

Financing Strategy and Roadmap for Prioritised Water-related Climate Technologies

Strengthening the NDA's institutional and technical capacity to mobilise gender-responsive climate finance for Eswatini



Executive Summary

The report provides a comprehensive financing strategy for prioritized water-related technologies in Eswatini, a country particularly vulnerable to climate change's impacts on its water resources. The primary aim of this report is to identify potential sources of finance and strategies that can facilitate the adoption of these water-related climate technologies in Eswatini. It also outlines the key actions, policy interventions, and responsible parties required to support the development, transfer, and application of these technologies.

The report provides a thorough review of the status and challenges of financing water technologies in Eswatini. It also discusses the several types and sources of climate technology financing, such as grants, loans, equity, guarantees, and blended finance, and the roles of public and private sector actors in mobilizing and accessing climate finance.

Furthermore, the report presents a detailed framework for addressing the financing challenges and revenue generation sources for 16 prioritized water technologies. This framework covers the stages of research and development, demonstration, deployment, and commercialization. For each technology, the framework includes the guiding policies, acts or regulations, the activities, the potential financing sources, and the key stakeholders. This comprehensive approach ensures a holistic understanding of the financing landscape for water technologies in Eswatini.

Finally, the report provides a roadmap for implementing the proposed financing strategies for water-related climate technologies. These are presented in the short-term (0-3 years), medium-term (4-7 years) and long-term (8+ years).

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1

Introduction



The report provides a comprehensive financing strategy for prioritized water-related climate technologies in Eswatini. The main goal of this strategy is to identify potential finance sources and strategies that can be implemented to facilitate the uptake and adoption of prioritised water-related Climate Technologies within Eswatini. It discusses innovative financing mechanisms that can be used to raise capital towards the uptake and adoption of climate technologies and ways to optimise both private and public financing methods.

Technology development and transfer on adaptation are receiving increasing attention globally and locally. The Paris Agreement speaks of the vision of fully realizing technology development and transfer for both improving resilience to climate change and reducing GHG emissions (UNFCCC, 2024). At the national level, Eswatini's National Development Plan (2023/24 - 2027/28) (MEPD, 2023) also puts a strong emphasis on technology adoption for enhancing the resilience of communities to the adverse impacts of climate change while also improving efficiency and productivity. The plan further calls for investments in technological innovation and adaptation capabilities as key in harnessing the country's competitive potential to regional and international standards (MEPD, 2023). This emphasis is also true for the water sector where adaptation technologies have been identified as a critical component for sustainable development and inclusive growth. Building resilience of the water sector through the adoption of innovative adaptation technologies has spillover effects on a variety of development challenges including food security, health, energy, ecosystems, and others.

Despite the referenced importance at both the global and national levels, water-related climate technologies have lacked the required finances to be adequately adopted by developing countries like Eswatini. Historically the water sector has been financed by the public sector and this alone will not be sufficient to achieve the adoption of innovative solutions to enhance the resilience of the water sector. Due to the limited availability and the competing demands on public budgets, it is becoming increasingly important to mobilize non-traditional forms of capital to the water sector. Whatever limited public financing is available, should be primarily used to leverage

private capital flows into the sector for increased adoption of technologies. This is built on the premise that the private sector has the potential to fund water adaptation technologies; however, it requires a sound enabling framework to be created by the government.

1.1 Objectives of the Financing Strategy

The financing strategy aims to outline a framework for attracting investments, mobilizing resources, and facilitating the adoption of water-related priority climate technologies in Eswatini. The main objectives of this strategy are as follows:

- Identify the key actions, policy interventions and responsible parties required to support the development, transfer, and application of prioritised water-related climate technologies in Eswatini.
- Identify and map the potential financing sources for the prioritized water-related climate technologies in Eswatini.
- Outline a roadmap with key actions to support the uptake and implantation of the prioritized water-related technologies in Eswatini.

1.2 Process for Development of the Eswatini Water Technology Financing Strategy

The process for developing the financing strategy for prioritised water-related technologies builds on previous studies conducted in Eswatini involving three main steps (Figure 1):

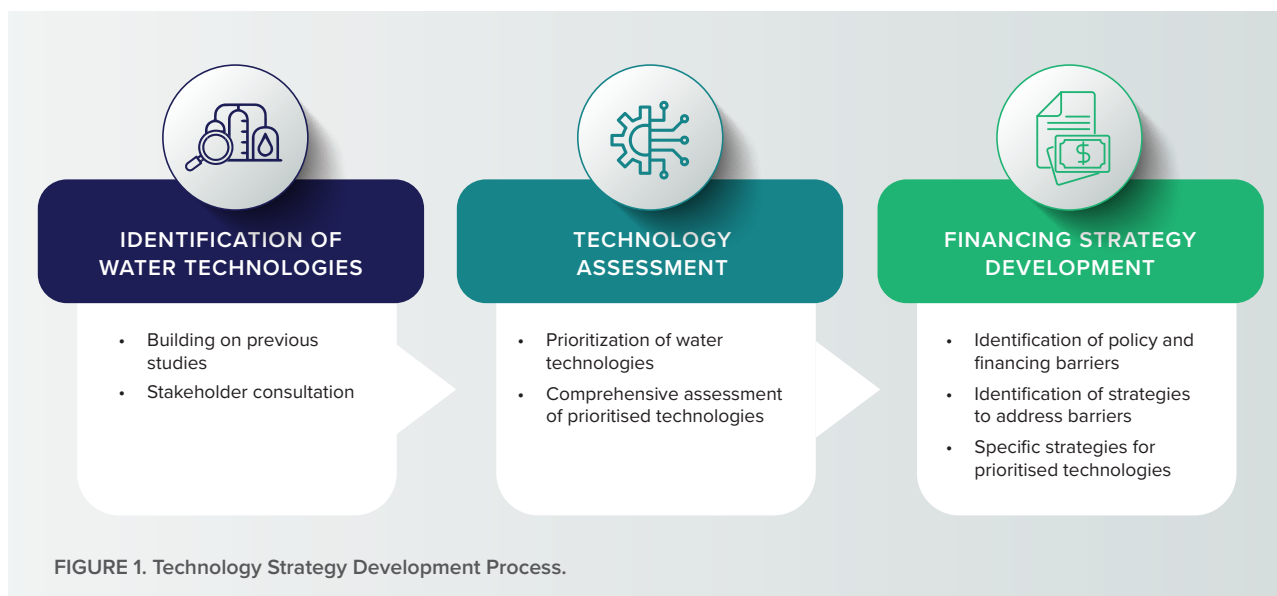


FIGURE 1. Technology Strategy Development Process.

1.3 Overview of Prioritised Climate Adaptation Technologies

Water adaptation technologies encompass both the implementation of technological tools and equipment, as well as approaches and management strategies relevant to climate change adaptation. These adaptation technologies can be broadly categorized into three groups, as identified by (Christiansen et al., 2011):

a. Hardware: This refers to the “hard” technologies, which involve physical infrastructure and technical equipment on the ground. Examples include water storage systems, dams, irrigation networks, and water treatment facilities.




b. Software: This category comprises “soft technologies” that encompass approaches, processes, and methodologies for adaptation. It includes planning and

decision support systems, models, knowledge transfer, and capacity-building activities aimed at developing the necessary skills for effective adaptation.

c. Orgware: Orgware represents the organizational technologies needed for the successful implementation and long-term sustainability of adaptation solutions. This involves establishing appropriate organizational, ownership, and institutional arrangements to support and manage adaptation efforts effectively. It includes governance structures, policy frameworks, institutional partnerships, and stakeholder engagement mechanisms.

From the 30 water-related technologies identified by stakeholders in Eswatini, 16 were prioritized for further interrogation on available financing opportunities including guiding actions for accessing those opportunities. A summary of these technologies is discussed in Table 1 below.

TABLE 1: Prioritized climate adaptation water technologies for Eswatini.

Technologies	Description of Technology	Reason for prioritization	Status of implementation and scale of investment
 <p>1. Flood and drought risk assessment and mapping</p>	<p>This involves evaluating the likelihood and potential impacts of drought events in a particular region. It considers factors such as historical climate data, precipitation patterns, soil moisture levels, and vegetation health. Drought risk mapping helps identify areas prone to drought and can assist in developing water management strategies, such as implementing water conservation measures, improving irrigation techniques, or promoting drought-resistant crops.</p> <p>Combines flood hazard information with vulnerability data to evaluate the potential impacts of flooding on human populations, infrastructure, and the environment. It considers factors such as population density, land-use patterns, and the resilience of infrastructure. Flood risk mapping helps identify areas at high risk and provides valuable information for land-use planning, emergency preparedness, and floodplain management.</p>	<p>A very low spatial resolution (50 km) was used for Eswatini, which may not well capture the landscape variability. The risk mapping conducted in 2021 highlighted the risks for Eswatini under climate change, without an in-depth assessment of each risk. Also, the spatial resolution was coarse, which is not ideal for a small country like Eswatini.</p>	<p>A disaster risk profile was done in 2019 using a grid of about 50km to simulate projections using the RCP2.6, RCP4.5 and RCP8.5 scenarios for 2006 – 2021. In all 3 scenarios, a sharper rise in temperature was observed (2.2 ~ 5.5 °C) with no clear trends for precipitation. Climate change-driven risk mapping was last conducted in 2021. NAP is developing a risk assessment mapping exercise.</p>
 <p>2. Central Data Storage Facility</p>	<p>This refers to a centralized location where data related to water resources, such as water quality, water levels, and rainfall, is collected, stored, and managed. This allows for efficient data analysis and decision-making for water management.</p>	<p>Technologies such as real-time monitoring networks depend on such structures for their success. In addition, successful modelling is heavily dependent on easy data access.</p>	<p>There is none; however, government departments/units and organizations, such as the National Disaster Management Agency (NDMA), do have their localized servers. Technologies such as real-time monitoring networks depend on such structures for their success. In addition, successful modelling is heavily dependent on easy data access.</p>
 <p>3. Optimization of reservoir operations</p>	<p>This involves managing the release and storage of water in reservoirs to meet various demands, such as irrigation, domestic water supply, hydropower generation, and environmental flow requirements. During periods of heavy rainfall, water can be released from the reservoir at a controlled rate, which helps prevent sudden and excessive increases in downstream river flow. In addition, reservoirs can be managed to maintain lower water levels during periods of heavy precipitation. By keeping the reservoir at a lower level when significant rainfall is expected, there is more room to store incoming runoff, which reduces the risk of overflow and flooding.</p>	<p>A valuable technology that can help to improve water security, reduce flooding, generate electricity, support irrigation, and provide recreation opportunities. It is a critical technology for the 21st century, as we face increasing challenges related to water scarcity and climate change, which can benefit from the central data storage and real-time monitoring networks.</p>	<p>The National Water Policy of 2018 states that the NWA will develop operating rules for the various uses of reservoirs. Currently, RBA and DWA are conducting dam operations.</p>

Technologies	Description of Technology	Reason for prioritization	Status of implementation and scale of investment
 <p>4. Water-saving toilets</p>	<p>These are also known as low-flow toilets and are designed to use less water per flush compared to traditional toilets. They incorporate technologies like dual-flush mechanisms or reduced water volume to conserve water without compromising functionality.</p>	<p>Water is increasingly becoming a scarce resource, and water-saving toilets are becoming more affordable and accessible.</p>	<p>Demonstrative dry toilets were constructed by the Green Living Movement (GLM) through the Mbabane Dry Sanitation and Waste Management Project (2014-2016). The VNR of 2019 advocates for the promotion of dry toilets; moreover, there is currently no evidence of such technology being adopted in the country.</p>
 <p>5. National and community disaster management plans</p>	<p>They outline strategies and actions to prepare for, respond to, and recover from disasters. These plans consider the specific risks and vulnerabilities of a region and involve collaboration among various stakeholders, including government agencies, emergency services, community organizations, and the public. Disaster management plans ensure a coordinated and effective response to disasters, reducing the impacts on human lives, infrastructure, and the environment.</p>	<p>The country has remained highly vulnerable to climate-related shocks, including droughts, wildfires, and floods. Incidences such as the 2015/16 El Niño drought challenge the ability of the nation to develop sustainably, and negatively impact the health, food security and productive economic activity of the population.</p>	<p>The Government of Eswatini (GoE) through various support have developed a National Disaster Management Plan (2000), National Emergency Response Mitigation and Adaptation Plan (2016-17), National Drought Plan (2020) and others. Furthermore, the GoE requested technical and financial support to build the necessary capacity for a more substantive and sustained drought preparedness programme from the World Bank. One component of the project focuses on the development of management plans for local councils.</p>
 <p>6. Wetland Restoration</p>	<p>Involves the rehabilitation or creation of wetland ecosystems that have been degraded or lost due to human activities. Wetlands provide valuable ecosystem services, including water filtration, flood control, and habitat for various species. Restoring wetlands helps improve water quality and biodiversity.</p>	<p>Wetlands are the key source of water in Eswatini. Their restoration remains a critical aspect of improved and sustained water availability at the source and downstream.</p>	<p>Through efforts from academic institutions and ENTIC, efforts have been made to raise awareness, and map and classify wetlands nationally. In addition, through the efforts of EEF and ENTIC, numerous wetlands across the country have been restored. EEF has supported over 50 projects, some of which may have had the potential to provide adaptation benefits. These projects have aimed to aid communities in preserving and restoring degraded regions, ecosystems, and nationally significant cultural wetlands.</p>
 <p>7. Hydro-geological studies to inform optimal groundwater usage</p>	<p>This involves analysing the characteristics of groundwater systems, such as aquifer properties, recharge rates, and groundwater flow patterns. These studies provide valuable information for managing and optimizing groundwater resources. By understanding the hydrogeology of an area, water managers can develop strategies for sustainable groundwater usage, such as implementing recharge projects, monitoring water levels, and regulating pumping rates.</p>	<p>One of the adaptation targets of the updated NDC (2021) talks about conducting studies on groundwater recharge to inform key groundwater recharge areas. The last comprehensive study on groundwater was conducted in 1992, which estimated the average borehole yield to range from 1.4 – 20 l/s.</p>	<p>The country developed a groundwater monitoring plan but was curtailed to enable the use of the groundwater boreholes to provide potable water to communities affected by the drought that has been observed over the years. However, groundwater monitoring is being revised through support from the SADC Groundwater Management Institute. A groundwater monitoring project is being piloted to roll out on a national scale subject to the availability of funds.</p>
 <p>8. Monitoring of licensing and permit compliance continuously</p>	<p>This ensures that water users adhere to regulations and guidelines for water use. This monitoring involves regular inspections, data collection, and reporting to ensure that water users are using water resources sustainably and within the allocated quotas. Continuous monitoring helps identify any violations and allows for timely enforcement actions.</p>	<p>Surface water flows are monitored by the Department of Water Affairs (DWA) through a network of river gauging stations which are mostly not real-time, making monitoring of licensing and permits difficult.</p>	<p>The DWA issues water permits following the guidance of the Water Act of 2003 and the National Water Policy of 2018. Furthermore, one of the updated NDC targets is to develop national groundwater permits.</p>
 <p>9. Urban green spaces</p>	<p>This refers to parks, gardens, and other green areas within urban areas. They provide numerous benefits, such as improving air quality, reducing urban heat, and promoting mental well-being. Urban green spaces also play a role in stormwater management and biodiversity conservation.</p>	<p>Studies have shown that cities with green spaces are better cushioned from disasters, which highlights the need for more investment in green spaces in the highly built-up urban spaces.</p>	<p>Municipalities of the Kingdom such as Manzini and Mbabane are embracing green spaces in the urban areas. Programmes are being adopted that are intentional in introducing green spaces within urban areas.</p>
 <p>10. Climate change vulnerability assessments</p>	<p>This involves analysing the potential impacts of climate change on a particular region or system. This assessment helps identify the areas or sectors that are most vulnerable to climate change, such as agricultural systems affected by temperature changes, or communities prone to extreme weather events. These assessments use a combination of climate models, socio-economic data, and vulnerability indicators to evaluate the potential risks and develop strategies for adaptation and resilience.</p>	<p>The country has 5 main basins, which are all vulnerable to climate change. Planning, proofing, and improved resilience are not easy to undertake unless assessments have been done.</p>	<p>Only the Mbuluzi basin has conducted a climate change vulnerability assessment which was in 2021, other basins are yet to be assessed.</p>

