LANCET COUNTDOWN: TRACKING PROGRESS ON HEALTH AND CLIMATE CHANGE

MEDECINS SANS FRONTIERES
DOCTORS WITHOUT BORDERS

Climate Change and Health: an urgent new frontier for humanitarianism

November 2018

Introduction

As part of the *Lancet Countdown* project, policy briefs are produced to highlight emerging issues of relevance to global and national discussions. Current and forecast climate-related impacts on human health and the operations of humanitarian actors, such as *Médecins Sans Frontières*/Doctors Without Borders (MSF), necessitate an updated analysis of the intersection of climate change and global health. This brief seeks to integrate the findings of the 2018 *Lancet Countdown* on Climate Change's International Report with MSF's on-the-ground experience in treating some of the world's most vulnerable populations, with a view to highlighting the dramatic health consequences already unfolding, as well the dangerous levels of humanitarian need likely if greenhouse gas emissions are not urgently brought in line with levels consistent with the Paris Agreement on climate change. The brief identifies major areas at the nexus of climate change and global health where new policies and approaches are needed and further research is required.

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About the Lancet Countdown

The *"Lancet Countdown: Tracking Progress on Health and Climate Change"* is a global, interdisciplinary research collaboration between 27 academic institutions and inter-governmental organisations. It monitors progress on the relationships between health and climate, and their implications for national governments, reporting annually. It was launched following the 2015 Lancet Commission on Health and Climate Change, which concluded that, left unmitigated, climate change will undermine 50 years of public health gains, whilst responding to it could represent "the greatest global health opportunity of the 21st century."[1] "These indicators are organised across five core domains: the health impacts of climate change; health system adaptation and resilience; the health co-benefits of mitigation; the economics and finance that drives these responses; and the public and political engagement that underpins this growing momentum.[2]

About Médecins Sans Frontières/Doctors Without Borders (MSF)

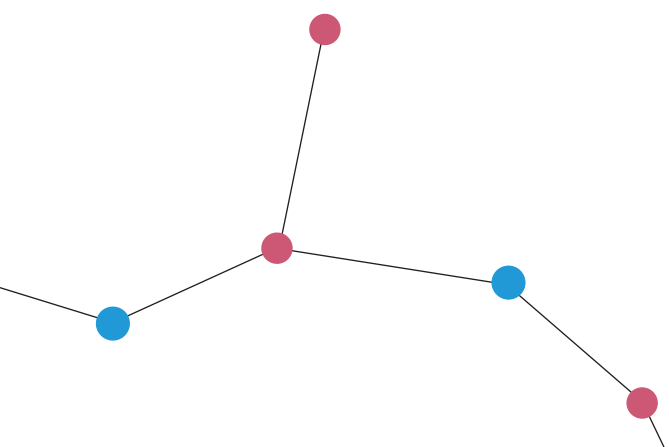
MSF is an international, independent, medical humanitarian organization working to alleviate suffering and to provide medical assistance to people affected by conflict, epidemics, disasters, or exclusion from healthcare in over 70 countries today.

Headline Findings

As stated in the 2018 *Lancet Countdown*, "present day changes in labour capacity, vector-borne disease, and food security provide early warning of compounded and overwhelming impacts expected if temperature continues to rise. Trends in climate change impacts, exposures, and vulnerabilities demonstrate an unacceptably high level of risk for the current and future health of populations across the world."[2] These converge to increase the risk of new, widespread humanitarian crises. Reducing greenhouse gas emissions to levels consistent with the well below 2°C target of the Paris Agreement is a global health priority.

Key Messages

- The health impacts of climate change demand an urgent response, with unmitigated warming threatening to undermine health systems and core global health objectives.
- Given the enormity of human impacts and political obstacles, adaptation and enhancement of resilience are essential but fundamentally insufficient, as anticipated needs will far exceed the response capabilities of relief actors.
- There is significant overlap between populations serviced by humanitarian actors and those most vulnerable to the health effects of climate change. Humanitarian organizations working in these contexts have a responsibility to collaborate with all sectors to contribute field-based data and analysis on impact and vulnerability mapping, and the efficacy of adaptation interventions.
- Planning is needed to build the specific skills and capacities of humanitarian organizations in the face of increases in water and sanitation needs related to climate change, while recognizing that the solution to the issue of water depletion and accessibility requires a global response by all sectors.
- Humanitarians must continue to advocate for people-centered policies to improve assistance and protection for the people most affected by the direct and indirect consequences of climate change.
- By contributing both stories and data to the public narrative, humanitarians can play a role in amplifying society's adaptation and mitigation response by definitively demonstrating that climate change is a human health issue.
- Meaningful medical mobilization must address the systemic causes of climate change and emphasize the duty to accelerate mitigation.



