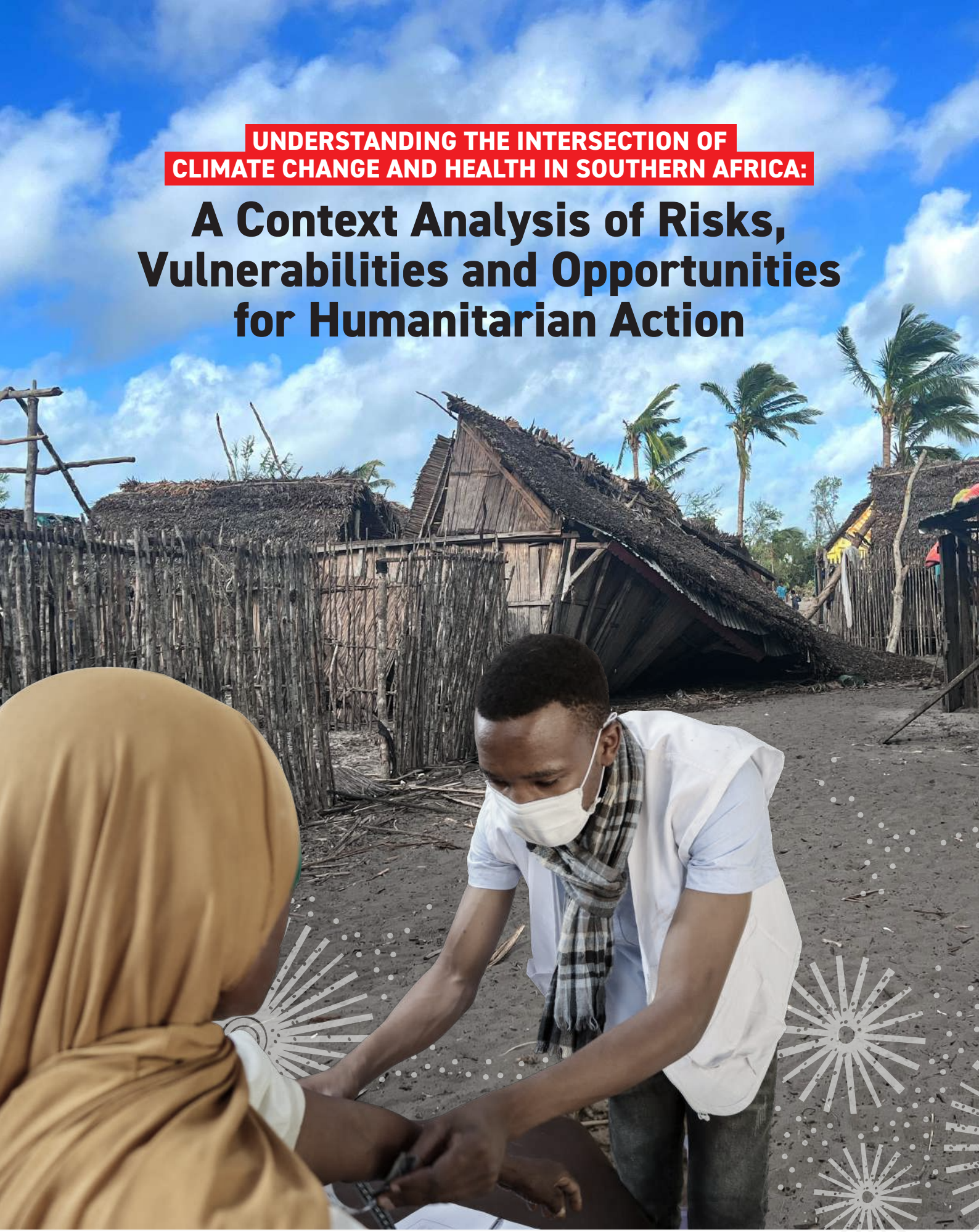
UNDERSTANDING THE INTERSECTION OF CLIMATE CHANGE AND HEALTH IN SOUTHERN AFRICA:

# A Context Analysis of Risks, Vulnerabilities and Opportunities for Humanitarian Action



MEDECINS SANS FRONTIERES
DOCTORS WITHOUT BORDERS

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# Executive Summary

Médecins Sans Frontières (MSF) is at the forefront of responding to the world's most urgent humanitarian crises. In many regions where MSF operates, communities already living in chronic emergencies face new and compounding challenges due to climate change and environmental degradation. From outbreaks of climate-sensitive diseases to the devastation of healthcare infrastructure, the strain on vulnerable populations continues to deepen. As extreme weather patterns intensify, MSF is witnessing firsthand how climate change exacerbates inequalities, placing disproportionate burdens on low-income countries that have contributed the least to the climate crisis.

The Operational Support Unit (OSU) within MSF Southern Africa Section, which incorporates Climate Crisis Engagement as one of its core pillars, commissioned this Context Analysis to begin building an evidence-based understanding of the climate crisis and its health implications in Southern Africa. This Context Analysis provides insights into recurring health risks, climate trends, and the differential vulnerabilities faced by specific population groups (women, children, elderly, farmers, people living with chronic health conditions, and internally displaced persons). This analysis not only explores the impacts on human health but also highlights the necessity of addressing these issues with a Global South perspective centred on communities and their resilience. Therefore, the OSU will continue to develop in-depth contextual understanding and build up capacity, analytical responses, evidence, and support for both operations and the Section in confronting issues related to the climate crisis.

To gather insights for this analysis, a mixed-methods approach was used. This included a review of external qualitative and quantitative literature on climate-related health impacts in Southern Africa, as well as internal MSF documents from projects focused on climate, environment, and health. Additionally, six key informant interviews (KIIs) were conducted with MSF field staff from Zimbabwe, South Africa, and Zambia. These interviews provided field perspectives that strengthened the desk research. Further insights were obtained from field visits to projects in Gwanda and Mbare, Zimbabwe, as well as Maputo and Beira, Mozambique.

The analysis found that climate change and environmental degradation are exacerbating unpredictable risks and vulnerabilities in a region with low adaptive capacity. Contributing factors include widespread poverty, limited livelihoods, a heavy reliance on rain-fed agriculture, a high disease burden, and ongoing conflict and internal displacement. Rising temperatures and erratic rainfall have intensified the frequency of extreme weather events, such as droughts, cyclones, and flooding. These events impact food security, particularly for children under five, who are at greater risk of undernutrition, stunted growth, and cognitive impairments.

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Water scarcity during droughts worsens the incidence of waterborne diseases like cholera. Additionally, drought conditions lead to increased gender-based violence and heightened HIV transmission among women and girls in rural areas prone to drought. Climate change is also altering the transmission patterns of vector-borne diseases, with rising temperatures accelerating the spread of malaria, dengue fever, and chikungunya. The Intergovernmental Panel on Climate Change (IPCC) projects that by 2030, seasonal malaria transmission hotspots are expected to emerge in central Angola, northwestern Zambia, southern Mozambique, and parts of South Africa, Zimbabwe, Malawi, and the Zambezi River Basin.

Furthermore, the region is projected to experience more hot days and heatwaves, posing additional health risks, including heatstroke, dehydration, respiratory illnesses, and adverse pregnancy outcomes. Climate change is also fuelling rural out-migration, as individuals seek alternative income opportunities, such as illegal artisanal small-scale gold mining, as evidenced by MSF's observations in Zimbabwe's Matabeleland South. These activities lead to land degradation and the contamination of both underground and surface water sources due to the unsafe use of hazardous chemicals, such as mercury, for gold amalgamation.

MSF's core work remains emergency humanitarian assistance, but it is also committed to climate action through adapting its operations, amplifying the voices and experiences of impacted communities and working towards reducing its carbon footprint. This Context Analysis proposes adaptive actions for operations, including: the integration of context-specific climate risk assessments and anticipatory actions into MSF emergency response and preparedness, piloting resilience building initiatives with local communities, promoting internal knowledge sharing and visibility of adaptation measures within MSF and expanding partnerships and advocacy efforts to address climate-related health challenges.

The evidence on the humanitarian and health consequences of climate change is clear: countries that contribute the least to global fossil fuel emissions are disproportionately impacted. These populations, often the least prepared and with the lowest adaptive capacity, are already facing severe losses, damages, and worsening humanitarian crises. This reality calls for urgent action, particularly in regions like Southern Africa, where climate-related disasters such as floods, cyclones, droughts, and extreme heat are becoming more frequent and intense, year after year. Moving forward, we will share the findings of this analysis within the MSF movement. We will develop our positioning, support projects to adapt their operations and build alliances with organisations that value building climate resilience in communities. At the same time, we will continue bearing witness to the humanitarian and health consequences of the climate crisis on MSF patients and communities, ensuring their voices, local knowledge and lived experiences shape our advocacy and communication.


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# Section A: Introduction

**BACKGROUND:**

Climate change is widely recognised as one of the greatest challenges facing humanity in the 21st century. We are now dealing with an **unprecedented climate crisis, which is consequently fuelling a humanitarian and health crisis**. The latest evidence from the Intergovernmental Panel on Climate Change (IPCC) in its Sixth Assessment Report (AR6) makes it clear that the frequency and intensity of extreme weather events are increasing sharply across all regions of the world, primarily due to human activities (IPCC, 2022). 2023 was declared the hottest year on record, with recent projections suggesting that 2024 is likely to be even warmer. Climate-related disasters occurred simultaneously around the world, including a record-breaking cyclone in Mozambique, Malawi, and Madagascar, a severe drought in the Horn of Africa, and intense heatwaves across Europe and South Asia (WMO, 2024). **As global temperatures continue to rise, we are confronted with a future where climate-related hazards present the potential for more frequent, compounding, and unpredictable humanitarian crises.** Already, the number of people needing humanitarian assistance has more than doubled in the last five years, increasing from 199.1 million in 2018 to 406.6 million in 2022 (Urquhart et al., 2023).


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Doctors Without Borders / Médecins Sans Frontières (MSF) is witnessing firsthand the impacts of climate change in the communities where they live and work. These communities, already living in a state of chronic emergency, are struggling to adapt to climate-related threats, whether from extreme weather events or outbreaks of climate-sensitive diseases. **MSF humanitarian health workers have witnessed two significant trends. First, there is the intersection and cascading of crises.** For example, in South Sudan, MSF has seen how unpredictable seasonal changes intersect with poverty and political instability, wreaking havoc on communities. The result has been acute food insecurity, high malaria incidence due to flooding, and frequent outbreaks of cholera and hepatitis E (MSF, 2023). In Cameroon, communities reliant on agriculture and livestock farming are the hardest hit by irregular rains, leading to poor harvests and food insecurity (MSF, 2022). In Mozambique's Mogovolas district, which is prone to tropical cyclones and flooding, MSF teams have witnessed how climate shocks have isolated entire communities from healthcare access by destroying healthcare facilities (MSF, 2023). In Madagascar, the cyclone and rainy season impedes access to healthcare as roads leading to health centres become muddy, flooded and unusable, creating a dangerous trend of patients arriving with severe health issues that could have been prevented if they had gone to facilities sooner (MSF, 2024).

**Secondly, MSF is seeing how climate change is widening inequalities. The burden of climate-related health risks is distributed and experienced unequally and inequitably** (MSF Lancet Briefing, 2021). Low-income countries face the greatest exposure to climate hazards, despite having contributed the least to the climate crisis. In contrast, highly developed countries in the Global North have experienced fewer impacts, despite not having fewer climate-related events (Donatti et al., 2024). For instance, Madagascar, one of the world's lowest carbon emitters per capita, is a global hotspot for climate-related disasters (World Bank, 2023). Vulnerability is highest in countries and regions with disproportionately large numbers of affected people due to structural factors such as poverty, colonialism, unemployment (IPCC, 2022). These factors intersect to increase populations' vulnerability to climate hazards and reduce their ability to prepare, respond, and recover.

