MRV Implementation Framework

Water Sector

Initiative for Climate Action Transparency - ICAT

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Executive Summary

The MRV Implementation Framework for Adaptation in the Water Sector in Eswatini is a comprehensive strategy to establish a Monitoring, Reporting, and Verification (MRV) framework specifically tailored for the water sector in Eswatini. This framework is part of a broader national effort to align with the Enhanced Transparency Framework (ETF) under the Paris Agreement, addressing the urgent need for systematic climate adaptation measures. The framework is designed to support Eswatini's Nationally Determined Contributions (NDCs) by providing reliable data on the implementation and effectiveness of adaptation strategies in the water sector.

The framework outlines the key components, focusing on institutional arrangements, data management processes, and the integration of these components into national and international reporting mechanisms, particularly the Biennial Transparency Report (BTR). It highlights the importance of establishing clear roles and responsibilities among stakeholders, including government agencies, local authorities, and private sector participants. This institutional clarity is crucial for ensuring efficient data flow, robust reporting structures, and the overall success of the MRV framework.

One of the primary objectives of the MRV framework is to enhance the accuracy and reliability of data related to climate adaptation in the water sector. The use of standardized data capture templates to streamline the collection, analysis, and reporting of relevant information has been proposed. These templates are designed to meet the specific needs of the water sector while also aligning with broader national and international requirements. The adoption of these templates is expected to improve the quality of data feeding into the BTR, thereby enhancing Eswatini’s ability to meet its international climate reporting obligations.

The framework also emphasizes the need for capacity building within the institutions responsible for implementing the MRV processes. Training and resource allocation have been identified as critical components to ensure that relevant stakeholders are equipped with the necessary skills and tools to effectively manage the MRV activities. By strengthening local capacity, the framework aims to foster a sustainable approach to climate adaptation monitoring that can be maintained over the long term.

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Abbreviations

MRV	: Monitoring Reporting and Verification
ETF	: Enhanced Transparency Framework
NDCs	: Nationally Determined Contributions
BTR	: Biennial Transparency Report
COP	: Conference of Parties
UNFCCC	: United Nations Framework Convention on Climate Change
GoE	: Government of Eswatini
ICAT	: Initiative for Climate Action Transparency
WASH	: Water Sanitation and Hygiene
a-BTR	: Adaptation – Biennial Transparency Report
IPCC	: intergovernmental panel on climate change
AR6	: sixth assessment report
R&D	: Research and Development
M&E	: Monitoring and Evaluation
TDS	: Total Dissolved Solids
COD	: Chemical Oxygen Demand
BOD	: Biological Oxygen Demand
DO	: Dissolved Oxygen
GIS	: Geometric Information System
IWRM	: Integrated Water Resources Management
KPIs	: Key Performance Indicators
MNRE	: Ministry of Natural Resources and Energy
MTEA	: Ministry of Tourism and Environmental Affairs
MoA	: Ministry of Agriculture
MoH	: Ministry of Health
MoF	: Ministry of Finance
MoPWT	: Ministry of Public Works and Transport

EWADE	: Eswatini Water Development Enterprise
MTAD	: Ministry of Tinkhudla Administration and Development
MHUD	: Ministry of Housing and Urban Development
NDMA	: National Disaster Management Agency
MEPD	: Ministry of Economic Planning and Development
CSO	: Central Statistics Office

Key Definitions

Measurement, Reporting, and Verification (MRV): A framework designed to measure, report, and verify actions and outcomes related to climate change mitigation and adaptation. It ensures transparency, accuracy, and accountability in climate action efforts.

Nationally Determined Contributions (NDC): National plans submitted by countries outlining their commitments to reduce greenhouse gas emissions and adapt to the impacts of climate change as part of the Paris Agreement.

Enhanced Transparency Framework (ETF): A framework established under the Paris Agreement aimed at providing a clear understanding of climate actions, including tracking progress towards NDCs and ensuring transparency and accountability in climate reporting.

Biennial Transparency Report (BTR): Reports that countries submit every two years under the ETF, detailing their climate actions, progress, and the support received or provided, to facilitate the global stock take of climate efforts.

Climate Change Adaptation: Adjustments in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderate, harm or exploit beneficial opportunities, thereby reducing vulnerability and enhancing resilience.

Water, Sanitation, and Hygiene (WASH): A collective term for the public health and environmental services that provide access to safe drinking water, sanitation facilities, and hygiene education, essential for health and well-being.

Conference of the Parties (COP): The supreme decision-making body of the UNFCCC, comprising representatives of all Parties to the Convention, which meets annually to review progress and update or revise existing climate policies, or establish new climate action policies.

Intergovernmental Panel on Climate Change (IPCC): The international body established to assess the science related to climate change, and to provide policymakers with regular assessments of the scientific basis of climate change, its impacts, and potential future risks.

Sustainable Development Goals (SDG): A set of 17 global goals established by the United Nations in 2015 to address pressing challenges such as poverty, inequality, environmental degradation, and climate change by 2030.

Greenhouse Gases (GHG): Gases that trap heat in the atmosphere, contributing to the greenhouse effect and global warming. Major GHGs include carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O).

Adaptation Biennial Transparency Report (a-BTR): A specific component of the Biennial Transparency Report focused on tracking and reporting progress on adaptation actions and strategies to enhance resilience against climate change.

Background

The adoption of several decisions detailing guidance at UNFCCC COP 13 in Bali (December 2007) improved the then existing systems of reporting information related to the implementation of climate action (UNFCCC, 2008). Another improvement to the reporting systems was the establishment of general guidelines for domestic measurement, reporting and verification (MRV). In 2015 the Paris Agreement was adopted at COP 21 which reviewed the goals across climate change, including adaptation, and introduced a new reporting framework, namely the Enhanced Transparency Framework (ETF) (UNFCCC, 2023a). The Biennial Transparency Report (BTR) was established as part of the ETF reporting process and is intended to facilitate country reporting on climate change mitigation, adaptation and other climate related activities (Dale et al., 2020).

