Addressing Climate Change Impacts on Health

Policy Working Paper

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Key messages

- **Climate change is a global health emergency** that presents diverse risks to human lives including but not limited to heat exposure and heat stress; water scarcity, flooding and droughts; changing distribution of vector-borne and other infectious diseases; and food insecurity and malnutrition. Impacts are felt most intensely by vulnerable populations and communities, including those with pre-existing health conditions.
- **Effective adaptation and resilience-building** to the health risks posed by climate change will need to be tailored to local circumstances and capacities; integrated into wider plans for sustainable development, disaster risk reduction and health sector reform, and should involve collaboration between national and local governmental bodies, public health professionals, health-care providers and local households and communities
- **Aligning climate change adaptation and mitigation actions** is more likely to be effective than addressing these actions separately in reducing the health impacts of climate change. Emphasising the co-benefits to health from climate change mitigation can incentivise decision-makers to undertake climate action that directly benefits a country's own population in the near term whilst also contributing to global efforts to combat climate change.
- Addressing the complex interactions between health and climate change requires **multi-sectoral and whole systems approaches and policies** to assess health challenges, support the development and implementation of effective policy solutions, minimise trade-offs and identify actions that achieve objectives for health and climate change at the same time.
- **Coordinated and multidisciplinary monitoring, surveillance and reporting of disease** in crops, livestock, and human populations are important to reduce health risks, and require long-term investment and cross-border collaborations and partnerships. Effective surveillance can support early warning systems, recognising that people and animals will move across borders in new ways due to climate change.
- **Sustainable management of agriculture and water** is essential to reduce health risks from spread of disease in animals and crops, as well as risks to food security, water scarcity and nutrition that can cause harm to population health and economic sustainability. Promoting healthy dietary choices, including increased consumption of plant-based foods, can also reduce emissions from food systems alongside non-communicable disease risks.
- **Mobilisation of public and private finance** is vital to closing climate and health financing gaps, through delivery of the committed US$100 billion in international climate finance to low and middle-income countries, combined with a doubling of adaptation finance by 2025.

Introduction

Climate change is an acute health emergency. Indeed, it has been described by the WHO as the greatest threat to global health in the 21st century, having far-reaching effects on both human health and also the environments that sustain health over the longer term.

Direct risks to health from climate change include extreme heat and heat waves, that lead to increased deaths, particularly amongst the elderly and vulnerable; heat exhaustion; heat stroke, and the exacerbation of pre-existing health conditions[1,2]. Indirect impacts are mediated through the impact of increasing heat and weather extremes on, for example, crop yields and the spread of waterborne, vector-borne and other infectious diseases as well through increasing poverty and displacement.

Climate change is also an issue of global health injustice which is exacerbating pre-existing inequalities and vulnerabilities, such as poverty, social inequality, gender inequality, demographic change and weak institutions, each of which has implications for health. Many lower-income countries already have worse health outcomes than higher-income countries, and this will be aggravated by climate change, if adequate support to address the risks is not provided. In 2009, high-income countries committed to provide US$100 billion of climate finance annually by 2020 to help lower-income countries deal with climate impacts and cut emissions. However, this climate finance target was not met in 2020, nor in 2021, causing continued challenges for both mitigation efforts and adaptation to climate risks in the countries most vulnerable to them.

Tackling health threats from climate change must be widely considered, funded, and implemented through strategic collaborative actions and a systematic approach. The health sector has a critical role to play in climate change adaptation within individual countries, but it cannot do so in isolation. Strengthening evidence on effective adaptation strategies in low- and middle-income countries will be important to reduce the exposure and vulnerability of populations to climate-related health risks and build resilience to shocks.[3]

Adaptation measures are likely to be most effective if they are based on the latest climate science, interdisciplinary research, and tailored to local circumstances and capacities; while integrated into wider plans for sustainable development, disaster risk reduction, and health sector reform; and if designed and implemented as a part of joined up governmental and societal approach. National and local level climate change adaptation strategies will be more effective if they are responsive to the health risks faced by different local regions and populations.