To enhance MSF's capacity to address the challenges posed by climate change and environmental degradation, **the Operational Support Unit (OSU) in the MSF Southern Africa Section has embedded a climate engagement pillar into its strategic priorities**. We are committed to bearing witness and speaking out about the health and humanitarian impacts of the climate crisis on the most vulnerable and impacted communities in Southern Africa and the Global South. **Our goal is to build a deeper, evidence-based understanding of the climate crisis' impact on MSF beneficiary health and wellbeing, amplify the voices of the communities we serve, and support our operations in adapting to these emerging challenges.** We will achieve this by collecting, documenting, and sharing our findings, processes, and learnings through the Climate Crisis Engagement dossier.

This Context Analysis serves as **a starting point** to understand and communicate how climate change is affecting the Southern Africa region by identifying key health risks in the region and building a foundation for future, in-depth country-specific climate and health assessments. It is also a step towards building an evidence base on the differential vulnerabilities, exposures and impacts experienced by marginalised populations in MSF humanitarian emergency settings. By working closely with regional operations, we seek to support projects in integrating climate mitigation, adaptation, and advocacy into their programme design and implementation, ensuring that the communities are at the centre of our efforts.

**OBJECTIVES OF THE CONTEXT ANALYSIS:**

This Context Analysis aims to highlight the intersection of climate change and health in Southern Africa. We specifically reviewed the regional context from a health standpoint, analysing how the **climate crisis affects the health needs and outcomes of vulnerable groups, including women, children, the elderly, internally displaced persons, migrants, host communities and those living in extreme poverty.** Ultimately, we envisage this work to grow the knowledge base of the MSF movement on the impacts of the climate crisis in Southern Africa and Global South and to help us develop concrete positioning, operational support, and advocacy centred around partnering with communities to build their resilience.

**Moreover, this Context Analysis has the following specific objectives:**

- Map current and future climate change projections and trends in the region.
- Identify the major climate change-related health risks in the region relevant to MSF's key health priorities: sexual and reproductive health, migration (climate refugees), pollution, water and sanitation, cholera, malaria, HIV/AIDS, TB and malnutrition.
- Suggest potential actions that can be implemented by MSF projects at the operational level and provide recommendations on key focus areas for the Climate Engagement dossier.
- Identify organisations working on climate, environment, and health issues, particularly those with a presence in Mozambique, South Africa, Zimbabwe and Madagascar.

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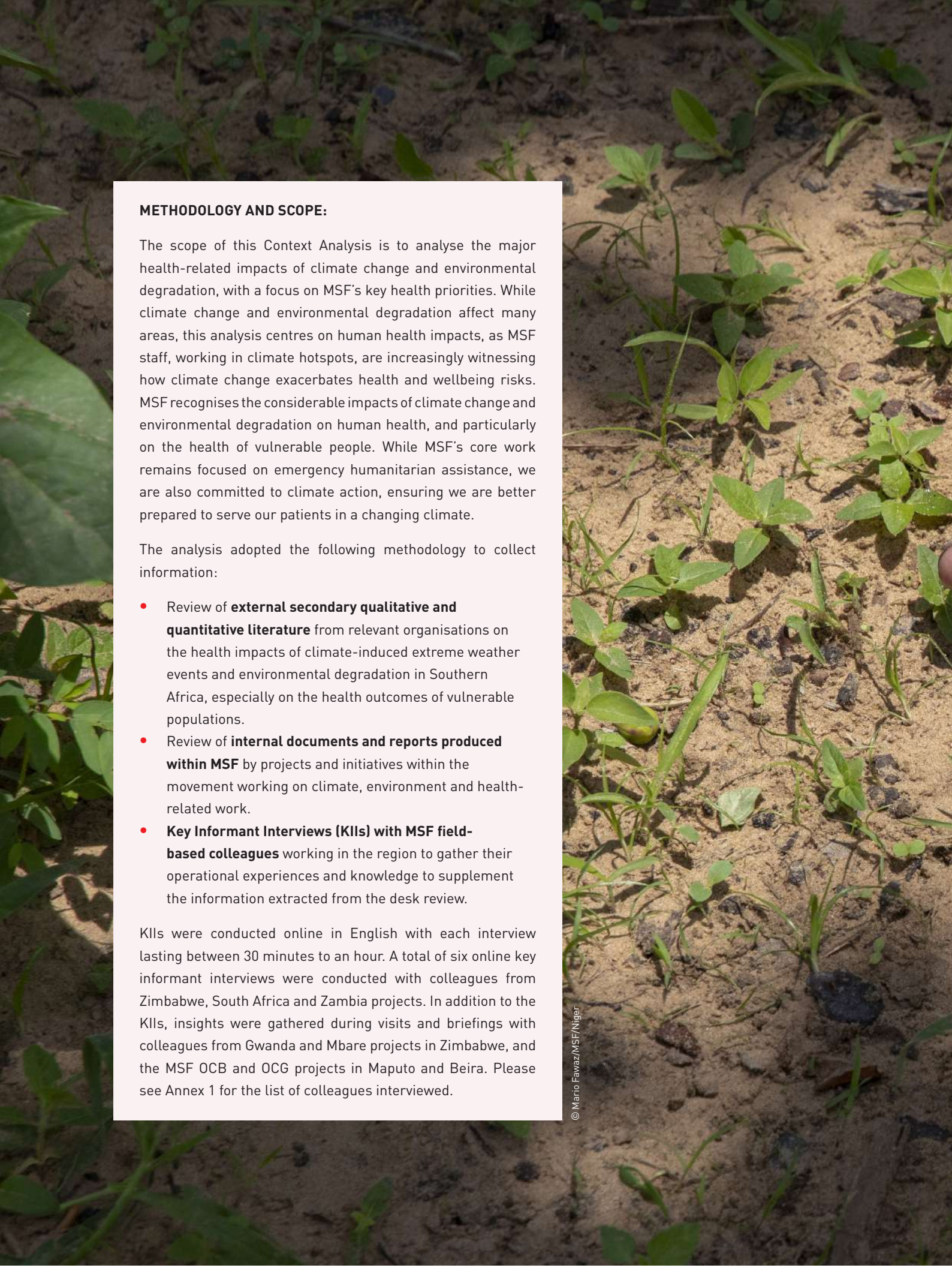

**METHODOLOGY AND SCOPE:**

The scope of this Context Analysis is to analyse the major health-related impacts of climate change and environmental degradation, with a focus on MSF's key health priorities. While climate change and environmental degradation affect many areas, this analysis centres on human health impacts, as MSF staff, working in climate hotspots, are increasingly witnessing how climate change exacerbates health and wellbeing risks. MSF recognises the considerable impacts of climate change and environmental degradation on human health, and particularly on the health of vulnerable people. While MSF's core work remains focused on emergency humanitarian assistance, we are also committed to climate action, ensuring we are better prepared to serve our patients in a changing climate.

The analysis adopted the following methodology to collect information:

- Review of **external secondary qualitative and quantitative literature** from relevant organisations on the health impacts of climate-induced extreme weather events and environmental degradation in Southern Africa, especially on the health outcomes of vulnerable populations.
- Review of **internal documents and reports produced within MSF** by projects and initiatives within the movement working on climate, environment and health-related work.
- **Key Informant Interviews (KIIs) with MSF field-based colleagues** working in the region to gather their operational experiences and knowledge to supplement the information extracted from the desk review.

KIIs were conducted online in English with each interview lasting between 30 minutes to an hour. A total of six online key informant interviews were conducted with colleagues from Zimbabwe, South Africa and Zambia projects. In addition to the KIIs, insights were gathered during visits and briefings with colleagues from Gwanda and Mbare projects in Zimbabwe, and the MSF OCB and OCG projects in Maputo and Beira. Please see Annex 1 for the list of colleagues interviewed.

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# Section B: Climate Change and MSF

MSF has increasingly observed that a significant portion of the health problems its medical teams address is climate-sensitive and are disproportionately affecting the world's most vulnerable populations (MSF Geneva). **Throughout its more than 50-year history, MSF has consistently responded to the world's most urgent humanitarian crises, including conflicts, displacement, disease outbreaks, and natural disasters**. However, the humanitarian sector is now recognising climate change as a key driver of these crises. Recurrent, seasonal climate-related disasters are occurring alongside protracted conflicts, making it difficult to understand one without the other (Wiggins, Mala & Oxley, 2024). This stresses the need for future humanitarian responses to be equipped and adapted to manage multiple, simultaneous disasters – referred to as compounding climate shocks. It also means that **populations will be pushed beyond their capacity to cope.**

MSF operates in some of the world's most climate-vulnerable settings, where patients are experiencing the health impacts of the climate crisis firsthand. A recent report by the Heidelberg University's Institute of Global Health (HIGH) and MSF Canada's Humanitarian Action on Climate and Environment (HACE) initiative highlights accounts from MSF staff across various regions, detailing the health impacts of climate change. These range from injury and death to respiratory diseases, heat stress, HIV/AIDS malnutrition, tuberculosis, malaria, cholera, and social consequences such as migration and conflict (HACE, 2023).

Recognising the humanitarian and health consequences of climate change and environmental degradation, **MSF has made several movement-wide commitments.** These include the International General Assembly (IGA) endorsed Environmental Pact in 2020, a public commitment in 2022 to reduce MSF's carbon footprint by 50% by 2030, and the signing of the Climate and Environment Charter for Humanitarian Organisations, also in 2022 (The Climate Hub, 2024).


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Therefore, since 2020, the **different MSF entities have developed their own strategic approaches and frameworks for addressing the challenges linked to the climate crisis**. The different operational centres have structured their activities, approaches, and strategies through the following framing/ initiatives:

- MSF Operational Centre Geneva - Planetary Health
- MSF Operational Centre Brussels - Climate, Environment and Health (CEH)
- MSF Operational Centre Amsterdam (OCA) -Climate, Environment and Health
- MSF Operational Centre Paris (OCP) – Green Team OCP (mainly focused on mitigation)
- MSF Operational Centre Barcelona-Athens (OCBA) – Climate & Environment (Approach explained in the OCBA Carbon and Environmental Footprint Reduction Roadmap) Focused on two key pillars: 1. Medical and Humanitarian Action (including Anticipation, Preparation, Response and Adaptation) and 2. Reducing the environmental footprint (Read more about the OCBA approach in its Carbon and Environmental Footprint Reduction Roadmap)

Although the various MSF Operational Sections have adopted different approaches, such as OCG's planetary health framework, they all broadly agree on using the term '**Climate, Environment, and Health' as a common language** to structure their climate-related programmes and activities. The approaches taken by each of the Operational Sections are centred around **three common pillars (although each OC has different language and meanings for these pillars as well): medical operations/operational adaptation or response, environmental footprint reduction, and advocacy.** For OCB, the operational adaptation pillar speaks to adapting MSF's humanitarian response to the intensified needs caused by climate change and environmental degradation, and the environmental footprint pillar is defined as "adapting operational and institutional practices to reduce MSF's overall environmental footprint whilst maintaining and continually improving quality of care for patients" (OCB Operational Adaptation Framework, 2023). The advocacy pillar covers positioning, reflections, debates, research, networking and informs communication on the medical humanitarian consequences of climate change (OCB Operational Adaptation Framework, 2023).

Based on the review of internal resources, key informant interviews and briefings with MSF colleagues, we assert that although MSF Operational Centres have deepened their understanding of the climate change and health nexus, their framings and the initiatives that have been implemented in recent years seem more focused on mitigation actions that focus on the reduction of MSF's carbon footprint. **It seems MSF has made a more concerted institutional effort to reduce existing emissions and work towards a "collective" measurable target – particularly on carbon and waste.**

This work has been carried out through the Climate Smart intersectional initiative, which aims to scale climate solutions in line with MSF's goal of reducing carbon emissions by 50% by 2030. A key initiative from the Climate Smart team is the movement-wide Environmental Impact Tool, which provides agile tools for to assess carbon emissions. The different operational teams have also worked with an external partner, Climate Action Accelerator, to develop their various Operational Centre Environmental Roadmaps.

