

**National Health and
Water Adaptation
State-of-Play
Inventory and Map**

Initiative for Climate Action Transparency – ICAT National Health and Water Adaptation State-of-Play Inventory and Map

Deliverable B

AUTHORS

Dr. T. Dlovu, Dr G.F. Sibandze, Dr D.G. Vilakati and Dr L.D. Mafu

Centre for Sustainable Energy Research (CSER)

March 2022

DISCLAIMER

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted, in any form or by any means, electronic, photocopying, recording or otherwise, for commercial purposes without prior permission of UNOPS. Otherwise, material in this publication may be used, shared, copied, reproduced, printed and/ or stored, provided that appropriate acknowledgement is given of UNOPS as the source. In all cases the material may not be altered or otherwise modified without the express permission of UNOPS.

PREPARED UNDER

The Initiative for Climate Action Transparency (ICAT), supported by Germany, Italy, the Children's Investment Fund Foundation and the ClimateWorks Foundation.



The ICAT Secretariat is managed and supported by the United Nations Office for Project Services (UNOPS)



Executive Summary

The release of greenhouse gases (GHGs) into the atmosphere, due to human activities, has resulted in changes in the climatic conditions. These gases trap heat, hence some of the predicted climate change variables include temperature rise, sea level rise and changes in precipitation, to name a few. It is also predicted that due to climate change, extreme events such as flooding, droughts and cyclones will be more frequent and more intense, some of which has already been experienced in Eswatini.

The changes in climatic conditions have inherently resulted in vulnerabilities for different sectors such as agriculture, water and health, where changes in water quality and availability have direct and indirect impacts, especially in rural, poor urban and peri-urban communities. It is, therefore, important to adapt to these changes to help people protect their homes and livelihoods from extreme and unpredictable weather phenomena, such as heat waves, droughts and floods.

The Government of Eswatini views climate change as one of the greatest challenges affecting our country in present times. The Government therefore prioritizes climate change as a development concern which requires urgent and long-term actions to reduce the vulnerability of its people by increasing adaptive capacity and improving resilience. Climate change is, therefore, the focus of the revision of the National Development Plans where all ministries are encouraged to develop, policies, projects and design technologies aligned with building climate change resilience. Health and water are two of the key sectors that have been prioritized as being vulnerable to climate change. These sectors have always been included in the National Communications (NCs), as well as Nationally Determined Contributions (NDCs) as priority areas for adaptation measures.

The third National Communication (NC3) reported that numerous adaptation measures were ongoing in the country in agriculture, biodiversity and conservation and the water sectors. The health sector was mentioned as a priority sector, but there were no specific adaptation measures identified. The recently updated NDC (2021) expounded on the adaptation measures for both the water and health sector, which was a welcome progress for the health sector. This component of the ICAT project is meant to develop a roadmap for tracking adaptation in the health and water sectors, through development of an inventory of adaptation activities in these sectors, identifying gaps, indicators and criteria for success for these activities. Finally, the project will develop an action plan to address the identified gaps. This deliverable therefore gives a summary of the inventory of adaptation activities in the two sectors. The approach employed involved document review, awareness raising (mainly for the health sector) and stakeholder consultations.

- For the water sector, it was noted that some of the activities related to what was prioritized in the updated NDC, were already ongoing as summarized below:
 - Improve water governance and compliance – several governance instruments have been developed
 - Develop water pricing structures – regulations to guide water pricing are being finalized
 - Strengthen the control and monitoring of water availability and use – manual gauging stations slowing being replaced by near real time gauging stations
 - Strengthen the capacity of early warning systems – HydroNet is still under development, efforts from different initiatives
 - Develop and implement water catchment adaptation plans and strategies - initiated the Mbuluzi catchment adaptation plan as a pilot project
 - Control of Invasive Alien plant species and pollution in catchments – several initiatives are being implemented in different institutions

- Design & construct water storage infrastructure for multiple use such as large dams, earth dams, sand dams etc. – some dams have already been built and there are plans to add more as well as increase capacity of existing ones

For the health sector, there were no activities that were implemented as climate change adaptation initiatives. This sector mainly responds to health problems through different programmes. The updated NDC identified some adaptation options, and a few are summarized below:

- Mainstreaming climate change into the national health policy and other strategic documents – the National Health Policy and the sector’s strategic plan provide an opportunity to mainstream climate change into the health sector.
- Establishing a multi-hazard early warning system to trigger prompt public health intervention when certain variables exceed a defined threshold – the health sector can benefit from the HydroNet system implemented in the water sector and presently through funding from the National Malaria Programme, there are weather stations in a few clinics in the country.
- Promote environmentally friendly waste management practices (SDG 6) – several WASH projects have been implemented by different stakeholders to address issues of sanitation and hygiene

Table of Contents

Executive Summary	ii
Table of Contents	iv
List of tables	vi
List of figures	vi
Abbreviations	vii
Introduction	1
1.1 Background	1
1.2 Climate change, adaptation and vulnerability	2
1.3 Climate change and Eswatini	2
1.4 Objectives.....	4
1.5 Approach and Methodology	4
Water Sector	7
2.1 Introduction	7
2.2 Climate change impacts to the water sector in Eswatini	8
2.3 Climate Change Adaptation in the Water Sector	8
2.3.1 Improve water governance and compliance	9
2.3.2 Develop water pricing structures	10
2.3.3 Strengthen the control and monitoring of water availability and use.....	11
2.3.4 Strengthen the capacity of early warning systems	12
2.3.5 Develop and implement catchment adaptation plans and strategies.....	13
2.3.6 Control of Invasive Alien plant species & pollution in catchments.....	13
2.3.7 Design and construct water storage infrastructure for multiple use	14
2.3.8 Enhance Water supply, Sanitation and Hygiene (WASH) Sector contribution to sustain healthy livelihoods.....	15
2.3.9 Create an enabling environment for the governance of WASH activities	16
2.3.10 Assess sustainable water supply options beyond 2030	17
2.4 Implementation progress of adaptation measures	17
Health Sector.....	21
3.1 Introduction	21
3.2 Overview of the health sector in Eswatini	22
3.3 Climate change impacts in the Eswatini health sector.....	23
3.4 Current programmes addressing climate change impacts.....	25
3.5 Adaptation option in the Health Sector – Eswatini Updated NDC perspective	31
3.5.1 Mainstreaming climate change into the national health policy and other strategic documents... 31	
3.5.2 Establishing a multi-hazard early warning system to trigger prompt public health intervention when certain variables exceed a defined threshold.....	32
3.5.3 Adopting sustainable climate smart technologies to enhance the resilience of health care facilities to the adverse effects of climate change	32
3.5.5 Financing health actions to address inequities and climate related vulnerabilities	32

3.5.6	Educating and informing the public of the needed measures to protect health from the adverse impacts of climate change.....	33
3.5.7	Improving and integrating the health management information system with other systems from relevant sectors to achieve a centralised MRV system	33
3.5.8	Mainstreaming gender responsive climate policies and emphasise special efforts to support vulnerable groups (women, youth, and children) in climate change adaptation efforts within all sectors of the economy.....	33
3.6	Water, Sanitation and Hygiene (WASH).....	37
	Conclusion and next steps.....	38
4.1	Conclusions	38
4.2	Next steps.....	38
	Bibliography	39

List of tables

Table 1.1:	State of knowledge on regional climate change.....	1
Table 2.1.	Water Sector adaptation implementation tracking.....	18
Table 3. 1:	Major causes of morbidity and mortality in Eswatini	23
Table 3. 2:	Climate change initiatives in the health sector.....	27
Table 3. 3:	Climate change adaptation measures initiatives in the health sector – Eswatini Updated NDC perspective	34

List of figures

Figure 1.1:	Timeline of major climate change policies.	3
Figure 3. 1:	Impact of climate change on human health.	22
Figure 3. 2:	Average annual natural hazard occurrence for the period 1980-2020	24
Figure 3. 3:	Climate impacts on health	25

Abbreviations

AdCom	Adaptation Communication
BERCS	Baphalali Eswatini Red Cross Society
CBD	Convention on Biological Diversity
CMIS	Client Management Information System
COP	Conference of the Parties
DWA	Department of Water Affairs
EIA	Environmental Impact Assessment
ETF	Enhanced Transparency Framework
ENTC	Eswatini National Trust Commission
EWSC	Eswatini Water Services Corporation
GHG	Greenhouse gases
GWP-E	Global Water Partnership - Eswatini
HMIS	Health Management Information System
IAPS	Invasive Alien Plant Species
ICA	International Consultation and Analysis
ICAT	Initiative for Climate Action Transparency
INDC	Intended Nationally Determined Contributions
IPCC	Intergovernmental Panel on Climate Change
IWRM	Integrated Water Resource Management
JRBA	Joint River Basin Authority
KOBWA	Komati Basin Water Authority
MoA	Ministry of Agriculture
MoH	Ministry of Health
MoICT	Ministry of Information, Communication and Technology
MoJ	Ministry of Justice
MEPD	Ministry of Economic Planning and Development
MTEA	Ministry of Tourism and Environmental Affairs
MTAD	Ministry of Tinkhundla Administration and Development
MNRE	Ministry of Natural Resources and Energy
MoWPT	Ministry of Public Works and Transport
MRV	Measurement, Reporting and Verification
NBSAP	National Biodiversity Strategy and Action Plan
NCCSAP	National Climate Change Strategy and Action Plan
NC1	First National Communication
NCCP	National Climate Change Policy
NC2	Second National Communication
NC3	Third National Communication
NC4	Fourth National Communication
NCs	National Communications
NDC	Nationally Determined Contributions
NDP	National Development Plan
NERMA	National Emergency Response Mitigation and Adaptation Plan
NGO	Non-Governmental Organisation
NIP	National irrigation Policy
NWA	National Water Authority
NWP	National Water Policy
RBA	River Basin Authorities
SADC	Southern African Development Community
SDGs	Sustainable development goals
UNFCCC	United Nations Framework Convention on Climate Change
WASH	Water, Sanitation and Hygiene
WHO	World Health Organisation

Introduction

1.1 Background

The sixth assessment report of the Intergovernmental Panel on Climate Change (IPCC) has concluded that it is unequivocal that human influence has warmed the atmosphere, ocean and land¹. Some of the major human activities contributing to global warming include deforestation, increasing livestock farming, industrialisation, burning fossil fuels, land use change, etc. Industrialisation has contributed to the emission of heat-trapping gases, such as carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O), which are released into the atmosphere causing the earth’s climate to change over time. The United Nations Framework Convention on Climate Change’s (UNFCCC) goal is to stabilize greenhouse gas (GHG) concentrations in the atmosphere at a level that will prevent dangerous human interference with the climate system, in a period which allows ecosystems to adapt naturally and enables sustainable development². The UNFCCC encourages Parties to put mitigation measures in place to limit the amount of GHGS emitted into the atmosphere and thus reduce the impacts of climate change. Even after introducing significant measures to reduce GHG emissions, some additional degree of climate change is unavoidable and will have significant economic, social and environmental impacts on communities.³ It is therefore, imperative that communities develop adaptive strategies to this change.

The changes in climatic conditions inherently affect different sectors and in varying degrees and these include the agriculture, water, ecosystems and biodiversity and health. It is, therefore, essential that countries develop adaptive capacity to protect their populace and the environment from the adverse impacts of climate change. There are known climate variables which inform the climate change story very clearly. These include temperature rise, sea level rise, changes in precipitation drought, etc. **Table 1.1** gives a summary of these variables, especially those that will directly and indirectly affect the water and health sectors.

Table 1.1: State of knowledge on regional climate change⁴

Climate variable	Change	Degree of confidence
Mean global sea level rise	Mean sea level rise will accelerate; IPCC projects 0.1 to 0.9 m by 2100.	Virtually certain
Temperature rise	IPCC projects global mean temperature to increase by 1.4°C to 5.8°C by 2100. Regional changes will vary. High latitude and inland areas will likely have more warming than global average.	Likely
Precipitation change	Direction generally uncertain – Very high latitude areas & equatorial regions could see an increase. Mediterranean region may see a decrease. Change in other areas is generally uncertain, but more information can be obtained by careful examination of model output.	Relatively low (the degree of confidence in projections of regional precipitation change is relatively low).
Intensity of peak precipitation	Increase on average – This does not mean that all precipitation events become more intense.	Very likely in many areas
Drought	Increase in most mid-continental areas during summer.	Likely
Flooding intensity	Increase in many areas.	Likely
Tropical cyclone wind & peak precipitation rate	Increase in some areas.	Likely

ADAPTATION

The adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities. In this regard, adaptation can be happening in response to perceived change in climate or in anticipation of future change in climate.

1.2 Climate change, adaptation and vulnerability

Climate extremes are increasingly major impediments to development in Southern Africa, where livelihoods and economies are highly sensitive to climate fluctuations. While the region boasts of an incredible diversity of ecosystems, natural resources, economic activities and cultures, it is also characterized by rapid population growth, urbanization, encroachment into ecologically marginal areas, with resultant effects on livelihoods, health and poverty. The changes in climatic conditions have inherently resulted in vulnerabilities for the agriculture, livestock and agricultural sectors, resulting in reduced and fluctuating food production; changes in water quality and availability, which have direct and indirect impacts on health and livelihoods, especially in rural, and poor urban and peri-urban communities. It is, therefore, important to note that adapting to these changes in climate is a necessity to help people protect their homes and livelihoods from extreme and unpredictable weather phenomena, such as heat waves, droughts and floods.

VULNERABILITY

The degree to which a system is susceptible to, or unable to cope with, the adverse effects of climate variability and change. It is described as a function of three components, namely exposure (what is at risk to climate change), sensitivity (the degree to which a system is affected) and adaptive capacity (the ability of a system to adjust to climate change). It can be noted that the greater the exposure or sensitivity, the greater the vulnerability. Low vulnerability is expected when there is a high adaptive capacity.

Adaptation commonly focuses on reducing vulnerability to the immediate and predicted impacts of climate change and increases the ability of communities to be more resilient and cope better with the impacts of a changing climate. However, it is also worth noting that people and communities are differentially exposed to hazards and are affected differently by climate-related health risks. Children, older adults, and low-income communities are at far greater risk than the rest of the population.

The UNFCCC gives equal weighting to both climate change adaptation and mitigation. Governments, therefore, have the responsibility to assist and support people to adapt to climate change, especially those who are poorest and most vulnerable. The key to providing and assisting people to adapt is through strong, consistent national policies and innovative, effective international agreements that address the key elements of climate change adaptation.