Technologies	Description of Technology	Reason for prioritization	Status of implementation and scale of investment
 <p>11. Model predictions on available seasonal water supply</p>	<p>This involves using hydrological models to forecast water availability during different seasons. These models consider factors such as precipitation patterns, snowmelt, evaporation rates, and river flow. By predicting the seasonal water supply, water managers can plan for water allocation, reservoir operations, and water conservation measures.</p>	<p>These predictions enable efficient resource allocation, aiding in infrastructure planning and drought management. Predictions also benefit agriculture by guiding crop planning and minimizing environmental impacts.</p>	<p>Piloting of global water availability forecasting service (at Mbuluzi river basins) to support water security through hydroNET in the period 2022 – 2027.</p>
 <p>12. Real-time monitoring networks</p>	<p>These involve the use of sensors and data collection systems to monitor water resources continuously. This allows for the real-time measurement of parameters like water levels, flow rates, and water quality. Real-time monitoring networks provide valuable data for decision-making and early warning systems.</p>	<p>Real-time monitoring provides an important source of information for early warning systems and timely flood preparedness. Sectoral outcome 7.3 of the National Development Plan 2023/24 – 2027/28, which talks to the water sector has the intervention of financing the installation of near-real-time data for 25 gauging stations.</p>	<p>Limited automated weather stations. HydroNET is currently used by JRBA. According to the country's adaptation communication (2021), DWA has installed eight near real-time hydrometric stations and five groundwater monitoring systems.</p>
 <p>13. Membrane Bioreactors</p>	<p>These are advanced wastewater treatment systems that combine biological processes with membrane filtration. They consist of a biological reactor where microorganisms break down organic matter and a membrane filtration unit that separates the treated water from the activated sludge. The membrane acts as a barrier, allowing clean water to pass through while retaining suspended solids and microorganisms. MBRs offer several advantages, including high-efficiency removal of pollutants, compact design, and the ability to produce high-quality treated water. They are widely used in various applications, including municipal wastewater treatment, industrial processes, and water reuse.</p>	<p>Membranes remove a broad spectrum of contaminants and pathogens, which are mostly likely to increase under climate change (through events such as flooding).</p>	<p>Not a widely adopted technology in Eswatini however is currently being utilised by the EWSC which is the only domestic water service supplier in the urban areas.</p>
 <p>14. Drip irrigation</p>	<p>This is an irrigation method that delivers water directly to the plant root zone in small, precise amounts. This method conserves water by reducing evaporation and ensuring efficient water use. It is commonly used in agriculture and garden irrigation systems.</p>	<p>Drip irrigation has a great potential to build resilience in water management, improve water use efficiency and improve yield for smallholder farmers.</p>	<p>Drip irrigation technology has been widely adopted in private farms with a slow adoption rate from smallholder farmers. The technology has been adopted by large-scale sugarcane estates in Eswatini like RES and Illovo. EWADE has also utilized them in some of its project interventions.</p>
 <p>15. Multi-purpose Dams</p>	<p>These are large structures built across rivers or streams to provide numerous benefits. They can serve purposes such as flood control, water supply, hydropower generation, and irrigation. Multipurpose dams play a crucial role in water resource management and regional development.</p>	<p>They serve several important functions simultaneously, making them highly efficient and cost-effective structures.</p>	<p>There have been several developed dams in Eswatini in recent years, through the Water Harvesting and Development Project (WHDP), EWADE and others. The country is also currently conducting feasibility studies for the Nondvo multi-purpose dam.</p>
 <p>16. Greywater Reuse and Recycling</p>	<p>Water recycling and reuse is the process of collecting, treating, and using wastewater, particularly from municipalities, industry, and agriculture. The recycled water can be used for irrigation or industrial purposes, as well as domestic purposes if properly treated. In some cases, treated wastewater is indirectly used for drinking purposes, for example by injecting it into groundwater aquifers to increase capacity and minimize saltwater intrusion.</p>	<p>Wastewater reuse can form an important component of both wastewater management and water resource management and can offer an environmentally sound option for managing wastewater that dramatically reduces environmental impacts associated with the discharge of wastewater to surface waters.</p>	<p>Greywater recycling has been piloted on small scales for domestic farming, especially in urban areas.</p> <p>Eswatini Water Services Corporation has 10 wastewater treatment plants following the required standards, such as EEA, Water Pollution Control 2010 then dispose of wastewater.</p>

2

Technology Innovation Chain Framework



This chapter explores the process of developing and deploying new technologies and follows the technology innovation chain consisting of four primary stages: Research and Development (R&D), Demonstration, Deployment, and Diffusion. An evolving mix of policy and support instruments is needed to help technologies progress down this chain, including regulations and codes, fiscal incentives, Public Finance Mechanisms, market mechanisms and information dissemination.

The investments required to help technologies reach market diffusion are two-fold: investments to support the readiness and a sound enabling environment for the technologies to be adopted, as well as scaling up investments to facilitate widespread diffusion. Readiness investments encompass activities such as stakeholder engagement, capacity building, policy development, and institutional strengthening to create an environment conducive to technology adoption. This includes ensuring adequate infrastructure, human resources, and regulatory frameworks to support the integration of climate technologies into existing systems. On the other hand, scaling up investments is necessary to overcome barriers hindering the widespread adoption of these technologies, such as high upfront costs and limited access to finance. By providing financial resources for research, development, and deployment initiatives, these investments can drive the diffusion of climate

technologies, enabling their broader uptake and impact in addressing climate change challenges.

Figure 2 shows the different technology innovation stages including the necessary support from key actors, such as academia, business, investors, government, and consumers. Technology-based innovation can come either from technology-push inventions which are initially researched and developed and later adopted by the market that become useful for new needs or from market pull interventions where market needs lead to the discovery of innovative technology to help meet the needs of the market. For Eswatini, it is important to understand that some water technologies may arrive at any stage in the innovation chain having undergone stages like research and development in other countries. This section discusses the innovation chain stages for each of Eswatini’s priority water technologies.

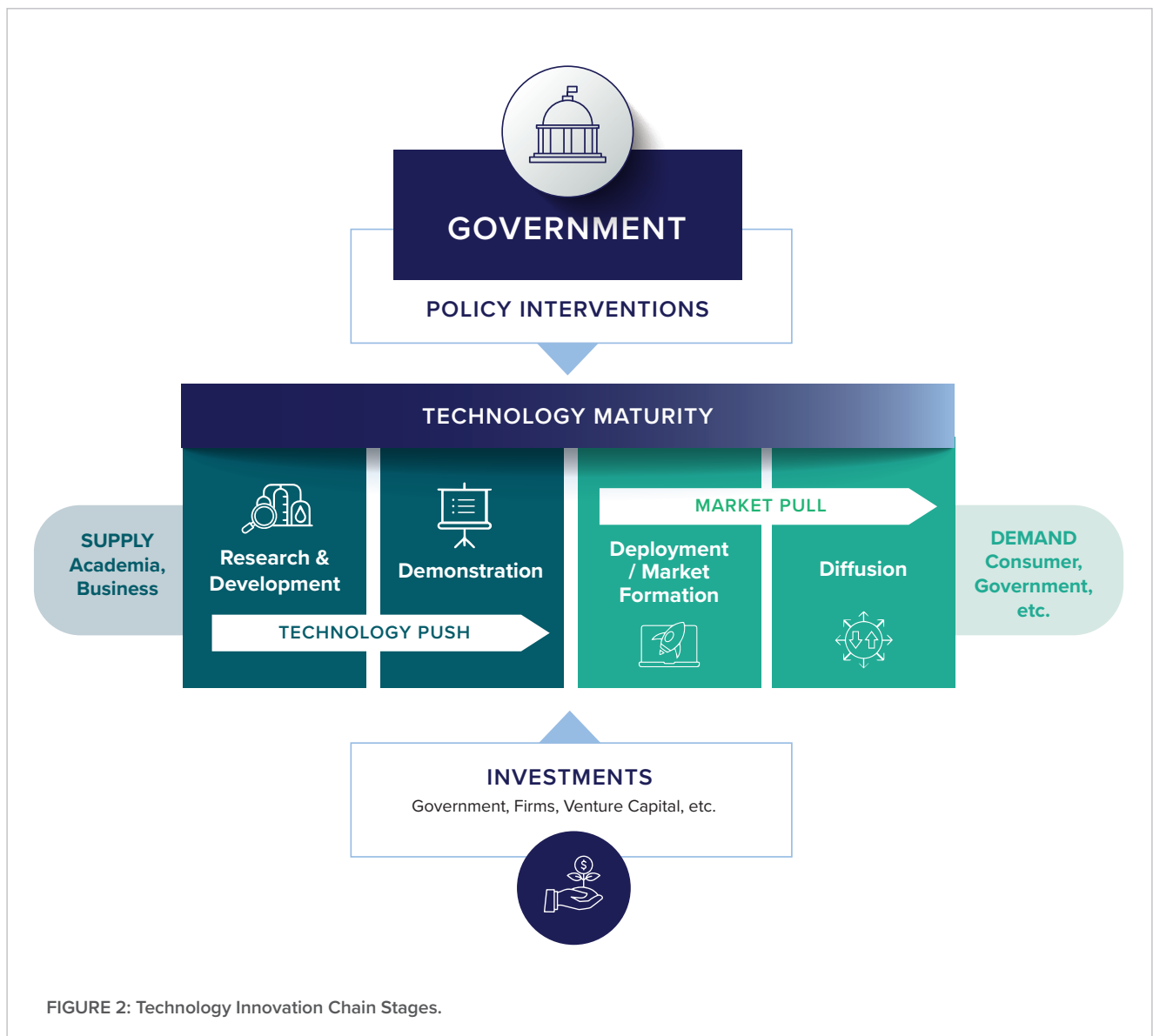


FIGURE 2: Technology Innovation Chain Stages.

2.1.1 Basic Research & Development (R&D)

The journey commences with basic research, aiming to identify technological solutions to environmental challenges. This phase of the innovation process is focused on both generating knowledge and solving problems, i.e., creating a combination of artefacts that are intended to perform a particular function or to achieve a specific goal. R&D involves uncertainty, which has multiple dimensions. At the outset of an R&D project, the kind of outcome and the cost (including time allocation) cannot be precisely determined relative to the goals. This phase, often resulting in patents, relies more heavily on public funds and some business funds, as this is where the risk is highest and viability for diffusion or commercialisation is most remote. In addition to addressing appropriability and market extent, the consideration of climate adaptation technologies in basic R&D is crucial. Government involvement and funding become imperative due to the global and public nature of climate challenges. Venture capitalists and angel investors that have a good risk appetite and see potential commercial viability for the technology will be involved in the next stage of innovation where the products are being developed or even in the market demonstration stage.

2.1.2 Demonstration

The Demonstration stage proves technology feasibility through large-scale projects, emphasising climate adaptation solutions. Public support, including grants, guarantees, and venture capital, is vital for overcoming financial challenges and facilitating the transition of demonstrated technologies into viable products for market adoption. Usually, during the demonstration phase, there is a need for subsidies and other forms of support to prepare the infrastructure for the private sector to handle the developing and financing projects. Demonstration financing is equally pertinent to climate adaptation technologies, with public finance instruments catalysing mitigating risks and supporting the development of innovative projects addressing environmental challenges.

2.1.3 Deployment

Deployment, also at times referred to as “technology transfer”, entails producing technology at a large scale and scaling up its adoption use across individual firms or households in each market, and different markets (Jaffe, 2015). Transitioning to widespread application involves deploying both clean energy and climate adaptation technologies. Subsidies and incentives play a critical role in encouraging the market adoption of these technologies. The challenge of adequately evaluating risks and returns is intensified for climate adaptation technologies, especially in developing economies where these solutions are equally essential. As technologies diffuse on a larger scale, public finance continues to play a vital role. This is particularly significant for climate adaptation technologies, ensuring the deployment of resilient solutions in the face of changing environmental conditions.

2.1.4 Diffusion

Technology diffusion can be defined as the process by which innovations are adopted by a population. This stage involves private investors and financial instruments such as Intellectual Property rights, cross-licensing agreements, and patents. In the context of climate adaptation technologies, which might include innovations in resilient infrastructure or sustainable agriculture, understanding and navigating intellectual property becomes essential for attracting private finance. At this diffusion stage, private investors and businesses become increasingly involved in ensuring these climate adaptation technologies are accessible to end users and consumers. The role of intellectual property becomes more pronounced, shaping the financial landscape for technologies aimed at mitigating and adapting to climate change.