Looking at the Environmental Actions Map, a resource that was developed to collate MSF field projects, reports, actions and initiatives related to climate change and environmental degradation, we see that MSF has long engaged in issues related to climate change and environmental degradation. However, most of the interventions shown on the map focus on mitigation actions. While we recognise that, **climate change mitigation and adaptation go hand in hand and are mutually reinforcing**, there is a noticeable delay in actioning MSF's institutional commitment to "adapting our responses" as outlined in the Environmental Pact. Operational sections appear to still be pulling in different directions when it comes to the strategy of 'adaptation'. With the growing health risks exacerbated by climate change and environmental degradation in vulnerable regions like Southern Africa, it is urgent that MSF operational teams are equipped to adapt humanitarian operations to context-specific climate-related threats. Adaptation must be prioritised across the movement, starting with a clear definition and a shared understanding and position on what operational adaptation practically means for MSF. Once this is established, the next step would be to systematically integrate adaptive and resilience measures into operational planning and emergency responses. In the sections to follow, this paper suggest possible adaptative measures for MSF operations.

There is also an opportunity for MSF to consider preparedness and anticipatory action – both of which prioritise proactiveness and forward-thinking approaches – without compromising its organisational identity. The Humanitarian Action on Climate and Environment (HACE) is an exemplary transversal initiative bolstering climate change adaptation within the movement. HACE develops climate services such as early warning systems and seasonal climate briefings tailored to operational needs and has created a community of practice around climate adaptation.

A **practical regional example of operationalising adaptation** is seen in the **OCG project in Nampula province, Mozambique**, where MSF is providing care for people with neglected tropical diseases like schistosomiasis and lymphatic filariasis, as well as vector-borne diseases such as malaria and dengue (these are diseases that MSF addresses regardless of climate change).. During a visit to the project in Maputo, discussions with the OCG Country Director, Stephane


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Foulon, and Deputy Medical Coordinator, Dr. Jonathan Prieto, highlighted how the Nampula project is uniquely implementing medical activities under the planetary health framework. According to an anthropological assessment of the project, the main objective is to "identify community perceptions and care-seeking practices to co-define the needs and services for effective adoption of healthy practices" (Véran 2023). What distinguishes this project is its **futuristic model of treating "people and populations as partners," based on the belief that the Muepane community drives the change they seek**. The project emphasises a community-based approach to implementing the planetary health concept, moving beyond traditional "community engagement" to consistent and sustainable community-based governance throughout the project's lifespan. The innovative structure of this project supports the recommendations presented later in this paper.

MSF Southern Africa has prioritised Climate Crisis Engagement and this comes with the acknowledgment and recognition of the decision taken by the IGA to reduce its carbon emissions. In the same breath, as one of the only areas in the world to have operations, a section office (with an advocacy unit) and clear climate-related emergencies on a regular basis, MSF Southern Africa is in a strong position to add value to MSF's response to the climate crisis. **Communities are the first responders to climate-related impacts** and are already factoring climate and environmental changes in their coping-strategies. Therefore, our **ambition is to focus our efforts towards locally led climate adaptation that prioritises communities and their resilience and strengthens the local disaster management systems.**

# Section C: Climate Change in the Southern Africa Region

## SOUTHERN AFRICA'S DEVELOPMENT, HEALTH, ECONOMIC AND SECURITY CONTEXT

Southern Africa is a sub-region of Africa and the countries it comprises are defined differently depending on the source. For this report, Southern Africa includes: Angola, Botswana, Eswatini, Lesotho, Malawi, Mozambique, Madagascar, Namibia, South Africa, Zambia and Zimbabwe. Collectively, these nations are home to more than 190 million people, with South Africa being the most populous. The region has **varied population growth rates**, ranging from as low as 1.0% in Eswatini and South Africa to 3.2% in Angola (World Bank Group). Projections suggest that by 2050, the **population of Southern Africa could exceed 360 million**.

Consistent with global climate shifts, Southern Africa, which the IPCC has recognised as a climate change hotspot, is significantly impacted by climate change, including **a rise in temperatures**, increased **frequency of extreme weather events such as tropical cyclones, flooding, droughts and shifts in rainfall patterns** (IPCC, 2022). Southern Africa has been experiencing pronounced warming trends, which are expected to continue, coupled with alterations in rainfall patterns. This exacerbates the vulnerability and uncertainty in a region already characterised as having low adaptive capacity (WFP, 2021).

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The vulnerability of Southern Africa to climate change shocks and stresses is compounded by **poverty, a heavy reliance on rain-fed agriculture, widespread food insecurity, a high disease burden**, and limited livelihood options. Current climate vulnerability is most acute in **hotspot countries including Mozambique, Malawi, Zimbabwe, and Zambia**, with additional vulnerable areas in Lesotho, Eswatini, and parts of Angola and Madagascar (Midgley, Davies & Chesterman, 2011). For instance, Madagascar and Mozambique face significant risks from yearly cyclones, floods, and sea-level rise, reflecting the high rate and impact of climate disasters in the region. Although the effects of climate change are experienced differently across the region because of its vast socio-economic, governance, health and political factors, people in Southern Africa are challenged by a lack of resources to effectively prepare for, respond to, and recover from climate change-induced events. This highlights a critical need for enhanced adaptive capacity and resilience to address the challenges posed by the climate crisis (WFP, 2021).

Economically, most of Southern Africa has witnessed strong economic growth in the past 20 years bolstered by economic reforms in some countries, and rising commodity prices (Binder et al, 2023). However, wealth is still very unevenly distributed within countries and across the region, and **high poverty rates and food insecurity continue to persist**. For example, countries like Zambia, Malawi, Mozambique, Lesotho and Madagascar all fell into the World Bank's low-income category for 2022-2023 (Hamadeh et al, 2022). The COVID-19 pandemic had significant socio-economic impacts on most countries in the region, with smallholding farmers being amongst the hardest hit because of trade restrictions and health impacts (WFP, 2021). Irrespective of the economic crises that have occurred in the past couple of years, **Southern Africa has long been characterised by high poverty rates** with most low-income economies geographically located in Sub-Saharan Africa. With that said, **poverty, unemployment, poor health and education are consistent regional challenges regardless of a country's development** (ILO 2013). Consequently, both resource-rich countries like South Africa, Angola, and Namibia, and primarily agricultural economies like Malawi and Zambia, have struggled to reduce significant wealth disparities and high unemployment rates. Therefore, neither resource-rich countries such as South Africa, Angola or Namibia, nor the mostly agriculture-based economies such as Malawi and Zambia have managed to reduce large wealth disparities and unemployment rates.


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Poverty and marginalisation remain high for vulnerable groups like women and youth. Although some SADC countries have made progress towards enhancing gender equality, women continue to be widely excluded from political participation, decision-making processes, and economic and educational opportunities (SADC & SARDC, 2022). Moreover, women and girls from certain ethnic groups experience what the United Nations Development Programme (UNDP) calls **"intersecting horizontal inequalities"** – inequalities that occur between groups of people who share specific characteristics, including aspects of their chosen self-identification (UNDP, 2022). For instance, women living in rural areas or those who are internally displaced are particularly vulnerable to the socio-economic impacts of climate change. Their livelihoods are often highly sensitive to climate-related hazards, and they have low adaptive capacity. Therefore, it is crucial to understand climate change impacts and vulnerability through an intersectional lens, as each person's identity is plural, and some individuals face discrimination on multiple fronts.

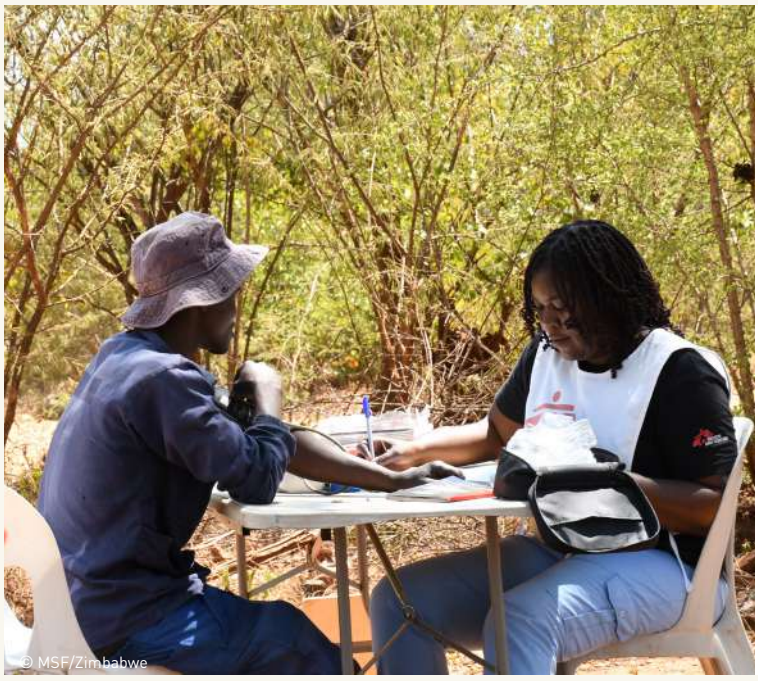
**Differential Vulnerabilities**

Differential vulnerability highlights that the impacts of climate change are not uniformly experienced, even within the same region, country, or community. Social factors such as gender, age, ethnicity, and economic status significantly influence how various groups are affected by the climate crisis. Those with limited adaptive capacity – such as women, children, the elderly, and marginalised ethnic groups – are more vulnerable to harm. The IPCC defines adaptive capacity as systems, humans or institutions' ability to adjust in response to climate changes or to expand the range of conditions it can manage (IPCC, 2022). In Africa, adaptive capacity is notably low due to weak economies, inadequate governance structures, and a heavy reliance on climate-sensitive livelihoods like smallholder farming and pastoralism (African Climate Policy Centre, 2013). This limited adaptive capacity exacerbates the vulnerabilities of disadvantaged groups, leaving them disproportionately exposed to the risks posed by climate change.

Social, economic, and environmental factors intersect to create varying degrees of risk and resilience among different groups. To avoid maladaptation (actions that may lead to increased risk of negative climate-related outcomes), it is crucial not to view vulnerable groups as homogeneous. Humanitarians must adopt an intersectional lens to climate change, recognising how social identities such as race, gender, and class interact to shape how individuals experience and respond to climate risks. This nuanced understanding of vulnerability emphasises the need for tailored adaptation measures that address the context-specific health needs of different social groups, especially in a region where adaptive capacity is already low.

The high inequality between and within countries has exacerbated migration in the region. **Climate change and environmental degradation are already contributing to migratory pressures**, mainly due to livelihoods linked to agriculture and food systems being vulnerable and continuously affected by droughts. In coastal areas, fisheries and aquaculture are a major source of income. For example, 80% of Mozambique and Madagascar's population and 60% of Zambia and Zimbabwe's population depend on agriculture. Coastal cities such as Beira, also face risks related to loss of fishing livelihoods (Migration Data Portal, 2023). When arable land depletes, migration becomes the only risk diversifier or adaptation strategy and, according to projections, **by 2050 the region is expected to host 86 million climate change migrants, primarily due to decreased crop production and water scarcity (WFP, 2021). Rural-urban migration is by far the largest human mobility in Southern Africa, and climate change impacts are intensifying these movements and straining rural livelihoods.** People move to cities in search of better employment and education opportunities, however, the problem is that this migration is largely uncontrolled and unmanaged and results in urban sprawl (UN-Habitat, 2022). Urban sprawl encroaches on farmland space surrounding the city with green areas having to move to make way for new housing developments or informal settlements. The main problem with this is that there is subsequently a loss of green areas that cool cities, reducing the impact of urban heat island (UHI) effect, clearing the air of pollutants and greenhouse gases. Rising populations require increased energy for cooking and transportation and, for many cities in Southern Africa, this results in high particulate matter and pollutants in the air due to coal stoves for cooking and heat, cooking in open fires and carbon emissions from vehicles.