Tackling climate change has also been described as the greatest global health opportunity of the 21st century[4], as many climate change mitigation strategies have important co-benefits for health. Reducing air pollution through the phase out of fossil fuels will improve health outcomes for people with pre-existing health conditions such as heart and lung disease; a move towards healthy dietary choices that reduce red meat consumption in high consuming populations and increasing fruit and vegetable intake can reduce GHG emissions and reduce risks of noncommunicable diseases. Sustainable transport policies promoting active travel can increase health through strengthening bones and muscles, and reduce risk of heart disease, diabetes and strokes.[5] More broadly, strong integration of climate adaptation and mitigation actions can minimise trade-offs and maximise synergies.

The view from Egypt

As the hosts of COP27, and given its own vulnerability to climate change, Egypt has an opportunity to highlight the need for embedding considerations of health risks from climate change at the core of international climate negotiations, and in exemplifying the opportunity for countries to deliver the Paris Agreement goals in a manner that builds resilient and healthy societies.

Egypt specifically is considered highly vulnerable to climate change due to the triple effect of the country's weather, low rainfall, hot summers; the nature of the land, desert and delta, large and densely populated cities; and geography, with the country having one main river and a long coastline. With a densely populated Nile Delta region, a rise in sea level would threaten people's lives, agriculture, access to clean water, and the economy as a whole.

Without adaptation measures, as many as 2.4 million people in Egypt are likely to suffer from the risks of floods between 2070 and 2100.[6] Similarly, a recent review has shown how the Eastern Mediterranean and Middle East region has experienced greater temperature increases than other inhabited regions, averaging 0.45°C per decade.[7] In Egypt, heat-related deaths are expected to rise, particularly in the age group above 65 years. As such, the health impacts of climate change for Egypt are particularly concerning.

By building resilience to the health impacts of climate change, and enabling health co-benefits from climate change mitigation, Egypt can, as host of COP27, alongside other low- and middle-income countries, and with sufficient financial support, ensure growth and prosperity as the global community transitions to a net zero emissions world.

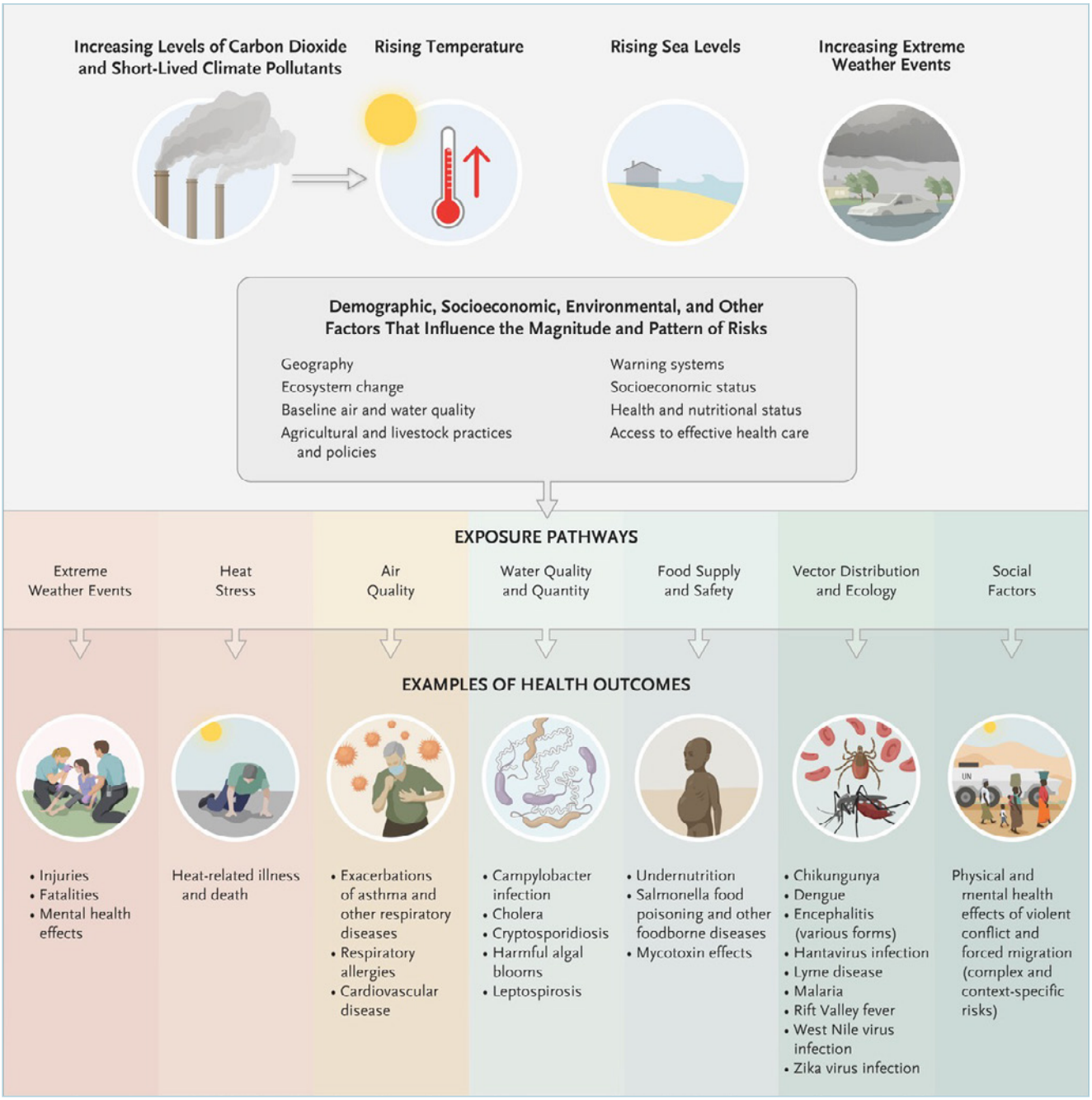
The following sections will further explore health risks from climate change in a global context, setting out key risks and actions towards addressing these