Climate Change and Health: a new and urgent frontier for humanitarianism

Bruno Jochum, Philippe Calain, Carol Devine

Today, the impacts of human activities on earth systems converge to increase the risk of new humanitarian crises.

Current scientific evidence for accelerating climate change is unequivocal, and the magnitude of adverse consequences can no longer be ignored or minimized. Some regions are more vulnerable to climate change, such as South Asia and the Pacific region, the Middle East, the Sahelian Belt, Southern Africa and Central America.[3] Existing social and economic inequities will also amplify consequences for health.[3] As an international organization which is often present in highly-impacted regions, *Médecins Sans Frontières*/Doctors Without Borders (MSF), is paying close attention to the negative implications of current climate change and future scenarios.

This brief focuses on the humanitarian impacts of climate change on the vulnerable populations served by MSF by combining empirical evidence provided by the *Lancet Countdown* and other sources with MSF's field-based experience in managing the consequences of extreme weather, vector-borne diseases; food insecurity and malnutrition; and migration. It focuses on the impacts of climate change with an awareness of their overlap with other health consequences of human-induced ecological degradation, including pollution, but does not examine other global environmental drivers of change, which are also vitally important to address as humanitarians in the Anthropocene.[4]

The goal of the Paris Agreement Climate Change is to keep global surface temperature warming to 2°C above pre-industrial levels, with major health benefits forecast for staying within 1.5°C.[5] A recent report by the Intergovernmental Panel on Climate Change (IPCC) shows that warming is likely to reach 1.5°C between 2030 and 2052 if it continues to increase at the current rate.[6] Staying below 2°C requires greenhouse gas emissions to be curbed by 2020, decreasing to zero net emissions by 2050.[6] Current emissions trajectories are tracking above the RCP8.5 scenario, which predicts warming of 2.7-4.8°C by the turn of the Century[7] and correlates with increased levels of sea-level rise as compared to 1.5°C.[6] While these unprecedented temperature projections depict global averages, greater regional variations will gravely amplify risks for populations who may lack adaptive capacity due to existing vulnerabilities and inequities.[2]

Such levels would challenge the maintenance of acceptable global health systems and escalate to repetitive humanitarian crises, including for the increasingly urban populations which are now forming a greater part of the population served by humanitarian organizations and which are impacted by the consequences of air pollution.[2] The additional risks of extreme weather events, altered patterns of infectious disease, water scarcity and food insecurity have the potential to generate critical levels of mortality and morbidity.[2] Some populations will be able to adjust to new environmental conditions, but many communities will face extreme situations, resulting in increased levels of migration.[7] Many will require humanitarian assistance to survive, with demands in excess of the response capabilities of both national and humanitarian actors.[8]

As a medical humanitarian organization working frequently in conflict zones and with displaced populations, MSF is specifically concerned about the potential for climate change to increasingly lead to disputes over water management and resources, social exclusion, and the risk of migration crises, all of which increase the risk of conflict.[3] Climate-related drought has been found to have influenced factors that led to or exacerbated the conflict that began in 2003 in Darfur,[9,10] amongst other political and social causes. Several academic papers have cited climate-related drought as one factor in the social instability that contributed to the current Syrian civil war, which in turn displaced many people in the country and around the world.[11]

On the response side, current humanitarian aid systems are vastly under-resourced, ill-equipped and slow to react, as illustrated by the 2014-2016 Ebola epidemic in West Africa and the recent crises in Yemen, and the Central African Republic.[12,13] Complex conflict dynamics make access to victims of floods, drought, malnutrition emergencies and epidemic diseases more difficult and dangerous for humanitarians. Aid delivery depends not only on resource availability, capacities, preparedness and techniques, but also on the politics of access to populations in need. Retaliation policies can amount to punishment and purposeful deprivation of basic resources,[14,15] as observed in some regions and recent conflicts.