Eswatini has presented an updated Nationally Determined Contributions (NDC) to the UNFCCC which outlines increased ambitions for both mitigation and adaptation measures for a climate adaptive Eswatini (GoE, 2021; UNFCCC, 2023b). This is one of the many efforts that have shown Eswatini's commitment to global climate action goals. The country has realised improved climate awareness, strengthened capacity building within government and stakeholders on climate change mainstreaming, and improved access to climate financing of late. The country has also improved the strengthening of the legislative framework to support climate action, experienced an improvement in the institutional framework and improved capacity to coordinate climate action across various sectors (GoE, 2021).

Eswatini implemented a Initiative for Climate Action Transparency (ICAT) Phase I project in 2021-2022 titled "The technical support to increase the overall transparency capacity and set-up sectoral MRV systems in the Kingdom of Eswatini". The project included an adaptation component for the water and health sectors.

The following were the outputs:

- National health and water adaptation state of play (ICAT, 2022a),
- Gap analysis and action plan for the water and health sectors (ICAT, 2022b), and,
- Adaptation road map for the water and health sector (ICAT, 2022c).

The key gaps identified in that project were broadly classified into legal and institutional, financial, capacity and infrastructure and technology. They could be linked to each of the adaptation options submitted in the NDC for the water and water sanitation and hygiene (WASH) sectors, with specific recommendations (ICAT, 2022b). The action plan listed the activities to be taken, indicators for the activities and assigned responsible institutions to the implementation of the activities, for each of the adaptation measures. The roadmap identified actions over an 8-year period that would strengthen adaptation actions that include strengthening of infrastructure, data

collection and verification, institutional and legal framework, amongst others (ICAT, 2022c).

The current project, “Developing a MRV framework for tracking adaptation actions in the health and water sectors”, builds upon the outcomes of the ICAT Phase I project. The current project seeks to increase the capacity of in-country personnel to compile the adaptation BTR (a-BTR). The development of the MRV framework for the water sector adaptation involves several key steps, including (a) assessment and risk identification, (b) stakeholder engagement, (c) setting adaptation goals, (d) selecting adaptation measures, (e) data collection, (f) monitoring, reporting and verification, and (g) capacity building and training. The framework development is guided by the recently submitted NDC, with the clearly articulated adaptation measures guiding data collection and monitoring, reporting as well as verification (i.e. MRV).

Adaptation Goals and Objectives

Eswatini has made significant strides in the socioeconomic development through improvements in different sectors. This has been achieved against climate impacts, which have reversed some of the developmental gains achieved. The urgency to action, as articulated in the AR6 IPCC report (IPCC, 2023), requires member states to invest more in adaptation to climate change to avoid the adverse effects of climatological hazards and disasters. Adaptation spans several sectors, namely; agriculture, water, health, ecosystems and biodiversity and infrastructure. The goals of adaptation in the water sector in Eswatini, are to;

- enhance water availability during climate events,
- improve resilience of water infrastructure, and
- maintain water quality standards.

Risk Assessment and Vulnerability Analysis

Eswatini undertakes an annual vulnerability assessment which focusses mainly on the food security and outlines the key drivers of vulnerabilities (GoE, 2023). These drivers are: dry spells, high unemployment and increase in food prices. These are all related to climate change (GoE, 2020). In addition, the country commissioned a detailed climate change risk mapping and vulnerability assessment to identify climate risk hot spots through a spatially-explicit analysis of the hazards, exposure to these hazards and vulnerability to the impacts of climate change (GoE, 2021). This was done using the IPCC risk analysis framework based on enumeration area analysis. The vulnerability was analysed by generating vulnerability indices to reflect exposure, sensitivity and adaptive capacity (GoE, 2021). The report identified the most vulnerable groups as women, children, orphans, people living with disabilities and the poor.

The vulnerability assessment identified, through a stakeholder engagement exercise, several hazards and their impacts for the different sectors of the economy. A summary

of the climate change hazards and the impacts on the water sector is presented in Table 1.

Table 1: ***A summary of climate change hazards and their impacts on the water sector as identified by the vulnerability assessment. (GoE, 2021; IPCC, 2023)***

Sector	Drought	Floods	Fire	Storm	Epidemics	Invasives	Heatwaves	Landslides
Water	Reduced water flows Reduced water availability Declining water table	Damage to infrastructure	Damage to infrastructure	Reduced water quality Damage to infrastructure	Reduced economic activity & productivity,	Reduced water flows Reduced water quality Damage to infrastructure Declining water table	Reduced water flows Reduced water quality Reduced agricultural activities Declining water table	Damage to infrastructure
WASH	Disruption in water supply Increase in waterborne diseases	Disruption in water supply Increase in waterborne diseases	Destruction of water supply infrastructure	Destruction of water supply infrastructure	Increase in waterborne diseases	Disruption of water supply	Disruption of water supply	Destruction of water supply infrastructure

Purpose of the MRV implementation framework

This MRV framework for adaptation in the water sector is a systematic approach to track and assess the effectiveness of adaptation strategies in improving water sector resilience to climate change. It emphasizes the collection of accurate data on water availability, usage, and progress of the implementation of adaptation actions. The framework will enable the country to prepare the a-BTR and achieve the following (UNFCCC, 2013; ICAT 2023; UNFCCC, 2023c).

- **Accurate data collection:** Ensures systematic and reliable collection of data related to water resources, usage, and quality which is important for data driven decision making and policy direction.
- **Transparency and accuracy:** Enhance the transparency amongst stakeholders within the sector through reporting clear and verifiable data.
- **Compliance and reporting:** The MRV enables the country to report on its progress in climate adaptation actions and progress towards sustainable water management practices.
- **Resource management and planning:** The data collected through the MRV framework may be used to forecast future water demands, plan for future water supply and WASH, and plan for emerging issues of quantity and quality.
- **Adaptation to climate change:** The MRV framework provides data and insights that are centric in the development of strategies for climate change adaptation.
- **Capacity building:** The implementation of the MRV framework includes training and development activities which strengthens the overall competency of in the centre.

