air Pollution Priority Area in South Africa' (2022) 22 *BMC Public Health* 1-11 at 2.

ambient air pollution come from old diesel-powered vehicles, poor household waste management, household burning biomass and vehicle fleet¹⁴⁴. In South Africa, emissions come from traffic, industrial activities, mining, residential and domestic solid fuel burning, as well as volatile organic compounds from plants, pollen, wind-blown dust, biomass burning and sea salt spray¹⁴⁵.

Populations with long-term exposure to air pollution are at increased risk of developing:

- cardiovascular diseases, nervous system dysfunctions, cutaneous disease¹⁴⁶, lung and bronchus cancer, asthma, ischemic heart disease, cerebrovascular disease, and chronic obstructive pulmonary disease¹⁴⁷.
- a wide range of respiratory illnesses such as allergies, frequent cough, wheezing chest, and doctor-diagnosed hay fever¹⁴⁸.

Air pollution, both indoor and outdoor, also causes non-communicable diseases like cancer, hypertension, heart disease and diabetes which are on the rise¹⁴⁹.

The WHO has estimated that:

- **6.7 million** people around the world die from the effects of ambient and household air pollution annually¹⁵⁰.
- **2.4 billion** people worldwide cook using open fires or inefficient stoves using kerosene, biomass, and coal.
- **2.3 million** people died in 2020, including 237,000 deaths of children under the age of 5, due to household pollution.

What this means is that without urgent attention, mitigation and adaptation, a large population of South Africans, including women, children, adolescents, the elderly and the disabled, will continue to be affected by household pollution which will also influence ambient pollution¹⁵¹. They will continue to bear the disproportionate burden of the environmental determinants of health due to their continued access to higher quantities of air pollution because of being economically, politically, and socially marginalized¹⁵². Of the 1.1 million deaths experienced in Africa annually due to air pollution¹⁵³, South Africa recorded 45 out of 100,000 deaths which were linked to air pollution in 2019¹⁵⁴.

144 A Abera et al op cit (n142) at 196.
 145 C Y Wright et al op cit (n137) at 16.
 146 D A Miller et al op cit (n143).
 147 N O Okello et al 'Changes in health risk associated with air pollution and policy response effectiveness, Richards Bay, South Africa' (2020) 30(1) *Clean Air Journal* 1-10 at 2.
 148 D A Miller et al op cit (n143).
 149 B G Glenn et al 'Ambient air pollution and non-communicable respiratory illness in Sub-Saharan Africa: a systematic review of the literature' (2022) 21(40) *Environmental Health* 1-14 at 2 and D Campbell-Lendrum et al 'Climate change, air pollution and noncommunicable diseases' *Bull World Health Organ.* 2019 Feb 1; 97(2): 160-161. Published online 2018 Dec 19. doi: 10.2471/BLT.18.224295 available at <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6357572/> accessed on 18 July 2023 .
 150 World Health Organization (WHO) 'Household Air Pollution' 28 November 2022 available at <https://www.who.int/news-room/fact-sheets/detail/household-air-pollution-and-health> accessed on 14 July 2023.
 151 *Ibid* and C Y Wright et al op cit (n137) at 15.
 152 M Hoffman 'Impossible to have healthy people on sick planet: Fighting back against air pollution' 30 June 2023 Health Policy Watch available at <https://healthpolicy-watch.news/impossible-to-have-healthy-people-on-a-sick-planet-fighting-back-against-air-pollution/> accessed on 14 July 2023.
 153 E R Fletcher 'Africa faces 1.1 million deaths Annually from air pollution- Second largest risk after malnutrition' 27 October 2022 Health Policy Watch available at <https://healthpolicy-watch.news/africa-faces-1-million-deaths-annually-from-air-pollution-second-only-to-malnutrition/> accessed on 14 July 2023.
 154 L Omarjee 'Air pollution contributes to more than a million African deaths a year' 28 October 2022 News24 available at https://www.news24.com/fin24/climate_future/environment/air-pollution-contributes-to-more-than-a-million-african-deaths-a-year-20221028 accessed on 14 July 2023.

In the matter of *Trustees for the time being of GroundWork Trust and Another v Minister of Environmental Affairs and Others* (the Deadly Air judgment), the Court found that the “poor air quality in the Highveld Priority Area (which extends from eastern Gauteng across the Mpumalanga Highveld), is in breach of residents’ section 24(a) Constitutional right to an environment that is not harmful to their health and well-being”¹⁵⁵.

While the mitigation of both air pollution and GHGs will reduce the risk of the world crossing the 2°C threshold¹⁵⁶, mitigation of one could result in the aggravation of another. For example, increasing the use of wood residentially (biomass), could reduce the emission of carbon dioxide. However, if the emission is not controlled properly, this could result in increased particulate matter and the degradation of air quality¹⁵⁷.

By 2040, emissions of sulfur dioxide (SO₂) would decrease by ~75%, nitrogen oxide (NO_x) by ~20% and PM_{2.5} by ~25% in 2040¹⁵⁸. To ensure that the global goals for air quality are met, emissions must be reduced, failing which climate change will make it harder to achieve air quality goals¹⁵⁹.

WHAT CAN HEALTH PROFESSIONALS DO to address air pollution?

1. Talk to patients about how climate change worsens air quality, and what they can do to minimize its impact on health.
2. Advise patients with asthma or other respiratory illness to check the Air Quality Index for unsafe ozone and particulate levels before they step out. Advocate for patients to wear masks when outdoors.
3. Advise patients to stay indoors and carry their appropriate medication while stepping out on poor air quality days.
4. Talk to patients about how to adjust their activities and recreation when air quality is poor. Advise them to contact their doctors in case of an emergency.
5. Encourage patients who smoke (or whose family members smoke) to quit and provide resource support.
6. Educate patients to engage in healthy behaviour that reduces individual footprint on air pollution. Some examples include the use of public transport, walking and cycling, waste segregation at source, composting and desisting from burning waste or dry leaves.
7. Educate colleagues and communities on the links between climate change, air quality and health, and what strategies can reduce the risks of both.

WHAT CAN HEALTH SYSTEMS DO to address air pollution?

1. Relay information on air quality with requisite health advisories to the public.
2. Promote the co-benefits of clean air in terms of health gains.
3. Promote sustainable, non-fossil fuel-based transportation options for staff and patients.
4. Opt for non-fossil fuel based energy to power health centres.
5. Upgrade their capacity to provide emergency and daily medical care to patients impacted by air pollution.
6. Train healthcare staff to identify patients impacted by air pollution to provide care.
7. Conduct short, medium, and long term research on correlating the air quality with emergency room admissions in the region and publish the information periodically.

¹⁵⁵ *Trustees for the time being of Groundwork Trust and Another v Minister of Environmental Affairs and Others* (39724/2019) [2022] ZAGPPHC 208 (18 March 2022)

¹⁵⁶ E von Schneidemesser et al op cit (n138) at 3857.

¹⁵⁷ *Ibid.*

¹⁵⁸ C Y Wright et al op cit (n137) at 17.

¹⁵⁹ E von Schneidemesser et al op cit (n138) at 3873.



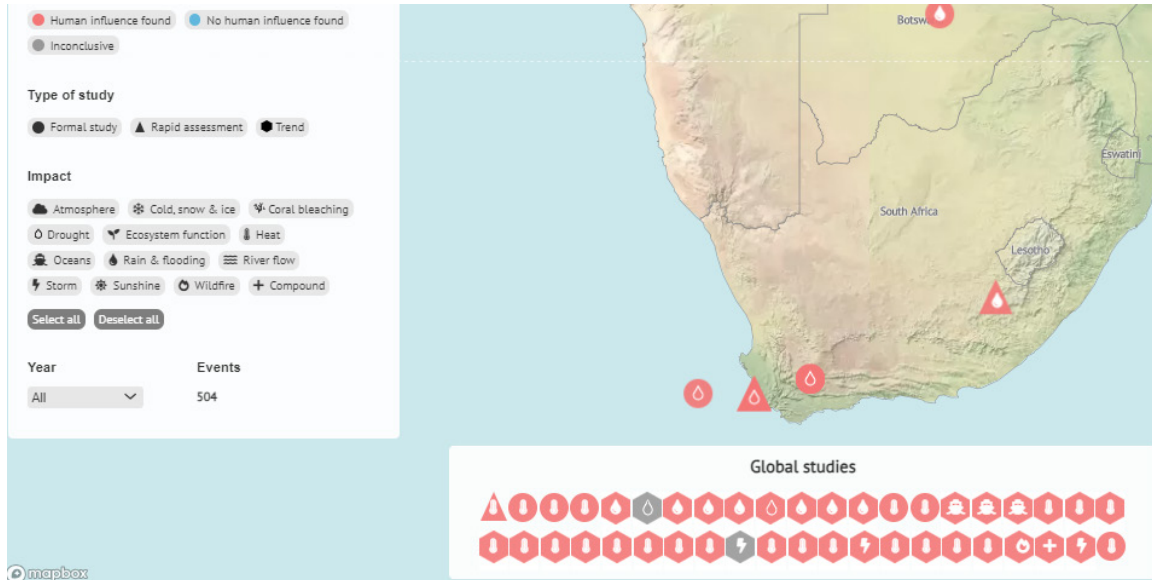
**CLIMATE
CHANGE** AND

**EXTREME
WEATHER
PATTERNS**

**FIRE, FLOODS
AND DROUGHT**

4.5. CLIMATE CHANGE AND EXTREME WEATHER PATTERNS: FIRE FLOODS AND DROUGHT

Figure 8 | This map depicts the extent to which climate change has affected weather in South Africa.



Source: Carbon Brief ‘Mapped: How climate change affects weather around the world’ 4 August 2022 available at <https://www.carbonbrief.org/mapped-how-climate-change-affects-extreme-weather-around-the-world/> accessed on 19 July 2023.

The emission of GHGs is changing how often and how severely extreme weather and climate events occur¹⁶⁰, like rain, snow, droughts, heatwaves, cold spells, storms, and cyclones¹⁶¹. The impacts of the weather and climate, felt by populations during extreme events, individually, in conjunction and in combination with other facts, lead to flooding, landslides and wildfires which serve to compound the extremes¹⁶². Over and beyond these extreme weather events damaging infrastructure, these events affect the health and well-being of communities and the working forces which are employed to assist and support, like our Emergency Medical Services (EMS) and nurses¹⁶³. Additionally, people suffer physical harm (floods cause foodborne and waterborne disease, wildfire smoke can harm the heart and lungs, and heat results in heat strokes and exhaustion)¹⁶⁴ and poor mental health. The health system and facilities are also affected due to impacts on patients, healthcare and other staff, medical and nonmedical supplies, facilities operations, and critical infrastructure¹⁶⁵.

- 160 K L Ebi et al ‘Extreme Weather and Climate Change: Population Health and Health System Implications’ (2021) 1(42) *Annu Rev Public Health* 1-26 at 2.
- 161 World Meteorological Organization ‘State of the Global Climate 2022’ Chair Publication Board Geneva, Switzerland 1-48 at 24.
- 162 *Ibid.*
- 163 *Ibid.*
- 164 National Institute of Environmental Health Sciences ‘Health Impacts of Extreme Weather’ 30 August 2022 available at https://www.niehs.nih.gov/research/programs/climatechange/health_impacts/weather_related_morbidity/index.cfm accessed on 19 July 2023.
- 165 K L Ebi et al op cit (n160).

Fast facts

Carbon Brief put together disaster data, humanitarian reports and local testimony to analyse extreme events in Africa in 2022¹⁶⁶. The analysis found that:

- in Africa, extreme weather has killed 4000 people and affected a further 19 million¹⁶⁷
- 71% of the 504 extreme events that occurred globally were likely made severe by human-induced climate change
- of the 152 global extreme heat events accessed by scientists, 93% found that climate change made the events more likely/severe
- of the 126 global rainfall/flooding events and 81 drought events that were studied, 56% and 68% respectively found that climate change made the events severe/more likely¹⁶⁸.

In the South African context, the effects of the extreme weather events that occurred in 2022 (floods in the Kwa-Zulu Natal and Eastern Cape Provinces) resulted in:

- emergency services running with skeletal staff
- deaths of 400 people, destruction of 16000 homes and R187 million damages to health infrastructure
- medical services had to be deferred until conditions had improved
- community health centres had to be closed due to departmental flooding
- water supplies were interrupted resulting in delayed provisioning of water to healthcare facilities
- onsite generators had to be used for power outages; these generators were diesel, contributing to emissions
- communities lost their homes and, with them, access to chronic medication
- storm drains were blocked with plastic pollution and informal settlements expanded¹⁶⁹.

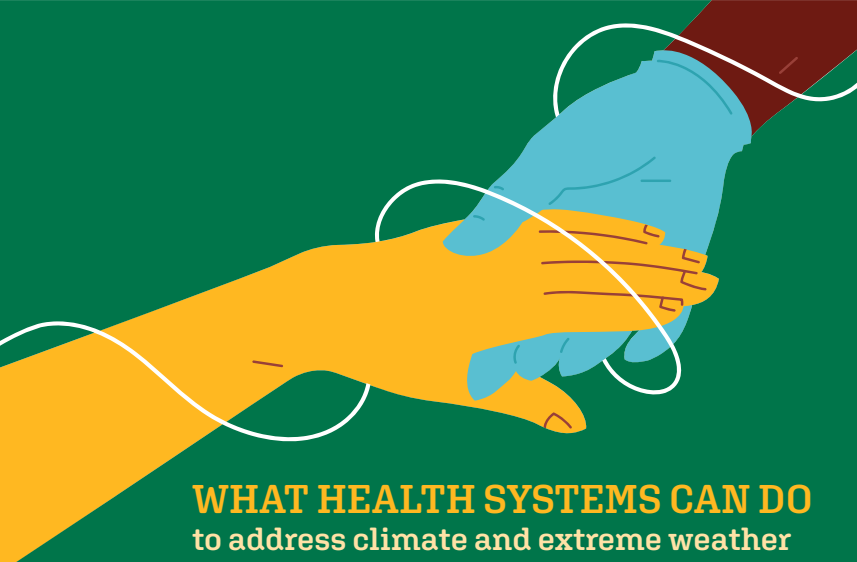


166 D Dunne 'Analysis: Africa's unreported extreme weather in 2022 and climate change' 26 October 2022 Prevention Web available at <https://www.preventionweb.net/news/analysis-africas-unreported-extreme-weather-2022-and-climate-change> accessed on 19 July 2023.

167 *Ibid.*

168 Carbon Brief 'Mapped: How climate change affects weather around the world' 4 August 2022 available at <https://www.carbonbrief.org/mapped-how-climate-change-affects-extreme-weather-around-the-world/> accessed on 19 July 2023.

169 K Naidoo et al 'Primary care disaster management for extreme weather events, South Africa' (2022) 14(1) 1-2.



WHAT HEALTH SYSTEMS CAN DO to address climate and extreme weather (droughts, floods, and wildfires)

Drought:

1. Health systems should ensure that there is a supplementary nutrition programme extended to drought prone areas.
2. All the vulnerable population in the drought prone areas should be covered under health insurance.
3. Raise awareness on sanitation, health and hygiene, nutritional status, socio psychological aspects and counselling.
4. Install rainwater harvesting techniques to conserve water at the health centre.
5. Implement best practices of health care with water conservation methods.

Floods:

1. Creating awareness of the types of injuries, illnesses and other health problems caused by cyclones to all the medical teams and the community at large.
2. Promoting personal hygiene practices and the use of boiled/safe water and food as part of community education.
3. Creating trained medical first responders for providing first aid to the injured and resuscitation measures for cases of drowning. The medical staff must be trained for cardiopulmonary resuscitation and basic life support for drowning cases. An inventory of trained medical and paramedical staff must also be made available to the district authorities.
4. Medical treatment kits need to be prepared for the management of cyclone casualties. Intravenous (IV) fluid ventilator, oxygen, splint, dressing material, tetanus toxoid drugs, antibiotics, vaccines, anti-snake venom and anti-diarrheal drugs will be the most needed medical resources.
5. Patient Evacuation Plan: Emergency medical equipment and drugs must be made available for resuscitation, at the cyclone site. Paramedical staff must be trained for resuscitation, triage and maintaining vital parameters like pulse, blood pressure, respiration, and intravenous

WHAT HEALTH PROFESSIONALS CAN DO to address climate and extreme weather (droughts, floods, and wildfires)

Drought:

1. Talk to patients about the impacts of drought and how best to protect their health especially from nutritional deficiencies.
2. Discuss the social and psychological impacts of drought on patients and refer them to appropriate mental healthcare resources.
3. Advocate for measures to protect against risks of vector-borne disease due to drought.
4. Advocate for efficient sanitation and hygiene techniques keeping in mind the drought.
5. Advocate for patients to stay hydrated and maintain nutritional balance during droughts.
6. Advocate for patients to conserve water during droughts.
7. Educate your colleagues and community on the links between climate change, drought, and health, and what can be done to prevent adverse health impacts.
8. Advocate and promote action to protect groundwater and surface water from contamination—for example, through the reduced use of fossil fuel based agricultural inputs like pesticides and nitrogen-based fertilizers, and the use of green infrastructure.
9. Advocate and promote water conservation in agriculture and in cities.
10. Promote local and sustainable agriculture practices, such as urban gardens, to reduce food insecurity when food prices increase.
11. Promote rainwater harvesting and the restoration of natural water bodies.

drip during evacuation. Heli-ambulances need to cater to evacuation of casualties in case of roadblocks. The ambulance will have SOPs for treatment procedures.