3

Situational Analysis on Enabling Environment and Financing Landscape



Despite the referenced importance at both the global and national levels, water-related climate technologies have lacked the required finances to be adequately adopted by developing countries like Eswatini. Historically the water sector has been financed by the public sector and this alone will not be sufficient to achieve the adoption of innovative solutions to enhance the resilience of the water sector. Due to the limited availability and the competing demands on public budgets, it is becoming increasingly important to mobilize non-traditional forms of capital to the water sector. Whatever limited public financing is available, should be primarily used to leverage private capital flows into the sector for increased adoption of technologies. This is built on the premise that the private sector has the potential to fund water adaptation technologies; however, it requires a sound enabling framework to be created by the government.

Underinvestment in water-related climate technologies also primarily stems from their often unfavourable risk-return profiles, because of their higher economic and upfront capital costs compared to incumbent technologies and because of their higher risks. For technologies with negative abatement costs, misaligned incentives, intangible benefits, high transaction costs and lack of standardization in the quantification of energy savings and other benefits, in addition to the upfront capital costs, frequently hamper their financing and uptake. Compared to mitigation technologies, technologies for adaptation face further barriers, including the lack of a revenue model for some technologies, the need for buy-in and involvement of large and complex groups of stakeholders in some cases, inadequate climate information and uncertainty about the benefits of adaptation (UNFCCC, 2015). Obtaining financing for climate technologies is particularly challenging in developing countries, such as Eswatini, due to additional uncertainty and risks that are hard to mitigate in private financial markets, lack of patient and low-cost capital, limited technical capacity and others.

The narrative around climate finance has emphasized supporting innovative technologies and approaches in developing countries to achieve transformational change. Climate finance is critical; however, it is also very limited. In line with the UNFCCC processes, Eswatini has developed a Technology Needs Assessment as well as technology action plans and project ideas to encourage implementation. Despite this, the Overseas Development Institute (ODI) reports that potential private and public investors still often find that these processes do not produce project proposals with the requisite detail to attract the interest or serious consideration of investors (ODI, 2015). Many investors hold the view that technology projects are often developed in a way that is not sensitive to their needs. This also applies to the users which greatly affects the market and uptake of technologies. In turn, the return or business case for investors to engage with technology development processes has not always been made clear.

Eswatini's economy has also faced significant challenges for the past few years, because of the 2015/16 El Niño drought, 2021 Tropical Cyclone Eloise and the COVID-19 pandemic (from 2019) among other natural disasters. The impact of these events has been severe, leading to increased public debt levels and creating a highly challenging domestic economic situation (Central Bank of Eswatini, 2021). Consequently, the government may face limitations in

making capital investments, including those related to climate actions. Moreover, the current economic status is likely to discourage the private sector from investing in climate actions as well.

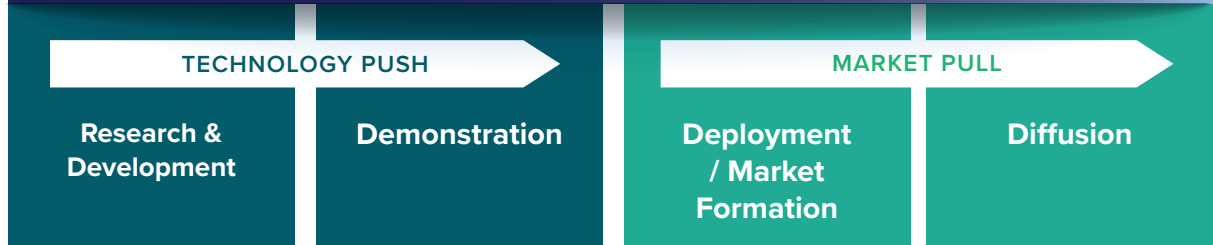
In Eswatini, the undervaluation of water resources and associated benefits is prevalent. This presents challenges with investments by both public and private sector-related financing opportunities. Not enough revenue is generated to ensure the sustainability of investments due to undervaluation. The country has not yet been able to develop a regulation to support the implementation of water pricing as stipulated in the Water Act of 2003. The OECD articulates the need for such in that a “weak or poorly designed enabling environment that fails to clearly define and provide a framework for the appropriate valuing and pricing of water resources and services can limit the scope of governments and service providers to access critical sources of revenue and finance” (OECD, 2023). Other challenges for financing these technologies are as discussed below.

Therefore, transferring some of the risks associated with the innovation chain process of water technologies is central to addressing barriers to climate technology investment. Policy risks affect those climate investments that rely on revenue and regulatory support; market and commercial risks refer to economic risks and include financial risks, such as access to capital and the cost of financing; and technology risks are inversely related to technology maturity. Together, they can present insurmountable risks to private investors. Risks can be mitigated through a variety of risk instruments, including publicly backed guarantees, credit, liquidity risk, etc (UNFCCC, 2015).

The need to look beyond these risks is justified by the even higher cost of inaction due to climate risks. Private businesses and investors have vested interests in their businesses whose revenues and costs can be directly and most significantly affected by water risks. For example, production volumes may be reduced due to drought, or operations may be shut down during a flood, resulting in lower incomes. Private businesses and companies can be impacted directly through increases in prices and the availability of water or water-intensive inputs in their supply chain. They can also be affected indirectly through increases in electricity prices, macroeconomic decreases in consumer spending, stranding of corporate infrastructure, or loss of access to markets or growth opportunities because of water-related climate risks like droughts, floods, and others.



TECHNOLOGY MATURITY



BARRIERS	Limited private sector engagement	
	Lack of enabling policies, regulations, standards and codes for market stimulation	
	Limited access to information	
	Inappropriate / unclear systems of IPRs	
	Limited institutional and local capacity	Lack of project development and entrepreneurship capacity
	Lack of early-stage investment for technology development	Lack of end-user financing
	Lack of end-user capacity	
POLICY INTERVENTIONS	<ul style="list-style-type: none"> • Create institutions supporting the integration of climate technology considerations in development and economic planning 	<ul style="list-style-type: none"> • Establish policy and regulatory frameworks that incentivize climate technology adoption, reduce investment risk and provide price support where necessary
	<ul style="list-style-type: none"> • Building capacity of local research institutions to support R&D 	<ul style="list-style-type: none"> • Local NGO and SME enterprise development and training. • Targeted capacity-building on accessing financing for technology developers and entrepreneurs • Increased awareness raising and training initiatives on the use and benefit of the technology
FINANCING INTERVENTIONS	<ul style="list-style-type: none"> • Increase government budget allocation to fund climate technology related R&D. • Access grant funding for technology demonstration • Implement seed capital incentives 	

FIGURE 3: Barriers and proposed interventions along the Technology Innovation Chain

4

Overview of Climate Technology Financing Types and Sources



Unlocking investments for climate adaptation technologies requires a wide range of financing sources and solutions. Globally, the water sector has been advocating for more financing and funding for investments that can contribute to water security and sustainable growth, including through climate adaptation and resilience. Eswatini's government has had quite substantial investments in its water sector in recent years; however, these traditional funding methods, like government grants and loans, have fallen short and are unable to meet the demands of implementing sustainable water systems like adaptation technologies for the water sector. A potential solution to this lies in pioneering innovative financing models that open new avenues of capital to develop critical water infrastructure.

There are different financing types and financing sources that can be used for funding the development, implementation, and upkeep of these technologies. This can encompass diverse strategies, including public-private partnerships, green bonds, impact investments, and other cutting-edge financial tools.

Even though the terms funding and financing are usually used interchangeably, the distinctions between them offer a broader understanding of the trade-offs that come with delivery models of either funding and/or financing adaptation investments. Funding may be defined as direct payments made by, often local, public, and/or private actors to invest in preparation for or response to climate change impacts. By contrast, financing includes the utilization of market-based instruments that may or may not utilize third-party funding to leverage what is otherwise underwritten to be an independently feasible project investment (Keenan et al., 2019). Both definitions still align with the objectives of mobilizing and generating

new streams of capital that mirror different models for the determination and pricing of risks and returns, including who benefits and who pays to ultimately support the sustainable adoption of adaptation water technologies for a resilient water sector in Eswatini.

The High-Level Panel (HLP) on Water Investments for Africa has identified nine investment sources (across three pathways) presented in the Pyramid of Transformation in the first HLP report. These sources are expected to mobilise an additional US\$ 30 billion annually by 2030 into the water sector. Figure 4 shows the nine investment sources. While these have been distinguished as separate sources, they often work together. For example, in terms of institutional investors, over 20 funds have been identified that supply (or plan to supply) financing for water in Africa (African Union, 2023). Many of these funds combine bilateral and multilateral funding, and some of them may be targeted for climate adaptation, while some may involve institutional investors.

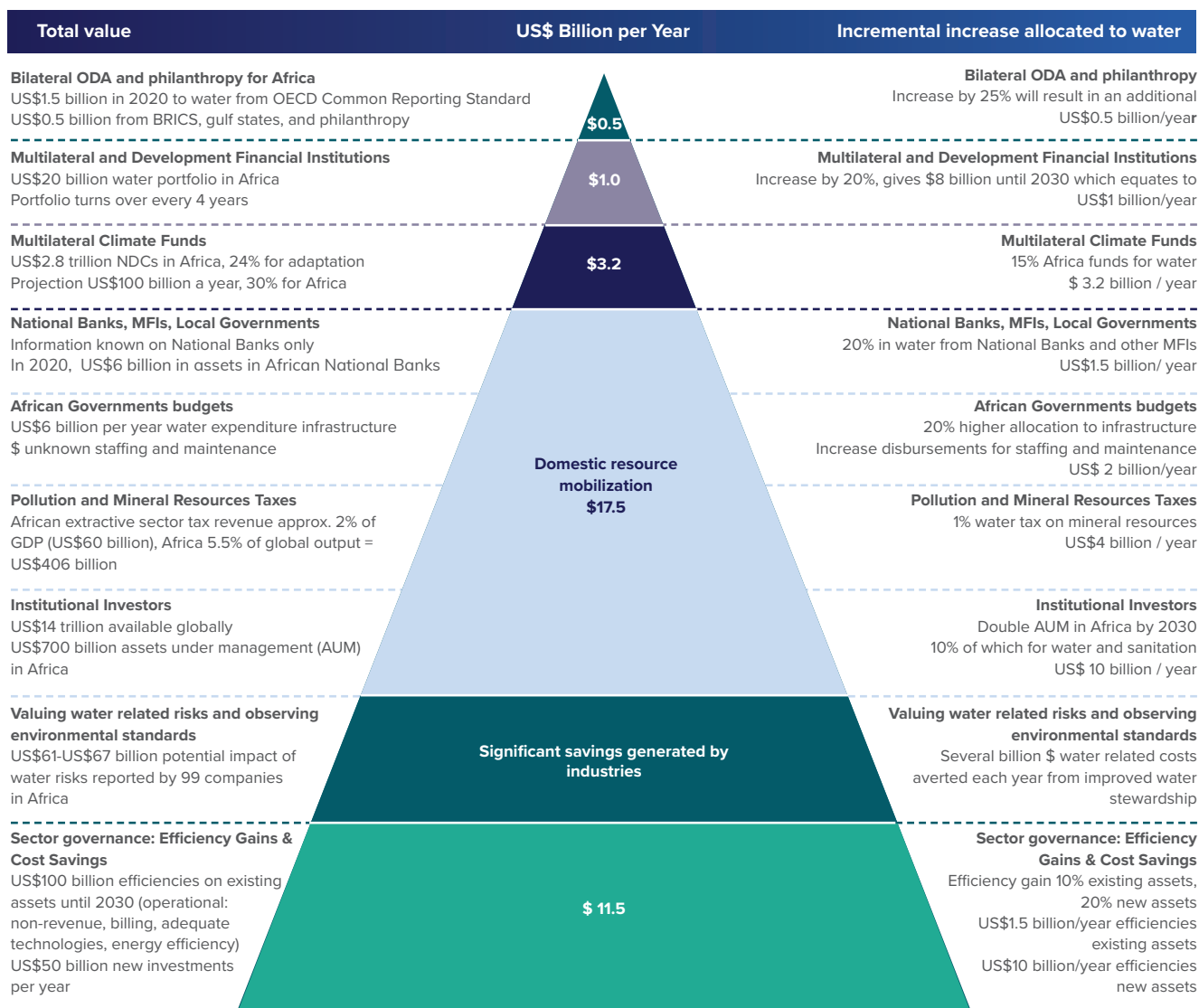


FIGURE 4: The 'Pyramid of Transformation': Potential finance sources to close the water investment gap in Africa (Source: International High-Level Panel on Water Investments for Africa (2023).