Adaptation Measures

The adaptation measures for Eswatini are extracted from the updated NDC of 2021 (GoE, 2021). The specific measures for the water sector, including WASH are:

1. Improve water governance and compliance to help manage water resources more efficiently and effectively to adapt to resultant water shortages from climate change.
2. Develop water pricing structures to encourage efficient water use and scale-up smart metering systems.
3. Strengthen the control and monitoring of water availability and use to protect surface and groundwater resources from over abstraction and impose timely restrictions when needed.
4. Strengthen the capacity of early warning systems to improve preparedness and response while reducing disaster risk.
5. Develop and implement catchment adaptation plans and strategies to promote ecosystem and community resilience.

6. Control invasive alien plant species and pollution in catchments to protect water resources (quality and quantity).
7. Design and construct water storage infrastructure for multiple use e.g. large dams, earth dams, sand dams etc.
8. Enhance Water Supply, Sanitation and Hygiene (WASH) Sector contribution to sustain healthy livelihoods.
9. Create an enabling environment for the governance of WASH activities to promote resilience against climate change.
10. Assess sustainable water supply options beyond 2030 through conducting water assessments/studies to identify potable water supply sources, opportunities, and constraints with a climate lens.
11. Secure climate proof water infrastructure including through developing resilient/ climate proof WASH infrastructure to increase community resilience and boost adaptive capacity.

Monitoring

The goal of monitoring within the MRV framework is to collect reliable and accurate data that indicates the effectiveness of adaptation actions in the water sector (UNFCCC, 2023a; UNFCCC, 2023b). Data will be collected in line with the roadmap produced in the ICAT Phase I Project, which identified the following activities for implementation: (i) resource mobilization, (ii) research and development (iii) legal framework, (iv) capacity building, (v) institutional set-up, (vi) infrastructure strengthening, and (vii) monitoring and evaluation (ICAT, 2022c; UNFCCC, 2020). The actions in the roadmap address different NDC measures and may be achieved through the implementation and measurement of the metrics. The key contributions of roadmap activities in climate change adaptation and the promotion of the NDC measures are presented below.

- ***Resource Mobilization*:** Successful mobilization of resources will ensure (a) investment in infrastructure development, research and innovation and availability of emergency funds, (b) resources are available for capacity building, (c) investment in technology for data collection and analysis (d), comprehensive stakeholder engagement and public awareness campaigns, (e) implementation of pilot projects and subsidies for sustainable practices, and, (f) funding is available for continuous monitoring and evaluation which informs programmatic strengthening and/or changes
- ***Research and Development (R&D)*:** Several ways in which R&D contributes to climate change adaptation in the water sector include: (a) development of innovative technologies and solutions, (b) strengthening of data collection and analysis, (c) providing scientific evidence to enhance policy and regulatory frameworks, (d) promoting capacity building and education; and, (e) supports climate resilience infrastructure development amongst other contributions.

- ***Strengthening of legal framework*:** A legal framework will establish the necessary legal documents for water management that outlines (a) clear responsibilities in coordination and planning, (b) development and implementation of policies and strategies, (c) resources allocation and management, (d) establishes requirements and systems for monitoring and reporting, (e) outlines mechanisms for funding and economic incentives for adaptation champions; and, (f) mandates and promotes public participation and education.
- ***Capacity Building*:** Capacity building stretches across several activities and enhances the ability of the water sector to adapt to climate change, through (a) enhanced knowledge and skills, (b) improved data collection and analysis, (c) development of adaptive strategies, (d) institutional strengthening, (e) community level engagement and awareness, (f) promoted innovation and technology adoption; and, (g) may be used as a tool for monitoring and evaluation.
- ***An effective institutional set-up*:** It provides the framework and support necessary to implement, coordinate, and sustain adaptation measures to ensure: (a) collaboration and integration of policies, (b) capacity building and training, (c) data collection and management, (d) development of policies and regulatory frameworks, (e) secure funding and allocation, (f) stakeholder engagement and public participation, (g) encouragement and support for research and innovation, (h) the undertaking of risks management and emergency preparedness; and (i) facilitation of monitoring and evaluation.
- ***Strengthening of infrastructure resilience*:** This provides the necessary adaptive capacity of infrastructure resilience to climate change impacts through: (a) increased resilience to extreme weather events, (b) improved water storage and management, (c) enhanced flood control, (d) improved sustainable water supply systems, (e) protection of water quality, (f) diversification of water sources, (g) integration of energy efficient technologies into water infrastructure' and, (h) early warning systems and monitoring and improved community and ecosystems protection.
- ***Monitoring and evaluation (M&E):*** M&E contributes to water sector adaption through: (a) enabling informed decision making, (b) providing assessment of adaptation effectiveness, (c) informed resources allocation, (d) supporting risk management, (e) continuous improvement of the systems through feedback mechanisms and learning and adaptation, (f) promotes transparency, accountability and community engagement, (g) ensures regulatory compliance and fulfil reporting obligations.

Water Sector Adaptation Metrics

The different ways in which the roadmap actions promote adaptation are also easily linkable to, and supportive of, the NDC actions. The Table below outlines the

adaptation metrics, linked to each NDC measure and also assigns responsible organizations to gather and provide the relevant data.