6. A Disaster Management plan needs to be prepared by all hospitals in coastal areas. Medical facilities, training of medical personnel, creating awareness about drowning and its management must part of the plan. Hospitals must nominate an incident officer for coordinating the management for cyclone casualties. Contingency plans must be made ready for capacity expansion of hospitals. Oxygen cylinders, continuous positive air pressure (CPAP), ventilators, splint, dressing material, blood and IV fluids for transfusion, must be stocked.
7. Hospital casualty rooms must be equipped with resuscitation equipment like suction apparatus, airways, laryngoscope, pulse oximeter, defibrillator, and life-saving drugs.
8. Hospital building and design should be planned based on the flood vulnerability of the region. If in a vulnerable region, it should plan to locate emergency power backups, medicine stock and expensive equipment in an elevated level that cannot be inundated.
9. In the aftermath of a cyclone, public health response is one of the prime responsibilities of medical authorities. They must ensure safe water supply and availability of clean food, along with maintenance of hygiene and sanitation through proper bio-waste disposal. Water testing and food inspection is required to be carried out regularly to prevent the outbreak of any epidemic. An effective communication system is an essential requirement for prompt medical response.
10. The state should develop contingency plans to have sufficient mortuaries to preserve the dead bodies. Sufficient capacity should be available in mortuaries to preserve dead bodies. After proper identification, dead bodies must be immediately disposed of through district authorities to prevent any outbreak of epidemic and environmental pollution. Planning for creating makeshift mortuary facilities is also to be carried out for emergency use.
11. Health systems should have a communicable diseases prevention plan and deployment protocols in the aftermath of floods.
12. Documentation throughout the medical response is very important for data collection, records, and references. Research programmes, data analysis and follow-up would be used as feedback for lessons learnt and future improvement.

Floods:

1. Talk to patients about the health risks of extreme precipitation, floods, and storms, and how to stay safe and healthy. Advise families on food and water safety during and after floods and storms.
2. Educate individuals to the increased risk of vector-borne disease following extreme rainfall. Advise them to not leave stagnant water in their yards, and other protective measures.
3. Encourage individuals and families to create emergency response plans to be followed in the event of flooding or extreme storms. Encourage patients and families to follow emergency communications in the event of anticipated extreme storms or flooding.
4. Work with your colleagues and hospital and clinic administrators to assess the vulnerability of healthcare facilities to extreme weather events, and to develop and implement a plan to ensure that facilities remain operational during an extreme event.
5. Advocate for stronger emergency response systems and resources for the most vulnerable communities, including closing the digital and communications divide.



**CLIMATE
CHANGE** AND
**OCCUPATIONAL
HEALTH**



4.6. CLIMATE CHANGE AND OCCUPATIONAL HEALTH

Figure 9 | This infographic shows how climate change affects the occupational health of workers by affecting the environment in which they work.



Source: World Health Organization (WHO) 'Estimating Environmental Health Impacts' (date unknown) available at <https://www.who.int/activities/environmental-health-impacts> accessed on 19 July 2023.

Considering the above picture by the WHO depicting the various ways in which our environment can impact our health, one can see the full impact for those working in the outdoor environment. This is not to say that those working indoors are not faced with their own air pollution, and other challenges. Indoor and outdoor workers are both disproportionately affected by variations in climate with climate-related impacts, worsening any existing health and safety issues for these workers, while bringing about new hazards¹⁷⁰.

In relation to public health, the WHO defines occupational health as an area of work to promote and maintain the highest degree of physical, mental, and social well-being of workers in all occupation¹⁷¹. Outdoor workers are placed at a higher risk of being subjected to increased temperatures, extreme

170 Centre of Disease Control and Prevention 'Occupational Safety and Health and Climate' 18 April 2023 available at <https://www.cdc.gov/niosh/topics/climate/default.html> accessed on 19 July 2023.

171 The World Health Organization (WHO) 'Environment, Climate Change and Health' (date unknown) available at <https://www.who.int/teams/environment-climate-change-and-health/occupational-health> accessed on 19 July 2023.

weather events and air pollution, because of the impacts of climate change¹⁷². Additionally, workers are at risk from climate related health threats including exposure to heat, ozone, pathogens, infectious disease, polycyclic aromatic hydrocarbons, wildfires, and workplace violence¹⁷³. These threats inhibit the attainment of the highest degree of physical, mental, and social well-being of the world’s workforce.

Table 2 | Climate Hazards and Health Impacts on the Workforce

Climate-related occupational factors/hazard ¹⁷⁴ :	Health impacts/risks ¹⁷⁵ :	Workforce affected ¹⁷⁶ :
Extreme temperatures (heat and cold)	<ul style="list-style-type: none"> ● occupational heat stress ● heat exhaustion and stroke ● fatigue and malnutrition ● dehydration leading to kidney damage ● acute cardiovascular and respiratory failure ● syncope ● personal Injury ● frost bite, hypothermia and muscle strains and pains ● mental health disorders 	<ul style="list-style-type: none"> ● Emergency Medical Services (EMS) ● farm workers ● firefighters ● fisherfolk ● Community Health Workers (CHWs) ● informal traders ● construction and metal industries ● fisherfolk
Air quality (indoor and outdoor pollution)	<ul style="list-style-type: none"> ● respiratory and cardiac disease 	<ul style="list-style-type: none"> ● Community Health Workers (CHWs) ● Emergency Medical Services (EMS) ● firefighters ● farmers ● informal traders ● miners ● construction and metal industries ● fisherfolk

172 R S Athauda et al ‘Climate Change impacts on Occupational Health and Safety of Façade maintenance workers: A Qualitative study’ (2023) 15 8008 *Sustainability* 1-18 at 2.

173 Milken Institute School of Public Health ‘Hazard Zone: The Impact of Climate Change on Occupational Health’ George Washington University 9 January 2017 available at <https://onlinepublichealth.gwu.edu/resources/impact-of-climate-change-on-occupational-health/> accessed on 19 July 2023.

174 T B Kjellstrom et al ‘Occupational Health and Safety impacts of climate conditions’ (2013) 1 *Climate Vulnerability: Understanding and Addressing Threats to Essential Resources*. Elsevier Inc., Academic Press, 145–156, C M Bennett, A J McMichael ‘Non-heat related impacts of climate change on working populations’ (2010) 3(1) *Global Health Action* 1-10, M A Ramadam, B H Mourad ‘Impact of Climate Change on Occupational Health and its possible preventative strategies (Review Articles)’ (2022) 46(3) *Egyptian Journal of Occupational Medicine* 47-62 and M S Butt et al ‘Climate change vulnerability, adaptation assessment, and policy development for occupational health’ (2022) 2(8) *Avicenna* 2-7.

175 *Ibid* and M Dillender ‘Climate Change and Occupational Health: Are there limits to our ability to adapt?’ (2019) 56(1) *The Journal of Human Resources* 184-224, H-A Rother et al ‘Perceptions of Occupational Heat, Sun Exposure, and Health Risk Prevention: A Qualitative Study of Forestry Workers in South Africa’ (2020) 11(37) *Atmosphere* 1-19, A Mathee et al ‘Climate change impacts on working people (the HOTHAPS initiative): findings of the South African pilot study’ (2010) 3(1) *Global Health Action* 1-9, M S Butt et al ‘Climate change vulnerability, adaptation assessment, and policy development for occupational health’ (2022) 2(8) *Avicenna* 2-7 and R S Athauda et al *op cit* (n172).

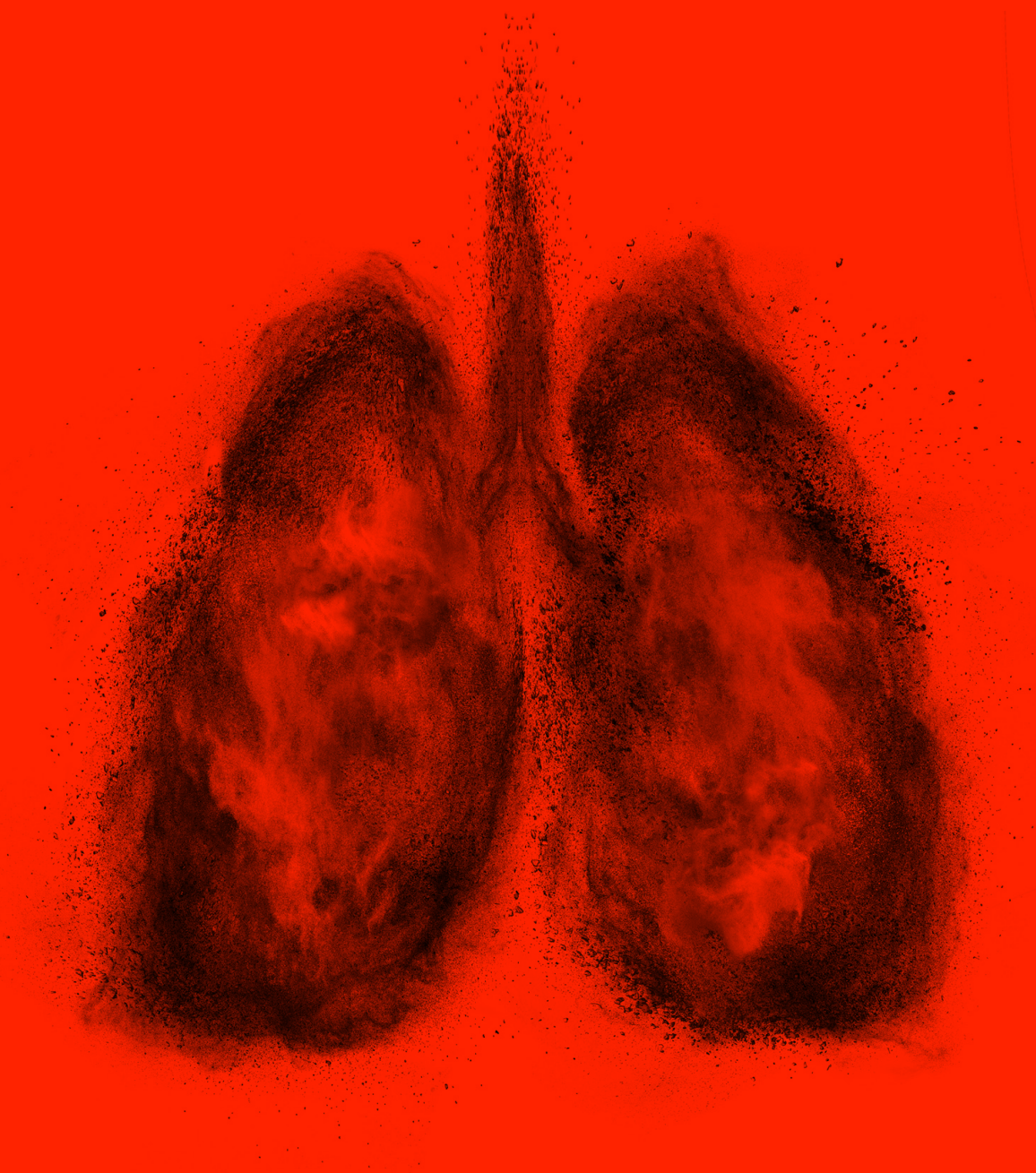
176 *Ibid*.

Climate-related occupational factors/hazard ¹⁷⁴ :	Health impacts/risks ¹⁷⁵ :	Workforce affected ¹⁷⁶ :
Extreme weather (floods, droughts, and wildfires)	<ul style="list-style-type: none"> ● malnutrition ● fatigue ● dehydration ● mental health disorders ● injury-related death ● thermal injuries ● asthma ● heart problems ● hyperthermia 	<ul style="list-style-type: none"> ● Community Health Workers (CHWs) ● nurses ● hospital and clinic staff ● firefighters ● Emergency Medical Services (EMS) ● medical specialists (psychiatry, urology, cardiovascular and critical care sector workers) ● informal traders ● fisherfolk
Infectious disease e.g.: Zoonotic (salmonellosis, rabies etc), vector-borne (yellow fever, malaria, risk valley fever, dengue fever, chikungunya), foodborne (salmonella, E. coli) and water-borne (diarrhoeal) disease	<ul style="list-style-type: none"> ● chills, headaches, back and muscle aches ● loss of appetite and nausea, high temperature, tummy pain and diarrhoea ● fatigue and rashes ● irritability and dehydration ● malnutrition ● dehydration ● fever and abdominal pain ● loose, watery stools ● mental health disorders 	<ul style="list-style-type: none"> ● workers in the forestry, road construction and water control system sector ● builders ● workers working with livestock ● abattoir workers ● veterinarians ● meat processors ● animal agriculture workers ● cattle farm workers ● Emergency response workers in sanitation and water infrastructure environments
Pathogenic microorganisms (tick-borne encephalitis, tularaemia, brucellosis, leptospirosis, rabies, anthrax etc)	<ul style="list-style-type: none"> ● ulcers, fever, loss of weight ● loss of appetite, headache, nausea, vomiting, swelling of the brain and/or spinal cord, confusion, and sensory disturbances and death ● insomnia, abnormal behaviour, hallucinations ● chest discomfort and sweats 	<ul style="list-style-type: none"> ● workers in the forestry and agricultural sector ● workers in animal husbandry and meat handling industries ● fisherfolk

Workers who are most vulnerable to climate change and its impacts on their health, safety and well-being are those located in countries, who due to their social, political, environmental factors, are unable to afford the repercussions of the impacts¹⁷⁷. In 2021, exposure to heat lead to the loss of 470 billion potential labour hours while extreme weather events led to global damages worth USD 253 billion (over R4.5 trillion)¹⁷⁸. What is clear from table 2 is that as climate change worsens, workers around the world will be exposed to: respiratory and cardiac disease, hyperthermia, and frost bite because of air pollution and extreme temperatures; and asthma and dehydration due to extreme weather events which will also spread zoonotic disease and pathogenic microorganisms. Overall and because of these impacts, mental health disorders will be on the rise. Workers will become more reliant on the healthcare system as their first line of defence; however, as the need for healthcare rises, the system, overburdened, may not be able to respond.

177 B H Mourad ‘Impact of Climate Change on Occupational Health and its possible preventative strategies (Review Articles)’ (2022) 46(3) *Egyptian Journal of Occupational Medicine* 47-62 at 49.

178 M Romanello et al ‘The 2022 report of the *Lancet* Countdown on health and climate change: health at the mercy of fossil fuels’ (2022) 400(5) 1619-54 at 1619.



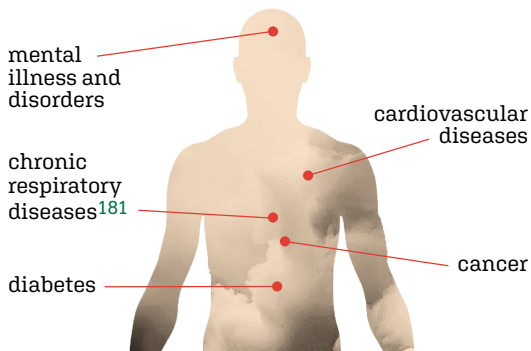
**CLIMATE
CHANGE** AND
**NON-COMMUNICABLE
DISEASE**

4.7. CLIMATE CHANGE AND NON-COMMUNICABLE DISEASE

4.7.1. What are non-communicable diseases

Non-communicable diseases (NCDs) are diseases that are not spread through infection or people but are often associated with unhealthy behaviours¹⁷⁹. NCDs may be chronic diseases of long duration and slow progression, or they may result in more rapid death such as a sudden stroke. According to WHO, NCDs represent a significant global health challenge, with 41 million people dying annually due to NCDs, and of those, an estimated 17 million are aged between 30 and 69 years old¹⁸⁰.

Non-communicable diseases (NCDs) include:



Conventionally, NCD prevention has predominantly focused on modifiable behavioural risk factors with an emphasis on reducing tobacco use, consuming healthy diets, increasing physical activity, and limiting alcohol use¹⁸³. Accordingly, there is a strong emphasis on people exercising “healthier” choices and taking personal responsibility as a primary method of dealing with NCDs¹⁸⁴. Unfortunately, not enough attention has been accorded to how an unhealthy environment, due to climate change for example, can contribute to the prevalence of NCDs in addition to the individual’s exercise of their own agency. Understanding how certain structures influence individual choices will not only help to address these significant public health issues, but also allow individuals and communities to recognize these influences and in turn exercise their agency to shape these structures¹⁸⁵. In attempting to understand NCDs and climate change, it is important that we

KEY FACTS

- NCDs kill 41 million people each year, equivalent to 74% of all deaths globally.
- Each year, 17 million people die from a NCD before age 70; 86% of these premature deaths occur in low- and middle-income countries.
- Of all NCD deaths, 77% are in low- and middle-income countries.
- Cardiovascular diseases account for most NCD deaths, or 17.9 million people annually, followed by cancers (9.3 million), chronic respiratory diseases (4.1 million), and diabetes (2.0 million including kidney disease deaths caused by diabetes). These four groups of diseases account for over 80% of all premature NCD deaths.
- Tobacco use, physical inactivity, the harmful use of alcohol and unhealthy diets all increase the risk of dying from an NCD. Interestingly, some of these are consequences of the effects of climate change on mental health and well-being.
- Detection, screening, and treatment of NCDs, as well as palliative care, are key components of the response to NCDs¹⁸².

179 The International Federation of Red Cross and Red Crescent Societies (IFRC) “Non-communicable diseases” (date unknown) available at <https://www.ifrc.org/our-work/health-and-care/community-health/non-communicable-diseases> accessed on 21 July 2023.

180 A Savage et al “Climate change and socioeconomic determinants are structural constraints to agency in diet-related non-communicable disease prevention in Vanuatu: a qualitative study.” BMC Public Health 21, 1231 (26 June 2021) available at <https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-021-11245-2> accessed on

181 IRFC op cit (n179).

182 World Health Organization (WHO) “Fact Sheets: Noncommunicable diseases” (2018, updated 16 September 2022) available at [https://www.who.int/news-room/fact-sheets/detail/noncommunicable-diseases#:~:text=The%20main%20types%20of%20NCD,disease%20and%20asthma\)%20and%20diabetes](https://www.who.int/news-room/fact-sheets/detail/noncommunicable-diseases#:~:text=The%20main%20types%20of%20NCD,disease%20and%20asthma)%20and%20diabetes) accessed on 21 July 2023.

