Republic of South Sudan

TECHNOLOGY NEEDS ASSESSMENT

TECHNOLOGY ACTION PLAN FOR ADAPTATION AND MITIGATION

AGRICULTURE, LIVESTOCK, AND FISHERIES, WATER, DRR, ENERGY, WASTE AND AGRICULTURE, FORESTRY, AND OTHER LAND USE (AFOLU) SECTORS

December 2024

UN environment programme | copenhagen climate centre

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TNA TECHNOLOGY NEEDS ASSESSMENT

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South Sudan

Disclaimer

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Abbreviations and Acronyms

AfDB	African Development Bank
AFOLU	Agricultural, Forestry and Other Land Use
BAEF	Barrier Analysis and Enabling Framework
CAD	County Agriculture Department
CAMP	Comprehensive Agriculture Master Plan 2015-2040
DRR	Disaster Risk Reduction
EWG	Experts working groups
FAO	Food and Agriculture Organization of the United Nations
FEWSNET	Famine Early Warning Systems Network
GCF	Green Climate Fund
GEF	Global Environment Facility
GHG	Greenhouse Gas
GHGR	Greenhouse Gas Emission Reduction
IDMP	Irrigation Development Master Plan 2015-2040
IDP	Internally Displaced Person (People)
IGAD	Intergovernmental Authority on Development
INC	Initial National Communication (to the UNFCCC)
INGO	International non-governmental Organization
IPCC	Intergovernmental Panel on Climate Change
JICA	Japan International Cooperation Agency
LEG	Least Developed Countries Expert Working Group
LULUCF	Land use, land-use change and forestry
MAFS	Ministry of Agriculture and Food Security
MARF	Ministry of Animal Resources and Fisheries
(MAF/CES)	States Ministry of Agriculture, Environment and Forestry (MAF/CES)
MERL	Monitoring, evaluation, reporting, and learning
MGCSW	Ministry of Gender, Child, and Social Welfare
MHADM	Ministry of Humanitarian Affairs and Disaster Management
MWRI	Ministry of Irrigation and Water Resources
MoED	Ministry of Electricity and Dams
MoEF	Ministry of Environment and Forestry
MoFP	Ministry of Finance and Planning
MoGEI	Ministry of General Education and Instruction
MoTR	Ministry of Transport and Road
MPM	Ministry of Petroleum and Mining
MWCT	Ministry of Wildlife Conservation and Tourism
NALEP	National Agriculture and Livestock Extension Policy
NAP	National Adaptation Plan
NAPA	National Adaptation Programme of Action
NATCOM	Initial National Communication to the United Nations Framework Convention on Climate Change
NBSAP	National Biodiversity Strategy and Action Plan 2018-2027

NDC	Nationally Determined Contribution (to the Paris Agreement)
NDS	National Development Strategy 2018-2021
NSI	National Innovation System
R-TGNU	Revitalized Transitional Government of National Unity
SDG	Sustainable Development Goals
SFM	Sustainable Forest Management
SSDP	South Sudan Development Plan 2011-2016
SSMD	South Sudan Meteorological Directorate
SSP	South Sudanese Pounds
TNA	Technology Needs Assessment
TAP	Technology Action Plan
TFS	Technology Fact Sheet
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNEP CCC	United Nations Environment Programme Copenhagen Climate Centre
UNFCCC	United Nations Framework Convention on Climate Change
UNOCHA	United Nations Office for the Coordination of Humanitarian Affairs
USAID	United States Agency for International Development
USD	United States Dollar
WASH	water supply, sanitation and hygiene
WUC	Water User Committees

Foreword

Technology transfer has been under focus since the Rio Summit in 1992, where issues related to technology transfer were included in Agenda 21 as well as in the United Nations Framework Convention on Climate Change. Technology Need Assessment (TNA) project in South Sudan was intended to produce four main reports notably TNA, Barrier Analysis & Enabling framework, Technology Action Plans (TAPs) and Project Ideas for each prioritized technology.

The review of the four reports was carried out at different levels. At the national level, the reports were reviewed by the TNA Steering Committee, National TNA Team members and other different stakeholders from the Agriculture, Livestock, and Fisheries sector, Water, Disaster risk Reduction, energy, waste and Agriculture, Forestry, and Other Land Use (AFOLU) sectors.

The ultimate goal of these reports is to guide political decision makers and national planners on selected economic sectors with highest vulnerability characteristics to the effects of climate change. They further highlight most appropriate technologies which would support these sectors and the country in general, to mitigate or adapt to the effects of climate change.

On behalf of the Government of South Sudan, I thank all stakeholders from public and private sectors who participated in different consultation and validation meetings held to evaluate the selection and prioritization of the sectors and technologies. Their inputs were invaluable and deeply appreciated. Lastly, I extend my gratitude to the Global Environmental Facility (GEF) for providing financial support. I also thank the UNEP Copenhagen Climate Centre (UNEP - CCC), the Ministry of Environment and Forestry (MoEF) and Bul John Ajak for their technical support and guidance.

Hon. Josephine Napwon Cosmas
Minister of Environment and Forestry (MoEF)
Republic of South Sudan

Executive Summary

The Technology Need Assessment Report III on "Technology Action Plan (TAP) for Climate Change Adaptation and Mitigation Technologies" is built on the findings of two earlier reports, i.e., "Technology Needs Assessment (TNA Report-I)" and "Barrier Analysis and Enabling Framework for Adaptation and Mitigation (TNA Report II)." The prioritized sectors are agriculture, livestock, and fisheries, water, disaster risk management, energy, waste management and AFOLU sectors. These sectors are vital for development and highly susceptible to climate change. Priority technologies for adaptation include Micro-Irrigation, Solar-powered water systems, and early warning systems, while mitigation focuses on Hydropower, 3Rs, and forest-based enterprises like beekeeping.

The TAP identifies concrete actions and activities needed for successful technology implementation and develops indicative investment proposals for selected technologies. These can be considered for funding by the potential public, private and international institutions in the prioritized sectors. The selected technologies have vast potential to scale up into projects and programs that can be implemented to strengthen adaptation and reduce greenhouse gas emissions and improve resilience to climate change as committed by the South Sudan government in its Nationally Determined Contributions (NDCs). The Technology Action Plan (TAP) and project idea notes in South Sudan aim to boost community resilience, cut GHG emissions, and assist in meeting NDC goals under the Paris Agreement. To achieve this, the government should establish a comprehensive National Climate Change adaptation and Mitigation Technology Development Programme with clear goals and targets. Prioritizing funding effectiveness, a multifaceted strategy is needed for tech development and diffusion in climate change adaptation and mitigation.

The Technology Action Plan (TAP) and project notes can help address climate change adaptation challenges and reduce emissions in South Sudan. Establishing a comprehensive National Climate Change adaptation program with short-, medium-, and long-term goals focusing on capacity building, curriculum development, technology centers, and youth scholarships is crucial. Awareness campaigns are needed for widespread dissemination of climate change mitigation technologies. Funding options can include national budgets, private contributions, and support from organizations like AfDB, World Bank, GEF, UNDP, and Green Climate Fund. Stakeholder engagement drives the pilot project ideas in early climate policy formation for South Sudan. Market analyses and awareness campaigns are needed to overcome barriers like lack of information and financial constraints. Addressing short-term goals, regional needs, and R&D limitations are key challenges for technology adaptation.

Recommended policies and measures are crucial for effective implementation and long-term sustainability of adaptation and mitigation technologies. Here are strategies to address barriers:

- Government support for climate change adaptation and mitigation technologies innovation and research
- Capacity building and training to
- Affordable financing sources
- Proper energy pricing

- Enhanced donor coordination
- Addressing market complexity
- Promoting local manufacturing
- Creating a favorable business environment.

Continued involvement from donor agencies is vital as South Sudan transitions to leading funding and development efforts for climate technologies. Focusing on institutional functionality will help in overcoming challenges and achieving desired outcomes towards sustainable development.

A summary of main actions proposed in each sector and the prioritized technologies for South Sudan is provided below for the six sectors (Agriculture, Livestock, and Fisheries, Water, Disaster Risk Management, Energy, Waste Management and AFOLU Sectors)

TAP for the Agriculture, Livestock and Fisheries Sector

The agriculture, livestock, and fisheries sectors are vital sources of livelihood for many South Sudanese people. However, climate change poses a serious threat to the sector, leading to challenges in food security and rural livelihoods. The projections indicate increased droughts and higher temperatures, jeopardizing crop yields and community resilience. Chapter 1 of the report details the Agriculture Technology Action Plan, highlighting the sector's landscape, barriers, and proposed technologies to boost diffusion of Sprinkler and Drip Irrigation Technology to strengthen communities' climate resilience. These technology ambitions are essential for South Sudan to adapt to climate variability, secure food sources, and support its farmers' livelihoods.

Technology 1: Sprinkler and Drip Irrigation Technology

Ambition: The ambition for technology transfer of Micro Irrigation (Sprinkler and Drip Irrigation Technology) is installing Sprinkler and Drip Irrigation systems for horticulture and cash crops in the 10 states benefitting 100,000 households and strengthen technical support services and to develop, promote and disseminate new practices, innovation and technologies that are environmentally sustainable, appropriate, manageable and affordable in South Sudan by 2050.

Actions selected for inclusion in the TAP are:

Action 1: Strengthen the institutions in terms of human resources and technical expertise in drip and sprinkler irrigation
Action 2: Strengthen coordination for Drip and Sprinkler technology diffusion
Action 3: Enable functional private sector engagement in Drip and Sprinkler Irrigation
Action 4: Increase farmers access to financing for Drip and Sprinkler Irrigation

Action 1 was selected and will be implemented as a Project Idea (PI). All activities under this action will be considered. The Ministry of Agriculture and Forestry (MAFS), Ministry of Irrigation and Water resources (MWRI) and States Ministry of Agriculture, Environment and Forestry (MAF/CES) will coordinate the project and all four actions that have been proposed for the implementation of the prioritized agriculture technology action plan in South Sudan.