NDC actions for the water sector		Metrics for Adaptation	Description/Explanations	Responsible organisation
1	Improve water governance and compliance to help manage water resources more efficiently and effectively to adapt to resultant water shortages from climate change	Water Usage efficiency	Measures the amount of water used and assists in optimizing water consumption.	MNRE (DWA)
		Water Governance	Assess the effectiveness of water governance structures, policies and institutions. Indicators; legal frameworks, stakeholder participation and transparency, gender sensitivity	MNRE (DWA), AG's Office, MTEA
		Water Resource Management	Assessment of how well water resources are managed to ensure long-term sustainability and evaluation of the quality and availability of water for different uses	MNRE (DWA)
		Community Engagement Metrics	Measures community involvement in water management decisions through consultations and participation in projects	MNRE (DWA & JRBA)
2	Develop water pricing structures to encourage efficient water use and scale-up smart metering systems	Establishment of Baseline Targets	Publication of baseline targets and water consumption patterns, reductions in water wastage, and improvements in water use efficiency	MNRE (DWA & JRBA)
		Smart metering systems	This will indicate the number of smart meters installed, Percentage of water consumers using smart metering systems.	MNRE (DWA & JRBA)
		Legislation for water pricing	Indicates progress in developing legislative structures for water pricing	MNRE (DWA & JRBA)
3	Strengthen the control and monitoring of water availability and use to protect surface and groundwater resources from over abstraction and impose timely restrictions when needed	Water Availability	Measures the rate at which water replenishes underground aquifers and levels of water in rivers or dams	MNRE (DWA & JRBA)
		Water Usage efficiency	Indicates the level of water stress in a region based on water availability and demand (Water withdrawals divided by available sources)	MNRE (DWA, JRBA, EWSC)

		Water Abstraction Compliance	ascertains the number and presence of compliance monitoring for abstractions and	MNRE (DWA, JRBA)
4	Strengthen the capacity of early warning systems to improve preparedness and response while reducing disaster risk	Extreme weather events	Susceptibility of a region to drought events. precipitation patterns, soil moisture and vegetation health	MTEA (MET), MNRE (DWA), DPMO (NDMA)
		Installation and reliability of early warning systems	Determines the extent of the installation and reliability of early warning systems for floods, drought.	MNRE (DWA, JRBA)
5	Develop and implement catchment adaptation plans and strategies to promote ecosystem and community resilience	Catchment adaptation plans	Number of catchment adaptation plans developed and implemented, Frequency and severity of climate-related event, Number of training sessions conducted for community capacity building	ENTC, DWA, MoT, MTEA
		Ecological Flow Assessment	Determines minimum flow required to maintain ecosystem health in rivers and streams	MNRE (DWA, JRBA)
6	Control Invasive Alien plant species and pollution in catchments to protect water resources (quality and quantity)	Biodiversity Indices	Assess changes in the diversity and abundance of native plants and animal species in catchment areas.	MNRE (DWA, JRBA), MTEA (ENTC, EEA)
		Water Quality _Catchments:	Assessment of water quality based on selected parameters. To find a water quality index (WQI) suitable for the different water sources.	MNRE (DWA, JRBA, EWSC)
		Water Quantity	This is determined by stream flow rates and ground water levels in catchments	MNRE (DWA, JRBA, EWSC)
		Monitoring Invasive plant species	Count the number of invasive species control programs initiated and completed.	MNRE (DWA, JRBA)
7	Design and construct water storage infrastructure for multiple use i.e., large dams, earth dams, sand dams etc.	Infrastructure Projects	This illustrates the number of projects initiated and completed in constructing dams for multiple use.	MNRE (DWA)
		Maintenance program	Number and effectiveness of maintenance programs	MNRE (DWA)
		Storage capacity	Total water storage capacity (in cubic meters) and the number of people benefitting from the stored water.	MNRE (DWA)

8	Enhance Water supply, Sanitation and Hygiene (WASH) Sector contribution to sustain healthy livelihoods	Water Supply and availability	Percentage of the population with access to safe and reliable drinking water sources, Frequency of water interruptions, average daily water consumption per person	EWSC, MoH, MNRE-DWA
		Sanitation	The percentage of the population connected to public wastewater treatment plants (water recycling), Percentage of the population with access to improved sanitation facilities (e.g., flush toilets, improved pit latrines).	EWSC, MoH, MNRE-DWA
		Water Quality _ Domestic:	Assessment of water quality based on selected parameters to ascertain percentage of the population with access to safe and reliable drinking water sources. Regular monitoring of water quality parameters, including microbial contamination (e.g., E. coli presence), chemical contaminants, and turbidity.	MNRE (DWA, EWSC)
		Hygiene	Percentage of households and public institutions (e.g., schools, healthcare facilities) with access to handwashing facilities with soap and water. Percentage of the population practicing regular handwashing at critical times. Number of hygiene education programs	MNRE (DWA & EWSC), MoH
9	Create an enabling environment for the governance of WASH activities to promote resilience against climate change	Community Engagement Metrics	This should track the number of wash programs implemented. Number and functionality of community-based WASH committees. Number of community members participating in WASH improvement programs	MoH-EHD, UNICEF
		Water-related Gender Equality Metrics	Tracks the representation of vulnerable groups (Female, elderly, living with disability) in water committees, access to sanitation facilities, etc.	MoH-EHD, UNICEF
		Water Governance Index	Assesses the effectiveness of water governance structures, policies, and institutions in relation to WASH.	MNRE (DWA), Attorney General's Office, MTEA

10	Assess sustainable water supply options beyond 2030 through conducting water assessments/studies to identify potable water supply sources, opportunities, and constraints with a climate lens	Water Supply Assessments	Summarises the number of new water supply assessments/studies initiated and completed. Number and type of constraints and risks identified (e.g., over-extraction, pollution, climate vulnerability). Number of mitigation strategies developed to address identified constraints and risks. Data availability, regular reporting, and transparency measures	MNRE (DWA), MTEA, EWSC, MTEA
11	Secure climate proof water infrastructure including through developing resilient/ climate proof WASH infrastructure to increase community resilience and boost adaptive capacity.	Resilience of Water Infrastructure	Measures the ability of water infrastructure to withstand extreme events (floods, droughts and storms): Inspection reports, maintenance schedules, emergency response plans of WASH infrastructure. Number of WASH infrastructure projects designed to be climate resilient. Frequency of vulnerability assessment on infrastructure	MNRE (DWA & EWSC), MTEA, NDMA

Reporting

This section is an essential component of the MRV framework as it provides a systematic approach to document progress, communicate results, and ensure transparency and accountability in the country's adaptation efforts (Dale, et al., 2020).