In the face of widely-varying predictions of the number of people displaced by climate change by 2050, with 200 million people the most frequently-cited,[16] current containment, criminalization policies and the lack of legal protection for people in forced flight are all deeply concerning.[14,15,17] States and societies often react to cross-border movements of populations, exacerbated by factors including climate change, by restricting the ability of medical non-governmental organizations to provide impartial assistance, criminalizing migration (and gestures of solidarity from civil society and non-governmental organizations[18,19]) and building walls. In Myanmar, Europe, Libya, Australia, in the region around Syria, and the parts of Central America through which many people transit, amongst other locations, MSF teams witness how forced migrants, driven often by a combination of insecurity, environmental degradation and poverty are subject to restrictive policies and institutionalized systematic mistreatment.[20] States increasingly enact policies that push refugees and displaced people back to danger zones under the guise of national security.[17]

In this context, adaptation and resilience efforts to prepare for adverse impacts of climate change are essential. However, given the enormity of the likely human impacts and political obstacles, adaptation and efforts to increase resilience will not be enough. The global health and international aid community must therefore monitor the negative health impacts of climate change, and join forces with partners and academic institutions to trigger appropriate and people-centered responses and policies.

Organizations such as MSF have a culture of rigorous data-gathering and analysis which can facilitate adaptation and contribute to a shared knowledge base. MSF projects are often located in the regions most impacted by the changing climate,[2,20] and in unstable contexts where other researchers do not often venture.[20] By expanding their field of view to include the ecological drivers of humanitarian need, and collaborating with academic institutions in a variety of fields, medical relief organizations can provide critical contributions to the emerging evidence base on climate change and health. Efforts are also needed to help humanitarian organizations redesign and adapt field programs; prioritize new forms of vulnerability linked to slow-onset disasters, displacement and livelihoods in megacities and urban slums;[21] and confront their own detrimental environmental practices.

Given evidence that presenting climate change in a health frame is effective at motivating action,[22] and data showing that health workers are some of the world's most trusted messengers,[23] humanitarians have the potential to amplify societal response by definitively showing climate change to be a human health issue. The humanitarian public narrative, motivated by and based in lived experience, can put a human face, a name, to the numbers of people impacted.

Beyond the life-saving care provided to patients and efforts to reduce risks through adaptation, meaningful medical mobilization must also address the systemic causes of climate change. Humanitarian workers must participate in efforts to accelerate mitigation, and call for a shift to the low-emission, equitable and sustainable development pathways required to prevent the worst climate-related outcomes. As humanitarians dealing every day with the human suffering of some of the world's most vulnerable people, the authors believe it is imperative that all responsible individuals, professionals and institutions now act decisively to limit warming, for without this, conditions will become unlivable for significant proportions of the world's population.

Indicator sections

Countdown Indicator 1.5: Health Effects of Extremes of Precipitation (Flood and Drought)

Humanitarian Perspective on Water security, floods and sanitation - Syed Imran Ali & Léo L. Tremblay

The 2018 *Lancet Countdown* report found clear regional trends to changes in extremes of precipitation in the period from 2000 to 2016 as compared to the average number of events per year in the 1986-2008 reference period, with South America and South East Asia among the regions most exposed to increased flood and drought.[2] Current models predict that climate change will severely exacerbate water scarcity throughout the world.[24] Prolonged droughts have the potential to reduce access to potable water, decrease crop yields, and increase food insecurity and malnutrition, which can lead to stunting, wasting and death in children.[2] Reductions in arable and habitable land as a result of drought may also be associated with increased spread of water-borne disease (principally due to contamination of increasingly scarce water sources) and increased migration, making prolonged drought one of the most dangerous environmental determinants of premature mortality.[2]

As witnessed by MSF fieldworkers, a lack of water deepens people's suffering and threatens survival. If rainfall is precipitously delayed, crops wither away and hunger stalks the population, as in Chad in 2016 where almost half of child deaths were related to malnutrition.[25] When drought also affects the health of cattle, as occurred in Ethiopia's Somali region in 2017, pastoralists' herds die, forcing nomads into camps where the struggle to find enough food to survive continues, and where childhood mortality from hunger can increase up to ten-fold.[26] Once displaced by hunger, thirst, or conflict, populations become even more vulnerable.

In some displacement camps, water can be a double-edged sword. It is not uncommon for people to have too little potable water while living in the midst of a floodplain, such as in Maban County, South Sudan, in 2012.[27] There, densely-packed refugees had as little as five litres of potable water per day while being deluged by rains that caused latrines to overflow, creating the perfect conditions for outbreaks of water-borne diseases like cholera, gastroenteritis, and hepatitis E.[28] This is a pattern field workers see repeatedly—from the Protection of Civilians camps of South Sudan,[29] to the Rohingya refugee camps in Bangladesh,[30] to the internally displaced persons (IDP) camps of northeastern Nigeria.[31]

Treating waterborne disease outbreaks in refugee camps once they take hold can be a formidable task. It is only by ensuring safe water supplies, robust sanitation infrastructure and good hygiene that medical humanitarians can interrupt the pathways by which waterborne pathogens reach their next victims.