TABLE 2: Examples of various financing sources

Financing Source	Description	Example organisations
Official Development Assistance	Official Development Assistance (ODA) constitutes a critical component of adaptation finance in Africa, serving the purpose of mitigating risks associated with adaptation activities and fostering a more conducive environment for commercial finance. Bilateral agencies display a relatively elevated appetite for risk and possess robust climate-oriented mandates.	<ul style="list-style-type: none"> • GIZ • JICA • European Union (EU)
Philanthropies, Foundations, Development Partners, and Non-profits	Like ODA, funding from these organizations can de-risk adaptation activities, draw in private finance, and support technical capacity building. Philanthropic funding is nimbler and more flexible than ODA and can serve as catalytic capital for private-sector investment.	<ul style="list-style-type: none"> • Bill and Melinda Gates Foundation • Red Cross • WWF
Bi/Multilateral Banks and Development Finance Institutions	<p>Multilateral and Bilateral Development Finance Institutions (DFIs) are international financial institutions established by one (Bilateral) or multiple (Multilateral) countries with the primary goal of promoting economic development through the provision of loans, grants, and technical assistance. Historically, most of the funding offered by these banks has been geared towards sovereign-guaranteed loans, which involve public debt backed by the government, with only a small fraction allocated to private lending. These banks typically collaborate with nationally based financial institutions to disburse their funding.</p> <p>In the period from 2019 to 2020, the most substantial amount of adaptation finance within each African Union region predominantly originated from multilateral DFIs. DFIs play a pivotal role in mainstreaming adaptation in development finance by evaluating climate risks and vulnerabilities, aiding national governments in enhancing their adaptation capabilities, and mobilizing private capital. Furthermore, DFIs occupy a unique position in supporting adaptation investments in the private sector, which can yield positive ripple effects for social and economic development. DFIs contribute to bridging knowledge gaps by employing tools such as feasibility studies, business risk assessments, technical assistance, and market studies.</p>	<ul style="list-style-type: none"> • The World Bank • The African Development Bank • The Asian Development Bank • KfW • AFD
Multilateral Climate Funds	Multilateral Climate Funds, established through international agreements or with a specific mandate, offer financial support for adaptation efforts in Africa through a combination of grants and market-linked instruments. These funds play a pivotal role in expediting and facilitating the financing of adaptation projects considered high-risk by providing various instruments such as first-loss or junior equity, repayment guarantees, and grants. These tools are aimed at stimulating and attracting private investments, making these funds a catalytic force in advancing and accelerating climate finance for adaptation projects in the region.	<ul style="list-style-type: none"> • Adaption Fund • Global Environment Facility (GEF) • Global Climate Change Alliance • Green Climate Fund (GCF) • Least Developed Countries Fund
National Banks	These include commercial banks or cooperative banks. These private institutions can generate their financial resources through bank deposits and are subject to stringent international regulations concerning capital sufficiency. These banks maintain extensive networks that can be utilized to support climate adaptation funding, including their affiliations with farmers, cooperatives, and Micro, Small and Medium Enterprises (MSMEs). Furthermore, commercial banks can also provide technical assistance for structuring financial instruments in collaboration with development banks and other providers of concessional finance (GCA, 2022).	<ul style="list-style-type: none"> • Eswatini Bank • FNB • Standard Bank • Nedbank • Building Society • Africa Alliance • Bunye Betfu Savings • Sibonelo Savings • Lubane Savings
National/Regional development banks	<p>National/ Regional Development Banks are financial institutions owned by the state or sponsored by the government, primarily tasked with providing long-term and concessional funding to high-risk sectors and industries that are underserved by private commercial banks. Their mission is to contribute to the country's development agenda. They serve as crucial intermediaries for international climate finance, with more than ten of them currently holding direct access to Green Climate Fund (GCF) funding.</p> <p>They possess valuable expertise in identifying opportunities within their domestic markets, cultivating relationships with both public and private sector entities, establishing partnerships with major DFIs, accessing international capital markets to secure funding from various sources, and offering co-lending capabilities for risk-mitigation tools denominated in local currency, such as guarantees. Their countercyclical nature of lending makes them potentially significant contributors to financing resilient development in Africa.</p>	<ul style="list-style-type: none"> • Eswatini Development & Savings Bank (EDSB) • Development Bank of Southern Africa

Financing Source	Description	Example organisations
Microfinance institutions (MFIs)	Microfinance involves the provision of small loans and other financial services to individuals, households, and small businesses that do not have access to traditional banking services. This form of finance can be used to support the uptake of water technologies, particularly at the small-scale level for low-income level businesses and individuals.	<ul style="list-style-type: none"> • MFI FINCORP • Select Management • Inhlanyelo Fund
National Governments	Budgetary allocations are among the largest and most well-suited mechanisms for financing adaptation activities in Africa and African governments are already spending a considerable share of their budget on adaptation. African governments are instrumental in deploying capital to non-commercial adaptation activities and current levels of expenditure meet around 10% of the total adaptation need.	<ul style="list-style-type: none"> • Ministries
State-owned Enterprises & Financial Institutions	State-owned Enterprises & Financial Institutions (SOEs) are public entities that are partly or wholly owned by the government to deliver services in a particular sector or sectors. SOEs have not financed many climate adaptation activities to date but have a substantial opportunity to lead in climate resilience given the size of their market share and public governance model.	<ul style="list-style-type: none"> • Eswatini Environmental Fund • Eswatini Agriculture Development Fund • Industrial Development Company of Eswatini (IDCE - Government Parastatal) • National Industrial Development Corporation of Swaziland (NIDCS) • Youth Enterprise Fund (Business funders) • Regional Development Fund (business funders)
Institutional Investors	Investments made on behalf of its members (includes sovereign wealth funds, pension funds, hedge funds, endowments etc.). African institutional investors have approximately \$1.8 trillion in assets under management as of 2020. Institutional investors' core goals are capital gains and stabilization of returns over the long term. They have a high capacity to mobilize funds through pensions and their prudential responsibilities require them to invest in assets that are listed and with high credit ratings (GCA, 2022).	<ul style="list-style-type: none"> • Old Mutual Eswatini • Liberty Life Swaziland • Eswatini National Provident fund • Public Service Pension Fund
Insurance companies	Financial entities offer risk-mitigation tools to safeguard individuals, businesses, and nations from financial losses. This protection is granted in exchange for periodic premium payments. Insurers can contribute by extending sovereign protection against the consequences of climate change and aiding households in managing climate-related uncertainties. Numerous insurance companies find it necessary to conduct comprehensive qualitative and quantitative evaluations of the effects of both physical and transition risks on their investment holdings. Consequently, many insurers have bolstered their technical capabilities to assess climate-related risks and introduce innovative climate risk transfer mechanisms (BASE, 2019).	<ul style="list-style-type: none"> • Eswatini Royal Insurance Corporation • Old Mutual Eswatini • Oracle Eswatini • Lidwala Insurance • United Holding
Large Corporations	Large multinational corporations, particularly those with global supply chains, are placing a growing emphasis on sustainability and resilience in production and supply chains. These corporations possess the capacity to deploy substantial financial resources, including the potential issuance of climate resilience bonds, and advanced technology on a significant scale to implement adaptation measures. However, these efforts are primarily concentrated on strengthening their supply chains. Some strategies that corporations in Africa have disclosed to tackle climate risk encompass making investments in analysing physical climate risk, endorsing sustainable agroforestry as a response to climate-related forestry challenges, and contributing to climate-smart capacity building for farmers within their supply chains.	<ul style="list-style-type: none"> • Royal Eswatini Sugar • Illovo Sugar • CONCO • Eswatini Breweries
Private Equity and Venture Capital	Financial mechanisms that aggregate funds for investment in projects or enterprises with the potential for attractive returns. These funding sources typically involve affluent investors, investment banks, and specialized VC funds. The development of Africa's Private Equity sector was instigated by Development Finance Institutions (DFIs) entrusted with the mission of investing in private-sector enterprises in Africa to stimulate social and economic progress. Over time, this industry has grown, with over 400 private equity, venture capital, and asset management firms now headquartered in Africa, spanning various regions and industries. Private equity and venture capital play a pivotal role in amplifying adaptation finance in Africa by furnishing risk-tolerant capital to businesses with limited access to traditional bank loans or bonds.	<ul style="list-style-type: none"> • Blackstone Inc. • Barclays Capital

There are three main types of financing that the abovementioned financing sources undertake when making investments into water technologies namely debt, equity, or grants. Table 3 describes each financing type. Private sector institutions who are

profit-seeking, often look to financing types around debt, or equity. Whereas institutions inclined towards philanthropy, ODA and government functions often employ the use of grants or non-repayable loans to finance water technologies.

TABLE 3: Financing types and their description.

Financing Types	Description
Debt / Repayable Loans	Borrowers commit to pay the lender the principal and interest (cost of funding) on an agreed schedule. Borrowers use assets as collateral as reassurance to the lender. Typical debt instruments include credit, mortgages, and leasing.
Equity	Equity financing normally implies selling a stake in the company and receiving funding from investors, who expect to share the profits of the company and the investment stake appreciation.
Grants / Non-repayable loans	Grants are non-repayable fund contributions (in cash or kind) bestowed by a grantor (often government, corporation, foundation, or trust) for specified purposes to a recipient. Grants are usually conditional upon specific objectives on use or benefit and might require a proportional contribution by the recipient or other grantors.

Mobilizing public and private resources at scale while exploring innovative ways to spur new financing faces a range of complex difficulties, from the complicated regulatory environment to inefficient policies and a low-return financial framework. There is, however, a range of financing instruments that can be employed to leverage funding and financing for Eswatini to implement its water technologies. These instruments can be used individually or in combination to

support the implementation of climate adaptation technologies, depending on the specific needs and circumstances of that technology or project. Table 4 below discusses some of the selected financing instruments applicable to climate adaptation water technologies. These instruments are provided by different financial sources, which can include public, philanthropic or private sources across the levels of national, international, or multilateral landscape.

TABLE 4: Overview of the financing instruments applicable to climate adaptation water technologies.

Financing Instruments	Description
Blended Loans	Blended loans mix grants or subsidised loans with additional funds raised from other sources (e.g. capital markets). Blended loans might reduce borrower costs and increase the capacity of funds to take higher risks. Blended mechanisms are increasingly used by multilateral development banks (e.g. the World Bank, the Asian Development Bank, the African Development Bank, the Inter-American Development Bank), and bilateral financial institutions (e.g. Agence Française de Développement, or KfW Group).
Green/climate bonds	Bonds are loans made to large organisations from one or many investors for a specific period and at a particular interest rate. A green bond is a bond specifically earmarked to be used for climate and environmental projects. E.g. a bank may sell a green bond to raise money to finance a water infrastructure project.
Convertible debt	A combination of debt and equity: loans are repaid or converted into company shares later.
Project Finance	Typically involves direct debt or equity investments into a single project; can be fully commercial, or forms of concessional finance could include loan guarantees, first loss debt, and off-taker guarantees. <ul style="list-style-type: none"> • Direct infrastructure debt and equity investments • PPP financing
Aggregation	Aggregation refers to aggregating demand, such as communities joining up in cooperatives or pooling water demand in a region and bulk-procuring services to deliver household water systems or aggregating a portfolio of projects (normally small enterprises or projects) with similar technologies or business models. Some of the benefits of aggregation include transaction cost reductions and limited risk exposure because aggregation distributes costs and diminishes the associated risks of a portfolio's execution; that is, risks are distributed if a project underperforms.
Technical Assistance	Technical assistance is a non-lending activity that consists of advisory services, capacity-building programs, and business linkages that help mitigate the risks of a transaction and aim to build the capacity of sponsors.
Risk Mitigation Instruments	Financial instruments that are available in the market to mitigate the risks of investing in an endeavour or location. The beneficiaries of risk mitigation instruments can be end-users, lenders, project developers, or the government. Insurance and credit guarantee instruments are the most common financial risk mitigation instruments.

5

Financing strategies/ pathways for the Eswatini prioritized water technologies



Table 5 presents the proposed financing strategies for the prioritised water technologies identified in Eswatini. It discusses the guiding legislation in the country that will help to support the implementation of the technologies and proposes additional policy, regulatory and legislative interventions that would be required. Using the Technology Innovation Chain framework, the table identifies the various activities and financing sources required for each technology and proposes relevant support institutions that could be engaged to support the financing of the technologies.

TABLE 5: Financing strategies/pathways for the Eswatini prioritized water technologies

Financing Instruments	Description	Actions to be financed for prioritised technology.
<p>1. Flood and drought risk assessment and mapping</p>	<p>Guiding Policies, Acts or Regulations</p> <ul style="list-style-type: none"> • National Disaster Management Act • Water Act, 2003 • National Water Policy 2018 • Draft Dam Safety Regulations • Multi-hazard Contingency Plan • Draft Water Application and Pricing Regulations, 2016 • Draft IWRM Masterplan 2016 <p>Proposed policy interventions</p> <ul style="list-style-type: none"> • Gazetting of flood-risk areas • Developing a framework for drought monitoring and early warning system • Framework that will allow for a comprehensive countrywide assessment of potential climate and disaster risks • Develop an inclusive drought risk assessment methodology document. 	<p>TECHNOLOGY PUSH</p> <p>The focus should be on technology transfer working with local institutions /stakeholders</p> <p>Research and Development</p> <ul style="list-style-type: none"> • Data and information collection in flood-risk zones • Data and information collection in drought-risk zones/areas • Information system software and technology (for assessment and modelling) • Strengthening of IP and patent rights on identified technologies • Research and development on open data platforms • Development of technology transfer strategy • Development of feasibility study for flood and drought risk mapping technology <p>Demonstration</p> <ul style="list-style-type: none"> • Work with research institutions to support flood and drought modelling. • Piloting flood forecasting and early warning systems using selected technology and software • Piloting the use of technologies in flood and drought-risk communities <hr/> <p>MARKET PULL</p> <p>Deployment</p> <ul style="list-style-type: none"> • Strengthening institutional arrangements to support flood and drought risk responses • Building institutional capacity for flood and drought risk mapping and reporting <p>Diffusion</p> <ul style="list-style-type: none"> • Education and awareness raising to promote climate science and science-based decision-making • Strengthen institutional coordination for timely data collection, management, information sharing and decision-making • Establishment of communication structures for transfer of results to Risk Management Authorities and stakeholders for action and decision-making
<p>2. Central Data Storage Facility</p>	<p>Guiding Policies, Acts or Regulations</p> <ul style="list-style-type: none"> • Water Act, 2003 • National Water Policy, 2018 • Draft IWRM Masterplan 2016 • Data Protection Act, 2020 <p>Proposed policy interventions</p> <ul style="list-style-type: none"> • Finalizing the National Adaptation Plan for Eswatini which has a component for a data management system for climate change-related data. • Framework for engaging relevant institutions or stakeholders to enable data-sharing protocols and partnerships. 	<p>TECHNOLOGY PUSH</p> <p>The focus should be on technology transfer working with local institutions/stakeholders to develop capacity for operationalisation</p> <p>Research and Development</p> <ul style="list-style-type: none"> • Researching appropriate and affordable technologies for data storage. • Development of technology transfer strategy • Data storage Technology needs assessment • Undertaking a feasibility study on the development of a data storage facility • Establishing a policy framework for central data storage and data sharing among institutions. <p>Demonstration</p> <ul style="list-style-type: none"> • Piloting of central data storage facility with technology solution providers for upscaling <hr/> <p>MARKET PULL</p> <p>Deployment</p> <ul style="list-style-type: none"> • Data and information collection for storage • Infrastructure installation • Establishing a framework for data sharing among institutions <p>Diffusion</p> <ul style="list-style-type: none"> • Capacity building on operation and maintenance of central data storage systems. • Service providers for running and maintenance. • Establish partnerships with the private sector and independent institutions.