Reporting Objectives

The objectives of reporting aim to enhance understanding, accountability and continuous improvement in adaptation activities. The specific objectives are therefore presented below (Dale et al., 2020):

- **Inform policy and decision making:** the report shall provide essential data and insights that inform strategic decisions and policy adjustments. Effective reporting can also improve alignment of actions with national and international climate change goals, as well as bridge the barrier between adaptation activities being implemented and policy development.
- **Engage stakeholders:** an adaptation report keeps all stakeholders informed about the progress and impact of adaptation measures, which also promotes trust and encourages further collaboration in climate adaptation activities. The inclusion of stakeholders in the reporting process ensures that reports are relevant, accessible and actionable.
- **Demonstrate accountability:** an adaptation report demonstrates accountability by documenting the use of resources, activities taken and the achieved outcomes.
- **Facilitate learning and improvement:** the adaptation report must share lessons learnt and best practices for improving future adaptation actions. The outline of areas of success and failures informs adaptation strategies and regular detailed reporting also identify gaps and assists the iterative process of adaptation planning and implementation.
- **Compliance and Reporting Obligations:** (a) National and International Commitments: Ensure compliance with national policies and international agreements related to climate change adaptation, including the Paris Agreement and (b) reporting to international bodies to fulfil reporting obligations to international bodies like the UNFCCC.

Report Structure

The **Adaptation Report** for Eswatini should demonstrate clarity and comprehensiveness and ensure consistency and completeness in the reports submitted to the UNFCCC. A recommended structure is presented below;

Section 1: Executive Summary

- Overview of key findings and recommendations.

Section 2: Introduction

- Objectives of the report.
- Scope and methodology.

Section 3: Vulnerability and Risk Assessment

- Description of vulnerabilities and risks identified.
- Maps and visualizations of vulnerable areas.

Section 4: Adaptation Measures and Implementation Status

- Detailed description of adaptation measures implemented.
- Status of implementation (completed, ongoing, planned).
- Performance metrics and key achievements.

Section 5: Financial and Resource Allocation

- Overview of financial resources mobilized.
- Breakdown of expenditures and resource utilization.
- Cost-benefit analysis of adaptation measures.

Section 6: Environmental and Social Impacts

- Assessment of environmental impacts and ecosystem health.
- Social impact analysis, including gender and social inclusion aspects.

Section 7: Stakeholder Engagement and Capacity Building

- Summary of stakeholder consultations and feedback.
- Capacity-building activities and outcomes.

Section 8: Lessons Learned and Best Practices

- Key lessons learned from adaptation measures.
- Best practices and recommendations for future actions.

Section 9: Conclusion and Next Steps

- Summary of key findings.
- Recommendations for future adaptation efforts.
- Planned next steps and timelines.

Section 10: Appendices

- Additional data and supporting documents.
- Detailed tables, charts, and maps.

Reporting Structure

A well-defined reporting structure is essential for the effective implementation of the MRV framework for climate adaptation in the water sector. The structure should ensure clarity, consistency, and comprehensiveness in reporting, meeting the requirements set by the UNFCCC (UNFCCC, 2014; UNFCCC, 2023d). This section outlines the key components and hierarchy of the reporting structure, detailing the roles and responsibilities at each level.

Sectoral Data Collection Teams (MRV)

Each sector will have a dedicated team responsible for collecting data on climate change impacts, adaptation measures, and resilience initiatives, ensuring accurate and comprehensive Monitoring, Reporting, and Verification (MRV) systems. The teams will use standardized methods and tools for data collection and analysis, ensure data quality, accuracy, and timeliness and support sectoral and national bodies with data-driven insights and visualizations.

Water Quality and Quantity Data Collection Team

The data collection team shall be chaired by a senior water engineer/ water resources specialist and shall comprise of hydrologists and water quality specialists, environmental scientists, representatives for NGOs and civil society organizations focused on water conservation and management and representatives from relevant ministries (e.g., Water, Health, Agriculture). It will perform the following responsibilities;

- Collect data on surface and groundwater availability, water quality, and contamination levels due to climate impacts.
- Monitor water usage across sectors to ensure sustainable management during climate-related events (e.g., droughts and floods).
- Participate in surveys and data verification

Agriculture Sector Data Collection Team

The agriculture sector data collection team shall be chaired by a senior agriculture officer and shall be constituted by agricultural extension officers, researchers within the sector, farmer organizations and cooperatives. The team shall;

- Collect and synthesise data on water consumed during agricultural productivity, food security, and the adoption of climate-smart agricultural practices.
- Participate in data verification exercises

Biodiversity and Ecosystem Conservation Data Collection Team

The team will be chaired by Senior Ecologist/conservationist and shall comprise of ecologists and conservationists and representatives for NGOs and civil society groups involved in environmental protection. The team shall;

- Collect data relevant to the measurement of the progress of climate change adaptation using indicators from biodiversity, including species migration, habitat loss and
- Participate in data verification

WASH Sector Data Collection Team

The WASH sectoral data collection team will be headed by a senior sanitation and hygiene officer and shall be constituted by officers from public health, sanitation and hygiene officers, representatives from health institutions. The team shall;

- Collect data on infrastructure resilience, progress in climate adaptive sanitation and hygiene practices and
- Participate in data verification exercises.

Infrastructure Planning Data Collection Team

The team shall be chaired by a senior infrastructure officer and shall comprise of civil engineers, disaster risk management specialist and local government representatives. They shall:

- Gather data on the resilience of infrastructure (e.g., roads, bridges, buildings, water systems) to climate change impacts, such as floods, heat waves, and extreme weather events,
- Map and assess infrastructure located in climate-vulnerable areas (e.g., floodplains, drought-prone zones).
- Analyze the vulnerability of existing and planned infrastructure to projected climate risks and
- Participate in data verification and report to the water sector adaptation committee.

