THE UNITED REPUBLIC OF TANZANIA
MINISTRY OF HEALTH, COMMUNITY DEVELOPMENT, GENDER, ELDERLY AND CHILDREN

HEALTH – NATIONAL ADAPTATION PLAN (HNAP) TO CLIMATE CHANGE IN TANZANIA 2018 – 2023

Ministry of Health, Community Development,
Gender, Elderly and Children,
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Email: ps@moh.go.tz
Dar es Salaam

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FOREWORD

It is evident that communities everywhere in the world are directly exposed to the negative impacts of climate change through extreme weather events (droughts, rising sea levels, floods, cyclones and hurricanes) and indirectly through weather- or climate-related impacts on food, water, air, infrastructure, agriculture, ecosystems and livelihoods. These direct and indirect exposures may lead to increased: malnutrition due to food scarcity as a result of drought; water-related diseases; vector-borne diseases; burden of respiratory diseases; as well as deaths, disease and injury due to heat waves, floods, storms, fires and droughts.

There is no country in the world that is not experiencing first-hand the drastic effects of climate change. Greenhouse gas emissions continue to rise, and are now more than 50 percent higher than their 1990 level. Further, global warming is causing long-lasting changes to our climate system, which threatens irreversible consequences if we do not take action now.

Sustainable Development Goal 13 on Climate Action aims to mobilize $100 billion annually by 2020 to address the needs of developing countries and help mitigate climate-related disasters.Helping vulnerable regions adapt to climate change must go hand-in-hand with efforts to integrate disaster risk measures into national strategies. This Climate Change and Health National Adaptation Plan (HNAP) will build on existing national efforts on health adaptation to climate change, including assessments, development and implementation of policies and programs at local to national levels. It also intends to promote the integration of health adaptation to climate change into national health planning strategies, processes, and monitoring systems. It is expected that the HNAP will maximize synergies across sector; mainly across those that determine health, such as the food, water, environment, energy, and housing sectors.

In light of the above, the Ministry of Health, Community Development, Gender, Elderly and Children advocates for the use of this HNAP to provide a broad framework for health sector action toward adaptation to climate change.The HNAP will be distributed widely to national and country government institutions, and amongst non-state actors, to guide their expected implementation roles. It is expected that development partners will find the information helpful in aligning their funding preferences with national aspirations. The Government is committed to the implementation and continuous revision of the HNAP.

Hon. Ummy A. Mwalimu (MP)
Minister for Health, Community Development,
Gender, Elderly and Children

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Similarly, the Ministry appreciates the commitments and efforts of the HNAP Task Team that coordinated all stakeholders meetings, identified available information on climate change impacts and assessed the gaps and needs of the enabling environment for the HNAP process. Special thanks are conveyed to the following Ministries, Departments and Agencies for their contribution to the HNAP document.

- Vice President's Office – Division of Environment
- President's Office – Regional Administration and Local Government
- Ministry of Finance and Economic Affairs
- Ministry of Water and Irrigation
- Tanzania Meteorological Agency
- Muhimbili University of Health and Allied Sciences
- University of Dar es Salaam
- Sokoine University of Agriculture Regional Secretariats and Local Government Authorities

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ABBREVIATIONS

CC	Climate Change
CCH	Climate Change and Health
COWSOs	Community Owned Water Source Organizations
CR WSP	Climate Resilient - Water Safety Plans
DC	District Council
DPD	Director, Preventive Department
HSSP	Health Sector Strategic Plan
(I)NDC	(Intended) Nationally Determined Contributions
LGAs	Local Government Authorities
MAFC	Ministry of Agriculture Food Security and Cooperatives
MC	Municipal Council
MDAs	Ministries, Departments, and Agencies
MLEYD	Ministry of Labour, Employment and Youth Development
MoHCDGEC	Ministry of Health, Community Development,Gender, Elderly and Children
MoHA	Ministry of Home Affairs
MoWI	Ministry of Water and Irrigation
MoWTC	Ministry of Works, Transport and Communication
NAP	National Adaptation Plan
NAPA	National Adaptation Programme of Action
NCCFP	National Climate Change Focal Point
NCCS	National Climate Change Strategy
NCCSC	National Climate Change Steering Committee
NGO	Non-Governmental Organization
RSs	Regional Secretariats
TMA	Tanzania Meteorological Agency
UNFCCC	United Nations Framework Convention on Climate Change
VIP	Ventilated Improved Latrines
VPO – DoE	Vice President's Office – Division of Environment
WASH	Water Sanitation and Hygiene
WHO	World Health Organization
WMO	World Meteorological Organization

Definitions

Adaptation	Adjustment in natural or human systems to a new changing environment intended to reduce vulnerability to current or anticipated change and variability.
Climate	"Average" weather for a given place or a region.It defines typical weather conditions for a given area based on long-term averages.
Climate Change	A statistically significant variation in either the mean state of the climate or in its variability, persisting for an extended period (typically Decades or longer).
Health	A state of complete physical, mental and socio wellbeing and not merely the absence of diseases or infirmity.
Mitigation	Actions to reduce greenhouse gases emissions and associated impacts on the global climate system.
Resilience	The capacity of a social-ecological system to cope with a hazardous event or disturbance, responding or reorganizing in ways that maintain its essential function, identity, and structure, while also maintaining thecapacity for adaptation, learning and transformation.
Weather	A meteorological state of the atmosphere at a specific place and time.
Vulnerability	Set of characteristics or conditions that adversely affect individuals and communities in coping with and responding to disaster events.

EXECUTIVE SUMMARY

The Tanzania Health National Adaptation Plan (HNAP) is a comprehensive document to guide the country towards a health system that is more resilient to climate change and a sustainable and healthy future for the Tanzanian people.

Tanzania is already experiencing the effects of climate change on health and these effects are likely to become more pronounced in the future. The Tanzania Vulnerability and Adaptation (V&A) assessment, conducted in 2015-2016, highlighted four key health adaptation priorities for the country:

- Vector-borne diseases: malaria, dengue, plague, rift valley fever, lymphatic filariasis, human Africa trypanosomiasis, onchocerciasis
- Nutrition: stunting, wasting
- Water-related diseases: diarrhea, dysentery, cholera, schistosomiasis, typhoid and trachoma
- Disasters: floods and droughts frequency

The HNAPis a strategic document that provides a long-term plan to address these challenges. However, it also incorporates a practical and measurable five-year action plan (2018-2023) with a progressive approach towards achieving long-term goals. The primary focus of the HNAP is to build a foundation for a climate-resilient health system and to mainstream climate change into existing health policies, strategies, plans and programmes rather than the implementation of specific interventions that address only an aspect of health and climate change. The plan's objectives and adaptation actions areorganized around the ten components of the World Health Organization's *Operational framework for building a climate-resilient health system*,which provides a systematic and comprehensive approach to addressing the health impacts of climate change.

The plan is also guided by five key strategic objectives:

- Reduce vulnerability to the impacts of climate change, by building adaptive capacity and resilience in the health sector;

- Facilitate the integration of climate change adaptation, in a coherent manner, into relevant new and existing policies, programmes and activities within the health sector;

- Guide health practitioners on the need to develop and operationalize a climate sensitive early warning system for disease outbreaks;

- Advocate for the mobilization and allocation of resources for adaptation to climate change in the health sector; and

- ∞ Facilitate the integration of health priorities into the National Adaptation Plan (NAP) and support the NDC implementation process.

The HNAP is structured in six parts; Part 1 provides an introduction to the HNAP process; Part 2 outlines the institutional and policy framework in which the HNAP process is situated; Part 3 describes some of the key health and climate change considerations for Tanzania; Part 4 addresses each of the ten components of the operational framework highlighting key strategic objectives, the current status, gaps and adaptation options; Part 5 specifies the implementation strategy of the HNAP; and Part 6 establishes the Monitoring & Evaluation Plan and ongoing reporting requirements.

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PART 1. INTRODUCTION: TANZANIA HEALTH NATIONAL ADAPTATION PLAN (HNAP)

1.1 Climate change in Tanzania: An introduction

Tanzania is alreadyexperiencing the effects of climate change. In the last 30 years, monthly minimum and maximum temperatures have steadily increased, while at the same time, annual rainfall has slightly declined in most of the parts of the country. Shifts in rainfall patterns, especially intra-seasonal andinter-annual late onset and early cessation of rain, have also led to an increase in dry spells. These changes in temperature and precipitation have impacted the hydro-ecological systems in Tanzania. Records of water levels of Lake Tanganyika, and of water flow of the rivers of Pangani, Malagarasi, and Wami-Ruvu indicate a decline, putting further pressure on limited fresh water resources.

Along with slow onset hydro-ecological changes, climate change-related extreme weather events, such as droughts and floods, are a key concern for the country. The many low-lying areas and the river valleys in Tanzania are particularly vulnerable to flooding. Tanzania has experienced several episodes of flooding in recent years with adverse impacts such as destruction of infrastructure,for example the railway line in Kilosa and Dar es Salaam; and increased outbreaks of water- and vector-borne diseases, such as malaria and diarrheal diseases.

As indicated in the Tanzanian National Climate Change Strategy (NCCS) 2012, mean annual temperature for Tanzania isprojected to increase by 1.7°C in North Eastern areas of the country and by2.5°C in Western parts of the country. Rainfall might increase in some areas while other areasare likely toexperience a decrease. The areas with two rainfall seasons, i.e. thenorth-eastern highland, Zanzibar, the Lake Victoria basin and the northerncoast,are likely toexperience an increase in March to May (long-rains) of rainfall by up to 15 percent. Southern, south-western, western and central areas willlikely experience a decrease in March to May rainfall by up to six percent.

Against this backdrop, the Tanzanian Government has recognized the urgent need for addressing the impacts of climate change andin pursuing a climate-resilient development pathway. In 2007, the Government prepared a National Adaptation Programme of Action (NAPA), and has submitted, prior to the Paris Agreement on Climate Change under the United Nations Framework Convention on Climate Change (UNFCCC), its Intended Nationally Determined Contributions (INDC). Both documents identify health as one of the key vulnerable sectors and propose strategic adaptation measures.

Currently, the Tanzanian Government is in the process of updating its INDC to be submitted as Tanzania's first Nationally Determined Contribution (NDC). Furthermore, to address the need for a coherent and comprehensive national adaptation actions, the Tanzanian Government has embarked on the National Adaptation Plan (NAP) process. The NAP process was established under the Cancun Adaptation Framework in 2010 to

support LDCs and other developing countries in medium to long-term adaptation planning for climate change.

Considering the increasing impact of the changing climate and hydro-ecological systems on health in Tanzania, the Ministry of Health, Community Development, Gender, Elderly and Children (MoHCDGEC) has developed this sector-specificHealth National Adaptation Plan (HNAP). The strategic objectives and adaptation actions it proposes are informed by climate change-related health risks and vulnerabilities in Tanzania, existing relevant national policies and programmes, and current adaptive capacity of the health system. To ensure a coherent and consistent approach that leads to the establishment and maintenance of a climate-resilient health system, the identification of strategic objectives was guided by the *Operational Framework for climate-resilient health systems* by the World Health Organization (WHO)(World Health Organization, 2015).

1.2 Objectives of the HNAP

The overall objective of this HNAP is to give strategic guidance to the Tanzanian health sector for establishing a climate-resilient health system. Specifically, it aims to:

- Reduce vulnerability to the impacts of climate change, by building adaptive capacity and resilience in the health sector;
- Facilitate the integration of climate change adaptation, in a coherent manner, into relevant new and existing policies, programmes and activities within the health sector;
- Guide health practitioners on the need to develop and operationalize a climate sensitive early warning system for disease outbreaks;
- Advocate for the mobilization and allocation of resources for adaptation to climate change in the health sector; and
- Facilitate the integration of health priorities into the National Adaptation Plan (NAP) and support the NDC implementation process.

1.3 HNAP development process

The HNAP was developed by the National HNAP task team, which consists of technical experts of the MoHCDGEC, the Vice President's Office Division of Environment (VPO-DoE), Ministry of Water and Irrigation (MoWI), President's Office, Regional Administration and Local Government (PO-RALG), Tanzania Meteorological Agency (TMA), Muhimbili University of Health Applied Sciences (MUHAS), University of Dar es Salaam, Sokoine University of Agriculture, Ardhi University, and the WHO Country Office.The following methodology was applied:

An extensive literature review was conductedto guide the preparation of the strategic objectives, strategies and actions. Among the reviewed documents were relevant national policies, guidelines, Acts, national and international strategies and reports of studies related to climate change and climate change adaptation pertinent to the health sector in Tanzania. The HNAP development was guided by the goal, objectives and strategies outlined in the National Climate Change Strategy (NCCS) and theWHO *Operational framework for building climate resilient health systems*.

The HNAP team leda series of stakeholder consultation meetings with development partners and government agencies at all levels for input on the HNAP priorities and actions.Following the consultations, the HNAP team conducted several working sessions to develop a draft HNAP document. In February 2018 the HNAP team, along with WHO, GIZ and a national consultant, conducted a five-day working session to finalize and validate the HNAP. Further zonal consultations were conducted in Arusha and Mwanzain March 2018.

PART 2. POLICY FRAMEWORK FOR HEALTH AND CLIMATE CHANGEIN TANZANIA

In order to implement climate change programs in Tanzania, a number of strategies, plans and guidelines have been put into place that provide specific directives for national and local level climate change mitigation and adaptation activities. These include the National Adaptation Programme of Action (NAPA) 2007, the National Climate Change Strategy (NCCS) 2012, and the National Climate Change Communication Strategy (NCCCS) 2012. Additionally, in line with the NCCS, the Government of Tanzania has developed several specific documents to support policy makers and government ministries, departments, and agencies to mainstream climate change within sectoral activities and national planning. These documents include the Guidelines for Integrating Climate Change Adaptation into National Sectoral Policies, Plans and Programmes (2012) and the Process and Roadmap for Formulating National Adaptation Plans in Tanzania (2013).

2.1 National Adaptation Programme of Action (NAPA)

The broad goal of the NAPA (2007)wasto enable Tanzania to identify climate change adaptation actions that will support sustainable development in a changing climate. The NAPA draws its targets from the National Development Vision 2025, and therefore strives to be well linked with existing national development goals. In regard tothe health sector, the NAPA primarily aimed to establish and strengthencommunity awareness programmes on preventable climate-relatedhealth risks.

2.2 National Climate Change Strategy (NCCS)

The broad goal of the NCCS(2012) is to enable Tanzania to adapt to climate change and participate in global efforts to mitigate climate change while achieving sustainable development under Tanzania's National Development Vision 2025 document. The NCCS designates the National Climate Change Steering Committee (NCCSC) and the National Climate Change Technical Committee (NCCTC) as the primary governmental bodies for overseeing climate change activities. The NCCTC is tasked with providing technical advice to the National Climate Change Focal Point (in the VPO-DoE), while the NCCSC is responsible for providing analysis and policy guidance, as well as coordinating climate change activities across various sectors. Respective ministries, departments, agencies, and local government authorities will implement specific strategic interventions and activities in line with mandates outlined in the Environmental Management Act (EMA)2004. The NCCS describes the health effects of climate change, outlines a health-related goal, strategic objectives and recommends some interventions.

The NCCS acknowledges that adaptation activities at all time scales will require reliable data about climate change impacts and vulnerabilities to inform adaptation and mitigation options. In this respect, the TMA is a key agency to engage for weather data

and climate models for predicting the impacts of climatechange and estimating adaptation and mitigation costs.

2.3 The National Environmental Policy

The National Environmental Policy(NEP) 1997 aims at ensuring sustainable and equitable use of resources for meeting basic societal needs, preventing and controlling degradation of land, water, vegetation and air, and improving the condition and productivity of degraded rural and urban areas. The policy emphasizes both cross-sectoral and sectoral issues with an aim of attaining sustainable economic growth and poverty reduction. Notably, the policy identifies six major environmental problems facing Tanzania, including: land degradation, lack of safe water, environmental pollution, loss of biodiversity, deterioration of aquatic systems, and deforestation. However, it should be noted that the policy neither specifically acknowledges climate change as one of the major environmental and developmental problems facing the country, nor does it recognize the linkage between climate change and health.

2.4 Environmental Management Act

The Environmental Management Act (EMA) 2004 stipulates the legal and institutional framework for environmental management in Tanzania and provides the basis for implementing and enforcing the NEP. The EMA provides the framework for environmental management principles and specifies the need for, and content of, environmental impact and risk assessments, environmental standards, and pollution controls. Climate change issues are specifically addressed in Section 75 of the EMA where it mandates the Minister responsible for environment (in this case VPO-DoE) to take measures to address climate change in consultation with relevant sector ministries, such as issuing guidelines to address climate change and its impacts.

2.5 National Climate Change Communication Strategy

The NCCCS (2012) was developed to facilitate the implementation of the NCCS, with the mandating action to increase public awareness of climate change. The strategy aims to enhance awareness and understanding of climate change throughout Tanzanian society within the context of the national communication channels and procedures, recognizing that there is a gap between the growing body of knowledge about climate change causes and impacts, and the information that is available to the general public. The strategy targets six thematic areas: general knowledge of climate change, adaptation, mitigation, climate change research, gender, and financing.

The strategy includes communication to audiences at the international, national, and sub-national levels. Designated sources for climate change information for audiences at the international and national level are policies and agreements, research reports, national and international meetings' reports, and Government directives. Suggested channels for delivery of climate change information include electronic and print media, social media, meetings and social gatherings, and theatrical performances. The strategy also identifies seven key health-specific topics: impacts of climate change on human health; public health care system's response to climate change related health

risks; disease surveillance and design of diseases control programmes (e.g. preventive and curative procedures); early warning system; sharing of best practices and lessons learnt, e.g. traditional/indigenous knowledge, on human diseases management and control; and the importance of International Health Regulations (IHR).

2.6 The health sector policy environment in Tanzania

The health sector is a key sector for the Tanzanian government and is identified in the National Development Vision 2025 as a priority area. There are two primary policy documents that drive Health sector activities. These are the National Health Policy (NHP) 2007 and the Health Sector Strategic Plan IV (HSSP IV). The NHP provides the overarching guidance toward the improvement and sustainability of the health of Tanzanian citizens through reductions in disability, morbidity, and mortality, improvements in nutritional status, and increased life expectancy. The primary goal of the HSSP IV is to contribute to Tanzania's efforts to reduce child and maternal mortality, to control important infectious disease and to improve the environment and access to clean water. The Tanzania Public Health Act of 2009 is also an important enforcement mechanism, which defines roles and responsibilities of MoHCDGEC and other relevant authorities for dealing with the prevention and management of communicable and non-communicable diseases, hygiene in both public and private spaces, waste management, and reporting requirements as related to these issues. It notes the role of the Minister in overseeing health issues and ensuring that issues related to climate change are addressed through the development of appropriate programmes and facilities, but does not elaborate how this should be achieved.