Another negative impact of climate change is **rural out-migration**, where people leave rural areas, resulting in decreased agricultural production and food security. **Indigenous and traditional agricultural knowledge is often also lost in this process.** For example, in Zimbabwe, prolonged droughts, irregular rainfall patterns affecting subsistence farming, and soaring unemployment have seen young people, mostly men, resorting to illegal and unregulated artisanal small-scale gold mining in and near mineral rich areas like Mazowe, Kenzamba, and Gwanda District (Nyavaya, 2021). **Illegal mining, however, is a major contributor to land degradation and the contamination of underground and surface water sources due to the use of hazardous chemicals such as mercury for gold amalgamation.** The resulting water and land pollution have health impacts for humans (artisanal small-scale miners themselves and mining communities), livestock and crops (Ncube-Phiri et al, 2015).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> *We're already at maximum alert level. As for the future, I can't predict what will happen tomorrow or the day after. However, I tell you that if we continue to act, at least we can reduce the impacts of climate change, the negative impact it has on human beings.*

**HERIZO RASOAMIARAMANANA, LOGISTICIAN IN MADAGASCAR**

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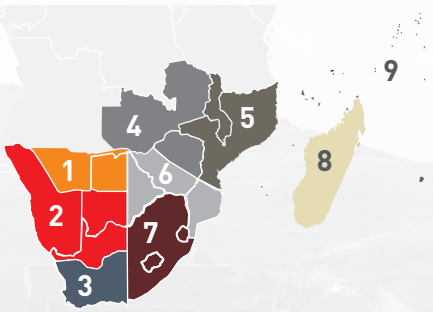
**Conflict is a significant driver of displacement in the region**, particularly in Northern Mozambique, where over 582,000 people were displaced as of January 2024 (Caux, 2024). In Mozambique's northern Cabo Delgado province, climate-related extreme weather events interact with conflict and displacement. Although conflict is the prime driver of displacement, Cabo Delgado is prone to droughts, tropical cyclones and flooding. These intensifying climate extremes exacerbate internal displacement and human insecurity (Maviza et al, 2023). **Cyclone Idai and Kenneth's impact in Cabo Delgado was a clear illustration of the triple threat of climate change, conflict and health emergencies.** The province has one of the highest rates of HIV/AIDS infections in Mozambique and has suffered a series of cholera outbreaks that have put immense pressure on an already weak health system – a deadly mix for the most vulnerable in fragile settings (Meek & Nene, 2021).

Although Southern Africa remains the **epicentre of the global HIV/AIDS epidemic,** the region has greatly progressed in combating this crisis (David-Reddy & Vincent, 2017). In the last 12 years, new HIV infections have decreased by 43%, and AIDS-related deaths have been reduced by half (UNAIDS, 2023). Noteworthy achievements include Botswana, Eswatini, and Malawi meeting the 2020 90-90-90 target set for testing, treatment, and viral suppression, with Eswatini surpassing this goal to achieve the 95-95-95 target a decade ahead of schedule. **However, despite these strides, climate change threatens this progress and puts a region that is already burdened by a high prevalence of HIV/AIDS under more vulnerability**. For example, Madagascar, one of the poorest countries in the region, has been repeatedly hit by seasonal climate-induced hazards such as droughts and tropical cyclones, making it difficult to recover and mount a strong HIV response. **As of 2024, the country has seen a 151% increase in new HIV infections since 2010, along with a 279% rise in AIDS-related deaths over the same period.** Furthermore, in 2022, only 18% of the 70,000 people living with HIV had access to treatment (UNAIDS, 2024).

**FIGURE 1: SPATIAL ZONES SHOWING THE CLIMATE REGIONS ACROSS SOUTHERN AFRICA**




Zone:

1. Semi-arid regions of Namibia and Botswana
2. Hot desert regions of Namibia, Botswana and South Africa
3. Cooler desert regions of South Africa
4. Temperate regions of Zambia and Zimbabwe
5. Tropical regions of Mozambique and Malawi
6. Semi-arid regions of Botswana, Zimbabwe and Mozambique
7. Temperate regions of South Africa, Lesotho and Eswatini
8. Madagascar
9. Small islands including Comoros, Seychelles and Mauritius

*Source: Richardson et al (2022) 'The nine spatial analysis zones across the Southern Africa region'*




## SOUTHERN AFRICA'S GENERAL CLIMATE

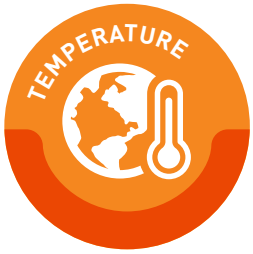
Southern Africa has a diverse range of climates including semi-arid, warm, cold desert and tropical (Engelbrecht et al, 2024). Areas such as Namibia and Botswana encompass a semi-arid climate, while cold desert climate can be found in western South Africa. A tropical humid and sub-humid climate extends over most of Zimbabwe, Zambia, Angola and Malawi. Tropical climate is also found in Mozambique. **In summer, temperatures are highest over the desert regions of Namibia and Botswana** with daytime temperatures exceeding 40°C in the summer influenced by the arid tropical climate of the Namib and Kalahari deserts, which cover large parts of Namibia and Botswana. These temperatures also extend to other countries such as Zimbabwe, Mozambique (which is a tropical coastal region that also receives higher levels of precipitation) and South Africa (Davis-Reddy & Vincent, 2017). Temperatures then decrease southwards and become colder in regions of high altitudes such as the highlands of Lesotho, South Africa and Zimbabwe (Binder et al, 2023).

Precipitation in Southern Africa also varies vastly across the region. The rainy season occurs from November to March and the dry season from April to October with countries experiencing varying amounts of precipitation. For example, areas in Namibia and western South Africa receive very little rainfall (less than 200mm) per year compared to Mozambique which receives higher levels of precipitation. It should be noted that trends in rainfall, however, are typically harder to detect than temperature because of the **high variability in rainfall trends both spatially and from year to year** (Davis-Reddy & Vincent, 2017). In Southern Africa's case, precipitation is **determined by an interaction of multiple drivers** including the migration of the Inter-tropical Convergence Zone (ITCZ - defined here) (EUMe Train, 2012) which affects the timing and intensity of rainfall, and the **El Nino Southern Oscillation (ENSO).** ENSO is a natural recurring climate phenomenon that influences the occurrence of extreme weather events like floods and droughts in different locations around the world. El Nino and El Nina events are associated with temperature precipitation changes. In Southern Africa specifically, **ENSO-induced rainfall variability is one of the stronger driver of droughts, cyclones and flooding.** For example, the 2015/16 below-average rainfall (OCHA, 2023) and drought experienced across the region coincided with a strong El Nino. Similarly, a recent study (Weather World Attribution, 2024) has found that the **2023/24 El Nino phase is the key driver of the current drought** affecting several countries in the region including Zimbabwe, Zambia, Mozambique and Malawi.

## OBSERVED AND PROJECTED CLIMATE CHANGE TRENDS IN THE REGION

### OBSERVED CLIMATE CHANGE

Southern Africa has warmed by between 1.0°C and 1.5°C from 1961 to 2015. Africa's average temperature has increased more rapidly than the global average, with a rise of +0.3°C per decade between 1991 and 2022, compared to the global trend of +0.2°C per decade. Similarly, **Southern Africa has also experienced warming at a rate faster than the global average**, though slower than other African sub-regions. For instance, North Africa has seen the fastest rate of temperature increases on the continent (WMO, 2022)




### PROJECTED CLIMATE CHANGE

At high and very high emissions levels, the average annual surface temperatures in Southern Africa are projected to be **higher than the global average temperatures** (CDKN, 2022).

The **annual number of heatwaves will increase** in Southern Africa as well as the number of **hot and very hot days** (daily maximum temperature above 35°C) (Engelbrecht et al, 2024).

A **decrease in mean rainfall** has been observed **throughout the region** since 1980, except in the north-western parts of the region such as Namibia, Botswana and southern Angola, which have experienced more rainfall from 1980 to 2015. Parts of South Africa, however, have been experiencing decreased rainfall since the 1960s (CKND, 2022).

**Extreme rainfall events** have increased in number and intensity in the region (CKND, 2022).


The region will continue to experience large variations in the timing and intensity of seasonal rains, with variability expected to increase through the 2050s. This will lead to **more frequent occurrence of both wetter and drier years, heightening the risk of prolonged and more frequent droughts and floods** due to intense rainfall events. An emerging threat in this context is **"weather whiplash"** – the sudden shift from one persistent weather pattern to a drastically different one. This phenomenon is expected to become more common in a warming world, particularly in regions with higher poverty rates, such as Africa (Zhang, 2023).

Around the coast of Southern Africa, **sea surface temperatures have been rising** at a rate of around 3 millimetres a year between 1993-2018 (OCHA, 2023).

**Heatwaves have increased in the oceans and have intensified and doubled along** the Southern Africa coastline from the early 1980s to 2016, mainly as a result of anthropogenic climate change (Engelbrecht et al, 2024).


**SEA LEVEL RISE, HEATWAVES AND ACIDIFICATION IN SOUTHERN AFRICA'S SURROUNDING WATERS**

The **oceans surrounding Southern Africa will continue to acidify** (a decrease in oceanic pH for an extended time due to increased carbon dioxide uptake) and the frequency of marine heatwaves will continue to increase. Rising sea levels will threaten coastal communities and marine food chains (Richardson et al, 2022).

There is medium confidence that the **number of intense tropical cyclones** (category 4 -5 storms) with higher wind speeds and more intense rainfall will **increase** in the 21st century. However, the **frequency** of tropical cyclones making landfall in eastern Southern Africa (Mozambique) and Madagascar are projected to **decrease** (Richardson et al, 2022).

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## HEALTH-RELATED IMPACTS OF CLIMATE CHANGE RELEVANT TO MSF IN SOUTHERN AFRICA

### Droughts, Food Insecurity and Malnutrition

Climate change is projected to increase the frequency and severity of droughts in Southern Africa, leading to hotter and drier conditions. Droughts directly affect food security through loss of production of both crops and livestock, as well as water scarcity, and the indirect impacts are felt through loss of employment or the increase in food prices. Rising temperatures will exacerbate the cycles of drought, making them more intense.

In Southern Africa, the most significant impact on the health outcomes of children under the age of five emanate from the acute and long-term effects of drought (WFP, 2021). **Children** are therefore amongst the **most vulnerable to undernutrition due to droughts.** Malnourished children under the age of five develop very weak immune systems that are not able to fight off common childhood illness and, as a result, their health is further compromised by infectious diseases such as malaria, respiratory infections and diarrhoea. **Stunted growth**, a symptom of malnutrition in children, is projected to be one of the biggest challenges in Southern Africa. As it stands, the WHO classifies the prevalence of stunting in every country in Southern Africa as high or very high, with nearly 20 million children affected, representing a third of all stunted children in Africa (WHO, 2021). Stunting refers to impaired physical growth and development caused by unmet nutritional needs and recurring infections, such as diarrhoeal diseases, which hinder nutrient absorption (Schmidt, 2019). Stunted children are not only shorter for their age but in the longer term may also experience cognitive impairments that can affect their schooling and, ultimately, their ability to earn a living later in life.