Potable water and sanitation services are essential first-line responses during any crisis. Society's current collective failure to ensure universal access to these basic necessities has left two billion people worldwide using a drinking water source contaminated by faeces,[32] meaning that huge swaths of the global population are less healthy and more vulnerable to current and future droughts, floods, and extreme heat events. Humanitarians struggle today to meet the world's need for emergency provision of water and sanitation services: planning and funding is required to increase capacity for national and humanitarian actors to respond to additional challenges as the climate changes.

Pulka town, northeast Nigeria. 28 May 2018 Igor Barbero.

Parched Pulka searches for water, Northeast Nigeria

"It is difficult to get even a container of water; sometimes we have to wait all day without getting any. We have to beg our neighbours," says Hauwa Ibrahim a displaced person and MSF beneficiary in Pulka in April 2018.[33]

Countdown Indicator 1.6: Lethality of Weather-Related Disasters

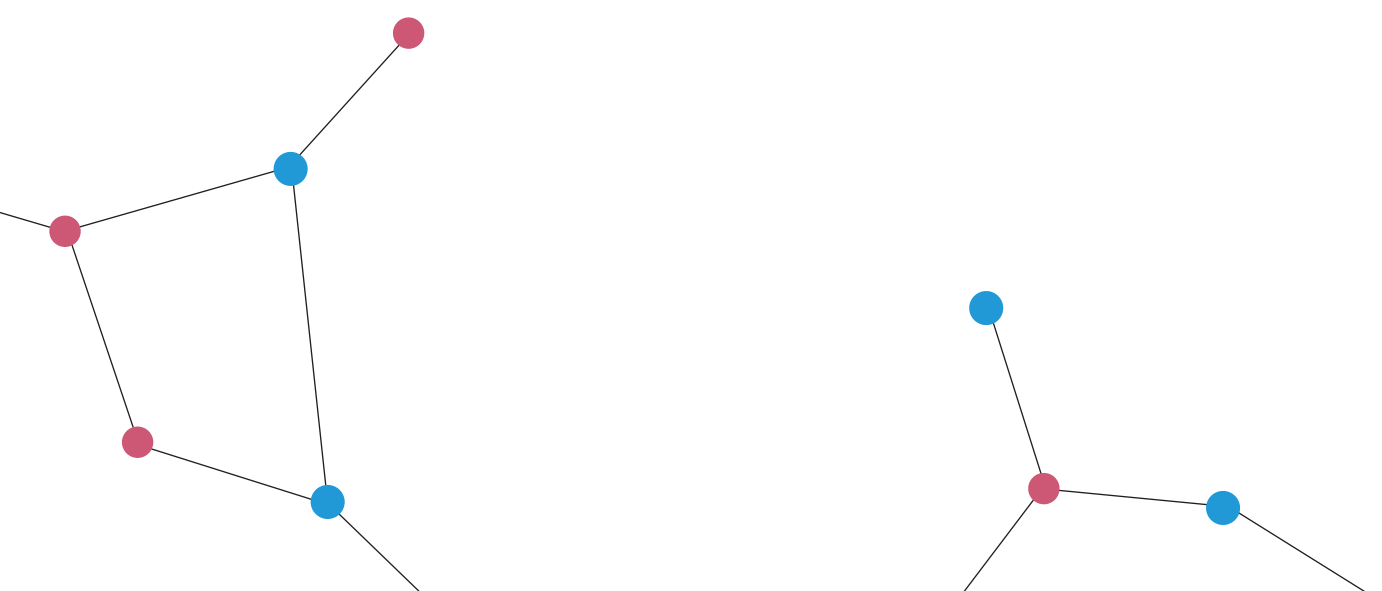
Focus on South East Asia and the Pacific region - Ken Xue

The 2018 *Lancet Countdown* report found that, "annual frequencies of floods and extreme temperature events have increased since 1990, with no clear upward or downward trend in the lethality of these events."[2] It also found that changes in heavy rainfall vary regionally, and that South East Asia has seen particularly significant increases in extreme heavy rainfall events over the 2000-2017 period relative to the mean number of events in the 1986-2008 reference period.[2] Other research indicates that natural disasters are now four times more likely to affect people in Asia and the Pacific than those in Africa, and 25 times more likely than those in Europe or North America.[34]