2.7 National Health Policy

The National Health Policy (NHP) 2007 provides details for institutional arrangements for health services at thethreeadministrative levels, national, regional and district, through which the provision of health services are provided. The main emphasis of the policy is to specify which duties are to be undertaken at each of these administrative levels. At the national level, primary responsibilities are formulating policy and legislation, resource mobilization, mobilizing public health interventions, management of national hospitals, training, monitoring and evaluation, and research. At the regional level, primary responsibilities include supervising health service provision, mobilizing resources, providing technical support, and interpreting policies for implementation at district and sub-district levels. The district level is the level at which primary health services are provided and other health interventions are implemented and where implementation and reporting are undertaken. The district level is also responsible for communicating directly with communities.

The NHP does not explicitly incorporate climate change dimensions within health sector activities despite the potential for climate change to impact several of the key objectives of the NHP. It lays out broad health service goals, all of which may be impacted by climate change: 1) access to clean and safe water; 2) food self-sufficiency and food security; and 3) gender equality and empowerment in all health parameters. Moreover, the policy lays out specific objectives with relation to national health services provision in Tanzania. Several of these are already sensitive to weather

and climate variables and may be further affected by long-term changes in climate. The first involves reducing the burden of disease through the promotion of environmental health and sanitation, adequate nutrition, and control of communicable diseases, which is likely to become more challenging under more variable and erratic weather patterns and long-term shifts in climate. The second is ensuring the availability of drugs and medical supplies and infrastructures. With changes in distribution of diseases that are expected with rising temperatures, as well as the challenges posed by expected increases in extreme weather events, it will become more challenging, but increasingly crucial, to plan and coordinate provision of medical supplies. The third climate sensitive objective involves improving capabilities to assess and analyze problems and design appropriate action through community involvement at all institutional levels.

The NHP recognizes the potential development and incorporation of climate services that are able to inform health sector activities. There are several entry points within the NHP for inclusion of climate services: the policy notes that changes in urban/rural dynamics and environmental change leads to new, emerging (and re-emerging) patterns of disease, such as cholera, malaria, or dengue. Another priority area for the health policy that is sensitive to weather and climate parameters is food security and nutrition. Potential interventions detailed in the policy include strengthening nutrition practices for vulnerable groups, particularly during disaster situations, and for promoting food safety during production, handling, distribution, storage, and preparation of food. Prediction and early detection of weather and climate events, such as flood and drought, may help to target interventions to ensure adequate food supply among vulnerable groups.

2.8 Health Sector Strategic Plan

HSSP IV (July 2015-June 2020)recognizes that health is a valuable individual asset enabling people to better contribute to social development and that improved health and social wellbeing of the nation are essential inrealizing the National Development Vision 2025. The overall objective of HSSP IV is to reach all households with essential health and social welfare services, meeting, as much as possible, the expectations of the population, adhering to objective quality standards, and implementing evidence-informed interventions through efficient channels of service delivery.

Adaptation to climate change is not addressed directly in the document. However, it is reflected under social determinants of health and wellbeing, like nutrition, housing, safe water, safe and hygienic environment, individual behaviors and security. Climate change scenarios can affect all of these determinants. The MoHCDGEC advocates for policies protecting and advancing health and social welfare, e.g. in reduction of point source environmental pollution, building resilient interventions for the reduction of harmful effects of climate change, improve road safety, protection from the double burden of non-communicable diseases and communicable diseases through promotion of healthier lifestyles, safety of consumer goods and food products.

2.9 The Public Health Act

The Public Health Act 2009 provides for the promotion, preservation, and maintenance of public health with a view to ensuring the provisions of comprehensive, functional and sustainable public health services to the general public and to provide for other related matters. The Act recognizes the importance of developing programmes and facilities to ensure that the issues of climate changes are well addressed.

2.10 International and regional policies and obligations

In addition to national policies and Acts that guide this HNAP document, there are multilateral, international and regional agreements which are relevant for the HNAP. Among these are the Paris Agreement 2015 under the United Nations Framework Convention on Climate Change (UNFCCC) and the related (I)NDC, the 2030 Agenda for Sustainable Development of the United Nations adopted by the General Assembly in 2015, and Agenda 2063 - the Africa we want of the African Union adopted in 2015. In addition, there are several sub-regional policies and strategies, such as the EAC Climate Change Policy (EACCCP-2011); and the EAC Vision 2050 from 2016.

2.10.1 The Paris Agreement

This agreement was adopted by the Conference of the Parties to the UNFCCC in Paris in 2015. The aim of the agreement is tostrengthen the global response to the threat of climate changeby: reducinggreenhouse gas (GHG) emissions to limit global temperature increase to well below 2°C above pre-industrial levels, enhancing adaptive capacity and fostering climate resilient and low-GHG development, and by ensuring adequate finance flows. The agreement also establishes the global goal on adaptation: enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change. This agreement highlights the need to integrate adaptation into relevant socio-economic and environmental policies and actions at national level. It also elaborates the need for implementation of the Cancun agreement including sharing information, good practices, experiences and lessons learned; strengthening scientific knowledge on climate, including researchand early warning systems to inform climate services and support decision-making; and assisting developing countries in identifying effectiveadaptation practices, adaptation needs and priorities. The Paris agreement also addresses issues related to loss and damage, and insists on cooperation and facilitation to enhance understanding, including on early warning systems; emergency preparedness; slow onset events; comprehensive risk assessment and management; risk insurance facilities; and resilience of communities, livelihoods and ecosystems.

2.10.2 The 2030 Agenda for Sustainable Development

The 2030 Agenda for Sustainable Development is a plan of action for people, planet and prosperity, which seeks to strengthen universal peace in larger freedom. It was adopted in 2015 by the General Assembly of the United Nations. It contains seventeen goals, most of which are heath related. Some of the most relevant goals include:

Goal1(end poverty in all its forms), Goal2 (end hunger and achieve food security and improved nutrition and promote sustainable agriculture), Goal 3 (ensure healthy lives and promote wellbeing for all and all ages), Goal 5 (achieve gender equality and empower women and girls), Goal 6 (ensure availability and sustainable management of water and sanitation for all), and Goal 13 (take urgent action to combat climate change and its impacts).

2.10.3 Agenda 2063 the Africa we want

The Agenda 2063 of the African Union represents an endogenous, shared strategic framework for inclusive growth and sustainable development for Africa's transformation, and a continuation of the Pan African drive for self-determination, freedom, progress and collective prosperity. It outlines seven common, and a shared set, of aspirations, namely: a prosperous Africa based on inclusive growth and sustainable development; an integrated continent, politically united, based on the ideals of Pan Africanism and the vision of Africa's Renaissance; an Africa of good governance, respect for human rights, justice and the rule of law; a peaceful and secure Africa; an Africa with a strong cultural identity, common heritage, values and ethics; an Africa whose development is people-driven, relying on the potential of African people, especially its women and youth, and caring for children; and Africa as a strong, united, resilient and influential global player and partner. It is in this context that the Agenda underlines the need for a healthy population within a changing climate, which poses a challenge in production and inclusive, as well as sustainable, development.The Agenda recognizes the need to reduce vulnerability of climate change in order to support socio-economic and inclusive development. While the health component is well articulated, the Agenda does not link heath-related challenges with climate change. Rather, it focuses mostly on common health challenges, such as maternal mortality, child mortality, HIV/AIDS and malaria.

2.10.4 The EAC Vision 2050 (2016)

The EAC Vision underscores the fact that climate change is a global challenge of our time, which requires collective effort from the sub-region and the world at large. It outlines some of the vulnerabilities and impacts experienced by partner states, such as persistent drought and extreme weather events, rising sea level, coastal erosion, and ocean acidification, which threaten food security and efforts to eradicate poverty. It also emphasizes the need to support adaptation and mitigation of climate change as immediate and urgent regional priorities. In addition, it underscores the need to enhance cooperation in addressing challenges posed by climate change. The Vision makes a case that it is necessary to operationalize the EAC Climate Change Fund and look for funding opportunities of all forms to financially support mitigation and adaptation interventions. It is from this context that the Vision outlines several targets, one of which is 100% access to Health Services by 2050. However, no clear linkage between climate change and health is made.

2.10.5 EAC Climate Change Policy (2011)

The overall aim of the EAC Climate Change Policy aims to contribute to sustainable development in the EAC region through harmonized and coordinated regional strategies, programmes and actions to respond to climate change. It outlines eight specific objectives, some of which are to identify priority adaptation and mitigation action areas and roles of Partner States and other stakeholders; promote public awareness and socio-economic importance of climate change issuesincluding vulnerability, impacts, risks, and response measures; promote climate change research and observations through, for example, monitoring, detection and attribution to enhance preparedness; and support the integration of climate change into regional development processes and planning including disaster risk management and gender development. On health, the policy recognizes a number of challenges, including: increasing frequency and intensity of floods and droughts, which contributes to various effects such as malnutrition, poor quality and quantity of water availability and low sanitation standards; increasing climate-sensitive water- and vector-borne diseases and epidemics; rising temperatures and its effects on health; and inadequate early warning systems leading to climate change-related disease outbreaks; and preparedness of health systems. As a result, the policy identifies six policy statements and actions to address such health challenges of climate change within the region.

PART 3. CLIMATE-RELATED HEALTH RISKS AND VULNERABILITIES IN TANZANIA

To better understand the climate-related vulnerabilities in the health sector, a health and climate change vulnerability and adaptation assessment (V&A)was conducted in 2015-2016, with the following objectives:

(1) To establish the association between climate change and four priority health issues (i.e. nutrition; vector-borne diseases; disasters; and water related diseases); defining the magnitude and distribution (in spatial and temporal scale) of vulnerability;
(2) To describe risks posed by climate change for the water and health sector and develop recommendations for key national strategies and sectoral programming;
(3) To assess impacts of climate change on water availability and quality, and its implications for health and rural WASH services (considering both quantity and quality issues) in order to inform investment in Water Safety Plans and other WASH programmes;
(4) To establish baseline health conditions and risk factors which can be monitored overtime to observe additional impacts of climate change on health;
(5) To describe the policy landscape and opportunities available to bridge, converge, and unite efforts under a climate strategy for health;
(6) To identify research needs and information gaps in relation to the impacts of climate change on health;
(7) To describe the health sector's existing capacities and adaptation needs in relation to climate information; and
(8) To assess current practices of health professionals to access, interpret and apply climate information in the design and implementation of nutrition, disease control and emergency preparedness programmes.

Four study sites were selected, representing the climatic zones present in Tanzania. Two additional sites were included in the V&A, as they were pilot project sites for Climate Resilient Water Safety Plans (CRWSP). Due to a lack of consistent health data over the last 30 years, it was not possible to conduct statistical analyses to establish potential statistically significant correlations between all climate-sensitive diseases and certain weather patterns and extreme weather events (e.g. precipitation, temperature, flooding, and drought). Nonetheless, based on available health data, published scientific evidence on relevant climate-sensitive diseases, and expert judgment, the V&A still offers a projection of climate change-related vulnerability in the health sector. The results of the V&A are summarized below.

3.1 Vector-borne diseases

Climate-sensitive vector-borne diseases in Tanzania have been associated either directly or indirectly with global climate change (Mrema*et al.*, 2012). For example, a

number of climate-associated vector-borne disease epidemics have been reported in various areas of Tanzania; the majority linked with increase in precipitation and temperature. These diseases include malaria, dengue fever, rift valley fever, and Human African Trypanosomiasis (Patz *et al.*, 1998).

Climate change and variability also hasan impact on abundance and distribution of vector-borne diseases. Increases in temperature and changes in precipitation patternspromote vector distribution innew areas (Kovats*et al.*, 2001).

3.1.1 Malaria

Malaria is the most important vector-borne disease in Tanzania, causing high morbidity and mortality(LEG Mboera, 2016). The disease has been common in low altitude areas in the country (Clyde 1967), but due to observed changes in climate parameters it is becoming more common in highland areas, which were previously malaria-free (Wandiga*et al.*, 2010; Chaves and Koenraadt, 2010; Himeidan and Kweka, 2012).

According to the V&A, malaria occurs in the majority of Tanzania. Only very few areas are considered malaria-free. The most affected regions are Dar es Salaam, Mwanza, Morogoro, Tanga and Shinyanga. The least affected regions are Iringa, Manyara, Rukwa and Arusha. High prevalence of malaria in the above-mentioned regions can be attributed to warm weather conditions and the presence of stagnant water, particularly in areas where rice is grown, such as Shinyanga and Mwanza.

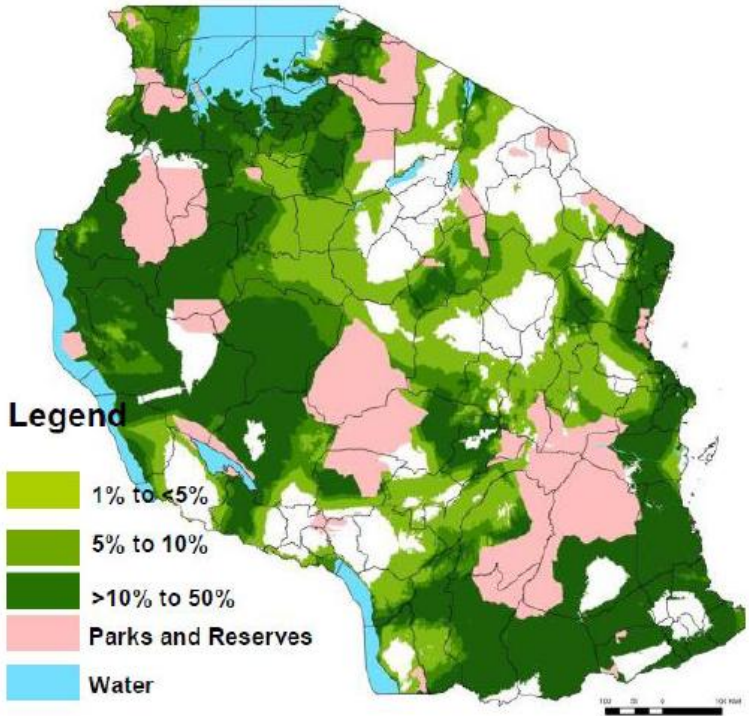


Figure 1: Malaria low and moderate transmission areas (Source: Molteni, 2013)

Climate change and variability will most likely further alter malaria prevalence and distribution. Changes in mean precipitation and mean maximum and minimum temperature accounts for 72.8%, 14.1% and 13.1% of the variation of malaria disease in the country respectively (Mboera*et al.*, 2010).For example, the increase in malaria cases in Mpwapwa District in central Tanzania since 1999 have been associated with the increase in temperature and prolonged rainfall periods (Mboera*et al.*, 2005). This implies that changes in climatic parameters, particularly increases in rainfall, have a positive association with the increase

of malaria cases in the country. With temperature likely toincrease across the country, and some areas likely to experience an increase in precipitation, a higher prevalence of malaria in the future is expected (see Figure 1 for a map of low and moderate transmission areas). Areas in higher altitude, includingTanga, Kilimanjaro, Iringa, Kagera and Mbeya, are already becoming increasingly vulnerable to the disease (Yanda *et al.*, 2006; Wandiga*et al.*, 2010).

3.1.2 Dengue

Dengue is a globally (re)emerging disease, mostly due to unplanned urbanization and rapid increase in population density, international travel and trade, lack of effective vector control systems and poor public health infrastructure. However, climate change is believed to contribute to increased spread and incidence of the disease by making the climate in some areas more favorable for both vector and virus (Hii, 2013; Hales *et al.,* 2002). Studies have shown that the dengue virus-transmitting mosquito *Aedesaegypti*responds positively to increasing mean temperaturesand higher humidity(Alto*et al.*, 2013;Watts*at al.*, 1987). Lifecycle development shortens with mean temperature increases above 15°C (but not higher than 32°C), leadingto smaller adult mosquitos, which in turn display an increased feeding frequency. This leads to a higher probability to spread andcontract the dengue virus. The virus itself also responds positively to an increasing mean temperature by exhibiting shorter extrinsic incubation time(Salazar, 2007). These factorsmightlead to an increased exposure to, and risk of, contracting dengue for humans.

Dengue is mostly found in urban and semi-urban areas of tropical and sub-tropical countries, but has also recently been reported to have spread to rural areas (Muhammad Azami*et al.,* 2011). In the past six years, Tanzania has experienced at least four separate dengue virus outbreaks. The worst outbreak occurred in 2014 in Dar es Salaam, with the cumulative number of confirmed and suspected dengue cases being 961 and 1,969, respectively, from January 2014 until end of May 2014(Mboera*et al.*, 2016). Due to the projected changes in precipitation and temperature in Tanzania further dengue outbreaks in thefuture are expected. However, further research in the Tanzania is needed to better understand the relationship between dengue outbreaks and certain climate risks.

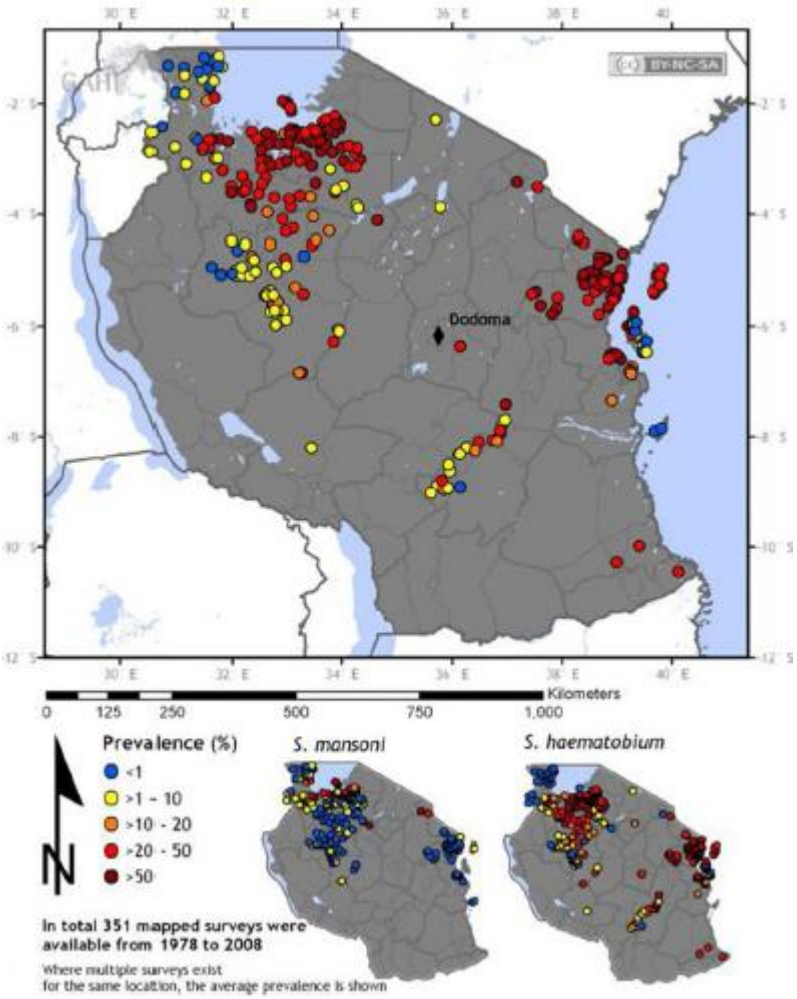


Figure 2: Distribution of*S. mansoni* and *S. haematobium* in Tanzania: Maximum point prevalence of schistosomes infection and location of *S. mansoni* and *S. haematobium* surveys in the United Republic of Tanzania (Source: Mazigo*et al.*, 2012).