The frequency and severity of droughts are increasing and with them, the risks of **displacement and migration**. Extreme weather events are predominantly responsible for most of the human displacement in Southern Africa apart from political and economic instability (Mpandeli et al, 2020). In 2023, Tropical Cyclone Freddy impacted more than 1 million people in Mozambique, Zimbabwe, Madagascar and Malawi, displaced over 160,000 people in these countries (Friedrich Ebert Stiftung, 2023). Extreme weather events not only disrupt human mobility patterns, but strip people of their livelihoods, leading to unemployment and loss of income. As a result, many turn to **alternative "coping strategies" such as illegal forest exploitation for fuelwood and charcoal production, which contributes to environmental degradation** and soil erosion, further worsening the cycle of droughts (Narvaez & Eberle, 2022).

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> *We're supposed to be phasing out from rainy season this month and sometimes it goes a little beyond April, maybe the first, or second week of May and that's when you see the rains are winding up. But unfortunately, this year it was really strange that we've not had enough rains starting from January. And that prompted most of us (farmers) not to even go ahead and do a bigger field of calculation because we saw the pattern of rains weren't really promising already.*

**BRIGHT MUMBA, FARMER AND LOGISTICS ASSISTANT IN MALAWI**

The climate crisis has also caused significant displacement in southern Angola, which experienced its worst drought in 40 years in 2022, leading to food insecure and malnourished families leaving their homes and fleeing to neighbouring Namibia, while almost 20,000 were internally displaced and thousands in emergency shelters. Women and girls formed the majority of the climate refugees (CARE International, 2022).

Southern Africa, compared to other regions in Africa, is also one of the most heavily affected by the **HIV/ AIDS epidemic**, with nine countries (Botswana, Lesotho, Malawi, Mozambique, Namibia, South Africa, Eswatini, Zambia, and Zimbabwe) having adult HIV prevalence rates over 10%, and Eswatini having the highest global HIV prevalence rate at 27.4% in 2021 (WFP, 2021). A study revealed that projected declines in water availability and quality due to droughts have a significant impact on Antiretroviral Therapy (ART) adherence among people living with HIV (PLWHIV) (Orievulu et al, 2022). **Access to clean water and the financial means to buy water are important socioeconomic factors supporting ART adherence, especially in poor, rural drought-stricken areas.** During droughts, individuals on ART may skip hospital appointments in search of clean water for themselves, their families, and livestock. Furthermore, unsanitary water practices due to limited supply can exacerbate the spread of waterborne diseases like cholera, dysentery, and typhoid, which are particularly detrimental to immunocompromised PLWHIV (Abayomi, 2014).

**Drought-induced food insecurity significantly heightens gender-based vulnerabilities to HIV**. A study in Lesotho found that droughts drive rural girls and women aged 15-19 to engage in riskier sexual behaviours such as early sexual debut and transactional sex, leading to higher HIV prevalence (Low et al, 2019). This is largely due to societal inequalities that **increase gender-based violence and transactional sex during food shortages**. Women and girls, facing hunger and deprivation, may engage in transactional sexual relationships, often referred to as "sex for basic needs," to secure food or money (Austin et al., 2020). However, in contrast, living in a drought-stricken area was associated with a lower HIV prevalence in young males and external migration, commonly seen during droughts, resulted in greater prevalence of HIV in both men and women.

The gendered impacts of food insecurity are also evident in nutrition, leading to poor pregnancy outcomes such as low birth weights, premature births, and gestational diabetes (UNFPA, 2021).

**POSSIBLE MSF SOUTHERN AFRICA ACTIONS:**

- Smallholder farmers primarily produce for local consumption and are often considered to be part of the informal economy with often limited access to export markets. MSF could contribute to economic movement around agricultural production by **including local smallholder producers as local suppliers for nutritional interventions.**

- Exploring new partnerships with other organisations, particularly those that **build climate adaptation and resilience of local agricultural producers through agroforestry**. An example is One Acre Fund's agroforestry programme (they have a presence in Zambia) which is a community led model that relies on and directly benefits rural farmers.

- The systematic monitoring of tools such as FEWS Net at project-level and the **developing a seasonal outlook product for Southern Africa, similar to what HACE produces for East Africa.**

- Droughts, desertification and epidemic diseases all have one thing in common: they are slow-onset emergencies that are forecasted ahead of time and unfold over a span of months or years. Slow-onset emergencies often provide a window of opportunity **to act proactively** before we see a rise in food insecurity, severe malnutrition, displacement, and human health deterioration. The notion of "emergency" cannot, therefore, be confined to acute and sudden emergencies, especially in the Southern African context. Where context-relevant, we propose that slow-onset disasters such as **droughts** (not excluding other climate hazards like heatwaves and floods) **be included as a climate hazard in project EPREP strategies** with appropriate early actions and 'triggers' outlined.

- **Community vegetable gardens and integrated trainings on climate-smart farming techniques, nutrition, and health** are low-hanging fruit in supporting food insecure communities in drought-prone areas. This is a potentially replicable initiative implemented in drought-prone southeastern Zimbabwe, where pregnant women, new mothers, and PLWHIV are ensured a well-balanced meal through a vegetable garden located in Chibuwe Health Clinic. The plants and vegetables are sustained by the clinics and communities around them.

- **MSF's partnership with Health in Harmony in Madagascar** is an example of the **operationalisation of planetary health** and an approach that could be replicated in other contexts in the region where MSF works. In 2023, in preparation for climate shocks, especially cyclones, Health in Harmony worked with local community members around the Manombo Rainforest to integrate climate resilience into all programming including creating emergency response protocols. They created tree nurseries that are drought- and flood-resistant and localised basic healthcare by shifting towards nurse-led care and having a Health Guardian programme where community selected villagers, usually women, are trained and employed to support vaccinations, malaria and malnutrition treatments and household medical screenings. **Organisations such as Eden Reforestation Projects present in Mozambique's Manicaland Province are potential partners for replicating** the Madagascar MSF-Health in Harmony programme. Eden works with communities to fight deforestation and environmental degradation through regenerative agroforestry and designing livelihood initiatives that diversify the income of rural households and increase climate resilience.

**Climate Change and Vector-Borne Diseases**

Climate change plays a crucial role in the spread of vector-borne diseases globally, with environmental conditions heavily impacting their seasonal and geographical distribution. Higher temperatures and shifts in rainfall patterns boost mosquito reproduction, survival, and biting rates, thereby facilitating the spread of diseases such as malaria, chikungunya, dengue fever, and Zika virus (WHO, 2023).

In Southern Africa, some areas are projected to become more suitable for transmission, while others may see a decline. For example, increasing rainfall and temperatures in Namibia could shift malaria outbreaks to the central and southern regions of the country. Countries like Lesotho, currently outside malaria transmission zones, could experience new outbreaks in the future. Zambia, Zimbabwe, eastern South Africa, Malawi, Botswana, and the highlands of Zimbabwe, which are currently moderately suitable for malaria (1-6 months), will see an increase in seasonal transmission (Zermoglio, Ryan, & Swaim 2019). This shift could put approximately 17-21 million people at increased risk of malaria by the 2030s. **Seasonal transmission hotspots will also develop in central Angola, northwestern Zambia, southern Mozambique, and parts of South Africa, Zimbabwe, Malawi, and the Zambezi River Basin by 2030**.

As climate change shifts the suitability for malaria transmission into new areas in central and Southern Africa, populations previously not exposed to malaria and lacking in immunity will be vulnerable to epidemic outbreaks or "flares" (Ryan, Lippi, & Zermoglio, 2020). However, beyond geographic shifts, factors such as health-seeking behaviour, human mobility, and healthcare systems inexperienced in malaria prevention and control will also contribute to millions of people being at risk of infection.

Arboviruses such as dengue fever, yellow fever, and chikungunya are already widespread but under-recognised in Africa. Multiple anthropogenic activities such as land use change and deforestation associated with urbanisation may drive the **prominent shifts in climates suitable for the transmission of arboviruses in most of Sub-Saharan Africa from those most suitable for malaria transmission** (Mordecai et al, 2020). However, the direction and magnitude of the effects of climate change on vector-borne disease transmission will differ across geographic regions, and countries such as **South Africa, Botswana, Zimbabwe, Zambia** may continue to have a low suitable habitat for yellow fever and dengue outbreaks while other countries in the region – including **Madagascar, Mozambique and Angola** – could **become more suitable for infectious yellow fever** incidence in future (Sintayehu, Tassie, & De Boer, 2020).

> *In the past, there was a specific malaria season, during which we had many cases of malaria. But with climate change, we now see malaria in almost every season. Malaria is constant with mosquitoes breeding all year round.*
>
> **ADAMO ARMANDO PALAME, HEALTH PROMOTION SUPERVISOR IN THE NAMPULA PROVINCE, MOZAMBIQUE**

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## POSSIBLE MSF SOUTHERN AFRICA ACTIONS:

- The **Malaria Anticipation Project (MAP)**, is an innovative malaria early warning system to aid operational planning. MAP provides MSF Southern Africa projects with a possible model of early warning. MAP was launched in 2021 in an MSF project in Lankien, South Sudan, and uses routinely collected health data and climatic indicators such as temperature, rainfall, humidity, and wind speed to predict the timing and intensity of malaria peaks. This is both an example of **anticipatory action** and an **early warning system** that has enabled MSF and other health actors to plan more efficient responses to reduce malaria-related mortality and morbidity. A crucial aspect of MAP's success is its **emphasis on community engagement**. Working closely with the community and using their local knowledge to contextualise the model's predictions is one of the strengths of MAP. Significant **population displacement**, for example, can drastically impact malaria transmission but is often not captured in available data. By working closely with local communities, MSF gathers critical information that enhances the accuracy and relevance of the early warning system. This **collaborative approach** ensures that interventions are timely and culturally appropriate.

- **Community-based conventional vector control methods and actions** are key in generating community involvement and ownership of malaria prevention and control efforts. The **Malaria Consortium** (a potential partner for MSF in Mozambique) implemented activities **in Nampula and Niassa** (two provinces that are impacted by malaria the most in Mozambique) and identified existing community groups at the administrative and local level in each district. They provided them with training on malaria prevention, control and treatment practices and equipped them with a set of educational materials to facilitate community-level learning (learning methods included the use of drama, role-playing, games and visual tools). One of the key successes that community groups noted was behaviour changes, in particular better use of mosquito nets for malaria prevention and a shift in care seeking from traditional healers to health centres.

- In **Madagascar's Ikongo district**, MSF has witnessed firsthand how climate change exacerbates **malaria and malnutrition**. The district frequently experiences heavy rains and flooding, devastating plantations and rice fields, and leading to severe food insecurity, with over 1 million people facing high acute food insecurity in late 2023. MSF's successful implementation of **Seasonal Malaria Chemoprevention** (SMC) in Aweil, South Sudan, where children aged 3 to 59 months received preventive antimalarial medications once a month for five months during the rainy season, could serve as a replicable model in Madagascar. However, SMC alone is insufficient; it needs integration with other preventive measures like distributing mosquito nets and sanitising stagnant water. For SMC to be effective in Ikongo, it must be contextualised. The strategy in Ikongo could **integrate SMC with nutritional supplementation, malnutrition screening, and treating relevant micronutrient deficiencies** to enhance SMC's protective effect against malaria in children, especially before and during the rainy/cyclone season. Once again the Malaria Consortium is a potential partner for MSF as it is currently a leading implementer of SMC and, through its research, has been able to demonstrate that **SMC is an appropriate intervention to use outside the Sahel region**, where it was initially recommended for use. They have also conducted operational research on integrating SMC with other health services like malnutrition screening, immunisation and Vitamin A supplementation.

- There is a need to look into the **development and implementation of vector surveillance and control of Aedes mosquitoes in Mozambique and Madagascar**. Through operational research, MSF missions could strengthen their understanding of current and future prevalence and disease burden of yellow fever and dengue fever in the districts/ provinces where they are present and start integrating Aedes control activities into existing malaria control measures.