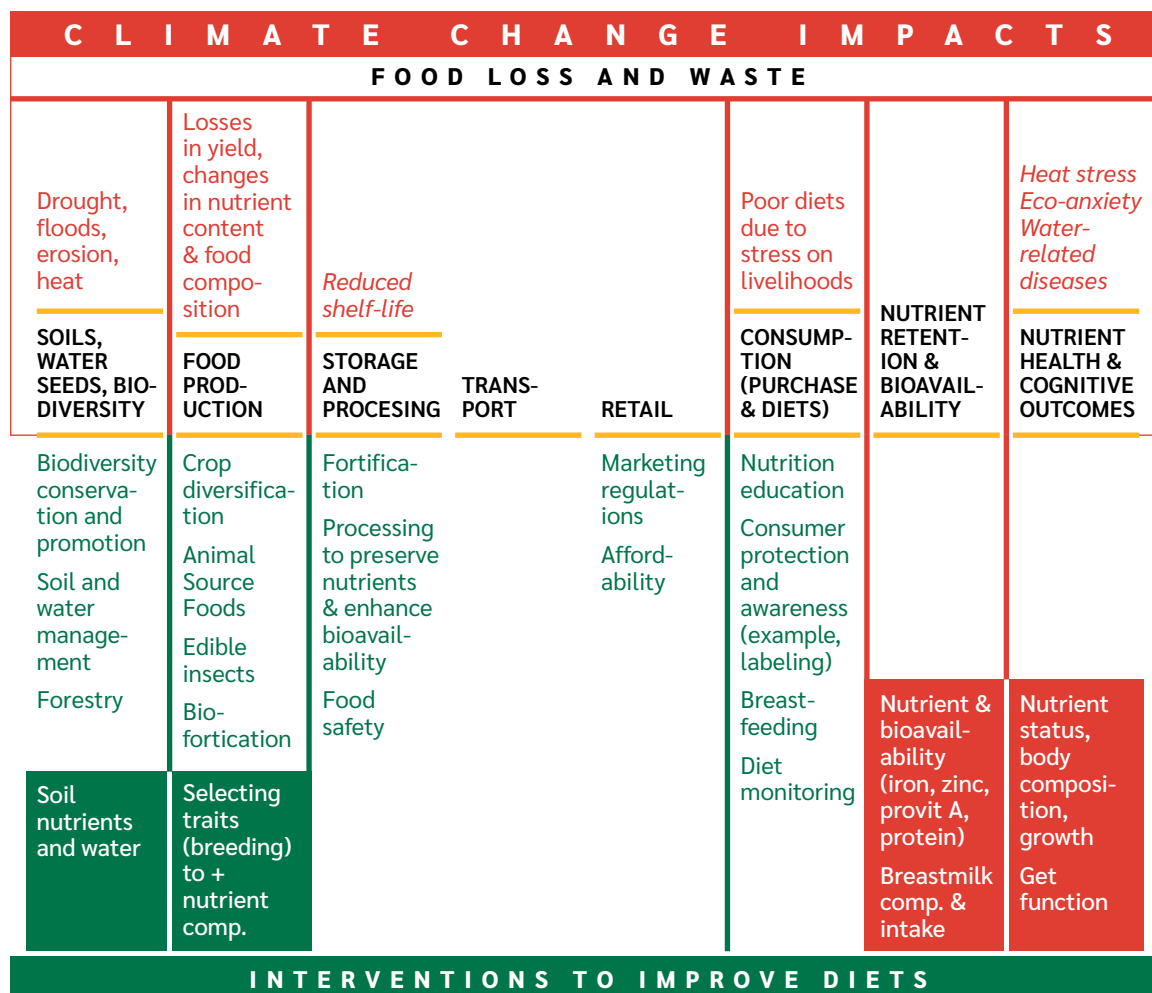
183 *Ibid.*

184 IRFC op cit (n179).

185 *Ibid.*

understand that both these global health challenges are intrinsically linked and should not be viewed from the perspective of silos, as though they are entirely separate¹⁸⁶. You cannot deal with the underlying causes related to the increasing prevalence of NCDs without dealing with the factors that underpin climate change.

Figure 10 | This infographic shows the interaction between climate change and NCDs.



Source: V Owino et al ‘The impact of climate change on food systems, diet quality, nutrition, and health outcomes: a narrative review’ (2022) 4 *Front.Clim* 1-10.

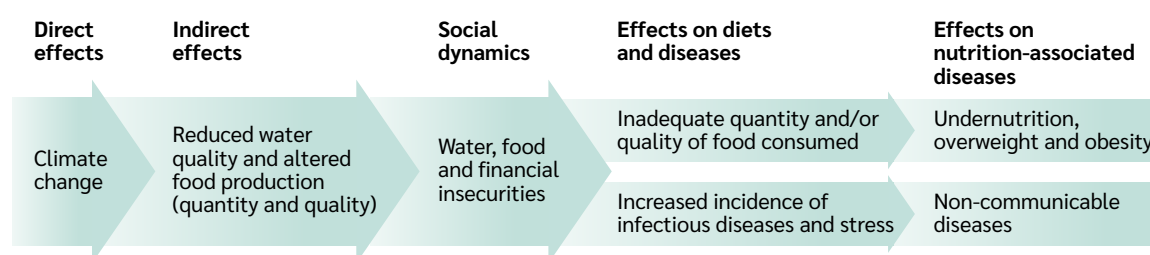
4.7.2. Extreme weather events and NCDs

Extreme weather events such as storms and floods represent significant threats and disruptions of the healthcare system in South Africa. As seen in the case of the 2022 floods in KwaZulu Natal and Eastern Cape, the healthcare disruptions resulted in limited staff availability and healthcare facilities being temporarily closed. This would have mostly likely resulted in an interruption of necessary healthcare monitoring and provision of medication for people with NCDs¹⁸⁷. It is highly likely that in such circumstances, the rates of mortality among people with NCDs would rise.

186 NCD Alliance “NCDs and Climate Change: Shared Opportunities for Action” (unknown) available at <https://ncdalliance.org/why-ncds/ncds-and-sustainable-human-development/environment-and-climate> accessed on 21 July 2023.

187 J Thomas et al “Floods create health risks: what to look out for and how to avoid them” UNDRR PreventionWeb (26 April 2022) available at <https://www.preventionweb.net/news/floods-create-health-risks-what-look-out-and-how-avoid-them> accessed on 21 July 2023.

Figure 10 | Links between climate change and dietary NCDs.



Source: Fanzo, J.C., Downs, S.M. Climate change and nutrition-associated diseases. *Nat Rev Dis Primers* 7, 90 (9 December 2021) available at <https://www.nature.com/articles/s41572-021-00329-3#Fig1> accessed on 24 July 2023.

4.7.3. Food insecurity and NCDs

South Africa is an increasingly food insecure nation and is facing a syndemic of three global problems: undernutrition, obesity, and climate change¹⁸⁸. Like climate change, malnutrition is increasingly concentrated in low- to middle-income countries like South Africa, where there is rapid urbanization and a shift away from healthy unprocessed foods and plant-based diets to more imported foods that are high in processed sugars and fats, large amounts of red meat and low in beneficial nutrients and fibres¹⁸⁹.

Climate change affects food and food security through GHGs emissions, natural climate disasters, less rainfall and hotter weather patterns. Overall, this will lead to more frequent crop failure and livestock loss, higher food prices and a shortage of food, especially fresh fruits and vegetables, which are essential for a healthy diet¹⁹⁰. As a result, people will consume cheaper foods that have a high content of sugar, fat, and salt, which will in turn drive up the rates of obesity and malnutrition¹⁹¹. Furthermore, when viewed against the backdrop of urban sprawl and the increased reliance on motor vehicles, as opposed to walking and cycling, the reduced rates of physical activity, when coupled with the higher rates of obesity and malnutrition, lead to higher occurrences of diet related NCDs such as diabetes, cardiovascular disease, and some cancers¹⁹².

4.7.4. Air pollution and NCDs

Air pollution (both indoor and outdoor) is one of the drivers of climate change and has a significant impact on health and healthy environments. Exposure to indoor and outdoor air pollution is estimated to be responsible for 404,000 and 258,000 premature deaths in Africa per year, respectively¹⁹³. Air pollution (both indoor and outdoor) accounts for over 14% of all non-communicable diseases (NCDs), a far greater share than the contribution of other key risks factors including alcohol, diet, and high sodium intake¹⁹⁴. Aerosol pollutants are known to raise the risk of development of chronic respiratory diseases such as asthma, chronic obstructive pulmonary disease, and allergic rhinitis¹⁹⁵.

188 A Erzse et al “Commentary on South Africa’s syndemic of undernutrition, obesity and climate change” (2023) available at https://www.researchgate.net/publication/369616185_Commentary_on_South_Africa’s_syndemic_of_undernutrition_obesity_and_climate_change accessed on 21 July 2023.

189 *Ibid.*

190 *Ibid.*

191 *Ibid.*

192 *Ibid* and A Savage et al op cit (n180).

193 AM Mbandi “Air Pollution in Africa in the time of COVID-19: the air we breathe indoors and outdoors” *Clean Air J.* vol.30 n.1 Pretoria 2020 (date unknown) available at http://www.scielo.org.za/scielo.php?script=sci_arttext&pid=S2410-972X2020000100001 accessed on 21 July 2023.

194 *Ibid.*

195 BG Glenn et al op cit (n149).

4.7.5. Infectious diseases and NCDs

As previously discussed, climate change will result in the emergence and re-emergence of disease-causing pathogens. The COVID-19 pandemic easily comes to mind, given the scientific evidence that it was likely a vector-borne disease that spread from an unknown organism to humans¹⁹⁶. While more information about the full extent of the harm caused by COVID-19 continues to emerge, it is abundantly clear that people suffering from NCDs such as hypertension and diabetes are at increased risk of hospitalization, death, and serious disability due to COVID-19 infection¹⁹⁷. As more infectious diseases continue to emerge, we may continue to see more harmful interactions between those diseases and people suffering from NCDs.

WHAT HEALTH SYSTEMS CAN DO to address NCDs

1. Incentivize individual health care professionals and institutions to adopt healthier dietary options for themselves and their communities.
2. Invest in transportation that would achieve a reduction in emissions such as staff transportation and encouraging walking and cycling to work
3. Provide increased resources to allow health care professionals to cultivate green spaces and gardens in areas belonging to hospitals and communities served by health care professionals.
4. Support campaigns that encourage people to be more physically active.
5. Actively ensure that healthcare institutions have clean energy sources like solar and wind.
6. Prioritize working with other sectors at the national and local level, including communities, to sensitize various stakeholders about the urgent need to address climate change and NCDs.
7. Commission more data-driven projects to demonstrate the links between climate change and NCDs.
8. Lobby stakeholders at a local and national government level to prioritize the creation of low cost, affordable and secure housing and recreational areas in urban centres. The objective being to put more people within walking and or cycling distance of their work and with easier access to exercise and recreational facilities.

WHAT CAN HEALTH SYSTEMS DO to address air pollution?

1. Relay information on air quality with requisite health advisories to the public.
2. Promote the co-benefits of clean air in terms of health gains.
3. Promote sustainable, non-fossil fuel-based transportation options for staff and patients.
4. Opt for non-fossil fuel based energy to power health centres.
5. Upgrade their capacity to provide emergency and daily medical care to patients impacted by air pollution.
6. Train healthcare staff to identify patients impacted by air pollution to provide care.
7. Conduct short, medium, and long term research on correlating the air quality with emergency room admissions in the region and publish the information periodically.

196 National Institute of Allergy and Infectious Diseases (NIH) “Origins of Coronaviruses” (updated 16 March 2022) available at <https://www.niaid.nih.gov/diseases-conditions/origins-coronaviruses> accessed on 21 July 2023.

197 E Ratshikhopha et al “Disease Severity and Comorbidities among Healthcare Worker COVID-19 Admissions in South Africa: A Retrospective Analysis” Int J Environ Res Public Health 2 May 2022 available at <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9104097/> accessed on 21 July 2023.

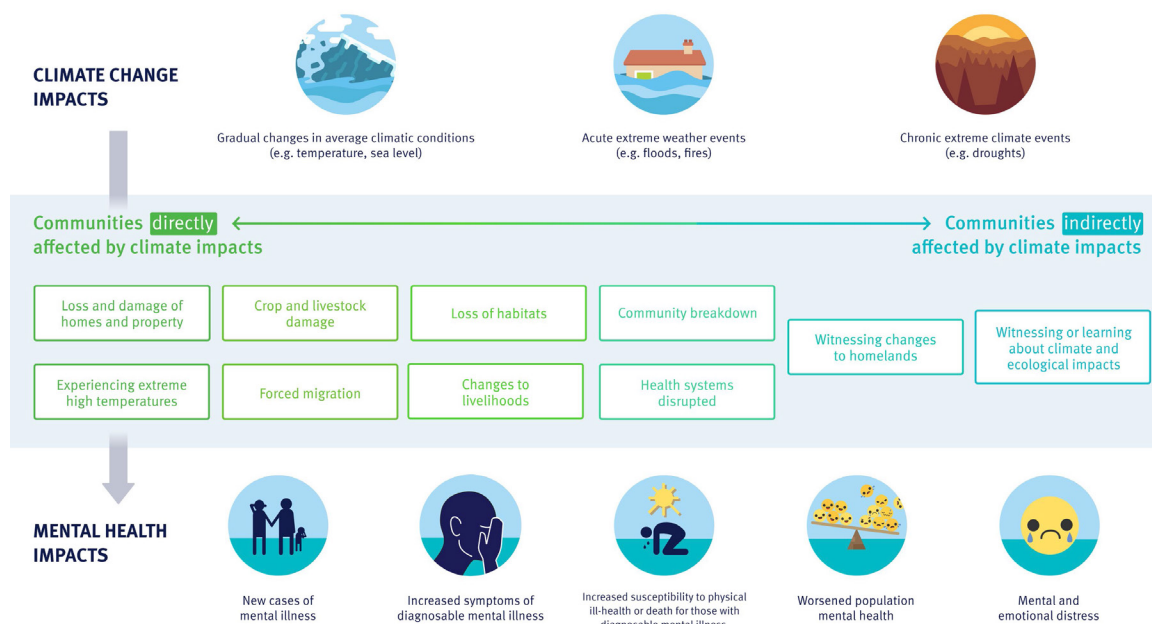
**CLIMATE
CHANGE** AND

**MENTAL HEALTH
AND WELL-BEING**



4.8. CLIMATE CHANGE AND MENTAL HEALTH AND WELL-BEING

Figure 12 | Chart showing the relationship between climate change, mental health and well-being.



Source: E Lawrence et al 'The impact of climate change on mental health and emotional wellbeing: current evidence and implications for policy and practice' (2021) 36 *Graham Institute of Global Health Innovation* 2-36 at 10.

Mental health and well-being are instrumental to a well-functioning society. Our mental health can be impacted by thoughts, feelings, and the general ability to cope with life stressors, achieve mental health well-being, flourish and be resilient in the face of adversity¹⁹⁸. Mental health is incidental to every facet of our lives. Yet even though 1 billion people globally live with mental health disorders, 3 out of 4 people do not have access to mental health services¹⁹⁹. This number is bound to grow in the face of climate catastrophes. It is estimated that from 2010 to 2030, the global economy will suffer a loss of USD 16 trillion due to mental disorders with a large global treatment gap, and physical health taking precedence over mental health²⁰⁰.

Mental and physical health are interlinked — threats to physical health also threaten mental health²⁰¹. Climate change and mental health must be looked at in conjunction because climate change does not occur in isolation²⁰². South Africa is vulnerable to climate change due to the country's history of apartheid and the systematic creation of economic, health and geospatial inequalities. South Africans carry conditions that are a source of psychosocial stress such as poverty, unemployment and the gap in mental health services — all drivers of psychosocial stress²⁰³. Additionally, the country is lacking in the provisioning and resourcing of quality mental health services²⁰⁴. Climate change and mental health are further intertwined because not only

- 198 E Lawrence et al 'The impact of climate change on mental health and emotional wellbeing: current evidence and implications for policy and practice' (2021) 36 *Graham Institute of Global Health Innovation* 2-36 at 4.
- 199 World Health Organization (WHO) 'Climate Action must include mental health' 3 June 2022 available at <https://www.who.int/news/item/03-06-2022-why-mental-health-is-a-priority-for-action-on-climate-change> accessed on 20 July 2023.
- 200 *Ibid.*
- 201 *Ibid* at 8.
- 202 G Barnwell 'The Psychological and mental health consequences of climate change in South Africa' (2021) Centre of Environmental Rights (CER) 1-35 at 10.
- 203 *Ibid.*
- 204 A October 'Spotlight on mental health' 4th October 2021 Spotlight available at <https://www.spotlightnsp.co.za/2021/10/04/editorial-spotlight-on-mental-health/> accessed on 20 July 2023.

is the threat of climate change traumatic and stressful, but the exposure of communities to direct, vicarious and accumulated threats to their life and well-being cause negative mental health impacts, more so for those people who have pre-existing mental health disorders²⁰⁵.

Climate change effects mental health in the following ways:



High temperatures: high temperatures and heat waves increase rates of suicide and mental distress because of reduced economic outputs and increased violence and conflict. Temperature changes also bring about changes in the body, affecting the central nervous system, the way the blood flows, and leads to cognitive and emotional changes which impact mental health and well-being²⁰⁶.



Extreme weather events: these events bring about psychological stress and a continuation of long-term stresses for some. Post-Traumatic Stress Disorder (PTSD), depression, and anxiety are some of the consequences of extreme weather events with repeat disaster occurrences and their detrimental psychological impacts²⁰⁷.



Flooding: during flooding, those involved go through depressive reactions and develop or experience an aggravation of anxiety and, after the event, PTSD. Considering that in cases of floods, people lose their homes and livelihoods, flooding has also been associated with suicidality²⁰⁸.