Actions, key activities, and resources needed are summarized in Table 1. The envisaged sources of funding to achieve this are potentially the government of South Sudan with support from development partners.

Table 1. Actions and key activities for Sprinkler and Drip Irrigation Technology

Action	Activity	Cost USD
Action 1: Strengthening the institutions in terms of human resources and technical expertise in drip and sprinkler irrigation	Develop and conduct training programs on drip and sprinkler irrigation and water management to develop irrigation professionals and engineers in the ten states in South Sudan	1,500,000
	Assess the resource needed in all the ten states by the Ministry of Agriculture and food security as well as County directorate of agriculture	100,000
	Strengthen the institutional structure for smoother implementation of micro irrigation schemes such as Directorate of agricultural engineering	500,000
Action 2: Strengthen coordination for Sprinkler and Drip Irrigation implementation	Conduct study on the potential of Sprinkler and Drip Irrigation at each district.	60,000
	Mobilize and form states Sprinkler and Drip Irrigation coordination committees.	30,000
	Develop Sprinkler and Drip Irrigation tens state and 3 administrative areas strategies.	390,000
	Implement Sprinkler and Drip Irrigation strategies	20,000,000
	Set up information sharing hub.	2,000,000
Action 3: Enable functional private sector engagement in Sprinkler and Drip Irrigation.	Reduce tax on Sprinkler and Drip Irrigation equipment.	100,000
	Develop partnerships with banks to provide soft loans.	200,000
	Provide capacity support for small and medium enterprises.	600,000
Action 4: Increase farmers access to financing of Sprinkler and Drip Irrigation.	Support community groups to access financing of Sprinkler and Drip Irrigation equipment.	12,000,000
Action 5: Design and implement effective technology information and awareness programs for micro irrigation	Conduct sprinkler and drip technology demos, field workshops, and state-level programs emphasizing farmer involvement at the County and Boma levels.	5,800,000

TAP for water sector

In 2022, South Sudan, highly vulnerable to climate change and politically fragile, is dealing with water insecurity due to floods. Limited clean water access persists despite ample water resources. Chapter 2 of the report outlines a technology action plan focusing on a climate-

smart approach using solar-powered water technology to ensure sustainable clean water supply amidst climate challenges. The plan details the technology ambition, key activities, and required resources for implementing the proposed project in the water sector.

Technology 2: Solar-powered water supply technology

Ambition: By 2050, 600,000 of households will be equipped with solar-powered water supply, and 20% of government institutions will use solar-powered water supply technology. Expanding the diffusion and penetration of solar-powered supply by providing community water supply from source to tap with zero energy costs and meagre running costs.

Actions selected for inclusion in the TAP are;

Action 1: Remove or mitigate financial and economic barriers
Action 2: Capacity building on Solar powered water technology
Action 3: Awareness Raising on benefits of solar-powered water supply.

Action 2 was selected and will be implemented as a Project Idea (PI). All activities under this action will be considered. The Ministry of Electricity and Dams and the MoEF and state-level local government will coordinate the project and all three actions that have been proposed for the implementation of the prioritized water technology action plan in South Sudan. Actions, key activities, and resources needed are summarized in Table 2. The envisaged sources of funding to achieve this are potentially the government of South Sudan with support from development partners.

Table 2. Action and key activities solar-powered water supply technology

Action	Activities to be implemented	Cost (USD)
Action 1: Remove or mitigate financial and economic barriers	Preparation and implementation of a comprehensive Program of incentives for users and Manufactures.	4,000,000
	Government funded Subsidies: Collaborate with the national and local governments to provide subsidies on solar-powered water supply systems.	10,000,000
	Subsidized Equipment Procurement: Negotiate bulk procurement deals with solar equipment suppliers to reduce costs for end users.	20,000,000
	Microfinance Solutions: Partner with microfinance institutions (MFIs) to offer low-interest loans or payment plans for HHs and small businesses	5,000,000
	Pay-As-You-Go (PAYGO) Models: Introduce PAYGO systems that allow households to pay for solar water systems in small, affordable instalments rather than upfront.	1,000,000
	Tax Reductions and Exemptions: Advocate for the removal of import taxes on solar equipment to reduce costs for consumers.	55,000
Action 2: Capacity building on Solar powered water technology	Training of trainers on Installation and operations of Solar Powered water supply	800,000
	Training of households/water management committees on operations and maintenance	750,000

	Training of government operators in operations and maintenance	500,000
	Building capacities of government institutes on regulations and policy framework	250,000
	Develop a specialized curriculum focusing on solar-powered water supply systems.	120,000
	Establish demonstration facilities for the public and users.	250,000
Action 3: Awareness Raising on benefits of solar-powered water supply.	Design and implement an effective advertising Program that can reach prospective and Potential users	180,000
	Community Meetings and Forums: Organize community gatherings in rural and urban areas to explain the benefits of solar-powered water supply systems.	300,000
	Deploy trained community volunteers to conduct door-to-door awareness campaigns on solar-powered water systems	400,000
	Set up live demonstrations where solar-powered water supply systems are installed.	260,000
	Launch a radio campaign highlighting solar-powered water systems' benefits and successful installations in rural and urban areas.	200,000
	Create national and sub national clubs to educate students on solar technology's role in water supply, conservation, and sustainability.	580,000

TAP for the Disaster Risk Management

South Sudan faces severe impacts of climate change like rising temperatures and more frequent extreme weather events, such as devastating floods. These shifts harm the environment and threaten peace and security by intensifying food shortages and tensions between pastoralists and farmers. Loss of livestock and rivalries among communities' increase conflict risks, necessitating a Technology Action Plan in Chapter 3 for disaster risk management. This plan suggests the development of monitoring and early warning systems to help South Sudan anticipate and tackle climate challenges, boosting resilience for a secure future.

Technology 3: Development and introduction of monitoring and early warning systems

Ambition: Developing and upgrading the existing EWS to become an effective end to-end early warning system (EWS), which provides more effective, accurate and real-time disaster detection, warnings and strengthen national and local authorities including communities in states that are at risk of floods, drought and pest and disease to effectively and timely response to the warnings.

Actions selected for inclusion in the TAP are

Action 1. Increase public investment and resources mobilization for EWS
Action 2: Increase institutional capacity and human resources

Action 3: Enhance EWS tools and infrastructure, create disaster-resilient plans, implement weather monitoring software, install radar systems, set up hydrological stations, develop communication systems, and relocate at-risk communities.
Action 4: Increase information and strengthening development and introduction of Early Warning system (EWS).
Action 5: Develop and enhance enforcement of policies or regulation on EWS and activities
Develop and enhance enforcement of policies and regulation on EWS
Action 6: Integration and development planning with activities of; Mainstreaming EWS to development program.
Action 7: Prevention and mitigation, with activities of; Identification of hazards and Risk assessment.
Action 8: Technology and infrastructure development with activities of; Establishment of flood monitoring stations in flood prone areas and Installation of early warning technologies.
Action 9: Monitoring and Evaluation with activities of; developing Performance indicators to assess effectiveness of EWS and also Establishment of community Feedback mechanisms.

Action 3, 4 and 5 were selected and will be implemented as a Project Ideas (PI). All activities under this actions will be considered. The Ministry of Humanitarian Affairs and Disaster Management (MHADM) and state-level local government will coordinate the project and all three actions that have been proposed for the implementation of the prioritized water technology action plan in South Sudan. Actions, key activities, and resources needed are summarized in Table 3. The envisaged sources of funding to achieve this are potentially the Government of South Sudan with support from development partners.

Table 3. Key activities for the development and introduction of monitoring and early warning systems

Action	Activities to be implemented	Cost (USD)
Action 1. Increase public investment and resources mobilization for EWS	Assess the financial needs, funding sources and feasibility policy advocacy. Establish funding Mechanisms at national and local levels to allocate resources for EWS.	250,000
	Develop and submit financeable project proposals.	80,000
Action 2: Increase institutional capacity and human resources (HR	Train and Educational programs for national and local authorities including communities at risk of disasters on EWS.	120,000
	Increase technical mobile team to facilitate the EWS	50,000
	Promote EWS network, think-tank and civil organizations and information exchanges.	600,000
	Improve EWS education and research.	600,000
	Strengthening institutional framework and coordination.	800,000
	Create early warning data sharing platform	360,000
Action 3: Improve tools, infrastructure	Improve weather numerical model (WNM) tools/ software.	820,000

and facilities for EWS and monitoring including response	Install weather radar systems in all the states in South Sudan.	650,000
	Develop automatic hydrological stations and gauge-to-gauge models for floods monitoring and forecast	700,000
	Develop operation centers including tools/software, equipment for EWS	1,500,000
	Develop warning guidelines and SOPs for EWS	320,000
	Develop operation centers including tools/software, equipment for EWS	2,000,000
Action 4: increase information and awareness	Research, downscale and improve hazard maps and profile and conduct post Disaster needs assessment (PDNA)	360,000
	Disseminate and organize awareness campaign Training and awareness (radio broadcasting, newspapers, sign posts and others)	500,000
	Develop policies or regulation on EWS	350,000
Action 5: Develop and enhance enforcement of policies and regulation on EWS	Enhance mainstreaming DRR and EWS in developments and ESIA system	800,000
	Mainstreaming EWS to development program. I.e. Urban development initiatives Link EWS to national Resilience Strategies	460,000

TAP for the Energy sector

South Sudan faces low energy access with only 7% having reliable electricity, mainly in Juba. Challenges include infrastructure, renewable energy investment, and NDC calls for clean energy usage. Plans for a hydroelectric plant at Fulla rapids aim to utilize water resources efficiently. Solar, wind energy potential to meet demand is stressed. Efficient biomass, electricity use is crucial. Hydropower management is key to providing sustainable, low-carbon power for development and improved living standards in South Sudan.