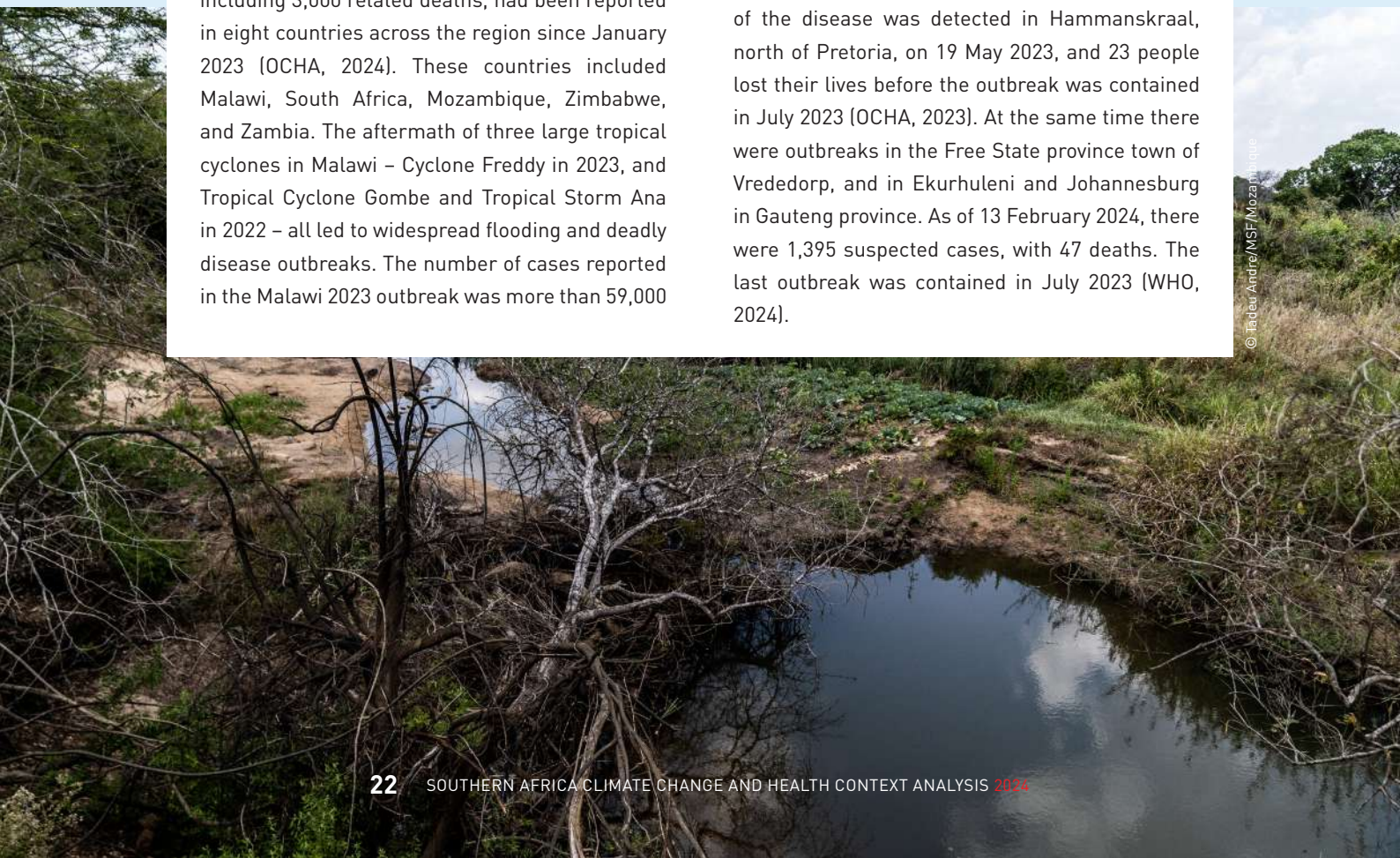
*We identified in this particular outbreak, it's really the impact of climate change and how climate change aggravates the cholera [outbreak... so, we'll continue to follow and monitor the situation and the impact of El Nino on cholera.*

**ABI KEBRA BELAYE, FORMER COUNTRY OPERATIONAL REPRESENTATIVE IN ZIMBABWE**

**Climate Change, Waterborne Diseases and WASH**

IPCC projections indicate that climate change will cause an additional 20,000 to 30,000 diarrhoeal deaths in children by 2050 under increasing global warming (IPCC, 2022). Globally, Africa has the highest rates of deaths due to diarrhoeal diseases, and many children experience repeated diarrhoeal episodes causing stunting, impaired growth, and immune dysfunction (Tristos, Adelekan, & Totin, 2022). **Thirty countries faced cholera outbreaks in 2022, causing an alarming 145% average increase from the previous five-year average (UNICEF, 2023). This is the global context in which the 2023 cholera outbreak in multiple countries in the region happened, putting an additional burden on vulnerable communities and healthcare systems.** As of January 2024, about 118,000 cholera cases, including 3,000 related deaths, had been reported in eight countries across the region since January 2023 (OCHA, 2024). These countries included Malawi, South Africa, Mozambique, Zimbabwe, and Zambia. The aftermath of three large tropical cyclones in Malawi – Cyclone Freddy in 2023, and Tropical Cyclone Gombe and Tropical Storm Ana in 2022 – all led to widespread flooding and deadly disease outbreaks. The number of cases reported in the Malawi 2023 outbreak was more than 59,000 with 1,750 deaths (noting that some cases may have gone unreported, so these numbers are estimates) (Kampala, 2024).

The cholera outbreak in Malawi has been described as the worst in its history and the largest outbreak in Africa in the past decade. Outbreaks normally occur during the rainy season, however, **the 2023 outbreak spanned all year, running through all seasons** (Lubanga et al, 2023). In Zimbabwe, the first cholera case was reported in January 2023, with over 20,000 people and 370 deaths recorded as of 23 January 2024. All 10 provinces of the country reported cholera outbreaks, with Harare, Manicaland, and Masvingo province being the worst affected provinces (WHO, 2024). In South Africa, where cholera is not endemic, the first case of the disease was detected in Hammanskraal, north of Pretoria, on 19 May 2023, and 23 people lost their lives before the outbreak was contained in July 2023 (OCHA, 2023). At the same time there were outbreaks in the Free State province town of Vrededorp, and in Ekurhuleni and Johannesburg in Gauteng province. As of 13 February 2024, there were 1,395 suspected cases, with 47 deaths. The last outbreak was contained in July 2023 (WHO, 2024).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## POSSIBLE MSF SOUTHERN AFRICA ACTIONS:

- Understanding WASH in the diverse Southern African context means addressing the biophysical, historical, and socio-economic factors impacting water and sanitation service delivery. Climate change exacerbates already inadequate services in cities such as Harare, for example, where, amid its water shortage issues, lack of waste management and collection system, deteriorating WASH infrastructure, cholera and other waterborne diseases have found ideal conditions to spread. Longer-term solutions, including **advocacy** from MSF and other NGOS for the replacement of antiquated water and sewage systems, sustainable waste disposal systems, and providing piped water are crucial for preventing and controlling waterborne diseases like cholera.

- **Enhancing the knowledge and capacity of MSF staff and communities to use the tools provided by the Environmental Health Toolkit** that has been developed and piloted by the MSF Zimbabwe Mission will be valuable. This resource consists of four modular components including how to manage water points through Community Health Clubs, the use of the Kobo Toolkit for efficient field data collection, borehole drilling, and construction techniques for the proper sealing of boreholes to avoid bacterial contamination. The use of this toolkit can be expanded to other MSF projects in the region, especially countries such as South Africa, which does not yet have extensive experience in cholera prevention and control at a community level.

- **Explore partnerships with WASH-focused organisations such as WaterAid** who are piloting and implementing various climate-resilient WASH facilities that withstand the effects of extreme weather events and the changing climate. WaterAid also empowers communities to sustainably manage and monitor their WASH services for the long term. For example, in Tanzania, they built a **solar-powered water supply scheme** giving over 2,500 people access to clean water and, to make sure the system lasts, they supported the local water supply organisation to develop a business plan to meet the costs of operation and maintenance.

- **Community centred preparedness and response is critical for both cholera endemic and non-endemic areas**. Actions include collecting and regularly monitoring risk factors in cholera hotspots; co-developing community action plans to incorporate communities' solutions; designing rapid interventions that draw on evidence of the socio-behavioural and environmental factors influencing transmission risks; and equipping community based organisations and other actors such as traditional healers with cholera prevention and prevention information for early referral of patients with cholera-like symptoms. The recent incident of people that died in a shipwreck in Nampula, Mozambique, while fleeing cholera in their village is evidence that there is still an urgent need for **strong risk communication and community engagement** which can done by identifying trusted community actors that can reinforce engagement in rural and urban communities to address rumours and misinformation about cholera and other waterborne diseases.

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**Climate Change and Sexual and Reproductive Health**

Climate change significantly impacts sexual and reproductive health (SRH) in Southern Africa, exacerbating gender inequalities and creating unique challenges for women and girls. Droughts and floods increase vulnerability to gender-based violence (GBV) and sexual exploitation and can restrict access to SRH services particularly in rural areas, townships and informal settlements (Women Deliver, 2021). For example, during **the 2015-2016 El Nino-induced drought in Mozambique, women's and girls' menstrual health was severely impacted when access to sanitary supplies for menstrual hygiene and the absorbent plant material they would traditionally use became scarce.** This led to many women and girls resorting to using harsher plant matter or packed sand to catch their menstrual blood (Fischer, 2016). These homemade alternatives can lead to health impacts such as urinary tract infections, as well as impacting self-esteem and mental health.

Climate-related disasters put a significant strain on health systems, limiting access to essential SRH services including contraceptives, maternal healthcare, and safe abortion services (UNFPA). A key finding from a report by IPAS found that **"the time immediately before, during, and after extreme weather events such as cyclones is when access to care for contraceptives, pregnancy, and abortion is most compromised"** (IPAS, 2022). This is all unfolding in a context of concerning levels of unsafe abortion and pregnancy and childbirth-related deaths in the region. In 2020, the levels of unsafe abortion were reported at 155,000, and pregnancy and childbirth-related deaths were reported to be 2,100 (Bankole et al, 2020). These figures have likely worsened since 2020 and will continue to worsen because of climate change.

**Pregnant women are some of the most vulnerable as they face higher risks** due to malnutrition and lack of clean water which can all lead to preterm births, low birth weight, and maternal mortality. Extreme weather events and the resulting food and water insecurity contribute to these health risks, as dehydration and poor living conditions heighten the susceptibility to diseases.

Moreover, women and girls bear the brunt of increased household workloads during climate crises, spending hours collecting water because of having to walk long distances to get to water collection points, rivers, or community wells. Young girls often face the risk of being sexually violated when water collection points and rivers are located far from their homes and communities. The **psychological stress and social disruption caused by climate-induced displacement and resource scarcity further affect women's mental health** and social wellbeing (IPAS, 2022). The stress of meeting basic needs coupled with the trauma of experiencing violence or losing loved ones can lead to long-term mental health issues that are often unaddressed in crisis situations.


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## POSSIBLE MSF SOUTHERN AFRICA ACTIONS:

- Reproductive health education and access to family planning is essential for climate resilience. However, **investing in operational research to build MSF's evidence base on the linkages between SRH and climate change could be one of MSF's greatest contributions for climate adaptation for adolescent girls and young women in the region**. Conducting context-specific, gender-aggregated analyses of the climate adaptation needs of specific groups including adolescents, women, refugees, internally displaced people, and indigenous people (often experiencing multiple and intersecting forms of discrimination and operation) to help develop health indicators may have a great impact.