3.1.3 Schistosomiasis

Tanzania is the country with the second-highest burden of schistosomiasis in thesub-Saharan Africa region (Mazigo et al., 2012). *Schistosoma haematobium* and*Schistosoma mansoni* are the main prevalent species in Tanzania. Both species cause intestinal and urogenital schistosomiasis, as well as significant morbidity. Mazigoet al. (2012) indicated that schistosomiasis was highly endemic throughout the countryand the level of endemicity varied from region to region. The north-western regions,surrounding Lake Victoria, the northern, central, southern and south east of the countryare highly endemic for *S. mansoni*, while *S. haematobium* is highly endemicalong the eastern and south-eastern coasts, the islands of Unguja and Pemba(Zanzibar) and the hinterland areas of the north-western zones of the country (see Figure 2).

According to McCreesh et al.(2015), climate change may alter the geographical distribution of schistosomiasis by affecting the suitability of freshwater bodies for hosting parasite and snail populations. All scenarios and climate projections used in their studyindicate that infection risk may increase in most parts of Tanzania over the next 20 years.

3.2 Water-borne diseases

Water-borne diseases, such as cholera, diarrhea and dysentery, are sensitive to changes in hydro-ecological systems due to altering precipitation patterns and increases in mean temperature. For instance, a statistically significant correlation between rainfall and the likelihood of detecting Giardia or Cryptosporidium oocysts in river water (Atherbolt*et al.*, 1998) and pathogenic enteric viruses in water (Miossec*et al.*,

2000) were established. Especially heavy rainfall leads to storm water runoff into surface water sources, which increases the risk of infection through contaminated water(Pascual*et al.*, 2002). For Tanzania, evidence points towards outbreaks of water-borne diseases following floods, such as the outbreak of cholera in Kilosa, Morogo in 2016. Hence, with projections indicating an increase of extreme weather events (see also 3.3), communities with limited access to safe drinking water and sanitation services might become more vulnerable to water-borne infectious diseases.

3.2.1 Cholera

Cholera is one of the most significant climate-sensitive infectious diseases in Tanzania. Since August 2015, Tanzania is experiencing a geographically disbursed outbreak, which originated in the region of Dar es Salaam and has since spread to allbut one region,Njombe. Until August 2017, a total of 26,355 cases and 415 deaths were reported (see Figure 3).A similar cholera outbreak occurred in 2007, with a total of 40,000 cholera cases. The outbreak in 2010, however, was limited to Tanga and Dar es Salaam regions with 1,997 reported cases (MoHCDGEC, 2017).

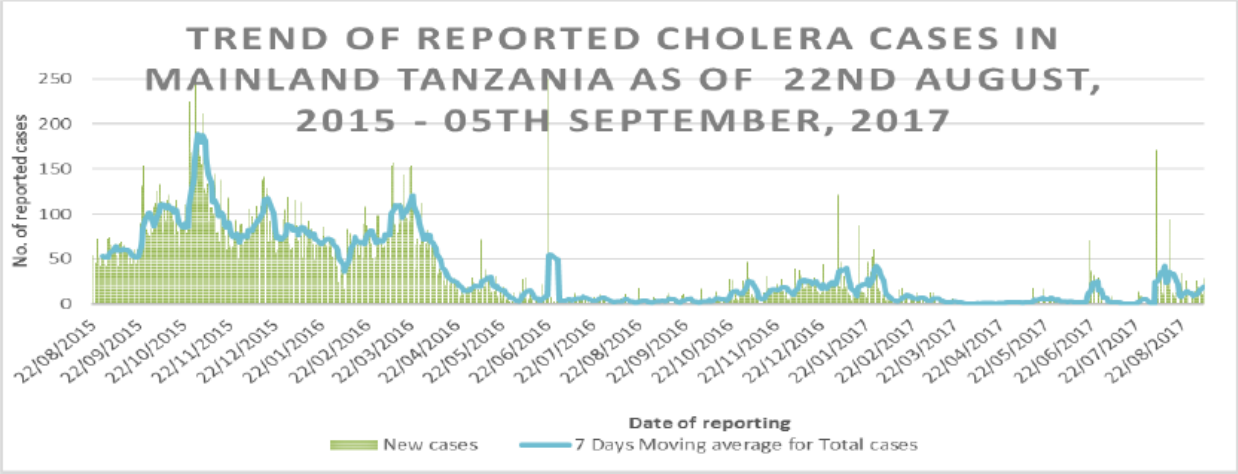


Figure 3: Reported cholera cases, August 2015 to September 2017 (MoHCDGEC, 2017)

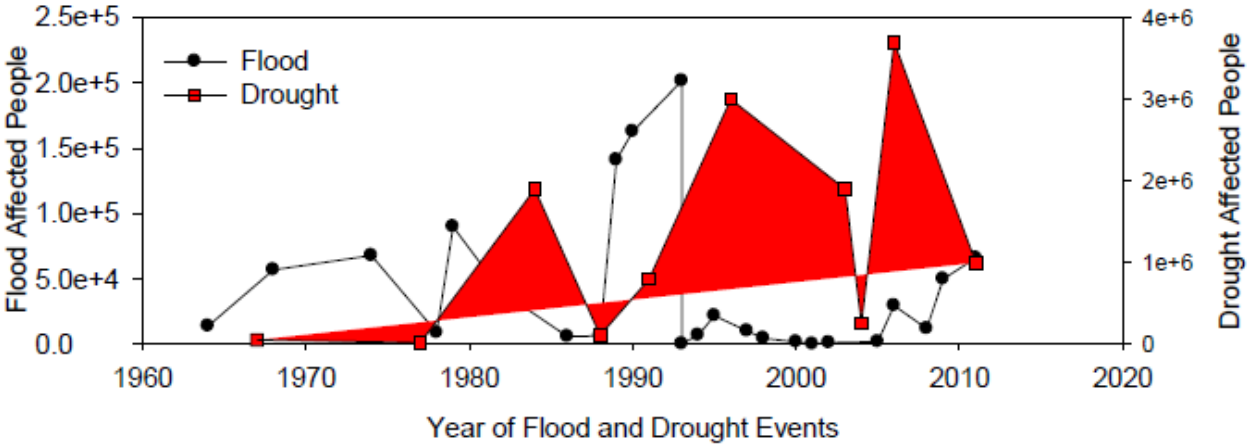
According to Trærup et al.(2011), temperature alone couldalready be a significant factor for an increase in cholera incidences: for every increase of 1 degree Celsius, there is an initial increase of cholera cases up to 29%.Additionally, increases in sea-surface temperature due to El-Niñoevents have been shown to occur right beforeincreases in cholera incidence around Lake Victoria. However, the V&A did not find a significant correlationbetween cholera cases and average minimum temperature (r = -0.13) and average maximum temperature (r = 0.16) for the past 50-60 years. Further research is required in this area.

Precipitation has also been shown toincrease cholera outbreaks. The V&A demonstrated associations between average annual rainfall and average cholera cases for the past 50-60 yearsrevealing a weak positive correlation (r= 0.311395). This correlation indicates that cholera cases increase in years with more rainfall for five regions in Tanzania Mainland: Dar es Salaam, Arusha, Kigoma, Mwanza, and Mtwara.

Further analysis of the association between cholera cases and rainfall levels revealed a negative correlation between the two variables for Arusha region but not for others. Thus,the risk of cholera outbreaks may be increasing in years with more rains predicted for most regions in Tanzania. Still, cholera episodes may also occur in other regionsthat might experience drier conditions due to climate change. Given the weak associations and some conflicting results further research is also needed to strengthen the evidence on the associations between precipitation and cholera outbreaks.

3.3 Disasters due to extreme weather events

Climate change-related extreme weather events, such as floods and droughts, can affect human health directly, through injuries or deaths, and indirectly, through the exacerbation of food insecurity and the increased risk of water- and vector-borne diseases. For Tanzania, droughts and floods are the primary climate-related hazards affecting the country, with increasingly more people being affected by these events



(see Figure 4).

Figure 4: People affected by droughts and floods in Tanzania from mid-1960 until 2012

3.3.1 Droughts

In the last 40 years, Tanzania has experienced severe and recurring droughts with devastating effects to the health, agricultural, water and energy sectors. Some notable drought events that had major impacts on society and ecosystems include those of 2003, 2005 and 2009, which severely affected the agriculture, energy and business sectors in Tanzania.Agriculture in the affected areas was crippled andsignificant livestock and wildlife perished due to starvation and lack of water. The drought in 2005-2006 caused a 50-70 percent drop in food and cash crop yields, resulting in food insecurity and an increase in cereal prices by 85 percent (WFP, 2006). The UN World Food Programme (WFP) estimated that 3.7 million people needed food assistance in Tanzania during that drought (McSweeney*et al.*, 2008). The drought of 2009 was particularly devastating in Northern Tanzania where a loss of 660,000 livestock, mostly cattle, was recorded in the five districts of Arusha region (Arusha Times, 2010). Figure 5 presents a drought risk map for Tanzania.

Droughts, therefore, might lead to decreased food security resulting in malnutrition. Droughts also often lead to reduced access to safe drinking water. Communities might turn towards unsafe sources of drinking water, which then increases the risk of water-borne diseases, such as diarrhea and cholera.

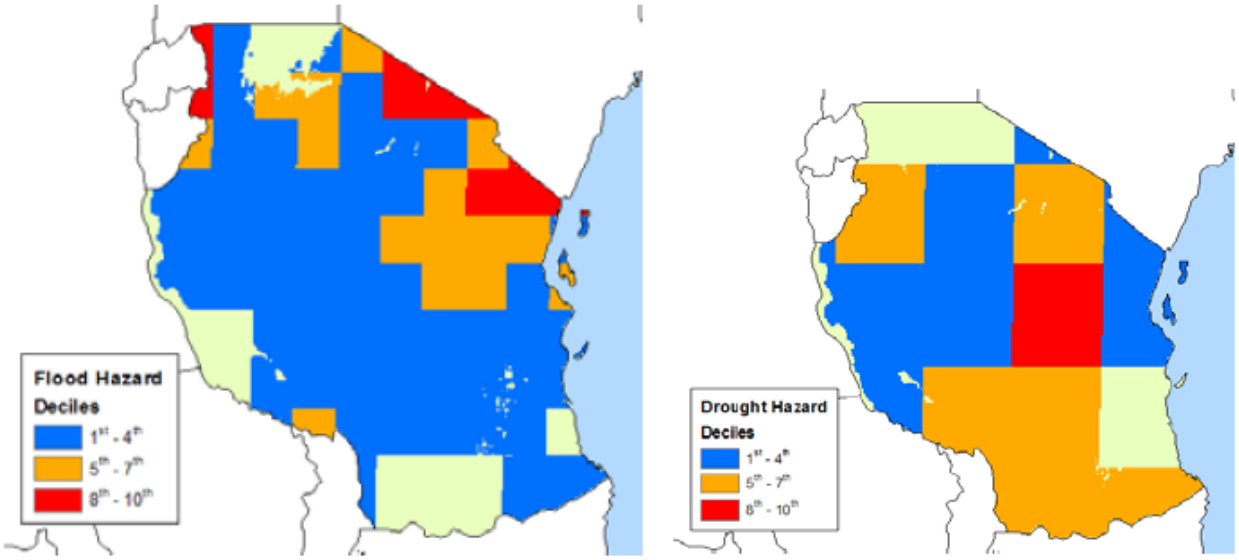


Figure 5: Maps showing flooding and drought vulnerable areas to climate change (Source: McSweeney et al., 2008)

3.3.2 Flooding

Flooding is one of the greatest climate change-related hazards in Tanzania. Flooding accounts for 70 percent of natural disasters in the country. Flood events are often followed by outbreaks of diseases such as diarrhea and cholera, as clean water and sanitation are in short supply. Vector-borne diseases, such as malaria and Rift Valley diseases, have also been seen to increaseduring flood events. For example, the 2006-2007 flood events were followed by outbreaks of Rift Valley fever in eight districts, resulting in deaths of humans and livestock (McSweeney*et al.*, 2008). Flooding also has a direct impact on human health. For example, the floods in late 2006 to early 2007 killed 35 people.

These floods also damaged or destroyed 5,000 homes in northern Tanzania (IFRC, 2008). Similar flooding events have frequently occurred in Dar es Salaam, Morogoro, Mwanza and Mbeya regions. Figure 5 displays the areas in Tanzania with the highest risk of flooding.

The most vulnerable to flooding are the urban poor living in informal settlements. Housing development in floodplains, inadequate waste management and lack of maintenance of storm-water drainage channels (if at allavailable) increase their vulnerability to flooding.

3.4 Risks to malnutrition (children under 5 years of age and women)

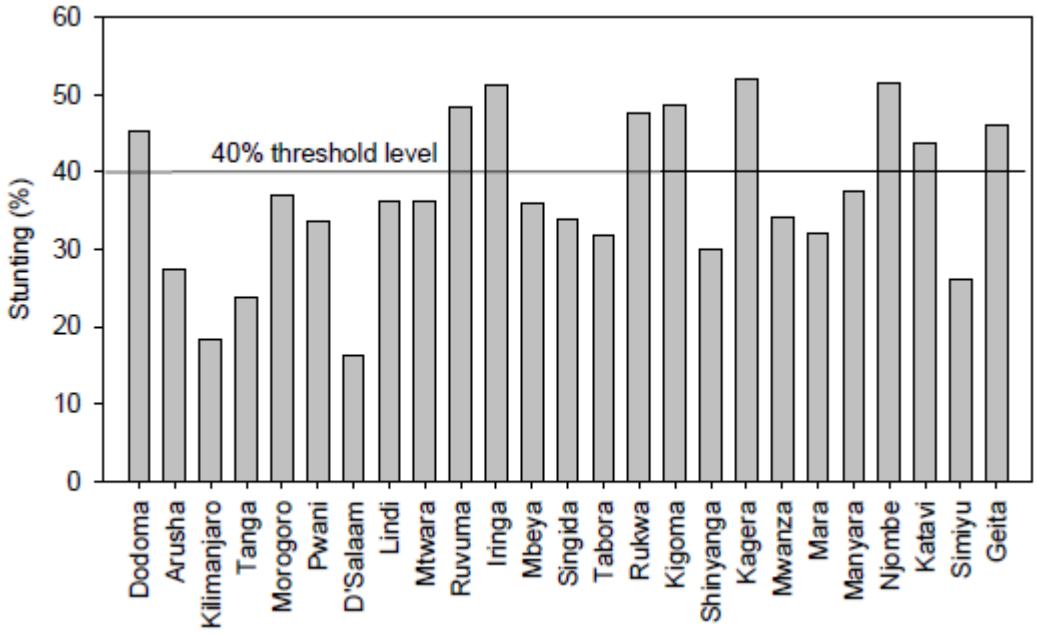


Figure 6: Level of stunting in various regions of mainland Tanzania in 2014 (MoHCDGEC, 2015)

Among the most significant impacts of climate change is the potential increase of food insecurity and malnutrition. Climate change-related extreme weather events, which are predicted to increase in both frequency and intensity, exacerbate the risks of malnutrition throughcrop destruction, livestock reductions, critical infrastructure and key community assets damage. These effects also affect livelihoods and exacerbatepoverty.

According to the Tanzania Food and Nutrition Centre (2014) the nine regions of Iringa, Njombe, Kagera, Dodoma, Ruvuma, Rukwa, Kigoma, Katavi and Geita have very high chronic malnutrition exceeding the 40% threshold level (see Figure 6). Very high chronic malnutrition above 50% has been recorded in Iringa (51.3%), Njombe (51.5%) and Kagera (51.9%). It is estimated that more than 2,700,000 children under five years of age are stunted in Tanzania. The regions with the highest number of stunted children and the highest prevalence of chronic malnutrition are Kagera, Kigoma, Dodoma, Mbeya and Mwanza.

PART 4. BUILDING A CLIMATE RESILIENT HEALTH SYSTEM IN TANZANIA

4.1 Introduction to the Operational Framework for building climateresilient health systems

The *Operational Framework for building climate resilient health systems*, developed by the WHO (WHO, 2015), outlines 10 components that can be used as a framework for systematically and effectively addressing the challenges presented by climate variability and change and developing a HNAP. Consideration of all 10 components within the local context and the implementation of appropriate strategies and actions to strengthen any weak areas will lead to increased resilience of the health system in the face of climate variability and change and assist in the integration of health in national adaptation efforts.The 10 components of the operational framework relate to the six 'building blocks' of an effective health system.

There is likely to be some overlap in the activities among the components; for example research conducted for Component 5 can be used to inform V&A assessments in Component 3 and early warning systems developed for Component 4 can assist in strengthening emergency preparedness and management (Component 9).

The Tanzania HNAP strategic objectives and adaptation actions are organized around these 10 components as a systematic and comprehensive approach to ensure the key aspects of a climate resilient health system are addressed and any gaps are easily identified.

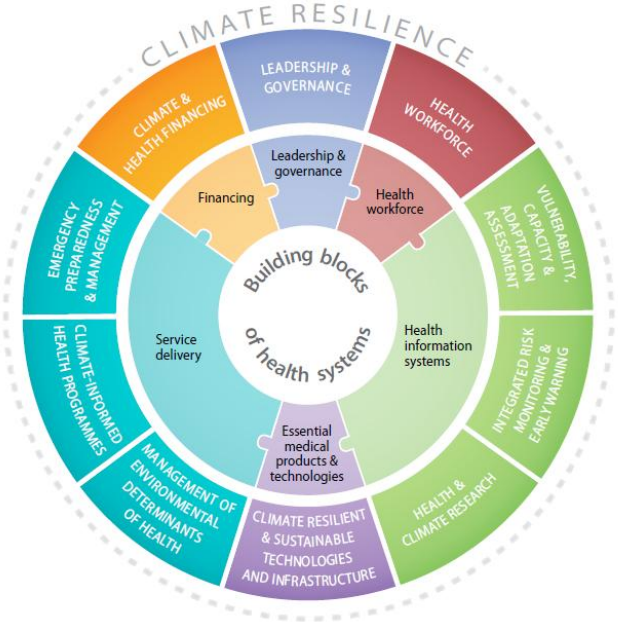


Figure 7:WHO Operational Framework for Building Climate-Resilient Health Systems (WHO, 2015)

4.2 Adaptation strategies and options in Tanzania

This section addresses each of the 10 components of the operational framework outlining the long-term strategic objectives for each component and the medium to long-term adaptation options specific to Tanzania that will significantly contribute to achieving these objectives.The purpose is to build a climate-resilient health system and aim for mainstreaming of climate change considerations across the strategies, plans and programmes of the health sector. The HNAP Action Plan 2018 - 2023 then prioritizes these adaptation options and identifies specific short-term actions, and related indicators, that can be implemented over the next five years.