MSF has recently responded to emergencies in the South East Asia and Pacific region caused by flooding and typhoons (known elsewhere as cyclones or hurricanes) and has become conscious of the increasing burden of weather-related disasters.[35] This region is particularly vulnerable as the high frequency of natural disasters is combined with densely-populated areas and poor infrastructure. Given that a report by the OECD predicts that the impact of climate change and urban development could more than triple the number of people around the world exposed to coastal flooding by 2070, it is clear that humanitarians must become experts in flood response in areas with poor infrastructure.[36]

In 2013, MSF intervened in the aftermath of Typhoon Haiyan – one of the strongest super-typhoons ever recorded in the Philippines. It caused over 6,300 confirmed deaths and displaced four million people.[37] Essential infrastructure, including health facilities, roads and ports, was damaged or destroyed, and emergency stocks, including medical supplies and equipment, were swept away.[38] Healthcare needs were immense, and in the face of collapsed infrastructure, the risk of communicable disease outbreaks was high. MSF rolled out a massive medical response which included psycho-social care, as well as providing shelter, water and sanitation services.[35] Logistical and access constraints posed the biggest challenges in the immediate post-Haiyan emergency response. Infrastructure damage hampered the transport of life-saving services and supplies.[39]

There are many actors in the South East Asia and Pacific region - UN agencies, local governments, civil society – working on building resilient communities[40] more adapted to a changing climate. However, with the adoption of the Sendai Risk Management Framework,[41] humanitarians fear decreasing attention and investment in the capacity for emergency response. Super-typhoons and other extreme weather events are a growing threat to health and health systems, and all actors must have the ability to respond quickly and efficiently to save lives and reduce suffering.



"Two days ago he came down with a fever. It didn't go away," says Niño's mother. "I am very worried. We came all the way from Buabua town, one and a half hours away by motorbike. There is no free health centre near our town; it was destroyed. We have nothing, we lost everything." The doctors suspect Niño suffers from dengue fever, complicated by pneumonia. The dengue-carrying mosquito breeds in pools of stagnant water – in cans, buckets, containers – all items scattered around following the Philippines typhoon. MSF, November 19, 2013

Five-month old Niño in the inpatient department of MSF's tented hospital in Guiuan, Samar island, Philippines. 2013 Baikong Mamid/MSF[42]

Two children look out across the Tacloban slum, which was badly damaged by typhoon Haiyan. Despite the destruction, months after the typhoon many people have started to rebuild their homes. 5 February 2014 Sophie-Jane Madden/MSF

Countdown Indicator 1.8: Climate-Sensitive Infectious Disease

Maria Guevara and Lachlan McIver

Warmer ambient temperatures, such as those associated with climate change, have been shown to increase the incidence of water- and food-borne diseases such as hepatitis, viral gastroenteritis and cholera.[43] Climate change has also been linked to the spread of infectious disease vectors including mosquitoes and ticks, leading to likely increases in malaria, dengue fever, and Lyme disease amongst others.[5]

At present, malaria accounts for about 57% of the estimated 700,000 yearly global deaths related to vector-borne diseases (VBDs),[44] with approximately 216 million cases in 91 countries reported in 2016--five million cases more than the preceding year.[45] Sub-Saharan Africa bears the brunt of the global malaria disease burden.[20] In 2012, 2014, and 2015, MSF teams observed significant spikes in malaria cases in several sub-Saharan countries compared to long-term averages.[46] While the reasons for this are complex, climatic variation in temperature and precipitation--including short term variations due to El Niño and long term climate-related changes--play a major role, and the weight of evidence suggests that the incidence and prevalence of malaria will increase, particularly in Africa.[47,48]

Other VBDs are similarly susceptible to changes in climate. The 2018 *Lancet Countdown* report found that in 2016, compared to a 1950s baseline, global vectorial capacity for the transmission of dengue virus was the highest on record.[2] The burden of dengue fever is expected to increase over coming decades due to climate change, and other factors such as urbanization.[2]

Zoonoses are also susceptible to climate change, with leptospirosis a prominent example, and outbreaks frequently linked to rain storms and floods.[49] Other climate-sensitive diseases that disproportionately affect populations where MSF works include, but are not limited to, soil-transmitted helminths, rickettsioses, schistosomiasis and serious infections transmitted by soil saprophytes such as melioidosis.[50]

As a field based, people-centered and research-oriented medical humanitarian organization, MSF is well-placed to link on-the-ground realities with scientifically-informed policies. Bridging the knowledge gaps in this field requires commitment and investment from all stakeholders, including governments, multilateral bodies, researchers, civil society and practitioners. Serious efforts to address these threats must include improving infectious disease diagnostics and surveillance, as well as ensuring access to essential medicines and health services for these highly vulnerable populations.