Technology 4. Mini/micro hydropower)/small hydropower

Ambition: Installing 120MW by 2030 of Mini/micro hydropower generation and particular attention on the development of Bedden, Shukoli, Lakki and Fula dam hydropower project, located 33 km downstream of the South Sudan-Uganda border.

Actions selected for inclusion in the TAP are:

Action 1: Boost public investment and resources Mobilization for Mini/Micro hydropower

Action 2: Develop specific regulations for

simplifying permission mechanism

Action 3: Develop mechanism for provision of long-term and low-interest loans, as well as grants through state, private and international funds

Action 4: Develop and implement financial incentives for Mini/micro hydropower by

The Ministry of Energy and Dams (MoED) and the South Sudan Electricity Corporation (SSEC)

Action 5: Formation of a network of small size companies in hydropower subsector

Action 6 Increase institutional capacity human resource

Action 1, 2, 3 and 4 were selected and will be implemented as a Project Ideas (PI). All activities under this actions will be considered. The Ministry of Energy and Dams (MoED) and the South Sudan Electricity Corporation (SSEC) and state-level local government will coordinate the project and all three actions that have been proposed for the implementation of the prioritized water technology action plan in South Sudan. Stakeholders at the workshop highlighted affordability as a major challenge for hydropower entities, suggesting financial incentives as a solution. Table 4 outlines necessary actions and resources, with funding possibly coming from the South Sudanese government with aid from development partners.

Table 4. Key activities for the Mini/micro hydropower)/small hydropower

Action	Activities to be implemented	Cost (USD)
Action 1: Boost public investment and resources Mobilization for Mini/Micro hydropower	Assessed the financial needs, funding sources and environmental impact assessment	75,237
	Prepare concept notes and project proposals to secure funding for micro hydropower plants	300,000
	Implementation of a comprehensive program of incentives for users and manufacturers of MHP spares and equipment	350,000
	Develop incentives like subsidies and tax exemptions to reduce costs for mini hydropower projects.	600,000
	Sensitize policy makers on incentivizing electricity to compete with fossil fuels through incentives or subsidies	100,000
Action 2: Develop specific regulations and rules to simplify permission mechanism.	Simplify permission mechanism to promote private sector initiatives	850,000
	The institutional framework both at the (national and state levels) and the Regulatory Agency of the electricity sector is strengthened.	240,000
	The development of regulations implementing the law of the electricity sector is supported	250,000
	Formation of a network of small size companies in the hydropower subsector.	600,000
	A national diagnostic study is launched to support the establishment of a Legal, Fiscal and administrative system of MHPP sector in South Sudan	90,000
Action 3: Develop mechanism for provision of long-term and low-interest loans, as well as grants through state, private	Develop portfolio of opportunities by identifying and mapping micro hydropower plant sites	245,000
	Develop credit programs and procedures including MIS and risk management system for micro hydropower plant	180,000
	Create easy access to affordable loans for private sector investment into the mini/micro hydropower plants development	230,000

and international fund	Recruitment of sales agents for promotion and facilitation in acquiring loans for the micro hydropower plants.	98,000
Action 4 Increase institutional capacity human resource	Train nationals and local authorities including communities at risks for Mini/Micro hydropower (Fula Dam)	900,000
	The accredited technicians and awareness raising of general public will pave the way for diffusion and dissemination of the micro hydropower plants.	1,800,000
	Awareness raising through electronic, print and social media	850,000
	Identification of accredited training institutes to develop modules and conduct training as per local needs	160,000
	Follow up training and lessons learnt.	75,0000
Action 5 Improve tools, infrastructure and facilities for Mini/Micro hydropower	Pilot investments in selected small scale hydropower stations in rural communities	6,000,000
	Procuring turbine, pump, waterwheel, generators or alternators, regulators and switchgear and associated protection system, cable wiring.	10,500,000
	Technical capacity building support for MoED Staffs, SSEC and other hydropower stakeholders	700,000
	Installation of a unit for assembly and production of hydropower components and machinery	1,800,600

TAP for the Waste sector

South Sudan faces challenges with waste management due to a lack of waste reduction, recycling, and reuse infrastructure; poor collection rates; and improper disposal. Stakeholders propose sustainable low-carbon technology to reduce waste and mitigate the effects of climate change through sustainable development initiatives. These initiatives include waste reduce, reuse, recycle (3Rs).

Technology 5: Reduce, Reuse, Recycle (3Rs) Technology

Ambition: By 2030, all ten states in South Sudan have developed integrated solid-waste management to tackle increasing waste generation and its impacts. An ISWM plan, centered in Juba, will address system gaps and promote recycling, reducing landfill use. Reforming waste practices and promoting citizen engagement in successful waste management.

Actions selected for inclusion in the TAP are;

Action 1: Improved economic livelihood through strengthening of waste management practice.
Action 2: Strengthening the provision of a soft credit line to boost diffusion and implementation of 3Rs technology.
Action 3: Production of accredited technicians and awareness raising on 3Rs climate mitigation practices
Action 4: Market based instruments including tariffs, levies, and incentives and business facilitation
Action 5: Establishment of quality standards and labelling for waste products.

Action 1, 2 and 4 above in table 31 will be implemented as a Project Idea (PI). Stakeholders at the workshop identified high costs as a major barrier to wider adoption of 3Rs technology and suggested financial incentives to overcome it. MoEF and local government will coordinate the project, implementing actions from the waste technology plan in South Sudan with potentially government and partner funding. Actions, key activities, and resources needed are summarized in Table 5.

Table 5. Key activities for the Reduce, Reuse, Recycle (3Rs) Technology

Action	Activities to be implemented	Cost (USD)
Action 1: Improved economic livelihood through strengthening of waste management practice	Train youth in waste collection and eco-friendly production to improve community well-being.	900,000
	Youth and women trained in up-cycling waste for income and composting kitchen waste to grow local food.	800,000
	Public awareness campaigns based on a public IEC strategy. Activities will, for instance, include promotion of the RRR-slogan	400,000
Action 2: Develop and implement a financial incentive scheme	Set-up a body to solicit funds for waste management	200,000
Action 3: Develop and put into action a comprehensive 3R technology training program.	Produce training programs on use of waste products targeting different stakeholders	800,000
Action 4: Develop market-based instruments including tariffs, levies, and incentives and business facilitation	Begin to conduct Trials of Improved Practices (TIPs) for key behaviors and willingness ability to pay	1,500,000
Action 5: Develop enabling 3R policies and regulatory framework	Develop a new policy on waste management to Encourage reuse, recycle, up cycle and waste-to-energy technologies	200,000
	Improve local implementation and enforcement of laws, policies, and regulations	200,000
Action 6: Establishment of minimum 5 plastic recycling facility in South Sudan that has pre-sorting, sorting and recycling technologies by 2030	Assess potential, locally viable technology and infrastructure solutions that may be recommended in future program years or support local/international decision making	160,000
	Construct 5 plastic recycling facility in South Sudan that has presorting, sorting and recycling technologies by 2030	950,000
	Establish policy standards for living wage, benefits, and working conditions to support livelihoods.	180,000
	Engage consultant to identify possible	140,000

Action 7: Develop the downstream use of separated waste	downstream uses of separated waste	
	Produce training programs on use of waste Products targeting different stakeholders	200,000
	Provide education and training to targeted stakeholders on down-stream uses of separated waste	300,000

TAP for the Agriculture, Forestry, and Other Land Use (AFOLU)

The AFOLU sector, a key focus in South Sudan's climate change initiatives, encompasses practices like sustainable agriculture and forestry management to curb greenhouse gas emissions. Chapter 6 outlines the sector, details prioritized technology, the ambition, barriers, enabling measures, action plan, activities, and project ideas.

Technology 6: Promoting Forest based enterprises

Ambition: 200,000 households in 10 forest landscapes of South Sudan. Ten forest landscapes chosen as entry points for advancing FBE in South Sudan: 1) Boma Jonglei; 2) Didinga and Imatong Mountains; 3) Nangondi, Yaboa, and Mborizanga in Western Equatoria State; 4) Adjuong Thok in Pariang County; 5) Ifwoto land; 6) Doro Camp in Maban County; 7) Karich forest, lake state; 8) Kagelu land (Yei); 9) Kinaite Catchment, Eastern Equatoria; 10) Western Bahr el (Namatina), Khor-Abonge.

Actions selected for inclusion in the TAP are;

Action 1: Enhancing access to inputs and services supporting of forest based enterprise (FBEs)
Action 2: Strengthening institutional capacity for forest based enterprises (FBE) development
Action 3: Reinforce policy implementation and enforcement to facilitate the transfer of FBEs
Action 4: Strengthening information and awareness creation about Forest based enterprise (FBEs)

Action 1, 2 ,3 and 4 will be implemented as a Project Idea (PI) with all the activities, under the actions considered. Ministry of Environment and Forestry (MoEF) and will coordinate the project and will work closely withState Ministry of Agriculture, Environment and Forestry (MAF/CES) including state, County Directorate Of Agricuture, Livestock And Forestry (CAD) and Financial Institutions (FIs). Roles for each of the stakeholders have been spelt out. **Actions and key activities and resources needed are summarized in Table 6.** The envisaged sources of funding to achieve this are potentially the Government of South Sudan with support from development partners.