4.2.1 Component 1: Leadership and Governance

Component 1focuses on managing climate risks at a strategic level to ensure they areincluded in health policies, plans and programs and to build political leadership and advocacy for climate change and health. Cross-sectoral and inter-departmental collaboration is crucial for the consideration of climate risks to health across policy and programmes in other health-determining sectors such as agriculture and food, water, waste, energy, transport,labor and industry, land planning, housing and infrastructureand disaster management.

Strategic objectives:
Governance: specific responsibility and accountability mechanismson climate change and health established within the health ministry.
Policy: climate variability and change considerations reflected in main health policies andprogrammes.
Cross-sectoral collaboration: cross-sectoral collaboration strengthened and synergiesmaximized to ensure that decisions taken in other sectors protect and promote health.
Community leadership: Community leaders, including political, spiritual and other influential leaders,haveownership and specific roles and responsibilities.

Current status:
The overall institutional arrangements and legal framework for climate change and health are described in PART 2of this document. In general, Tanzania has progressed several key responsibility and accountability mechanisms and policy documents on climate change, however, the incorporation of health in these is largelyinadequate. Additionally, climate change is often not considered in key health policies and strategies such as the HSSP IV. The NCCS, however, incorporates health as a key sector and identifies relevant adaptation strategies. The MoHCDGECis coordinating the HNAP development and there is an environmental health section in the Ministry that coordinates climate change and health issues.However, specific responsibilities and accountability for climate change and healthwithin the Ministry could be strengthened. Some cross-sectoral collaboration has been demonstrated, particularly within the HNAP team which consists of members from a range of relevant departments and institutions. Additionally, Guidelines for Integrating Climate Change Adaptation into National Sectoral Policies, Plans, and Programmes have been developed which could enhance cross-sectoral collaboration.

Summary of key gaps:

- Specific responsibilities and accountability mechanisms on climate change and health in the MoHCDGEC, RSs and Local Government Authoritiesshould be enhanced
- Mainstreaming of health in climate change policies and programmes, and vice versa, is lacking
- Cross-sectoral and inter-departmental collaboration is not yet comprehensiveor systematic

Adaptation options:

a) Designate/ recruit a National Focal Point at the MoHCDGEC, RSs and local government authorities
b) Establishment of a Climate Change and Health Technical Working Group at national, RSs and LGAs
c) Printing and dissemination of HNAP to all regions and LGAs
d) Conduct regular advocacy meetings at national and local levels on climate change and health

4.2.2 Component 2: Health Workforce

Strategies and actions for Component 2 aim to build the capacity of the health workforce, health system organization and institutions to manage the health risks and consequences of climate variability and change. This includes communication and awareness-raising to those outside the health sector to ensure underlying knowledge and support from other sectors and within communities.

Strategic objectives:

Human resources: sufficient number of health workers with the required technical capacityavailable to deal with the health risks posed by climate variability and change.

Organizational capacity development: resources, information, knowledge and processesemployed by health organizations used in an efficient and targeted manner to ensure effective care and services delivery in the face ofadditional risks posed by climate variability and change.

Communications and awareness-raising: raise awareness of the link between climatevariability/climate change and health outcomes among different target audiences (e.g. policymakers, senior staff, media and communities).

Current Status:

The National Climate Change Strategy (NCCS) highlights the generally low level of public awareness about climate change and identifies actions for increasing community understanding, including on the health effects of climate change.

The National climate change communication strategy (NCCCS) was developed in 2012 and outlines strategies, including key messages and communication mediums, and an implementation plan for climate change awareness-raising. The strategy targets a

diverse range of audiences including the general public, politicians and policy-makers, the media, local governments and development partners. Health workers, however, are not identified as a specific target audience. Thus far, implementation of the strategy has been limited. A draft Health and Climate Change Communication Strategy exists but has not yet been approved.

Similar to many countries, climate change and health considerations are not currently incorporated into medical/health training and curricula in Tanzania. Specialized training or mentoring on the issue for qualified health workers also does not currently exist in the country. Furthermore, the HSSP IV has identified that a key constraint for the health sector is a shortage of skilled specialists and qualified personnel. As such, it is important to integrate climate change considerations within existing training programmes so as not to add an extra burden to an already stretched capacity.

MoHCDGEC has developed climate change and health training materials for health workers which were used to train approximately 170 health practitioners from across the country. The Ministry has also developed a range of IEC materials to demonstrate the link between climate change and health which have been distributed to the regions.

Summary of key gaps:

- Implementation of National Climate Change Communication Strategy (NCCCS) has been limited
- Climate change and health is not currently included in secondary and tertiary curricula and there are no existing training courses for qualified health workers
- Low levels of awareness of the health effects of climate change in policy and decision-makers, health workers and the general public
- The Health and Climate Change Communication Strategy has not yet been approved

Adaptation options:

a) Finalize and implement the Health and Climate Change Communication Strategy
b) Prepare capacity-building plans in the health sector specific to climate change adaptation to fill the gaps identified from vulnerability assessments
c) Mainstreamhealth and climate changein thehealthprofessional training curriculum
d) Mainstream the assessment and management of public health impacts of climate change into existing trainings of health practitioners

4.2.3 Component 3: Vulnerability, capacity and adaptation assessment

The development of context-specific evidence on the type and magnitude of climate-related health risks, identify the most vulnerable populations, the level of resilience, vulnerability and adaptive capacity of the health system and use the evidence to inform policy and programmes is the focus of Component 3. Ongoing monitoring is a key to this process to keep abreast of changes to the health risks of climate change and adjust policies, plans and actions accordingly.

Strategic objectives:
Vulnerability: a sound understanding of the main health risks posed by climate vulnerabilityand change, and of the most vulnerable population groups available in the country.
Capacity: baseline information on capacities and gaps within the health system to face thechallenges posed by climate change.
Adaptation options: information on the main adaptation options available, including theircomparative advantages, potential costs and efficiency, available for selection by healthsystem decision makers.

Current Status:
A vulnerability and adaptation (V&A) assessment focusing on the water and health sectors was conducted in Tanzania in 2015 and 2016. (See PART 3 for further information on the V&A findings).

The V&A outlines four key adaptation priorities for the country:

1. Vector-borne diseases: Malaria, dengue, plague, rift valley fever, lymphatic filariasis, human Africa trypanosomiasis, onchocerciasis
2. Nutrition: stunting, wasting
3. Water-relateddiseases: diarrhea, dysentery, cholera, schistosomiasis, typhoid and trachoma
4. Disasters: floods and droughts frequency

Furthermore, the NCCS outlines some of the key vulnerabilities of the water and health sectors and an assessment of strategies or actions available for implementation.

The development of this HNAP forms part of the implementation of this component, particularly as it helps to identify capacity and adaptation options. The HNAP identifies potential gaps in the resilience and adaptive capacity of the health system and recommendations for their improvement are provided. The HNAP action plan also identifies a range of activities to improve the understanding of vulnerability and adaptive capacity of the health system to climate change in Tanzania.

Summary of key gaps:
- A process for ongoing monitoring of vulnerability and adaptation does not exist
- An in-depth analysis of available adaptation options within the health sector should be developed
- Analysis of the impact on health of adaptation and mitigation activities in other sectors is needed
- Limited high-quality baseline data for health and meteorological variables
- Limited qualitative data on community awareness and perspectives on climate change and health

- Lack of assessment of risk and adaptation options for other climate-sensitive vector-borne and other diseases outlined in the V&A, such as dengue, schistosomiasis, African trypanosomiasis, diarrhea etc.
- Lack of projections of burden and geographical distribution of climate-sensitive diseases
- Some of the objectives of the previous V&A were not completed
- The V&A does not include analysis of disaster risk reduction and infrastructure

Adaptation options:

a) Develop a national guidance on health and climate change V&A assessment standard approach, including risk assessment of extreme weather events, and timeframe
b) Conduct Health Impact Assessments for key adaptation and mitigation policies and programmes of health-determining sectors

4.2.4 Component 4: Integrated risk monitoring and early warning

Component 4 aims to ensure that adequate health and epidemiologic surveillance systems exist and are integrated with climate early warning systems. Early warning systems can enhance the preparedness of decision-makers, health workers and community members for climate-related natural hazards and weather variability and related health impacts such as disease outbreaks. Early warning systems for climate-related events and patterns need to have not only a sound scientific and technical basis, but also a strong focus on the people exposed to risks, including particularly vulnerable populations. Implementation of Component 4 involves the identification of climate-related health risks, forecasting health risks for anticipation and preparedness and risk communication to Government, health workers and communities. These systems should also incorporate traditional early warning knowledge, as deemed appropriate.

Strategic objectives:

Integrated disease surveillance and early warnings: data on climate-sensitiveenvironmental risks and epidemiological trends collected, analysed and interpreted on acontinual basis and timely response to risks promoted.

Monitoring: information on climate change impacts, vulnerability, response capacity andemergency preparedness capacity reported over time.

Communication: timely warnings communicated to health decision-makers, the mediaand the public and translated into effective action to prevent negative healthoutcomes.

Current Status:

Health service data is gathered through a routine national Health Management Information System (HMIS). There are two health surveillance systems exist in the country – the HMIS web portal (DHIS 2) and the Integrated Disease Surveillance and Response system(IDSR).Recently, the MOHSW has worked with the HIV/AIDS, TB/L, malaria and PMTCT to harmonize reporting in DHIS2.

The IDSR is an electronic system whereby health facility workers can input data using a mobile phone. This is done in batches, eg. once a week, or some high-risk diseases must be reported immediately. This allows a rapid response to any potential health outbreaks. To date, the IDSR has been rolled out in approximately half of the country and is likely to expand to the remainder of the country.

TMA provides a quarterly briefing to different sectors for short-term seasonal forecasts, including representatives from the epidemiology department and the Malaria Programme, for planning and preparedness purposes. The TMA also provides country-wideextreme weather updates. The Global Framework for Climate Services (GFCS) initiative, completed Phase 1 in December 2017, aimed to strengthen the capacity of TMA to be able to produce useful data for the relevant Ministries, and will continue from 2018 into Phase 2. One of the aims of this project is to strengthen collaboration of the MoHCDGEC with TMA to communicate their meteorological information needs and see what, when and in which form that information can be provided. This process will continue into phase two. The GFCS project was integral in raising awareness of health and climate within the MoHCDGEC and institutionalizing its importance to health outcomes. MoHCDGEC and TMA have commenced discussions on how to integrate meteorological data into DHIS2.

The Tanzania Monitoring and Evaluation Strategic Initiative (MESI) has been developed to strengthen health information systems, monitoring, integration and data quality. This strategy outlines specific plans for strengthening all facets of health and disease surveillance. Additionally, theTanzania Digital Health Investment Roadmap 2017 – 2023 outlines 17 investment recommendations to improve health system performance through better data use.

These systems and initiatives form the base for developing an early warning system. There are efforts in Tanzania to strengthen meteorological data and its integration with health and to improve health surveillance data quality. These are the first steps to develop a strong foundation for anearly warning system in health that is integrated with climate data.

<u>Summary of key gaps:</u>

- Need to strengthen early warning system and integrate health and meteorological data
- Need to identify the key climate-related health risks, and related indicators, to be monitored and ensure they are included in surveillance systems
- Comprehensive geographical mapping of key climate-related health risks should be developed
- Improvement of data quality required
- Existing traditional knowledge on early warning systems is not well-documented
- Need to strengthen communication to all stakeholders at all levels on climate change and related weather events for improved early warning

<u>Adaptation options:</u>

a) Advocacy for Ministry of Health and Tanzania Meteorological Agency (TMA) cooperation at high and lower levels of government and stress the importance of climate data for health planning
b) Strengthen the surveillance and monitoring of climate induced diseases
c) Strengthen the integration of health and meteorological data in surveillance systems
d) Strengthen early warning systems of extreme events
e) Traditional knowledge of early warning systems is documented and integrated into early warning systems
f) Communicate climate change and health information across levels and scale, including community leaders

4.2.5 Component 5: Health and climate research

Research on health and climate change is necessary for building a climate resilient health system to inform the implementation of all the components and their related actions.

Strategic objectives:
Research agenda: multidisciplinary research agenda on health and climate change defined and endorsed by stakeholders.
Support for research: research capacity on health and climate change built by supportingrelevant multidisciplinary networks, making available financial resources and creatingtraining opportunities.
Connect to policy: research findings on health and climate change disseminated to andused by policy makers.

Current Status:
The Tanzania National Health Research Priorities, developed by the national Institute for Medical Research (NIMR), and the NIMR strategic plan includes climate change as one of the priorities.

The main focus of existing health and climate change research and publications in Tanzania has primarily been on malaria, cholera and other water-borne diseases. An example of ongoing research includes the study *Determining the effectiveness of WASH interventions to reduce health vulnerability to climate change in Tanzania*. This is a field trial being implemented by Ifakara Health Institute, on behalf of the Tanzanian Government, investigating the association between weather and water-borne diseases. A few other health and climate change research pieces are being conducted by research institutes across the country.

Research by educational/research institutions are primarily funded through grants to individuals/projects. Available research funding for the topic of health and climate change is extremely limited.

Mechanisms that exist for communicating research findings on health and climate change to policy makers is largely to academic publications. Government and other organizations, such as MoHCDGEC and WHO, use research findings to inform their work

and advocate for health and climate change considerations, however, a systematic approach does not yet exist and relevant conference and symposium opportunities are inadequate.

Summary of key gaps:

- Funding for research is limited and particularly for health and climate change
- Limited awareness and/or interest in health and climate change as a topic
- Inadequate expertise in research institutes on health and climate change
- Lack of a research agenda and related resource mobilization plan for health and climate change
- Ineffective mechanisms and formalized processes for communication of research findings and for their translation to policy
- Lack of inter- sectoral research collaboration on health and climate change
- Limited engagement of the National Research Council on climate change and health

Adaptation options:

a) Develop an inter-sectoral research agenda on health and climate change that includes a resource mobilization plan
b) Strengthen capacity of research institutes for conducting research in health and climate change
c) Establish a platform for sharing health and climate change–related research and information to ensure it informs policies, plans and strategies

4.2.6 Component 6: Climate resilient and sustainable technologies and infrastructure

Health system resilience to climate change can be enhanced through investment in specific technologies that reduce vulnerability to climate change, including preventive and curative health products related to climate-sensitive diseases and specialized equipment. Health infrastructure, services and products can be impacted by the effects of a changing climate and this should be considered when constructing health facilities, managing and planning health services and purchasing and storing medications. Additionally, the sustainability of health infrastructure and services and mitigation of the contribution of the health sector to climate change should be considered for long-term resilience. Finally, new technologies, particularly information technology, has the potential to significantly increase the resilience of the health system to climate change.

Strategic objectives:

Adaptation of current infrastructures, technologies and processes: future climate riskssystematically considered with regard to revision or upgrading of technologies, productsand procedures for health system service delivery.

Promotion of new technologies: new technologies, processes and products selected anddeployed to increase climate resilience through enhanced health service delivery.

Sustainability of health operations: low environmental impact technologies procured andpromoted by the health sector to enhance resilience to climate and contribute to long-termsustainability.

Current Status:
The HSSP IV has identified that approximately 600 new health facilities will be built and others will be refurbished and upgraded. While existing building and renovation standards consider items that will enhance the climate resilience of infrastructure and systematic approach to ensuring that infrastructure is climate resilient has not yet been adopted.

As mentioned in 4.2.4 information technology can be, and is being, harnessed in Tanzania to enhance health and climate surveillance and early warning systems.
The national and sub-national laboratories are not equipped with all the diagnostic kits for climate-sensitive diseases and the MoHCDGEC works with WHO to procure them on as-needs basis.

Environmental sustainability and climate change mitigation in the health sector are not yet strongly considered in regard to infrastructure and technology.

Summary of key gaps:
- Diagnostic kits for climate-sensitive are not in stock in the country and can sometimes be difficult to obtain
- Climate-resilience and DRRare not considered in the infrastructure sections of the HSSP IV and other policies and strategies
- Shortage of health staff, medicine and hospital supplies resulting in less capacity to address climate-sensitive health issues

Adaptation options:
a) Conduct assessment of existing health facilities and sanitation infrastructureusing the Smart Hospitals Toolkit/other designated tool kit to ascertain their climate resilience
b) Review current building and renovation standards for health facilities for climate-resilience considerations and modify if necessary
c) New health facilities and refurbishment of existing health facilities (as per the HSSP IV) are built in line with climate-resilience standards

4.2.7 Component 7: Management of environmental determinants of health

Climate change is likely to impact on the environmental determinants of health, such as air quality, water quantity and quality and food and nutrition security and effective cross-sectoral collaboration can mitigate these effects and result in improved health outcomes.

Strategic objectives:
Monitoring joint monitoring of climate-sensitive environmental risks against evidence-basedstandards.
Regulation: regulatory policies protecting populations against climate-sensitiveenvironmental risks defined, revised and enforced.
Coordinated management: environmental determinants of health jointly managed, withclear roles and responsibilities defined across sectors at all levels.

Current Status:

Air Quality

Morogoro is currently the only municipality reporting to the WHO and has high levels of particulate matter contributing to poor air quality.Two specific acts in Tanzania mention air quality: NEMC EnvironmentalProtection Bill, 1994 - to establish criteria, guidelines, specificationsand standards to protect air quality and The NationalEnvironmental Policy1997 - to prevent further deterioration of theenvironment.The National Air Quality Standards (Regulation), set by the Tanzania Bureau of Standards (TBS), provide indicators to monitor air quality. The NEMC regulate and enforce the air quality standards.There is some monitoring of the health effects of air quality; primarily in occupational health and safety considerations in industry.

Water, Sanitation and Hygiene

MoWI is the lead agency for ensuring a safe and sufficient water supply in Tanzania. There is close collaboration between MoHCDGEC, MoW and VPOin water, sanitation and hygiene matters, including the development of the*Guidelines for the implementation of water safety plans that are resilient to climate change* for both rural and urban water supply services. National Drinking Water Quality Guidelines exist and were developed by both MoHCDGEC and MoW. The MoW conducts regular water quality monitoring. National Water Quality Standards (Regulation) have been developed by TBS and are enforced by NEMC.

The MoHCDGEC is responsible for the development and coordination ofpolicies, strategies, guidelines, legislation and regulation as well as setting standards for sanitation and hygienein the country. The National Environmental Health, Hygiene and Sanitation Strategy (NEHHSAS 2008-2017)designates benchmarks for mainstreaming environmental health into the strategic planning frameworks of the Councils and the National Guidelines for Water, Sanitation and Hygiene in HealthCare Facilities. WASH is managed cross-sectorally in the GoT and, for example, the MoE has developed the National Guideline for Water, Sanitation and Hygiene for Tanzania Schools.

The WHO and UNICEF Joint Monitoring Programme reports on country-level estimates of progress on drinking water, sanitation and hygiene (WASH)(UNICEF, 2017). The latest reports estimate that only 23.5% of the population have access to basic sanitation and 11% still perform open defecation. Sanitation access is worse in rural areas than urban (see Figure 8). A high proportion of the urban population have access to drinking with 33.5% with access to safely managed drinking water and another 46% to basic drinking water. However, rural access is more limited with 37% of the rural population having access to basic drinking water and 18% with surface water only (see Figure 9). Finally, 47% of the country's total population has access to basic hygiene with greater access in urban areas (see Figure 10).