Disaster Management Data collection team

The team contributes to the MRV system by tracking, analysing, and verifying data on climate-related disasters, supporting the national adaptation strategy. It shall be headed by a senior disaster management officer and shall include members who are disaster risk management specialists, meteorologists and climate experts, emergency response coordinators and local government representatives. They shall;

- Collect data on the occurrence, frequency, and impact of climate-related disasters (e.g., floods, droughts, heat waves, storms) across the country,
- Map disaster-prone areas and monitor changes in disaster risk due to climate change

- Analyze the vulnerability of communities, infrastructure, and ecosystems to climate-induced disasters
- Identify high-risk areas and population groups most vulnerable to extreme weather events and climate variability
- Cross-check collected data with relevant sectoral teams (e.g., infrastructure, health, water) to ensure consistency and accuracy
- Track and assess the effectiveness of disaster response efforts, focusing on post-disaster recovery and adaptation initiatives
- Contribute to the development of reports on disaster risk reduction and climate resilience

Finance and Economic Planning

The team shall be chaired by an economist and shall be constituted by financial analysts, economists, budget and resources allocation experts, representatives from developmental partners and local government financial representatives. It shall be responsible for;

- Collect and track data on financial resources allocated to climate adaptation and resilience projects across sectors (water, agriculture, infrastructure, etc.)
- Monitor sources of climate finance, including government budgets, international funding (e.g., Green Climate Fund), and private sector contributions.
- Document financial flows related to climate adaptation investments at the national and local levels
- Assess the economic resilience of vulnerable sectors and communities to climate risks
- Analyze the economic impact of climate change on various sectors, including the costs and benefits of adaptation measures.
- Collaborate with other sectoral teams (e.g., water, infrastructure, disaster management) to verify the financial data related to climate adaptation projects.
- Ensure the accuracy and transparency of financial data reported in national MRV systems, including reconciliation of financial inputs with project outcomes.
- Identify gaps in financing for climate adaptation and resilience and propose measures to close those gaps
- Submit financial data and economic analysis reports.

Water Sector Adaptation Committee

The water sector adaptation committee shall be established and appointed by the Principal Secretary in the MNRE and chaired by the Director of the Department of Water Affairs. It shall be established either by an act of parliament of government directive and shall have its terms of reference. It shall have climate change specialists from the MNRE, MoA, MoPWT, MEPD, MTAD, MoH. The membership shall be; representatives from ministries responsible for water, agriculture, and infrastructure,

hydrologists and water management experts and NGOs and civil society groups working on water issues. The committee shall, in addition to their other responsibilities;

- Oversee and coordinate data collection efforts related to climate change adaptation within the water sector
- Ensure that data collection teams across the sector (e.g., agriculture, health, infrastructure) adhere to standardized methodologies and procedures for collecting climate adaptation data
- Facilitate collaboration and communication between all involved sub-sectors to avoid data duplication and ensure comprehensive coverage of water-related adaptation efforts
- Analyze water sector-specific data collected from all relevant teams
- Identify gaps in the data or areas requiring further investigation and ensure that corrective actions are taken
- Liaise with the Technical Advisory Committee on Adaptation and Resilience, providing regular updates, reports, and insights derived from water sector data
- Discuss and propose any necessary adjustments to the Standard Operating Procedures (SOPs) for data collection, based on insights from field data and technical assessments
- Compile and develop a comprehensive Water Sector Adaptation Report that consolidates data, analysis, and recommendations from across the sector.
- Highlight progress on water-related adaptation initiatives, challenges faced, and any necessary interventions.
- Submit the water sector adaptation report to the National Climate Change Committee (NCCC) through the Technical Advisory Committee for consideration and integration into the broader national adaptation strategy

Technical Advisory Committee on Adaptation and Resilience

This committee has responsibilities for oversight of all matters linked to adaptation, provides technical advice to the National Climate Change Committee, and other sub-committees to ensure climate change adaptation strategies are science based and align with global best practices and assist in the development of national guidelines and frameworks. The committee shall be chaired by a Senior Climate Change Expert and consists of the following members; climate science experts from academia and

research institutes, sector specialists, international partners. The committee, in addition to its current responsibilities, shall;

- Lead the development and monitoring of water related adaptation measures
- Oversee data collection for the water sector adaptation progress
- Coordinate the sub-sectors of the water sector to ensure synergy in data collection, standard operating procedures for data collection
- Coordinate the communication of yearly climate change adaptation outcomes and/or progress of the sector
- Organize training and capacity building programs on climate change adaptation techniques and document progress
- Analyse trends in climate-related risks and adaptation needs and receive data from data collection teams and develop reports.

National Climate Change Committee

The NCCC is the highest decision-making body, providing overarching leadership and strategic guidance on climate change adaptation, mitigation and resilience across

sectors. The committee has 2 sub-committees, the executive and operational committees.

The executive sub-committee shall:

- Evaluate and approve water related adaptation strategies
- Make key decisions on the exclusion criteria in the collected and analysed data
- Review reports from the water sector adaptation committee and ensure compliance with international commitments,
- Approve budgets and resource allocations decisions for adaptation initiatives
- Analyse long term trends in climate related risks and provide strategic guidance on policy direction
- Endorse and approve national reports on water sector adaptation progress and ensure that they are submitted to international bodies.

The Operational Sub-Committee shall:

- Oversee data collection, monitoring and management of data on water sector adaptation,
- Ensure standard operating procedures for data collection are implemented uniformly across sub-sectors
- Coordinate data integration and triangulation as an internal verification exercise
- Coordinate with operational managers from water-related sub-sectors to ensure efficient communication and data-sharing for climate adaptation.
- Ensure timely communication of climate change adaptation outcomes and progress within the water sector to the Executive Sub-Committee and other stakeholder
- Provide detailed reports to the Executive Sub-Committee for high-level decision-making and strategic adjustments.