1.3 Climate change and Eswatini

The Government of Eswatini views climate change as one of the greatest challenges of present times, which is not only affecting the country, but the region and the entire world. The Government therefore prioritizes climate

change as a development concern which requires urgent and long-term actions to reduce the vulnerability of its people by increasing adaptive capacity and improving resilience.

The Kingdom of Eswatini ratified the UNFCCC in 1996 and the Kyoto Protocol in 2002, to contribute to the global fight against climate change. As part of the obligations under the UNFCCC, Eswatini submitted its First National Communication (NC1) in May 2002, the Second National Communication (NC2) in March 2012 and the Third National Communication (NC3) in October 2016 (**Figure 1.1**). The country is also in the process of compiling its Fourth National Communication (NC4). This is because the Government of Eswatini considers the elaboration of National Communications (NCs) as a national priority, not only fulfilling its commitments to the UNFCCC, but as a key instrument to gauge implementation of national policies and strategies related to climate change within the context of its development agenda. Moreover, as a country, Eswatini is geared towards setting the scene and paving the way for increased national engagements for meeting the objectives of the Convention.

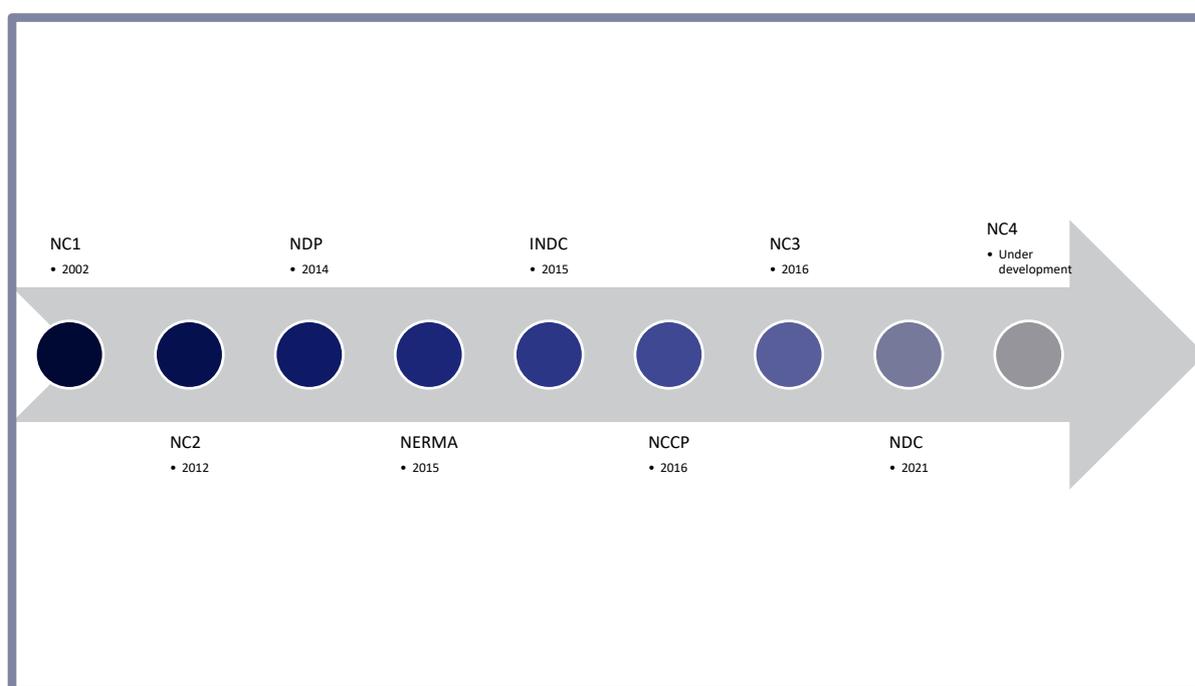


Figure 1.1: Timeline of major climate change policies.

From the NC1, it was clear that both the water and health sectors are sensitive to climate change and hence at risk of climate change impacts. Adaptation strategies were mainly identified for the water sector, while no adaptation options were identified for the health sector. The water sector adaptation strategies were directed at developing robust water resource systems as well as techniques to incorporate climate change uncertainties into the long-term planning. These included efficient water use, especially for irrigation purposes, as well as water storage through dam construction and modification of existing structures (installing canal linings, changing location of water intakes etc.).⁵ Similar adaptation options were proposed in the NC2 and these included implementation of efficient water use, strengthening of stream flow observation, early warning systems, implementation of integrated water resources management and rainwater harvesting.⁶

The proposed actions in the NC1 to NC3 resulted in the development of a number of new policy documents and instruments, such as the revised National Development Plan (NDP) (2014), the National Emergency Response Mitigation and Adaptation Plan (NERMA) (2015) and the newly-approved National Climate Change Policy (NCCP) (2016) (**Figure 1.1**). Eswatini also made a number of key adaptation related commitments in its Intended Nationally Determined Contributions (INDC) developed in 2015 for presentation at the 21st UNFCCC Conference of Parties (COP21) in Paris, France, December 2015.⁷ In the Updated NDC⁸, Eswatini identified some key sectors

(also identified in the INDC) that need to be targeted to form the adaptation contribution of the country to the UNFCCC. These sectors are Biodiversity and Ecosystems, Water, Agriculture and Health. Notably, the adaptation actions are silent on gender issues, whereas in Eswatini, the economic sectors identified in the NDCs are largely driven by women. Hence, the negative effects of climate change fall most heavily upon women. For effectiveness in the reviewed NDCs, it will be critical to adopt gender-inclusive national adaptation actions. This needs to be done through engagement with all relevant stakeholders.

The NC3 reported that numerous adaptation measures were ongoing in the country which included various agricultural and community irrigation projects as well as biodiversity and conservation efforts which addressed cross-cutting measures that addressed priority areas related to water and agriculture.⁹ Even though the health sector was included, there were no specific adaptation measures from this sector. In the NC3, the water sector adaptation strategies were also related to those identified in previous NCs and these addressed four priority areas which were:

- Institutional strengthening to support climate change resilient strategies;
- Systems for weather and climate early warning and information;
- Community-based adaptation to climate related changes in water resources (including catchment flows, rainfall pattern and intensity and water quality); and,
- Awareness raising and knowledge management for communities.

1.4 Objectives

This work is one of five activities under the ICAT Eswatini project, and it is the only component that focusses on adaptation as opposed to mitigation. The overall aim of this activity is to develop a roadmap for tracking adaptation in the health and water sector (with a focus on gender). This will be done through a series of steps, namely:

- Development of an inventory of past and current climate adaptation plans, policies and activities in the health and water sector, including:
- Identification of key indicators for adaptation in health and water sector;
- Identification of key criteria for success for these adaptation indicators;
- Identify key gaps (institutional, monitoring, tracking) in health and water adaptation sectors;
- Development of a draft action plan recommending how to fill gaps to enable measuring and tracking progress towards achieving these indicators;
- Develop a draft Roadmap reflecting gap analysis and findings from workshop.

This report “National Health and Water Adaptation State-of-Play Inventory and Map” is the first deliverable for this component. The aim of this report is to present the inventory of past and current climate adaptation plans, policies and activities in the health and water sector.

1.5 Approach and Methodology

The Kingdom of Eswatini has made considerable strides in responding to climate change, including conducting vulnerability and adaptation assessments for some of the key sectors that are susceptible to climate change impacts, including the water sector. Eswatini’s updated NDC has been the result of extensive work in the climate agenda of the Kingdom. However, there is still a considerable knowledge gap with regards to climate change impacts in the health sector. Even though there has been much work in the water sector, there is still opportunity for improvement and further mainstreaming of the activities with the Kingdom’s climate framework. Institutional arrangements for climate change adaptation need to be better understood by government and key government stakeholders to work towards a concerted effort in adaptation. The health sector’s involvement in

adaptation planning is still at infancy and there is considerable opportunity to bring the sector on board the country's climate agenda. In completing the State-of-play report the following activities were undertaken:

1. Document review:

- a. A review of existing plans, organizational reports, policies and other relevant documents from government departments, government and regional agencies, online sites, stakeholder organizations directories, and websites, peer-reviewed journal reviews and other available literature/reports was undertaken.
- b. The review of documents was complemented by the review of current projects and regional reports addressing climate change adaptation including the NCs and NDCs.
- c. As part of the review adaptation indicators and criteria for success in both the health and water sectors were also identified.

2. Creating awareness in the health sector

The first part of the stakeholder engagement was to build climate change awareness, particularly in the Health sector. This is because the health sector has lagged in climate change adaptation planning in Eswatini. No comprehensive assessment has been conducted to determine the health impacts associated with climate change as well as adaptation strategies that can be explored to minimize the impacts of climate change in this sector. During the process of revising the NDC, one of the adaptation goals identified in the health sector was the need for awareness creation on the impacts of climate change and therefore, this activity was necessary to bring the key people in the Ministry of Health (MoH) on board. Due to the prevailing COVID-19 conditions, it was not easy to conduct large group gatherings. Consequently, the awareness-raising engagements were targeted and undertaken for programme managers for the different health programmes. The MoH has numerous programmes that address climate change adaptation activities. However, these programmes are not linked to the country's climate change agenda and, therefore, a considerable lack of data on climate adaptation is observed from the MoH.

For this activity an awareness workshop was held on 2nd February 2022 at Hilton Hotel, Mbabane (see the workshop report titled "Awareness Raising & Stakeholder Consultation Workshop Report")¹⁰

3. Stakeholder engagement

Stakeholder engagement was necessary to obtain in-depth information about adaptation activities undertaken by the two sectors. The following activities were conducted:

- a. Data collection tools were designed for both sectors and these were administered to the stakeholders during the workshops. The aim was to document current adaptation actions in both sectors, focussing on the legal framework, programmes/projects being implemented, indicators for success, gaps and the reporting framework in both these sectors.
- b. Initial stakeholder engagement was conducted during the ICAT Eswatini Inception Workshop (9th and 10th September 2021)¹¹ where the developed tool was used to get in-depth information on adaptation activities in the health and water sectors. In this consultation, the proposed methodology was presented to the stakeholders and engagements led to better understanding of both sectors.
- c. A second stakeholder workshop (3rd February 2022, which was a follow up to the initial one) was used to get more information about the adaptation activities in each sector and the gaps that exist. In this

workshop, stakeholders were brought to deliberate on the adaptation activities in their respective sectors.

- d. Further consultations were organized via electronic means and face-to-face consultations to complement data gathered from the workshops.
- e. A final workshop was held with key stakeholders on the 28th of April 2022 to review and discuss the findings as set out in this and other ICAT Eswatini Activity 1 activities and work.

Water Sector

2.1 Introduction

The national investment report on water for agriculture and energy for Eswatini, published in 2015, reported that Eswatini has plentiful surface water resources, but has limited groundwater resources.¹² Surface water resources are estimated at 4.5 km³/year with 42% originating from South Africa¹³ and are mostly from the five (5) river basins namely: Lomati, Komati, Mbuluzi, Usutu and Ngwavuma rivers.¹⁴ The Komati, Usuthu and Lomati rivers originate from South Africa and as such are governed by transboundary treaties and Southern Africa Development Community (SADC) protocols on water-shared courses. Both the Lomati and Komati are sub basins of the Incomati River basin, and the Komati basin flows from the eastern part of South Africa, through the north of Eswatini, into the southern part of Mozambique, where it discharges into the Indian Ocean. It covers approximately 47,000 km² in the country. Even though groundwater is available, it is used to a lesser extent due to restricted recharge rates estimated between 2 – 10% due to reduced rainfall.¹⁵

The country receives, on average, 800 mm of rain, as estimated for the period between 1991 and 2020¹⁶. The highveld records the highest rains followed by the middleveld, the Lubombo plateau, then the Lowveld. Precipitation in the country varies considerably and this has resulted in periods of flash floods and/or droughts. These events have been witnessed more frequently over the past several decades due to climate change that have led to Eswatini being considered a semi-arid country. The precipitation trends are synonymous with the decline in the number of rainy days, impacting on the intensity and dry spell durations¹⁷. Other observed trends over time in Eswatini include changes in the onset or rains, their duration, dry spell frequencies, and rainfall variations and intensities¹⁸. These changes influence the economy, and well-being, health and livelihoods of the population as water is one of the basic needs for human health as well as food production in the agriculture sector.

The water sector remains one of the most complex to navigate yet vital for socioeconomic development. It plays a central role in the health, agriculture, various industries and for domestic use. The water resource is often described on two parameters: the water quantity and quality which are documented to be the most affected by climate change effects in a number of national documents^{19,20} and peer reviewed research works.^{21,22} The water resource in Eswatini is covered and managed at a national administrative and political level by the Ministry of Natural Resources and Energy (MNRE) through its Department of Water Affairs (DWA). DWA's activities and jurisdiction in the water sector are guided by a number of legislative documents within the MNRE and partner ministries who also provide support on policy direction and water's regulatory framework²³ including the MoH, the Ministry of Tourism Environmental Affairs (MTEA), the Ministry of Agriculture (MoA), Ministry of Justice (MoJ) and Ministry of Economic Planning and Development (MEPD). It is through the collaborative understanding of these ministries, and other government agencies, that the government of Eswatini has been able to establish, maintain and improve the institutional and legal frameworks with which the water resource is managed.

Eswatini's central vision for the water sector, which is to "*attain national economic prosperity and social upliftment through equitable, productive and optimum utilisation of water resources while ensuring environmental sustainability*,"⁶ is being negatively obstructed by the impacts of climate change. As such, the country, governmental partners, has developed legal documents and set-up institutions that seek to streamline climate change adaptation in the water sector and other adjacent sectors. These documents include the National Water Policy (NWP) of 2018, NCCP of 2016²⁴, Water Resources Master Plan of 2015²⁵ and National Irrigation Policy (NIP) of 2015,²⁶ amongst others. These legal documents have been crafted such that they align with relevant regional and international agreements that seeks to protect the water resource from climate impacts, including the SADC regional water policy and strategy of 2006, the revised protocol on shared water sources SADC of 2000, Regional climate change strategy of 2015, transboundary water sharing agreements, and the SADC Agriculture Policy of 2013 and the United Nations' Sustainable Development Goals (SDGs).²⁷

In the recently updated NDC, the country prioritized the agriculture, water, health, ecosystems and biodiversity and infrastructure sectors for adaptation actions.²⁸ The inclusion of the health sector, which is often left behind in climate change interventions, yet is a receptor of the outcomes of the water and other sectors, has been a progressive action by the country. In line with the objectives of this project, the influence of the water sector on the health sector provides an opportunity to improve the monitoring and tracking of adaptation actions in the water sector that will also improve the capacity in the water and health sectors and also enhance the adaptive capacity of the health sector through a careful assessment of the water sanitation and hygiene (WASH) as a sector.