Table 6. Key activities for the Reduce, Reuse, Recycle (3Rs) Technology

Action	Activities to be implemented	Cost (USD)
Action 1: Enhancing access to inputs and services supporting of forest-based enterprise (FBEs)	Increased availability of market infrastructure and information for women, men, and young people	4,500,000
	Enhance access for women, men, and youth to transport forest-based products and agro-forestry services to the market.	3,000,000
	Promote the saving culture by the forest adjacent communities and their organizations,	2,700,000

	Promote access and control to financial management trainings through collaboration with financial institution	600,000
	Provision of various alternative livelihood options and services.	900,000
	Promoting alternative gender responsive technology for easing land clearing and opening for agricultural production.	1,200.000
Action 2: Strengthening institutional capacity for forest-based enterprises (FBE) development	Strengthen institutional capacity community- based institutions.	320,000
	Strengthen institutional capacity of mandated institutions to effectively support/ promote forest-based enterprise	280,000
	Strengthen leadership skills of the collaborative forest management group leaders	400,000
	Strengthen organizational and business skills among forest adjacent community organizations	500,000
	Promote access to structured training, exposure and mentoring- targeting and involving men, women and youth.	700,000
	Improve organization & coordination capacity by the forest adjacent communities – through bulk production and marketing	340,000
	Conduct targeted trainings, mentoring and backstopping in forest-based enterprise	420,000
	Strengthen knowledge and skills on savings and credit schemes by forest adjacent communities and their organizations	300,000
Action 3: Reinforce policy implementation and enforcement to facilitate the transfer of FBEs	Update/review of outdated policies-laws – ordinances- bylaws. For discouraging bush burning and stray livestock grazing	250,000
	Strengthen enforcement of forestry & land policies, laws and guidelines	340,000
	Strengthen the agriculture and forestry extension services at the local Government levels for effective service deliver	600,000
	Strengthen enforcement of guidelines and standard	450,000
	Strengthen implementation/ enforcement of bush burning & livestock grazing bylaws and ordinances where they exist	160,000
Action 4: Strengthening information and awareness creation about Forest based enterprise (FBEs)	Advance community & mass awareness on bush burning & stray livestock grazing	350,000
	Work with cultural institutions to change mindset, behavior and attitudes on bush burning and stray livestock grazing	300,000
	Promote targeted awareness of policies and laws, on these rights and obligation	600,000

Chapter 1 Technology Action Plan and Project Ideas for Agriculture, Livestock, and Fisheries sector

1.1 TAP for Agriculture, Livestock, and Fisheries sector

1.1.1 Sector overview

In South Sudan, irrigated agriculture is currently practiced only on less than 5% of the cultivated land with natural conditions characterized by a diverse range of geographical regions, with annual rainfall ranging from less than 500 mm in the far north and far southeast to up to 1,500 mm in the southwest. Agriculture, livestock, and fisheries face threats from climate change, leading to challenges in food security and rural livelihoods. Extreme weather events disrupt farming practices, reducing productivity. Farmers require climate-resilient technologies, like micro-irrigation systems, to cope with climate variability and sustain agriculture. Implementing innovative practices is vital for resilient agricultural systems amid unpredictable weather conditions (Chen, H., et al. (2013). This necessitates the use of Sprinkler and Drip Irrigation technology as the reliable solution for national food security (MoED, 2015). Sprinkler and drip irrigation technology is of high efficiency in crop production especially in the semi-arid regions like those of South Sudan (Hesham S. Ghazzawy *et al*., (2018). One of the main challenges in water resource planning and management is the lack of reliable data, professionals, adequate staff, and quality irrigation infrastructure. Local Water User Associations (WUAs) are weak due to limited human resources and support, leading to ineffective operations. There is also a lack of irrigation technology dissemination and limited knowledge among local extension workers.

Existing policies and measures related to agriculture sectors development and technology Development. A number of policies and measures related to the agriculture, livestock and fisheries sector's development and technology deployment have been put in place to enable the transfer and diffusion of energy technologies in the country. These include:

1. **A comprehensive Agricultural Master Plan, 2015–2040** guides agricultural development for 25 years, covering crops, livestock, forestry, fishery, and sustainability. It promotes micro irrigation, climate tech for resilience, and holistic growth amid environmental changes.
2. **The Irrigation Development Master Plan (IDMP 2015 -2040)** is "a comprehensive programmatic approach to address policy, institutional, capacity development and infrastructure issues and requirements of the agriculture sector in relation to water resources across South Sudan.
3. **Agricultural Sector Policy Framework (ASPF).** A plan that aims to increase food and agricultural production while ensuring that growth is sustainable and pro-poor. The ASPF also aims to improve access to land and water, technologies, knowledge, markets, and finance.
4. **Agriculture and Livestock Extension Policy (NALEP)** which provides a clear direction to all stakeholder working in the agriculture sector towards agricultural intensification and transformation in the face of climate variability.

1.1.2 Action Plan for Micro Irrigation – Sprinkler and Drip Irrigation Technology

1.1.2.1 Introduction

Sprinkler irrigation is a type of pressurized irrigation that involves applying water to the soil surface using mechanical and hydraulic devices that simulate natural rainfall. The aim of irrigation is to supply every plant with sufficient amount of water it requires. Here, water is distributed from overhead by high-pressure sprinklers on risers or moving platforms and there are varieties of sprinkler systems ranging from simple hand-move to large self-propelled systems that are used worldwide.

Drip irrigation delivers precise water amounts to soil crops through pipes, valves, and drippers from sources like wells. It efficiently meets plant needs, cutting water waste by up to 90% compared to sprinklers. Both systems reduce reliance on rainfall and help conserve water resources, with drip irrigation being more effective during dry periods and reducing groundwater depletion (Kose Musa & Kongas Kuyu. (2023). In South Sudan, these technologies are well known, and local supply chains are present for the supply and installation of sprinkler and drip irrigation technologies, but there is generally low uptake by small and medium-sized farmers. Farming remains primarily rain-fed; irrigation farming is still limited; this can be attributed to the high capital investment cost and to some extent the low technical knowhow of the farmers regarding the use of the technology (GoSS, 2024).

1.1.2.2 Ambition for the TAP

The ambition is to increase the area under irrigation by installing drip and sprinkler irrigation systems for horticulture and cash crops in the 10 states, benefitting 100,000 South Sudan households. The Comprehensive Agriculture Master Plan (CAMP) and Irrigation Development Master Plan (IDMP) aim “to strengthen technical support services and to develop, promote and disseminate new practices, innovation and technologies that are environmentally sustainable, appropriate, manageable and affordable” and in the process introduce and support such technologies as drip and sprinkler irrigation. MAFS will need to budget for a sufficient amount of money in USD over the target years for the transfer and diffusion of the technologies in the 10 states. MAFS will need to initiate a decentralized rural development project under the relevant stakeholders for funding with the objective of demonstrating and promoting drip and mini-sprinkler irrigation technologies to the farmers for both food crops and cash crop production.

Gender considerations

In South Sudan, women make up 85% of rural agricultural labour, emphasizing their vital role in food production and economic stability. This project will benefit these communities by introducing innovative micro-irrigation systems, aiming to boost agricultural productivity sustainably. Women account for a significant portion of farmers, especially in irrigated and rain fed agriculture. The project will empower these women through tailored initiatives, including capacity-building, leadership training, and equal participation strategies. By focusing on these areas, the project aims to enhance agricultural productivity, promote gender equality, increase women's ownership of irrigation infrastructure, and improve the socio-economic status of women in these regions.

1.1.2.3 Actions and activities selected for inclusion in the TAP

Summary of barriers and measures to overcome barriers

The financial-economic and non-financial barriers and measures are summarised in Table 7.

Table 7. Summary of barriers and measures to overcome barriers in Forest based enterprises technology.

Barrier category	Critical barrier	Measure to address the barrier
Economic and Financial	**Low profit on the investment in drip and sprinkler technology.** This is because the high initial investment cost for mini-sprinkler and drip irrigation systems as compared to traditional irrigation methods.	• Introduce financial incentives for affordable Sprinkler and drip irrigation systems through low-interest or interest-free loans provided by the government. • Tax incentives and reduced duties on parts can lower capital costs for adopting Sprinkler and drip irrigation. • Invest in water infrastructure to support irrigation in dry areas, offering incentives for efficient systems and assisting Micro-irrigation pioneers.
	Limited access to credit for farmers for the technology. Manufacturers in the South Sudan are unable to access financing for the initial capital to purchase the hardware for sprinkler and drip irrigation systems.	• Establishing a funding policy, like a farmers' irrigation development fund, can assist MAFs and MWRI in providing credit guarantees to eligible farmers.
Non- financial	**Limited technical skills in drips and sprinkler irrigation.** Many farmers are unaware of the proper use of the technology; how to install and maintain the systems for the efficient collection and use of water; and the application for optimizing production;	• Government must train MAFS and MWRI staff nationally and locally on sprinkler and drip irrigation system maintenance, as well as Water user Associations and service providers on design, installation, operation, and upkeep.
	Policy, Legal and regulatory: South Sudan, the lack of supportive policies for micro-sprinkler systems and drip irrigation hinders individual investment and efficient water use in agriculture, which is crucial for food security and sustainable development.	• South Sudan government must create polices for water access in agriculture, including revising water rights, pricing, and supporting investment in services.