Food and water insecurity: drought and the failure of crops results in the loss of livelihoods; hunger, thirst, and lack of access have a direct effect on mental health and emotional well-being. The changes associated with loss can lead to psychological stress, humiliation, anxiety, depression, and suicide²⁰⁹.



Migration: forced migration and displacement can leave people without a sense of belonging, and have been linked to anxiety and PTSD with long-term migration resulting in mental disorders and worsening mental well-being²¹⁰.



Wildfires: because of wildfires, communities have lost their homes, their family members, and have been displaced. Wildfires bring with them psychological distress, paranoia, somatization, depression, anxiety, rumination, and suicidal ideation²¹¹.



Communicable diseases: climate change increases the risk of infectious diseases increasing and spreading, which will heighten distress²¹² because illness brings with it its own mental health and well-being associated issues.



Air and noise pollution: higher levels of air and noise pollution cause poor mental health and increase levels of depression, anxiety, psychosis, bipolar disorder, schizophrenia, and suicide²¹³. Air pollution has also been associated with increased risks of dementia, cognitive impairment, and a decline of cognitive functioning²¹⁴.

205 G Barnwell op cit (n202) at 11.

206 E Lawrence at al op cit (n198) at 8.

207 *Ibid*.

208 G Barnwell op cit (n202) at 14.

209 *Ibid* and E Lawrence at al op cit (n198) at 8.

210 E Lawrence at al op cit (n198) at 8.

211 G Barnwell op cit (n202) at 14.

212 E Lawrence at al op cit (n198) at 11.

213 *Ibid* at 11.

214 *Ibid* and G Barnwell op cit (n202) at 17.



**CLIMATE
CHANGE**

AND

**WOMEN AND
CHILDREN**

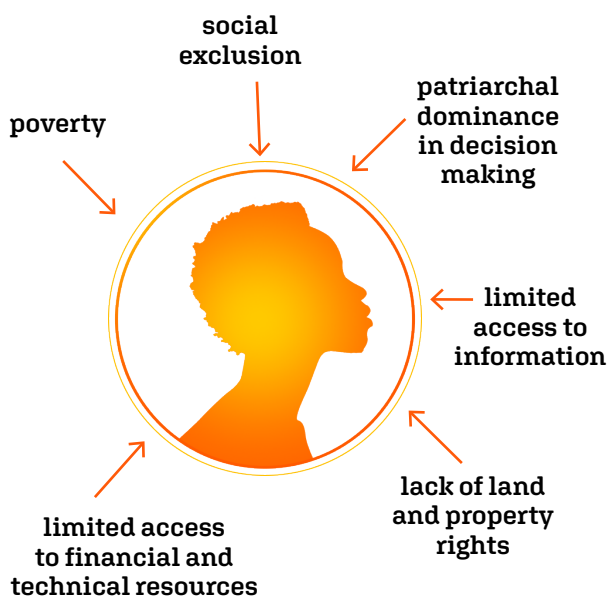


5 CLIMATE CHANGE AND ITS IMPACTS ON WOMEN AND CHILDREN

Women and children are marginalized in society, making them more vulnerable to the impacts of climate change. Because of their position in society, they cannot sufficiently prepare for and respond to observed and anticipated climate risks, as and when they occur²¹⁵. Thus, they warrant greater protections and involvement in climate policy and action.

5.1. CLIMATE CHANGE AND WOMEN

Women are disproportionately affected by climate change due to²¹⁶:



Due to structural and systematic constraints, women face difficulties in adapting to the effects of climate change²¹⁷. Women make up 80% of those displaced during extreme weather events or drought because of cultural biases which come in the way of them receiving information from early warning systems and weather alerts. They are also within the 70-80% mark of those requiring support in the aftermath of disasters, even though their workload increases by 2-3 times, post disaster²¹⁸.

Climate change will affect women in areas of agricultural production, food and nutrition security, health, water and energy and climate related disaster, migration, conflict²¹⁹ and Sexual and Reproductive Health and Rights (SRH&R)²²⁰. Women are impacted more than

²¹⁵ S Hlahla et al 'Climate-Urban Nexus: A Study of Vulnerable Women in Urban Areas of Kwa-Zulu Natal Province, South Africa' (2022) 14 *American Meteorological Society* 933-948 at 934.

²¹⁶ L Nyahunda, H M Tirivangasi 'Adaptation Strategies employed by rural women in the face of climate change impacts in Vhembe district, Limpopo Province, South Africa' (2022) 33(4) *MEQ* 1061-1075 at 1061.

²¹⁷ *Ibid* at 1062.

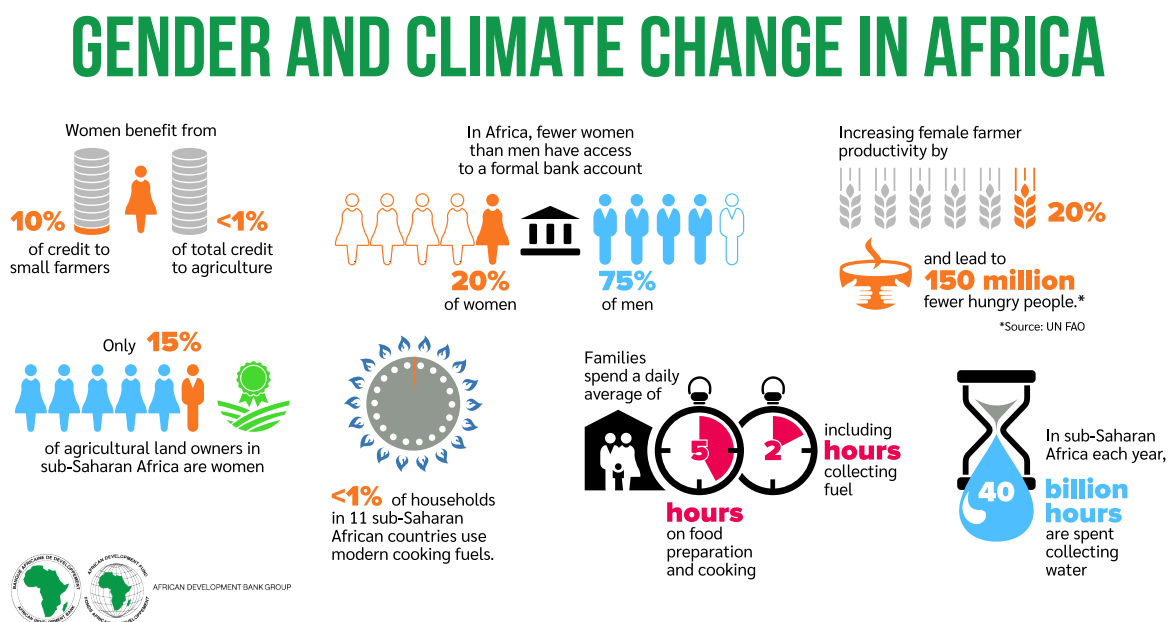
²¹⁸ S Hlahla et al op cit (n215) at 934.

²¹⁹ The Centre for Human Rights 'This National Women's Day, the centre for Human Rights calls for gender responsive solutions to climate change impact in South Africa' The University of Pretoria 11 August 2022 available at <https://www.chr.up.ac.za/news-wru/3113-this-national-women-s-day-the-centre-for-human-rights-calls-for-gender-responsive-solutions-to-climate-change-impact-in-south-africa> accessed on 17 July 2023.

²²⁰ United Nations Population Fund (UNFPA) 'The Impact of the Climate Crisis on Sexual and Reproductive Health and Rights' May 2022 available at <https://esaro.unfpa.org/en/publications/impact-climate-crisis-sexual-and-reproductive-health-and-rights> accessed on 9 August 2023 and Women Deliver 'The link between climate change and Sexual and Reproductive Health and Rights An Evidence Review' January 2021 available at <https://womendeliver.org/publications/climate-change-and-srh/> accessed on 9 August 2023.

men because the natural environment on which they depend, for food security, is susceptible to changes in the climate resulting in droughts, heat waves and floods²²¹. Women are heavily involved in agriculture, constitute 80% of subsistence farmers globally²²², 60% of employed women work in the formal agriculture sector²²³ and they seldom own the land, affecting how they interact with land and tenure²²⁴. Due to their gender roles, women are tasked with managing water and agricultural natural resources while cooking, doing laundry and collecting water and firewood²²⁵. When droughts occur, it is usually women and girls who travel farther to collect water while dealing with poor access to sanitation and hygiene resources, which could impact their health²²⁶. Furthermore, women are exposed to ambient and indoor air pollution due to their work, pollutant gases during cooking and poor ventilation in the cooking area²²⁷.

Figure 13 | The extent to which climate change affects women.



Source: African Development Bank Group ‘COP24: From Policy to Action: Integrating Gender into National Climate Actions in Africa’ 18 December 2018 available at <https://www.afdb.org/en/news-and-events/cop24-from-policy-to-action-integrating-gender-into-national-climate-actions-in-africa-18834> accessed on 17 July 2023.

Women located in under-resourced communities bear the greatest risk of harm to their health, including their mental health and well-being, especially in instances where climate change over-burdens an already fragile public health system, and complex public health challenges and socioeconomic issues exist²²⁸.

221 L Nyahunda, H M Tirivangasi op cit (n216) at 1062.
 222 *Ibid.*
 223 ISS ‘African women bear the brunt off climate change’ 6 March 2023 PSE Report available at <https://issafrica.org/psc-report/psc-insights/african-women-bear-the-brunt-of-climate-change> accessed on 17 July 2023.
 224 J Evans ‘How the Climate crisis disproportionately affects women’ 7 August 2022 Daily Maverick available at <https://www.dailymaverick.co.za/article/2022-08-07-how-the-climate-crisis-disproportionately-affects-women/> accessed on 17 July 2023.
 225 L Nyahunda, H M Tirivangasi op cit (n216) at 1062.
 226 J Evans op cit (n224).
 227 Z Desai, Y Zhang ‘Climate Change and Women’s Health: A scoping review’ (2021) *GeoHealth* 1-11 at 1.
 228 M Lencoasa ‘Towards women-centred climate change decision making and budgeting’ 26 August 2022 Spotlight available at <https://www.spotlightnsp.co.za/2022/08/26/opinion-towards-women-centred-climate-change-decision-making-and-budgeting/> accessed on 17 July 2023.

Extreme weather events like floods may negatively impact the public health systems that women rely on for access to healthcare. The floods that occurred in Kwa-Zulu Natal and the Eastern Cape in 2022 resulted in the destruction of 85 healthcare facilities and extensive flood damage to 12 facilities, respectively²²⁹. As a result, termination of pregnancy and other healthcare services were inaccessible during the duration of the closure to the healthcare facilities raising concerns about the state of healthcare facilities in the country²³⁰.

Climate change effects the health and well-being of women in the following ways:

- Women are susceptible to high temperatures and less tolerant to heat stress affecting maternal health: exposure to high temperatures contributes to birth defects and reproductive complications²³¹, hypertension, exhaustion, miscarriages, and stillbirths²³².
- Women are at risk of physical and domestic violence due to rising temperatures²³³.
- Women are at risk of vector-borne disease due to their proximity to wells, rivers, and ponds when they collect water²³⁴. Vector-borne diseases cause negative maternal and child outcomes (maternal illness and low birth weight) and can increase the risk of spontaneous termination of pregnancy, premature delivery, stillbirth, low birth weight, eclampsia and caesarean delivery²³⁵.
- Women develop respiratory conditions from the inhalation of toxic pollutants while using traditional biomass for cooking²³⁶. Air pollution is linked to stillbirth, preterm birth and low birth weight²³⁷.
- Women will experience malnutrition and hunger due to the inaccessibility and unpredictability of traditional food sources²³⁸, due to the increase in prices of food²³⁹, and due to nutrition being placed second to survival²⁴⁰. Maternal nutrition will also be worsened by climate change²⁴¹.
- Food insecurity resulting from climate change forces women to migrate, leaving them with limited and high-risk labour options, like sex work, and placing them at risk of HIV contraction and transmission²⁴².
- Climate related emergencies disrupt access to healthcare services; for women, this means disruptions to life saving commodities and contraceptives²⁴³. For example, in instances of drought and disruptions in access to fresh water sources, dehydration affects fetal growth, causes preterm birth and increases anemia and eclampsia²⁴⁴.

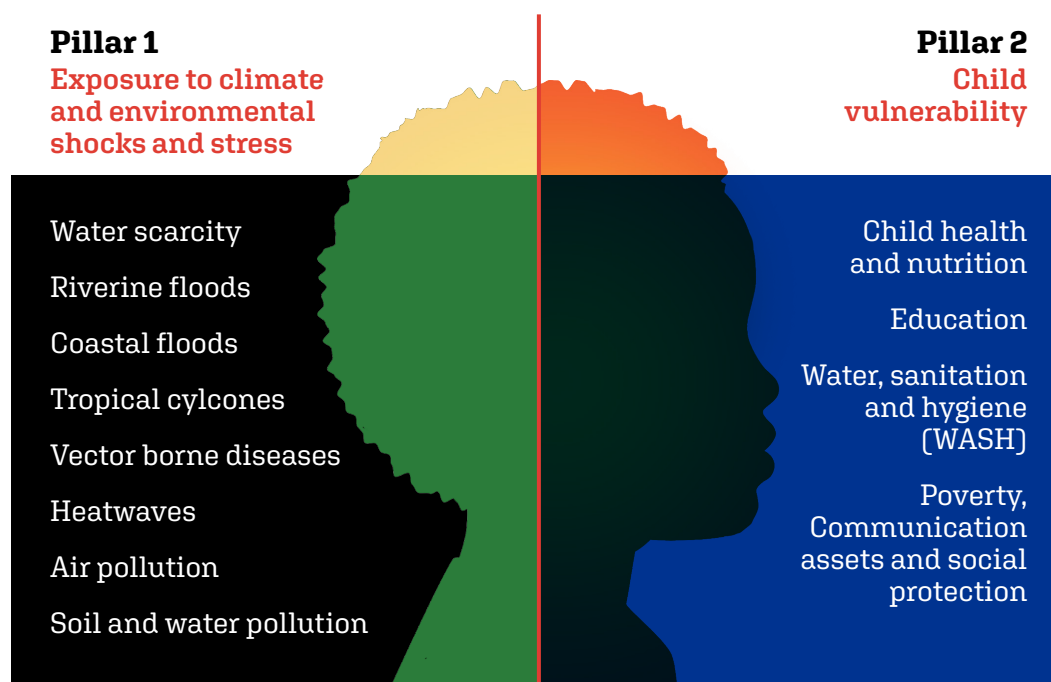
Ultimately, climate change-induced natural disasters reinforce gender inequalities further declining the economic and social rights of women²⁴⁵.

229 *Ibid.*
 230 *Ibid.*
 231 *Ibid.*
 232 Z Desai, Y Zhang op cit (n227) at 6.
 233 S Shayegh, S Dasgupta 'Climate Change, labour availability and the future of gender inequality in South Africa' (2022) *Climate and Development* 1-18.
 234 Z Desai, Y Zhang op cit (n227) at 6.
 235 United Nations Population Fund (UNFPA) Women Deliver op cit (n220).
 236 Z Desai, Y Zhang op cit (n227) at 6.
 237 United Nations Population Fund (UNFPA) and Women Deliver op cit (n220).
 238 L Nyahunda, H M Tirivangasi op cit (n216) at 1062.
 239 S Hlahla et al op cit (n215) at 936.
 240 *Ibid.*
 241 United Nations Population Fund (UNFPA) and Women Deliver op cit (n220).
 242 M M Khine, U Langkelsen 'The Implications of Climate Change on Health among Vulnerable Populations in South Africa: A Systematic Review' (2023) 20(4) *Int J Environ Res Public Health* 1-19 at 3 and 4.
 243 United Nations Population Fund (UNFPA) and Women Deliver op cit (n220).
 244 *Ibid.*
 245 S Shayegh, S Dasgupta op cit (n233) at 2.

5.2. CLIMATE CHANGE AND CHILDREN

The environment does not belong to us; rather, it is held in trust, to be inherited by our children. Due to human-induced climate change, those responsible for the emission of GHGs will only experience some of these impacts, the majority of which will be felt by future generations²⁴⁶. It is estimated that because of climate change, 125 million children on the African continent will be subjected to water scarcity, malnutrition, and displacement by 2030, and this will in turn continue to undermine the rights of children to life, health, survival, development, human dignity, adequate standard of living and access to clean water, education, health and food²⁴⁷.

Figure 14 | Children’s Climate Risk Index (CCRI).



Source: UNICEF ‘The Climate Crisis is a Child Rights Crisis: Introducing the Children’s Climate Risk Index’ (2021) New York: United Nations Children’s Fund (UNICEF) 4-120 at 73.

Children, unlike adults, will experience the effects of climate change and the degradation of the environment differently due to their biological, psychological, and cognitive development²⁴⁸. Because of their genetic make-up, children are more vulnerable to extreme weather, toxic hazards and stresses and diseases like malaria and dengue²⁴⁹. Their immature physiology and metabolism and their high intake of food and water creates unique pathways of exposure and susceptibility to climate hazards²⁵⁰. As a result of their age, access to fewer economic resources, less mobility, and their reliance on adults for care and the fulfilment of their needs, children are more vulnerable to climate change’s negative impacts²⁵¹.

- 246 M F Chersich et al ‘Climate change and adolescence in South Africa: The role of youth activism and health sector in safeguarding adolescent health and education’ (2019) 109(9) *SAMJ* 615-619 at 615.
- 247 R Fambasayi, M Addaney ‘Cascading impacts of climate change and the rights of children in South Africa: A reflection on the principle of intergenerational equity’ (2021) 1 *South African Journal of Human Rights* 29-51 at 31.
- 248 *Ibid* at 33.
- 249 UNICEF ‘The Climate Crisis is a Child Rights Crisis: Introducing the Children’s Climate Risk Index’ (2021) *United Nations Children’s Fund (UNICEF)*, New York 4-120 at 19 and 20.
- 250 A H Coovadia et al ‘Climate change and the health of children in Southern Africa – The time to act is now’ (2022) 4(3) *Wits Journal of Clinical Medicine* 157-162 at 159.
- 251 R Fambasayi, M Addaney op cit (n247) at 34.