risks, with a particular emphasis on adaptation measures. In the context of COP27, it will draw in a focus on Egypt as a case study throughout to exemplify the risks faced by low-and middle-income countries which are particularly vulnerable to the health impacts of climate change.

Health impacts from climate change

There is clear evidence that climate change is already having a negative impact on health, particularly for the most vulnerable populations, and those with pre-existing health conditions[9,10]. The following section will explore some of the major health risks from climate change, both globally and as they manifest specifically in Egypt and surrounding regions.

Many health impacts from climate change are interconnected and have a compounding effect, which will affect actions to tackle them. Extreme weather events and the changing climate can lead to displacement of people, which in turn may increase the risks of overcrowding in cities and the growth of informal settlements, leading to disruption of water and food supplies, medical and other services, increased spread of diseases such as schistosomiasis, and infectious diseases to make appearances in new areas. Such interconnected impacts require integrated, systematic approaches to tackle them in turn.



Graphic: Examples of potential health outcomes from climate change, including factors that influence the risks.[8]

Heat exposure and heat stress

Heat exposure exacerbates existing health conditions[11,12]. Older people and those with impaired cardiovascular health are particularly at risk of heat-related mortality and morbidity. As populations grow and age, so will the adverse effects associated with ambient heat exposure.[13] Pregnant women are also particularly vulnerable, with the risks of premature birth and stillbirth increasing with temperature[14], particularly amongst socioeconomically disadvantaged populations. Physical work is negatively affected by heat stress, resulting in lower labour productivity and occupational health problems. Those most at risk include outdoor workers, such as those working in agricultural, construction, and manufacturing sectors.[15]

In large and densely populated cities, the urban heat island effect is of increasing concern, given rising temperatures due to climate change, and increasingly urban and ageing populations. Exposure to dangerously high temperatures in cities nearly tripled between 1983 and 2016, with the urban poor most negatively affected.[16] In Egypt, climate change interacts with substandard infrastructure, poor environmental conditions and lack of easy access to social services, increasing the risk of heat exposure and overheating in cities.[17]

The concept of Wet Bulb Globe Temperature (WBGT) takes into account temperature, humidity, sun angle, cloud cover, and wind speed[18,19], which makes it a useful measure for how well the human body can cool itself via evaporation of sweat from the skin, and so for understanding occupational health risks from heat. An ambient temperature of 50°C, with a relative humidity of 40%, has a WBGT of 36°C, equating to an ambient temperature of 36°C at 100 % humidity, a condition in which it is almost impossible for the human body to cool itself.