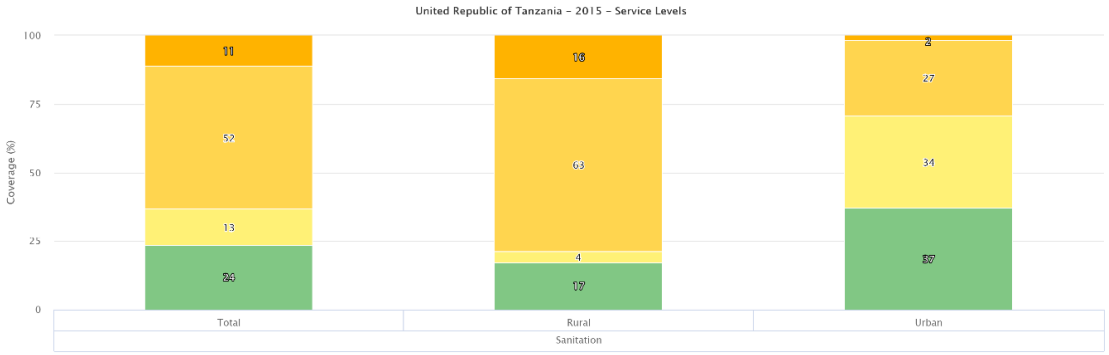


Figure 8: Sanitation Service Levels Tanzania (UNICEF, 2017)

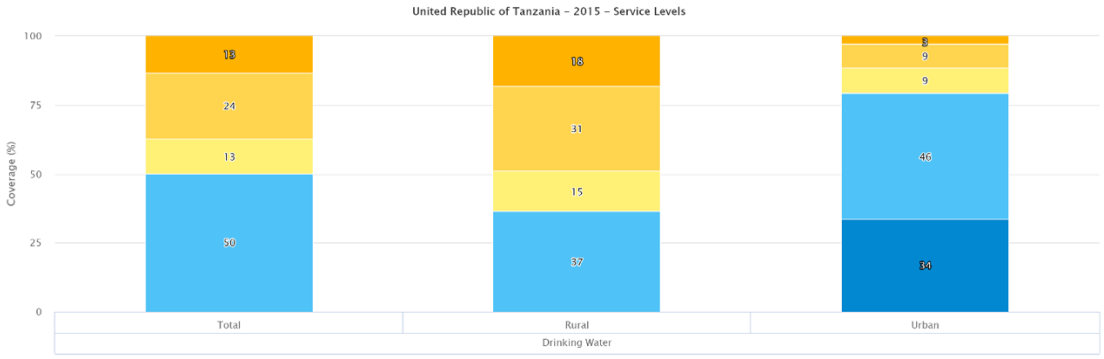


Figure 9: Drinking Water Service Levels Tanzania (UNICEF, 2017)

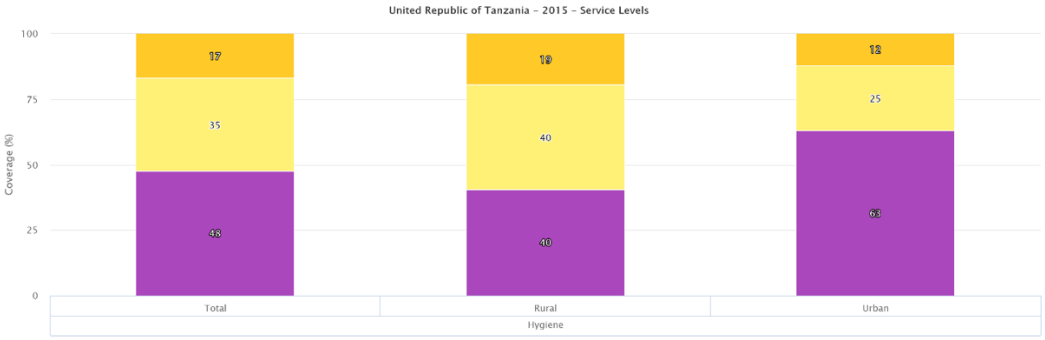


Figure 10: Hygiene Service Levels Tanzania (UNICEF, 2017)

Poor water, sanitation and hygiene can increase the risk of climate-sensitive disease outbreaks, particularly water-borne diseases such as cholera. 3.2.1it was noted that cholera is one of the most significant climate-sensitive infectious diseases in Tanzania and that weather and climate variability, such as El Nino and floods, increase the risk of outbreaks. The Cholera Vulnerability Risk Assessment and Mapping Report 2017 highlights the impact of poor WASH levels on cholera vulnerability in urban areas: "Poor

communities living in slums are disproportionally affected, largely because of poor access to safe water and sanitation. Women and children are more vulnerable due to patterns of water collection, handling, storage and drinking practices at home"(Ministry of Health, 2017).

There are various WASH projects being implemented in Tanzania. The majority of WASH projects do not consider climate change specifically; however, increasing WASH levels is likely to decrease underlying vulnerability to climate-sensitive diseases. The*Building adaptation to climate change in health in least developed countries through resilient water, sanitation and hygiene (WASH)* is a health and climate change project that integrates WASH. The project, finishing in March 2018, was implemented by WHO and funded by DFID and aimed to a develop a clear framework for protecting health and reducing the risk of disease as a consequence of climate change and lay the groundwork for scaling up investment into climate-resilient WASH programmes that will improve and protect health. The second phase is currently being planned.

Food and nutrition security

Food security and nutrition is monitored and regulated cross-sectorally. The Ministry of Agriculture monitors the status of agricultural yields and provides early warning for food security. The Tanzania Food and Drug Authority, within the MoHCDGEC, is mandated to regulate the quality, safety and efficacy of food, medicines, cosmetics and medical devices. The Tanzania Food and Nutrition Center (TFNC) is an autonomous institution, also within the MoHCDGEC, implements nutrition interventions with partners, e.g. food fortification, conducts research, develops guidelines and advises the Government and related institutions on food and nutrition.There is also a Nutrition section in the MoHCDGEC that develops policies, monitors nutrition status through the DHIS2 and conducts food and nutrition promotion and education (in collaboration with the Health Promotion and Education Section).

At the Council level, anutrition and food safety section (Council Nutrition Steering Committee) exists which is working to ensure the quality and safety of food manufactured or sold in various premises and is monitored through on-site inspection.

Environmental Impact Assessments

An Environmental Impact Assessment process occurs for any new project or programme as required under the Environmental Management Act 2004 and the Environmental Impact Assessment and Audit Regulations 2005. Health expertsare usually requested to participate in the assessment; however, health is not adequately included in the regulations. Additionally, the Public Health Act 2009 requires Health Impact Assessmentsto be conducted for all new projects, programmes and developments. However, these requirements are inadequately enforced.

Summary of key gaps:

- Weak cross-sectoral collaboration on management and monitoring of climate-related environmental health risks
- Inadequate inclusion of Health in the Environmental Impact Assessment and Audit Regulations 2005

- Inadequate resource capacity of health sector to conduct HIAs
- Lack of enforcement/implementation of regulations
- Poor monitoring of EIAs
- Only 23.5% of the population have access to basic sanitation and 11% still perform open defecation
- Inadequate knowledge, infrastructure and technology to manage floods which accelerates water pollution through seepage of stable elements/chemicals like mercury and cyanide

Adaptation options:

a) Strengthen joint multi-sectoral risk management approaches to proactively manage health risks related to water, sanitation, food and nutrition security and air quality
b) Advocate for review of the Environmental Impact Assessment and Audit Regulations to strengthen the involvement of health experts in the EIA and audit process
c) Increase of basic sanitation coverage from 23.5% to 65%
d) Enhance capacity of health sector to conduct HIAS
e) Strengthen public awareness of health risks related to water, sanitation, food security, nutrition and air quality
f) Ensure enforcement and compliance of laws and regulations on preventing environmental pollution

4.2.8 Component 8: Climate-informed health programme

Along with cross-sectoral collaboration it is important to mainstream climate change across health sector programmes and operations.

Strategic objectives:

Health programming: information on current and projected (future) climatic conditions integrated into strategic planning of health programmes for climate-sensitive diseases.
Delivery of interventions: public health programmes revise their standard operating procedures to respond to climate risks in delivery of interventions.

Current Status:

Mainstreaming of climate change into health programmes, plans, strategies, policies and intervention delivery is still new and is currently limited. Some existing programmes, particularly for climate-sensitive diseases, use weather data for prevention of outbreaks, including the Malaria and NTD programmes.

There are several initiatives under way to improve climate change mainstreaming in health. The revised National Health Policy, currently in draft, considers climate change as a key policy statement. The strategies and actions of this HNAP will contribute significantly to the mainstreaming of climate change in health

Summary of key gaps:

- Limited mainstreaming of climate change into health and policy and programmes

Adaptation actions:

a) Strengthen community and CSO capacity on health adaptation to climate change
b) Mainstream climate change into national health policy and its implementation strategies and guidelines
c) Regional and district health plans incorporate climate-related health risks
d) Medium- and long-term plans for disease control programmes revised to consider capacities that may be stressed or exceeded by climate change

4.2.9 Component 9: Emergency preparedness and management

In line with mainstreaming climate change in the health sector, emergency preparedness should be included in the management of public health risks – both at the government and community level. Preparedness should be integrated in strategies, policies and plans across the sector including for infrastructure, public health risk response, community-based actions etc.

Strategic objectives:

Inform policies and protocols: emergency and disaster risk management protocols and policies adequately informed by current and likely future climatic conditions.
Risk management: strengthen health system capacity to manage risks so that overall vulnerability and exposure to hazards are reduced and residual risks and uncertainties effectively managed.
Empowerment of communities: empower communities to effectively prevent and respondto the health risks posed by extreme weather events.

Current Status:

Disaster management in Tanzania is guided by Disaster Management Act of 2014, which provides for establishment of the Disaster Management Agency under the Prime Minister's Office.The Prime Minister's Office developed the National Disaster Management Policy (2004), which highlights broad strategies, approaches and Framework for Disaster Management. Other disaster management guiding documents in the country include Tanzania Emergency Preparedness and Response Plan (TEPRP) of 2012 and Tanzania Disaster Communication Strategy (TDCS) of 2012 and National Operational Guidelines (NOG) for Disaster Management 2014.

The National Disaster Management Policy of (2004) provides guidance for mainstreaming of disaster management activities as an integral part of development programs of all sectors in the country. The Sendai Framework for Disaster Risk Reduction (SFDRR) puts health at the centre of disaster risk management. It advocates for countries to enhance the resilience of national health systems and promotes the implementation of the International Health Regulations (2005). These regulations are adequately implemented in Tanzania with national focal points and core capacity

strengthening and progress is reported to WHO annually. Also,the revised Tanzania National Health Policy addresses issues relating to Disaster Risk Management (DRM).

Coordination of health emergencies in the MoHCDGEC is through the Emergency Preparedness and Response Section (EPRS) and the MoHCDGEC and its stakeholders have been implementing disaster risk management as an integral part of its activities as per the National Disaster Management Policy 2004. MoHCDGEC has specific response plans for some climate-sensitive diseases, such as cholera and malaria.Vulnerability and Risk Assessment and Mapping (VRAM) for cholera was conducted in 2012 and 2016 in some parts of the country identifying risks, exposures, vulnerability and disaster response capacity. District emergency response plans exist, however, the health response to climate-related hazards is not adequately addressed.

An all hazard risk assessment was completed in 2016 which identified the key risks for the country and led to the development of the *All Hazard Health Emergency Preparedness and Response Plan 2016*. This plan is a comprehensivemultisectoral approach to facilitate all levels of the health care service in efficient contingency planning and response to specific public health emergencies and disasters, which includes climate-related hazards. It outlines a detailed action plan to enhance preparedness and response in the country.

Furthermore, the MoHCDGEC recently launched the *National Action Plan for Health Security (NAPHS)* as a response to the requirements of the IHRs. This multi-sectoral action plan addresses various climate-associated hazards and risks and climate-sensitive diseases including drought, floods, storms, dengue, cholera and rift valley fever, amongst others. The NAPHS provides a risk profiling of public health threats, a five-year plan with costings and a comprehensive M&E plan.

The *All Hazard Health Emergency Preparedness and Response Plan*and the*National Action Plan for Health Security*provide a strong foundation for preparedness and response to climate-related emergencies in the health sector. However, the use of climate data and the consideration of the dynamic nature of climate-sensitive health risks and the need for ongoing monitoring are not adequately addressed.

<u>Summary of key gaps:</u>

- The health response to climate-associated hazards and climate-sensitive diseases are not adequately included in regional and district level emergency response plans
- Inadequate multi-sectoral participation in response to emergency at regional and district levels
- Health worker capacity for emergency preparedness and response for climate-related hazards needs to be improved
- TheAll Hazard Health Emergency Preparedness and Response Plan and National Action Plan for Health Securityneed to be implemented by relevant departments
- Consideration of the changing nature of climate-sensitive health risks should be included in the *All Hazard Health Emergency Preparedness and Response Plan* and *National Action Plan for Health Security*

Adaptation options:

a) Incorporate the use of climate data in the *All Hazard Health Emergency Preparedness and Response Plan* and *National Action Plan for Health Security* to ensure the changing nature of climate-related health risks is considered for emergency preparedness
b) Strengthening of climatic data sharing from TMA to all levels of Government
c) Regional and district health plans incorporate climate-related health risk interventions
d) Strengthen multi-sectoral participation in responding to emergencies at regional and district levels
e) Routinely use risk assessments for current and projected future exposure to extreme weather events to inform health sector strategic development plans and programmes
f) Implement emergency preparedness and response capacity development programmes for health workers that include climate-related hazards and health risks (combine with actions in Component 2)
g) Implement capacity development programmes to identify and support the roles of local communities to identify risks, prevent exposure to hazards and take action to save lives in extreme weather events (combine with actions in Component 8)
h) Integrate climate-related health emergency preparedness and response in the School Health Programme

4.2.10 Component 10: Climate and health financing

The operationalization of the HNAP and climate change adaptation actions, both in health and other sectors, to enhance the resilience of the health system to climate will require significant financial resources. Financing will include core health system funding and climate change-specific funding. There are various mechanisms for accessing health and climate change funding.

Strategic objectives:

Health-specific funding mechanisms: climate change considerations included in proposalsrelated to climate-sensitive diseases submitted to and funded by health funding mechanisms.

Funding for sectors influencing health: health and climate change considerationsincorporated in projects and programmes supported through development funding availablefor main health determining sectors.

Climate change funding streams: climate change funding mechanisms available at nationallevel accessed.

Current Status:

The observed and perceived future climate related diseases and disasters coupled with climate extreme events have created an unaffordable additional burden on the existing health sector budget.

The V&A assessment conducted by the Ministry of Health in collaboration with the WHO 2015 noted that health-related adaptation costs in Tanzania are not yet clearly known

and onlya small fraction of climate finance available is being allocated to adaptation programmes and projects in the health sector. It is therefore important that enhanced, clear and comprehensive climate financing mechanisms be established within the health sector in line with existing structures. This will facilitate transformative actions to sustain paradigm change from budgetary to policy issues towards health-climate resilience financing in Tanzania.

Various multi-stakeholders' national, zonal and health sector workshops revealed that collaboration among different actors across departmental and within departmental systems in the health sector, line ministries, donor communities and funding agencies to enhance scaling up financial investments/flows for climate resilient health system in Tanzania is key to close the financing gaps. Implementation of HNAP actions will enable access to specific climate financing as opposed to traditional expenditure, which is concentrated in programs that do not specifically aim to tackle climate change challenges in the health sector.

See5.3.3 for a description of key climate financing bodies.

Summary of key gaps:

- The actual cost requirements for climate change adaptation in the health sector and to build a climate-resilient health system are not known
- The 'cost of doing nothing' has not been estimated in Tanzania
- The health sector is not currently accessing national and international climate change funding streams
- Potential costs of climate-related health issues and events are not explicitly included in Government budgets
- Low capacity for developing the complex proposals required for international climate financing bodies
- Climate related health risksare not incorporated in regional and district health plans
- Clear and comprehensive climate financing mechanisms do not exist at all levels of Government
- Lack of funds for conducting advocacy meeting on climatic change and health-related risks at regional and district levels

Adaptation options:

a) Develop a comprehensive resource mobilization plan that identifies funding mechanisms for health, sectors influencing health and climate change, specific proposal options, timelines and responsibilities
b) Advocate for the allocation of resources to increase health sector resilience to climate variability and change as a line item in national and LGAhealth budgets
c) Develop and submit proposal for projects and programmes on building health system resilience to international climate change funding sources (e.g. GEF, GCF, bilateral donors etc.)

PART 5. HNAP IMPLEMENTATION STRATEGY

A comprehensive implementation strategy is key for an effective and successful implementation of the national health adaption strategies and options, as outlined in part 4 of this HNAP document. An important underlying success factoris mainstreaming climate change considerationsinto existing health processes and programmes. Climate variability andchange will primarily affect the burden of climate-sensitive diseases, which are already presentin Tanzania and for whichcontrol programmes already exist. Hence, rather than designing the HNAP as an independent process andinitiating new climate change and health programmes, it is more efficient to build resilience of existing processes and programmes through appropriate modifications. This will be achieved, on the one hand, through establishing an effective coordination mechanism. This allows for the integration of climate change considerations into health planning from national to local scale and additionally ensures that the health sector is connectedwith the overall NAP process. On the other hand, the HNAP Action Plan lays out concrete actions for 2018 to 2023 that are first and essential steps towards making appropriate modifications of relevant health processes and programmes.

Finally, this HNAP implementation strategy presents a financing strategy in part 5.3. It includes cost estimates of adaptation actions to facilitate the integration of these actions into national health budgeting and planning cycles, and actions and strategies to secure access to external climate financing streams.

5.1 Coordination mechanisms

The Vice President's Office Division of Environment (VPO-DoE) is the national focal point for climate change under the United Nations Framework Convention on Climate Change (UNFCCC) and the designated National Authority for climate change in Tanzania. It also leads the National Adaptation Plan (NAP) process.

The HNAPis coordinated by the MoHCDGEC-EHS, specifically by the Health and Climate Change focal point, who shall be appointed as part of this HNAP. All relevant stakeholders in the health sector, as shown in Figure 11, are involved in the implementation of the HNAP.The coordination mechanism for the comprehensive implementation of the HNAP will be based on existing mechanisms within the health sector. However, enhanced coordination will be ensured through the creation of a health and climate change working group with members from all relevant stakeholders in the health sector.