How then is the health of children affected? Climate change is projected to worsen acute respiratory diseases, diarrhoea, malnutrition, and neonatal deaths — some of the top causes of deaths for children under the age of 5²⁵². Additionally, children spend more time outdoors than adults, exposing them to increased climate change hazards²⁵³. During extreme temperatures and heatwaves, children will adapt slower, making them more vulnerable to heat-related health risks. This may lead to heatstroke, heat rash, heat-related cramps, exhaustion, dehydration, hyperthermia, and mortality²⁵⁴. Heat has also been linked to preterm births, low birthweight, and stillbirths²⁵⁵. If a child or adolescent has chronic health conditions which are respiratory in nature, they may be slower in sensing and responding to changes in temperature putting them at risk of hospitalization²⁵⁶.

Water is becoming a scarce resource in Africa and is predicted to be the next cause of war²⁵⁷. Water scarcity increases the likelihood of diseases, lack of access to fresh water sources results in exposure to cholera, typhoid, acute respiratory infections, malaria, and measles and reductions in the volume of water leads to increases in the concentration of biological and chemical contaminants, which can harm children²⁵⁸. Amidst water scarcity, conflicts related to water, and household pressures relating to water scarcity, the mental health and well-being of children is affected with children experiencing emotional distress and fear of family separation²⁵⁹.

99% of the world's children reside in areas where they are susceptible to breathing poisonous air daily, putting them, their lungs and immune system, which are still developing, at risk while endangering the functionality of their lungs²⁶⁰. Asthma, bronchitis, pneumonia are debilitating diseases, which force children to miss school, have long-lasting damaging effects to their health and well-being and possibly affect their cognitive development²⁶¹.

In addition to the direct impacts of climate change on children, climate change also indirectly affects children's care²⁶². By enhancing the drivers of inadequate care: poverty, education, mental health and stress, migration and displacement, deaths of parents and caregivers, violence against women, it hinders care and protection services²⁶³.

252 *Ibid* at 35.

253 M F Chersich et al op cit (n246) at 615.

254 UNICEF op cit (n249) at 27.

255 A H Coovadia et al op cit (n250) at 158.

256 UNICEF op cit (n249) at 30.

257 M N Rahaman 'Water wars in 21st century: speculation or reality' (2012) 4(1-2) *International Journal of Sustainable Society* 3-10.

258 UNICEF op cit (n249) at 33.

259 *Ibid* at 36.

260 *Ibid* at 48.

261 *Ibid*.

262 UNICEF 'Building climate change into care reform in Eastern and Southern Africa' (2023) UNICEF ESARO 4-17 at 6-9.

263 *Ibid*.

CLIMATE CHANGE AND MIGRATION



fast facts

3.3 billion people are living in countries that have high human vulnerability to climate change²⁶⁴.

It is predicted that climate change will lead to the forced internal migration of 143 million people in sub-Saharan Africa, South Asia, and Latin America by 2050²⁶⁵.

One in every 45 people would have been displaced by climate induced disasters by 2050²⁶⁶.

In sub-Saharan Africa, internal migration due to climate variation and change is projected to exceed 86 million by 2050²⁶⁷.

There may be 700 million climate migrants by 2100²⁶⁸.

Rising sea levels may add an additional 187 million migrants, globally²⁶⁹.

From 2080 to 2099, 263 million people may leave nations in Africa due to heat and rain anomalies.

Heat anomalies may add 20 million asylum seekers²⁷⁰.

²⁶⁴ European Union (EU) 'Addressing displacement and migration related disasters, climate change and environmental degradation' (2022) Luxembourg: Publications Office of the European Union, 2022 5-22 at 6.
²⁶⁵ C McMichael 'Climate and Environmental Change, Migration and Health' (2023) 44 Annu. Rev. Public Health 171-91 at 172.
²⁶⁶ S Mpandeli et al 'Migration under climate change in Southern Africa: A Nexus planning perspective' (2020) 12 –14 at 2.
²⁶⁷ T Xiao et al 'Complex climate and network effects on internal migration in South Africa revealed by a network model' (2022) *Population and Environment* 289-318 at 290.
²⁶⁸ R Reuveny 'Climate-related migration and population health: social-science oriented dynamic simulation model' (2021) 21 *BMC Public health* 1-22 at 2.
²⁶⁹ *Ibid.*
²⁷⁰ *Ibid.*

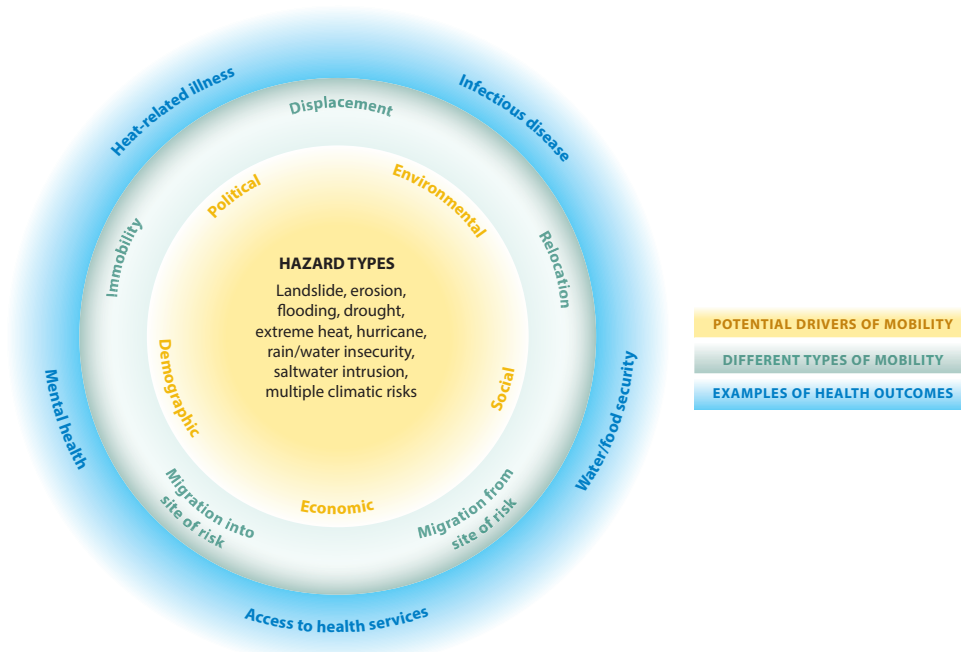


CLIMATE CHANGE AND MIGRATION

Climate change is a driver for mobility and is expected to increase the mobility and migration of people globally. The three main types of climate related mobility are:

- displacement, which entails the forceful removal of people from their places of residence
- relocation, which involves the permanent movement of people and infrastructure from areas of settlement and hazards to new locations
- migration, the voluntary movement, and settlement of people within and across borders²⁷¹.

Figure 15 | This figure highlights potential drivers of mobility, types of mobility and examples of health outcomes experienced as a result of mobility.



Source: C McMichael 'Climate and Environmental Change, Migration and Health' (2023) 44 Annu. Rev. Public Health 171-91 at 175.

Climate change itself does not cause mobility; rather, it is its effects, which include the loss in land productivity, the disruption of livelihoods, food and water insecurity and the reduction in the habitability of places where people live, that bring about mobility²⁷².

²⁷¹ C McMichael op cit (n265) at 175.

²⁷² *Ibid.*

The impacts of climate change are altering the patterns of migration with people likely to move to cope, adjust, avoid deteriorating environments that could impact their livelihoods²⁷³ and ability to survive, and their food security²⁷⁴. While this is the case, migration and mobility could also influence the environment, economics, and epidemiology of the countries that the migrants are moving from, and those that they are moving to²⁷⁵. Where receiving areas are stretched in terms of infrastructure, schooling, access to healthcare facilities and water, they run the risk of migration worsening the socioeconomic challenges faced by the area²⁷⁶.

A good example of this is internal migration in the South African context. South Africa has a high internal migration rate with a flow to urban areas which has influenced population growth, resource distribution, and access to public healthcare facilities²⁷⁷. This in turn poses a challenge for future planning around climate change²⁷⁸.

For migrants, climate change is considered a burden due to its direct effects on determinants of health (nutrition, water supply, hygiene, housing, and safe environments)²⁷⁹. The sexual and reproductive well-being of women and children migrants deteriorates in environments that are insecure. Migrants are vulnerable to threats of rape and sexual violence and must resort to survival sex as a bartering tool for food and water, more so in situations where access to condoms and contraceptives is limited²⁸⁰. The threat of climate change, the sudden loss of shelter, hardship, and threat of violence²⁸¹ and the lack of access to necessities also impacts the mental health and well-being of migrants with little to no access to facilities during the duration of their migration, or upon arrival in a new area²⁸². Climate change may also affect the distribution of vectors and the spread of disease, resulting in the creation of new ones²⁸³.



Image Courtesy: AP

- 273 V T Amadi, M N Vundamina 'Migration and climate change in Africa: A differentiated approach through legal frameworks on free movement of people' (2023) 27 *Law, Democracy and Development* 31-54 at 33.
- 274 R Bharadwaj, S Huq 'Climate-induced migration and health issues A toolkit for policymakers' (2022) IIED, London 4-17 at 4.
- 275 T Xiao et al op cit (n269) at 290.
- 276 S Mpandeli et al op cit (n268) at 2.
- 277 T Xiao et al op cit (n269) at 290.
- 278 *Ibid.*
- 279 U Trummer et al 'Climate change aggravating migration and health issues in the African context: The views and direct experiences of a community of interest in the field' (2023) 7 *Journal of Migration and Health* 1-6 at 3.
- 280 *Ibid.*
- 281 *Ibid.*
- 282 *Ibid.*
- 283 *Ibid.*

THE ROLE OF THE HEALTH SECTOR IN CLIMATE CHANGE MITIGATION AND ADAPTATION



The image outlines South Africa's progress towards the globally agreed aim of holding warming below 2°C and limiting warming below 1.5°C.

Source:

Health Care Without Harm 'Climate Action: A Playbook for Hospitals'
available at <https://climatecouncil.noharm.org/>
accessed on 23 July 2023



THE ROLE OF THE HEALTH SECTOR IN CLIMATE CHANGE MITIGATION AND ADAPTATION

Globally, emissions emanating directly from health care facilities and health care-owned vehicles (Scope 1) make up 17% of the sector's worldwide footprint; indirect emissions from purchased energy sources such as electricity, steam, cooling, and heating (Scope 2) comprise another 12%; and the remaining 71% is primarily derived from the health care supply chain (Scope 3) through the production, transport, and disposal of goods and services such as pharmaceuticals and other chemicals, food and agricultural products, medical devices, hospital equipment, and instruments.

Source: J Karliner, S Slotterback 'Healthcare's Climate Footprint: How the Health sector contributes to the Global climate crisis and opportunities for action' (2019) Health Care Without Harm Climate -smart health series Green paper 1 1-48.

Contributing 4.4% to the global net emission, the health care sector has a moral responsibility and historic opportunity to invest in healthy, resilient communities for the benefit of all. The worst effects of climate change can be prevented, and such prevention presents an opportunity for health care to play a leadership role by implementing resilience and low-carbon development strategies within the sector, while influencing others to mitigate climate change and improve population health. As a public health professional, there are many ways that you can act as a Climate and Health Champion in your practice, in your local community, and more widely in influencing community leaders and policymakers who make decisions with larger impacts.

Health Care Without Harm has developed its climate program with the goal to transform health care into a climate-smart, resilient, and innovative sector that protects public health from climate change and accelerates the transition to a low-carbon economy, while improving health equity and access.

THE HEALTH SECTOR'S CLIMATE ACTION RESTS ON A THREE-PRONGED APPROACH:

1. Mitigation

Reduce health care's own carbon footprint. That is by decarbonizing health care's energy consumption, operations, and supply chain, reducing its climate footprint in alignment with the ambition of the Paris accord.

2. Resilience

Prepare for the impacts of extreme weather, slow onset disasters, and the shifting burden of disease. That is by building health systems and facilities to withstand the impacts of climate change while deploying climate-smart & resilient health care as an anchor strategy to achieve more equitable access to care, resulting in healthy, resilient communities.

3. Leadership

Educate staff and the public about climate and health, and promote policies to protect public health from climate change. That is by accelerating the transition to a low-carbon economy by activating health care as a climate policy advocate, leveraging health care's purchasing power to hasten societal de-carbonization, and mobilizing health care institutions and their employees as trusted climate communicators.

7.1. PERSONAL CLIMATE ACTION LIST FOR PUBLIC HEALTH PROFESSIONALS

7.1.1. Steps that can be taken to reduce personal footprints

- Walk or bike instead of driving; drive a low- or no-carbon vehicle.
- Be energy efficient at home and in your office: use energy efficient appliances, electronics, and light bulbs.
- Engage in effective waste management practices, segregation, and composting.
- Reduce the use of plastic in all forms.
- Place climate change educational material brochures, factsheets, posters about climate change and health in visible areas in private or public healthcare facilities and in consultancy rooms.
- Look for appropriate ways to incorporate climate change and health into patient education materials (e.g., disease management plans, discharge materials, medication sheets, etc).
- Speak on the health impacts of climate change, and strategies to address them, at your local clubs or community meetings.
- Include climate change and health information when your clinic participates in community events.
- Write an Op-Ed in your local or regional newspaper on the connections between climate change and health equity.
- Capitalize on current events: Write Letters to the Editor after relevant events, such as extreme weather events, about the connection between events, climate change and health.
- Speak on local radio or television programs about climate change and health.

1 CHEMICALS: Substitute harmful chemicals with safer alternatives; by addressing chemical exposure in health settings, the health sector can not only protect patient and worker health, but also actively demonstrate the safe management of chemicals thereby leading by example. Develop institution-wide chemicals and materials policy and protocols to protect patient, worker, and community health and the environment, while helping drive society wide demand for alternatives.

2 LEADERSHIP: Prioritize environmental health; develop and commit to a system-wide green and healthy hospital policy. This means making environmental health, safety, and sustainability key organizational priorities. This can be achieved through education, goal setting, accountability, and incorporating these priorities in all external relations and communications. It amounts to a major change in the culture of the organization.

3 FOOD: Purchase and serve sustainably grown, healthy food. By promoting and supporting nutritious, localized sustainable food systems, hospitals can both reduce their own immediate footprint while supporting food access and nutrition, thereby helping to foster the prevention of disease, a reduction in the health sector's environmental health impacts and contributing to a longer-term reduction in the population's need for healthcare.

4 TRANSPORTATION: Improve transportation strategies for patients and state & develop transportation and service delivery strategies that reduce hospitals' climate footprint and their contribution to local pollution. Plan shifting to hybrid technologies, all-electric vehicles, as well as compressed natural gas or some biofuels. This will all have the net impact of reducing emissions for fleet vehicles such as ambulances and vans. Encouraging hospital staff and patients to use bicycles, public transportation and carpools can also help reduce the air pollution emissions related to health care facilities.

11

CLIMATE ACTION GOALS FOR HEALTH CARE INSTITUTIONS

5 ENERGY: Implement energy efficiency and clean, renewable energy generation. Greater energy efficiency and transitioning to clean, renewable energy sources, such as solar and wind, can significantly reduce greenhouse gas emissions and also protect public health from the myriad impacts of climate change, including increased heat-related illnesses, the expansion of vector borne diseases, increased droughts and water scarcity in some regions and storms and flooding in others. Moving away from fossil fuels also brings with it the health and direct economic benefit of cost efficiency and reduced electricity bills and co-benefits of reductions in hospital admissions and treatments for chronic illnesses such as asthma, lung and heart disease caused by the pollution created from the extraction, refining and combustion of coal, oil, and gas.

6 WATER: Reduce hospital water consumption and supply potable water. Health facilities can conserve water resources by closely metering water use, installing water-efficient fixtures and technologies, growing drought-resistant landscape, and making sure that leaks are quickly repaired. For even greater impact on overall usage, hospitals in several countries are harvesting rainwater.

7 PURCHASING: Buy safer and more sustainable products and materials. Source sustainably produced supply chain materials from socially and environmentally responsible vendors.

9 BUILDINGS: Support green and healthy hospital design and construction. Aspire to carbon-neutral building operation in a planned manner. Protect and restore natural habitat; minimize the combined footprint of building, parking, roads, and walks. Design within local natural and social contexts to better integrate the building with the community and natural environment. Site facilities after conducting a thorough climatic vulnerability assessment and in accordance with solar orientation and prevailing wind.

8 DIGITAL HEALTH: Using information and communication technology to address health emergency response, improving human health and healthcare services and wellness for individuals and populations through the collection of data, monitoring disease, early risk assessment, initiating investigation and control activities and providing information for decision-making²⁸⁴. Digital health can be used in the mitigation of climate change through the reduction of travel, digitizing work processes, and optimizing health system energy use²⁸⁵. It can also be used for climate adaptation by delivering health care in difficult-to-reach settings and for monitoring and mitigating localized environmental health-related impacts that are caused by natural disasters²⁸⁶.

10 PHARMACEUTICALS: Safely manage and dispose of pharmaceuticals. Prescribe appropriately, safely manage and properly dispose of pharmaceuticals. Reduce pharmaceutical pollution by reducing over-prescription practices, minimizing inappropriate pharmaceutical waste disposal, promoting manufacturer take-back, and ending the dumping of pharmaceuticals as part of disaster relief.

11 WASTE: Reduce, treat, and safely dispose of healthcare waste; protect public health by reducing the volume and toxicity of waste produced by the health sector, while implementing the most environmentally sound waste management and disposal options.

284 H Rahimi-Ardabili et al 'Digital health for climate change mitigation and response: a scoping review' (2022) 29(12) *Journal of the American Informatics Association* 2140-2152 at 2141 and 2148.