Health risks from drought, water scarcity and flooding

Climate change is affecting water resources worldwide through warming, shifts in precipitation patterns, and extreme weather events.[20] Increasing water scarcity is strongly associated with impaired agricultural activity and subsequent impacts on food production as well as infectious diseases, including water-borne diseases such as cholera, diarrheal diseases and leptospirosis, and vector-borne diseases such as malaria and dengue fever.[21,22,23] Egypt is particularly vulnerable to these health risks as water is already scarce, and has been declining in the past decades, whilst the population has been growing.[24]

Stagnant water provides conditions in which disease vectors like mosquitoes reproduce and thrive, leading to increased transmission and risk of outbreak from insect-borne diseases like malaria and Dengue fever. Water scarcity can also form a barrier to basic sanitation and hygiene practices, leading to the spread of infectious diseases that could otherwise be prevented through washing and improving hygiene.[25] Droughts can also lead to increased dust in the atmosphere, exacerbating chronic and respiratory diseases such as asthma and allergies.[26]

Exposure to flooding may lead to deaths from drowning, extensive indirect health effects and impacts on water provision and ecosystem disruption. Increasing rainfall rates can lead to disruption of sewage systems, contaminating drinking water sources and facilities with pathogens present in wastewater, increasing the risk of outbreaks of water-borne diseases and leading indirectly to the rise of diseases transmitted by insects or rodents through the increase in the chances of multiplication and expansion of the hosts of vectors.

Longer-term effects of flooding may include population displacement[27], as well as mental health problems such as anxiety, post-traumatic stress disorder and depression[28,29]. Generally, women, children and elders are more vulnerable to water-related natural disasters with higher risk of water-borne diseases, while negative mental health impacts tend to affect adolescents disproportionally.[30]

New distribution of vector-borne and infectious diseases

Major environmental factors associated with outbreaks of disease include air and water temperature, sea-level, precipitation and flooding[31], that are in turn affected by climate variability and change.[32] As climatic conditions change, so too do the population movements of human and animal disease vectors such as sandflies, ticks, and most prominently, mosquitoes, which hatch quicker, and survive longer, in warmer temperatures[33,34], up to approximately 40°C.

The subsequent challenges faced by individual countries will vary. While nations such as Egypt are forecast to experience increased rainfall and temperatures further amenable to vector reproduction[35], countries within the Gulf Cooperation Council (GCC) region are forecast for temperatures and desertification[36] that may either reduce vector prevalence, or trigger migration events.

In Egypt, malaria has been endemic in all governorates, including Fayoum, which was the last nidus of the disease.[37] Available epidemiological evidence suggests that in areas where malaria was eliminated, but the vectors still exist, there is a risk of re-emergence of the disease.[38] Given current temperature increase forecasts as a result of climate change, the MENA population at risk of Aedes-borne disease may increase by 20-30% by 2050.[39]

There has also been a sharp increase in recent years in Egypt of seropositivity rates for dengue and West Nile virus, and persistent seropositivity rates for Rift Valley fever, Chikungunya, and Sindbis.[40] Spillover events to neighbouring countries have also been recorded.

Potential changes in human-to-human communicable disease transmission are challenging to project.[41] This is further complicated by the wider impacts of urbanisation and increasing health inequality. Movement of populations create specific risks in the MENA region, as they further complicate the ability to tackle, and forecast epidemics in the region, due to increased risk of disease importation. As climate change is likely to change human migration patterns, imported cases of diseases are likely to change as well.

Food security and nutrition

Nutritional security enables adequate physical and mental development, and active and healthy lives, and overall health status affects how nutrients are absorbed and utilised. The nutritional diversity, quality and safety of the food supply is likely to be impacted by climate change through multiple pathways.

Climate change is already having a negative impact on food security and nutrition through its impact on crop yields, livestock productivity, food quality, food prices, incomes, access to sanitation, access to healthcare, and increases in the incidence of infectious and diarrhoeal diseases[42], particularly in lower-income countries that are already experiencing high levels of food insecurity. Not only has warming increased the probability of food insecurity, but the magnitude of this impact has increased over time.[43]

Climate change also alters the distribution and abundance of plant disease vectors, including important agricultural pests such as whiteflies and aphids by influencing their phenology, migration, number of generations per year and overwintering strategies.[44] For example, plant-parasitic nematodes are a common pest in Egypt[45] that are predicted to increase their distribution within the country and MENA region.[46] This presents risks to food security from crop failure.