This report, therefore, collates the climate action plans, consolidated as the NDCs, to adapt to the impacts of climate change in the water sector. These measures have been curated to include actions that are already taking place and commitments by the country on climate action. They are then linked to legislative documents, country master plans and other such documents to link the legislative framework to the projects being implemented by various stakeholders to advance climate action in Eswatini. As such, the next section elaborates on the adaptation measures, lists the legislative documents and discusses specific projects that are being implemented in support of the measure to demonstrate the current state of play.

2.2 Climate change impacts to the water sector in Eswatini

A recent vulnerability study of the water sector and infrastructure report states that impacts of climate change on water resources and infrastructure are likely to show through changes in the frequency and intensity of extreme events such as drought, floods and storms. It is expected that changes in the frequency of droughts and floods will be observed or have already started to be experienced in Eswatini. Other effects of climate change in the water sector include rising surface temperatures, changing rainfall patterns and hailstorms as reported in a Green Climate fund report.²⁹

Climate change can affect the amount, intensity and temporal distribution of precipitation and this is likely to alter the hydrologic cycle in ways that may cause substantial impacts on water resource availability and changes in water quality.³⁰ Other effects include changes in run-off, which could arise because the amount of water evaporated from the landscape and transpired by plants, will change with changes in soil moisture availability and plant responses to elevated CO₂ concentrations. Hence impacts will be seen in stream flows and groundwater elevations. The projected future warming of the earth is expected to cause changes in atmospheric and oceanic circulation, and in the hydrologic cycle, leading to altered patterns of precipitation and run-off.

An increase in global average precipitation and evaporation as a direct consequence of warmer temperatures is one of the changes that will be observed. These effects are unpredictable, as some parts of the world or regions experience flooding, others may experience extreme droughts. Some of the impacts of climate change on the water sector which are already being experienced by Eswatini include: erratic rainfall, prolonged droughts and heatwaves, dropping lower temperatures whilst maximum temperatures are increasing and more frequent floods.³¹ The water sector has been prioritised since the NC1 submitted in 2002 as a result of the glaring impacts of climate change in the sector and the centrality of water in the socioeconomic development agenda as outlined in a number of country plans.

2.3 Climate Change Adaptation in the Water Sector

The shrinkage of water resources, because of climate change, has frustrated a number of economic actions in the agriculture sector and has also resulted in resources stress in the health sector of Eswatini. This necessitated a careful and well-coordinated drafting of actions that are implementable to adapt in climate change. These actions have been evolving with each report or country document that strengthens the sector adaptation to climate change. The adaptation measures that are discussed in this report are extracted from the recent NDC of 2021. As such, for each adaptation action, the report synthesises the actions in implementation, legal documents that allows for such

actions and institutions that are responsible. Lastly, a stocktaking summary table (Table 2.1) is presented to track the progress in the implementation.

2.3.1 Improve water governance and compliance

Water governance institutions and legislation creates a conducive environment for water resources management, improves equitable water use and strengthens adaptation to water shortages by improving water use efficiency³². This adaptation measure includes the set-up of institutions that will play a role in the governing of water resources, their use and revenue collection associated with water use. A comprehensive approach has been the establishment of an intentional working relationship within government departments as well as with the private sector with interests and benefits from the water sector. This is led by the MNRE through the DWA and the following ministries playing significant roles from development of legislation to overseeing implementation of various actions; MoJ, MoH, MoA, MEPA, Ministry of Tinkhundla Administration and Development (MTAD) and the MTEA. Through the cooperation of these ministries, and other stakeholders, the country has been able to strengthen the water governance through the development and strengthening of legislation and institutions at national and community level.

Water legislation is extracted from the Constitution into the Water Act of 2003 which consolidates the administration of water resources under the MNRE and establishes basin level structures (river basin authorities, irrigation districts and water user associations) with powers to manage water resources.³³ However, above these structures is the National Water Authority (NWA) whose role is to supervise the activities of the structures described above and to advise the Minister on policy matters.³⁴ The Act provides for among others the Authority committees, the Department of Water Affairs and the Water Apportionment Board that have varying roles powers and functions under the Act including potable water supply for rural areas. On the other hand, the Water Services Act of 1992 established the then Water Services Corporation (SWSC), now Eswatini Water Services Corporation (EWSC) to provide water and waste water services in urban and peri-urban areas.³⁵ Other legislative guides include the NWP (2018), the Water Resources Master plan update of 2016, the NCCP (2016), The Food Security Policy of 2005, The Eswatini National Agricultural Investment Plan of 2015, The National Irrigation Policy of 2015, The National Environment Policy, Public Health Act, 1969, the Pesticides Management Act of 2017, The Environment management act, 2002, Disaster management act 2006, the National Forest Policy of 2002 and other national sectoral plans in the health, water and agriculture sectors.³⁶ The country has made strides in developing relevant regulations and strategies to operationalize and implement the various acts.

Relevant Projects

The following projects are being implemented by the government, her partners and stakeholders to promote the adaptation to climate change by the water sector in terms of strengthening the governance of the sector. These include;

- Strengthening of legislation through
 - development of the following:
 - the draft drinking water regulations of 2020;
 - the revision of the draft water permitting and charging regulations of 2021;
 - the draft dam safety regulations, 2016;
 - the draft health bill, 2018;
 - draft wetlands policy, 2020; (approved in 2022)
 - the draft biodiversity conservation and management policy and action plan, 2016;
 - draft biodiversity conservation and management bill of 2008;
 - the forest bill of 2008 (confirm year);
 - revision of environmental audit assessment and review regulations (EAARR) and
 - the operationalization/implementation of the various policies (NWP, 2018; NCCP, 2016; NBSAP post 2020.

- Institutional development and capacity strengthening through:
 - development and set-up and launch of joint river basin authorities (JRBA board) for effective management of the water resource (2020).
 - strengthening of water governance institutions to better and effectively manage water resources at national and community level (e.g. strengthening of RBAs, establishment of improved water management models, training of rural water committees);
 - empowerment of irrigation districts and water user associations; and
 - linkages with research institutions for collaborations on data gathering, analysis and presentations.
- Awareness raising, infrastructural upgrades and maintenance through:
 - installation of near real time surface and groundwater monitoring equipment and centralized information systems;
 - readiness for water permitting and development of the implementation plan;
 - re-establishment of the groundwater monitoring network;
 - rehabilitation of water gauging stations;
 - increased insight project (project on improving understanding of water distribution in the Usuthu basin);
 - expansion of reticulated water supply network for the Shiselweni and Manzini regions;
 - assessments and feasibility studies for storage infrastructure (Nondvo, mkhondvo-ngwavuma; and
 - improvement of maintenance and construction of dams for water storage.

2.3.2 Develop water pricing structures

Water pricing structures will enable efficient water use and scale up smart metering systems. Under this measure, the country envisages to establish water pricing structures to encourage efficient water use and scale up smart water metering systems by ensuring the monitoring and equitable pricing of water use, for the management of basins and monitoring of best practices in irrigation in the various sectors that abstract surface water. There have been a number of interactions between the government and stakeholders that are affected, interested and ought to benefit from water pricing, to forge a way forward and how to better implement this measure. The outcomes of such workshops have assisted in crafting the best way for implementation.

Water pricing was first introduced by the Water Act of 2003 and further expanded on in the NWP (2018) and included in the water resources master plan update 2016-2025. The water resources master plan update rightly entrusts the MNRE, through the DWA, as a strategic objective, to implement water permitting and establish charging systems at sub-national level water resources management institutions. This will develop and implement water abstraction and effluent discharge strategies that will also generate and collect revenue.^{37,38} The same is covered in the NWP (2018) under water utilization control in issuing permits and water allocation for agricultural use to promote good irrigation practice and efficiency and monitoring of water use. These have resulted in the development of the draft water permitting regulations of 2016 which have still not been passed into law.

Relevant projects

The following specific actions have been earmarked and others are already being implemented to advance this measure;

- Strengthen legislation through:
 - development and revision of the draft water permitting and charging regulations of 2021;
 - implementation of the integrated water resources management and the water resources master plan;
 - enforce the borehole drilling regulations in partnership with EWSC; and
 - implementation and operationalization of the NWP of 2018.
- Institutional development and capacity strengthening through:
 - conduct organizational review and set up RBAs;

- establishment and launch of the JRBA project board;
- build capacity for the river basin project boards, irrigation districts and water user associations; and
- institute structures for water use revenue collection.
- Awareness raising, research and assessments and infrastructural upgrades and maintenance through:
 - securing funding for the implementation of the implementation of the water resources master plan;
 - engagement of stakeholders including water user associations, irrigation districts and river basin authority boards on water pricing regulations; and
 - development the water use efficiency policy.

2.3.3 Strengthen the control and monitoring of water availability and use

Water availability and its use define the social and economic health of the country with a number of its economic activities dependent on water availability, such as agriculture. Most of the impacts of climate change, including droughts and floods, affect availability of water and its usability. More than 42% of water resources in Eswatini are on shared water courses and as such their governing and use is guided by the transboundary legislative framework together with local legislation and plans.³⁹ Therefore, climate change adaptation also requires the country to strengthen and monitor water availability and use to protect surface & groundwater resources from over abstraction & impose timely restrictions when needed. The mixed climate in many catchments and the land and water use patterns for agricultural use has resulted in increasing water demand over the years. However, the importance of water use efficiency and equitable use through water permitting and other adaptation measures have reduced the burden.

The legislative guidance, from the Water Act of 2003 and the climate change adaptation strategy has been progressive for the water sector. The vision of the NWP (2018) captures the importance of water resources and its contribution to the country's growth. To cater for the transboundary management of water quantity and quality, the treaty on development and utilisation of water resources of the Komati River Basin established the Komati Basin Water Authority (KOBWA) which has played a pivotal leadership role in the management of the basin and capacity building of other basin authorities on water resources management.⁴⁰ KOBWA has also imparted skills to water user associations and irrigation districts collaboratively with the DWA. The establishment of JRBA project board will expand this function for local basins and strengthen reporting and data sharing for better control and monitoring of water availability. Other guiding legislative documents include; Water Resources Master plan update 2016-2025; National Climate Change Strategy and Action Plan (NCCSAP) for the period 2014–2019 (2014); The NIP (2015); The Comprehensive Agriculture Sector Policy (2005); National Agricultural Investment Plan (2015); National Disaster Risk Management Policy (2011).

Relevant Projects

The following projects are being implemented through the guidance of the relevant government ministries and departments;

- Strengthen legislation through;
 - development and launch of the NWP of 2018;
 - review and update of the water resources master plan of 2016; and
 - development of the draft water permitting and charging regulations of 2015.
- Institutional development and capacity strengthening by;
 - building capacity for the RBA project boards, irrigation districts and water user associations;
 - setting-up of the Global Water Partnership Eswatini; and
 - strengthening of irrigation districts and capacitation of water user associations.
- Awareness raising, research and assessments and infrastructural upgrades and maintenance through;

- monitoring of the abstraction propensity to avoid over abstraction of water for designated use. e.g. reduction of abstraction at Hawane dam;
- installation of near real time surface and groundwater monitoring equipment and centralised information systems;
- set-up of satellite monitoring systems in decision support;
- rehabilitation of water gauging stations; and
- readiness for water permitting and development of the implementation plan.

2.3.4 Strengthen the capacity of early warning systems

Early warning information assists in the preparation and planning for extreme and/or dangerous events and allows the population adequate time to manage risks and reduce impact of extreme events.⁴¹ It also allows for proper management and mitigation of risks associated with infrastructure and downstream users and reduces disaster risk. With this measure, the country seeks to improve preparedness and response to disaster whilst reducing disaster risk, through the implementation of early warning systems for water related hazards and avail information to help the nation prepare and plan for extreme events and manage associated risks and the development and update of emergency preparedness plans, dam safety plans, flood and drought risk reduction strategies.⁴²

The legislative guidance is provided by the National Disaster Management Act of 2006; National Disaster Risk Management Policy of 2011 and early warning systems are also mentioned in the NWP (2018); the NCCP (2016); Water Resources Master plan update 2016-2025 and the Swaziland Disaster Risk Reduction National Action Plan 2008 – 2015 and the Water Pollution Regulations of 2010. The NWP (2018) gives direction on the strategies for managing impacts of droughts, protection of watercourse ecosystems, the management of droughts and floods and pronouncing on the preservation of flood zones. Also, the monitoring of water sources, both quantity and quality, is a strategy that ensures the prevention of risks of water availability/unavailability, and impacts of pollution.⁴³

Relevant Projects

Several projects have been undertaken to advance the capacity of early warning systems and they are categorised as follows;

- Strengthen Legislation through;
 - development and implementation of a national flood and drought risk reduction strategy by 2030.
 - development, review and update emergency preparedness plans for all the major dams.
- Institutional development and capacity building by;
 - the establishment, capacitation of sub-national authorities to set-up, develop and create awareness on early warning systems, including river basin boards, irrigation districts, user associations and the WASH forum
- Rehabilitation and upgrade of infrastructure and programs for implementation of the measure through;
 - development and implementation of Hydronet and Hydromet for water related hazards for River Basin Authorities;
 - development of methods to quantify water usage in the River Basins by sector and users' groups including installation of water meters in agricultural water use targeting 25% of smallholder farmers by 2030;
 - undertake water resources assessment for climate change impacts, including continuing determination of resource availability and quality, and water demand trends in the river basins;
 - augment and improve integrated weather and climate observation stations;
 - secure water allocations for community-driven water efficient projects that are driven by the youth and women;
 - re-establishment of ground water monitoring network; and
 - building and rehabilitation of analogue gauging stations.

2.3.5 Develop and implement catchment adaptation plans and strategies

Catchment adaptation plans and strategies improve and enhance ecosystem and community resilience through reduced flooding and disaster risks, preservation of forests for carbon sequestration and provision of fuel and timber as well as provision of sustainable natural resources for immediate communities. The establishment and capacitation of the JRBA project board advances the country's better management of catchment areas while advancing gender inclusion and youth integration. This measure requires harmonised baseline data for catchments to ascertain the impact of the implementation of catchment adaptation plans and strategies as well as guidelines on parameters for the monitoring of catchments.

This measure is provided for in the Water Act of 2003, expanded in the NWP (2018), Intergrated Water Resources Management (IWRM) strategy 2015, Second National Biodiversity Strategy and Action Plan (NBSAP) of 2016 and the National Environmental Policy of 2006. These are implementable through collaborative guidance from the MNRE's DWA, MoJ, MoA, MTAD and MTEA.