285 *Ibid.*

286 Z Lokmin-Tomkins et al 'Designing Digital Health applications for climate change mitigation and adaptation' (2023) 218(3) *MJA* 106-110 at 106.

Climate-Smart Health Care: A “Climate-Smart Health Care” Approach: Mitigation and Anchoring Community Resilience

In 2017 the World Bank published a report, co-produced with Health Care Without Harm, establishing a new approach that bridges the divide between adaptation and mitigation in the health sector. While mitigation and resilience are often placed in separate silos in the climate world, the “Climate-Smart Healthcare” approach encompasses both low-carbon and resilience strategies in an overarching framework.

Indeed, as hospitals and health systems explore opportunities to address climate change, they are finding significant overlap and synergy between mitigation measures and climate change resilience interventions.

Many of these strategies can yield significant operational cost-savings as well as facility resilience in the case of short-term grid energy loss. For instance, hospitals are finding that the interventions which enable them to reduce their dependence on large power grids and infrastructure also enable them to better withstand situations, like increased storms, that disable centralized infrastructure.

By jointly implementing resilience and de-carbonization strategies within the sector, climate-smart health care can reduce emissions from large systems. This approach can form a foundation from which health care can contribute to broader policy, economic and communications initiatives in concert with global climate and health goals.

Thousands of hospitals, health centres and entire health systems around the world are already implementing climate-smart health care strategies. Kaiser Permanente, one of the largest hospital systems in the U.S., will be carbon net positive by 2025. Working with UNDP, the government of Zimbabwe installed solar energy systems on more than 400 health centres across the country. Health systems in New Zealand, Canada, Costa Rica and more are committed to becoming carbon neutral.

Climate Impact Checkup

Climate Impact Checkup is a calculator that was created by Global Green and Healthy Hospitals (GGHH), an international network of hospitals, health care facilities, health systems, and health organizations dedicated to reducing their environmental footprint and promoting public and environmental health. The Climate Impact Checkup helps health care institutions anywhere in the world measure their GHG footprint. It provides a starting point to measure, manage, and support mitigation goals and action planning no matter where your facility is located.

The Climate Impact Checkup calculates facility emission originating from three scopes:

- Scope 1: Stationary and mobile combustion, fugitive emission and waste
- Scope 2: Purchased electricity
- Scope 3: Business travel, waste off-site treatment, electricity transmission and losses inhalers, employee, and patient communing.

The Climate Impact Checkup can be used by the following groups:

- health care facilities, both public and private, of any level of complexity and in any location
- sub-national (city, state or provincial) health care systems
- private and charitable health care systems
- national ministries of health (to measure their facilities’ footprint)
- research institutions, such as universities.

For more information on the Climate Impact Checkup, please visit <https://greenhospitals.org/checkup>.

7.3. NATIONAL AND INTERNATIONAL ACTORS IN THE CLIMATE SPACE



Health Care Climate Challenge (HCCC)

The Health Care Climate Challenge is mobilizing health care institutions around the world to protect public health from climate change. As the only sector with healing as its mission, health care has an opportunity to use its ethical, economic, and political influence to be a leader in climate solutions.

By moving toward climate-smart health care, the health sector can mitigate its own climate impact, save money, and lead by example. By becoming more resilient, health care systems can help prepare their own facilities and their communities for the growing impacts of climate change. And by providing societal leadership, the health sector can help forge a vision of a future with healthy hospitals and healthy people living on a healthy planet.

For more details on Healthcare Climate Challenge, please visit: <https://www.greenhospitals.net/join-climate-challenge/>.



The Climate Justice Coalition

The Climate Justice Coalition is a UK-based coalition made up of groups and individuals seeking to build solidarity and power around Climate Justice and Global Solidarity. Coalition members include environment and development NGOs, trade unions, grassroots community campaigns, faith groups, youth groups, migrant and racial justice networks - to name a few.

For more information on the Climate Justice Coalition, United Kingdom, visit: <https://climatejustice.uk/>



The Global Climate and Health Alliance

The Global Climate and Health Alliance is an alliance of health NGOs, health professional organizations, and health and environment alliances from around the world.

For more information on the Global Climate and Health Alliance, please visit: <https://climateandhealthalliance.org/>



Global Green and Healthy Hospitals Network (GGHH)

An HCWH project, GGHH is an international network of hospitals, health care facilities, health systems, and health organizations dedicated to reducing their environmental footprint and promoting public and environmental health. As of 9 August 2023, GGHH has more than 1788 institutional members in 84 countries who represent the interests of over 70 000 hospitals and health centres. GGHH members commit to a framework and roadmap to reach 10 interconnected sustainability goals. GGHH staff are based in Argentina, Australia, Brazil, Belgium, China, Costa Rica, England, India, Nepal, the Philippines, South Africa, and the United States. The network is increasingly prioritizing climate, providing members with tools, resources, and expertise to address climate-related issues such as carbon footprint reduction and resiliency, through sustainability strategies on energy, waste, buildings, procurement and more.

For more information on the Global Green and Healthy Hospitals Network, visit: <https://www.greenhospitals.net/>.



Health and Climate Network (HCN)

The HCN is a community of experts and organisations working together to advocate for health-centred climate policy. The network includes expertise across sectors, including climate change, energy, transport, cities, food and diet, and health care; using the networks combined knowledge and experience, the network advocate for solutions in the intersect between health and climate change.

The HCN community co-create policy to influence global decision making, hold events, workshops and seminars to build the community and advocate together for healthy climate action.

For more information on the Health and Climate Network, please visit: <https://healthandclimatenetwork.org/>



Southern African Faith Communities' Environmental Initiative (SAFCEI)

The Southern African Faith Communities' Environment Institute (SAFCEI) is a multi-faith organisation committed to supporting faith leaders and their communities in Southern Africa to increase awareness, understanding and action on eco-justice, sustainable living, and climate change. It was launched in 2005 after a multi-faith environment conference which called for the establishment of a faith-based environment initiative. They have a broad spectrum of membership, including African Traditional Healers, Baha'i, Buddhist, Hindu, Muslim, Jewish, Quaker, and a wide range of Christian denominations. They emphasise the spiritual and moral imperative to care for the earth and the community of all life. They call for ethical leadership from all in power and speak out on issues of eco-justice, encouraging citizen action.

For more information on the Southern African Faith Communities' Environment Institute, please visit <https://safcei.org/>.



The Centre for Environmental Rights (CER)

The Centre for Environmental Rights (CER) is made up of activist lawyers who defend the right of communities and civil society organizations to an environment not harmful to health or well-being for present and future generations. Through litigation, advocacy and activist support and training, they seek to advance their vision of a more equal society, free of fossil fuels, in which environmental and climate justice is realised and all people and the planet flourish.

For more information on the Centre for Environmental Rights (CER), please visit <https://cer.org.za/>.



GroundWork

GroundWork is a non-profit environmental justice service and developmental organisation working primarily in Southern Africa in the areas of Climate and Energy Justice, Coal, Environmental Health, Global Green and Healthy Hospitals, and Waste.

For more information on GroundWork, please visit <https://groundwork.org.za/>.



Fossil Free South Africa

Fossil Free South Africa is a legally established voluntary association which was established in 2015. The association campaigns for investment to support a swift, fair, South African and global transition to a socially just and cleaner energy economy and that takes care of workers in the fossil fuel industry.

For more information on Fossil Free South Africa, please visit <https://fossilfreesa.org.za/>.



The Public Health Association of South Africa (PHASA)

The Public Health Association of South Africa (PHASA) is a professional public health organisation, providing leadership and a collective voice to improve health through knowledge sharing, capacity building and partnerships. PHASA has a climate, energy and health special interest working group (SIG) which consists of a network of practitioners, decision-makers, researchers, lobbyists, students, and academics, among others, working in the fields of public health, energy and fossil fuels, and climate vulnerability and change.

For more information on the Public Health Association of South Africa (PHASA), please visit <https://phasa.org.za/>.



The African Climate and Development Initiative (ACDI)

The African Climate and Development Initiative (ACDI) was established in 2011 by the Vice Chancellor of the University of Cape Town (UCT) as a strategic initiative to “*facilitate and substantially extend climate change research and education at UCT with the specific context of addressing the development challenges of Africa from an African perspective*”. ACDI surpassed this initial mandate and achieved formal status as a university institute in 2018. Viewed as one of the continent’s foremost climate change institutes, ACDI provides a platform for UCT’s and African Research Universities Alliance (ARUA’s) collective response to the challenge of climate change by coordinating and centralising resources to enable inter- and transdisciplinary research, teaching and learning in the areas of climate change and sustainable development across Africa and beyond.

For more information on the African Climate and Development Initiative, please visit <https://acdi.uct.ac.za/>.



The Climate Justice Coalition, South Africa

The Climate Justice Coalition (CJC) is a South African coalition of trade unions, civil society, grassroots, and community-based organisations taking on the climate crisis by advancing a transformative climate justice agenda, which works to overcome the deep inequality, poverty and multiple injustices that South Africa faces. The coalition is made up of 40 member organizations who work together towards a climate justice agenda which advances environmental, energy, youth, gender, racial, immigrant, social, and economic justice together. The coalition seeks to capacitate and empower Black womxn and youth to actively engage in spaces they have been historically and purposely excluded from, as we build an intergenerational, anti-racist, and feminist movement. The CJC is grounded in respect for and the advancement of human rights, equality, dignity, justice and fairness for all.

For more information on the Climate Justice Coalition South Africa, please visit <https://climatejusticecoalition.org/>



African Climate Alliance

The African Climate Alliance is a youth led, grassroots movement based organization advocating for afrocentric climate justice. The organization aims to act and advocate for climate justice whilst inclusively building up and amplifying youth voices across sectors of society, bridging connections to create intergenerational organising potential with youth at the centre. We do this by focusing on Afrocentric socio-environmental education, advocacy and action, whilst providing a safe and inclusive space for South African youth. Currently we work through four project areas including an ambassador programme that spans across various African countries.

For more information on the African Climate Alliance, please visit: <https://africanclimatealliance.org/>



“salient points”

key
terms

“talking
points”

COMMUNICATING

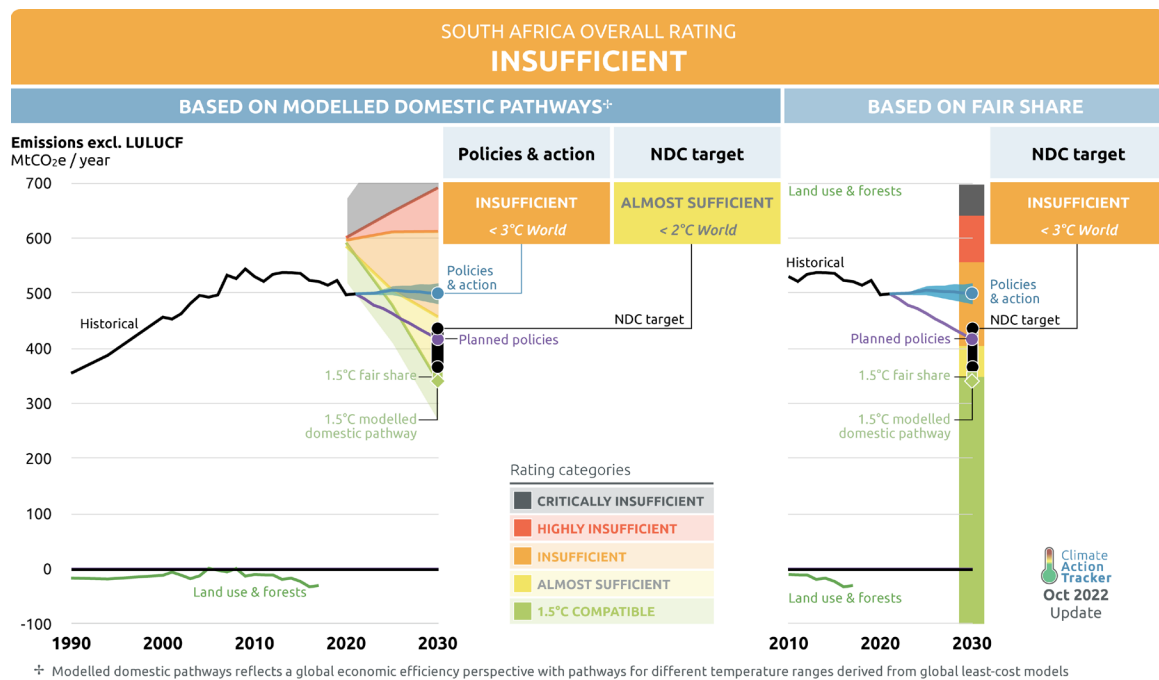
CLIMATE CHANGE



COMMUNICATING CLIMATE CHANGE SALIENT POINTS, KEY TERMS AND TALKING POINTS

As a public health practitioner, irrespective of profession, you can make a difference in your community by talking about climate change and health. Public health practitioners need to understand the various ways in which climate change impacts health so that they can then speak with authority to our patients, communities, peers, and local leaders on the climate–health connection and the benefits of building resilience to climate change.

Figure 16 | This figure outlines South Africa's progress towards the globally agreed aim of holding warming below 2°C and limiting warming below 1.5°C.



Source: Climate Action Tracker 'South Africa' 18 October 2022 available at <https://climateactiontracker.org/countries/south-africa/> accessed on 26 July 2023.

It is equally important to understand where your country is with regards to its climate action and commitment towards a globally agreed aim of holding warming below 2°C and limiting warming to 1.5°C. To this end, activists, advocates, and those working in the climate justice space can use the Climate Action Tracker to track the climate action of their countries (<https://climateactiontracker.org/>).

In addition, see below a short selection of salient points, starting points, talking points and counters for sceptics. Tailor and use them in your conversations, speeches, and writing to build support for climate solutions.

You don't need (much) data: first and foremost, your primary task is not to tell people climate change is happening, or to make them worry about it. They already know, and they are already concerned.

Talk about what is already happening: to create urgency, talk about what we are already experiencing. For example, extreme heat — 2022 was the hottest year (ever). It brought storms, fires and floods that killed at least 8,200 people and cost the world \$210 billion in losses.

Localize the impacts: emphasize how climate change affects us here and now, in our everyday lives. Talk about the local and most recent impacts of climate change that affect the community, instead of generalizing or globalizing.

Emphasize solutions: using tangible, local examples, point out how climate solutions are accessible, are available here and now, and are creating safe and healthy communities that protect our families' health.

Focus on personal benefit: let them know we can save money by saving energy, be healthier by eating locally

grown food and cycling or walking instead of driving, and protect and promote the well-being of our families and communities by reducing carbon pollution. When people realize they will gain benefits from climate solutions, they are more willing to participate.

8.1 SALIENT POINTS

8.2 STARTING POINTS

I'm a health professional because I care about the health of everyone in our community. I want to heal people, but it's even more important to prevent the causes of illness and injury.

We can prevent further climate change and protect our health at the same time.

Fossil fuels pollute our air and water. The toxic pollution we're adding to the atmosphere is not going away, it is steadily building up to dangerous levels.

Healthy people and healthy communities require clean air and water to grow healthy food and prevent respiratory disease and other illnesses. We have a fundamental right to clean air and water.

If we stop pollution from fossil fuels, we stop climate change and improve our health. We reduce diseases, illness, and injury brought on by pollution and severe weather.

We slow the rising temperatures that are changing weather patterns and causing more intense storms and heat waves, all of which impact food prices and create health threats.

Some people are more vulnerable to the health impacts of climate change, especially children, the elderly and the sick. Our efforts to stop pollution help all of these groups live longer, healthier lives.

The health risks of heat, air pollution and flooding are increasing as climate change brings warmer temperatures, more extreme weather events and rising sea levels.

Climate change will reduce worldwide food production through adverse impacts on crop yields and fisheries. This will increase food insecurity and increase the risk of chronic illness and under-nutrition.

Switching from coal combustion and other fossil fuels to clean, safe, renewable energy — like wind, solar and hydroelectric — is one of the most important things we can do for our health and for the climate.

Energy efficiency and clean renewable energy have substantial benefits for health, including reduction in asthma and other respiratory disease, cardiovascular disease, and premature deaths.

Trees absorb carbon dioxide, improve air quality, capture rainwater, replenish groundwater and cool urban environments.

Our car-dependent land use, housing and transportation patterns have taken physical activity out of our daily routines. Sedentary lifestyle increases the risk of heart disease, stroke, diabetes, depression, osteoporosis, obesity, and some cancers.

Replacing car travel with walking, cycling, and using public transit increases physical activity and significantly reduces risk of chronic disease, while also reducing air pollution.

Increased energy efficiency (in homes, offices, and industry) allows us to meet our energy needs at a lower cost and with less climate and air pollution.

Urban greening reduces the risk of heat illness and flooding, lowers energy costs, and improves health.

8.3 TALKING POINTS

Green spaces provide places for us to be physically active and improve our overall well-being.

Sustainable agricultural practices conserve water, reduce pesticide and fertilizer use, protect topsoil and store carbon.

8.4

TALKING TO

CYNICS, SCEPTICS, AND DENIERS

“ Climate change does not affect me ”

- 1 Climate change affects us all because it affects the world our children and we will live in. The causes and consequences of our changing climate are impacting personal and public health now, across the nation, and this will accelerate if we don't curb carbon pollution. Marginalized communities are suffering from a higher frequency and intensity of diseases, illness, injury, and other health impacts brought on by pollution and climate change related severe weather.

“ I am more concerned about my family/health/job right now ”

- 2 Exactly. All of which are at risk directly or indirectly due to climate change. The Indian Lung Association tells us that toxic pollution in the air we breathe is affecting the health of nearly half of all Indians. We have a problem. All of us want to live in the best place for our families. Let's ensure our families have clean air, clean water, and safe communities to live in, now and in the future, by moving away from the dirty fuels that make us sick and shifting towards safe and clean energy like wind and solar. Caring for our climate is caring for ourselves, our family and health.