- Designing **WASH interventions and facilities to be gender-responsive and climate-resilient.** This toolkit on Water and Gender includes guidelines that could be helpful in guiding operations' collection of gender-disaggregated water data and gender responsive indicators for water assessment specific to geographic regions.

- Ensuring the **continuation of healthcare access and provision during rapid and slow-onset climate disasters through preparedness.** Extreme weather events disrupt services such as safe abortion, antenatal care, access to contraceptives, and other SRH services. It is important that women and girls know how and where to access MSF's SRH and healthcare services during emergencies. Updating project EPREP strategies with interventions specific to addressing SRH healthcare provision during climate shocks (including interventions such as stockpiling of contraceptives and menstrual hygiene products) is key.

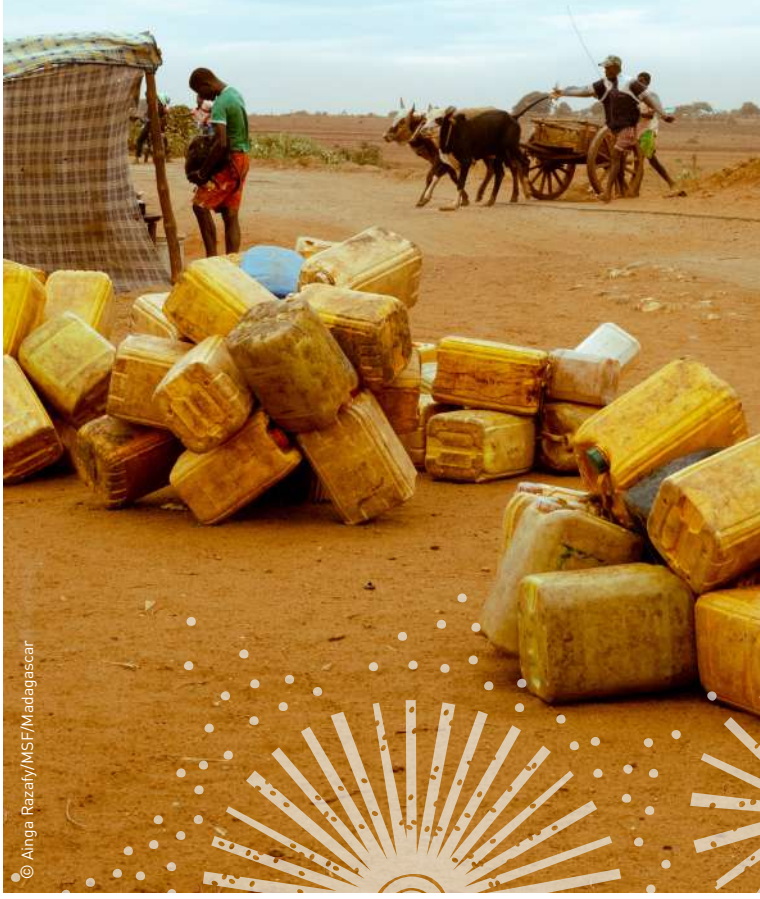
- Strengthening collaborations with local and international actors focused on women's health and climate adaptation to understand how they respond to reproductive health needs during emergencies. IPAS Southern Africa is an example – see here their response in Mozambique.

### Climate Change and Heat-Related Health Impacts

Southern Africa is projected to continue experiencing intense and frequent hot extremes, including heatwaves in the near term (the next 20 years) with estimates already showing that between 1991 and 2018, anthropogenic climate change was responsible for almost 44% of heat-related deaths in South Africa (Trisos, Totin, & Adelekan, 2022). **Researchers and climate scientists from the University of Witwatersrand have been sounding the alarm on the deadly impacts of heat exposure to human health**. For example, in a recent study, they argue that the possibility exists of regional climate change in the near term reaching a tipping point (the occurrence of irreversible ecological and socioeconomic changes at a regional scale) where heatwaves of unprecedented duration and intensity may kill thousands of people and livestock across the region (Engelbrecht et al, 2024).

The projected increase in temperature extremes and heatwaves in the region will have significant impacts on people's health, including, but not limited to, heat stroke, dehydration, exacerbation of respiratory conditions, and reduced productivity. **More frequent and longer hot days are projected for the region**, and this may increase instances where overnight temperatures do not drop below 20°C to allow for people to experience sufficient cooling (Richardson et al, 2022). Heat stress presents increased risks for the elderly (65 years and older), pregnant women, children (especially newborn babies), people on chronic medication, and outdoor workers. Extreme heat exposure during pregnancy has been linked to adverse birth outcomes, including prematurity, stillbirth, low birth weight and congenital defects (Chersich, 2019). **Although the interactions are complex and require further study in the region, heat exposure may also impact the Prevention of Mother-to-Child Transmission (PMTCT) of HIV**. Extreme weather events like floods and wildfires could disrupt the already fragile drug supply chain in South Africa. Additionally, the mental health effects of hot weather and other climate change impacts may worsen ART adherence during the postpartum period. Moreover, during hot weather, infants may consume more breast milk, potentially increasing their exposure to the HIV virus (Cherisch, 2019).

> *Obviously I think that across the board, things like droughts and floods, there are people in South Africa who are more affected in terms of their ability to withstand the kind of health implications of this. But I also don't think that's specifically focused on a certain demographic. I would say that people who have a large proportion of comorbidities are more vulnerable. So, people with HIV, TB and NCDs are definitely more vulnerable because they're more likely to get sick. In the case of really long floods or winters or exposures to different elements.*
>
> **CAMREN McARAVEY, COUNTRY OPERATIONAL REPRESENTATIVE IN SOUTH AFRICA**



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**POSSIBLE MSF SOUTHERN AFRICA ACTIONS:**

- Stimulate **operational research to understand the true scale and context-specific impacts of extreme heat conditions**, including heatwaves in MSF catchment areas. Improved surveillance and data collection should be complemented by more focused research and analysis on African heatwaves, heat stress and the differentiated risks faced by vulnerable groups, particularly pregnant and breastfeeding women, children (including infants), outdoor workers, and the elderly.

- Test the viability of more thermally appropriate healthcare centres and MSF offices with a possibility of **piloting green roofs, the planting of trees** in MSF projects and other adaptation measures aimed at cooling. These initiatives would contribute to operational carbon footprint mitigation measures.

- Explore the development of **heat season plans** in contexts where seasonal forecasts (which themselves need to be a more familiar and widely used tool to systematically monitor climate events and to be integrated into MSF operational emergency preparedness and response planning) show a heightened risk of extreme heat conditions. This, however, needs project teams to recognise heat as a climate hazard and that protocols need to be embedded in EPREP strategies and developed well in advance to realise the benefits of early action.

# Section D: Going Forward

MSF Southern Africa acknowledges the importance of advocacy and anticipatory work in preparing and adapting our operational responses to tackle the humanitarian challenges posed by the climate crisis. This includes recognising the direct and indirect consequences of climate, environment, and health (CEH) and understanding its intersection with other root causes, such as inequality, poverty, displacement, and conflict. By conducting climate risk assessments and utilising tools like seasonal climate forecasts, MSF can gather evidence to inform its anticipatory efforts. In addition, we believe MSF should prioritise integrating CEH considerations into new and existing projects, ensuring it does not overshadow other critical components.

MSF Southern Africa acknowledges and recognises the decision taken by the International General Assembly (IGA) in December 2021 to reduce our total carbon emissions by 50% by 2030. As the OSU, we have a role in identifying the best levers to reduce carbon emissions for the Section and to seek guidance from operations to ensure that healthcare and medical aid are not compromised. While we will continue to support the scaling up of climate mitigation efforts to reduce emissions, the **OSU will use its proximity to focus on climate change adaptation that centres the voices, lived experiences, and local knowledge of the most vulnerable and marginalised populations in the region and the Global South.**

By addressing climate change as a threat multiplier and emphasising its impact on humanitarian medical operations, MSF Southern Africa aims to support operations to enhance their prevention, preparedness and response capacity to assist vulnerable populations. Therefore, it is critical that MSF operations prioritise integrating climate change considerations into new and existing projects and programmes, ensuring it does not overshadow other critical components.

> *There is need for proper advocacy or educational communication with the communities not to be ignorant of what is existing...*

**MATUSELA NYAMADZAWO, ENVIRONMENTAL HEALTH MANAGER IN GWANDA**

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**THROUGH THIS DOSSIER, WE WILL FOCUS ON THE FOLLOWING AREAS OF WORK:**

1. **Building internal and community knowledge and awareness.**

- Enhancing our internal knowledge and understanding of the differentiated and context-specific health risks that climate change and environmental degradation pose for people in the Global South and the Southern Africa region will not only enable us to anticipate and effectively respond, with context-appropriate and adapted actions, to climate hazards but also help us bring community needs and realities into our programming and operational decision-making. Building our understanding of anticipatory action, documenting our lessons learnt and promoting knowledge exchange across MSF projects and the movement is a key priority for the Climate Engagement dossier. As a humanitarian medical organisation, we play a key role in equipping vulnerable groups and communities with the climate and health information that benefits them. As we document our learnings, findings, and processes, the OSU will ultimately be able to offer advice, training, and tools to the movement to influence MSF's global approach in this area of work.

- There exists an opportunity for lessons learnt from pilot initiatives to be documented and shared to ensure visibility of the impacts on patients and communities in different countries where MSF works and how MSF projects are adapting. The initiative to strengthen healthcare facility roofs in Mogovolas, Mozambique, to withstand climate shocks through promoting community empowerment, resilience, and sustainable practices, is an example of a climate adaptation initiative that has the potential to be replicated and scaled in other locations facing similar climate hazards. By documenting and capitalising on these efforts, we can identify successful strategies that can be applied in various contexts within the region. To achieve this, we must break down internal silos and foster the exchange of tools, expertise, and learnings among Operational Centres and projects.

2. **Provide operational support to MSF projects in the region to integrate climate change adaptation into their programmes and emergency planning and response.**

- MSF teams are already adapting to the challenges posed by the climate crisis, albeit in an ad hoc way. We will provide support to projects on how to integrate climate change into existing activities and programmes (rather than to develop stand-alone climate change activities) to ensure that operations and emergency response plans are climate-risk informed. The general starting point would be to develop location-specific climate risk assessments that include the differentiated impacts of vulnerable populations. These are critical in understanding the specific climate hazards impacting the project area and MSF beneficiaries. While there is often a general awareness of how extreme weather events such as cyclones and flooding impact countries like Mozambique, it is crucial to perform in-depth climate risk assessments for the specific catchment areas where an MSF project operate. These assessments should include an evaluation of how healthcare facilities and services may be affected by certain climate hazards and identify the most at-risk groups (women, girls, children, the elderly, female-headed households, people living with chronic illnesses, internally displaced people, small-scale artisanal miners). Moreover, understanding the geographic distribution of vulnerable populations and their unique health needs is essential for effective planning and response during emergencies. We acknowledge that projects may not have the in-house climate science expertise, therefore, the OSU would support projects to reach out to meteorological agencies, academic institutions, and other MSF initiatives such as the Humanitarian Action on Climate and Environment (HACE) initiative.

- The coming year, as countries update their Nationally Determined Contributions, will be crucial for MSF to identify government and national departments of health and environment asks and help shape policies and plans that align with their Paris Agreement commitments. The Section can support projects in integrating climate action into their advocacy efforts. At the country level, efforts could focus on: engaging in the process of developing National Adaptation Plans to ensure they reflect the needs of vulnerable populations and MSF's policy asks; conducting public advocacy campaigns and raising awareness among communities, health practitioners, youth movements, and CSOs on the importance of scaling up climate action; and ultimately increasing the global visibility and voices of MSF beneficiaries and communities in key climate and health processes at UNFCCC Conference of the Parties (COP) meetings and discussions on Loss and Damage and climate adaptation finance.