Potential Financing Sources

Relevant support institutions responsible for sourcing identified finance

Official Development Assistance (ODA), Philanthropies and Development Partners

Grant funding for research grants (promote partnerships with other academic institutions in the north and south) for:

- Data and information collection
- Research on open data platforms
- Modelling
- Development of technology transfer strategy

- University of Eswatini
- WaterNet
- CTCN
- International Cooperating Partners (JICA, EU Horizon Grants, GIZ, ADA)
- UN Agencies (CTCN, UNDP)
- GWP
- SADC

Government budgets

- Enhancing Institutional arrangements
- Intellectual property rights
- Piloting technologies
- Strengthening institutional coordination
- Establishment of communication structures

- Ministry of Finance
- Eswatini Environmental Fund
- IDCE
- Municipal Councils
- Eswatini Agriculture Development Fund
- River Basin Authorities
- National Disaster Management Agency
- Ministry of Natural Resources and Energy
- National Disaster Management Agency

Private sector funding

- Acquiring or filing intellectual property rights
- Early-stage venture capital funds for Demonstration and patent rights
- Financing technology companies via debt or equity
- Corporate Social Responsibility from large technology solution providers

- Tech firms (Google, Microsoft)
- VC Firms (Acuity Ventures, Vantage Capital, Convergence Partners, Seedstar Africa)
- Insurance companies
- Eswatini Sugar Association

Multilateral Climate Fund

- Building institutional capacity on the use of technology
- Education and awareness-raising
- Establishment of communication structures
- Piloting technologies

- GEF
- GCF
- Adaptation Fund
- Other Climate

ODA, Philanthropies and Development Partners

Grant funding for:

- Researching available technologies for central data storage
- Development of technology transfer strategy
- Data storage technology needs assessment

- University of Eswatini
- International Cooperating Partners (JICA, EU Horizon Grants, GIZ, ADA)
- UN Agencies (CTCN, UNDP)
- Others

Multilateral and Development Finance Institutions

Loans and equity

- Feasibility studies
- Technology transfer

- AfDB
- DBSA
- Taiwan Development Assistance
- World Bank
- UNIDO

Government budgets

- Enhancing Institutional arrangements
- Piloting technologies
- Establishing a policy framework for central data storage sharing
- Capacity building

- Ministry of Information Communication and Technology
- Department of Water Affairs
- Royal Science Technology Park
- Eswatini Communications Commissions
- Ministry of Economic Planning and Development (MEPD)
- UNESWA

Private sector funding for:

- Public-private partnership for deployment and diffusion of technology
- Financing technology companies via debt or equity

- Google
- Amazon Web Services
- Microsoft
- Huawei

Financing Instruments	Description	Actions to be financed for prioritised technology.
3. Optimisation of reservoir operations	<p>Guiding Policies, Acts or Regulations</p> <ul style="list-style-type: none"> • Water Act, 2003 • National Water Policy, 2018 • Draft Dam Safety Regulations • Stream bank regulations • IWRM Master Plan 2016 <p>Proposed policy interventions</p> <ul style="list-style-type: none"> • Finalize draft National Sanitation and Hygiene Regulations (2019) • Review the Sanitation and Hygiene Policy and the Water Policy to ensure that they cover aspects of water-saving toilets. 	<p>TECHNOLOGY PUSH</p> <p>The focus should be on the transfer of physical hardware and software required for optimization with local development and capacity building for modelling and management.</p> <p>Research and Development</p> <ul style="list-style-type: none"> • Research and analysis of available hydrological models and optimization models to assess and compare the performance and benefits of reservoir operations under different scenarios. • Assessment of existing reservoir optimisation technologies and management practices in Eswatini • Capacity needs assessment • Development of feasibility study on reservoir optimisations in Eswatini <p>Demonstration</p> <ul style="list-style-type: none"> • Evaluation of reservoir operation optimisation at selected sites in Eswatini <hr/> <p>MARKET PULL</p> <p>Deployment</p> <ul style="list-style-type: none"> • Retrofitting of existing reservoirs • Modelling and database development • Data collection <p>Diffusion</p> <ul style="list-style-type: none"> • Develop specialized training aimed at building the capacities in relevant institutions – in areas of optimization of reservoir operations, operationalisation, and maintenance.
4. Water-saving toilets	<p>Guiding Policies, Acts or Regulations</p> <ul style="list-style-type: none"> • National Water Policy, 2018 • National Sanitation and Hygiene Policy, 2019 • Eswatini National Health Policy, 2016 • National Hygiene and Sanitation Strategy (2019 - 2023) <p>Proposed policy interventions</p> <ul style="list-style-type: none"> • Finalize draft National Sanitation and Hygiene Regulations (2019) • Review the Sanitation and Hygiene Policy and the Water Policy to ensure that they cover aspects of water-saving toilets. 	<p>TECHNOLOGY PUSH</p> <p>The focus should be on the development of local industry and SMEs with technology transfer of patented technologies.</p> <p>Research and Development</p> <ul style="list-style-type: none"> • Research and analysis of water-saving technologies in the market both nationally and internationally • Assessment of national standards regarding sanitary ware in Eswatini • Investigation of IP and patent rights on identified technologies • Assessment of current toilets within the market in Eswatini and toilet manufacturing capabilities • Designs and Standard Guidelines • Research on financial incentives to assist in lowering the cost of water-saving toilets (e.g. introduce subsidies, tax exemptions) <p>Demonstration</p> <ul style="list-style-type: none"> • Piloting of selected water-saving toilet technologies <hr/> <p>MARKET PULL</p> <p>Deployment</p> <ul style="list-style-type: none"> • Identify financial incentives to assist in lowering the cost of water-saving toilets (e.g. introduce subsidies, tax exemptions) • Development of national standards and regulations for water-saving toilets • Capacity strengthening of SMMes on the manufacture/sale of water-saving toilet businesses <p>Diffusion</p> <ul style="list-style-type: none"> • Increase public information and awareness on water-saving toilets. • Promotion of water-saving toilet technologies

Potential Financing Sources

Relevant support institutions responsible for sourcing identified finance

ODA, Philanthropies and Development Partners

Grant funding for research grants (promote partnerships with other academic institutions in the north and south) for:

- data and information collection
- research on open data platforms
- modelling
- Development of technology transfer strategy
- Capacity building

- University of Eswatini
- WaterNet
- International Cooperating Partners (JICA, EU Horizon Grants, GIZ, ADA)
- UN Agencies (CTCN, UNDP)

Government budgets for:

- Enhancing Institutional arrangements
- Intellectual property rights
- Piloting technologies

- Department of Water Affairs
- KOBWA
- River Basin Authorities
- Eswatini Water Services Cooperation
- Eswatini Electricity Company

Multilateral Climate Funds and DFIs

- Technical assistance to assess existing reservoir optimisation strategies
- Capacity needs assessment
- Modelling
- Piloting
- Capacity building

- Adaptation Fund Climate Innovation Accelerator
- GEF
- GCF
- European Union

Private sector funding for:

- Piloting technologies
- Private investors for obtaining patent rights
- Early-stage venture capital funds for Demonstration and patent rights

- VC Firms (Acuity Ventures, Vantage Capital, Convergence Partners, Seedstar Africa)
- Water technology companies (Xylem, Veolia)

Bilateral ODA, Development Partners, and Philanthropies

Grant funding for:

- Research and analysis of water-saving technologies in the market
- Piloting water-saving technologies
- Capacity building of SMME's
- Awareness raising on water-saving toilet benefits

- Bill and Melinda Gates Foundation
- WaterAid
- UNICEF
- World Vision
- Youth SMME grants
- Environmental grants

Government budgets

Funding for:

- Development of national standards and regulations for water-saving technologies
- Development of tax incentives on water-saving toilets

- Ministry of Health – Environment and Health Department
- Department of Water Affairs – WASH unit
- National WASH Forum Partners
- Eswatini Water Services Cooperation
- ERS

Private sector funding for:

- Development of climate technology investment eco-systems
- Financing technology companies via debt or equity

- Sanitech
- CemForce
- Enviroloo

Financing Instruments	Description	Actions to be financed for prioritised technology.
5. National and community disaster management plans	<p>Guiding Policies, Acts or Regulations</p> <ul style="list-style-type: none"> National Disaster Management Act, 2006 Disaster Risk Management Policy, 2011 Disaster Management Strategy The Disaster Risk Management Plan and Disaster Risk Management Policy, 2010 Disaster Risk Reduction and Management Strategy <p>Activities</p> <ul style="list-style-type: none"> Validate the disaster management policy to ensure it includes the development of plans. Review the Resilience Strategy and Action Plan developed in 2017. Develop a drought monitoring and early warning system, as well as the development of a framework that will allow for a comprehensive countrywide assessment of potential climate and disaster risks. An annual Multi Hazard Contingency Plan exists, and it is reviewed every year. Develop and operationalize a disaster management Fund. Develop a disaster Risk Financing Strategy 	<p>TECHNOLOGY PUSH</p> <p>The focus should be on the in-country development of the technology to suit the country's context.</p> <p>Research and Development</p> <ul style="list-style-type: none"> Stakeholder engagement Assessment of existing national and disaster management policies and plans Capacity needs assessment <p>Demonstration</p> <ul style="list-style-type: none"> Stakeholder consultation Testing of plan effectiveness and procedures <hr/> <p>MARKET PULL</p> <p>Deployment</p> <ul style="list-style-type: none"> Incorporation of disaster risk management into national policies Establishment of a framework that specifies the roles of the responsible institutions/committees. Establishment of tailor-made communication and information dissemination channels/systems Capacity building/ training of identified emergency support functions <p>Diffusion</p> <ul style="list-style-type: none"> Regular updating of disaster management plans to ensure that they are kept up to date. Establishment of mutual aid agreements between government, private agencies, and regional and international assistance Awareness raising of disaster management plans and standard operating procedures across national to community levels. Regular simulations to test the effectiveness of disaster response and the level of capacity of responsible actors Review the coordination mechanisms including local authorities' roles.
6. Wetland restoration	<p>Guiding Policies, Acts or Regulations</p> <ul style="list-style-type: none"> The Environment Policy Environmental Management Act no. 5, 2002 National Wetland Strategic Action Plan, 2021-2030 Draft National Wetlands Policy (2020 Environment Action Plan, 1997 National Biodiversity Strategy and Action Plan, 2005 Environmental Assessment, Audit and Review Regulations, 2010 <p>Proposed policy interventions</p> <ul style="list-style-type: none"> Develop a wetland policy to sensitize the importance of wetland conservation. Finalize and enact the long-awaited Land Policy. Ensure that this policy also guides the conservation of wetlands. Put in place legislation limiting human settlements in wetlands. 	<p>TECHNOLOGY PUSH</p> <p>The focus should be on the in-country development of the technology to suit the country's context</p> <p>Research and Development</p> <ul style="list-style-type: none"> Continued mapping and identification of wetland hotspots in Eswatini Develop a framework for diverse financial incentives to fund wetland restoration projects on public and private land Review of policy and legislation on wetland management in Eswatini Develop financing strategy for wetland restoration research proposals. Continual capacity building and public awareness for relevant Authorities in both SNL and TDL tenure system. <p>Demonstration</p> <ul style="list-style-type: none"> Partner with local and international universities and research institutions to conduct wetland restoration pilot projects and studies at identified hotspots in Eswatini <hr/> <p>MARKET PULL</p> <p>Deployment</p> <ul style="list-style-type: none"> Strengthen enforcement for the protection and restoration of wetlands. Improve institutional set-up and organisational capacity. Undertake restoration projects <p>Diffusion</p> <ul style="list-style-type: none"> Build technical expertise in wetland restoration, through internship opportunities, cross-country learning exchange, and strengthening the university curriculum Improve awareness and understanding of climate change and methods to protect wetlands among key stakeholders Post-implementation monitoring and maintenance

Potential Financing Sources

Relevant support institutions responsible for sourcing identified finance

Bilateral ODA, Development Partners, and Philanthropies

Grant funding and technical assistance for:

- Stakeholder engagement
- Assessment of existing policies and plans
- Capacity building/training
- Development of disaster management plans
- Establishment of communication and information dissemination system

- UNDP
- IFRC
- CTCN

Government budgets for:

- Stakeholder consultations
- Development of required policies and framework
- Establishment of aid agreements
- Awareness raising

- National Disaster Management Agency
- Department of Meteorology
- Ministry of Natural Resources and Energy
- Ministry of Tinkhundla Administration and Development
- Eswatini National Trust Commission
- Municipal Councils

Multilateral Climate Funds and DFIs

- Technical assistance to develop Plans
- Capacity needs assessment

- Adaption Fund
- Global Environment Facility (GEF)
- Global Climate Change Alliance
- Green Climate Fund (GCF)
- Least Developed Countries Fund

ODA, Philanthropies and Development Partners

Grant funding for research grants (promote partnerships with other academic institutions in the north and south) for:

- Mapping and identification of hotspots
- Technical support for policy revisions on wetland management in Eswatini
- Demonstration projects at selected sites
- Developing technical expertise in wetland restoration

- TNC
- UN Agencies (CTCN, FAO, UNDP)
- University of Eswatini
- ENTC

Government budgets

- Strengthening enforcement and institutional arrangements
- Awareness raising
- Post-implementation monitoring and maintenance
- Capacity development
- Stakeholder engagement
- Land acquisition

- Eswatini Environmental Authority
- Department of Water Affairs
- Eswatini National Trust Commission
- Ministry of Agriculture
- Eswatini Water and Agricultural Enterprise (ESWADE)

Private sector:

- Public-private partnership wetland restorations for privately owned wetlands
- Corporate Social Responsibility funds for demonstration, mapping, and monitoring

- Royal Eswatini Sugar
- Illovo Sugar
- CONCO
- Eswatini Breweries
- Embiveni meat
- Montigny Investments