“ There is nothing I can do to stop climate change ”

- 3 In nearly every aspect of our daily lives, we can do something to prevent climate change. From saving energy at home to recycling, eating locally produced fresh food, and taking public transportation, we can reduce energy consumption and emissions that damage our climate, and protect and enhance our health at the same time.

“ Why should we do anything when the western/developed countries aren't? ”

- 4 South Africa's carbon footprint is high so we must embrace clean energy: affordable, local solar and wind power made here and now. While Africa's contribution to the emission of GHGs is low, the reality is that the continent has suffered a high amount of collateral damage risking our economies, infrastructure investments, water and food systems, public health, agriculture and livelihoods pushing the continent into higher levels of poverty. In the context of South Africa, while the country is racing to provide adequate transport, power and communication networks, water, sanitation and other infrastructure services, the country's development may increase GHG emission worsening climate change. With the worsening of climate change, the country will experience an increase in vulnerability towards poverty, disease, droughts, floods and ill health, including mental health. Development must go hand in hand with the reduction of emission and through adaptation.

8.5. KEY TERMS

Climate change	A change of climate, which is attributed directly or indirectly to human activity, which alters the composition of the global atmosphere and is in addition to natural climate variability observed over comparable time periods.
Climate change adaptation	The process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm, or exploit beneficial opportunities. In some natural systems, human intervention may facilitate adjustment to expected climate and its effects.
Climate migration	The movement of a person or groups of persons who, predominantly for reasons of sudden or progressive change in the environment due to climate change, are obliged to leave their habitual place of residence, or choose to do so, either temporarily or permanently, within a state or across an international border.
Climate change mitigation	Efforts to reduce or prevent emission of greenhouse gases; can mean using new technologies and renewable energies, making older equipment more energy efficient, or changing management practices or consumer behaviour.
Loss and damage	While there is no commonly accepted definition available yet, here is a working definition of loss and damage as a baseline for common understanding of the concept at local level. Loss and damage refer to the negative effects of climate variability and climate change that people have not been able to cope with or adapt to. This definition includes the inability to respond to climate stresses (i.e., the costs of inaction) and the costs associated with existing coping and adaptive strategies (in comparison with erosive coping strategies and maladaptation). Such costs can be monetary or non-monetary.
Social protection	The set of policies and programmes that aim to reduce poverty and vulnerability, and to enhance the capacity of people to manage economic and social risks like unemployment, sickness, disability, and old age. It includes social assistance programmes which are not conditional on having previously made contributions (e.g., cash transfers to poor households), and social insurance programmes which are conditional on past contributions (e.g., contributory old age pensions).
Vulnerability	The conditions determined by physical, social, economic, and environmental factors or processes which increase the susceptibility of an individual, a community, assets, or systems to the impacts of hazards.

References

1. A Erzse et al “Commentary on South Africa’s syndemic of undernutrition, obesity and climate change” (2023) available at https://www.researchgate.net/publication/369616185_Commentary_on_South_Africa's_syndemic_of_undernutrition_obesity_and_climate_change accessed on 21 July 2023.
2. AM Mbandi “Air Pollution in Africa in the time of COVID-19: the air we breathe indoors and outdoors” Clean Air J. vol.30 n.1 Pretoria 2020 (date unknown) available at http://www.scielo.org.za/scielo.php?script=sci_arttext&pid=S2410-972X2020000100001 accessed on 21 July 2023.
3. A October ‘Spotlight on mental health’ 4th October 2021 Spotlight available at <https://www.spotlightnsp.co.za/2021/10/04/editorial-spotlight-on-mental-health/> accessed on 20 July 2023.
4. A Savage et al “Climate change and socioeconomic determinants are structural constraints to agency in diet-related non-communicable disease prevention in Vanuatu: a qualitative study.” BMC Public Health 21, 1231 (26 June 2021) available at <https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-021-11245-2> accessed on 21 July 2023.
5. A Mathee et al ‘Climate change impacts on working people (the HOTHAPS initiative): findings of the South African pilot study’ (2010) 3(1) *Global Health Action* 1-9.
6. A Manga et al ‘Healthcare and Climate Change: A South African Health Professionals Perspective’ (2022) 4(3) *Wits Journal of Clinical Medicine* 173-180 at 173.
7. Africa Check “ South Africa the 12th biggest source of greenhouse gases? Yes, but that’s not the only measure that matters” available at <https://m.polity.org.za/article/south-africa-the-12th-biggest-source-of-greenhouse-gases-yes-but-thats-not-the-only-measure-that-matters-2021-04-19> Accessed 11 July 2023.
8. African Development Bank Group (date unknown) available at [https://www.afdb.org/en/cop25/climate-change-africa#:~:text=Seven%20of%20the%2010%20countries, Madagascar%20\(joint%20th%20position\)](https://www.afdb.org/en/cop25/climate-change-africa#:~:text=Seven%20of%20the%2010%20countries, Madagascar%20(joint%20th%20position)) accessed on 7 July 2023.
9. A Tandon ‘Climate change made extreme rains in 2022 South Africa floods ‘twice as likely’ 13 May 2022 CarbonBrief available at <https://www.carbonbrief.org/climate-change-made-extreme-rains-in-2022-south-africa-floods-twice-as-likely/> accessed on 18 July 2023.
10. A Bennie, A Satgoor ‘Deepening the Just transition through food sovereignty and the solidarity economy’ (2018)293-313 at 293.
11. A Abera et al ‘Air quality in Africa: Public Health Implication’ (2021) 42 *Annu. Rev. Public Health* 193-210 at 194.
12. A Mtinstilana ‘Hunger in South Africa: study shows one in five are at risk’ 15 February 2023 The Conversation available at <https://theconversation.com/hunger-in-south-africa-study-shows-one-in-five-are-at-risk-199133> accessed on 14 July 2023.
13. BusinessTech ‘Rough start to 2023 for hungry South Africans’ 5 January 2023 available at <https://businesstech.co.za/news/lifestyle/653981/rough-start-to-2023-for-hungry-south-africans/> accessed on 10 July 2023.
14. B H Mourad ‘Impact of Climate Change on Occupational Health and its possible preventative strategies (Review Articles)’ (2022) 46(3) *Egyptian Journal of Occupational Medicine* 47-62 at 49.
15. B Moyo ‘Fulfilling the Right to Food in South: Justice, Security, Sovereignty and the Politics of Malnutrition’ (2020) 11(3) *World Nutrition* 112-152 at 127.
16. B Parks et al ‘Heat stress in Africa under high intensity climate change’ (2022) 66 *International Journal of Biometeorology* 1531-1545 at 1531 and 2.
17. B G Glenn et al ‘Ambient air pollution and non-communicable respiratory illness in Sub-Saharan Africa: a systematic review of the literature’ (2022) 21(40) *Environmental Health* 1-14 at 2.
18. C Y Wright et al ‘Major climate change- induced risks to human health in South Africa’ (2021) 196(1) *Environ Res* 1-36 at 16 and United Nations Environment Programme ‘Air Pollution and Climate Change: two sides of the same coin’ 23 April 2019 available at <https://www.unep.org/news-and-stories/story/air-pollution-and-climate-change-two-sides-same-coin> accessed on 14 July 2023.
19. C Howard et al ‘Learning to treat the climate emergency together: social tipping interventions by the health community’ (2023) 7 *Lancet Planet Health* 251-64 at 251
20. C McMichael ‘Climate change-related migration and infectious disease (2015) 6(6) *Virulence* 548-553 at 548.
21. C H Trisos et al ‘2022: Africa. In: Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change’ Cambridge University Press, Cambridge, UK and New York 1285–1455.
22. C Mbow et al ‘2019: Food Security. In: Climate Change and Land: an IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems’ (2019) 437-550 available at <https://www.ipcc.ch/srccl/chapter/chapter-5/> accessed on 14 July 2023 at 442.
23. Centre for Disease Control and Prevention ‘About global NCD’s’ 17 December 2021 available at [https://www.cdc.gov/globalhealth/healthprotection/ncd/global-ncd-overview.html#:~:text=Noncommunicable%20diseases%20\(NCDs\)%2C%20such,all%20communicable%20disease%20deaths%20combined.](https://www.cdc.gov/globalhealth/healthprotection/ncd/global-ncd-overview.html#:~:text=Noncommunicable%20diseases%20(NCDs)%2C%20such,all%20communicable%20disease%20deaths%20combined.) accessed on 18 July 2023.
24. C K Uejio, C.K et al ‘Primer on climate science’ (2015) Chapter 1 *Global Climate Change and Human Health: From Science to practice* Wiley Publishing San Francisco, CA 12-18.

25. C K Uejio J D Tamerius K Wertz K M Konchar 'Primer on climate science' In G Luber & J Lemery (Eds.), *Global Climate Change and Human Health* CA: Jossey-Bass San Francisco 12-18.
26. C H Trisos I.O. Adelekan E. Totin A. Ayanlade J. Efitre A. Gemedo K. Kalaba C. Lennard C. Masao Y. Mgaya G. Ngaruiya D. Olago N.P. Simpson S. Zakieldeen '2022: Africa. In: *Climate Change 2022: Impacts, Adaptation and Vulnerability*' (2022) Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Lösschke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press, Cambridge, UK and New York 1289-1403.
27. Carbon Brief 'Mapped: How climate change affects weather around the world' 4 August 2022 available at <https://www.carbonbrief.org/mapped-how-climate-change-affects-extreme-weather-around-the-world/> accessed on 19 July 2023.
28. Centre of Disease Control and Prevention 'Occupational Safety and Health and Climate' 18 April 2023 available at <https://www.cdc.gov/niosh/topics/climate/default.html> accessed on 19 July 2023.
29. C M Bennett, A J McMichael 'Non-heat related impacts of climate change on working populations' (2010) 3(1) *Global Health Action* 1-10.
30. C McMichael 'Climate and Environmental Change, Migration and Health' (2023) 44 *Annu. Rev. Public Health* 171-91 at 175.
31. D Campbell-Lendrum et al 'Climate change, air pollution and noncommunicable diseases' *Bull World Health Organ.* 2019 Feb 1; 97(2): 160–161. Published online 2018 Dec 19. doi: [10.2471/BLT.18.224295](https://doi.org/10.2471/BLT.18.224295) available at <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6357572/> accessed on 18 July 2023
32. European Union (EU) 'Addressing displacement and migration related disasters, climate change and environmental degradation' (2022) Luxembourg: Publications Office of the European Union, 2022 5-22 at 6.
33. E von Schneidmesser et al 'Chemistry and Linkages between Air Quality and Climate Change' (2015) 115 *Chem Rev* 3856-3897 at 3856 and 3857.
34. E R Fletcher 'Africa faces 1.1 million deaths Annually from air pollution- Second largest risk after malnutrition' 27 October 2022 *Health Policy Watch* available at <https://healthpolicy-watch.news/africa-faces-1-million-deaths-annually-from-air-pollution-second-only-to-malnutrition/> accessed on 14 July 2023.
35. D Dunne 'Analysis: Africa's unreported extreme weather in 2022 and climate change' 26 October 2022 *Prevention Web* available at <https://www.preventionweb.net/news/analysis-africas-unreported-extreme-weather-2022-and-climate-change> accessed on 19 July 2023
36. D A Miller et al 'Respiratory Health amongst adolescents living in the Highveld Air Pollution Priority Area in South Africa' (2022) 22 *BMC Public Health* 1-11 at 2.
37. D Charitar 'South Africa is ranked 96 out of 182 Countries in terms of Climate Change Vulnerability and its Preparedness to Enhance Resilience' *Climate Scorecard* 9 October 2022 available at <https://www.climatescorecard.org/2022/10/south-africa-is-ranked-96-out-of-182-countries-in-terms-of-climate-change-vulnerability-and-its-preparedness-to-enhance-resilience/#:~:text=and%20Action%20Alert-,South%20Africa%20is%20Ranked%2096%20out%20of%20182%20Countries%20in,Its%20Preparedness%20to%20Enhance%20Resilience&text=Droughts%2C%20floods%2C%20storms%2C%20landslides,globe%20due%20to%20climate%20change> accessed on 10 July 2023.
38. D Campbell-Lendrum et al 'Climate Change and vector-borne disease: what are the implications for public health research and policy?' (2015) *Phil. Trans. R. Soc. B* 1-8 at 1.
39. D M S Batista et al 'Climate Change and Chronic Food Insecurity in Sub-Saharan Africa' *International Monetary Fund (IMF)* 15 September 2022 available at <https://www.imf.org/en/Publications/Departmental-Papers-Policy-Papers/Issues/2022/09/13/Climate-Change-and-Chronic-Food-Insecurity-in-Sub-Saharan-Africa-522211> accessed on 14 July 2023 at 1.
40. D Naidoo 'SA cholera outbreak: governance failures bode ill for climate catastrophe' 19 June 2023 *Institute for Security Studies* available at <https://issafrica.org/iss-today/sa-cholera-outbreak-governance-failures-bode-ill-for-climate-catastrophes> accessed on 20 July 2023.
41. E C Ryan et al 'Medical, nursing, and physician assistant student knowledge and attitudes toward climate change, pollution, and resource conservation in health care' (2020) 20 *BMC Medical Education* 1-14 at 2.
42. E Ratshikhopha et al "Disease Severity and Comorbidities among Healthcare Worker COVID-19 Admissions in South Africa: A Retrospective Analysis" *Int J Environ Res Public Health* 2 May 2022 available at <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9104097/> accessed on 21 July 2023.
43. E Lawrence et al 'The impact of climate change on mental health and emotional wellbeing: current evidence and implications for policy and practice' (2021) 36 *Graham Institute of Global Health Innovation* 2-36 at 4.
44. G Barnwell 'The Psychological and mental health consequences of climate change in South Africa' (2021) *Centre of Environmental Rights (CER)* 1-35 at 10.
45. G Ziervogal et al 'Climate change in South Africa: Risks and opportunities for climate-resilient development in the IPCC Sixth Assessment WGII Report' (2022) 118 (9/10) *S Afr J Sci.* 1-5 at 1.
46. H Onyeaka et al 'Impact of COVID-19 on food-borne illness in Africa – A perspective piece' (2023) 16 *Journal of Infection and Public Health* 651-659 at 655.
47. H-A Rother et al 'Perceptions of Occupational Heat, Sun Exposure, and Health Risk Prevention: A Qualitative Study of Forestry Workers in South Africa' (2020) 11(37) *Atmosphere* 1-19.

48. Healthy Energy Initiative India 'No Vaccine for Climate Change: a Guidance Document on Climate Change and Health Impacts for Healthcare Professionals in India' 29 June 2021 available at <https://rri-tools.eu/-/no-vaccine-for-climate-change-a-communication-guide-on-climate-and-health-for-the-healthcare-professionals-in-india> accessed on 18 July 2023.
49. H K Ghazy, D M Fathy 'Effect of Awareness Program Regarding Climate Change on Knowledge, Attitudes and Practices of University Students' (2023) 3(2) *International Egyptian Journal of Nursing Science and Research* 186-203 at 187.
50. H Rahimi-Ardabili et al 'Digital health for climate change mitigation and response: a scoping review' (2022) 29(12) *Journal of the American Informatics Association* 2140-2152 at 2141 and 2148.
51. ISS 'African women bear the brunt off climate change' 6 March 2023 PSE Report available at <https://issafrika.org/pscreport/psc-insights/african-women-bear-the-brunt-of-climate-change> accessed on 17 July 2023.
52. I Andersen 'The Triple planetary crisis and public health' United Nations (UN) Environmental Programme 5 September 2021 available at <https://www.unep.org/news-and-stories/speech/triple-planetary-crisis-and-public-health> accessed on 18 July 2023.
53. International Budget Partnership (IBP) 'Asivikelane: Helping South Africa's informal settlement residents' voices be heard' 27 October 2021 available at <https://internationalbudget.org/asivikelane-helping-south-africas-informal-settlement-residents-voices-be-heard/#:~:text=Background,running%20water%20and%20refuse%20removal>. accessed on 12 July 2023.
54. International Council of Nurses 'Nurses, Climate Change and Health' 27 September 2018 available at <https://www.icn.ch/news/international-council-nurses-calls-increased-nursing-leadership-combat-effects-climate-change> accessed on 10 July 2023.
55. International Council of Nurses 'Nurses, Climate Change and Health' 27 September 2018 available at <https://www.icn.ch/news/international-council-nurses-calls-increased-nursing-leadership-combat-effects-climate-change> accessed on 10 July 2023.
56. International Panel on Climate Change (IPCC) 'Climate Change 2014: Impacts, Adaptation, and Vulnerability Part A: Global and Sectoral Aspects' (2014) Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. University Press, Cambridge, United Kingdom and New York, NY, USA.
57. J Thomas et al "Floods create health risks: what to look out for and how to avoid them" UNDRR PreventionWeb (26 April 2022) available at <https://www.preventionweb.net/news/floods-create-health-risks-what-look-out-and-how-avoid-them> accessed on 21 July 2023.
58. J Evans 'How the Climate crisis disproportionately affects women' 7 August 2022 Daily Maverick available at <https://www.dailymaverick.co.za/article/2022-08-07-how-the-climate-crisis-disproportionately-affects-women/> accessed on 17 July 2023.
59. J Kotcher et al 'Views of health professionals on climate change and health: a multinational survey study' (2021) 5 *Lancet Planet Health* 316-23 at 316.
60. J M Hugo 'Heat stress: Adaptation measures in South African informal settlements' (2023) 4(1) *Buildings and Cities* 55-73 at 57.
61. J N Mills, K L Cage, A S Khan 'Potential impacts of climate change on Vector-borne and Zoonotic Disease: A Review and Proposed Research Plan' (2010) *Environmental Health Perspectives (EHP)* 118(11) 1507-1514.
62. K P Nongwane et al 'Characteristics and Long-Term trends of Heat Stress for South Africa' (2021) 13 *Sustainability* 1-20 at 1.
63. J E Meyers, H A Rother 'Public Health Impacts of and Response to Climate Change in South Africa' (2013/13) *SAHR* 127-138 at 131.
64. J Nel, L Richards 'Climate Change and impact on infectious disease' (2022) 4(3) *Wits Journal of Clinical Medicine* 129-134 at 129.
65. J Burck et al 'The Climate Change Performance Index 2023' GermanWatch 11 November 2022 available at <https://www.germanwatch.org/en/87632> accessed on 18 July 2023.
66. K De Villiers 'Bridging the health equity gap: An examination of South Africa's social innovation in health landscape' (2021) 10(19) *Infectious Disease of Poverty* 1-7.
67. K P Ngongwane et al op cit (n81) at 16 and N Jones et al 'Beating the Heat in South African Cities: Lessons from citizen science assessments' 17 November 2022 World Bank Blogs available at <https://blogs.worldbank.org/sustainablecities/beating-heat-south-african-cities-lessons-citizen-science-assessment> accessed on 12 July 2023.
68. K L Ebi et al 'Extreme Weather and Climate Change: Population Health and Health System Implications' (2021) 1(42) *Annu Rev Public Health* 1-26 at 2.
69. K Naidoo et al 'Primary care disaster management for extreme weather events, South Africa' (2022) 14(1) 1-2.
70. L Nyahunda, H M Tirivangasi 'Adaptation Strategies employed by rural women in the face of climate change impacts in Vhembe district, Limpopo Province, South Africa' (2022) 33(4) *MEQ* 1061-1075 at 1061.
71. L Omarjee 'Air pollution contributes to more than a million African deaths a year' 28 October 2022 News24 available at https://www.news24.com/fin24/climate_future/environment/air-pollution-contributes-to-more-than-a-million-african-deaths-a-year-20221028 accessed on 14 July 2023.
72. L Smith 'The nexus between climate change and healthcare' 19 January 2022 The Health Policy Partnership available at <https://www.healthpolicypartnership.com/the-nexus-between-climate-change-and-healthcare/> accessed on 6 August 2023.