	Limited essential knowledge and practical experience Inadequate capacity building in Micro-Irrigation; Absence of technical know-how on Micro-Irrigation. It is necessary to build capacity of researchers, extension, farmers and entrepreneurs involved in design and installation/ after sale service	• MAFs and MWRI should prioritize providing micro sprinkler and drip irrigation services to farmers, including design, installation, and maintenance guidance. • Practical guidelines will be developed for system design and management to aid governments and stakeholders in promoting technology transfer.
	Market for drip and sprinkler equipment's. South Sudan lacks dealers for irrigation technology, leading to limited market understanding among farmers.	• Implementing market-oriented approach for Micro-Irrigation Technology with private sector investment supported by GOSS; aim for policy enforcement in all states. • The South Sudan government should offer tax breaks on irrigation equipment imports to attract investors. Financial support can be given for research and pilot projects.
	Information and awareness: Communities in South Sudan lack trust in financial institutions and government, exacerbating the lack of information on improved irrigation practices due to limited institutional capacity.	• Identifying training needs for beneficiaries in Micro-Irrigation technology and management, human resource development through training, regional workshops for promotion, farm demonstrations, and guidelines for design and management will be undertaken.
	Theft and Insecurity barrier: Farmers and agencies worry about theft and safety of irrigation systems due to distance from house.	• Government conducts campaigns on irrigation techniques for engineers, CAD, farmers, and agents. They provide training on social, cultural, and financial aspects. Farmers are also sensitized to protect their equipment.
	Institutional Barrier: The country faces institutional challenges affecting commercial agriculture due to limited	• South Sudan government should enhance capacity and linkages to benefit farmers and the country. The government policy should

	resources and weak R&D linkages with equipment suppliers.	promote collaboration, data sharing by various sectors, funded by partners with defined roles.
	Lack of research network and collaboration. South Sudan's government faces challenges with research and development capacity. Improving research links can enhance farmer welfare and productivity, helping alleviate poverty.	• Establish research network, enhance skills, funded by GOSS, success measured by publications and farmer aid in Micro-Irrigation. • Establish a research network funded by GOSS and regional partners. Enhance researcher skills through training. Implement with MAFs, MWRI, and University of Juba. Success: publications on irrigation and assisting farmers with Micro-Irrigation.

Actions selected for inclusion in the TAP

The key actions identified from the BAEF report (GoSS, 2024) to address micro irrigation (Drip and Sprinkler Irrigation) technology barriers in South Sudan were chosen based on cost, acceptability, and ongoing initiatives. The main measures for advancing forestry adaptation through Drip and Sprinkler Irrigation were prioritized during the Technology Needs Assessment phase.

Action 1: Strength the institutions in terms of human resources and technical expertise in drip and sprinkler irrigation

Action 2: Strengthen coordination for Drip And Sprinkler technology diffusion

Action 3: Enable functional private sector engagement in Drip and Sprinkler Irrigation

Action 4: Increase farmers access to financing for Drip and Sprinkler Irrigation

Activities identified for implementation of selected actions

The activities identified for the effective implementation of the proposed actions encompass a comprehensive range of initiatives designed to enhance irrigation practices across various states. These initiatives include:

Table 8: Activities identified for implementation of selected actions

Action	Activities for Action Implementation
Action 1: Strengthening the institutions in terms of human resources and technical expertise in drip and sprinkler irrigation	• Conduct a study on the potential of Sprinkler and Drip Irrigation in each of the 10 states (desk work) • Mobilize and form Sprinkler and Drip Irrigation coordination committee at states level • Develop state levels Sprinkler and Drip Irrigation strategies • Implement Sprinkler and Drip Irrigation strategy • Set up information sharing hub at the states level

Action 2: Strengthening coordination for Sprinkler and Drip Irrigation technology diffusion	• Develop and conduct training programs on drip and sprinkler irrigation and water management to develop irrigation professionals • Assess the resource needed in all the ten states by the MAFs and CADs
Action 3: Enable functional private sector engagement in Sprinkler and Drip Irrigation	• Reduce tax on Sprinkler and Drip Irrigation equipment • Develop partnerships with banks to provide soft loans for Sprinkler and Drip Irrigation equipment. • Provide capacity support for small and medium enterprises on Micro irrigation practices
Action 4: Increase farmers access to financing for Sprinkler and Drip Irrigation	• Support community groups to access finance for Sprinkler and Drip Irrigation equipment • Identify rural and agricultural banks providing such loans, sensitizing the bank with importance of development and dissemination of the technology. • Suitably incentivizing the banks to provide such loans by introducing refinancing and credit risk guarantee schemes
Action 5: Design and implement effective technology information and awareness programs for micro irrigation	• Conduct sprinkler and drip technology demonstrations, field demonstrations, and workshops on the efficacy of the technology at the state level with special focus on the inclusion of farmers at the County and Boma level • Conduct media talks with focus on successful case studies of sprinkler and drip irrigation from other Eastern Africa countries

Actions to be implemented as Project Ideas

Action 1: Strengthening the institutions in terms of human resources and technical expertise in drip and sprinkler irrigation technology will be implemented as a Project Idea (PI). During the barrier analysis and enabling framework workshop, stakeholders identified inadequate capacity building in micro irrigation; absence of technical know-how on micro-irrigation to support wider spread uptake of Drip and sprinkler irrigation systems. The stakeholders proposed development capacity building and training programs to support state and County level agricultural engineers, extension agents and farmers regionally. The project will also come with a financial incentive scheme most suitable for improving the financing viability of these systems for the farmer, to be implemented at the national level financial incentives and a key measure in overcoming this barrier. All activities under the action will be considered.

Gender Considerations

The TAP will involve women in various activities with varying levels of participation. In Action 1, women, men, girls, and boys engage equally in workshops for micro-irrigation system implementation and funding consultations. Local authorities are urged to include women in coordination committees. Women have a key role in Actions 3 and 4, focusing on their technology needs. Gender working groups will have at least 50% women. The TAP

emphasizes inclusive gender-transformative approaches for women in project development and irrigation management to support equality and adaptation to climate change.

1.1.2.4 Stakeholders and timeline for implementation of TAP

Overview of Stakeholders for the implementation of the TAP

MWRI will coordinate national strategy planning and budgeting for Sprinkler and Drip Irrigation while MoFP will handle tax amendments, enforce regulations, and negotiate soft loans. Local government officials will establish stakeholder committees, update the guidebook, offer advisory support, and enhance financial literacy. Universities like University of Juba and vocational schools will enhance educational programs, conduct studies, and collaborate on capacity building. Enterprise groups will support small and medium enterprises, and the private sector will supply equipment, advise on regulations, train consumers, promote demand, and develop rainwater storage strategies.

Scheduling and sequencing of specific activities

The detailed activities for each of the actions, the associated responsible key stakeholders who will be involved in the planning and implementation; and the sequencing and timelines for implementation of each of the planned activity in the TAP is detailed in Table 12.

Gender considerations

To achieve gender outcomes effectively, the TAP will offer tailored training for women to enhance their skills and empower them for increased roles in technology development. A Gender Action Plan (GAP) will be implemented across the program to integrate gender considerations thoroughly. Women's associations will be key in drip and sprinkler technology deployment within agriculture, providing essential knowledge and resources. Their active involvement is crucial not only for implementation but also as beneficiaries, fostering a more inclusive technology upake. This approach emphasizes women's empowerment in the drip and sprnikler irrigation technology development in the face of climate change.

1.1.2.5 Estimation of resources needed for actions and activities

Estimation of capacity building needs

The main capacity-building needs for those implementing the TAP focus on acquiring technical knowledge and skills. Specifically, they need to improve in preparing concept notes and proposals that target development opportunities effectively, following the format required by development partners. Enhancing these skills is crucial for creating stronger, more compelling proposals that align with development partners' expectations and increase funding and support chances.

Estimations of costs of actions and activities

The estimated cost for the actions and activities of the TAP (see Table 9) were determined by building on the earlier based economic asssessment undertaken as part of the process for preparation of the South Sudan BAEF Report, 2024. Besides, these were updated based on estimation of costs of inputs in the implementation of these actions and activities.

Table 9. Estimation of resources needed for actions and activities

Action	Activity	Cost (USD)
Strengthening the institutions in terms of human resources and technical expertise in drip and sprinkler irrigation	Develop and conduct training programs on drip and sprinkler irrigation and water management to develop irrigation professionals and engineers in the ten states in South Sudan	1,500,000
	Assess the resource needed in all the ten states by the Ministry of Agriculture and food security as well as County directorate of agriculture	100,000
	Strengthen the institutional structure for smoother implementation of micro irrigation schemes such as Directorate of agricultural engineering	500,000
Strengthen coordination for Sprinkler and Drip Irrigation implementation	Conduct study on the potential of Sprinkler and Drip Irrigation at each district.	60,000
	Mobilize and form states Sprinkler and Drip Irrigation coordination committees.	30,000
	Develop Sprinkler and Drip Irrigation tens state and 3 administrative areas strategies.	390,000
	Implement Sprinkler and Drip Irrigation strategies	20,000,000
	Set up information sharing hub.	2,000,000
Sub-total		**24,580,000**
Enable functional private sector engagement in Sprinkler and Drip Irrigation.	Reduce tax on Sprinkler and Drip Irrigation equipment.	100,000
	Develop partnerships with banks to provide soft loans.	200,000
	Provide capacity support for small and medium enterprises.	600,000
Sub-total		**900.000**
Increase farmers access to financing of Sprinkler and Drip Irrigation.	Support community groups to access financing of Sprinkler and Drip Irrigation equipment.	12,000,000
Sub-total		**12,000,000**
Design and implement effective technology information and awareness programs for micro irrigation	Conduct sprinkler and drip technology demonstrations, field demonstrations, and workshops on the efficacy of the technology at the state level with special focus on the inclusion of farmers at the County and Boma level;	5,800,000
Sub-total		**5,800,000**
Total		**43,280,000**

Gender considerations

The TAP aims to boost gender-responsive participation by actively involving women in managing irrigation systems. Program offers specialized training to 50% of women on maintenance, technical skills, and policy development with flexible schedules. Budgets

allocate funds for workshops, training, and support to empower women. Data collection tracks progress through gender-disaggregated metrics. These efforts promote gender equity by providing equal opportunities in technical and leadership roles, fostering inclusivity for sustainable agriculture and community development.

1.1.2.6 Management planning

Risks and Contingency Planning

Stakeholders identified risks related to costs, schedules, capacity, and information for technology implementation. Contingency measures for each risk are shown in Table 10.