Relevant projects

The following projects advance the implementation of catchment adaptation plans and strategies;

- Strengthen legislation through;
 - development of the draft wetlands management policy, 2020;
 - development of the IAPS strategy of 2021; and
 - alignment with and implementation of transboundary agreements.
- Institutional development and capacity building through
 - the establishment and operationalizing of the JRBA project board;
 - implementation of the National Environmental Policy of 1997;
 - capacity building and strengthening of Eswatini National Trust Commission (ENTC) programmes, EEA regulatory functions; and
 - capacity building within DWA and partners and other Water Act institutions.
- Awareness raising, research and assessments and infrastructural upgrades and maintenance
 - development and implementation of Tinkhundla and chiefdom development plans to include climate change adaptation;
 - rehabilitation of degraded areas and conservation of biodiversity and protected areas within communities;
 - undertake research and practise crop diversification and promote the farming of specialised crops in dedicated zones, e.g. drought tolerant crops in drought prone areas;
 - gather data for water consumption estimates for different crops and tree species; and
 - create awareness and prohibit excessive deforestation and the exploitation of wetlands.

2.3.6 Control of Invasive Alien plant species & pollution in catchments

The progression of climate change has resulted in a number of impacts in the water sector which include the proliferation of alien invasive plants which temper with stream flows and shrink the available water resources thus reducing the desirability of water for other uses. The control of invasive alien plant species (IAPS) and pollution in catchments protects both water quantity and quality, which is also directly impacted by the reduced rainfalls due to climate change. Waste management becomes an integral part of the prevention of catchment pollution by communities and activities within basin catchments.⁴⁴

A number of legislative documents are being implemented by the Eswatini Environmental Authority with the key function of *"improving the level of protection, conservation and enhancement of the environment and the sustainable management of natural resources."*⁴⁵ As such, the management and control of invasive plants and catchment pollution is covered in a number of environmental legislation including; Water act of 2003 and expanded

on in the Environment management act of 2002, Pesticides management act of 2017, control of plastic bags of 2021, water pollution regulations of 2010, chemical control regulations, second NBSAP of 2016, the NWP (2018), National Environmental Policy of 1997. Invasive plants were declared a national disaster in 2005 and robust efforts were made to clear them with an intention to eradicate them from both land and basic catchment areas. The NWP (2018) provides for the prevention of waste disposal and further spells out the control of invasive species through the enactment and enforcement of laws and regulations “to control the management, entry, and spread of alien invasive species”, that will align with the SADC instruments and global biodiversity conventions and raise awareness on the eradication of non-economic alien invasive species.⁴⁶

Relevant projects

The country had committed to eradicating alien species by 2020, a target which was shifted to 2022. This was contained in the fifth national report to the convention on biological diversity (CBD) in 2014 and the second national biodiversity strategy and action plan in 2016. Other projects are;

- Strengthening of legislation through:
 - synergism of various legislation that deals with the protection of catchment from pollution and preventing infestation of catchments by invasive species;
 - development of the draft National Wetlands policy of 2020 to assist in the administration of existing laws and regulations related to wetlands;
 - revision of the Second National Biodiversity Strategy and Action Plan to align with the post 2020 global strategy;
 - development and update of Environmental Impact Assessment (EIA) guidelines for assigning project categories, scoping report, initial environmental evaluation, environmental impact assessment, comprehensive mitigation plan, environmental audit report and consultation and public participation; and
 - revised and formalized the IAPS strategy of 2021.
- Institutional development and capacity strengthening through:
 - Strengthening and repurposing of Water Act and partner institutions; and
 - Establishment of the Global Water Partnership – Eswatini (GWP-E) and capacity building of partners.
- awareness raising, research and assessments and infrastructural upgrades and maintenance
 - commissioning and development of the State of Environment assessments (2014, 2020);
 - development and support of integrated waste management strategies for Mbabane, Kwaluseni, Siphofaneni and Lobamba;
 - management of the environmental fund to promote environmental protection and promote climate resilient communities;
 - KOBWA is finalising a climate change strategy for the Komati catchment, focusing on adaptation in relation to water resources;
 - continued commitment to strengthening risk-based approaches at border entries;
 - development of a robust risk assessment and prioritization framework for Eswatini; and
 - putting in place early detection and monitoring systems for prominent IAPS within Eswatini.

2.3.7 Design and construct water storage infrastructure for multiple use

The water resource, availability and use, is greatly impacted by climate change events such as droughts and floods. An adaptation measure that seeks to ensure water is available in either of the events is the expansion of climate resilient water storage infrastructure for multiple use; large dams, earth dams, sand dams and temporal storage infrastructure. The establishment of the Maguga dam, for instance, has ensured water users and irrigation districts within the Komati catchment covers water duty in excess of 12000 m³/ha/a for the sugarcane irrigation, citrus growing and domestic use.

The DWA of the MNRE is mandated by the Water Act of 2003 to lead and coordinate the infrastructural expansion of water resources including the building and maintenance of dams in partnership with other government ministries including the Ministry of Public Works and Transport (MoPWT), and MoA. The NWP of 2018 identifies the need to optimally operate the available dam infrastructure for maximum benefits for water availability, sanitation and hygiene (WASH) and the water resources master plan update enlists the strategies to achieve the objective to increase availability of water. Other legislative documents and plans that enable this measure are; NCCP of 2016, NCCSAP for the period 2014–2019, Inco-Maputo agreement, National Sanitation and Hygiene Strategy 2019-2023.

Relevant Projects

- Strengthening of legislation through
 - development of the draft Dam Safety Regulations of 2020; and
 - update of and implementation of the streams and banks regulations of 1951.
- Institutional development and capacity strengthening through
 - establishment of the JRBA project board; and
 - strengthening and availing resources for the NWA to fully operate as per the guidance of the Water Act of 2003.
- awareness raising, research and assessments and infrastructural upgrades and maintenance;
 - development and implementation of chiefdom development plans through MTAD;
 - construction of medium scale dams in the high and upper middleveld agro-ecological zones;
 - expansion of potable water reservoirs and rural potable water schemes;
 - rehabilitation and construction of more dams such as Nondvo, Mpakeni and Ethemba dams;
 - construct and rehabilitate irrigation schemes targeting development of downstream irrigation infrastructure in the areas where new dams are being constructed; and
 - expansion of reticulated rural water schemes.

2.3.8 Enhance Water supply, Sanitation and Hygiene (WASH) Sector contribution to sustain healthy livelihoods

The WASH sector remains as one of the fundamental practices that the country has prioritized to improve public health. The National Water Authority, duly established by the Water Act is responsible for the overall coordination of integrated water resources management, allocation and supply. WASH as a sector links the water and health sectors with the water sector enabling best practices of sanitation and hygiene which influence health systems. As a result, the MNRE and MoH co-leads WASH sector interventions and manages the impacts of climate change on WASH and develop it to public health sustainability.

A number of legal documents have been developed to fully establish the WASH sector and ensure best practices for sanitation and hygiene. The interventions are drawn from the Water policy that promotes collaborations between all stakeholders to advance WASH contribution to public health. Other documents include the IWRM project 2015, Water Resources Master plan update 2016-2025; the National Sanitation Hygiene policy of 2019, NCCSAP for the period 2014–2019, The National Health Policy of 2016. National Sanitation and Hygiene Strategy 2019-2023, National Water and Sanitation Sector Development Plan and Monitoring Framework.

Relevant Projects

A number of actions have been instituted to ensure that WASH contributes to sustainable livelihoods. These include;

- Strengthening of legislation through:
 - development of the draft drinking water regulations of 2020;
 - development of the draft health bill of 2018;
 - implementation of the National Sanitation and Hygiene strategy 2019 -2023; and

- launch of the water policy of 2018 and the national sanitation hygiene policy of 2019.
- Institutional development and capacity strengthening through:
 - strengthening and availing resources for the NWA to fully operate as per the guidance of the Water Act of 2003;
 - development and launch of the JRBA project board; and
 - strengthening the WASH forum.
- awareness raising, research and assessments and infrastructural upgrades and maintenance through:
 - the LUSIP II project, whose beneficiaries are predominantly smallholder homesteads who will be empowered to operate the irrigation systems and adopt modern farming technologies, with efficient use of water and energy resources;
 - EWSC developed a drought response plan that included: desilting of the Hawane dam, public awareness and education on water conservation, water rationing, discounting non-essential water uses and water trucking to assist with insufficient water;
 - construction of water treatment plants to expand the reach of potable water in peri-urban and some rural areas such as the Lomahasha – Namacha and Nhlanguano – Siphambanweni water supply projects;
 - commissioning and implementation of the recommendations of WASH and climate change assessments such as the Lubombo and Shiselweni WASH vulnerability assessment (BERCS), the water point mapping exercise (by WATERAID); and
 - provision of alternative water storage facilities such as tanks to promote safe rainwater harvesting.

2.3.9 Create an enabling environment for the governance of WASH activities

The implementation of climate resilient WASH activities require an enabling environment with clear institutional set-up supported by self-explanatory legislation and policies. This sector enables the implementation of programs that are resilient to climate change and prevent health disasters such as disease outbreaks. The MNRE and the MoH coordinates and synergizes actions in the WASH sector. The development of Sanitation and Hygiene Policy of 2019 expands on the aspirations of the water policy of 2018 on WASH issues and entrusts ministries and government departments with guiding interventions with particular interests in climate resilience and gender mainstreaming. Other legal documents for this adaptation measure includes the National Health Policy of 2016, the National Environmental Health Policy of 2002, National sanitation and hygiene strategy for the period 2019-2023 and the National Water and Sanitation Sector Development Plan and Monitoring Framework.

Relevant Projects

The projects and actions below have been implemented and whilst others are still to be implemented to advance the adaptation measure;

- Strengthening of legislation through:
 - development of the draft health bill of 2018;
 - launch and implementation of the National Sanitation and Hygiene strategy 2019 -2023; and
 - launch of the NWP 2018.
- Institutional development and capacity strengthening through:
 - strengthening and availing resources for the NWA to fully operate as per the guidance of the Water Act of 2003;
 - establishment of the WASH forum and periodic reporting on activities by WASH stakeholders; and
 - establishment of improved capacities of Project Boards, Irrigation Districts and Water User Associations.

2.3.10 Assess sustainable water supply options beyond 2030

The National Development Strategy of 1997 pronounced the expansion of water supply coverage for domestic use to 100% by 2022. This has been done through a number of assessments and the support of rural water supply through the development of water schemes, coordination of the WASH sector and awareness campaigns on sanitation and hygiene over the years. The COVID-19 pandemic exposed the extent to which potable water and sanitation and hygiene are important in the control of diseases and management of public health. The impacts of climate change impacts limited water access to the most climate vulnerable Lubombo and Shiselweni regions. Resultantly, this requires robust assessments to identify water supply options with a climate lens.

The water policy and the water resources master plan update outlines important interventions and policy direction in water supply and sanitation, mostly covering infrastructural requirements, studies to be implemented, institutional rearrangements and awareness raising as led by the DWA and EWSC. Other policies and legislative documents that guide this adaptation measure are; the National Sanitation and Hygiene Strategy, 2019-2023, Swaziland Poverty Reduction Strategy and Action Plan (2007), Water pollution control regulation, 2010 and IWRM Strategy of 2015.

Relevant Projects

- Strengthening of legislation through:
 - development of rural water supply guidelines;
 - develop and enforce borehole regulations for sustainable groundwater use and equitable investment; and
- Institutional development and capacity strengthening through:
 - organise regular WASH joint sector reviews to share information between partners; and
 - clarify and confirm legal status and ownership of rural water supply assets and review economic and community aspects and select preferred management models for rural water service provision.
- awareness raising, research and assessments and infrastructural upgrades and maintenance through:
 - implementation of the rural water supply XIII project;
 - mobilisation and training of communities for effective participation and ownership of rural water, sanitation and hygiene infrastructure;
 - securing climate proof water infrastructure including through developing resilient/climate proof WASH infrastructure to increase community resilience and boost adaptive capacity;
 - strengthening water harvesting as alternative sources for domestic water use at household and community levels; and
 - expanding water storage capacity for domestic water supply.

2.4 Implementation progress of adaptation measures

The climate change adaptation measures, as drawn from a number of national documents, have been in implementation since the formalization and launch of the various policies and strategies that seek to strengthen and implement the ideals of the constitution. The Table below is a statement of the adaptation activities as outlined in Section 2.3, drawn from the NDC document of 2021. The water sector has made some appreciable strides in climate change adaptation and the progress that has been achieved have been due to forward-thinking programming and relative availability of funding.