- MSF projects in the region are increasingly making the links between climate change, extreme weather events, environmental degradation, and seasonal outbreaks of infectious diseases. MSF is also well versed in responding to climate-sensitive infectious diseases such as cholera, typhoid, and malaria in endemic and non-endemic areas following extreme events such as flooding. There is now an opportunity to stimulate operational research to refine our understanding of the health risks associated with solid waste pollution in urban areas, air pollution, deforestation, and mercury contamination from illegal artisanal small-scale mining, sexual and reproductive health in emergencies and how climate change will aggravate these risks.

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3. **Systematise the monitoring of seasonal forecasts and foster an anticipatory approach within projects.**

    - The monitoring and use of seasonal forecasts can provide useful climate information to MSF projects about forthcoming health risks associated with forecasted climate hazards such as tropical cyclones, flooding, and droughts. Although not always 100% accurate, these forecasts can be combined with shorter-term weather forecasts (3-7 days) to improve operational preparedness and response. Combining climate information from seasonal climate briefings with health surveillance data can help develop context-specific anticipatory action or early action protocols and seasonal emergency calendars. An example of early actions for a drought is the Drought Early Action Protocol for Zimbabwe by the Red Cross' Anticipation Hub, which is an example of integrating climate and health data to enhance preparedness and response for a slow-onset emergency.

*Our locally hired staff are integral members of the communities we serve and can act as the first ambassadors in these communities. Often, when we think about community engagement, we focus on bringing in external people, but the reality is that these individuals are embedded within the community. A lot of what we understood about the impact of Cyclone Idai on the community was through talking to them.*

**ANTONIO FLORES, SENIOR HIV/TB ADVISOR IN SOUTH AFRICAN MEDICAL UNIT (SAMU)**

**4. Expand our partnerships, engagements and advocacy.**

- To anticipate and address the health-related consequences of climate change and environmental degradation experienced by people that are most exposed and vulnerable will require the use of new knowledge and partnerships. MSF has extensive experience in environmental health, disaster and emergency preparedness and response, delivery of equitable healthcare, and community engagement. However, we will need to draw expertise from and collaborate with meteorological agencies for data collection, climate information, partnering with the Ministry of Health and civil society groups and community-based organisations to advocate and support the climate readiness of health systems. We will also need to collaborate with youth climate activists and networks to provide peer-to-peer health promotion that targets climate risks in schools and their communities.
- Most important will be to establish partnerships with communities and community-based organisations (CBOs) centred on the concept of 'transformative community level adaptation' which emphasises a new type of capacity building that relies on knowledge creation at a grassroots level as a first phase, and then the empowerment of community actors to meaningfully inform and implement context-specific climate responses (Ziervogel et al, 2022). It is critical that we position local actors, communities, and CBOs as the experts that have the indigenous and local knowledge they need to co-create, alongside MSF, the contextual understandings that can bring about the change, solutions and climate resilience they need. We believe that for climate adaptation interventions to be truly transformational, we need to confront issues of power and justice by creating space and opportunity for the voice and stories of the marginalised to be heard and trusted and influence broader climate adaptation policies and measures at local, national, and global levels. Climate Engagement is undoubtedly an area of work that is inextricably linked with working more closely with communities, thus tying in closely with the Community Engagement pillar (which aims to equitably engage with CBOs, focusing on capacitation, agency, and empowerment). The OSU will continue to explore ways in which the Climate Engagement and Community Engagement pillars can harmonise their work with the aim of ensuring communities are empowered, capacitated, and have the autonomy to drive sustainable interventions and solutions during and after MSF's presence.

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# Conclusion

Southern African communities continue to bear the brunt of the impacts of the climate crisis. The climate crisis impacts everyone globally, but it disproportionately affects those with the least adaptive capacity and resilience. This context analysis marks the beginning of a deeper understanding of the challenges that a changing climate will have for MSF operations in the region and beyond and the health risks posed on MSF patients and communities. It is imperative that MSF adapts to the climate emergency. As the frequency and severity of emergencies increase, our traditional emergency response, resources, and ways of working will fall short unless we shift our approach towards anticipation and climate adaptation. Anticipation will involve not just predicting but also taking proactive steps to mitigate the adverse effects. Incorporating community education and indigenous knowledge is critical for understanding the long-term impact of our interventions and fostering community autonomy and resilience to climate change. Advancing operational research on climate adaptation should prioritise the recognition that the impacts, vulnerabilities, and lack of resilience in developing regions like Southern Africa and the Global South are rooted in historical, structural, and systemic factors. These factors contribute to the climate injustices experienced by people, patients, and communities in the Global South. As the OSU – through the Climate Engagement dossier – continues to embark on the work towards developing its position on climate, environment, and health in the region and building a holistic understanding that climate change impacts and causes are not distributed nor experienced equally, ours will need to involve listening and learning from people living through the impacts of the climate crisis. We will also need to invest in operational solutions that build climate resilience in the Southern African communities where we deliver our medical humanitarian assistance.

# Appendices

## APPENDIX A

The key informants that were interviewed included MSF field-based medical and non-medical staff. Their knowledge and experiences were shared regarding the impacts of environmental degradation and climate change on the health of vulnerable populations within MSF catchment area communities. Semi-structured interviews were conducted to provide further context regarding information obtained from the desk review. The questions asked focused on the perspectives from MSF staff with expertise and experience in emergency response intervention, emergency preparedness, health promotion, and research at operational and/or field levels.

The objectives of the key informant interviews are to comprehensively bear witness to the impact of climate change on operations within the region and to assess the health risks faced by MSF patients and communities through insights provided by both medical and non-medical field-based staff. We also aimed to gather additional insights into past and ongoing climate mitigation and adaptation initiatives undertaken by MSF operational projects in the region, including key lessons learnt from these efforts. The participants were selected based on their willingness to be interviewed, their interest in discussing climate change impacts on public health, and a minimum of two years' experience working in the field across the Southern African region.

### THE FOLLOWING MSF STAFF WERE INTERVIEWED:

| Name and Surname | Position | Project |
|---|---|---|
| Camren McAravey | Country Operational Representative | South Africa - CST |
| Antonio Flores | Senior HIV/TB Advisor | South Africa - SAMU |
| Matusela Nyamadzawo | Environmental Health Manager | Gwanda project |
| Abi Kebra Belaye | Country Operational Representative | Zimbabwe Country Support Team |
| Carla Melki | Emergency Coordinator | Zambia project |
| Bright Mumba | Logistics Assistant | Zambia project |
| Stephane Foulon | Head of Mission | Nampula and Mozambique projects |
| Dr. Jonathan Prieto | Deputy Medical Coordinator | Nampula and Mozambique projects |
| Dr. Benjamin Mwangombe | Country Medical Representative | Mozambique project |
| Jessie Ashay Kurnurkar | Project Operations Responsible | Beira project |

## APPENDIX B: LIST OF ACRONYMS

ACDI – African Climate and Development Initiative

AIDS – Acquired Immunodeficiency Syndrome

ART – Antiretroviral Therapy

ASGM – Artisanal Small-Scale Gold Mining

CATS – Community Adolescent Treatment Supporters

CBOs – Community Based Organisations

CEH – Climate, Environment and Health

ENSO – El Nino Southern Oscillation

EPREP – Emergency Preparedness

FGS – Female Genital Schistosomiasis

GBV – Gender-based Violence

HACE – Humanitarian Action on Climate Environment

HIV – Human Immunodeficiency Virus

IDPs – Internally Displaced Persons

IGA – International General Assembly

IPCC – Intergovernmental Panel on Climate Change

ITCZ – Inter-tropical Convergence Zone

KII – Key Informant Interview

MAP – Malaria Anticipation Project

MSF – Médecins Sans Frontières

NGOs – Non-Governmental Organisations

OCB – Operational Centre Brussels

OCG – Operational Centre Geneva

OCs – Operational Centres

OSU – Operational Support Unit

PLWHIV – People Living With HIV

SMC – Seasonal Malaria Chemoprevention

SRH – Sexual and Reproductive Health

WASH – Water, Sanitation and Hygiene

WFP – World Food Programme

WHO – World Health Organization

UNDP – United Nations Development Programme

## APPENDIX C: LIST OF DEFINITIONS

**Acidify**
The decrease of oceanic pH balance for a prolonged period, which is typically caused by the absorption of carbon dioxide from the atmosphere (National Ocean Services, 2024).

**Anthropogenic Climate Change**
Processes that have resulted from human or man-made activities that emit greenhouse gases, greenhouse gas precursors, and aerosols (IPCC, 2018).

**Anticipatory Action**
An approach whereby humanitarian aids or actors implement preventative or mitigation measures prior to shocks of a disaster or before acute impacts of a disaster is felt (MSF OCB, 2024).

**Climate Change Adaptation**
The process of adjustments in a human system to expected or actual climate, to moderate harm or exploit beneficial opportunities. In natural systems, human intervention can facilitate adjustment for the expected climate and its effects (IPCC, 2022).

**Climate Change**
Anthropogenic climate change is the processes relating to long-term temperature and weather pattern shifts (MSF OCB, 2024).

**Climate-induced Displacement:**
The displacement of individuals due to extreme weather events, slow-onset events, and/or other adverse climate change impacts (IFRC).

**Extreme Weather Events**
An event that is considered rare in statistical reference distribution in a specific area (IPCC, 2018).

**Mitigation**
Human intervention to reduce emissions or enhance greenhouse gas sinks (IPCC, 2018).

## APPENDIX C: LIST OF DEFINITIONS

**Climate-sensitive**
The degree to which a system is adversely or beneficially impacted by climatic stimuli. These impacts can be direct or indirect (IPCC, 2018).

**Climate Variability**
The variations within the average state and other statistics of the climate on spatial and temporal scales beyond individual weather events. Variability can occur due to natural internal processes in the climate system (internal variability), or due to variations in natural or anthropogenic external forcing (external variability) (IPCC, 2018).

**Climate Vulnerability**
The degree to which a system is able or unable to handle or cope with climate extremes and climate variabilities (Kay).

**El Nino Southern Oscillation**
An oceanic event is associated with a fluctuation of a global-scale tropical and subtropical surface pressure pattern called the Southern Oscillation, with preferred time scales of two to about seven years (IPCC, 2018).

**Environmental Degradation**
The process by which the natural environment becomes compromised, which results in the reduction of biodiversity and the overall health of the environment (GEMET).

**Environmental Health**
A division of health which is concerned with related aspects of the natural and the built environment which can affect human health, and often needs to be monitored or mitigated (Baxter and Friedl, 2023).

**EPREP/ Emergency Preparedness**
The planning and response to a disaster, encompassing diverse fields (NIH, 2023). The knowledge and capacities developed by governments, response and recovery organisations, communities and individuals to effectively anticipate, respond to and recover from the impacts of likely, imminent, or current disasters (UNDRR).

**Global South**
A term which refers broadly to the regions of Latin America, Asia, Africa, and Oceania, but particularly pertains to low-income and often politically or culturally marginalised countries (Sage Journals, 2012).

**Inter-tropical Convergence Zone**
The area near the equator where the northeast and southeast trade winds converge, and it is also known as the doldrums (EUMe Train).

**Operational Adaptation**
The processes within human systems of adjusting to actual or anticipated climate effects to moderate harm or exploit beneficial opportunities (MSF OCB, 2024).

**Resilience**
The amount of change a system can undergo without changing its state (IPCC, 2018).

**Slow-onset Disaster**
Disasters that can be predicted further in advance and unfold over months or years (MSF OCB, 2024).

**Vulnerable Populations**
The degree in which a group of individuals of a system are unable to cope or are susceptible to the adverse effects of climate change, including climate extremes and vulnerabilities (IPCC, 2018).

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