Ocean warming and acidification are also adversely affecting food production from aquaculture and fisheries, which are important industries in Egypt and elsewhere. Extreme events such as marine heatwaves cause mass mortalities in aquatic ecosystems such as coral reefs, leading to acute food insecurity with the collapse of regional fisheries and aquaculture. In addition, food safety risks in fisheries and aquaculture are expected through harmful algal blooms, pathogens and the accumulation of persistent organic pollutants.[47]

Economic impacts of health risks from climate change

The impacts of climate change threaten to undermine the last half century of gains in development and global health.[48] Climate-related extreme heat events are already affecting the health of outdoor workers through their impact on labour supply, labour productivity, agricultural production and income, particularly in Africa.[49] Occupational heat stress disproportionately reduces male workers' ability to work, primarily in low-income countries with a large share of employment in the agricultural and construction sectors.

For example, agricultural workers were most severely affected in Egypt, suffering 679.1 million potential work hours lost in 2020 from 182.1 million in 1990.[50] Climate-related disasters are also affecting the mental health of workers through direct economic damages to local infrastructure and disruptions to agricultural and manufacturing supply chains, which could push an additional 39.7 million people into extreme poverty in Africa by 2030.[51]

Impacts on labour productivity, in turn, exacerbate health inequalities through affecting social determinants of health, including loss of earnings and jobs, higher out-of-pocket health expenditure, gender inequalities, food insecurity, and poverty. If the global average temperature increase reaches 2.5°C, 1 billion people worldwide may be unable to safely undertake even moderate physical activity safely during the hottest month of the year.[52]

The global economic costs of such loss of labour productivity due to heat stress are projected to reach US$2,400 billion by 2030, resulting in the potential work hours lost equivalent to 80 million job losses.[53] 134,000 jobs could be lost in Egypt, where small- and medium-sized enterprises (SMEs) account for over 90% of total employment.[54]

Climate change also impacts and intersects with health care systems. Not only are health care systems responsible for GHG emissions, but the impacts of climate change have also been highlighted as a major threat to the sustainability of their day-to-day operations, through affecting patients and health care staff, medical and nonmedical supplies, facility operations, and critical infrastructures that might be disrupted by extreme weather events.[55] Such impacts hamper access to healthcare and disrupt the ability to deliver safe, effective and high-quality services.

Co-benefits of climate mitigation for health

The risks explored in the previous section require adaptation actions to protect people from their impacts and harm. However, many policies to reduce greenhouse gas emissions have major ancillary (co-) near-term benefits for health as well. This makes climate mitigation actions important for policymakers to consider alongside adaptation actions to enable resilient, healthy societies.

Important climate mitigation actions that result in near term health co-benefits include reductions in air pollution from phasing out the combustion of fossil fuels; increased physical activity from increased active travel (walking and cycling) particularly in cities; and a move to more balanced diets, particularly in higher-income countries, with lower consumption of red meat and higher consumption of plant-based foods. Particularly in colder countries, home insulation can also result in reduced emissions, warmer houses, reduced heating expenditure, and a healthier living environment as long as ventilation is adequate.[56]

The magnitude of health co-benefits from climate mitigation could be substantial. For example, one study estimated that reducing fossil fuel burning sufficiently to keep the global mean temperature increase to 1.5°C, instead of 2°C, could help to avert more than 100 million premature deaths globally from air pollution over the 21st century, with about 40% of the benefits accruing over the next 40 years.[57]

Whilst historically low-emitting, lower-income countries such as Egypt will focus primarily on climate adaptation and building resilient and prosperous societies, there are also substantial co-benefits to health from climate change mitigation policies that might be optimal from the individual country's perspective. For example, short-lived climate pollutants (SLCP) such as black carbon, methane and tropospheric ozone from inefficient burning of fossil fuels not only contribute to climate change and its associated health hazards, but additionally have immediate detrimental health effects.[58] It has been estimated, using 2015 data, that about 18,000 annual premature deaths could be prevented in Egypt from reduced air pollution resulting from the phasing out of fossil fuels[59].

Determining the marginal costs and benefits for Egypt, and for other low-and middle-income countries, of reducing SLCPs – and other health co-benefits to climate mitigation – can help to inform effective policy making that both builds resilience to climate change and reduces greenhouse gas emissions.