"Malaria and malnutrition are closely linked. Every year, when the rainy season starts, the number of malaria cases rises. And when a body, already mildly malnourished, is affected by malaria, it weakens very quickly. A moderate malnutrition becomes acute. It's like a vicious cycle. And when it gets to that stage, our facility is the only place in the region people can be treated. There is nowhere else," Nathanaël Momba, MSF nurse supervisor, Central African Republic, 12 October 2018[51]

Méda and Mathuri with their son Therence outside the pediatric department of Bossangoa's hospital. It is the fourth time that Therence suffers from malaria. "We are very worried this time," says Maturi. "He hasn't eaten anything for the past five days and he is extremely tired. We both already had malaria many times, so we weren't that scared, but it's the first time it's gotten so bad and now, we fear he won't ever get better." 6 September 2018 Elisa Fourt.[51]

Countdown Indicator 1.9: Food Security and Undernutrition

Focus on the Sahel
Geza Harczi

The 2018 *Lancet Countdown* report finds that, "30 countries are currently experiencing downwards trends in crop yields, reversing a decade-long trend that had previously seen global improvement. Proxied by accumulated thermal time, yield potential is declining in every region."[2] There is also an expected reduction in the nutritional quality of crops such as rice and wheat, and the nutrient profile (i.e. iron, zinc and protein) of other staple foods globally.[6] Reductions in projected food availability will be larger at 2°C than at 1.5°C in the Sahel, Southern Africa, the Mediterranean, central Europe, and the Amazon.[6] Human food insecurity is further exacerbated as heat-related health impacts extend to livestock.[2] These are also projected to be adversely affected by rising temperatures, depending on the change in feed quality, the spread of diseases and water resource availability.[6]

Undernutrition is a complex issue, with the nutritional status of any one individual depending not only on food yields, but on the person's place in society and the myriad policies and actions by organizations and countries which influence how food is distributed and who can access it. Impacts of climate change on undernutrition therefore depend not only on the number of calories available for consumption and the nutrient content of food, but on climate impacts to societal systems and the resilience and adaptation capacity that these muster in the face of challenge. Already, approximately 45% of deaths of children under 5 are linked to undernutrition.[52] As a result of overlapping climate-related impacts, undernutrition is forecast to be the largest health impact of climate change in the 21st century, making it a subject of key humanitarian concern.[3]

The Sahel, long affected by conflict and insecurity, is now also increasingly affected by environmental factors that seriously impact the health and nutrition of its populations. In West Africa, the combination of a high level of exposure to climate impacts and low adaptive capacity[53] multiplies the threat of existing vulnerabilities, tensions and conflicts. This impairs farming, pastoralism, household economies and the cohesion and co-existence of communities.

Lake Chad, located in the Sahel region and shared by Cameroon, Chad, Niger and Nigeria, was once one of Africa's largest lakes, but has decreased in size by 90 per cent over the last 60 years as a result of overuse of water and extended drought.[44] MSF teams note that these changes as well as failing development policies and the impact of poverty put local communities under strain, and contribute to political tensions.[45] Undernutrition challenges are endemic, with climate-related impacts compounding a longstanding yearly "hunger gap" in the Sahel, a five-month period that usually lasts from June until end October.[46] Wasting (acute malnutrition with muscle loss) and stunting (chronic malnutrition with impaired growth) are both the result of to severe nutritional deficiencies and expose children to repeated illness, developmental challenges and risk of death.[53]

In recent years existing insecurity has worsened, with approximately 17 million people now living in areas affected by violence resulting from the conflict between non-state armed groups and military forces in the Lake Chad region.[54] Further reduced food availability, as projected for the Sahel, will have devastating impacts in an already-insecure area, illustrating the challenge which exists at the intersection of climate change, undernutrition, conflict and migration. High levels of exposure and sensitivity to climate change, coupled with low adaptive capacity, as in the Chad Basin, renders climate change a "threat multiplier" of vulnerabilities, tensions and conflicts.