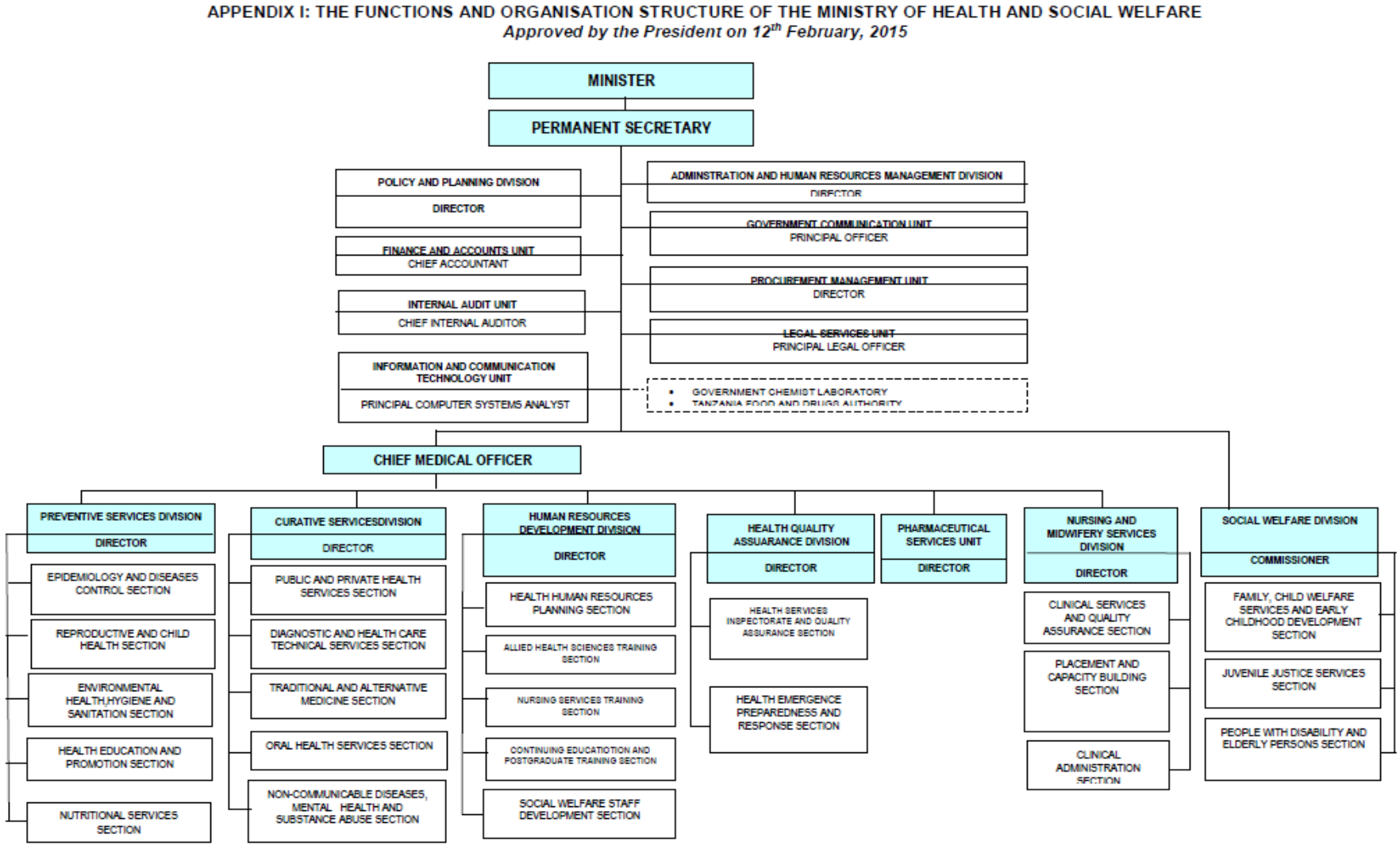


Figure 11: Institutional arrangements of the health sector in Tanzania; with MOHSW now beingMoHCDGEC (Source: HSSP IV)

The HNAP will also build on existinginstitutional collaboration as part of the NAP process and the NCCS. This will facilitate the collaboration between the MoHCDGECand other health-determining line ministries and institutions, such as the VPO-DoE, the Tanzania Meteorological Agency (TMA), the Ministry of Water and Irrigation, theUniversity of Dar es Salaam, Sokoine University of Agriculture, and Ardhi University. Hence, participation of the MoHCDGEC at the NAP and the NCCS process is key, which areled by the NAP Focal Point within the VPO-DoE.

As shown in Figure 12, the overall HNAP coordination mechanism, is based on existing national health coordination mechanisms, and on the NAP and the NCCS processes, but strengthened by newly institutionalized structures and positions: the health and climate change focal point and the health and climate change technical working group (see also Component 1, Action Plan, p. 51).

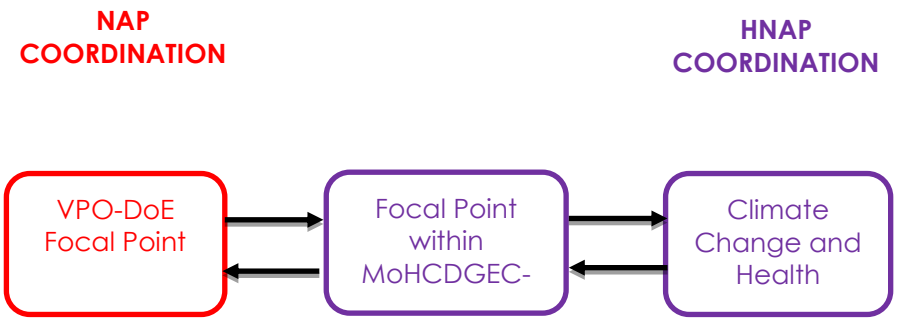


Figure 12: Main HNAP coordination mechanism

5.2 HNAP Action Plan 2018 - 2023

The HNAP action plan outlines the key adaptation actions that will take place over a period of five years and consist of short and medium-term actions. These actions have been prioritizedfrom the options previously identified, they contribute to the overall long-term objectives of the HNAP, and the strategic objectives outlined inPART 4. The focus of the action plan is to build a strong foundation for building a climate-resilient health system and as such, not all adaptation options identified in PART 4 are included in the action plan. The action plan describes the key performance indicators for each adaptation action, which will be evaluated and revised after five years of implementation. The plan also designates responsibilities and provides an estimated budget in USD.

Actions	Key performance indicators	Responsible Institution	Contributing Institutions	Estimated Budget USD (5 yrs)
Component 1: Leadership & Governance				
Designate/ recruit a National Focal Point at the Ministry of Health, RSs and LGAs	Focal Points in place with respective ToR	MoHCDGEC-EHS/MoHCDGEC-HR/RSs and LGAs		75,000
Establishment of a Climate Change and Health Technical Working Groups	TWG is established with respective ToR	MoHCDGEC-EHS/RSs and LGAs		25,000
Printing and dissemination of HNAP to all regions and LGAs	Dissemination meetings in all regions took place	MoHCDGEC-EHS/RSs and LGAs		55,000
Conduct regular advocacy meetingsat national and local levels on climate change and health	Advocacy meetings took place	MoHCDGEC-EHS/RSs and LGAs		45,000
Sub-total				**200,000**
Component 2: Health Workforce				
Finalize and implement the Health and Climate Change Communication Strategy	The Health and Climate Change Communication Strategy is in place and is implemented	MoHCDGEC-HPS/MoHCDGEC-EHS, Zonal and Regional referral hospitals		55,000
Prepare capacity-building plans in the health sector specific to climate change adaptation to fill the gaps identified from vulnerability assessments	The capacity-building plan and related tools are available	MoHCDGEC-EHS, Zonal and Regional referral hospitals	MoHCDGEC-HPS/MoHCDGEC-HR	25,000
Mainstream health and climate change in the health professional training curriculum	Technical meetings between MoHCDGEC and relevant academic institutions on how to integrate climate change considerations into existing health professional training curricula took place Climate change	MoHCDGEC-EHS/MoHCDGEC-HR/Health education institutions/NACTE/Secondary and Primary schools	WHO	40,000

Actions	Key performance indicators	Responsible Institution	Contributing Institutions	Estimated Budget USD (5 yrs)
	considerations are integrated into health professional training curricula			
Mainstream the assessment and management of public health impacts of climate change into existing trainings of health practitioners	Relevant existing trainings and possible entry points for integrating climate change related considerations are identified Climate change considerations are integrated into existing emergency preparedness and response training	MoHCDGEC-EHS/MoHCDGEC-HR/PO-RALG	WHO	10,000
Sub-total				**130,000**
Component 3: Vulnerability, capacity and adaptation assessment				
Develop a national guidance on health and climate change V&A assessment standard approach, including risk assessment of extreme weather events, and timeframe	National guidance on health and climate change V&A has been developed	MoHCDGEC-EHS	WHO	15,000
Conduct Health Impact Assessments for key adaptation and mitigation policies and programmes of health-determining sectors	Relevant adaptation and mitigation policies and programmes of health-determining sectors to be assessed are identified	MoHCDGEC-EHS/VPO-DoE	Other sectors	3,000
Sub-total				**18,000**
Component 4: Integrated risk monitoring and early warning				
Strengthen the surveillance and monitoring of climate-sensitive diseases	A comprehensive assessment of gaps of the current surveillance and monitoring system of	MoHCDGEC-EHS/MoHCDGEC-Epidem	WHO	10,000

Actions	Key performance indicators	Responsible Institution	Contributing Institutions	Estimated Budget USD (5 yrs)
	climate-sensitive diseases has been completed and target areas for improvement identified			
Advocacy for Ministry of Health and Tanzania Meteorological Agency (TMA) cooperation at high levels of government and stress the importance of climate data for health planning	The National Climate Change Technical Committee (NCCTC) issues a recommendation to the National Climate Change Steering Committee (NCCSC) for strengthened data sharing between TMA and MoHCDGEC	MoHCDGEC-EHS/VPO-DoE	TMA, HNAP team	5,000
Sub-total				**15,000**
Component 5: Health and climate research				
Develop an inter-sectoral research agenda on health and climate change that includes a resource mobilization plan	An inter-sectoral research agenda on health and climate change including resource mobilization plan has been developed	NMRI/ MoHCDGEC-EHS/MoHCDGEC-DPP/TCU/COSTECH, TMA	VPO, other relevant sectors, agencies, academic and research institutes	20,000
Strengthen capacity of research institutes, RHMT for conducting research in health and climate change	A capacity assessment of health and climate change research is completed and next steps identified	NMRI/MoHCDGEC-EHS	UDSM-CCCS, TMA and other relevant scientific institutes	30,000
Establish a platform for sharing health and climate change–related research and information to ensure it informs policies, plans and strategies	Health and climate change-related research is shared at X number of conferences/symposiums	MoHCDGEC-EHS/MUHAS	NMRI/UDSM-CCCS, TMA and other relevant scientific institutes	20,000
Sub-total				**70,000**
Component 6: Climate resilient and sustainable technologies and infrastructure				
Conduct assessment of existing health facilities and WASH infrastructure using the Smart	X health facilities and WASH infrastructure at each level (i.e. dispensary, health	MoHCDGEC-EHS/MoHCDGEC-DQA/MoHCDGEC-	LGAs/WHO/PO-RALG	20,000

Actions	Key performance indicators	Responsible Institution	Contributing Institutions	Estimated Budget USD (5 yrs)
Hospitals Toolkit/other designed tool kit to ascertain their climate resilience	center, etc. up to national hospital) have been assessed using the Smart Hospitals Toolkit/other designated toolkit	DCS/MoWI		
Review current building and renovation standards for health facilities for climate-resilience considerations and modify if necessary	Climate-resilience standards for the building and refurbishment of health facilities at all levels is incorporated into the health facility star rating tool A review of current building standards for health facilities and WASH infrastructure for climate-resilience considerations has been completed and necessary modifications integrated	MoHCDGEC-EHS/MoHCDGEC-DQA/MoHCDGEC-DCS/PO-RALG/TBA/MOWI	WHO, RSs, LGAs and ARU	5,000
New health facilities and refurbishment of existing health facilities (as per the HSSP IV) are built in line with climate-resilience standards	All new health facility construction and refurbishment implemented as part of the HSSP IV is in line with climate-resilient standards	MoHCDGEC-EHS/MoHCDGEC-DQA, RSs and LGAs		5000
Sub-total				**30,000**
Component 7: Management of environmental determinants of health				
Strengthen joint multi-sectoral risk management approaches to proactively manage health risks related to water, sanitation, food and nutrition security and air	Environmental risks for the health sector are assessed and priority areas identified A multisectoral risk	MoHCDGEC-EHS/VPO-DoE, RSs and LGAs	PO-RALG/NMRI/WHO	10,000

Actions	Key performance indicators	Responsible Institution	Contributing Institutions	Estimated Budget USD (5 yrs)
quality	monitoring plan is developed			
Advocate for review of the Environmental Impact Assessment and Audit Regulations to strengthen the involvement of health experts in the EIA and audit process	Review of EIA and audit regulations to strengthen the involvement of health experts was conducted	MoHCDGEC-EHS, VPO-DoE, NEMC	WHO	10,000
Increase of basic sanitation proportions from 23.5% to 65% through health promotions	X number of basic sanitation infrastructure increased	MoHCDGEC-EHS/MoHCDGEC-EPRS, VPO, NEMC, RSs, LGAs		20,000
Enhance capacity of health sector to conduct HIAs	X number of HIAs experts in the health sector	MoHCDGEC-EHS/MoHCDGEC-EPRS, VPO, NEMC, RSs, LGAs		50,000
Strengthen public awareness on health risks related to water, sanitation, food security, nutrition and air quality	X number of awareness raising meetings and participants on health risks related to water, sanitation, food security, nutrition and air quality	MoHCDGEC-EHS/MoHCDGEC-EPRS, VPO, NEMC, RSs, LGAs		50,000
Sub-total				**140,000**
Component 8: Climate-informed health programmes				
Strengthen community and CSO's capacities on health adaptation to climate change	X community-based health interventions are climate-informed Climate-change considerations are integrated into existing disaster response and management community trainings	MoHCDGEC-EHS/MoHCDGEC-EPRS	WHO/PO-RALG/MoHCDGEC-CDD	30,000
Mainstream climate change into national health policy and its	The revised National Health Policy and the HSSP V	MoHCDGEC-EHS/MoHCDGEC-DPP	WHO	-

Actions	Key performance indicators	Responsible Institution	Contributing Institutions	Estimated Budget USD (5 yrs)
implementation strategies and guidelines	include climate-change considerations			
Regional and district health plans incorporate climate-related health risks	X number of updated district health plans with climate-related health risk incorporated	MoHCDGEC-EHS/RSs and LGAs		50,000
Medium- and long-term plans for disease control programmes revised to consider capacities that may be stressed or exceeded by climate change	Medium- and long-term plans for disease control programmes consider climate change impact on health	MoHCDGEC-EHS/MoHCDGEC-DPS, RHMTS and LGAs	WHO	-
Sub-total				**80,000**
Component 9: Emergency preparedness and management				
Incorporate the use of climate data in the All Hazard Health Emergency Preparedness and Response Plan and National Action Plan for Health Security to ensure the changing nature of climate-related health risks is considered for emergency preparedness	An analysis of gaps in the consideration of climate change in the AHHEPRP and NAPHS is completed and recommendations provided Advocacy for the use of climate data in the AHHEPRP and NAPHS is conducted at monitoring and review meetings	MoHCDGEC-EHS/RSs/LGAs	MoHCDGEC-EPRS, WHO	10,000
Incorporate climate-related health risks and hazards in regional and district level emergency preparedness and response plans	X regional and district emergency response plans include climate-related health risks	MoHCDGEC-EHS/RSs/LGAs	MoHCDGEC/EPRS/PO-RALG/WHO	50,000
Integrate climate-related health emergency preparedness and response in the School Health Programme/College and	Climate-related health emergency preparedness and response is integrated into the School Health	MoHCDGEC-EHS/Universities and colleges	MoHCDGEC-HPS/WHO	10,000

Actions	Key performance indicators	Responsible Institution	Contributing Institutions	Estimated Budget USD (5 yrs)
University curriculum	Programme/College and University curriculum			
Sub-total				**70,000**
Component 10: Climate and health financing				
Develop a comprehensive resource mobilization plan that identifies funding mechanisms for health, sectors influencing health and climate change, specific proposal options, timelines and responsibilities	Comprehensive resource mobilization plan that identifies funding mechanisms for health, sectors influencing health and climate change, specific proposal options, timelines and responsibilities is developed	MoHCDGEC-EHS	VPO-DoE/MoF/WHO	10,000
Advocate for the allocation of resources to increase health sector resilience to climate variability and change as a line item in national and LGA health budgets	Cost-benefit analysis of adaptation to climate change in the health sector is conducted	MoHCDGEC-EHS	MoHCDGEC-DPP/VPO-DoE/WHO	20,000
Develop and submit proposal for projects and programmes on building health system resilience to international climate change funding sources (eg. GEF, GCF, bilateral donors etc)	The health sector received training in developing project and programme proposals for accessing international climate change financing X proposals on health and climate change are submitted to international climate change funding sources	MoHCDGEC-EHS/VPO-DoE	MoF/MoHCDGEC-DPP/WHO /UNDP/GIZ/Relevant departments and sections of the MoHCDGEC	50,000
Sub-total				**80,000**
TOTAL COST OF HNAP ACTION PLAN IMPLEMENTATION				**USD833,000**

5.3 HNAP financing strategy

The financing strategy of this HNAP includes providing cost estimates for each adaptation action of the action plan, which, therefore, provide an indication of the cost of the HNAP implementation over the next five years. Furthermore, the financing strategy outlines actions and a financing strategy to access external funding to implement adaptation interventions that target specific climate-sensitive health risks.

5.3.1 Cost estimates for the HNAP actions

The estimatedcost of implementing the HNAP actions over the coming five years is USD 570,000. Costing of the action plan allows for enhanced planning and facilitates inclusion of the HNAP in the health sector budget. The costing described here are estimatesfor each action, however, as implementation commences the MoHCDGEC, through the responsible department/unit, will refine them to more accurately reflect funding required.

These costing were developed based on a review of current MoHCDGEC environmental health-related expenditure and HNAP team validation. The costs were also validated at twostakeholders' meetingsin Arusha and Mwanza in March 2018 that involved MoHCDGEC, MoF, VPO,LGAs, WHO, GIZ and other stakeholders.

5.3.2 Health and climate change financing in Tanzania

In order to build a climate-resilient health system it is important to establish a long-term and sustainable financing stream. Financing will need to be sought, not only for implementation of the HNAP, but also for specific health and climate change adaptation projects. It is particularly critical to strategically access funding for high investment projects that are not currently funded. A key aspect of accessing finance is building the capacity of the MoHCDGEC to effectively develop successful funding proposals. This HNAP identifies three key actions for beginning to establish a health and climate change financing over the next 5 years:

a) Develop a comprehensive resource mobilization plan that identifies funding mechanisms for health, sectors influencing health and climate change, specific proposal options, timelines and responsibilities

b) Advocate for the allocation of resources to increase health sector resilience to climate variability and change as a line item in national and LGA health budgets

c) Develop and submit proposal for projects and programmes on building health system resilience to international climate change funding sources (e.g. GEF, GCF, bilateral donors etc.)

5.3.3 Funding sources

Leveraging external funding sources is critical and will remain an essential element for implementation of the HNAP. There is a wide range of potential climate funding

sources, includingnational organizations, bilateral support, multinational organizations, nongovernmental organizations and international funding bodies, among others, but a strategic and planned approach is required to effectively and efficiently access these sources.