Table 10. Risks and Contingency Planning

Activity	Risk	Contingency plan
Strengthening the institutions in terms of human resources and technical expertise in drip and sprinkler irrigation		
Develop and conduct training programs on drip and sprinkler irrigation and water management to develop irrigation professionals and engineers in the ten states in South Sudan	Delay in Securing fund for the development of development and conduct of the training	Encourage the State Ministry of Agriculture and Food Security to allocate sufficient to the directorate of agriculture engineering.
Strengthen coordination for Sprinkler and Drip Irrigation		
Develop national and sub national inter- sectorial strategy for Sprinkler and Drip Irrigation.	Inadequate allocation and unclear sharing of budgets and roles both at the national and sub national level slow down the diffusion of the technology	Develop a jointly agreed budget and timeline of action. Set up an inter-sectorial budget and committee. Clear definition of roles both at the national and sub national
Conduct 10 state level and administrative areas studies on Sprinkler and Drip Irrigation potential.	Inadequate reliable information on the actual situation of Sprinkler and Drip Irrigation.	Conduct a field /demonstration study on Sprinkler and Drip Irrigation potential of each of the ten states.
Mobilise and form a Sprinkler and Drip Irrigation coordination committee both at national and state level.	Unwillingness of community members to serve on committee. Inactive committee members and politicizing the irrigation association.	Clarifying the significance of a committee; offering non-financial benefits; Careful screening of committee members; Defining committee duties and responsibilities
Develop states micro irrigation (Sprinkler and Drip irrigation) Strategies.	Limited follow up on issues discussed.	Report on issues discussed Motivate community members taking on follow up roles.
Implement Sprinkler and Drip Irrigation. strategy	Non-cooperation of actors Unrealistic demands from implementing actors.	Discussing terms of implementation, stating benefits from cooperating with the committee
Set up information sharing hub (a desk at the	Inadequate funds to run the hub and low utilisation of	Update information regularly

state level office in coordination with the state MAFs and MWRI	the E information E options limited by inadequate access to phones.	Customise info for different users. Use radio which is widely available to provide information updates
Enable functional private sector engagement in Sprinkler and Drip Irrigation		
Reduce tax on Sprinkler and Drip Irrigation equipment.	Price reductions too low to make Sprinkler and Drip Irrigationequipment affordable.	Package with additional support e.g. subsidised installation services.
Develop partnerships with banks to support Sprinkler and Drip Irrigation.	Diversion of capital Likely unprofitability to banks.	Disbursing loans in kind.
Provide capacity support for small and medium enterprises.	Disinterest of SMEs to venture into Sprinkler and Drip Irrigation business.	Provide incentives for SMEs to engage Sprinkler and Drip Irrigation.
Increase farmers access to financing for Sprinkler and Drip Irrigation		
Support community groups to access finance for Sprinkler and Drip Irrigation.	Inadequate financial management capacity.	Build capacity of committee leaders in financial management and governance.

Next Steps

Table 11. Immediate requirement and critical steps for Sprinkler and Drip Irrigation

Immediate requirements	• Increasing the diffusion and transfer of Sprinkler and Drip Irrigation for climate change adaptation will entail the following immediate requirements. The MAFs, MWRI, and MoEF, especially the Directorate of Climate Change, will coordinate to create a shared strategy for specialized users involving Sprinkler and Drip Irrigation. • Develop mechanisms of engaging the private sector in a way that makes a business case to increase access to Sprinkler and Drip Irrigation equipment.
Critical steps	• Engage engineers and technicians to strategize on including Sprinkler and Drip Irrigation in house plans. Develop laws, guidelines, and incentives to promote these irrigation methods.

Gender considerations

Gender considerations in micro irrigation, specifically in sprinkler and drip technology, will be integrated to promote sustainable agricultural practices benefiting all stakeholders. A gender-sensitive design approach ensures equal access to irrigation structures, enhances income opportunities, and promotes gender equity in the sector. Empowering men and women through inclusive decision-making and providing necessary tools and training for irrigation technology use are crucial (Dawit *et al*., (2021). Technology implementation must avoid additional burdens on women and instead strive to address existing inequalities, foster gender collaboration, and create a fair agricultural landscape. Inclusive practices enhance productivity, sustainability, and community well-being while supporting food security (Nicole Jang *et al*., (2024).

1.1.2.7 Reporting

Table 12. Promoting the deployment of Micro Irrigation – Sprinkler and Drip Irrigation Technology Overview

TAP overview table

Sector	Agriculture, Livestock, and Fisheries sector							
Technology	Promoting the deployment of Micro Irrigation – Sprinkler and Drip Irrigation Technology							
Ambition	There will be need to increase area under irrigation by installing Drip and Sprinkler Irrigation systems for horticulture and cash crops in the 10 states benefitting 100,000 households in South Sudan by 2050. The National Irrigation Policy of South Sudan also aims "to strengthen technical support services and to develop, promote and disseminate new practices, innovation and technologies that are environmentally sustainable, appropriate, manageable and affordable".							
Benefits	Increased yield per acre, food security and improved health, environmental conservation and employment creation for the people of South Sudan							
Action	**Activities to be implemented**	**Sources of funding**	**Responsible body**	**Time frame (years)**	**Risks**	**Success criteria**	**Indicators for Monitoring of implementation**	**Budget per activity (USD)**
Action 1: Strengthen coordination for implementation of Sprinkler and Drip irrigation.	Conduct a study on the potential of Sprinkler and Drip Irrigation in each of the 10 states	GoSS, AfDB, WB	MWRI and MAFS	2.	Inadequate information on the status of Sprinkler and Drip Irrigation.	Sprinkler and Drip Irrigation study to be conducted.	Reports on the findings of the study from all the ten states and administrative areas in South Sudan	100,000
	Mobilize and form Sprinkler and Drip Irrigation coordination committee at states level	MoFP, development partners	MWRI and MAFS	2	Inactive committee members.	Functional Sprinkler and Drip Irrigation committee members.	Committee formation documents, reports, by-laws.	80,000

	Develop state levels Sprinkler and Drip Irrigation strategies	Development partners.	District water department	2	Limited follow up on issues.	Sprinkler and Drip Irrigation strategy and plan draft.	Reports and meetings minutes.	390,000
	Implement Sprinkler and Drip Irrigation strategy	Development partners.	Rural Water Supply & Sanitation Dept.; Local Gov't	5	Unrealistic demands from implementing actors.	Functional Sprinkler and Drip Irrigation actors committee to be formed and strategy implemented.	MOU documents	20,000,000
	Set up information sharing hub at the states level	MoFP and, development partners	State directorate of Agricultural engineering	2	Inadequate funds to run the hub.	Demonstration setup Users utilizing the hub.	Information material added to the hub; Number of farmers or user visits made.	2,000,000
Action 2. Strengthening the institutions in terms of human resources and technical expertise in drip and sprinkler irrigation	Develop and conduct training programs on drip and sprinkler irrigation and water management to develop irrigation professionals	GOSS FAO, UNDP, GCF. GEF	MAFs, MWRI, State MAFs and CAD	3	Insufficient resources, experiences, information and guidelines	Practical training curriculum including teaching materials and research put in place	Number of drip and sprinkler professional trained and deployed	1,500,000
	Assess the resources needed in all ten states by the MAFs and CADs	GOSS, JICA, UNDP	MAFs, MWRI, State MAFs and CAD	2	Inability to secure funds for the study	Comprehensive assessment of resources for the deployment of the technology	Assessment report on technology resources need submitted	100,000

Action 3. Enable functional private sector engagement in Sprinkler and Drip Irrigation.	Reduce tax on Sprinkler and Drip Irrigation equipment	MoFP, MWRI	South Sudan revenue authority	5	Price reductions too low to make RWH equipment affordable for rural farmer.	Tax to be reduced on Sprinkler and Drip Irrigation equipment	Tax review meeting minutes Number of tax review meetings held.	100,000
	Develop partnerships with banks to provide soft loans for Sprinkler and Drip Irrigation equipment.	MWRI	MWRI; District water dept., Local Government.	5	Likely Unprofitability to bank	Partnerships established will increase access to finance for Sprinkler and Drip Irrigation.	Number and amount of Sprinkler and Drip Irrigation loans disbursed, MOU documents of partnerships with financial institution.	200,000
	Provide capacity support for small and medium enterprises on Micro irrigation practices	MoFP, MWRI, Development partners	MWRI; Technical Support Units, Local Government	5	Disinterest of SMEs to venture into Sprinkler and Drip Irrigation business.	Equipment for Sprinkler and Drip Irrigation; Advertisement setup; Sprinkler and Drip Irrigation SME workshop to be conducted.	Number of Sprinkler and Drip Irrigation systems sold according to suppliers accounts	600,000
Action:4 Increase farmers' access to financing for	Support community groups to access finance for Sprinkler and Drip	Development partners.	MWRI; Technical Support	5	Members defaulting on loans.	Financial Community groups established	Meeting minutes Number of Sprinkler and Drip Irrigation	12,000,000

Sprinkler and Drip Irrigation equipment.	Irrigation equipment's		Units, Local Government				financial community group accessing fund.	
Action 5: Design and implement effective technology information and awareness programs for micro irrigation	Conduct sprinkler and drip technology demonstrations, field demonstrations, and workshops on the efficacy of the technology at the state level with special focus on the inclusion of farmers at the County and Boma level;	GIZ, JICA, World Bank, AFDB	State Ministry of Agriculture, MWRI	5	-Inadequate funding -Lack of support from policy and decision makers	Community participated in the demonstration of sprinkler and drip technology for diffusion among farmers	Number of trainings, workshops, exhibitions and field demonstrations	5,500,000
	Conduct media talks with focus on successful case studies of sprinkler and drip irrigation from other Eastern Africa countries	GOSS, UNDP and FAO	MWRI and MAFS and Universities such as University of Juba and Upper Nile University	4	Inadequate funding	Success stories shared with the public on TV and radio.	Number of media talks conducted	300,000

Gender considerations

The TAP for Drip and sprinkler irrigation will monitor gender-disaggregated data, prioritize women's involvement in financing, training, and leadership, ensuring gender inclusion in drip and sprinkler irrigation promotion. Women's participation in activities will guarantee fair access to opportunities. Reports will detail budget allocations for gender-responsive initiatives, ensuring gender parity and accountability throughout the technology implementation.