Resilience-building to health risks from climate change

Effective resilience-building to the health risks of climate change requires both long term and short term actions; enhanced collaboration between local government bodies, public health professionals, hospitals, health-care providers and heat-health research and planning agencies with a key focus on data sharing; and engagement with a range of stakeholders, including individuals, households and communities. The World Health Organization (WHO) Operational framework for building climate resilient health systems provides a useful systematic approach, based on 10 essential components, to strengthen capacity for protecting health in an unstable and changing climate. Any development of policy requires careful consideration of how intervention efforts will support and inform one-another in a community of practice.

Assessing solutions through a localised lens, and ensuring solutions align with assessment of development priorities in a given country, will be important. Transdisciplinary, cross-sectoral, climate-resilient and low-carbon health infrastructure and associated behaviour change campaigns are also integral components to achieving these ambitions.

Avoiding maladaptation will be essential to effectively tackling health risks from climate change. There are extensive examples of health-related mal-adaptations from across the globe, but particularly in low-and-middle income regions where short-term coping mechanisms have led to ineffective long-term strategies.[60] Potential solutions must consider unintended consequences to ensure they do not create conditions which will potentially widen inequalities and leave marginalised and vulnerable groups further behind.

Actions to address heat exposure

Actions to address heat exposure and heat stress require both early warning systems and solutions to mitigate its impacts. Heat early warning and response signals are increasingly being used to address risks of heat stress. They are more effective if incorporating iterative management activities that take into account changes in hazard distribution,

population vulnerabilities, and overall system effectiveness[61]; and if they have suitable response plans that reach vulnerable populations.[62]

Response plans can include cooling centres and changes to working hours or other labour market adaptations.[63] The government of Egypt is developing early warning systems that also incorporate public awareness and educational programmes and include social and health actors.[64]

Adaptation solutions include active and passive cooling strategies, building retrofit measures and behaviour change campaigns. Active cooling, such as reliance on air conditioning may be unsustainable because of energy demands and grid failures and is likely to be an example of maladaptation if the electricity used comes from fossil fuels.[65]

Passive cooling measures and occupant led strategies such as window shutters, cool roofs and encouraging window opening to allow for cross ventilation, can help to reduce heat exposure without increasing energy demands, and will have implications for architectural design and building and planning regulations.

In Egypt, in common with many low- and middle-income countries, a lack of green areas and open spaces in cities is also a major factor preventing the night-time cooling required for recovery from the heat of the day. Improving urban green spaces can support both climate change mitigation and mental health co-benefits.

While adaptation is crucial to protect people from the impacts of high heat, it has clear limits with respect to physiological survival in hot weather[66]. Many lower-income countries are likely to be the first to reach these limits, due to their geographical location. The WHO has explicitly recognised that heat stress is likely to be an increasing health problem for Egypt. During a severe heat wave that occurred in 2015, more than 500 were admitted to hospitals with heat exhaustion, and many suffered from heat-related strokes.[67] Ultimately, actions to reduce emissions and tackle climate change are essential to avoid increasing temperatures.

Actions to address vector-borne and infectious disease risk

Successful approaches to intervention of vector-borne disease involve the collaboration of ecologists, epidemiologists, and climate scientists. For example, by recognising the impact that deforestation had in amplifying mosquito populations, Brazil was able to successfully curb outbreaks of malaria.[68,69] This was achieved through the use of targeted interventions driven by modelling work that depended on real time climate projections and surveillance of human disease.

Provision of safe, affordable and accessible water, sanitation (both human and animal) and hygiene at household, institutional and public space level is important to avoid spread of disease. Beyond that, affordable and accessible diagnostic testing, measures for vector control, effective vaccines and therapeutics are highly effective in combating the spread of vector-borne diseases as they enable real-time monitoring of emerging pathogens and rapid, informed responses to epidemics. These resources require investment in fundamental pathogen-specific research as linked to climate change and are most impactful when readily available early in an epidemic.