External funding sources can be accessed through competitive funding proposals developed by the MoHCDGEC in collaboration with line ministries including MoF and the VPO.Universities and other research institutions should be encouraged to develop collaborative research proposals with MoHCDGEC for health and climate change-related research.Well-structured coordination for implementation of the HNAP activities in the health sector is crucial for accessing funding from external sources.

5.3.3.1 Internal funding

Mainstreaming climate change into the existing policies, strategies, plans and programmes of the health sector, and across Government, is key to improving access to internal funds. The costing of the HNAP action plan will assist to improve theinclusion of climate-specific costs in Government budgets.

Additionally, the National Environmental Fund established under the National Environmental Act, 2004, and the Tanzania Forest Fund can also be approached to fund some HNAP actions that align with their priorities.

5.3.3.2 External funding

The HNAP action plan stipulates that aresource mobilization plan will be developed. This plan will be a comprehensive document outlining specific external sources, their priority focus and the best way to target the funds. The resource mobilization plan should consider health, climate change and health-determining sector financing streams. This section provides a brief overview of some of the major funding options.

Development Partners (DPs), including bilateral donors, multilateral and UN organizations and nongovernment organizations contribute the largest proportion of climate finance in Tanzania and may be approached for initial funding to begin implementation of the HNAP. The MoHCDGEC together with the VPO can also leverage relationships with DPs for technical assistance on climate resilient health and integrate HNAP activities into existing or future DP projects and programmes. It will be important to frame the HNAP actions within priority areas of the DPs. UN agencies have a wide range of climate funding options that are a potential source for HNAP implementation. For instance, WHO has previously mobilized climate funds to pilot a climate resilience for health project in Tanzania. Many bilateral aid organizations provide adaptation funding and they can be considered for implementation for activities under the HNAP. Those that will be initially targeted include USAID, SIDA, GIZ, UNEP, UNDP, WHO.

The **UNFCCC**has some financing mechanisms which are a significant international source of adaptation funding. The two funds (Adaptation Fund, and Green Climate Fund) have different rules and accessing mechanisms. At national level, the VPO

climate change team can act as a coordinating office and provide information on accessing these funds.

Green Climate Fund (GCF) The Green Climate Fund (GCF) is a new global fund, within the UNFCC mechanisms, created to support the efforts of developing countries to respond to the challenge of climate change with both mitigation and adaptation actions. As the HNAP is linked to the NAP, climate actions identified in the HNAP contributes to the implementation of the NAP. This is key for accessing GCF resources, which requires high quality proposals aspiring to promote paradigm shifts. The GCF is aiming for 50% of the funds to go to Least Developed Countries (LDCs), Small Island Developing States (SIDS), and African States.

The Adaptation Fund (AF) was established by the Parties to the Kyoto Protocol of the UN Framework Convention on Climate Change to finance concrete adaptation projects and programmes in developing countries that are parties to the Kyoto Protocol. It provides resources for adaptation projects and program in developing countries including LDCs.

The Global Environment Facility (GEF)is an international partnership of 183 countries, international institutions, civil society organizations and the private sector that addresses global environmental issue and funds are available to developing countries and countries with economies in transition to meet the objectives of the international environmental conventions and agreements. Two funds under GEF are the Least Developed Country Fund (LDCF) and the Special Climate Change Fund (SCCF).

TheLeast Developed Country Fund (LDCF) was established under GEF to assist least developed countries, like Tanzania, to take quick actions including implementing projects identified under NAPA. The Tanzania NAPA identified the health sector to be among of priority sectors that have been affected by climate change and need urgent adaptation initiatives.

Special Climate Change Fund (SCCF), a GEF initiative, supports adaptation and technology transfer in all developing country parties to the UNFCCC. The SCCF supports both long-term and short-term adaptation activities in water resources management; land management; agriculture; health; infrastructure development; fragile ecosystems including mountainous ecosystems; and integrated coastal zone management.

Development Special Fund for Africa of AfDB has the objective of strengthening the institutional capacities of national and sub regional bodies to formulate and implement effective climate-sensitive policies and actions.

The **Global Climate Change Alliance** of the European Union, which provides funding on climate change adaption initiatives.

The **World Bank**, and **other development banks**,have climate fundingstreams which can be accessed for HNAP implementation and adaptation actions.

PART 6. HNAP REPORTING, MONITORING AND REVIEW

A well-functioningMonitoring and Evaluation (M&E) framework is an important factor for a successful implementation of the HNAP. M&E of the HNAP is an iterative process with the following aims:

(1) totrack the progress of implementation of the HNAP action plan on the level of input and output;
(2) toevaluate the effectiveness and appropriatenessof the adaptation actions to the strategic objectives and the overall objectives of the HNAP, including the allocated resources;
(3) toprovide information to the beneficiaries, implementing agencies and financiers on the progress of HNAP actions.

To build resilience of the Tanzanian health system there is a need forcollective inputs also from other sectors, whose activities may, directly or indirectly, affect the health of the communities. The following complementary and collaborative principles guide theHNAP M&E framework:

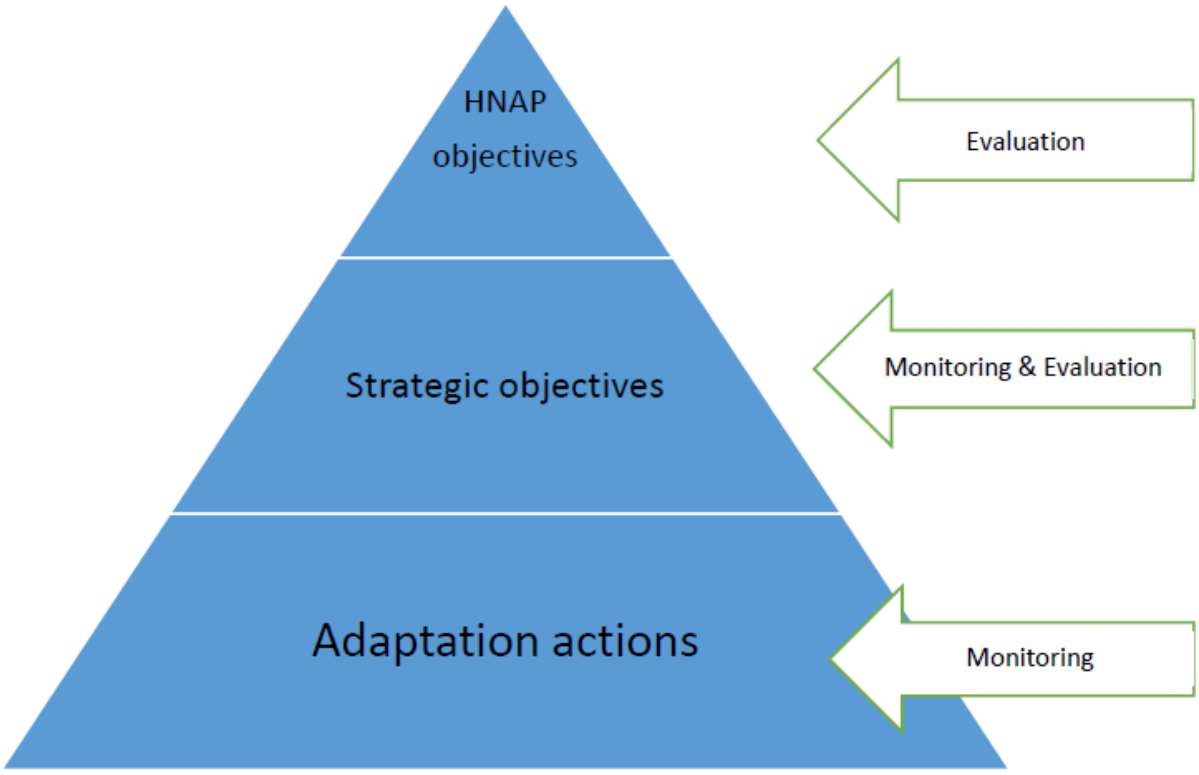
Collective participation: All units, sections and departments in the health sector, at national, regional, district and local levels, have an assigned role to play. The collective participation at all levels will ensure that proposed interventions are coordinated and interlinked for optimal and streamlined process and outcomes.

Transparency: Regular reporting through progress reports, some of which will be made available to the public, aims toensure openness and supportfrom all relevant parties.

Accountability: The M&E plan identifies responsible institutions and departments for each indicator to be monitored and evaluated.MoHCDGEC-EHShas theresponsibility in coordinating the necessary inputs from other related implementing institutions of that specific action. This facilitates accountability for all units, sections and departments responsible for implementing, monitoring and reviewing the HNAP.

6.1 M&E logical framework

The M&E framework is based on the following logical framework or result chain, which defines the level of indicators that measure and monitor progress, and those that measure and evaluate effectiveness of the HNAP:



Monitoring and evaluation of adaptation actions and HNAP strategic objectives will be based on performance indicators, which are quantifiable measurements reflecting implementation achievements of the HNAP. Performance indicators show results relative to what was planned at the levels of input, output, and occasionally outcome:

i. **Process/input indicators**: These refer to resources required to facilitate the execution of proposed actions to address areas of concern at national and local level. These may include human and financial resources, technologies and infrastructure needed to improve adaptive capacity as well as trainings for building health workforce capacity.
ii. **Output Indicators:** These refer to the deliverables of a specific action in the Action Plan of the HNAP, such as achieving a specific number of workshops, trainings, analyses or reports.
iii. **Outcome indicators:** These refer to the overall impact(s) or achievements of the Plan of Action in reaching the strategic objectives. Outcomes, therefore, measure the positive change that followed as result of the outputs of the respective actions in the Action Plan.

Evaluation will occur at the level of the HNAP overall objectives and of the strategic objectives based on the respective performance indicators. However, the following will also be taken into account to evaluate the aptness of the current HNAP:

Relevance: the continuing relevance of goals and outcomes and the assumptions, including the risks considered during and after completion of implementation.

Effectiveness: the extent to which the goal, inputs, outputs, and outcomes have been attained within the various timelines set in the macro and micro matrices.

Efficiency: the extent to which the management of implementation and the design of the plan at inception were appropriate. This is based on an analysis of the initial budget, disbursement to each implementing entity andany variances between expenditures incurred and projected budget etc.

6.2 HNAP review process

HNAP review will be conducted every five years. The evaluation of the current HNAP action plan, as well as the HNAP objectives, as described above, will lead to the development of an updated 5-year HNAP action plan (2024-2029). To adequately review the HNAP, a standardized Vulnerability and Adaptation Assessment (V&A) will be conducted on a regular basis to establish changesin vulnerabilities and adaptive capacities in the health sector due to climate change, including health (e.g. priority climate-related diseases), environment (e.g. climatic variables), socioeconomics (e.g. poverty, demographics and occupation), and level of interventions and health systems capacity. This standardized V&A approach is part of the adaptation actions as outlined in the HNAP action plan under component 3.

6.3 HNAP reporting

The HNAP reporting mechanism will focus on two areas. Quarterly and annual reports aim at monitoring the progress of implementation of the Action Plan (2018-2023).Evaluation and review reports of the HNAP will present the overall cumulative evaluation of the performance indicators of the Action Plan, reporting on performance indicators of HNAP strategic objectives, and a reflection of effectively fulfilling the overall HNAP objectives. This evaluation and review report will inform the review process of the HNAP for 2024-2029. Table 1 presents the reporting frequency and the total number of respective performance indicators as part of the HNAP M&E, reporting and review mechanism.

Table 1: Reporting frequency and related indicators

Level	Reporting frequency	Number of indicators
Adaptation actions	Quarterly monitoring reports	20
Adaptation actions	Annual monitoring reports	18 (+20 quarterly indicators)
HNAP strategic objectives	Evaluation report in 2023	7 (+38 adaptation action indicators)

6.4 M&E Plan (2018-2023)

Based on the logical framework, the M&E Plan lays out indicators at the level of outcome, input, output, with respective indicator definition, means of verification, frequency of reporting, and responsible institutions.

Level	Indicators	Indicator Definition	Means of verification	Frequency of reporting	Responsible institutions
Long-term HNAP strategic objectives					
Political commitment and effective leadership to build climate resilience	1. Number of strategies and policies that integrate climate change considerations 2. Institutional mechanisms in place, including clear roles and responsibilities, to address climate change in the health sector	Indicators will guide evaluation and review of HNAP every 5 years	• Strategies and policies • Establishment document of the MoHCDGEC	Every 5 years	MoHCDGE C-EHS
Technical and professional capacity of health personnel, as well as organizational and institutional capacity of the health system to address additional risks posed by climate variability and change	Percentage of healthcare personnel at national, regional and district level with information and training to address climate change and health links, appropriate to their role and function	Indicator will guide evaluation and review of HNAP every 5 years	• Training reports • Dissemination and sensitization reports • Human resource for health report	Every 5 years	MoHCDGE C-EHS
Regular monitoring of health vulnerabilities and risks due to climate change for reviewing adaptation options	Number of climate-sensitive diseases for which there are monitoring systems that are able to forecast and monitor risks and/ or to monitor disease risks posed by climate variability and change	Indicator will guide evaluation and review of HNAP every 5 years	M&E reports of climate-sensitive disease and health programmes	Every 5 years	MoHCDGE C-EHS
Integrated risk monitoring and early warning generate a holistic perspective of					

Level	Indicators	Indicator Definition	Means of verification	Frequency of reporting	Responsible institutions
health risks with real-time information					
National health and climate research build evidence to strengthen health and climate change related decision-making					
Health-related technologies and infrastructure is climate-resilient and sustainable	Percentage of healthcare facilities incorporating climate variability and change in siting, construction, technologies and procedures to ensure provision of basic services (including energy, water and sanitation)	Indicator will guide evaluation and review of HNAP every 5 years	Quality assurance inspection reports	Every 5 years	MoHCDGE C-EHS
Environmental determinants of health are monitored and managed across health-determining sectors	Percentage of medium- and long-term plans for control programmes of climate-sensitive diseases and emergency management that include consideration of climate change risks	Indicator will guide evaluation and review of HNAP every 5 years	Medium- and long-term plans for control programmes of climate-sensitive diseases and emergency management	Every 5 years	MoHCDGE C-EHS
Health programming and operations consider climate risks and vulnerability					
Health emergency preparedness and management is climate-informed					
Health specific climate-financing mechanism are in place and climate	Percentage of the national (internal and external) health budget	Indicator will guide evaluation and review of HNAP every 5 years	Annual expenditure reports	Every 5 years	MoHCDGE C-EHS

Level	Indicators	Indicator Definition	Means of verification	Frequency of reporting	Responsible institutions
change funding streams are successfully accessed	that addresses risks posed by climate variability and change				
Adaptation Actions (2018-2023)					
Component 1: Leadership & Governance					
Designate/ recruit a National Focal Point at the Ministry of Health, RSs and LDAs	Focal Points in place with respective ToR	• MoHCDGEC creates a new position for a focal point on health and climate change within environmental health section • ToR include role and responsibilities, including HNAP reporting duties; timeline for deliverables • MoHCDGEC advocates for the establishment of focal points on health and climate change with RSs and LGAs	• MoHCDGEC HR registry • ToR	Quarterly	MoHCDGEC-EHS, MoHCDGEC-HR
Establishment of a Climate Change and Health Technical Working Group	TWG is established with respective ToR	ToR should include roles and responsibilities of the TWG and of the members from relevant line ministries, and a schedule for regular meetings	• Meeting minutes • ToR	Quarterly	MoHCDGEC-EHS
Printing and dissemination of HNAP to all regions and LGAs	Dissemination meetings in all regions took place	HNAP documents have to be printed and disseminated in all regions	• Printed HNAP documents • HNAP dissemination meeting reports	Quarterly	MoHCDGEC-EHS
Conduct regular advocacy meetings at national and local levels on climate change and	Advocacy meetings took place	• Advocacy meeting for decision-makers within MoHCDGEC and LGAs • Cross-sectoral advocacy	Meeting reports	Annually	MoHCDGEC-EHS

Level	Indicators	Indicator Definition	Means of verification	Frequency of reporting	Responsible institutions
health mainstreaming		meeting with relevant ministries and institutes			
Component 2: Health workforce					
Finalize and implement the Health and Climate Change Communication Strategy	The Health and Climate Change Communication Strategy (HCCCS) is in place and is implemented	• Draft HCCCS is reviewed • HCCCS is approved, printed and disseminated • Implementation plan developed • Priority actions implemented	• HCCCS document • HCCCS implementation plan • Implementation reports	Quarterly	MoHCDGEC-HPS, MoHCDGEC-EHS
Prepare capacity-building plans in the health sector specific to climate change adaptation to fill the gaps identified from vulnerability assessments	The capacity-building plan and related tools are available	• Capacity-building plan addresses the capacity gaps of health workers • Tools include IEC materials and training manuals	• Capacity building plan • Tools • workers	Quarterly	MoHCDGEC-EHS, MoHCDGEC-HR, MoHCDGEC-HPS
Mainstream the assessment and management of public health impacts of climate change into existing trainings of health practitioners	Climate change is integrated into existing emergency preparedness and response training	• Relevant existing trainings and possible entry points for integrating climate change related considerations are identified in a technical meeting	•	Quarterly	MoHCDGEC-EHS, MoHCDGEC-HR, PO-RALG
Mainstream health and climate change in the health professional training curriculum	Climate change considerations are integrated into health professional training curricula	• Technical meetings should review and identify suitable entry points of where and how to integrate climate change considerations into existing health professional training curricula	Meeting reports and minutes	Quarterly	MoHCDGEC-EHS, MoHCDGEC-HR, NACTE

Level	Indicators	Indicator Definition	Means of verification	Frequency of reporting	Responsible institutions
		• Health professional training curricula are revised accordingly			
Component 3: Vulnerability, capacity and adaptation assessment					
Develop a national guidance on health and climate change V&A assessment standard approach, including risk assessment of extreme weather events, and timeframe	National guidance on health and climate change V&A has been developed	• Guidance document should include scope, methodology (including data sources and data collection and analysis methods), and frequency • V&A guidance should also include risk assessment of health impacts due to extreme weather events • TWG is responsible for the development • Relevant academic and research institutes to be consulted	V&A national guidance document	Annually	MoHCDGE C-EHS
Conduct Health Impact Assessments for key adaptation and mitigation policies and programmes of health-determining sectors	Relevant adaptation and mitigation policies and programmes of health-determining sectors to be assessed have been identified	• TWG provides technical advice • Relevant academic and research institutes are consulted • Stocktaking of relevant adaptation and mitigation policies of health-determining sectors • Prioritization of these policies and programmes outlined in a report	Report on identified relevant adaptation and mitigation policies and programmes of health-determining sectors	Annually	MoHCDGE C-EHS, VPO-DoE
Component 4: Integrate risk monitoring and early warning					