1.1.2.8 Tracking the implementation status of drip and sprinkler irrigation

Rationale, responsibility and content of TAP tracking

The national process for tracking Drip and Sprinkler irrigation technology involves a comprehensive M&E framework, institutional responsibilities, and specific information. It aims to monitor implementation status, effectiveness, and adoption rates across agricultural sectors. By detailed tracking, insights on water conservation, crop yield, and sustainability can be gained.

Comprehensive tracking identifies farmer challenges, assesses benefits, and informs policy decisions for sustainable practices. The Ministry of Water Resources and Irrigation establishes a Steering Committee for implementing the Action Plan. The Ministry of Agriculture and Food Security (MoEF) will support the implementation of the technology by sourcing, procurement and supplying quality inputs (irrigation kits) that met the required technical specification and support the installation process of drip irrigation facilities until commissioning and testing at project sites. The Ministry of Finance and Planning manages financial schemes and collaborates on funding. Technical institutions provide expertise, while the South Sudan Bureau of Standards sets technical standards for maintenance programs. This collaborative approach aims to increase efficient irrigation technology adoption.

Gender considerations

Gender considerations in micro irrigation, specifically in sprinkler and drip technology, will be integrated to promote sustainable agricultural practices benefiting all stakeholders. A gender-sensitive design approach ensures equal access to irrigation structures, enhances income opportunities, and promotes gender equity in the sector. Empowering men and women through inclusive decision-making and providing necessary tools and training for irrigation technology use are crucial. Technology implementation must avoid additional burdens on women and instead strive to address existing inequalities, foster gender collaboration, and create a fair agricultural landscape. Inclusive practices enhance productivity, sustainability, and community well-being while supporting food security.

2.2 Project Ideas for agriculture, livestock and fisheries

2.2.1 Brief summary of project ideas for agriculture, livestock and fisheries

South Sudan faces severe water scarcity worsened by changing rainfall patterns and rising water needs due to a growing population and economic activities. Reliance on rain-fed

agriculture leaves the country vulnerable to drought, with climate change exacerbating these issues. The agriculture sector aims to commercialize, leading to higher water demand for increased crop production. Efficient irrigation technologies like drip irrigation are crucial for this transition. The Ministry of Agriculture and Food Security (MAFS) is piloting World Bank-funded projects to test these technologies, but challenges remain in knowledge and funding. Introducing micro-irrigation aims to improve water efficiency, agricultural productivity, and resilience in South Sudan, supporting sustainable development and livelihood improvements.

2.2.2 Project Idea – Promoting Micro Irrigation (Drip and Sprinkler Irrigation) technology.

Background/Rationale:

The project aims to establish drip and sprinkler irrigation schemes for 2,000 ha, improve existing schemes, increase food production through double cropping, expand irrigated land, boost productivity, and reduce poverty by enhancing farm income. It focuses on climate-resilient solutions such as conservation agriculture, water management, and promotes social inclusion, capacity building, and asset development, especially for women and youth in South Sudan.

The Project will develop and implement holistic, business-driven solutions to increase availability of climate resilient solutions while increasing inclusion. These activities and technologies include drip irrigation, conservation agriculture and improved water management, while addressing social inclusion, capacity, and asset building for all community members, especially women and youth, in South Sudan.

The project idea involves training programs and innovative financing to address climate challenges for small-scale farmers. It will establish micro irrigation facilities to enhance productivity, targeting 100,000 food crop growers over five years in a 2000-hectare area. Farmers will receive a $1,600 per hectare subsidy for essential equipment. Capacity-building will promote sustainable practices like rainwater harvesting, improving yields and empowering farmers to combat climate change impacts.

Objectives

Developing micro irrigation for 100,000 food crop growers in a 2000-hectare area over five years. Providing a USD 1,600 per hectare subsidy for essential equipment and supporting Micro-irrigation adoption through incentives and capacity building.

The project aims to achieve the following: Reduce crop failure from water stress, optimize water and nutrient use to improve crop productivity, enhance food security, and boost farmers' income and welfare. Enhance agro pastoralist communities' capacities through training on drip and sprinkler irrigation techniques.

- Identify innovative financing mechanisms for encouraging the uptake of these systems by farmers and recommend the most suitable scheme for the country.

Project Outputs

Output 1: Installation and establishment of fully equipped drip irrigation scheme and increased awareness among farmers about the benefits of investing in micro irrigation and water management.

Output 2: Improve farmer resilience to climate change and optimize water resource use.

Output 3: Enhance crop productivity by reducing water stress

The following measurable outputs would be attained at the end of the project

- Conduct at least four training programs covering the four RDCs on drip and sprinkler irrigation system installations, operation and maintenance.
- A report on feasibility analysis of different financial incentives and improving access to finance for increasing uptake of drip and sprinkler irrigation systems.

Relationship to the country's sustainable development priorities

Several actions in the country are being driven by the importance of agriculture and the growing awareness of climate change impacts on agriculture and water resources. The current project focuses on diffusion of drip and sprinkler irrigation systems in alignment with the country's strategies, including the Agriculture Master Plan (CAMP), NAP, NDCs to UNFCCC, and the Irrigation Development Master Plan (IDMP) by the Ministry of Agriculture and Food Security (MAFS, 2016). The proposed program aims to raise awareness on new irrigation technologies, conduct demonstrations, and deploy new systems for horticultural crops, all in line with the upcoming Five-Year Plan of the Government of South Sudan. This project aims to support ongoing efforts and achieve targets set in the Five-Year Plan.

Project Deliverables

The Project aims to train national and subnational agricultural stakeholders in installing and managing irrigation systems to boost productivity. An assessment will explore financial incentives for farmers. The goal is to enhance agricultural productivity and resource management, promote technology adoption, and support long-term viability. Ultimately, this integration can improve water conservation, increase crop yields, and contribute to food security and economic growth in South Sudan.

Project Scope and Possible Implementation

The project covers the entire nation targeting both central level planning as well as local level implementation. The capacity building and training programs would be conducted for state and County level agricultural engineers, extension agents and farmers regionally, covering the jurisdiction of all the ten and 3 administrative areas. The project will also come with a financial incentive scheme most suitable for improving the financing viability of these systems to the farmer, to be implemented at the national level. The implementation possibility is very high, as some pilot projects have already been set up and targeted beneficiaries for the capacity building and training programs have been tentatively identified. The national MAFS has also been proactive in initiating partnerships with technology suppliers and research institutions for

introducing drip and sprinkler systems in their agriculture sector. The proposed project idea would also assist the MAFs in achieving the target set under their CAMP plan for covering 500 hectares of land under new irrigation systems.

Project activities and timelines

Activity	Sub-activity	Duration (years)	Budget USD	Responsibility agency
1. Implement Climate Smart-Community-Based (CSCB) – drip and sprinkler irrigation scheme in all the ten states in South Sudan to increase community resilience and food security	Installation of 500 km of buried pipe distribution systems, including hydrants, each serving about 18 ha, and associated mobile sprinkler equipment in Aweil Rice schemes Drip and sprinkler irrigation structures/schemes at selected sites Selected members of farmer and women groups trained on operation and Maintenance of drip irrigation facilities Tailored training on best farming practices and transformation of traditional farming system through using farmer field school approach provided to farmers in the selected community.	5	2,800,000	MoAF, MWRI and County directorate of Agriculture (CAD)
2. Train agricultural engineers and extension workers in South Sudan's ten states on drip and sprinkler irrigation installation, operation, and maintenance.	Develop certification programs with MoAF to train engineers and farmers on drip and sprinkler system installation and maintenance.	5	600,000	State MoAF, CAD and the Directorate Irrigation
	Develop drip and sprinkler irrigation materials for training programs and handouts for farmers and engineers, possibly by hiring consultants.	2.	700,000	MWRI, MAFS, State MoAF, CAD and the Directorate Irrigation
	Assign a CAD team/individual as the contact point for states to coordinate with, responsible for planning training programs periodically.	4	120,000	MWRI, MAFS, State MoAF, CAD and the Directorate Irrigation

3. financing mechanism is implemented for the diffusion and transfer of drip and sprinkler irrigation	Appoint an agency for conducting such a study, domestic or international consultants Analyze and prepare a list of possible financial incentives that can be introduced such as a capital subsidy, low interest debts etc. Conduct review of similar schemes in other countries Undertake a cost benefit analysis of the scheme and assign budget for micro- irrigation scheme. Explore funding options from domestic and international sources	3	630,000	MAFS and Ministry of Finance and Planning.

Possible Challenges

The key challenges in the project are: High cost of these systems in absence of any financial incentives may result in limited adoption of these systems by the farmers. Another one is the limited human resources in Directorate of Agriculture mechanization both at the national, state and County level may slow down the process and thereby increase lag time. There is also delay in finding the relevant consultants for carrying out the feasibility study for example, lower participation in the training programmers by farmers, due to less confidence in new technology and mindset issues towards traditional practices.

Measurement/Evaluation

The MoAFs and MWRI will mobilize funds during the beginning, mid-term and towards end of the project, State Ministry of Agriculture, Environment and Forestry will undertake the implementation of project activities from start to the end, the national MAFS and MWRI will do the monitoring and evaluation of the entire project and enforcement of by-laws and Ministry of Justice will undertake the inaction of laws on micro-irrigation.

Responsibilities and Coordination

An assessment of stakeholder participation shall be conducted; there will also be processes towards development and implementation of legislation on Micro Irrigation; process of selecting consultants, process of staff selection and quality of staff trained, equipment selection process and integrity of education and training to stakeholders.