These impacts can destabilize an entire region. In 2018, demographic growth, rapid migration of the rural poor to urban centres such as N'djamena, Chad's capital, socio-economic crises, deepening food insecurity and increased pressure on scarce resources and services collectively contributed to severe nutritional deterioration in the area.[56]

Today, as well as responding to malnutrition emergencies, MSF runs massive nutritional programs to address permanent severe acute malnutrition (SAM)[20] crises, with some areas requiring ever increasing-expansion of assistance. SAM admissions are increasing: for example, from January to April 2018 there was an 18 per cent rise in admissions in the Sahel belt as compared to the same period in 2017.[57]

In order to optimize nutritional outcomes in the context of climate change, it will be necessary to invest in both inpatient and outpatient nutritional interventions, to support government initiatives and humanitarian action, and, given likely limits to adaptation, to mobilize as a world community to meet the Paris Agreement target of keeping global surface temperature warming to well-below 2°C, aiming for 1.5°C. Investments in nutrition are among the most impactful in the realm of development and humanitarianism, with a return of between US$4 and $35 for every $1 invested.[58] The World Bank Group estimates that given current circumstances, to meet World Health Assembly targets for improvements in stunting, exclusive breastfeeding, maternal anemia and the scaling up of the treatment of severe wasting, an additional investment of $70 billion over 10 years is needed, which would result in 3.7 million pediatric deaths saved.[58]

"The children often arrive in a very critical state and at this age, when they are so fragile, the worst can happen very quickly. Endemic in the region, acute malnutrition affects not only the rural provinces of the Sahel strip. It is chronic among children under five in the Chadian capital, N'Djamena, and has reached alarming proportions in this city of about 1.5 million inhabitants." - Patient Kighoma, manager of the MSF inpatient therapeutic feeding centre in N'Djamena August, 2018.[56]

The inpatient ward at MSF's therapeutic feeding centre in N'Djamena, Chad, on 4 August 2018. Mohammad Ghannam.[56]

Migration and Population Displacement

Patricia Nayna Schwerdtle and Linn Biorklund Belliveau

Climate change is increasingly influencing human mobility. Millions of people are on the move. The conditions that create such displacement are expected to be exacerbated by climate change in the near future.[59] Whilst global attention focuses on cross-border migration and the implications for host countries, most climate-related migration is expected to occur within borders and towards urban areas,[60] where people may face continued environmental, physical and psychological threats. Reducing the negative humanitarian consequences of migration for the host, home and mobile populations is a key concern of MSF.

While the scale of mobility intensified by climate change is disputed, it is known to take place on a spectrum from forced displacement to voluntary migration and depends on an interplay between climate impacts, vulnerability and resilience, which influences the resultant medical humanitarian needs.[61, 62]

Regions experiencing strong climate shocks that are also home to densely populated, impoverished communities are particularly vulnerable. These 'hot spots' include (but are not limited to) large river deltas in South Asia, semi-arid regions in Africa and the Middle East,[63] glacier and river basins in Central Asia,[64] low-lying islands and coastal regions vulnerable to sea level rise and areas increasingly affected by extreme weather events including Central America, the Caribbean and the Pacific.[65] MSF has large scale operations in several such climate 'hotspots' and continuously responds to population displacement caused by storms, floods and droughts, including in Haiti, Bangladesh, Nigeria, Somalia and Yemen.[20]

Cities have become a focal point for absorbing large population movements. Two and a half billion people are expected to be added to urban environments by 2050, with 90% of this increase occurring in Asia and Africa.[66] MSF experience in Kamrangirchar, Bangladesh, suggests that land-pressure and increasingly poor farming yields are key drivers of migration to this urban slum, where slum-dwellers are then exposed to highly-polluted living environments and hazardous working conditions, sometimes with significant health consequences such as poisoning, exacerbation of chronic disease, and complex injuries.[67] In such contexts, MSF has started to develop programming around land and water remediation, toxicological therapies, occupational health, industrial hygiene and injury prevention. Local authorities, governments and other humanitarian actors need to better understand the implications of climate change for urban migration and adapt operationally in order to properly address the resultant health impacts from extreme heat, pollution, water contamination, overcrowding, undernutrition, and exclusion from healthcare.[68-70]

The health impacts of climate-related migration are broadly similar to those due to other forms of migration, and indeed, migration drivers are interrelated. Adding to this complexity, the health of migrating populations will be affected at the place of origin, en-route and at destination sites by climate change itself either directly or indirectly, as mediated through ecological and social systems. Importantly, the nexus of climate change, migration and health is an understudied area, requiring further attention.[71,72] Climate-related migration is increasingly seen as an adaptive response to climate change,[73,74] yet this does not preclude potential negative physical, mental and social consequences. In particular, the loss of land, livelihoods and identity associated with climate-related migration can cause significant mental health problems.[71, 75]

In cases of forced displacement, the risk of adverse health outcomes is higher among vulnerable populations: women, children, the elderly, and people with other existing health issues.[76] Evidence indicates that environmental change can also prevent human mobility and result in trapped populations who lack the resources to flee.[77] These groups may be unaccounted for and inaccessible to state and humanitarian actors, and are of particular concern due to their amplified vulnerability. MSF pays special attention to the health needs of trapped populations suffering the consequences of extreme environmental conditions; those experiencing violence, including sexual violence; and those subject to restrictive and exclusionary state policies.[20]

There are a number of principles, conventions and international agreements that seek to provide guidance on climate-related migration, including the 2018 Global Compact for Safe, Orderly and Regular Migration.[78] The majority are non-binding ('soft-laws') and emphasize short-term displacement and, arguably, the interests of recipient countries.[79] To date, less effort has been made to minimize long-term vulnerability for internally displaced persons and migrants affected by climate change, or people living in urban settings. These groups repeatedly fall into gaps in existing protection and assistance frameworks.