73. L Leonard 'Climate Change Impacts and Challenges of Combating Food Insecurity in Rural Somkhele, KwaZulu-Natal, South Africa' (2022) 14 *Sustainability* 1-17 at 1 and 2.
74. M Hoffman 'Impossible to have healthy people on sick planet: Fighting back against air pollution' 30 June 2023 Health Policy Watch available at <https://healthpolicy-watch.news/impossible-to-have-healthy-people-on-a-sick-planet-fighting-back-against-air-pollution/> accessed on 14 July 2023.
75. M Lencoasa 'Towards women-centred climate change decision making and budgeting' 26 August 2022 Spotlight available at <https://www.spotlightnsp.co.za/2022/08/26/opinion-towards-women-centred-climate-change-decision-making-and-budgeting/> accessed on 17 July 2023.
76. M M Khine, U Langkulsen 'The Implications of Climate Change on Health among Vulnerable Populations in South Africa: A Systematic Review' (2023) 20(4) *Int J Environ Res Public Health* 1-19 at 3 and 4.
77. M F Chersich et al 'Climate change and adolescence in South Africa: The role of youth activism and health sector in safeguarding adolescent health and education' (2019) 109(9) *SAMJ* 615-619 at 615.
78. M N Rahaman 'Water wars in 21st century: speculation or reality' (2012) 4(1-2) *International Journal of Sustainable Society* 3-10.
79. Milken Institute School of Public Health 'Hazard Zone: The Impact of Climate Change on Occupational Health' George Washington University 9 January 2017 available at <https://onlinepublichealth.gwu.edu/resources/impact-of-climate-change-on-occupational-health/> accessed on 19 July 2023.
80. M A Ramadam, B H Mourad 'Impact of Climate Change on Occupational Health and its possible preventative strategies (Review Articles)' (2022) 46(3) *Egyptian Journal of Occupational Medicine* 47-62
81. M S Butt et al 'Climate change vulnerability, adaptation assessment, and policy development for occupational health' (2022) 2(8) *Avicenna* 2-7.
82. N O Okello et al 'Changes in health risk associated with air pollution and policy response effectiveness, Richards Bay, South Africa' (2020) 30(1) *Clean Air Journal* 1-10 at 2.
83. M Dillender 'Climate Change and Occupational Health: Are there limits to our ability to adapt?' (2019) 56(1) *The Journal of Human Resources* 184-224
84. M S Butt et al 'Climate change vulnerability, adaptation assessment, and policy development for occupational health' (2022) 2(8) *Avicenna* 2-7.
85. M Romanello et al 'The 2022 report of the *Lancet* Countdown on health and climate change: health at the mercy of fossil fuels' (2022) 400(5) 1619-54 at 1619.
86. M F Chersich et al 'Impacts of Climate Change on Health and Well-being in South Africa' (2018) 15:9 *Int J Environ Res Public Health*. 2-14 at 1.
87. M Ghil 'Natural Climate Variability' (2002) 1 *Encyclopaedia of Global Environmental Change* 544-549 at 544.
88. M R Behera et al 'Planetary Health and the role of Community Health Workers' (2020) 9 *Journal of Family Medicine and Primary Care* 3183-8 at 3183.
89. M Amodu et al 'Impact of climate change and heat stress on workers' health and productivity: A scoping review' (2023) 12 *The Journal of Climate Change and Health* 1-15 at 1.
90. M C Herbst 'Fact Sheet on Climate Change, Heatwaves, and its Effect on the Incidence of Skin Cancer' February 2019 Cancer Association of South Africa available at https://www.researchgate.net/publication/331319819_Fact_Sheet_on_Climate_Change_Heatwaves_and_its_Effect_on_the_Incidence_of_Skin_Cancer accessed on 12 July 2023.
91. M D Khan et al 'Aggravation of Human Disease and Climate Change Nexus' (2019) 16 *International Journal of Environmental Research and Public Health* 1-26 at 1.
92. M M Khine, U Langkulsen 'The Implications of Climate Change on Health among Vulnerable Populations in South Africa: A Systematic Review' (2023) 20 *Int. J. Environ.Res. Public Health* 1-19 at 4.
93. N Seltnerich 'Between extremes: Health effects of heat and cold' (2015) 123(11) *Environ Health Perspect* 276-280 at 276.
94. N De Wet-Billings 'Climate change is not what South Africans see as their main problem' 13 December 2022 University of the Witwatersrand, Johannesburg available at <https://www.wits.ac.za/news/latest-news/opinion/2022/2022-12/climate-change-is-not-what-south-africans-see-as-their-main-problem.html#:~:text=Analysis%20of%20responses%20revealed%20that,change%20will%20intensify%20those%20challenges>. Accessed on 10 July 2023.
95. NCD Alliance "NCDs and Climate Change: Shared Opportunities for Action" (unknown) available at <https://ncdalliance.org/why-ncds/ncds-and-sustainable-human-development/environment-and-climate> accessed on 21 July 2023.
96. National Institute of Allergy and Infectious Diseases (NIH) "Origins of Coronaviruses" (updated 16 March 2022) available at <https://www.niaid.nih.gov/diseases-conditions/origins-coronaviruses> accessed on 21 July 2023.
97. National Institute for Communicable Diseases 'How higher temperatures and pollution are affecting mosquitoes' 24 April 2019 available at <https://www.nicd.ac.za/how-higher-temperatures-and-pollution-are-affecting-mosquitoes/> accessed on 12 July 2023.
98. National Institute of Environmental Health Sciences 'Health Impacts of Extreme Weather' 30 August 2022 available at https://www.niehs.nih.gov/research/programs/climatechange/health_impacts/weather_related_morbidity/index.cfm accessed on 19 July 2023.

99. Parliamentary Monitoring Group (PMG) 'Burden of Health and Disease in South Africa: Medical Research Council Briefing' 15 March 2015 National Council of Provinces Health and Social Services available at <https://pmg.org.za/committee-meeting/22198/#:~:text=The%20quadrangle%20burden%20of%20disease,diseases%3B%20and%20violence%20and%20injury>. Accessed on 10 July 2023.
100. R B Pickson, E Boateng 'Climate change: a friend or foe to food security in Africa' (2022) 24 *Environmental, Development, Sustainability* 4387-4412 at 4390.
101. R Metzke 'Here's how healthcare can reduce its carbon footprint' 24 October 2022 World Economic Forum available at <https://www.weforum.org/agenda/2022/10/cop27-how-healthcare-can-reduce-carbon-footprint/> accessed on 23 July 2023.
102. R R Guinto et al 'Health sector solutions for promoting sustainable and nutritious diets' (2022) *BMJ* 1-15.
103. R S Athauda et al 'Climate Change impacts on Occupational Health and Safety of Façade maintenance workers: A Qualitative study' (2023) 15 8008 *Sustainability* 1-18 at 2.
104. S Hlahla et al 'Climate-Urban Nexus: A Study of Vulnerable Women in Urban Areas of Kwa-Zulu Natal Province, South Africa' (2022) 14 *American Meteorological Society* 933-948 at 934.
105. Statistics South Africa (Stats SA) 'Incident of long-term unemployment amongst women is higher than the national average' 28 January 2023 available at <https://www.statssa.gov.za/?p=16113> accessed on 10 July 2023.
106. S Roffe et al, 'Heat is rising in Southern Africa' 26 January 2023 University of the Witwatersrand, Johannesburg available at <https://www.wits.ac.za/news/latest-news/opinion/2023/2023-01/heat-stress-is-rising-in-southern-africa.html> accessed on 12 July 2023.
107. Statistics South Africa (Stats SA) 'Focus on food inadequacy and hunger in South Africa in 2021' 11 April 2023 available at <https://www.statssa.gov.za/?p=16235#:~:text=In%202021%2C%20about%20%2C1,and%20rising%20costs%20of%20living>. accessed on 14 July 2023.
108. S Andreae 'Climate change and global health: What actions are healthcare leaders taking' 8 November 2022 World Economic Forum available at <https://www.weforum.org/agenda/2022/11/climate-change-global-health-actions-healthcare-leaders/> accessed on 23 July 2023.
109. S Shayegh, S Dasgupta 'Climate Change, labour availability and the future of gender inequality in South Africa' (2022) *Climate and Development* 1-18.
110. S Wynes 'Guidance for health professionals seeking climate action' (2022) 7 *Journal of Climate Change and Health* 1-3 at 2.
111. South Africa - Climate Performance Rating available at <https://ccpi.org/country/zaf/> accessed on 18 July 2023.
112. R Fambasayi, M Addaney 'Cascading impacts of climate change and the rights of children in South Africa: A reflection on the principle of intergenerational equity' (2021) 1 *South African Journal of Human Rights* 29-51 at 31.
113. R Reuveny 'Climate-related migration and population health: social-science oriented dynamic simulation model' (2021) 21 *BMC Public health* 1-22 at 2.
114. R Bharadwaj, S Huq 'Climate-induced migration and health issues A toolkit for policymakers' (2022) IIED, London 4-17 at 4.
115. S Mpandeli et al 'Migration under climate change in Southern Africa: A Nexus planning perspective' (2020) 12 -14 at 2.
116. *Trustees for the time being of Groundwork Trust and Another v Minister of Environmental Affairs and Others* (39724/2019) [2022] ZAGPPHC 208 (18 March 2022).
117. T B Kjellstrom et al 'Occupational Health and Safety impacts of climate conditions' (2013) 1 *Climate Vulnerability: Understanding and Addressing Threats to Essential Resources*. Elsevier Inc., Academic Press, 145-156.
118. The International Federation of Red Cross and Red Crescent Societies (IFRC) "Non-communicable diseases" (date unknown) available at <https://www.ifrc.org/our-work/health-and-care/community-health/non-communicable-diseases> accessed on 21 July 2023.
119. The Centre for Human Rights 'This National Women's Day, the centre for Human Rights calls for gender responsive solutions to climate change impact in South Africa' The University of Pretoria 11 August 2022 available at <https://www.chr.up.ac.za/news-wru/3113-this-national-women-s-day-the-centre-for-human-rights-calls-for-gender-responsive-solutions-to-climate-change-impact-in-south-africa> accessed on 17 July 2023.
120. The Presidential Climate Commission (PCC) 'A Framework for a Just Transition in South Africa' June 2022 available at <https://pcccommissionflow.imgix.net/uploads/images/A-Just-Transition-Framework-for-South-Africa-2022.pdf> accessed on 6 August 2023 1-33.
121. T H Mathew et al 'Climate change impacts and effects on health system: A challenge towards the achievement of sustainable development goal 3 in South Africa' (2020) 26 *Technium Social Sciences Journal* 950-967 at 954-956.
122. T Kapwata et al 'An analysis of past and future heatwaves based on a heat-associated mortality threshold: towards a heat health warning system' (2022) 21 (112) *BMC* 1-12 at 1.
123. The Kresge Foundation 'Bounce forward, urban resilience in the era of climate change' 4 May 2015 available at <https://kresge.org/resource/bounce-forward-urban-resilience-in-the-era-of-climate-change/> accessed on 17 July 2023.
124. T Xiao et al 'Complex climate and network effects on internal migration in South Africa revealed by a network model' (2022) *Population and Environment* 289-318 at 290.
125. The Lancet 'Twin threats: climate change and zoonoses' (2023) *The Lancet Infectious Disease* 23 (1).

126. The World Health Organization WHO (Europe) 'A health perspective on the role of the environment in One Health' (2022) Copenhagen: WHO Regional Office for Europe 1-60.
127. UNICEF 'The Climate Crisis is a Child Rights Crisis: Introducing the Children's Climate Risk Index' (2021) *United Nations Children's Fund (UNICEF)*, New York 4-120 at 19 and 20.
128. UNICEF 'Building climate change into care reform in Eastern and Southern Africa' (2023) UNICEF ESARO 4-17 at 6-9.
129. U Trummer et al 'Climate change aggravating migration and health issues in the African context: The views and direct experiences of a community of interest in the field' (2023) *7 Journal of Migration and Health* 1-6 at 3.
130. United Nations 'Biodiversity- our strongest natural defence against climate change' (date unknown) available at <https://www.un.org/en/climatechange/science/climate-issues/biodiversity> accessed on 18 July 2023 and J Watts 'Stop Biodiversity loss or we could face our own extinction, warns UN' 6 November 2018 available at <https://www.theguardian.com/environment/2018/nov/03/stop-biodiversity-loss-or-we-could-face-our-own-extinction-warns-un> accessed on 18 July 2023.
131. United Nations 'Causes and Effects of Climate Change' (date unknown) available at <https://www.un.org/en/climatechange/science/causes-effects-climate-change> accessed on 18 July 2023.
132. United Nations Climate Change 'What is the Triple Planetary Crisis' 13 April 2020 available at <https://unfccc.int/blog/what-is-the-triple-planetary-crisis> accessed on 10 July 2023.
133. United Nations Population Fund (UNFPA) 'The Impact of the Climate Crisis on Sexual and Reproductive Health and Rights' May 2022 available at <https://esaro.unfpa.org/en/publications/impact-climate-crisis-sexual-and-reproductive-health-and-rights> accessed on 9 August 2023.
134. V T Amadi, M N Vundamina 'Migration and climate change in Africa: A differentiated approach through legal frameworks on free movement of people' (2023) *27 Law, Democracy and Development* 31-54 at 33.
135. World Health Organization (WHO) 'Africa faces rising climate-linked health emergencies' 6 April 2022 available at <https://www.afro.who.int/news/africa-faces-rising-climate-linked-health-emergencies> accessed on 10 July 2023.
136. World Health Organization (WHO) 'World Health Statistics 2023 Monitoring Health for the Sustainable Development Goals (SDGs)' (2023) Geneva 2-119 at 24.
137. World Health Organization (WHO) 'Hospital Preparedness for Epidemics' 4 April 2014 available at <https://www.who.int/publications/i/item/hospital-preparedness-for-epidemics> accessed on 25 July 2023.
138. World Health Organization (WHO) 'Household Air Pollution' 28 November 2022 available at <https://www.who.int/news-room/fact-sheets/detail/household-air-pollution-and-health> accessed on 14 July 2023.
139. World Health Organization (WHO) 'Environment, Climate Change and Health' (date unknown) available at <https://www.who.int/teams/environment-climate-change-and-health/occupational-health> accessed on 19 July 2023.
140. World Health Organization (WHO) "Fact Sheets: Noncommunicable diseases" (2018, updated 16 September 2022) available at [https://www.who.int/news-room/fact-sheets/detail/noncommunicable-diseases#:~:text=The%20main%20types%20of%20NCD,disease%20and%20asthma\)%20and%20diabetes](https://www.who.int/news-room/fact-sheets/detail/noncommunicable-diseases#:~:text=The%20main%20types%20of%20NCD,disease%20and%20asthma)%20and%20diabetes) accessed on 21 July 2023.
141. World Health Organization (WHO) 'Climate Action must include mental health' 3 June 2022 available at <https://www.who.int/news/item/03-06-2022-why-mental-health-is-a-priority-for-action-on-climate-change> accessed on 20 July 2023.
142. World Meteorological Organization 'State of the Global Climate 2022' Chair Publication Board Geneva, Switzerland 1-48.
143. World Meteorological Organization (WMO) 'WMO Global Annual to Decadal Climate Update 2023-2027' (2023) WMO 1-24.
144. Women Deliver 'The link between climate change and Sexual and Reproductive Health and Rights An Evidence Review' January 2021 available at <https://womensdeliver.org/publications/climate-change-and-srhr/> accessed on 9 August 2023.
145. Y-Ju Yong et al 'Impact of Climate Change on Water-Borne Disease: Directions towards Sustainability' (2023) *15 Water* 1-11 at 2.
146. Z Desai, Y Zhang 'Climate Change and Women's Health: A scoping review' (2021) *GeoHealth* 1-11 at 1.
147. Z Lokmin-Tomkins et al 'Designing Digital Health applications for climate change mitigation and adaptation' (2023) *218(3) MJA* 106-110 at 106.



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