Financing Instruments	Description	Actions to be financed for prioritised technology.
<p>6. Wetland restoration</p>	<p>Guiding Policies, Acts or Regulations</p> <ul style="list-style-type: none"> • The Environment Policy • Environmental Management Act no. 5, 2002 • National Wetland Strategic Action Plan, 2021-2030 • Draft National Wetlands Policy (2020 • Environment Action Plan, 1997 • National Biodiversity Strategy and Action Plan, 2005 • Environmental Assessment, Audit and Review Regulations, 2010 <p>Proposed policy interventions</p> <ul style="list-style-type: none"> • Develop a wetland policy to sensitize the importance of wetland conservation. • Finalize and enact the long-awaited Land Policy. Ensure that this policy also guides the conservation of wetlands. • Put in place legislation limiting human settlements in wetlands. 	<p>TECHNOLOGY PUSH</p> <p>The focus should be on the in-country development of the technology to suit the country's context.</p> <p>Research and Development</p> <ul style="list-style-type: none"> • Continued mapping and identification of wetland hotspots in Eswatini • Develop a framework for diverse financial incentives to fund wetland restoration projects on public and private land • Review of policy and legislation on wetland management in Eswatini • Develop financing strategy for wetland restoration research proposals. • Continual capacity building and public awareness for relevant Authorities in both SNL and TDL tenure system. <p>Demonstration</p> <ul style="list-style-type: none"> • Partner with local and international universities and research institutions to conduct wetland restoration pilot projects and studies at identified hotspots in Eswatini <hr/> <p>MARKET PULL</p> <p>Deployment</p> <ul style="list-style-type: none"> • Strengthen enforcement for the protection and restoration of wetlands. • Improve institutional set-up and organisational capacity. • Undertake restoration projects <p>Diffusion</p> <ul style="list-style-type: none"> • Build technical expertise in wetland restoration, through internship opportunities, cross-country learning exchange, and strengthening the university curriculum • Improve awareness and understanding of climate change and methods to protect wetlands among key stakeholders • Post-implementation monitoring and maintenance
<p>7. Hydro-geological studies to inform optimal groundwater usage</p>	<p>Guiding Policies, Acts or Regulations</p> <ul style="list-style-type: none"> • Water Act, No. 7, 2003 • IWRM Masterplan 2016 • Water Policy 2018. • Draft Water Application and Pricing Regulations, 2016 <p>Proposed policy interventions</p> <ul style="list-style-type: none"> • Finalize draft regulation for groundwater use. • Ensure incorporation of groundwater-related issues and finalization of the National Water Supply, Sanitation and Hygiene master plan. • Review of the IWRM Master Plan, 2016 to update its relevance with the current climatic condition. • Establish a central data storage system including a data sharing protocol to inform these studies 	<p>TECHNOLOGY PUSH</p> <p>The focus should be on technology transfer working with local institutions capacitated for operation and maintenance.</p> <p>Research and Development</p> <ul style="list-style-type: none"> • The collection of information/data on aquifers in Eswatini • Research on appropriate software/technology required for analysis of groundwater characteristics • Conduct technology needs assessment • Exploration of IP or patent rights • Explore open data platforms <p>Demonstration</p> <ul style="list-style-type: none"> • Work with research institutions to support modelling • Piloting selected technology/software <hr/> <p>MARKET PULL</p> <p>Deployment</p> <ul style="list-style-type: none"> • Develop and establish a framework for data sharing among institutions • Investing in hydro-geological studies software/technologies • Development of a platform or database • Building technical expertise through university partnerships • Establishment of a hydrogeology centre <p>Diffusion</p> <ul style="list-style-type: none"> • Building institutional capacity for a national hub for hydrogeological assessments and reporting • Education and awareness raising to promote climate science and science-based decision-making • Strengthen institutional coordination for timely data collection, management and decision-making

Potential Financing Sources

Relevant support institutions responsible for sourcing identified finance

ODA, Philanthropies and Development Partners

- Grant funding for research grants (promote partnerships with other academic institutions in the north and south) for:
- Mapping and identification of hotspots
 - Technical support for policy revisions on wetland management in Eswatini
 - Demonstration projects at selected sites
 - Developing technical expertise in wetland restoration

- TNC
- UN Agencies (CTCN, FAO, UNDP)
- University of Eswatini
- ENTC

Government budgets for:

- Strengthening enforcement and institutional arrangements
- Awareness raising
- Post-implementation monitoring and maintenance
- Capacity development
- Stakeholder engagement
- Land acquisition

- Eswatini Environmental Authority
- Department of Water Affairs
- Eswatini National Trust Commission
- Ministry of Agriculture
- Eswatini Water and Agricultural Enterprise (ESWADE)

Private Sector

- Public-private partnership wetland restorations for privately owned wetlands
- Corporate Social Responsibility funds for demonstration, mapping, and monitoring

- Royal Eswatini Sugar
- Illovo Sugar
- CONCO
- Eswatini Breweries
- Embiveni meat
- Montigny Investments

ODA, Philanthropies and Development Partners

- Grant funding for research grants (promote partnerships with other academic institutions in the north and south) for:
- Data and information collection
 - Research on open data platforms
 - Modelling
 - Development of technology transfer strategy

- University of Eswatini
- WaterNet
- International Cooperating Partners (JICA, EU Horizon Grants, GIZ, ADA)
- UN Agencies (CTCN, UNDP)
- SADC GMI

Government budgets

- Enhancing Institutional arrangements
- Intellectual property rights
- Piloting technologies
- Strengthening institutional coordination
- Establishment of communication structures

- Eswatini Environmental Fund
- IDCE
- Eswatini Agriculture Development Fund
- National Disaster Management Agency
- Ministry of Natural Resources and Energy
- Ministry of Agriculture
- Eswatini Water Services Cooperation

Private sector funding:

- Corporate Social Responsibility from large technology solution providers

- Tech firms (Google, Microsoft)
- Royal Eswatini Sugar
- Illovo Sugar
- CONCO
- Eswatini Breweries

Financing Instruments	Description	Actions to be financed for prioritised technology.
<p>8. Monitoring of licensing and permit compliance continuously</p>	<p>Guiding Policies, Acts or Regulations</p> <ul style="list-style-type: none"> • Water Act, No.7 2003 • National Water Policy, 2018 • IWRM Master Plan, 2016 • Water Services Act, 1992 • Environment Management Act, 2002 <p>Proposed policy interventions</p> <ul style="list-style-type: none"> • Establish regulations for water licensing to supplement the Act. • Develop an integrated watershed management plan. • Development of a central database and data-sharing protocols. 	<p>TECHNOLOGY PUSH</p> <p>The focus should be on the in-country development of the technology to suit the country's context.</p> <p>Research and Development</p> <ul style="list-style-type: none"> • Stakeholder engagement • Assessment of existing water use monitoring, compliance, enforcement and audit processes and legislation • Capacity needs assessment • Assessment of water use licence and audit backlogs <p>Demonstration</p> <ul style="list-style-type: none"> • Piloting compliance monitoring and audits at selected sites to establish processes • Identification of regulatory and policy amendments required to strengthen enforcement <hr/> <p>MARKET PULL</p> <p>Deployment</p> <ul style="list-style-type: none"> • Development of compliance monitoring and audit standards for enforcing water use licences, as well as audit and compliance reports • Development of an accessible repository of water use licences, as well as audit and compliance reports • Establishment/strengthening of the Compliance Monitoring and Enforcement Unit comprising national and regional staff in the water sector set up to curb water transgressions and ensure the protection of all water resources • Develop specialized training programs aimed at building the capacities of relevant institutions in areas of compliance monitoring and enforcement <p>Diffusion</p> <ul style="list-style-type: none"> • Upskill SMMEs and government institutions to undertake compliance monitoring and auditing. • Conducting regular compliance audits and developing associated reports • Specialised compliance monitoring and enforcement training in collaboration with the Environmental Department, Police Services etc • Strengthen institutional coordination between compliance for timely data collection, management, and decision-making.
<p>9. Urban green spaces</p>	<p>Guiding Policies, Acts or Regulations</p> <ul style="list-style-type: none"> • National Sanitation and Hygiene Policy • The Environment Policy and Environment Action Plan, 1997 • The Forestry Policy, 2002 • Environmental Management Act, 2002 <p>Proposed policy interventions</p> <ul style="list-style-type: none"> • Assess the current situation regarding urban spaces and vulnerabilities to climate change. • Identify and cost ecosystem benefits to justify the need for greening urban spaces. • Develop regulations to guide municipalities on urban greening. • Development of detailed urban designs with relevant stakeholders. • Develop a monitoring and evaluation framework to assess progress made and lessons learnt. 	<p>TECHNOLOGY PUSH</p> <p>The focus should be on the in-country development of the technology to suit the country's context.</p> <p>Research and Development</p> <ul style="list-style-type: none"> • Identification of potential sites for urban greening • Stakeholder engagement • Assessment of the current state of green urban spaces in Eswatini • Research on green space planning optimisation and best practices • Research on the status of drainage systems for Eswatini urban areas. <p>Demonstration</p> <ul style="list-style-type: none"> • Piloting urban greening at selected sites and tracking the impact • A feasibility study was conducted to implement urban greening at the identified sites • Piloting rainwater harvesting for urban green space irrigation <hr/> <p>MARKET PULL</p> <p>Deployment</p> <ul style="list-style-type: none"> • Detailed design of the urban green spaces • Approvals for implementing urban green initiative at selected site • Stakeholder consultations and engagement • Construction/refurbishment of urban green spaces • Establishment of maintenance and safety plans for green spaces <p>Diffusion</p> <ul style="list-style-type: none"> • Maintenance and safekeeping of green spaces

Potential Financing Sources

Relevant support institutions responsible for sourcing identified finance

ODA, Philanthropies and Development Partners

Grant funding for research grants (promote partnerships with other academic institutions in the north and south) for:

- Research on existing water use monitoring, compliance, enforcement and audit processes and legislation
- Stakeholder engagement
- Piloting technology
- Building institutional capacity on the use of technology
- Research on policy amendments required to strengthen enforcement
- Development of Repository

- University of Eswatini
- WaterNet
- International Cooperating Partners (JICA, GIZ, ADA, Blue Deal)
- UN Agencies (CTCN, UNDP)

Government budgets for:

- Enhancing Institutional arrangements
- Intellectual property rights
- Piloting technologies
- Strengthening institutional coordination
- Education and awareness-raising
- Upskill SMMEs and government institutions to undertake compliance monitoring and auditing.
- Conducting compliance audits
- Establishment of communication structures

- Department of Water Affairs
- Decentralized Water Management Institutions (RBAs, IDs, PBs, WUAs)
- National Water Authority.
- Ministry of Agriculture

ODA, Philanthropies and Development Partners

Grant funding for research grants (promote partnerships with other academic institutions in the north and south) for:

- Research on current and potential sites in Eswatini for urban greening and global best practices
- Stakeholder engagement
- Piloting technology
- Building institutional capacity on the use of technology
- Development of Repository
- Feasibility study

- University of Eswatini
- International Cooperating Partners (JICA, GIZ, ADA)
- UN Agencies (UNDP, FAO)

Government budgets for:

- Piloting technologies
- Strengthening institutional coordination
- Education and awareness-raising
- Upskill SMMEs and government institutions to undertake compliance monitoring and auditing.
- Conducting compliance audits
- Establishment of communication structures
- Maintenance and safekeeping

- Municipalities
- Ministry of Housing and Urban Development
- Ministry of Tourism and Environmental Affairs – (Forestry and Meteorology Departments)
- National Disaster Management Agency
- Eswatini Environmental Authority

Multilateral and Development Finance Institutions

Loans and equity

- Feasibility studies
- Construction

- AfDB
- DBSA
- World Bank

Financing Instruments	Description	Actions to be financed for prioritised technology.
10. Climate change vulnerability assessments	<p>Guiding Policies, Acts or Regulations</p> <ul style="list-style-type: none"> National Climate Change Policy, 2016 Environment Action Plan, 1997 National Climate Change Strategy and Action Plan (2015-2020) National Resilience Strategy and Disaster Risk Reduction Plan of Action (2017 – 2021) Draft Climate Change Management Bill, 2023 Eswatini National Determined Contribution (NDC), 2021 <p>Proposed policy interventions</p> <ul style="list-style-type: none"> Review the outdated National Climate Change Strategy and Action Plan Develop Climate Change Vulnerability Assessment Framework guidelines. Make Climate Change Vulnerability Assessments mandatory for all businesses and institutions. Establish data collection tools and protocols to be used including guidelines for access to data and information. 	<p>TECHNOLOGY PUSH</p> <p>The focus should be on the in-country development of the technology to suit the country's context</p> <p>Research and Development</p> <ul style="list-style-type: none"> Review/update of Eswatini climate vulnerability assessment framework Assessment of available frameworks and methods for vulnerability assessments analysed Identification of vulnerable ecosystems and most appropriate adaptation interventions to be implemented <p>Demonstration</p> <ul style="list-style-type: none"> Development/update of Eswatini climate vulnerability assessment framework for vulnerability analysis informed by a variety of criteria, including the purpose of the assessment, information availability, costs, assessment priorities, time scale of desired planning as well as required information detail for decision-making. Development of implementation plan for climate vulnerability assessment, including stakeholder engagement method Data collection and analysis <hr/> <p>MARKET PULL</p> <p>Deployment</p> <ul style="list-style-type: none"> Implementation of vulnerability assessment focused on system vulnerability to reduced water availability, increased seasonal variability, changes in water quality <p>Diffusion</p> <ul style="list-style-type: none"> Implementation of identified adaptation interventions Capacity development Public awareness of the identified vulnerable ecosystems and the recommended adaptation interventions.
11. Model predictions on available seasonal water supply	<p>Guiding Policies, Acts or Regulations</p> <ul style="list-style-type: none"> Water Act, 2003 National Water Policy, 2018 National Climate Change Policy, 2016 IWRM Masterplan 2016 Eswatini National Communications to the UNFCCC Draft Wash masterplan <p>Proposed policy interventions</p> <ul style="list-style-type: none"> Establish guidelines for information and data-sharing protocols. Speed up the finalization of the WASH masterplan Develop river basins and management plan 	<p>TECHNOLOGY PUSH</p> <p>The focus should be on technology transfer working with local institutions capacitated for operation and maintenance.</p> <p>Research and Development</p> <ul style="list-style-type: none"> The collection of information/data on precipitation patterns, evaporation rates, river flow, evapotranspiration, runoffs, water use, water quality, groundwater recharge infiltration and storage etc. Explore relational database Identify appropriate software/technology required for model predictions. Conduct technology needs assessment Explore open data platforms <p>Demonstration to the stakeholder</p> <ul style="list-style-type: none"> Work with research institutions to support modelling Piloting selected technology/software <hr/> <p>MARKET PULL</p> <p>Deployment</p> <ul style="list-style-type: none"> Develop and establish a framework for data sharing among institutions Investing in hydrological modelling software/technologies Development of a platform or database Building technical expertise through university partnerships Establish more river flow measuring stations and water quality hotspots Facilitate coordinated engagement and information dissemination to all stakeholders using various platforms. <p>Diffusion</p> <ul style="list-style-type: none"> Building institutional capacity for a national hub for hydrological assessments and reporting Education and awareness raising to promote climate science and science-based decision-making Strengthen institutional coordination for timely data collection, management and decision-making

Potential Financing Sources

Relevant support institutions responsible for sourcing identified finance

ODA, Philanthropies and Development Partners

Grant funding for research grants (promote partnerships with other academic institutions in the north and south) for:

- Research and development of CVA frameworks
- Stakeholder engagement
- Piloting technology
- Building institutional capacity on the use of technology
- Data collection

- University of Eswatini
- International Cooperating Partners (JICA, GIZ, ADA)
- UN Agencies (FAO, UNDP)