Table 2.1. Water Sector adaptation implementation tracking

Adaptation action		Responsible Ministries/organizations	Indicators	Progress Rating
1.	Improve water governance & compliance	MNRE (DWA), MoJ, MoA, MEPD, MTAD, MTEA, EWSC, ESWADE, NDMA.	<ul style="list-style-type: none"> ○ Existence and level of implementation of a water law; ○ Existence and functioning of ministry, line ministry, central agency with core water-related responsibilities for policy making; ○ Existence and implementation of mechanisms to review roles and responsibilities, to diagnose gaps and adjust when need be; ○ Existence and level of implementation of cross-sectoral policies and strategies promoting policy coherence between water and key related areas, in particular environment, health, energy, agriculture, land use and spatial planning; ○ Existence and functioning of an inter-ministerial body or institutions for horizontal co-ordination across water related policies; ○ Existence and functioning of mechanisms to identify and address capacity gaps in water institutions; and ○ Existence and functioning of updated, timely shared, consistent and comparable water information systems. 	In progress - 2
2.	Develop water pricing structures	MNRE (DWA, JRBA, RBA, Irrigation districts, water user associations), MoJ, MoA	<ul style="list-style-type: none"> ○ Existence of water pricing legislation; ○ Existence and implementation of water pricing mechanisms; ○ Number of customers connected to water pricing infrastructure; and ○ Level of compliance to water pricing by water users ○ Existence and functioning of dedicated institutions in charge of collecting water revenues and allocating them at the appropriate scale 	In progress - 3
3.	Strengthen the control & monitoring of water availability & use	MNRE (DWA, JRBA), MoA, NDMA, MoJ.	<ul style="list-style-type: none"> ○ Development of water monitoring network infrastructure; ○ Number of functional RBAs; and ○ Existence and functioning of updated, timely shared, consistent and comparable water information systems. 	In progress - 2
4.	Strengthen the capacity of early warning systems	MNRE (DWA), NDMA, MTEA, SWSC.	<ul style="list-style-type: none"> ○ Development and formalization of national flood and drought risk reduction strategy; ○ Number of personnel within sub-national authorities and national officers trained on early warning systems; ○ Number of rehabilitated and upgraded weather and climate stations in the country; and ○ Extent of implementation of ground water monitoring infrastructure around the country. 	In progress - 3

Adaptation action		Responsible Ministries/organizations	Indicators	Progress Rating
5.	Develop & implement catchment adaptation plans & strategies	MNRE (DWA, JRBA), MoJ, MoA, MTAD, MTEA.	<ul style="list-style-type: none"> ○ Passing and formalization of the draft wetlands policy of 2020 and IAPS strategy of 2021; ○ Number of projects implemented to address IAPS; and ○ Number of implemented projects that promote environmental conservation and protection. 	In progress - 2
6.	Control Invasive Alien plant species & pollution in catchments	MNRE (DWA, JRBA), MoA, MTEA (ENTC, EEA), MTAD.	<ul style="list-style-type: none"> ○ Passing of the draft wetlands policy of 2020; ○ Development of the implementation strategy of the draft wetlands policy of 2020; ○ Number of waste management strategies developed; ○ Number of partners who join the Global Water partnership Eswatini; ○ Number of officers trained on IAPS, their early detection and monitoring systems; and ○ Extent of investment to the environment fund. 	In progress - 3
7.	Design & construct water storage infrastructure for multiple use i.e., large dams, earth dams, sand dams etc.	MNRE (DWA), MoPWT, MoA.	<ul style="list-style-type: none"> ○ Passing of the draft dam safety regulations of 2020; ○ Update of the streams and banks regulations of 1951; ○ Number of dams constructed and rehabilitated by 2030; ○ Number of chiefdom development plans developed and implemented; and ○ Size of investment to capacitate the NWA. 	In progress - 2
8.	Enhance Water supply, Sanitation and Hygiene (WASH) Sector contribution	MNRE (DWA), MoH, ESWC.	<ul style="list-style-type: none"> ○ Passing of the draft drinking water regulations of 2020 and the draft health bill of 2018; ○ Number of projects that expand potable; ○ Number of beneficiaries of the Lomasha – Namacha water supply project; and ○ Number of recommendations of the vulnerability assessments and other assessment that have been implemented. 	In progress – 1
9.	Create an enabling environment for the governance of WASH activities to promote resilience against climate change	MOH, MNRE, DWA,	<ul style="list-style-type: none"> ○ Existence and level of implementation of legal frameworks to engage stakeholders in the design and implementation of water-related decisions, policies and projects; ○ Extent of implementation of the NWP of 2018 and the NCCP of 2016; ○ Existence and implementation of mechanisms or platforms to manage trade-offs across users, territories and/or over time in a non-discriminatory, transparent and evidence-based manner; and ○ Existence and level of implementation of legal frameworks to engage stakeholders in the design and implementation of water-related decisions, policies and projects. 	In progress – 2
10.	Assess sustainable water supply options beyond 2030 through conducting water assessments/studies	MNRE (DWA), MoE, MEPD; MoICT Research Institutions	<ul style="list-style-type: none"> ○ Existence and level of implementation of mechanisms to identify and review data gaps, overlaps and unnecessary overload; ○ Existence and level of implementation of mechanisms to assess short-, medium-, and long-term investment and operational needs and ensure the availability and sustainability of such finance 	In progress - 3

	Adaptation action	Responsible Ministries/organizations	Indicators	Progress Rating
			<ul style="list-style-type: none"> ○ Existence and level of implementation of policy frameworks and incentives fostering innovation in water management practices and processes; ○ Existence and functioning of institutions encouraging bottom-up initiatives, dialogue and social learning as well as experimentation in water management at various levels; ○ Existence and level of implementation of knowledge and experience-sharing mechanisms to bridge the divide between science, policy and practice 	

NB: In progress - 1: Implementation is fast and well resourced; In progress - 2: Implementation is moderate and receive relevant support; and in progress – 3: Implementation is slow and receives limited report.

Health Sector

3.1 Introduction

Weather and climate have a profound influence on life on Earth. They are part of the daily experience of human beings and are essential for health, food production and well-being.⁴⁷ Although there are many determinants for health outcomes, it is increasingly evident that climate change adversely affects the health of populations around the world. The greatest of these impacts is experienced in low-income countries,⁴⁸ who are usually more vulnerable to climate change impacts than more developed countries whose health systems tend to be more adaptable to these impacts. The World Health Organization (WHO) and IPCC⁴⁹ have identified some diseases and other aspects of poor health that are sensitive to weather and climate change. These include vector-borne diseases (such as malaria), water and food-borne diseases (such as cholera), direct injuries or death, mental health, malnutrition, heat-related and poor air quality-related illnesses,⁵⁰ as summarised in **Figure 3.1**.

For the health sector to reduce the risks, impacts and vulnerabilities associated with climate change, it is imperative that this sector also develops adaptive capacity for climate variability and change. This is especially critical because the frequency and intensity of some types of extreme weather events are expected to increase over coming decades because of climate change,⁵¹ suggesting that the associated health impacts could increase without additional preventive actions. Current estimates forecast that climate change will cause approximately 250,000 additional deaths per year between 2030 and 2050, related only to malaria, diarrhoea, malnutrition and heat stress.⁵²

According to the WHO, a climate resilient health system is one that is capable of anticipating, responding, coping with, recover from and adapt to climate-related shocks and stresses, in order to bring sustained improvements in population health, despite an unstable climate.⁵³ In other parts of the world, proactive adaptation policies and programmes have reduced the risks and impacts from climate-sensitive health outcomes and from disruptions in healthcare services.⁵⁴ It is therefore imperative that Eswatini's health care system is strengthened to ensure that communities are resilient to the risks of climate variability and change, with strategies, policies and measures explicitly incorporating climate change, and with close cooperation across sectors to create a 'win-win' scenario. In addition, it has also become apparent that climate change not only poses specific vulnerabilities to women and children, poor communities, older populations and those with underlying conditions, but also other social groups, depending on their cultural role in society. As an example, young boys with cattle herding responsibilities are normally more at risk of lightning strikes than other people in society. It is therefore imperative that climate change adaptation is inclusive of all these social groups.

The specific objective of this chapter is to understand the current state of Eswatini's health sector and determine what adaptive actions have been undertaken, and need to be undertaken, in order to respond to the impacts of climate change. The view is that although it is known that climate change is yet to be mainstreamed in the health sector, there are programmes and projects currently in place that directly respond to the impacts of climate change. The chapter focuses on how the health sector in Eswatini is structured, the impacts of climate change on the health sector and programmes or activities that directly respond to climate change, some adaptive options or measures as highlighted in the Updated NDC, and the enabling legislation for adaptation actions.

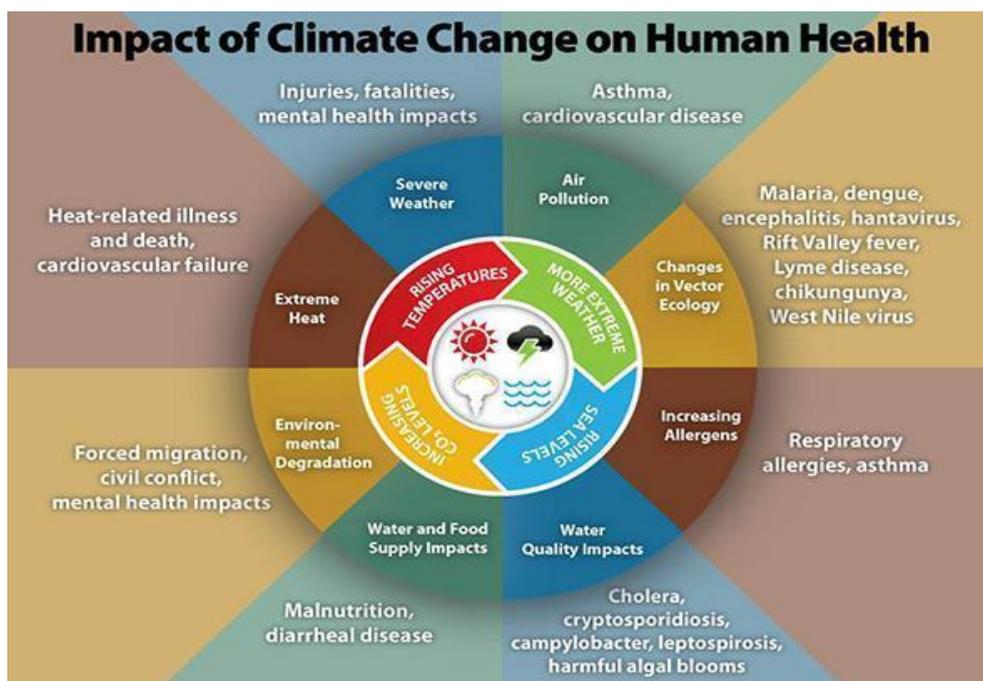


Figure 3. 1: Impact of climate change on human health.⁵⁵

3.2 Overview of the health sector in Eswatini

The National Health Policy (2016)⁵⁶ asserts the Ministry of Health’s mission as ‘to improve the health and social welfare status of the people of Eswatini by providing preventive, health promotion, curative and rehabilitative services that are of high quality, relevant, accessible, affordable, equitable and socially acceptable. The overall goal is further set out in the National Health Sector Strategic Plan (NHSSP) 2019-2023, which is “To attain universal health coverage with defined health services”. Eswatini’s health service delivery system is structured around a four-tiered system of service provision, comprising:

- National Referral Hospital
- Regional Hospitals
- Primary Health Care facilities including Health Centres, Public Health Units (PHUs), Rural Clinics and a network of outreach sites
- Community-Based Care (CBC) where Rural Health Motivators (RHM), Faith-based Health Care Providers, Volunteers and Traditional Practitioners provide care, support and treatment.

The Service Availability and Readiness Assessment report of 2017⁵⁷ reported a total of 327 health facilities in the country, largely distributed in the Hhohho and Manzini regions. These facilities consist of 18 hospitals (9 of these are private hospitals), 5 government health centres, 7 public health units and 297 clinics. The clinics are mostly situated in the rural areas and only 29 have maternity facilities. Most of these clinics are managed by nurses.

Life expectancy currently stands at 60 years in Eswatini, whilst infant mortality is at 56.3 per 1000 live births.⁵⁸ Malaria deaths per 1,000 of population stood at 0.002 in 2018,⁵⁹ whilst non-communicable diseases, particularly diabetes mellitus, hypertension, cardio-vascular diseases (CVDs), cancers, psychiatric illnesses, trauma and injuries as well as other chronic diseases significantly contribute to the country’s burden of disease.⁶⁰ The HIV prevalence for the age group 15-49 years is currently estimated at 26.8%.⁶¹ The major causes of morbidity and mortality in Eswatini are summarised in **Table 3.1**.

Table 3. 1: Major causes of morbidity and mortality in Eswatini⁶²

Top 10 causes of morbidity	Top 10 causes of mortality
1. Upper respiratory infections	1. Tuberculosis
2. Skin disorders	2. Acquired Immune Deficiency Syndrome
3. Hypertension	3. Pneumonia and Influenza
4. Musculoskeletal conditions	4. Diabetes mellitus
5. Acute watery diarrhoea	5. Cancer
6. Lower respiratory infections	6. Non-infective enteritis and colitis
7. Digestive disorders	7. Diseases of blood and blood-forming organs
8. Diabetes mellitus	8. Inflammatory diseases of central nervous system
9. Eye diseases	9. Cerebrovascular disease
10. Injury	10. Hypertensive disease

3.3 Climate change impacts in the Eswatini health sector

Although there is normally limited data relating climate change impacts to health outcomes in Eswatini, it is recognized that certain climate impacts result in significant effects in the health sector.⁶³ Several climate stressors have been identified in Eswatini and these invariably have an impact on climate sensitive health outcomes. **Figure 3.2** illustrates some of the major hazards experienced in the country between the period 1980 to 2020. A majority of these are climate change related. The key climate stressors and their related health impacts are enumerated below:

- Temperature** – A steady and consistent increase in the average temperature has been noted in many parts of Eswatini. In the past two decades, the frequency of very hot days, exceeding 34°C, has increased. The trends show a consistent warming throughout the year with winters becoming warmer and summers getting hotter. The frequency of heat waves, resulting in the destruction of crops and animals is also continuing to increase.⁶⁴ This increase in hot temperatures results in an increase in heat-related illnesses/ conditions and events such as cardiovascular diseases, heat strokes, headaches, snake bites, skin-burn and vector borne diseases, e.g., malaria. With the increase in daily average temperatures, the most significant and recorded change in the health sector is projected to be the encroachment of malaria into previously malaria free areas⁶⁵ as well as the likely increase in the number of snake bites due to snakes encroaching previously snake-free areas.

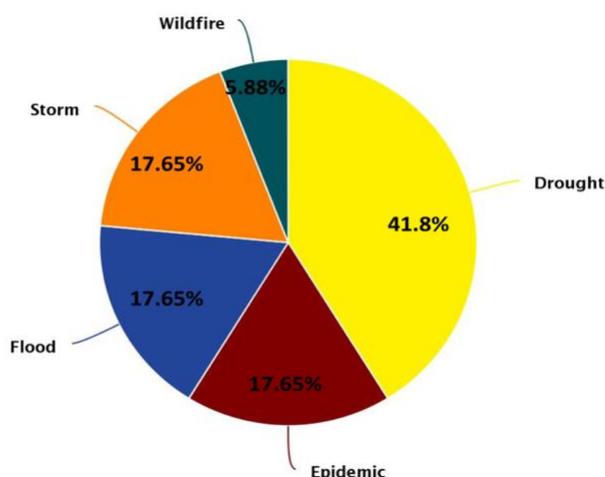


Figure 3. 2: Average annual natural hazard occurrence for the period 1980-2020⁶⁶

Precipitation – In January 2021, the country experienced the Eloise Tropical Storm which caused severe destruction to infrastructure including roads and bridges. In the current rainy season (2021/22), there has also been above normal rainfall leading to flash floods and destruction of the infrastructure. It is also probable that the current floods will result in a reduction in agricultural yields. The variability in precipitation has a significant impact on food production and water supply and by extension, food and nutrition of especially the under-five and over 65 years group; water, sanitation and hygiene (WASH); as well as on water-related diseases such as bilharzia, skin diseases, diarrhoea and cholera. Floods also result in injury and an increase in mortality due to drowning.