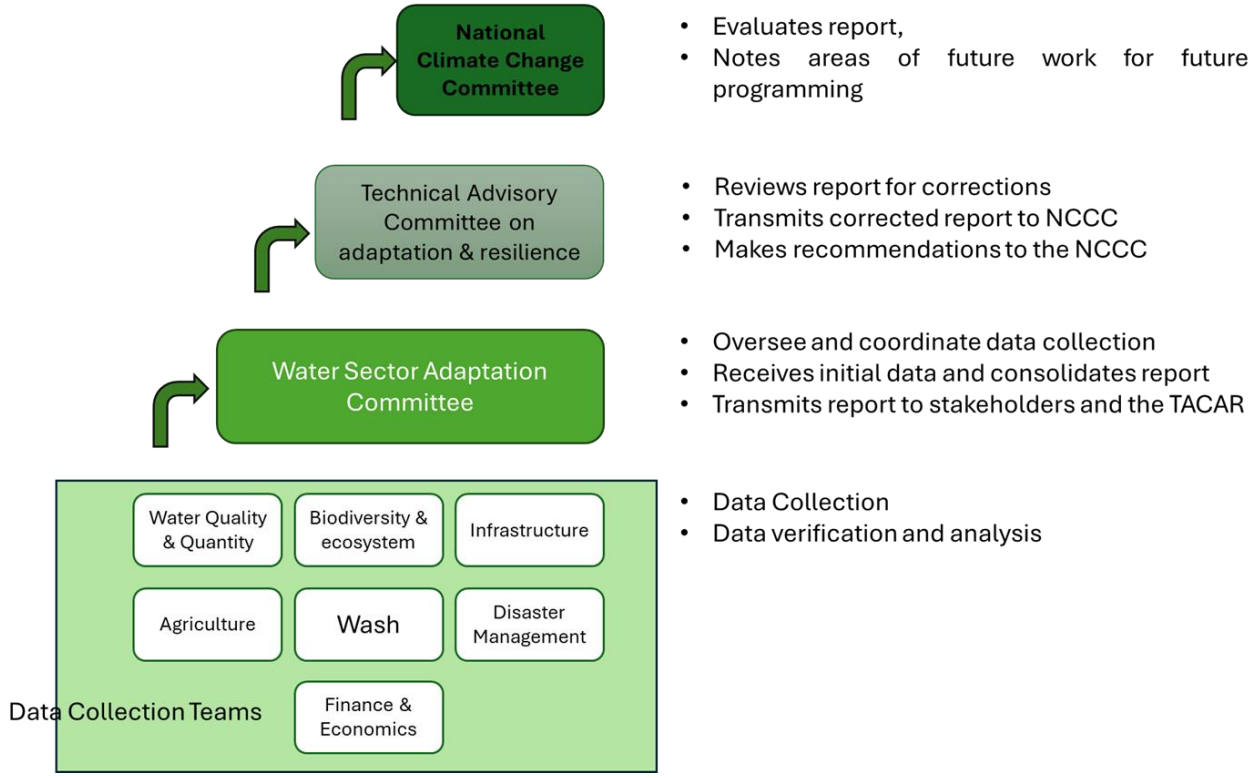

Figure 1: Institutional Arrangements for Water Sector Adaptation reporting

Reporting Flow

Data Collection Reporting

Each sectoral data collection team operates independently but contributes to a unified reporting framework for climate adaptation in the water sector. The teams report their findings to the Water Sector Adaptation Committee.

Water Quality and Quantity Data Collection Team: Submits reports on surface and groundwater availability, water quality assessments, and contamination levels.

Agriculture Sector Data Collection Team: Provides synthesized reports on water consumption in agriculture, productivity metrics, and climate-smart practices.

Biodiversity and Ecosystem Conservation Data Collection Team: Delivers reports on biodiversity indicators, species migration, and habitat health.

WASH Sector Data Collection Team: Reports on infrastructure resilience and the status of sanitation and hygiene practices.

Infrastructure Planning Data Collection Team: Submits findings related to infrastructure vulnerability assessments and climate-prone area mapping.

Disaster Management Data Collection Team: Provides reports on the occurrence and impact of climate-related disasters and community vulnerabilities.

Finance and Economic Planning Data Collection Team: Submits reports tracking financial resources allocated to climate adaptation and economic impact analyses.

Data Verification and Analysis Reporting

Each team participates in data verification exercises to ensure data quality and consistency. This includes collaborative efforts to cross-check and validate information with other relevant sectoral teams. Verified data is compiled and submitted to the Water Sector Adaptation Committee for thorough analysis.

Consolidated Reporting

The Water Sector Adaptation Committee consolidates data from all sectoral teams, performing comprehensive analyses to identify trends, gaps, and necessary actions. Findings are documented in a Water Sector Adaptation Report summarizing insights, challenges, and recommendations derived from the analyzed data.

Communication of Findings

The Water Sector Adaptation Report is transmitted to the Technical Advisory Committee on Adaptation and Resilience, which reviews the report and ensures that the findings align with national adaptation strategies. The Technical Advisory Committee communicates the summarized findings and recommendations to the Climate Change Committee (NCCC).

Decision-Making Reporting

The NCCC evaluates the reports and makes strategic decisions regarding adaptation strategies, resource allocations, and policy directions based on the consolidated data. Both the Executive Sub-Committee and Operational Sub-Committee of the NCCC play vital roles in overseeing the reporting process, approving budgets, and ensuring compliance with standard operating procedures.

Continuous Improvement Reporting

Feedback mechanisms are established to allow insights from the NCCC and Technical Advisory Committee to inform future reporting practices and data collection efforts. This iterative reporting process ensures that the MRV framework adapts effectively to emerging challenges and maintains alignment with the overall objectives of climate adaptation in the water sector.