Multilateral Climate Funds and DFIs

- Technical assistance
- Capacity development
- Implementation of CVA

- Adaption Fund
- Global Environment Facility (GEF)
- Global Climate Change Alliance
- Green Climate Fund (GCF)
- Least Developed Countries Fund

Government budgets for:

- Stakeholder engagement
- Development and implementation of the CVA framework
- Capacity development

- Ministry of Tourism and Environmental Affairs – (Forestry and Meteorology Departments)
- National Disaster Management Agency
- Eswatini Environmental Authority

ODA, Philanthropies and Development Partners

Grant funding for research grants (promote partnerships with other academic institutions in the north and south) for:

- Research and development of appropriate technology requirements and open data platforms
- Modelling
- Piloting technology
- Building institutional capacity on the use of technology
- Data collection

- University of Eswatini
- International Cooperating Partners (JICA, GIZ, ADA)
- UN Agencies (UNDP)

Government budgets for:

- Enhancing Institutional Arrangements and Coordination
- Piloting technologies
- Information dissemination
- Stakeholder engagement
- Capacity development

- Ministry of Finance
- Eswatini Environmental Fund
- Eswatini Agriculture Development Fund
- River Basin Authorities
- National Disaster Management Agency
- Ministry of Natural Resources and Energy

Multilateral Climate Funds and DFIs

- Technical assistance
- Capacity development
- Establishment of river flow measuring stations

- Adaption Fund
- Global Environment Facility (GEF)
- Global Climate Change Alliance
- Green Climate Fund (GCF)
- Least Developed Countries Fund

Financing Instruments	Description	Actions to be financed for prioritised technology.
12. Real-time monitoring networks	<p>Guiding Policies, Acts or Regulations</p> <ul style="list-style-type: none"> • National Data Protection Act, 2022 • Water Act, 2003 • National Information and Infrastructure and Communication Policy, 2012 • Climate Change Policy, 2016 <p>Proposed policy interventions</p> <ul style="list-style-type: none"> • Develop monitoring and information-sharing guidelines. • Develop river basin management plans 	<p>TECHNOLOGY PUSH</p> <p>The focus should be on technology transfer working with local institutions capacitated for operation and maintenance.</p> <p>Research and Development</p> <ul style="list-style-type: none"> • Analysis of available real-time monitoring network technologies • Assessment of existing real-time monitoring technologies and management practices in Eswatini • Capacity needs assessment • Invest in hardware and software for integration <p>Demonstration</p> <ul style="list-style-type: none"> • Piloting of real-time monitoring network at selected sites in Eswatini • Development of feasibility study on the roll-out of real-time monitoring network in Eswatini <hr/> <p>MARKET PULL</p> <p>Deployment</p> <ul style="list-style-type: none"> • Data collection • Retrofitting of existing infrastructure with real-time monitoring equipment • Modelling and database development <p>Diffusion</p> <ul style="list-style-type: none"> • Develop specialized training aimed at building the capacities in relevant institutions – in areas of real-time monitoring, operationalisation and maintenance.
13. Membrane Bioreactors	<p>Guiding Policies, Acts or Regulations</p> <ul style="list-style-type: none"> • Water Services Act, 1992 • Water Act, 2003 • National Water Policy, 2018 • Waste Regulations, 2000 • National Sanitation and Hygiene Policy, 2019 • Environment Act (2002) <p>Proposed policy interventions</p> <ul style="list-style-type: none"> • Enforce water pollution regulations of 2010. • More pronouncement of water pollution control elements on the updated Water Act of 2003. • Endorsement of Water quality regulations • Finalization of WASH masterplan 	<p>TECHNOLOGY PUSH</p> <p>The focus should be on technology transfer working with local institutions capacitated for operation and maintenance.</p> <p>Research and Development</p> <ul style="list-style-type: none"> • Analysis of membrane technologies in the market both nationally and internationally • Investigation of IP and patent rights on identified technologies. • Assessment of current membrane technology use within the market in Eswatini <p>Demonstration to the stakeholder</p> <ul style="list-style-type: none"> • Piloting of selected membrane bioreactor technologies selected. • Feasibility study on the retrofitting of WWTW for membrane bioreactors <hr/> <p>MARKET PULL</p> <p>Deployment</p> <ul style="list-style-type: none"> • Retrofitting WWTW with membrane bioreactors <p>Diffusion</p> <ul style="list-style-type: none"> • Capacity strengthening on the operation and maintenance of membrane bioreactors.

Potential Financing Sources

Relevant support institutions responsible for sourcing identified finance

ODA, Philanthropies and Development Partners

Grant funding for research grants (promote partnerships with other academic institutions in the north and south) for:

- Data and information collection
- Research on existing real-time monitoring technologies
- Modelling and database development
- Development of technology transfer strategy
- Capacity building

- University of Eswatini
- WaterNet
- International Cooperating Partners (JICA, EU Horizon Grants, GIZ, ADA)
- UN Agencies (CTCN, UNDP)

Government budgets

- Enhancing Institutional arrangements
- Piloting technologies
- Strengthening institutional coordination

- Ministry of Finance
- Eswatini Environmental Fund
- Eswatini Agriculture Development Fund
- River Basin Authorities
- National Disaster Management Agency
- Ministry of Natural Resources and Energy
- Eswatini Water Services Cooperation
- RSTP

Private sector funding

- Acquiring or filing intellectual property rights
- Early-stage venture capital funds for Demonstration and patent rights
- Financing technology companies via debt or equity
- Corporate Social Responsibility from large technology solution providers

- Tech firms (Google, Microsoft)
- VC Firms (Acuity Ventures, Vantage Capital, Convergence Partners, Seedstar Africa)
- Insurance companies

Multilateral Climate Fund

- Building institutional capacity on the use of technology
- Education and awareness-raising
- Establishment of communication structures
- Piloting technologies

- GEF
- GCF
- Adaptation Fund

ODA, Philanthropies and Development Partners

Grant funding for research grants (promote partnerships with other academic institutions in the north and south) for:

- Research on existing membrane technologies
- Development of technology transfer strategy
- Piloting
- Capacity development

- University of Eswatini
- International Cooperating Partners (JICA, GIZ, ADA)
- UN Agencies (UNDP)

Government budgets for:

- Piloting technologies
- Strengthening institutional coordination
- Retrofitting
- Capacity development

- Eswatini Water Services Corporation
- Department of Water Affairs
- River Basin Authorities
- Eswatini Water and Agricultural Development Enterprise
- Municipal Councils

Private sector funding

- Financing small-scale demonstrations on private sites
- Venture capital financing for demonstration and acquiring IP rights
- Financing MBR companies via debt or equity

- VC Firms (Acuity Ventures, Vantage Capital, Convergence Partners, Seedstar Africa)
- Royal Eswatini Sugar
- Illovo Sugar
- CONCO
- Eswatini Breweries
- USA DISTILLERS
- Textile Industries

Multilateral and Development Finance Institutions

- Loans and equity
- Feasibility studies
- Construction

- AfDB
- DBSA
- World Bank

Financing Instruments	Description	Actions to be financed for prioritised technology.
14. Drip Irrigation	<p>Guiding Policies, Acts or Regulations</p> <ul style="list-style-type: none"> • The National Irrigation Policy 2005 • Eswatini National Agricultural Investment Plan, 2015 • Draft Water Application and Pricing Regulations, 2016 • Water Act, 2003 • National Water Policy, 2018 <p>Proposed policy interventions</p> <ul style="list-style-type: none"> • Enforce Water Pricing Regulations • Implementation of Water Pricing regulations to enforce efficient water use • Develop groundwater regulations. 	<p>TECHNOLOGY PUSH</p> <p>The focus should be on technology transfer working with local institutions capacitated for local production, operation and maintenance.</p> <p>Research and Development</p> <ul style="list-style-type: none"> • Analysis of drip irrigation technologies in the market both nationally and internationally • Investigation of IP and patent rights on identified technologies • Assessment of current drip irrigation technologies within the market in Eswatini and drip irrigation manufacturing capabilities in-country <p>Demonstration</p> <ul style="list-style-type: none"> • Piloting of selected drip irrigation technologies • Sensitise the policymakers on the importance of incentives and or subsidies for drip irrigation systems • Identify financial incentives to assist in lowering the cost of drip irrigation systems (e.g. introduce subsidies, tax exemptions) • Promote the development of drip irrigation water systems locally to reduce initial costs of investment. <hr/> <p>MARKET PULL</p> <p>Deployment / Market Formation</p> <ul style="list-style-type: none"> • Implement financial incentives to assist in lowering the cost of drip irrigation systems (e.g. introduce subsidies, tax exemptions) • Capacity strengthening of SMMEs on the manufacture/sale of drip irrigation systems <p>Diffusion</p> <ul style="list-style-type: none"> • Increase public information and awareness of the benefits of drip irrigation • Promotion of drip irrigation technologies • Capacity building
15. Multi-purpose Dams	<p>Guiding Policies, Acts or Regulations</p> <ul style="list-style-type: none"> • National Water Policy, 2018 • Eswatini National Agricultural Investment Plan, 2015 • Irrigation Policy, 2005 • Eswatini's Nationally Determined Contribution (NDC, 2021) • Swaziland PPP Policy • Swaziland PPP Implementation Guidelines • National Development Plan • Transboundary Agreements • Water Act (2003) <p>Proposed policy interventions</p> <ul style="list-style-type: none"> • Timely update of the Water Resources masterplan to talk about the development of multi-purpose dams. • Adopt the WEF nexus approach in planning for the establishment of these dams • Finalization of WASH Masterplan 	<p>TECHNOLOGY PUSH</p> <p>The focus should be on developing technology locally with support from international partners to ensure that local institutions are capacitated for design, construction, operation and maintenance.</p> <p>Research and Development</p> <ul style="list-style-type: none"> • Scoping assessments to determine sites for the dams • Early-stage concept design work • Concept note development, basic and technical financial modelling • Conducting due diligence and • Finalizing of the pre-feasibility studies • Stakeholder engagement <p>Demonstration</p> <ul style="list-style-type: none"> • Conducting a feasibility study which covers organizational, financial, technical, social, environmental and other aspects of the project • Securing project approval • Conducting detailed project engineering designs • Conducting detailed financial modelling <hr/> <p>MARKET PULL</p> <p>Deployment / Market Formation</p> <ul style="list-style-type: none"> • Financial and legal structuring • Tendering for construction <p>Diffusion</p> <ul style="list-style-type: none"> • Construction and physical implementation of the infrastructure project • Operation and maintenance of the infrastructure

Potential Financing Sources

Relevant support institutions responsible for sourcing identified finance

ODA, Philanthropies and Development Partners

Grant funding for research grants (promote partnerships with other academic institutions in the north and south) for:

- Research on existing drip irrigation technologies.
- Development of technology transfer strategy
- Piloting
- Capacity development

- University of Eswatini
- WaterNet
- International Cooperating Partners (JICA, EU Horizon Grants, GIZ, ADA)
- UN Agencies (CTCN, UNDP)

Government budgets

- Piloting technologies
- Implementing incentives and subsidies for the use of drip irrigation
- Capacity building

- SOEs – Industrial Development Company, Environmental Fund, Youth Enterprise Fund, Regional Development Fund.
- River Basin Authorities
- National Agricultural Marketing Board (NAMBOARD)
- Eswatini Water and Agriculture Development Enterprise (ESWADE)

Development Finance Institutions

- Loans and equity
- Feasibility studies
- Construction

- AfDB
- DBSA
- World Bank
- Eswatini Development Bank

Multilateral Climate Fund

- Building institutional capacity on the use of technology
- Education and awareness-raising
- Establishment of communication structures
- Piloting technologies

- GEF
- GCF
- Adaptation Fund

Private sector funding

- Financing small-scale demonstrations on private sites
- Venture capital financing for demonstration and acquiring IP rights
- Financing MBR companies via debt or equity
- Corporate Social Responsibility from Large Corporations

- VC Firms (Acuity Ventures, Vantage Capital, Convergence Partners, Seedstar Africa)
- Royal Eswatini Sugar
- Illovo Sugar
- Eswatini Sugar Association

ODA, Philanthropies and Development Partners

- Pre-feasibility studies
- Stakeholder engagement
- ESIA
- Gender equity and mainstreaming

- University of Eswatini
- International Cooperating Partners (JICA, EU Horizon Grants, GIZ, ADA)
- UN Agencies (UNDP)
- Development Partners (GWPSA, IUCN, WWF)

Development Finance Institutions

- Loans
- Feasibility and detailed design studies
- Financial and deal Structuring
- Construction

- AfDB
- DBSA
- World Bank
- Eswatini Development Bank

Multilateral Climate Fund

- Grant/Co-financing

- GCF
- GEF
- AF

Government budgets

- Co-financing for acquisition of land, engagement efforts, construction, design etc

- Ministry of Natural Resources and Energy
- Ministry of Agriculture
- Ministry of Finance
- Ministry of Economic Planning & Development

Private sector funding (PPP modalities)

- Equity financing
- Long-term investment loans
- Financing for operations and maintenance

- Fichtner
- RES

Financing Instruments	Description	Actions to be financed for prioritised technology.
16. Water Recycling and reuse	<p>Guiding Policies, Acts or Regulations</p> <ul style="list-style-type: none"> • Climate Change Policy, 2016 • Water Act, 2003 • National Sanitation and Hygiene Policy • The Environment Policy and Environment Action Plan, 1997 • Water Pollution Control Regulations of 2010. • Water Services Act (1992) <p>Proposed policy interventions</p> <ul style="list-style-type: none"> • Enforce water pollution regulations of 2010. • Establish more water monitoring systems. • Finalization of WASH Masterplan 	<p>TECHNOLOGY PUSH</p> <p>The focus should be on developing technology locally with support from international partners to ensure that local institutions are capacitated for design, construction, operation and maintenance.</p> <p>Research and Development</p> <ul style="list-style-type: none"> • Advocacy on policymakers • Analysis of current water recycling used to include technologies and methods • Capacity needs assessment on water recycling <p>Demonstration</p> <ul style="list-style-type: none"> • Piloting water recycling in targeted areas and testing water reuse • Putting systems in place to monitor • Raising more awareness <hr/> <p>MARKET PULL</p> <p>Deployment</p> <ul style="list-style-type: none"> • Piloting, and assessing the technology in both rural and urban areas. • More awareness on saving water. <p>Diffusion</p> <ul style="list-style-type: none"> • Awareness and adequate understanding of recycling water • Monitoring systems are put in place. • Continued Public Awareness

Potential Financing Sources

Relevant support institutions responsible for sourcing identified finance

ODA, Philanthropies and Development Partners

Grant funding for research grants (promote partnerships with other academic institutions in the north and south) for:

- Research on existing water recycling and reuse technologies
- Development of technology transfer strategy
- Piloting
- Capacity development

- University of Eswatini
- International Cooperating Partners (JICA, EU Horizon Grants, GIZ, ADA)
- UN Agencies (CTCN, UNDP)

Government budgets

- Piloting technologies
- Strengthening institutional coordination
- Retrofitting
- Capacity development

- Eswatini Water Services Corporation
- Department of Water Affairs
- River Basin Authorities
- Eswatini Water and Agricultural Development Enterprise
- Municipal Councils
- Eswatini Environmental Authority

Private sector funding

- Financing small-scale demonstrations on private sites
- Venture capital financing for demonstration and acquiring IP rights
- Financing companies via debt or equity

- VC Firms (Acuity Ventures, Vantage Capital, Convergence Partners, Seedstar Africa)
- Royal Eswatini Sugar
- Illovo Sugar
- CONCO
- Eswatini Breweries

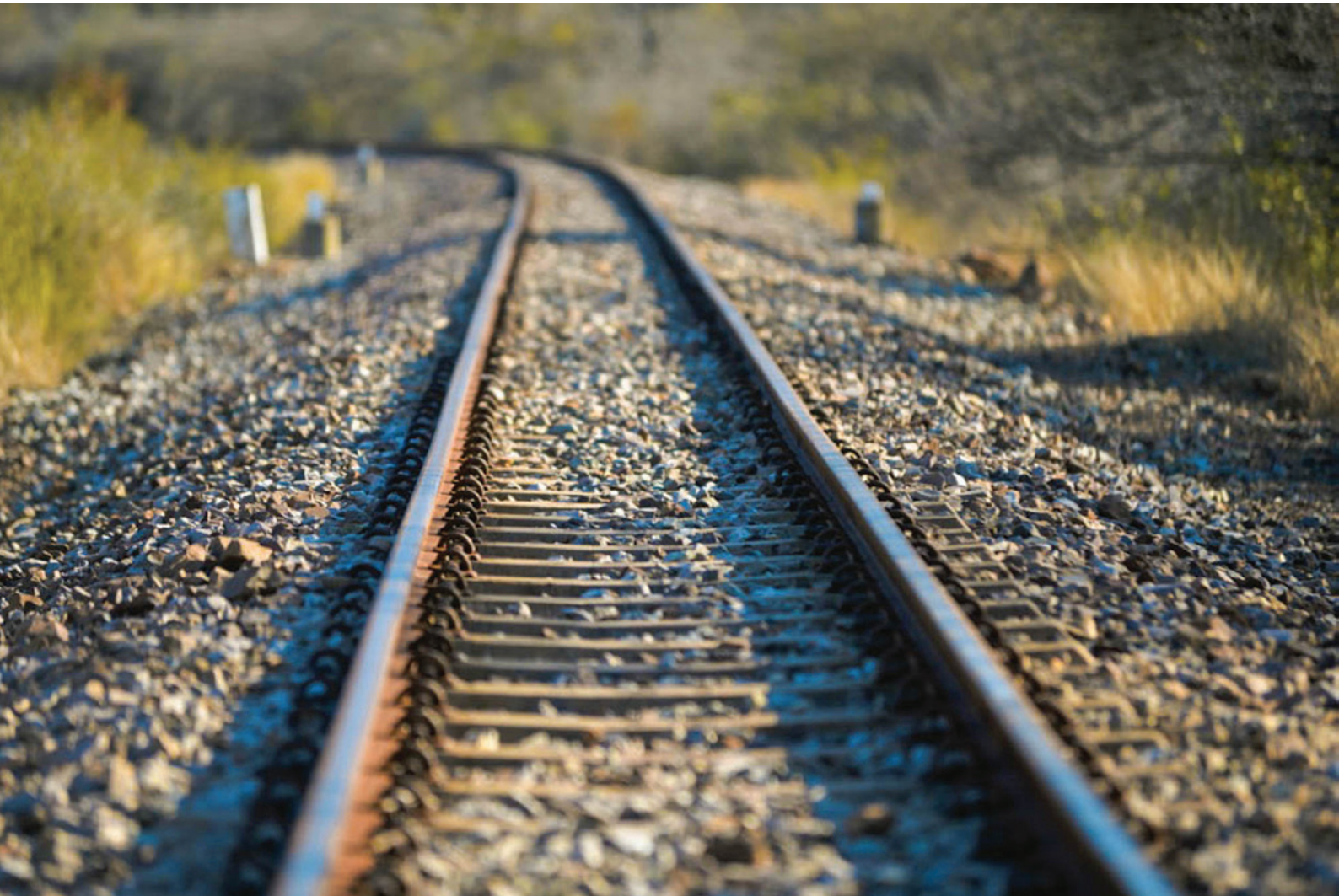
Multilateral and Development Finance Institutions

- Loans and equity
- Feasibility studies
- Construction

- AfDB
- DBSA
- World Bank

6

Roadmap for implementing the proposed financing strategies for water-related climate technologies



To support the adoption and uptake of the identified prioritized technologies, the following key actions in the form of a roadmap are recommended. The roadmap identifies key actions that need to be implemented in the short, medium, and long term to support the implementation of the financing strategy.

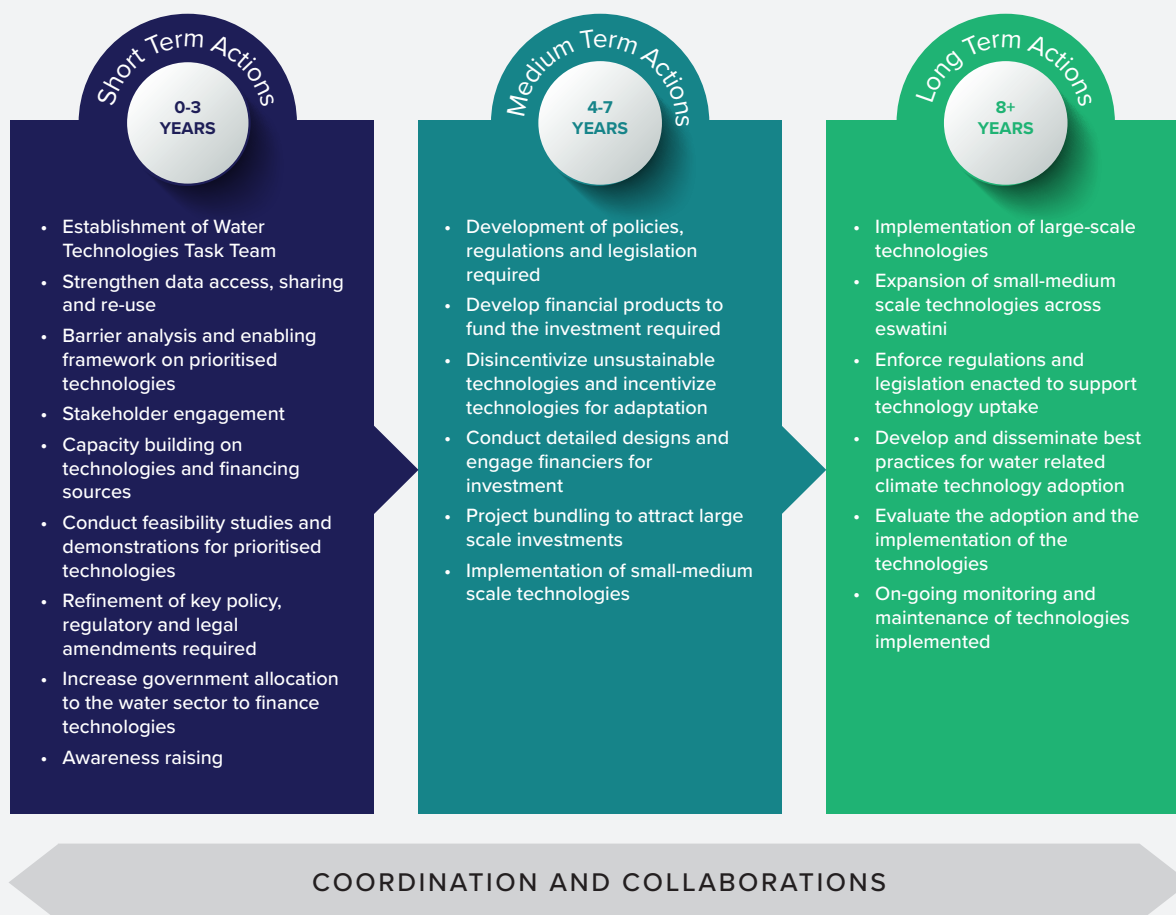


FIGURE 5: Roadmap for the adoption of water-related climate technologies in Eswatini.

Additionally, as an element transversal to all three timeframes is improved coordination and collaboration among the relevant actors and activities. Strengthening institutional mechanisms increases adaptation action efficiency. Information-sharing alliances and regional networks can reduce duplication and strengthen capacities for implementation.

6.1 Short-Term Actions (0-3 years)

- Establishment of a Climate Technologies Task Team comprising representatives from the various institutions identified as critical to supporting the development and implementation of each prioritised technology.
- Strengthen data access, sharing and re-use to allow for quick adoption of the proposed technology, and for easier monitoring and evaluation processes.

- Detailed barrier analysis and enabling framework for each climate technology. This includes further identification and analysis of the legal, institutional, financial, social, and economic barriers for each technology and the associated measures for improving the enabling frameworks. Furthermore, an economic assessment of the measures to transfer and diffuse the prioritised technologies will be required.
- Domestic resources can mobilize a more immediate, nationally driven response to climate change, and when aligned with external funding sources, can gain a much greater impact. This can be achieved through the government taking a leadership role and ensuring an increased budgetary allocation towards the water sector to support the application of these technologies and the required capacity-building and awareness initiatives to easily attract the private sector to consider adopting and financing these technologies.

- There is a need to strengthen the enabling environment for investments in the water sector. With the country currently developing a national water supply and sanitation master plan, similar interventions are necessary, including finalizing draft regulations for groundwater use, land policy and others.
- Engage and build the capacity of finance institutions to provide tailored finance and financial products to finance the various stages of the technology innovation chain to encourage the adoption and use of priority water technologies.
- Map and engage the relevant actors and stakeholders at all levels for each prioritised technology from inception through policy development, implementation, and monitoring. Private sector engagement can unlock potential financing sources. Similarly, engagement at the grassroots level can be useful in identifying and disseminating technological needs, making certain grassroots alternatives viable. The private sector can help improve value chains for technologies and design relevant awareness programmes. Mandates for engagement can often support technology dissemination.
- Establish partnerships for technical assistance and expertise from both local and international organizations to strengthen local capacities for adoption and use e.g. CTCN.
- Develop and implement capacity building and education programmes at universities and research institutions for further local research and design on the prioritised technologies.
- Implement demonstration projects to promote awareness and skills transfer from private sector and academic institutions for the benefit of the youth and other relevant stakeholders.
- Work with business accelerators and incubation hubs to establish competitions and support programmes for capacity building and development of innovative solutions in the water sector for water management technologies into viable business ideas. Emphasis can be placed on attracting youth and women-led initiatives or businesses.
- Build capacity for diverse groups including farmers, communities and relevant stakeholders on the use, operation, and maintenance of prioritised water technologies.
- Build capacity for the different stakeholder groups on the available financing sources and financing instruments which are relevant for the various stages of the innovation chain for water technologies.
- Develop a comprehensive communication and outreach strategy to raise public awareness about the importance of water-related technologies and their financing.
- Develop a strategic water investment plan to ensure resilient investments in the context of uncertain future climatic conditions.

6.2 Medium-term Actions (4-7 years)

- Ensure that financial institutions consider climate insurance to outsource the possibility of climate change risks and impacts thus offering covered finance for financing water technologies.
- Engage financial regulatory authorities to develop laws/legislation to influence financial institutions to incorporate climate risks and impacts in their portfolios.
- Design and implement new enabling policies and legal and regulatory frameworks, which accelerate the diffusion of technologies in the industry beyond the demonstration phase and promote private sector engagement.
- Disincentivize unsustainable technologies (e.g. levying environmental taxes) and incentivize technologies for adaptation (e.g. subsidies) that accelerate the diffusion of technologies and promote private sector engagement.
- Develop innovative financial products or mechanisms to fund the investment required for the prioritised water technologies (e.g. short-term loans (with no interest), bonds, leasing, equity, mezzanine, and others). Form public-

private partnerships between the government and financiers, where applicable, to enable these products.

- Conduct detailed designs and project structuring for each technology and engage financiers for project investment.
- Regulate the possibility of project bundling, especially for small-scale projects which adopt the use of technologies to attract more private sector and large-scale investors.
- Implementation of small-medium scale technologies (e.g. solar-powered drip irrigation, water-saving toilets etc).

6.3 Long-Term Actions (8+ years)

- Implementation of large-scale technologies (e.g. multi-purpose dams)
- Expansion of successful small-medium scale water-related technology projects to other regions or communities within Eswatini.

- Enforce regulations and legislation enacted to support technology uptake, including supporting the payment of water charges, tariffs, and levies.
- Develop a comprehensive information dissemination strategy for climate finance opportunities.
- Share best practices and lessons learned to promote knowledge-sharing and capacity building.
- Develop and disseminate best practices for water-related climate technology adoption to enable faster learning about the application of the prioritised technologies.
- Evaluate the adoption and implementation of the technologies.
- Ensure ongoing monitoring and maintenance of technologies implemented for improved sustainability and use of the technology.

7. Conclusion

Investments in water-related sectors can significantly contribute to both mitigation and adaptation efforts, accelerating the transition to net-zero carbon dioxide emissions and enhancing climate resilience. This strategy outlines the financial opportunities and challenges in mobilizing resources for the adoption of prioritized water technologies in Eswatini. It highlights the importance of partnerships between the public and private sectors and research institutions throughout the innovation chain of each technology.

The actions to be financed through the various stages of the innovation chain should align with other relevant national plans like those for Nationally Determined Contributions (NDC) implementation, Sustainable Development Goals (SDGs), and the

national development agenda. This alignment is crucial for mobilizing both public and private finances efficiently.

The government of Eswatini is encouraged to play a leadership role, focusing on increased budgetary allocations to water, capacity building and raising awareness to attract the private sector's interest in adopting and financing technologies. The strategy also recommends improving the investment climate through regulatory reforms, promoting information sharing on climate finance, and fostering collaboration among stakeholders to streamline resource use and technology uptake.

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