Extreme Weather Events – The occurrence of extreme weather events has increased over the past years. These include hailstorms with strong winds and heavy lightning, which destroys infrastructure and sometimes leads to injury and death. Hailstorms, were experienced in the 2021/22 rainy season and affected, in particular, fruit and vegetable production.⁶⁷ Such damage may lead to an increase in food prices, a decrease in consumption of essential nutrients, especially by the poor and economically disadvantaged people and thus leading to malnutrition. Strong winds and windstorms are likely to result in an increase in respiratory illnesses and allergies due to poor air quality.

Apart from the direct impact of climate change on health, there is sometimes a less subtle but very significant effect of climate change on mental health⁶⁸. The link between climate change and mental health is not always conspicuous. However, social impacts such as the loss of income and loss of property due to extreme weather events, etc., may lead to mental health challenges (**Figure 3.3**). The loss of jobs is normally seen in the agriculture sector, which is very sensitive to weather and climate change. People, who experience job losses due to climate change, may find it difficult to cope with the stresses and this may lead to climate induced mental health challenges. It is also important to note that climate change does not only affect health outcomes but may have a significant impact on health facilities and health systems. An impact on health facilities in the context of Eswatini includes, but is not limited to, the destruction of clinics and access roads due to extreme weather events such as flooding. This invariably affects public health delivery and causes the vulnerable communities in rural areas to be disproportionately affected by climate change.

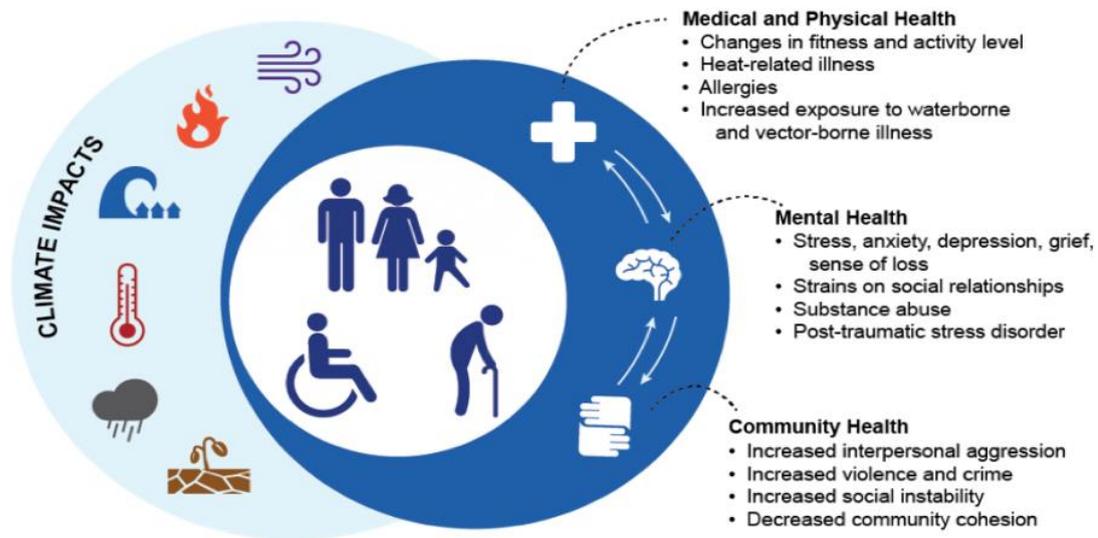


Figure 3. 3: Climate impacts on health⁶⁹

Another critical impact of climate change that is less understood is the impact on gender and sexual reproductive health. Climate change poses negative impacts on maternal health and also creates conditions that result in an increase in gender-based violence and harmful practices such as child marriage.⁷⁰ For example, during floods or extreme weather events, it is usually difficult for women, especially pregnant and lactating women, to access either pre or postnatal care. This has an effect on the woman’s health and that of the baby. Secondly, social relationships are affected by the climate change stressors, and this can result in gender-based violence as people lose

employment and stay at home, with a resultant increase in the frequency and severity of conflict. Practices, such as child marriage can also result from climate induced poverty as parents find themselves marrying their children to wealthier men in society to have returns such as dowry. It is therefore important to include matters of gender and sexual reproductive health in climate change adaptation as these are clearly impacted by climate change.

Exacerbating the impact of climate change on the health system in Eswatini, is the country’s disease burden, poverty and poor Water, Sanitation and Hygiene (WASH) infrastructure, which amplify the health sector’s vulnerability to climate change. The high HIV/AIDS prevalence poses an added burden on the existing vulnerabilities⁷¹ which has also been worsened by the COVID-19 pandemic. Response to the pandemic has resulted in the diversion of resources and thereby increasing vulnerabilities of some groups to the climate-sensitive health outcomes. With the death of many elderlies, it is likely that the impact of the pandemic will be felt for many years as it is likely to leave child-headed homes and increase the vulnerability of this group to the effects of climate change.

3.4 Current programmes addressing climate change impacts

The health sector in Eswatini responds to climate change, albeit in an ad hoc manner. There are a number of health services outlined in the Ministry of Health’s strategic documents, such as the NHSSP 2019-2023, that are aimed at attaining universal health coverage. These services are designed to promote health through the life course; prevent diseases; promptly and effectively manage medical and related conditions; rehabilitate individuals following health events as well as reducing the impact of disability; enhance participation and inclusion in societal roles; and also

influence health actions in key related sectors.⁷² Although these services were not designed to respond to climate change impacts, they provide a good platform to develop adaptive capacity within the sector. To implement its strategic plan, the Ministry has several programmes that target specific public health outcomes and many of these programmes respond directly or indirectly to climate change impacts.

Table 3.2 summarises climate change impacts and their associated adaptive actions/ measures, together with the activities that are currently implemented through various health programmes or projects in response to the climate change impacts. Some of the programmes that are directly responding to climate change impacts include the National Malaria Control Programme, Neglected Tropical Disease Programme, Epidemiology and Disease Control Unit, Emergency Preparedness Response Unit, National Nutrition Council and others. There is also a legal framework and strategic documents that guide the implementation of these programmes such as the National Health Policy 2016, the National Health Sector Strategic Plan 2019-2023, Swaziland National Malaria Elimination Policy 2010; Emergency Preparedness Response Strategic Plan 2017 and many others illustrated in **Table 3.2**. The Constitution of the Kingdom of Swaziland 2004, National Development Strategy (NDS 1997-2022) and the National Development Plan 2019-2022 are the overarching and enabling legislation for programmes within the health sector.

The actions that are implemented are anchored on three types of interventions: prevention, response and control. Whether it is malaria, or dealing with mental health illnesses, the strategy is to prevent the hazard through education or preventative measures such as prophylaxis and vector control; control the hazard by clinical intervention and responding as necessary, especially as some are notifiable diseases. It is worth noting that some of the programmes that are currently implemented by the Ministry of Health and directly responding to the climate change impacts involve multiple stakeholders such as World Vision, United Nations Development Programme, Eswatini Antivenom Foundation, Save the Children, etc. This creates an excellent opportunity for their success if the activities are well coordinated.

Table 3. 2: Climate change initiatives in the health sector

Climate change impact	Adaptation action	Legal framework /policies/regulations/ strategic documents	Programmes/projects	Implementing body
Increase in water related diseases, including water based or vector diseases, water washed diseases such as skin diseases and water borne diseases such as diarrhoea	<ul style="list-style-type: none"> Strengthen vector control in the community Improve waste management Improve sanitation Improve access to safe drinking water Develop resilient/ climate proof WASH infrastructure 	<ul style="list-style-type: none"> Swaziland National Malaria Elimination Policy 2010 National Health Policy 2016 National Health Sector Strategic Plan 2019-2023 National Neglected Tropical Disease Masterplan Integrated Vector Management (IVM) National Sanitation and Hygiene Policy 2019 National Sanitation and Hygiene Strategy (NSHS) 2019-2023 National Environmental Health Policy, 2002 Water and Sanitation Drought Mitigation and Response Plan 2016-2017 Municipal Integrated Development Plan Open Defecation Free Protocol 2019 National Water Policy 2018 Sanitation & Hygiene Regulations Sanitation and Hygiene Manual (under development) Public Health Bill 2012 Environmental Management Act 2002 	<ul style="list-style-type: none"> National Malaria Control Programme Neglected Tropical Disease Programme Epidemiology and Disease Control Unit Integrated Management of Neonatal and Childhood illnesses Environmental Health Programme Sanitation Safe water supply in healthcare facilities Healthcare waste management Regional Development Fund World Vision’s WASH Programme UNICEF Eswatini Country Programme 2021-2025 Municipalities WASH Forum Water Sanitation Cluster (NDMA) School Health Programme Open Defecation Free Project 2016-17 Infection Prevention & Control Programme 	<p>MOH: Public Health Programme Environmental health Programme Infection Prevention & Control Programme</p> <p>MOA MNRE MOET Non-Governmental Organisations</p>

Climate change impact	Adaptation action	Legal framework /policies/regulations/ strategic documents	Programmes/projects	Implementing body
Increase heat related illnesses, conditions and events (e.g., cardiovascular diseases, heat stroke, snake bites, skin-burns, skin cancers, etc.)	<p>Response, Prevention & Control:</p> <ul style="list-style-type: none"> Response is both clinical and preventative (all health facilities should have all necessary capacity, equipment & drugs) Conduct awareness raising campaigns Upscale screening for NCDs 	<ul style="list-style-type: none"> National Health Policy 2016 Non-Communicable Diseases Strategic Plan 2021-2023 National Emergency Response, Mitigation and Adaptation Plan 2016-2022 National Snakebite Management Guidelines 2021 National Cancer Control Unit Strategic Plan 2019-2023 	<ul style="list-style-type: none"> Non-Communicable Disease Programme Neglected Tropical Disease Programme Emergency Preparedness Response National Cancer Control Unit Health Promotion Programme National Nutrition Council Eswatini Antivenom Foundation 	MOH NGOs
Increase in number of deaths, injuries due to extreme weather events (lighting, drowning, landslides)	<ul style="list-style-type: none"> Prevention - MVA hosts a programme to prevent accidents, raise awareness, and conducts health facility & community preparedness Response to emergencies – use of 112 national emergency reporting health line Early warning to enable preparedness and response 	<ul style="list-style-type: none"> National Health Policy 2016 Emergency Preparedness Response Strategic Plan Health Promotion strategy Preparedness plans Essential Health Care Package, 2010 	<ul style="list-style-type: none"> Emergency Preparedness and Response Health Promotion HydroNET – still under development 	EPR Unit HMIS/M&E MTEA – Meteorology Department
Food and Nutrition (food safety and food quality)	<p>Prevention and Control:</p> <ul style="list-style-type: none"> Infant and Young Child Feeding – Promoting exclusive breastfeeding & complementary feeding (to prevent acute malnutrition) Collaborating with Rural Health Motivators for capacity building Distribute awareness material Promote backyard gardens in collaboration with Ministry of Agriculture 	<ul style="list-style-type: none"> National Health Sector Strategic Plan 2019-2023 National Health Policy 2016 Food Security Policy Draft Food and Nutrition Policy Food and Nutrition Strategy Sexual Reproductive Maternal New-born Child Adolescent Health and Nutrition (SRMNCAH&N) Strategic Plan Eswatini National Drought Plan 2020 	<ul style="list-style-type: none"> Nutrition Programme Multisector Food and Nutrition Security Coordination Forum, Health and Nutrition Cluster (NDMA) School Health Programme Integrated Management of Neonatal and Childhood illnesses School Feeding schemes Private companies Tinkhundla centres Feeding schemes Social Clubs 	MOH NDMA MOET MOA Ministry of Tinkhundla Administration and Development

Climate change impact	Adaptation action	Legal framework /policies/regulations/ strategic documents	Programmes/projects	Implementing body
	<ul style="list-style-type: none"> Promote food preservation & processing for future use Nutritional assessment in children Administration of therapeutic foods such as F75, F100, plumpy nut NDMA distributes foods during disasters Awareness for pregnant women which is done through the public health unit Evaluation of donated food supplements & exotic foods 	<ul style="list-style-type: none"> National Emergency Response, Mitigation and Adaptation Plan 2016-22 		
Climate induced mental conditions (forced migration, displacement, sector dependant - in terms of agriculture, infrastructure, etc.)	<ul style="list-style-type: none"> Counselling in hospitals by healthcare workers Specialised hospital in Manzini deals with referred cases of mental illness Nursing and Dental Councils conduct examinations on mental health through Board examinations to capacitate healthcare workers to be able to deal with mental health illness in patients Conduct awareness raising campaigns Distribution of mental illness medicines in various health facilities 	Mental Health Strategic Plan 2021-2023	<ul style="list-style-type: none"> National Psychiatric Referral Hospital Non-Communicable Disease Programme 	MOH

Climate change impact	Adaptation action	Legal framework /policies/regulations/ strategic documents	Programmes/projects	Implementing body
Increase in respiratory illnesses due to poor air quality	Response, Prevention & Control: <ul style="list-style-type: none"> • Response is both clinical and preventative (all health facilities should have all necessary capacity & drugs etc.) • Awareness raising 	<ul style="list-style-type: none"> • National Health Policy 2016 • Non-Communicable Diseases Strategic Plan 2021-2023 	<ul style="list-style-type: none"> • Non-Communicable Disease Programme • Emergency Preparedness Response • Health Promotion Programme 	MOH

3.5 Adaptation option in the Health Sector – Eswatini Updated NDC⁷³ perspective

Adapting to climate change normally means the health system must develop resilience to the impacts of climate change. Eswatini is yet to develop and/or implement a health adaptation strategy for climate change. However, several adaptation options have been proposed through many fora and climate change projects. The recently updated NDC, National Adaptation Communication (AdCom), 2021 and Stocktaking Report, 2021 have identified several adaptation options in the health sector. These focussed holistically into the contribution of the health sector to adaptation actions of the country. They are high level and include:

- Mainstreaming climate change into the national health policy and other strategic documents.
- Establishing a multi-hazard early warning system to trigger prompt public health intervention when certain variables exceed a defined threshold.
- Adopting sustainable climate smart technologies to enhance the resilience of health care facilities to the adverse effects of climate change.
- Improving basic public health programmes that address vulnerability to climate change induced infections.
- Promoting capacity building through research and development, education and awareness, and training in climate change related issues.
- Improving and integrating the health management information system with other systems from relevant sectors to achieve a centralized MRV system.
- Educating and informing the public of the needed measures to protect health from the adverse impacts of climate change.
- Financing health actions to address inequities and climate related vulnerabilities
- Mainstreaming gender responsive climate policies and emphasize special efforts to support vulnerable groups (women, youth, and children) in climate change adaptation efforts within all sectors of the economy.
- Promoting environmentally friendly waste management practices.
- Developing resilient / climate proof WASH infrastructure

These adaptation options are aimed at increasing resilience and, therefore, protecting Eswatini from the impacts of climate change. Some of these actions cut across different programmes and are yet to be implemented whilst others are a general adaptive response. Although the NDC adaptation actions for health are new, some of them are already being implemented, such as promoting environmentally friendly waste management practices, developing climate resilient WASH infrastructure and addressing malnutrition for improved health. These actions are being implemented by multiple programmes within the Ministry of Health as well as other government ministries and non-governmental organisations, **Table 3.3**.