Level	Indicators	Indicator Definition	Means of verification	Frequency of reporting	Responsible institutions
Strengthen the surveillance and monitoring of climate-sensitive diseases	A comprehensive assessment of gaps of the current surveillance and monitoring system of climate-sensitive diseases has been completed and target areas for improvement identified	• Analysis should include current practices and systems of all disease-specific programmes, departments, sections, and units of MoHCDGEC, and of LGAs • TWG will provide technical advise • Relevant research institutes are consulted	Assessment report	Annually	MoHCDGEC-EHS, MoHCDGEC-Epidem
Advocacy for Ministry of Health and Tanzanian Meteorological Agency (TMA) cooperation at high levels of government and stress the importance of climate data for health planning	The National Climate Change Technical Committee (NCCTC) issues a recommendation to the National Climate Change Steering Committee (NCCSC) for strengthened data sharing between TMA and MoHCDGEC	• TWG will provide technical advice for developing a technical brief on health sector's need of climate data • Technical brief is presented to the NCCTC and subsequently to the NCCSC	• Technical brief • Meeting minutes of the NCCTC and NCCSC	Quarterly	MoHCDGEC-EHS, VPO-DoE
Component 5: Health and climate research					
Develop an inter-sectoral research agenda on health and climate change that includes a resource mobilization plan	An inter-sectoral research agenda on health and climate change including resource mobilization plan has been developed	• TWG provides technical advise • Relevant research and academic institutes are mapped and consulted • Identification of possible funding opportunities • Identification of priority health and climate change research areas	• Research agenda with resource mobilization plan • TWG meeting minutes • Working sessions reports	Quarterly	MoHCDGEC-EHS, NMRI, MoHCDGEC-DPP, TCU, COSTECH
Strengthen capacity of research institutes for	A capacity assessment of health and climate	• According to priority health and climate	Report of capacity	Quarterly	MoHCDGEC-EHS, NMRI

Level	Indicators	Indicator Definition	Means of verification	Frequency of reporting	Responsible institutions
conducting research in health and climate change	change research is completed and next steps identified	change research areas, capacity needs assessment is conducted • Include all relevant research institutions • Priorities for capacity building identified	assessment		
Establish a platform for sharing health and climate change–related research and information to ensure it informs policies, plans and strategies	Health and climate change-related research is shared at X number of conferences/symposiums	• The symposium/ conference provides a platform for sharing policy-relevant research results, discuss experiences and disseminate relevant information • Relevant existing conferences/ symposiums are identified as part of the research mobilization plan, and indicator quantified	Reports of symposium/ conferences	Annually	MoHCDGE C-EHS, NMRI
Component 6: Climate resilient and sustainable technologies and infrastructure					
Conduct assessment of existing health facilities using the Smart Hospitals Toolkit to ascertain their climate resilience	X health facilities at each level (i.e. dispensary, health center, etc. up to national hospital) have been assessed using the Smart Hospitals Toolkit	• Health facilities at each level should be selected for piloting the Smart Hospital Toolkit • Applying Smart Hospital Toolkit for selected health facilities • Adjust Smart Hospital Toolkit to the Tanzanian context when necessary	Report of the assessment with Smart Hospital Toolkit	Quarterly	MoHCDGE C-EHS, MoHCDGE C-DQA, MoHCDGE C-DCS, PO-RALG
Review current building and renovation standards for health	1. Climate-resilience standards for the building and	• Review of health facility star rating tool to integrate climate-	• Health facility star rating tool • Review report	Annually	MoHCDGE C-EHS, MoHCDGE

Level	Indicators	Indicator Definition	Means of verification	Frequency of reporting	Responsible institutions
facilities for climate-resilience considerations and modify if necessary	refurbishment of health facilities at all levels is incorporated into the health facility star rating tool 2. A review of current building standards for health facilities for climate-resilience considerations has been completed and necessary modifications integrated	resilience standards, based on adjusted Smart Hospital Toolkit • Assessment of whether current building and renovation standards include climate-related risks in a sufficient manner • Gaps identified and necessary modification integrated • TWG provides technical advice	of climate-resilience considerations of current building and renovation standards for health facilities		C-DQA, MoHCDGE C-DCS, PO-RALG, TBA
New health facilities and refurbishment of existing health facilities (as per the HSSP IV) are built in line with climate-resilience standards	All new health facility construction and refurbishment implemented as part of the HSSP IV is in line with climate-resilient standards	• Orient Quality Assurance officers on reviewed building and renovation standards addressing climate-resilience • Monitor compliance to reviewed standards during construction and refurbishment of health facilities	• Orientation reports • Inspection reports of Quality Assurance officers	Quarterly	MoHCDGE C-EHS, MoHCDGE C-DQA
Component 7: Management of environmental determinants of health					
Strengthen joint multisectoral risk management approaches to proactively manage health risks related to water, sanitation, food and nutrition security, and air quality	1. Environmental risks for the health sector are assessed and priority areas identified 2. A multisectoral risk monitoring plan is developed	• TWG provides technical advice • An approach for standardized environmental health risk assessment, including data sources, methodology is developed, taking into account the National	• Guidelines of standardized environmental health risk assessment • Report on orientation of LGAs • Health environmental	Quarterly	MoHCDGE C-EHS, VPO-DoE, NMRI, PO-RALG

Level	Indicators	Indicator Definition	Means of verification	Frequency of reporting	Responsible institutions
		Action Plan for Health Security and the All Hazard Health Emergency Preparedness and Response Plan • Orient LGAs on applying standardized environmental health risk assessment • Based on identified priority areas, multisectoral risk monitoring plans are developed	risk assessment report • Multisectoral risk monitoring plans		
Advocate for review of the Environmental Impact Assessment and Audit Regulations to strengthen the involvement of health experts in the EIA and audit process	A review of EIA and audit regulations to strengthen the involvement of health experts was conducted	• The need to review the EIA and audit regulations to strengthen the involvement of health experts in EIA and audit processes is presented by the MoHCDGEC to the National Environmental Advisory Committee (NEAC)	• NEAC meeting minutes • EIA and audit regulations	Annually	MoHCDGE C-EHS, VPO-DoE
Increase basic sanitation coverage from 23.5% to 65%	65% of population has access to improved sanitation facilities	• Sanitation facilities that hygienically separate human excreta from human contact.	• Monitoring report	Annually	MoWI/MoH CDGE
Enhance capacity of health sector to conduct HIAS	X number of HIAS experts in the health sector	• Training for HIAs is provided to X people in the health sector	• Training reports • Database of HIAS experts	Annually	MoHCDGE C-EHS, VPO-DoE
Strengthen public awareness on health risks related to water,	X number of awareness raising meetings on health risks related to	• Awareness raising sessions for the wider public at local, district and national	• Session reports	Annually	MoHCDGE C-EHS

Level	Indicators	Indicator Definition	Means of verification	Frequency of reporting	Responsible institutions
sanitation, food security, nutrition and air quality	water, sanitation, food security, nutrition and air quality have taken place.	level on health risks related to water, sanitation, food security, nutrition and air quality are conceptualized and conducted			
Component 8: Climate-informed health programmes					
Strengthen community and CSO's capacities on health adaptation to climate change	1. X community-based health interventions are climate-informed 2. Climate change considerations are integrated into existing disaster response and management community trainings	• Identification and prioritization of community-based health interventions • Indicator to be quantified after prioritization • Relevant CSOs sensitized to include climate change considerations into their project planning of implementation • Focal points at the district level receive training and IEC materials to include health and climate change considerations when conducting DRM trainings in communities	• List of community-based health interventions • Reports of sensitization session with CSOs • Reports of trainings of focal points at district level	Quarterly	MoHCDGEC-EHS, PO-RALG, MoHCDGEC-EPRS, MoHCDGEC-CDD
Mainstream climate change into national health policy and its implementation strategies	The revised National Health Policy and the HSSP V include climate-change considerations	• During the development process of HSSP V climate change considerations and relevant actions of the HNAP action plan are proposed to be included into the HSSP V	HSSP V and revised National Health Policy	Annually	MoHCDGEC-EHS, MoHCDGEC-DPP
Regional and district health plans incorporate climate-related health	75 percent of district health plans incorporate climate-related health	• TWG provides technical advice • Advocate and provide	Regional and district health plans	Annually	MoHCDGEC-EHS, PO-RALG

Level	Indicators	Indicator Definition	Means of verification	Frequency of reporting	Responsible institutions
risks	risks	guidance for an inclusion of climate change considerations at regional and distric level			
Medium- and long-term plans for disease control programmes are revised to consider capacities that may be stressed or exceeded by climate change	Medium- and long-term plans for disease control programmes consider climate change impact on health	• TWG provides technical advice • Advocate for an inclusion of climate change considerations into the strategies and actions plans of the disease control programmes • Programmes include the National Malaria Control Programme and NTD programme, especially Schistosomiasis, Dengue, and the Sanitation Programme	Strategies and action plans of disease control programmes	Annually	MoHCDGE C-EHS, MoHCDGE C-DPS
Component 9: Emergency preparedness and management					
Incorporate the use of climate data in the All Hazard Health Emergency Preparedness and Response Plan (AHHEPRP) and National Action Plan for Health Security (NAPHS) to ensure the changing nature of climate-related health risks is considered for emergency preparedness	1. Analysis of gaps in the consideration of climate change in the AHHEPRP and NAPHS is completed and recommendations provided 2. Advocacy for the use of climate data in the AHHEPRP and NAPHS is conducted at monitoring and review meetings	• Report includes an analysis of gaps and provides recommendations for improvement • Report is presented at the AHHEPRP and NAPHS monitoring and review meetings	Report of the gap analysis	Annually	MoHCDGE C-EHS, MoHCDGE C-EPRS
Incorporate climate-	X district emergency	• Advocacy sessions for	Advocacy session	Quarterly	MoHCDGE

Level	Indicators	Indicator Definition	Means of verification	Frequency of reporting	Responsible institutions
related health risks and hazards in district level emergency response plans	response plans include climate-related health risks	District Disaster Committees in flood and drought prone areas are conducted • Quantification of indicator after identification of number of districts within flood and drought prone areas	reports		C-EHS, PO-RALG, MoHCDGE C-EPRS
Integrate climate-related health emergency preparedness and response in the School Health Programme	Climate-related health emergency preparedness and response is integrated into the School Health Programme	• Identify gaps in the School Health Strategy 2017 in relation to integrating climate-related health emergency preparedness and response and propose recommendations • Convene advocacy meeting with relevant stakeholders for addressing identified gaps in the strategy	• Gap analysis report • Advocacy meeting report	Annually	MoHCDGE C-EHS, MoHCDGE C-HPS
Component 10: Climate and health financing					
Develop a comprehensive resource mobilization plan that identifies funding mechanisms for health, sectors influencing health and climate change, specific proposal options, timelines and responsibilities	Comprehensive resource mobilization plan that identifies funding mechanisms for health, sectors influencing health and climate change, specific proposal options, timelines and responsibilities is developed	• Analyzing and mapping of funding windows for climate change and health adaptation interventions • Identify climate change and health thematic areas for funding • Disaggregation of timelines of the interventions in terms of	• List of funding windows • List of priority funding areas for climate change and health in place • Resource mobilization plan in place	Quarterly	MoHCDGE C-EHS, MoF, VPO-DoE

Level	Indicators	Indicator Definition	Means of verification	Frequency of reporting	Responsible institutions
		short, medium and long term intervention			
Advocate for the allocation of resources to increase health sector resilience to climate variability and change as a line item in national and LGA health budgets	Cost-benefit analysis of adaptation to climate change in the health sector is conducted	• TWG is providing technical advice • Conducted in collaboration with relevant research and academic institutions	Report on cost-benefit analysis	Annually	MoHCDGEC-EHS, MoHCDGEC-DPP,
Develop and submit proposal for projects and programmes on building health system resilience tointernational climate change funding sources (eg. GEF, GCF, bilateral donors etc)	1. The health sector received training in developing project and programme proposals for accessing international climate change financing 2. X proposals on health and climate change are submitted to international climate change funding sources	• Ensure that health Programme managers and coordinators participate at trainings on proposal development at the national level • Those who receive training develop fundable project ideas • For international climate change funding resources concept notes are developed and supported by VPO • Advocate amongst bilateral donors for supporting HNAP actions	• Reports of training received • Documented fundable project ideas • Submitted concept notes • Accepted concept notes • Submitted and accepted project proposal	Quarterly	MoHCDGEC-EHS, MoHCDGEC-DPP, VPO-DoE, MoF, relevant Departments and Sections of the MoHCDGEC

PART 7. Reference List

Alto BW and D Bettinardi (2013). Temperature and Dengue Virus Infection in Mosquitoes: Independent Effects on the Immature and Adult Stages. *Am J Trop Med Hyg, 88*(3), 497–505.

Arusha Times(2010). Arusha Records 700,000 Livestock Deaths at End of Drought Spell, The Arusha Times, Retrieved from: http://allafrica.com/stories/201005311054.html

Atherbolt, T.B., LeChevallier, M.W., Norton, W.D. and Rosen, J.S.(1998) Effect of rainfall on Giardia and Cryptosporidium. Journal ofthe American Water Works Association; 90:66–80.

Chaves LF and CJ KLoenraadt (2010). Climate change and highland malaria: fresh air for a hot debate. Q Rev Biol; 85(1):27-55.

Clyde DF (1967). *Malaria in Tanzania*. London: Oxford University Press.

Hales S, N de Wet, J Maindonald, A Woodward (2002). Potential effect of population and climate change on global distribution of dengue fever: an empirical model. Lancet;

Hii YL (2013). Climate and Dengue Fever: Early warning based on temperature and rainfall. Medical Dissertation. Umeå, Sweden: Umeå University.

Himeidan YE and EJ Kweka (2012). Malaria in East African highlands during the past 30 years: impact of environmental changes. *Frontiers in Physiology; 3:315. DOI=10.3389/fphys.2012.00315*

International Federation of Red Cross and Red Crescent Societies (IFRC) (2008). Tanzania: Flood. Final Report. Retrieved from: http://www.ifrc.org/docs/appeals/08/MDRTZ005fr.pdf

Kovats, R. S., Campbell-Lendrum, D. H., McMichael, A. J., Woodward, A., & Cox, J. S. (2001). Early effects of climate change: do they include changes in vector-borne disease? *Philosophical Transactions of the Royal Society B: Biological Sciences*, *356*(1411), 1057–1068. http://doi.org/10.1098/rstb2001.0894

Mazigo, H.D., Nuwaha F, Kinung'hi S.M., Morona D, Pinot de Moira A, Wilson S, Heukelbach J, Dunne D.W. (2012).Epidemiology and control of human schistosomiasis in Tanzania. *Parasit Vectors; 5:274. doi: 10.1186/1756-3305-5-274*.

Mboera, L.E.G., Molteni, F., Nyange, A. & Thomas, E.G. (2005). Using retrospective epidemiologicaldata to determine malaria epidemic prone areas and development of

an epidemic earlywarning system in Mpwapwa District, central Tanzania. *Tanzania Health Research Bulletin; 7:73-78*.

Mboera, L.E.G., Massaga, J.J., Munga, M.A., Mayala, B.K., Kahwa, A.M., Msovela, J.,Shija, A., Mushi, A.K. &Kilale, A.M. (2010). Current status of the service availability at various levels Health System in Tanzania. National Institute for Medical Research, Dar es Salaam, Tanzania.

Mboera LEG, Mweya CN, Rumisha SF, Tungu PK, Stanley G, Makange MR, et al. (2016). The Risk of Dengue Virus Transmission in Dar es Salaam, Tanzania during an Epidemic Period of 2014. PLoSNegl Trop Dis, 10(1). doi:10.1371/journal.pntd.0004313

McCreesh, N., Nikulin, G. and Booth, M. (2015). Predicting the effects of climate change on Schistosoma mansoni transmission in eastern Africa. Parasites & Vectors; 8:4.

McSweeney, C., New, M. and Lizcano, G. (2008). *UNDP Climate Change Country Profiles: Tanzania*.

Miossec L, Le Guyader F, Haugarreau L, Pommepuy M. 2000. Magnitude of rainfall on viral contamination of the marine environment during gastroenteritis epidemics in human coastal population [in French]. RevEpidemiol Sante Publique 48(suppl 2):2S62–S71.

Mrema, S., Shamte, A., Selemani, M., &Masanja, H. (2012). The influence of weather on mortality in rural Tanzania: a time-series analysis 1999–2010. *Global Health Action*, *5*, 10.3402/gha.v5i0.19068. http://doi.org/10.3402/gha.v5i0.19068

Ministry of Health, Community Development,Gender, Elderly and Children. (2015). Dar Es Salaam: The United Republic of Tanzania.

Ministry of Health, Community Development,Gender, Elderly and Children. (2017). Cholera Vulnerability Risk Assessment and Mapping Report. Final Draft. Dar Es Salaam: The United Republic of Tanzania.

Muhammad Azami NA, S Salleh, H-m Neoh, S Syed Zakaria, R Jamal (2011). Dengue epidemic in Malaysia: Not a predominantly urban disease anymore. BMC Research Notes; 4:216.

Pascual M, X Rodo, SP Ellner, R Colwell, and MJ Bouma (2002). Cholera dynamics and El Niño—Southern oscillation. Science; 289:1766–1769.

Patz, J.A. (1998) Climate Change and Health: New Research Challenges. Health& Environment Digest;12:49–53.

Salazar MS, JH Richardson, I Sánchez-Vargas, KE Olson and BJ Beaty (2007). Dengue virus type 2: replication and tropisms in orally infected Aedesaegypti mosquitoes. BMC Microbiology; 7:9. doi:10.1186/1471-2180-7-9.

Trærup SLM, Ramon A Ortiz and A Markandya (2011). The Costs of Climate Change: A Study of Cholera in Tanzania. Int. J Environ Res Public Health , 8(12), 4386–4405.

UNICEF, World Health Organization. (2017). Joint Monitoring Programme for Water Supply, Sanitation and Hygiene (JMP). Retrieved February 14, 2018, from Joint Monitoring Programme for Water Supply, Sanitation and Hygiene (JMP): https://washdata.org/

Wandiga, S.O., Opondo, M., Olago, D. et al. (2010). Vulnerability to epidemic malaria in the highlands of Lake Victoria basin: the role of climate change/variability, hydrology and socio-economic factors. *Climatic Change; 99(3-4): 473-97.*

Watts DM, DS Burke, BA Harrison, RE Whitmire, and A Nisalak (1987). Effect of Temperature on the vector efficiency of Aedesaegypti for Dengue 2 virus. Am J Trop Med Hyg, 36:143–152.

World Food Programme (2006). Tanzania drought: urgent food aid for half a million. Retrieved from: https://www.wfp.org/news/news-release/tanzania-drought-urgent-food-aid-half-million

World Health Organization (2015). Operational framework for building climate resilient health systems. Geneva: World Health Organization.

Yanda P, Wandiga S, Kangalawe R, Opondo M, Olago D, Githeko A, Downs T, Kabumbuli R, Opere A, Githui F, Kathuri J, Olaka L, Apindi E, Marshall M, Ogallo L, Mugambi P, Kirumira E, Nanyunja R, Baguma T, Sigalla R, Achola P (2006). Adaptation to ClimateChange/Variability-Induced Highland Malaria and Cholera in the LakeVictoria Region, AIACC Working Paper No. 43

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