In addition, diagnostics along with tools like vaccines and therapeutics, can mitigate the risk of cross-species transmission of viral diseases caused by climate change by enabling bio surveillance and disease management in animal and human populations.[70]

Finally, expansive cross-border data gathering and sharing is crucial to enable early-warning systems that can support effective interventions on disease-risks from climate change. A 2007 review of mosquito control programmes across Africa and the Middle East identified that failures in intervention could be directly attributed to a lack of inter-sector collaboration, alongside insufficiently providing sustainable funding to such schemes.[71]

Actions to ensure food security and nutrition

Addressing food security and nutrition will need to focus on availability and access to nutritional food, sustainable food production and affordability, food safety, and trade. Understanding the local context matters, in particular, how climate shocks are manifested, whether as food shortages, rising prices, or falling incomes.[72] Given the role that the agricultural sector plays in contributing to climate change as one of the most GHG intensive industries, sustainable food production and consumption are also key to long-term resilience and effective GHG mitigation.

As countries that are highly dependent on food imports are increasingly at risk of systemic crisis across the food chain, leading to rapidly increasing prices, food security is likely to require increasing food self-sufficiency, which may put pressure on other land-uses and biodiversity. Interventions will need to address smallholder agricultural productivity, including investments in soil quality and improvements in the food supply chain and regional storage.[73]

Food and cash safety nets have proven to be effective in addressing food insecurity, with cash transfers often more effective than food transfers during the recent Covid-19 pandemic, and targeting vulnerable households proving particularly important. Furthermore, using nutritionally sensitive mitigation and adaptation measures such as diverse and resilient crop and livestock varieties and minimum tillage/mulching for soil improvement, can help maximise net nutrition within the food system.[74]

To address the risks of crop disease and failure brought on by climate change, climate-smart pest management (CSPM) offers an interdisciplinary, coordinated approach that integrates pest monitoring, management and forecasting with climate services and projections alongside end-user engagement and support, and reduces the use of and risk of pesticides.[75] Adopting further agro-ecological crop protection approaches can increase ecological resilience of agro-ecosystems against biotic stresses through promoting biodiversity and soil health.[76]

Systems-based and cross-sectoral approaches

Climate change impacts on human health and wellbeing unfold in dynamic interactions that are non-linear. To effectively address complex interactions and avoid adverse consequences, multisectoral and whole-systems approaches and policies can help assess health challenges, support the development and implementation of effective policy solutions, minimise trade-offs and identify collective actions that achieve multiple objectives for both health and climate change simultaneously.

A transdisciplinary systems-based approach[77] that aims to understand how health, climate and socio-economic factors interact with one another can be utilised to map the relationship between policy decisions and their different impacts on climate and health outcomes, how they affect different groups, and may have unintended side-effects.

Multi-sectoral coordination requires several enabling key factors to be successful. These include **political commitment:** the actions, events, and factors that encourage governments to establish and sustain policies to address the impacts of climate change on health; **institutional structure**, involving governmental multi-sectoral coordination mechanisms; **management and coordination capacity** that enable integration of health into all sectoral and cross-sectoral policies and plans at local, national, and regional levels, and the capacity to monitor and measure progress toward objectives; **integrated planning and implementation** through effective public-private partnerships to address climate change and its health impacts through national roadmaps, simulations and projections, and managing disease investigations; **technical and financial resources** to operate and strengthen coordination mechanisms; and an underlying principle of **data and evidence-driven decision-making** to enable targeted interventions.

One approach that utilises such systems-based thinking is the One Health approach, which recognises the complex connections among humans, animals, and ecosystems within the systems they operate, and promotes collaboration across sectors to specifically address and manage diseases at the human-animal-environmental interface.

Enabling access to data for effective solutions

A data-driven approach is essential to identify the most vulnerable populations when it comes to climate change and health hazards. The availability of data has led to innovations in the cross-disciplinary field of biometeorology[78] which can help identify exposure and vulnerability hotspots, track progress, and monitor and evaluate the effectiveness of adaptation measures. By using data effectively, interventions and decisions can be made that will improve public health outcomes while minimising the risk of unintended consequences.

Earth observation data from satellites, meteorological data and models have the potential for developing cost-effective methods to monitor and predict risks to human health from infectious diseases, with free and open data available at the global scale.[79] Data gathering is paramount to monitor sites, cities, and areas more vulnerable to climate change effects as well as enabling the assessment of the human health effects of climatic elements in various urban micro-environments through the use of micro-scale mobile sensing devices.[80]

Geographic Information Systems (GIS) could play a vital role in this aspect and require capacity-building and skills development to be used effectively. As an example, Ain Shams University in Egypt and the national remote-sensing authority in Egypt has recently developed a joint diploma aimed at training students in producing and interpreting data for use by decision-makers.