Verification

Verification is a critical component of the (MRV) framework for climate adaptation in the water sector. It ensures the accuracy, reliability, and transparency of reported data and adaptation measures. This chapter outlines the verification processes, methodologies, roles and responsibilities, and key performance indicators for verifying water sector climate adaptation initiatives, aligning with guidelines set by the UNFCCC (UNFCCC, 2014).

Objectives of Verification

***Ensure Data Accuracy*:**

Purpose: To guarantee that the data collected and reported is precise and reflective of the actual conditions and outcomes.

Methods: Cross-checking data, using robust data collection tools, and employing statistical methods to verify accuracy.

***Enhance Transparency*:**

Purpose: To provide clear and accessible information to all stakeholders, facilitating trust and accountability.

Methods: Public disclosure of data, transparent methodologies, and regular reporting aligned with UNFCCC standards.

***Build Stakeholder Trust*:**

Purpose: To establish confidence among stakeholders that the data and reported outcomes are reliable and valid.

Methods: Involving stakeholders in verification processes, independent third-party audits, and public consultations.

***Support Decision-Making*:**

Purpose: To provide accurate and verified data to inform policymaking, resource allocation, and strategic planning.

Methods: Using verified data to create evidence-based reports and recommendations for decision-makers.

Data Verification

***Internal Data Audits*:**

Purpose: To internally review and confirm the accuracy and integrity of the collected data.

Methods: Regular audits conducted by internal teams, review of data entry processes, and cross-checking with historical data.

***Cross-Verification*:**

Purpose: To ensure data reliability by comparing it across multiple sources.

Methods: Utilizing remote sensing data, on-site measurements, and community reports to cross-verify information.

***Sampling and Surveys*:**

Purpose: To validate data through statistical sampling and surveys.

Methods: Implementing random sampling, stratified sampling techniques, and comprehensive surveys to gather and verify data.

Process of Verification

***Standard Operating Procedures (SOPs)*:**

Purpose: To review and verify adherence to established SOPs for data collection, reporting and adaptation implementation, ensuring compliance and alignment with UNFCCC methodologies.

Methods: Regular review and adherence checks of SOPs, training for staff on SOPs, and updates based on best practices.

***Documentation Review*:**

Purpose: To verify all documentation related to adaptation measures, including plans, progress reports and outcome assessments, aligned with UNFCCC guidelines.

Methods: Thorough review of plans, progress reports, and outcome assessments to ensure completeness and accuracy.

***On-Site Inspections*:**

Purpose: To physically verify the implementation and effectiveness of adaptation measures.

Methods: Scheduled and random on-site inspections, field visits, and interviews with local stakeholders.

Verification Outcomes

***Performance Indicators*:**

Purpose: To measure the effectiveness of adaptation measures using specific KPIs.

Methods: Tracking and verifying indicators such as flood risk reduction, water quality improvement, and infrastructure resilience.

***Impact Assessments*:**

Purpose: To assess the socio-economic and environmental impacts of adaptation measures.

Methods: Conducting impact assessments using established methodologies, collecting data on economic benefits, health outcomes, and environmental improvements.

***Beneficiary Feedback*:**

Purpose: To ensure that adaptation measures meet the needs and expectations of the affected communities.

Methods: Gathering and verifying feedback through surveys, focus groups, and community meetings.

Roles and Responsibilities

Verification Team

Internal Verifiers: Conduct internal audits and verification of data and processes and is responsible for data checks, process adherence reviews, and internal reporting.

External Verifiers: External verifies will provide independent and unbiased verification, conducts third-party audits, verify compliance with standards, and produce independent verification reports.

Stakeholders

Government Ministries/Departments: government shall provide oversight and ensure compliance during the verification process and monitor the process and alignment with national policies as well as collect information to inform future planning.

Community Representatives: the participation of communities is essential to provide local insights and verify community-level impacts. They participate in the verification processes, provide feedback and ensure that issues that affect and impact the communities are addressed.

Donors and International Bodies: they ensure that verification meets funding and international framework requirements and, where necessary, monitor and evaluate verification processes, ensure compliance with funding agreements, and support continuous improvement.

Key Performance Indicators for Verification

Data Accuracy Rate: This refers to the number of data entries that have been found by the verification to be accurate and is a measure of the reliability of data. This is determined by performing regular audits and cross-verification exercises.

Compliance Rate: This refers to the percentage of adaptation measures that follow standard operating systems and standards and it enhances the adherence to procedures. The compliance rate may be tested through process reviews and onsite inspection.

Verification Coverage: This refers to the proportion of projects and data points that are included in the verification and measures the extent of verification efforts through comprehensive audits and sampling.

Timeliness of Verification: The average time taken to complete the verification process for each reporting period. This ensures timely verification and should be achievable through tracking verification timelines.

Stakeholder Satisfaction: The level of satisfaction among stakeholders regarding the verification process and outcomes which measures the effectiveness of the verification process. Will be achieved through conductive surveys and collection of feedback from stakeholders and communities.

Verification Reporting

Verification Reports Content: The contents in the verification reports will include methodology, findings, discrepancies in the data, corrective actions suggested/done and recommendations. The report shall follow a typical structure which includes executive summary, methodology, detailed findings, discrepancies identified, corrective actions taken, and recommendations for improvement.

Verification report frequency: The frequency of reporting ensures regular engagement with stakeholders, on the outcomes of verification and shall be carried out after every reporting period.

Distribution of reports: Reports should be distributed so that all stakeholders have access and knowledge of verification findings and ensure that negative findings may not be reported in the next reporting period. All stakeholders should have access to the reports, as per the transparency requirements of the UNFCCC. The distribution list shall include government ministries/departments, communities, civic society, donors and developmental partners.

Feedback Mechanisms

Stakeholder Consultations: Organize consultations with stakeholders to discuss verification findings and gather feedback, ensuring that the process aligns with UNFCCC participatory approaches.

Continuous Mechanisms: Utilise the verification outcomes and stakeholder feedback to continuously improve data collection, reporting, and adaptation processes.

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