3.5.1 Mainstreaming climate change into the national health policy and other strategic documents

This is the most critical adaptation measure that needs to be integrated in the health sector. Currently, there are no programmes or projects that mainstream climate change into the health sector. However, the National Health Policy

2016 and National Health Sector Strategic Plan 2019-2023 form the backbone for the implementation of this action. The ambition to attain universal health coverage encompasses a determination to employ all strategies and actions

to ensure that the populace is protected from adverse impacts on health. The indicator for this adaptation option will be policies and strategic documents that mainstream climate change in the health sector.

3.5.2. Establishing a multi-hazard early warning system to trigger prompt public health intervention when certain variables exceed a defined threshold.

The use of multi-hazard early warning systems to trigger prompt and appropriate response is very important in the health sector as this helps in alleviating some of the adverse impacts of climate extremes. Presently, the Ministry of Health, represented by the Epidemiology and Disease Control Unit and the National Malaria Control Programme, participates in seasonal and monthly forecasting meetings facilitated by the National Disaster Management Agency and the Meteorological Services Department (MTEA). Through these meetings, the multi-stakeholder forum forecasts the weather for the upcoming season and month. Presently, the National Malaria Control Programme has eight (8) automatic weather stations set up in clinics in the four regions of the country. These stations collect weather information, which is also used to forecast, especially for Malaria variables. The indicator will be an increase in the number of departments receiving early warning information. The overall outcome of this multi-hazard early warning system will be increased preparedness and the reduction in mortality and incidence of diseases related to climate change and weather extremes.

3.5.3 Adopting sustainable climate smart technologies to enhance the resilience of health care facilities to the adverse effects of climate change

Adopting sustainable climate smart technologies is important in enhancing the resilience of healthcare facilities to the adverse effects of climate change. This will ensure that health services are not disrupted during adverse weather events. Provision of a sustainable water supply is currently being undertaken through the Microprojects funding where boreholes are installed in rural clinics to ensure safe and reliable water supply. Another important component will be to use solar power to generate electricity for these clinics, ensuring that the water supply is not disrupted and that there is electricity even during power outages. The National Climate Change Policy 2016, National Health Policy 2016, and the National Health Sector Strategic Plan 2019-2023 are some of the instruments that support these initiatives. The Ministry has also received a loan from the World Bank under the project Health System Strengthening for Human Capital Development in Eswatini Project, 2020.⁷⁴ This project will assist the Ministry in improving health service delivery. Among some of the components of the project is the utilisation of energy efficient and sustainable technologies to improve service delivery. Indicators for this adaptation measure will be the increase in the number of health facilities with climate smart technologies and the outcome will be decreased disruption of health services during adverse weather events as a result of climate change.

3.5.5 Financing health actions to address inequities and climate related vulnerabilities

The Health System Strengthening for Human Capital Development in Eswatini Project, 2020 will provide finance for addressing inequities and some climate related vulnerabilities. The project is focussing on nutrition, non-communicable diseases and reproductive, maternal, new-born, child and adolescent health (RMNCAH). It is anchored on the National Health Policy 2016, and the National Health Sector Strategic Plan 2019-2023, the National Development Strategy 1997 and the Eswatini Strategic Roadmap, 2019-2030. Another World Bank funded project, Eswatini COVID-19 Emergency Response Project, P17587 currently funds the Ministry of Health to strengthen the country's national systems for public health preparedness. Further, the Eastern and Southern African Region Office (ESARO) project 2019 has also determined the state of WASH financing in Eswatini.⁷⁵ An increase in funding for climate related diseases will reduce inequities and vulnerabilities associated with climate change.

3.5.6 Educating and informing the public of the needed measures to protect health from the adverse impacts of climate change.

Education is important for people to protect themselves from the adverse impacts of climate change. The Health Promotion Unit in the Ministry of Health presents education fora in various platforms, one of which is the national radio. However, it was noted that the talks are not normally on climate change as a subject, but on specific events such as floods, lightning strikes, malaria, etc. These need to be focussed to create the link between the adverse effects and our anthropogenic activities which cause climate change. The National Emergency Response Council on HIV/AIDS (NERCHA) has also prepared a documentary on climate change impacts on health. An increase in the number of knowledge dissemination fora, particularly on the subject of climate change and health will address this adaptation option.

3.5.7 Improving and integrating the health management information system with other systems from relevant sectors to achieve a centralised MRV system

The Ministry has worked to improve its data management system through its Health Management Information System (HMIS) unit and is also introducing and training personnel on the client management information system (CMIS).⁷⁶ This will improve data collection and capturing within the Ministry and facilitate ease in sharing data with other relevant sectors.

3.5.8 Mainstreaming gender responsive climate policies and emphasise special efforts to support vulnerable groups (women, youth, and children) in climate change adaptation efforts within all sectors of the economy

Although there are no specific climate policies that are gender responsive, there are efforts by the Ministry of health to target vulnerable groups. The Sexual Reproductive Maternal New-born Child Adolescent Health and Nutrition (SRMNCAH&N) Strategic Plan (2019-2023) and other programmes focussing on people living with HIV/AIDS, reproductive women and children are milestones within the health sector that help in addressing some of the gender inequities. The National Health Policy is the overarching policy that emphasise universal coverage for all. Some of the programmes that are gender and vulnerable groups aware include the School Health Programme, Integrated Management of Childhood illnesses and Public Health Programme. There is still a need for deliberate actions on this adaptation measure for the policies to be gender mainstreamed.

Table 3.3 gives a detailed description of the many projects and programmes, together with their associated legal framework, which attempt to address the adaptation options as outlined in Updated NDC.

Table 3. 3: Climate change adaptation measures initiatives in the health sector – Eswatini Updated NDC perspective

Adaptation options	Legal framework/ policies/regulations/ strategic documents	Programmes / projects	Responsible body	Indicators
Mainstreaming climate change into the national health policy and other strategic documents	<ul style="list-style-type: none"> National Health Policy 2016 National Health Sector Strategic Plan 2019-2023 	Currently none	MOH	Number of policy documents integrating climate change
Establishing a multi-hazard early warning system to trigger prompt public health intervention when certain variables exceed a defined threshold.	<ul style="list-style-type: none"> Disaster Management Act 2006 National Disaster Risk Management Policy of 2011 Climate Change Policy of 2016 Swaziland Disaster Risk Reduction National Action Plan 2008 – 2015 	<p>HydroNetT which is still under development – can give early warning for upcoming weather events</p> <p>Epidemiology and Disease Control Unit together with National Malaria Control Programme participate in seasonal and monthly meetings for weather forecasting with the Meteorology Department</p>	MNRE DWA JRBA MOH MTEA-CCU NDMA	<p>Number of early warning and health hazards disseminated to programmes</p> <p>% reduction in mortality and incidence for diseases related to weather patterns</p>
Adopting sustainable climate smart technologies to enhance the resilience of health care facilities to the adverse effects of climate change (SDG 11, 13)	<ul style="list-style-type: none"> National Climate Change Policy 2016. National Health Policy 2016 National Health Sector Strategic Plan 2019-2023 	<p>Eastern and Southern African Region Office (ESARO) project 2019 to determine the state of WASH financing in Eswatini</p> <p>Health System Strengthening for Human Capital Development in Eswatini Project, 2020</p>	MOH	<p>Number of health facilities with solar power/sustainable energy source</p> <p>Number of health facilities with boreholes</p>
Promoting capacity building through research and development, education,	<ul style="list-style-type: none"> National Health Sector Strategic Plan 2019-2023 	Epidemiology and Disease Control Unit	MOH	Number of climate change related projects in the health sector

Adaptation options	Legal framework/ policies/regulations/ strategic documents	Programmes / projects	Responsible body	Indicators
awareness, and training in climate change related issues	<ul style="list-style-type: none"> Human Resources for Health Strategic Plan 2012-2017 Policy for Human Resources for Health 2012 	National Health Research and Innovations Department		Number of training/workshops on linkages between climate change and health Number of awareness campaigns
Promote environmentally friendly waste management practices (SDG 6)	<ul style="list-style-type: none"> National Climate Change Policy 2016. National Health Sector Strategic Plan 2019-2023 Open Defecation Free Protocol 2019 National Sanitation and Hygiene Strategy (NSHS) 2019-23 National Environmental Health Policy, 2002 National Health Care Waste Management Guidelines 2013 National Water Policy, 2018 EMA, 2002 National Waste Regulations, 2000 National Health Care Waste Management Policy 2018 National Sanitation and Hygiene Policy 2019 	Open Defecation Free Project 2016-17 World Vision WASH programme Environmental Health Programme Waste and livelihoods project implemented by UNDP – ongoing Project to develop National Integrated Waste Management Pollution Prevention and Control Policy – ongoing	MOH MNRE - DWA MOET MHUD Municipalities Town Councils	% of homes with toilets Number of schools with toilets (sanitation facilities) Number of health facilities with waste management facility
Improving and integrating the health management information system with other systems from relevant sectors to achieve a centralised MRV system	<ul style="list-style-type: none"> National Health Policy 2016 National Health Sector Strategic Plan 2019-2023 	Health Management Information System (HMIS)	MOH	HMIS integrated with other systems

Adaptation options	Legal framework/ policies/regulations/ strategic documents	Programmes / projects	Responsible body	Indicators
Educating and informing the public of the needed measures to protect health from the adverse impacts of climate change.	<ul style="list-style-type: none"> National Health Policy 2016 National Health Sector Strategic Plan 2019-2023 	<p>NERCHA has done a documentary on climate change impacts on health</p> <p>Many education initiatives but not climate change centric</p>	MOH - Health Promotion Unit	Number of climate change information dissemination programmes to the public
Financing health actions to address inequities and climate related vulnerabilities	<ul style="list-style-type: none"> National Health Policy 2016 National Health Sector Strategic Plan 2019-2023 National Development Strategy 1997 Eswatini Strategic Roadmap 2019-2030 	<p>Eastern and Southern African Region Office (ESARO) project 2019 to determine the state of WASH financing in Eswatini</p> <p>World Bank funded projects, P168564 and P17587</p> <p>End Malaria Fund 2019</p>	MOH	Increase in government budget allocation for climate related inequities and vulnerabilities
Mainstreaming gender responsive climate policies and emphasise special efforts to support vulnerable groups (women, youth, and children) in climate change adaptation efforts within all sectors of the economy (SDG 5, 10)	<ul style="list-style-type: none"> National Health Policy 2016 National Health Sector Strategic Plan 2019-2023 	World Bank funded projects, P168564 and P17587	MOH Deputy Prime Minister's Office All sectors	Number of gender mainstreamed policies

3.6 Water, Sanitation and Hygiene (WASH)

The National Water Policy, 2018 puts it as a responsibility of the National Water Authority to ensure that all citizens have access to safe and adequate water supply and sanitation. This is also articulated in the Integrated Water Resource Management master plan. On the other hand, the National Health National Health Policy enacted in 2007, calls for the advancement of safe water supply sanitation and hygiene. It is from this policy that the sanitation policy and its strategy was enacted in 2019. The National Sanitation and Hygiene Strategy, 2019-2023 which aims to improve sanitation and hygiene from 46% to 100% by 2023.

Several actions have been instituted to ensure that WASH contributes to sustainable livelihoods, and these include;

- EWSC developed a drought response plan that included: desilting of the Hawane dam, public awareness and education on water conservation, water rationing, discounting non-essential water uses and water trucking to assist with insufficient water.
- Construction of water treatment plants to expand the reach of potable water in peri-urban and some rural areas such as the Lomahasha – Namacha and Nhlngano – Siphambanweni water supply projects
- Commissioning and implementation of the recommendations of WASH and climate change assessments such as the Lubombo and Shiselweni WASH vulnerability assessment, Baphalali Eswatini Red Cross Society (BERCS), the water point mapping exercise (by WATERAID)
- Provision of alternative water storage facilities such as tanks to promote safe rainwater harvesting
- The following legal instruments are available to create an enabling environment, only when properly implemented:
 - National Health Policy 2016,
 - National Water Policy 2018,
 - Sanitation and Hygiene Policy 2019,
 - National Environmental Health Policy 2002,
 - National Sanitation and Hygiene Strategy, 2019-2023 and
 - National Water and Sanitation Sector Development Plan and Monitoring Framework, 2006.

Water, Sanitation and Hygiene have a huge bearing on health outcomes. If people do not have access to clean and safe drinking water, there will be an increase in water related diseases such as cholera, diarrhoea, skin diseases, etc. Equally, poor waste management practices, especially household and industrial waste, leads to the spread of diseases. A number of projects and programmes have been set up to respond to the WASH health crisis. These are led by various players such as the Ministry of Health's Environmental Health Programme, Ministry of Education, Ministry of Natural Resources, Ministry of Tinkhundla Administration and development and many non-governmental organisations (NGOs), who are jointly promoting WASH infrastructure improvement, through programmes and projects such as the Open Defecation Free Project 2016-17, the World Vision WASH programme, Regional Development Fund (RDF), UNDPs Waste and Livelihoods project, WASH Forum and the Ministry of Health's Environmental Health Programme.

At present, 65 % of the population use improved sources for drinking water, meaning that the water is piped water, tube well/borehole, protected well, protected spring, and rainwater harvesting.⁷⁷ Through partners and the Government's RDF, there are a number of newly drilled boreholes in communities in Eswatini which should improve access to water.

A national WASH financing study was undertaken by ESARO in 2019 and a budget brief was developed to influence planning and advocacy activities to support more effective allocation and use of resources by government ministries, donors and other financiers engaged in delivering, operating and maintaining WASH services.