Climate-related population displacement highlights opportunities for improvement in a failing migration system which was designed in a previous geological epoch and is not fit for purpose in the Anthropocene. MSF will continue to address humanitarian consequences resulting from the disruption of climate, ecological and social systems, irrespective of individuals' legal status, and will call for adequate protection mechanisms for the climate-vulnerable, who are least responsible for climate change yet suffer the gravest consequences.

Workers in Kamrangirchar slum, 9 February 2014 Brian T Scott

"Due to excess labour sometimes the body becomes too weak. Sometimes the head is dizzy. I also mentioned the problem of eyes linked to welding. Along with that, when smoke comes out and gets inside the body as you breathe, then you feel pain in this side of chest… Again, it is seen that as we work with iron materials, sometimes, there is a risk of infection. So, in case of these problems, if immediate [medical] services are there, wouldn't it be good?" — Adult male factory worker

Kamrangirchar is the biggest slum in Dhaka, and home to over 400,000 people. The slum is situated next to the Buriganga River, which is black in colour and gives off a strong odor, as it receives thousands of cubic meters of untreated toxic waste from the tanneries, factories and homes in the area. MSF established a clinic in the area and found that 14.6% of visits were due to suspected work-related diseases.[80, 81]

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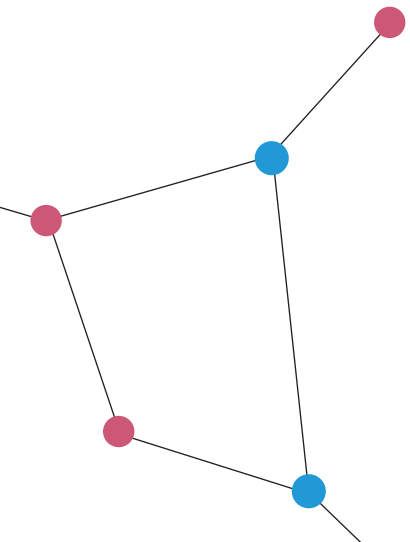

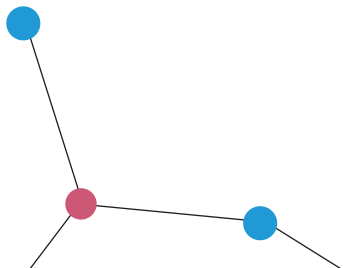

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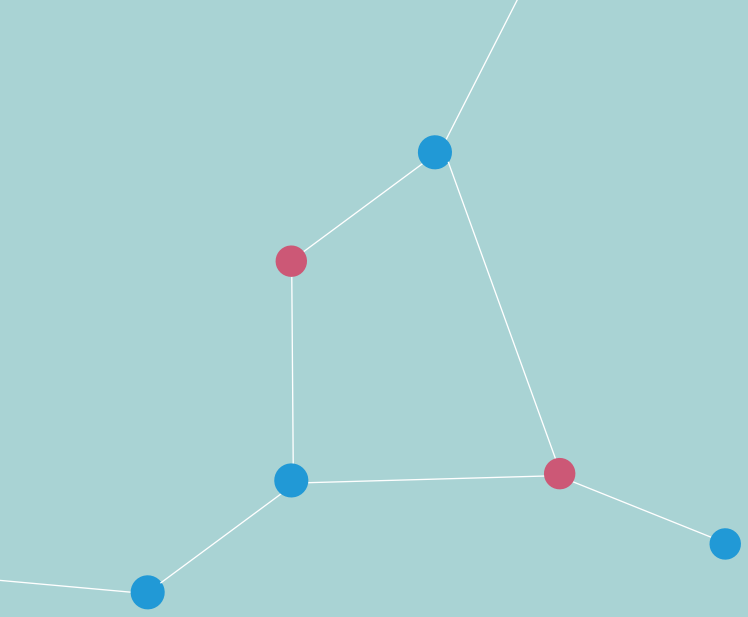

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