However, remote-sensing data and models can be difficult for low-and-middle income countries to utilise given limitations in the technical skills and expertise required to gather, process and publish data and issues in translating scientific data into common language that is useful to decision makers. A lack of climate services can similarly make enabling effective adaptation policies to health risks from climate change challenging. Achieving equitable solutions to health risks from climate change will necessitate a focus on ensuring open-access data for all countries, alongside capacity-building for its use.

Cross-border collaboration

The health risks from climate change are not confined by national borders, which makes global collaboration on solutions essential, such as on health surveillance and data sharing.

Expansive cross-border data surveillance and sharing is also crucial to the development of early-warning systems, which are likely to be important for a wide range of adaptation strategies to the health risks of climate change. For example, the recently founded European Climate and Health Observatory (ECHO) sources, combines, and provides a wide array of climate and health data to prepare for the impacts of climate change by developing indicators, early warning systems, tools, and information systems. This allows researchers to collaborate and prioritise areas of research from shared data sources.[81]

The sharing of expertise has also seen success in the Middle East via the Middle East Consortium for Infectious Disease Surveillance (MECIDS). Outbreaks of avian influenza and H1N1 influenza were suppressed through shared knowledge, laboratory studies, and communication strategies – utilising partnerships in government and research, as well as the transportation, education, interior, and media sectors.[82]

Similarly, COVID-19 provides lessons and highlights the fundamental role of scientific research and the public health sector, and the advantage of intersectoral, regional and global collaboration to tackle health risks.

International finance for health and climate resilience

International cooperation has a significant role to play in unlocking the benefits of planetary health. Mobilisation of all sources of finance through partnerships is vital to closing climate and health financing gaps, particularly given less than 0.5% of multilateral climate finance has been allocated to health projects.[83]

Reinforced action is needed to accelerate the delivery of US$100 billion in international climate finance to low and middle-income countries, combined with a doubling of adaptation finance by 2025.[84] Blended concessional finance provided by multilateral funds and multilateral development banks is instrumental in catalysing private investments for planetary health goals. For example, a Financial Intermediary Fund for Pandemic Prevention, Preparedness and Response (PPR), administered by the World Bank, can mobilise additional sources for increased investments in One Health and climate-resilient health systems.[85]

The increasing role of health in climate litigation can be a turning point in scaling up climate and sustainable financing.[86] A just transition can be enabled by creating a Loss and Damage Finance Facility at COP27 for climate-vulnerable countries. Through international research and collaboration, quantifying the health co-benefits of climate mitigation policies can support policymakers in mobilising domestic resources for sustainable development, through the development of carbon pricing mechanisms and the removal of harmful fossil fuel and agricultural subsidies.

Looking ahead to COP27

Climate change is an acute health emergency with far-reaching effects on both human health and the environments that sustain it. Not only is climate change and the health of citizens interlinked but they also share the same solutions. At the same time, climate change is an issue of global injustice. Global heating is increasing the severity and frequency of extreme weather events and vulnerable countries do not have the capacities and finance to mitigate and adapt to these impacts.

This paper has explored some of the key ways climate change is threatening human health and wellbeing, the intersections of those threats with existing vulnerabilities and inequalities, and what approaches to adaptation and resilience-building can help address those risks. The paper has also highlighted the importance of climate mitigation and reducing greenhouse gas emissions in creating health co-benefits for people and communities.

The health sector has a critical role to play in climate change adaptation, but it cannot do so in isolation. Adaptation measures must be based on the latest climate science, and interdisciplinary research and tailored to local circumstances and capacities. They will need to be designed and implemented as a part of governmental and societal whole-in-one approach. The costs of inaction on climate change are far greater than the costs of the action.

The upcoming COP27 in Sharm El-Sheikh, and the following Egyptian COP Presidency, represent a key moment to promote integrating such considerations in the core of international climate negotiations, and in particular in discussions of how low-and-middle income countries - those that are most vulnerable to climate change - can receive the international support necessary to address the climate risks they face and maximise health and climate co-benefits.

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