Conclusion and next steps

4.1 Conclusions

This study documents the state-of-play of adaptation measures employed in the Kingdom of Eswatini for the water and health sectors. It identifies adaptation options, current activities, indicators and criteria for success. Previous reports have identified the impacts of climate change in both sectors. To note is the fact that temperature rise, changes in precipitation as well as extreme weather are variables that are affected by climate change. Some of these changes are already experienced in the country and have an adverse effect on both the water and health sectors.

Eswatini has identified and prioritised adaptation options in the updated NDC (2021) for both sectors. In the water sector, some of these include improving governance and compliance, developing water pricing structures, strengthening control and monitoring of water availability and use, strengthening capacity of early warning systems, development and implementation of catchment adaptation and management plans and strategies as well as designing and construction of climate proof storage infrastructure. Several legal instruments have been developed and used to implement some of the adaptation options based on human and financial capacity (Chapter 2).

Even though there are no deliberate actions to adapt to climate change in the health sector, there are several initiatives that respond to climate change impacts, such as the National Malaria Programme, Neglected Tropical Disease Programme, Epidemiology and Disease Control Unit, Integrated Management of Neonatal and Childhood illnesses, Environmental Health Programme, to name a few. These programmes are responding to the impacts of climate change, albeit, in an ad hoc manner. Consequently, some of the adaptation options expounded in the NDC for this sector include mainstreaming climate change into the national health policy and other strategic documents, promoting capacity building through research and development, education, awareness, and training in climate change related issues, Improving and integrating the health management information system with other systems from relevant sectors to achieve a centralised MRV system⁷⁸ to name a few. These adaptation measures still need commitment and capacity to be fully implemented in the health sector.

Although there is notable progress in terms of implementing the adaptation measures, as outlined in the NDC, particularly in the water sector, it is apparent that there is still a long way to go for these two sectors to fully adapt to the impacts of climate change.

4.2 Next steps

To fully address the challenges faced by these sectors in implementing the adaptation expounded in the NDC, it was important to understand the state-of-play of adaption measures in both the water and health sectors then identify the gaps that prevent the country from fully implementing her commitment to the UNFCCC. The next step in this activity is to document the gaps (institutional, policy, reporting and implementation) to track the adaptation actions in these two sectors. A draft action plan will be developed to suggest a way forward for filling the gaps.

Bibliography

- 1 IPCC 2021. Sixth Assessment Report.
https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_Full_Report.pdf (Accessed 21 March 2022)
- 2 UN Climate Change. <https://unfccc.int/about-us/about-the-secretariat#:~:text=The%20ultimate%20objective%20of%20all,naturally%20and%20enables%20sustainable%20development.> (Accessed 21 March 2021)
- 3 <https://www.nrcan.gc.ca/changements-climatiques/impacts-adaptation/chapter-1-introduction-climate-change-adaptation/10081> (Accessed 18 March 2022)
- 4 Swaziland Government, MTEA, Swaziland's 2NC (2002)
- 5 Swaziland Government, Ministry of Tourism and Environmental Affairs, Swaziland's Second National Communication to the UNFCCC (2002)
- 6 Swaziland Government, Ministry of Tourism and Environmental Affairs, Swaziland's Second National Communication to the UNFCCC (2012)
- ⁷ COP21, with all the INDC's presented by the signatories to the UNFCCC, resulted in the so-called 'Paris Accord' which resulted in all non-Annex I (NAI) countries, including Eswatini, taking on legal targets in their commitment to reducing greenhouse gases (GHG) and other elements of climate change to the year 2030.
- 8 Kingdom of Eswatini, Ministry of Tourism and Environmental Affairs, Update of the Nationally Determined Contributions (2021)
- 9 Swaziland Government, Ministry of Tourism and Environmental Affairs, Swaziland's Third National Communication to the UNFCCC (2016)
- 10 Awareness Raising & Stakeholder Consultation Workshop Report, Editors T. Ndlovu, G.F. Sibandze, L.D. Mafu & D.G. Vilakati, Ministry of Tourism and Environmental Affairs, Eswatini
- 11 Project inception report (Technical) Technical support to increase the overall transparency capacity and set-up of sectoral MRV systems in the Kingdom of Eswatini. Ministry of Tourism and Environmental Affairs, Eswatini
- 12 National Investment Profile. Water for Agriculture and Energy: Swaziland, 2015
- 13 Government of Eswatini (2014). Climate change vulnerability assessment of the water sector and infrastructure in Swaziland (Edited by Ncamiso Mhlanga)
- 14 Government of Eswatini, Department of Water Affairs (2011). Integrated water resources management plan, Vol 1. Situational Analysis
- 15 Matondo JI. Msibi KM. 2010. Water resources development in Swaziland. In Tevera DS. And Matondo JI. (eds). 2010. Socio Economic Development and the Environment in Swaziland. GEP/PrintPark. Mbabane
- 16 Government of Eswatini – Eswatini Environment Authority 2020. State of the Environment Report
- 1717 Climate Risk Profile: eSwatini (2021): The World Bank Group, <https://climateknowledgeportal.worldbank.org/> (accessed 20 February 2022)
- 18 Government of Eswatini, Department of Water Affairs (2011). Integrated water resources management plan, Vol 1. Situational Analysis
- 19 GoE-MEPD, 1999. National Development Plan
- 20 GoE-MTEA, 2002. First National Communication to the United Nations Framework Convention on Climate Change (UNFCCC)
- 21 Dlamini, W. (2011). Probabilistic spatio-temporal assessment of vegetation vulnerability to climate change in Swaziland. *Global Change Biology*, 17(3), 1425–1441
- 22 Dlamini, W. (2011). Probabilistic spatio-temporal assessment of vegetation vulnerability to climate change in Swaziland. *Global Change Biology*, 17(3), 1425–1441
- 23 Government of Eswatini – Ministry of Natural Resources (2018). National Water Policy
- 24 Government of Eswatini – Ministry of Natural Resources (2018). National Climate Change Policy
- 25 Puri S. (2021). Improvement of intergrated water resources management in Swaziland. Technical Report
- 26 Government of Eswatini – Ministry of Natural Resources (2015). National Irrigation Policy
- 27 UNDP-WRI-NDCSP, 2019. Enhancing NDCs: A Guide to Strengthening National Climate Plans by 2020
- 28 Government of Eswatini – Ministry of Tourism and Environmental Authority (2021). Kingdom of Eswatini update

of the Nationally Determined Contributions Submitted to the UNFCCC

- 29 Improving climate resilience in eSwatini through the integrated management of mountain ecosystems. It is further categorised by altitude into Lowveld, Middleveld and Highveld.
- 30 Mtsetfwa F. (2020). Understanding Impacts of Climate and land-use changes on keystone savanna tree species distributions. PhD Dissertation, University of Florida
- 31 Ncamiso Mhlanga, Climate Change Vulnerability Assessment of the Water Sector and Infrastructure in Swaziland, Ministry of Natural Resources and Energy-Department of Water Affairs, Editor: (2014).
- 32 UNDP, 2015. Adapting National Trans-Boundary Water Resources Management in Swaziland to Manage the Expected Impacts of Climate Change.
- 33 Government of Eswatini – Ministry of Tourism and Environmental Authority (2021). Kingdom of Eswatini update of the Nationally Determined Contributions Submitted to the UNFCCC
- 34 The Water Act, (2003). The Government of Eswatini Water Act, Act no.7 of 2003
- 35 EWSC, 2019. Eswatini Water Services Corporation. Annual Report 2019/20. Mbabane. Also, older versions consulted.
- 36 Government of Eswatini – Ministry of Natural Resources (2018). National Water Policy
- 37 Puri S. (2021). Improvement of intergrated water resources management in Swaziland. Technical Report
- 38 Government of Eswatini – Ministry of Natural Resources (2018). National Water Policy
- 39 SADC (2006). African Development Community Regional Water Strategy, 2006
- 40 KOBWA (Komati River Basin Authority) TREATY The Development and utilization of water resources of the Komati River Basin between the Republic of South Africa and the Kingdom of Eswatini, 1992
- 41 Government of Eswatini (2016). Annual Vulnerability Assessment & Analysis report. National Disaster Management Agency. Mbabane
- 42 Government of Eswatini (2019). Annual Vulnerability Assessment & Analysis report. National Disaster Management Agency. Mbabane
- 43 MNRE, 2018. Ministry of Natural Resources and Energy, Final National Water Policy Implementation Strategy. Mbabane, Swaziland
- 44 Matondo, I, J. (2012) Assessing the vulnerability of the sector of water resources in Swaziland due to Climate Change. World environmental and Water Resource congress. ASCE
- 45 Government of Eswatini, Eswatini Environmental Authority (2013). State of the environment report for Swaziland, The consequences of inaction (2013)
- 46 Government of Eswatini/UNDP, 2015. Strategy Paper: Managing National Water Resources in Swaziland to 2050 against a backdrop of climate change.
- 47 J.T. Houghton, Y. Ding, D.J. Griggs, M. Noguer, P.J. van der Linden, X. Dai, K. Maskell C.A. Johnson, Climate change 2001: The Scientific Basis, https://www.ipcc.ch/site/assets/uploads/2018/03/WGI_TAR_full_report.pdf (Accessed 10 August 2021)
- 48 WHO 2013. Protecting Human Health from Climate Change: Vulnerability and Adaptation Assessment. World Health Organization, Geneva
- 49 Smith, K.R., A. Woodward, D. Campbell-Lendrum, D.D. Chadee, Y. Honda, Q. Liu, J.M. Olwoch, B. Revich, and R. Sauerborn, 2014. Human health: impacts, adaptation, and co-benefits. In: Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 709-75
- 50 WHO 2018. Health and climate change survey report: tracking global progress. Geneva: World Health Organization; 2019 (WHO/CED/PHE/EPE/19.11).
- 51 IPCC 2007b. Working group I contribution to the fourth assessment report of the Intergovernmental Panel on Climate Change: Climate change 2007 – the physical science basis. Summary for policymakers. Geneva, Intergovernmental Panel on Climate Change Secretariat.
- 52 WHO 2018. Climate change and health. <https://www.who.int/news-room/fact-sheets/detail/climate-change-and-health> (accessed 15 February 2022).

-
- 53 J.T. Houghton, Y. Ding, D.J. Griggs, M. Noguer, P.J. van der Linden, X. Dai, K. Maskell C.A. Johnson, Climate change 2001: The Scientific Basis, https://www.ipcc.ch/site/assets/uploads/2018/03/WGI_TAR_full_report.pdf (Accessed 10 August 2021)
- 54 WHO 2013. Protecting Human Health from Climate Change: Vulnerability and Adaptation Assessment. World Health Organization, Geneva
- 55 Climate Effects on Health, Centres for disease control and prevention <https://www.cdc.gov/climateandhealth/effects/default.htm> (accessed 15 August 2021)
- 56 National Health Policy 2016. Ministry of Health. Eswatini.
- 57 Service Availability and Readiness Assessment (SARA) 2017. Ministry of Health. Eswatini. [https://www.hst.org.za/publications/NonHST%20Publications/Eswatini%20SARA%20March%20\(05%2004%202019\).pdf](https://www.hst.org.za/publications/NonHST%20Publications/Eswatini%20SARA%20March%20(05%2004%202019).pdf) (accessed 21 February 2021)
- 58 The World Bank Group. World Bank Data. <https://data.worldbank.org/country/eswatini> (accessed February 2022)
- 59 WHO, 2018. Country Cooperation Strategy at a glance. https://apps.who.int/iris/bitstream/handle/10665/136886/ccsbrief_swz_en.pdf?sequence=1 (accessed 21 February 2022)
- 60 Service Availability and Readiness Assessment (SARA) 2017. Ministry of Health. Eswatini. [https://www.hst.org.za/publications/NonHST%20Publications/Eswatini%20SARA%20March%20\(05%2004%202019\).pdf](https://www.hst.org.za/publications/NonHST%20Publications/Eswatini%20SARA%20March%20(05%2004%202019).pdf) (accessed 21 February 2021)
- 61 WHO, 2018. Country Cooperation Strategy at a glance.
- 62 Ministry of Health. Health Management Information System 2017
- 63 WHO 2013. Protecting Human Health from Climate Change: Vulnerability and Adaptation Assessment. World Health Organization, Geneva
- 64 World Bank. Climate Change Knowledge Portal (CCKP) 2021 <https://climateknowledgeportal.worldbank.org/country/eSwatini/climate-data-historical> (accessed 21 February 2022)
- 65 USAID-ATLAS, 2022. Shifting Risks of Malaria in Southern Africa- A Regional Analysis. https://www.climatelinks.org/sites/default/files/asset/document/2020_USAID_ATLAS_Shifting-Risks-of-Malaria-in-Southern-Africa.pdf (accessed on 21 February 2022)
- 66 Climate Change Knowledge Portal 2021 (accessed 28 February 2022) <https://climateknowledgeportal.worldbank.org/country/eswatini/vulnerability>
- 67 Times of Eswatini. <https://www.pressreader.com/eswatini/times-of-eswatini/20211112/281487869591140/textview> (accessed 28 February 2022)
- 68 Hayes, K., Blashki, G., Wiseman, J. et al. Climate change and mental health: risks, impacts and priority actions. *Int J Ment Health Syst* 12, 28 (2018). <https://doi.org/10.1186/s13033-018-0210-6>
- 69 <https://www.psychiatry.org/patients-families/climate-change-and-mental-health-connections>
- 70 Women Deliver 2021. <https://womendeliver.org/wp-content/uploads/2021/02/Climate-Change-Report.pdf> (accessed 25 February 2022)
- 71 Eswatini (2016). Eswatini's Third National Communication to the UNFCCC. Ministry of Tourism and Environmental Affairs. URL: <https://unfccc.int/sites/default/files/resource/swznc3.pdf>
- 72 National Health Sector Strategic Plan 2019-2023. Ministry of Health. Eswatini.
- 73 Kingdom of Eswatini Update of the Nationally Determined Contributions Submitted to the United Nations Framework Convention on Climate Change (UNFCCC), 12 October 2021
- 74 Ministry of Health 2020. Health System Strengthening for Human Capital Development P168564.
- 75 Jones, O. 2019. The State Of Wash Financing In Eastern and Southern Africa - Eswatini Country Level Assessment. Eastern and Southern and African Regional Office, UNICEF (accessed on 15 February 2022). <https://www.unicef.org/esa/media/5066/file>
- 76 Ministry of Health 2020. Second Quarter Performance Report, 2019-2020.
- 77 Vulnerability Assessment Committee (VAC). Annual Vulnerability Assessment & Analysis Report 2019. Government of Eswatini.
- 78 Kingdom of Eswatini, Ministry of Tourism and Environmental Affairs, Update of the Nationally Determined Contributions (2021)