Chapter 2: Technology Action Plan and Project Ideas for Water sector technologies

2.1 TAP for Water sector technologies

2.1.1 Sector overview

South Sudan has abundant water resources but faces challenges like uneven distribution, inadequate monitoring, and impacts of climate change (Jubek, D., et al (2019). The water sector, overseen by MWRI and South Sudan Urban Water Corporation, must provide access to water and sanitation for all residents. Only half the population has basic drinking water access, with poor infrastructure maintenance and limited sanitation facilities. Water scarcity affects rural areas heavily, with long travel times to collect water, mostly done by women. Solar-powered water technologies are currently lacking in many areas, which highlights the urgent need for both the dissemination and improvement of solar-powered water supply systems. These advancements would enable households to access clean and reliable water more efficiently, ultimately enhancing their quality of life and promoting sustainable water management practices in the face of climate change.

South Sudan water policies

South Sudan's Water Policy. The 2007 policy aims to enhance access to safe water, sanitation, and hygiene education, as well as efficiently and equitably develop water resources. It covers water resources management, rural and urban water supply, sanitation, and hygiene.

Water Resources Management Policy: The overall goal of WRM policy is to promote effective management of quantity, quality and reliability of available water resources in order to maximize social and economic benefits while ensuring long term environmental sustainability.

- **Rural Water Supply and Sanitation Policy:** The overall goal of Rural Water Supply and Sanitation Policy is to improve access to safe water supply and sanitation facilities and to promote hygiene education for all people living in rural areas of Southern Sudan.
- **Urban Water Supply and Sanitation Policy:** The Government of South Sudan aims to provide safe water and sanitation services to urban populations efficiently and sustainably.

2.1.2 Action Plan for Solar-powered water supply technology

2.1.2.1 Introduction

A solar-powered water supply system uses solar energy to pump water to various destinations like homes, farms, and communities, often using gravity for distribution in water supply projects from boreholes or surface bodies to storage tanks.

A solar powered pump is a system designed to lift ground water, whereby the energy for pumping is provided by the sun through solar panels. In this technology the solar photovoltaic panels convert the sun’s energy into electricity. The electricity powers a submersible pump, which lifts water from a borehole up to a storage tank. The water is then gravity-fed through

pipes to taps where people collect it. Solar panels are mounted on frames or on poles and are positioned to receive maximum sunlight.

In South Sudan ground water tables are deep and yet other water points are distant, yet there might be a requirement for large quantities of water (USAID, 2021). Therefore, pumping such huge amounts of water, calls for high energy consumption and therefore high recurrent costs, particularly for fuel supply and maintenance of equipment. This is among the many other operation and maintenance costs and risks. The sun, on the other hand, is not only a potential source of energy but is also environmentally friendly to the individuals that will be utilizing the water.

2.1.2.2 Ambition for the TAP

Ambition: By the year 2050, an impressive 600,000 households will be equipped with solar-powered water supply systems, ensuring sustainable access to clean water. Additionally, 20% of government institutions adopting solar-powered water supply as part of their operations by 2050. This significant expansion aims to enhance the diffusion and penetration of solar-powered water supply solutions within communities. By providing a comprehensive water supply system that transports water from the source to the tap, we can achieve zero energy costs and minimal running expenses. This initiative not only promotes environmental sustainability but also improves the quality of life for residents, making clean water accessible to all without the burden of high operational costs.

Gender considerations

The TAP will introduce gender-sensitive solar-powered water systems to meet diverse needs, engaging stakeholders from public and private sectors for collaborative gender equality advancement. By addressing different gender needs, the TAP aims to promote small-scale solar pumps for improved water access and community empowerment through inclusivity and participatory decision-making in water and energy management.

2.1.2.3 Actions and activities selected for inclusion in the TAP

Summary of barriers and measures to overcome barriers

To achieve the stated ambition for the transfer of technology, the major obstacles and actions that have been identified and previously recorded in the barrier analyses and enabling environment report for the Forest based enterprises technology (South Sudan BAEF Report, 2024), are shown in Table 13.

Table 13. Summary of barriers and measures to overcome barriers in Solar-powered water supply system technology.

Barrier category	Critical barrier	Measure to address the barrier
Economic and Financial	Low private sector investment in solar-powered water supply systems.	Enable functional private sector engagement in solar-powered water supply systems.

	Limited financial access hinders the deployment of the Solar – Powered water supply systems	Improve household access to financing for solar-powered water supply systems
Non- financial	Inadequate extension advisory capacity for supporting solar-powered water supply systems.	Develop a catalogue or database of information on solar-powered water supply systems technology. Strengthen technical capacity in solar-powered water supply systems. Strengthen community organization for solar-powered water supply systems.
	Low social culture of solar-powered water supply systems.	Demonstrate the value of solar-powered water supply systems in different climate scenarios.
	Inadequate policy and legal support for solar-powered water supply systems.	Strengthen coordination for implementation of solar-powered water supply systems policy provisions
	Solar theft and Political instability and lack of government support in South Sudan. Which makes it difficult for businesses and investors to plan for the long term and make investments in the sector due to uncertainty.	The Government must provide security for communities solar powered water supply safeguarding against vandalism by conflicts and theft of the solar

Actions selected for inclusion in the TAP

During the consultation the following actions were proposed for inclusion into the TAP

Action 1: Remove or mitigate financial and economic barriers

Action 2: Capacity building on Solar powered water technology

Action 3: Awareness Raising on benefits of solar-powered water supply.

Activities identified for implementation of selected actions

This section summarizes the identified actions into more specific activities the selection of activities for each action was carried out through a stakeholder consultation process. These activities need to be done to make each identified action work. A list of activities needed for the implementation of each identified action is presented in Table 14.

Table 14. Activities identified for implementation of selected actions

Action	Activities for Action Implementation
Action 1: Remove or mitigate financial and economic barriers	1. Preparation and implementation of a comprehensive Program of incentives for users and Manufactures. Target 100,000 household. 2. Government-Backed Subsidies: Collaborate with the national and local governments to provide subsidies on solar-powered water supply systems. 3. Subsidized Equipment Procurement: Negotiate bulk procurement deals with solar equipment suppliers to reduce costs for end users. 4. Microfinance Solutions: Partner with microfinance institutions (MFIs) to offer low-interest loans or payment plans for households and small businesses interested in installing solar-powered water systems. 100,000 households. 5. Tax Reductions and Exemptions: Advocate for the removal of import taxes on solar equipment to reduce costs for consumers.
Action 2: Capacity building on Solar powered water technology	1 Training of trainers on Installation and operations of Solar Powered water supply 2 Training of household's/water management committees on operations and maintenance 3 Training of government operators on operations and maintenance 4 Building capacities of government institutes on regulations and policy framework 5 Develop a specialized curriculum focusing on solar-powered water supply systems. This should cover 6 Establish demonstration facilities for the public and users.
Action 3: Awareness Raising on benefits of solar-powered water supply.	1. Design and implement an effective advertising Program that can reach prospective and potential users. 2. Community Meetings and Forums: Organize community gatherings in rural and urban areas to explain the benefits of solar-powered water supply systems, including reduced energy costs, sustainability, and reliability. 3. Deploy trained community volunteers to conduct door-to-door awareness campaigns, engaging directly with households to explain the benefits and address concerns about solar-powered water systems. 4. Set up live demonstrations in both Urban and rural community areas where solar-powered water supply systems are installed. 5. Launch a radio campaign targeting rural and urban communities, focusing on the advantages of solar-powered water supply systems, with practical examples from successful installations

Actions to be implemented as Project Ideas

Action 2: Promoting solar-powered, climate-resilient water supplies in urban and rural South Sudan is key for enhancing well-being. Training households and communities improves system longevity. Educating government operators lowers maintenance costs, ensuring ongoing effectiveness. Stakeholders identified limited capacity in extension advisory as a major barrier to wider adoption. Addressing these challenges aims to create a more sustainable water supply system, empowering communities.

Gender Considerations

The TAP will achieve gender outcomes by assessing women's needs for solar-powered water systems, facilitate women farmers' access to solar-powered water pumps, developing a gender action plan involving all stakeholders to help women, girls, boys and men's become owners, users, and service providers of solar-powered water systems, and promoting small-sized solar pumps to target women and marginalized individuals. The activities aimed to empower women to become owners, users, and service providers of the technology, ensuring it meets their needs and benefits them.

2.1.2.4 Stakeholders and timeline for implementation of TAP

Overview of Stakeholders for the implementation of the TAP

MWRI & South Sudan Urban Water Cooperation coordinate national strategy planning and budgeting for solar-powered water systems; MoFP supports tax amendments, negotiates soft loans for solar water equipment, and ensures enforcement; Local Government mobilizes stakeholders, oversees implementation, and forms committees for solar water planning; CSOs track equipment implementation, develop guidebooks, build capacity, and support financial group formation; Ministry of Education designs specialized curriculum; University of Juba and Vocational institutes update guidebook information; Media popularizes guidebooks in local languages and e-versions.

Scheduling and sequencing of specific activities

The detailed activities for each of the actions, the associated responsible key stakeholders who will be involved in the planning and implementation; and the sequencing and timelines for implementation of each of the planned activity in the TAP are detailed in Table 18.

Gender considerations

The TAP will undertake gender analysis and engage diverse stakeholders, including different genders, backgrounds, and abilities, enriches discussions and ensures a balanced representation. The TAP will also create a safe space for all participants, which promotes confidence and effective engagement in the diffusion and transfer of Solar-powered water technology. Tailoring approaches to address unique vulnerabilities and designing inclusive programs fosters collaboration between stakeholders engaged in technology development. Inclusive communication strategies enhance co-creation and technological solutions' responsiveness to societal needs, advancing gender equality in technology development.

2.1.2.5 Estimation of resources needed for actions and activities

Estimation of capacity building needs

Required capacity building for implementing the technology is related to capacity building on updating and developing the policy and legal framework and technical training on and Maintenance of solar-powered water system to ensure accelerated diffusion of the technology in the country.

Estimations of costs of actions and activities

The estimation of resources needed for action and activities was counted per activity and summarized in Table 15.

Table 15. Showing budget for the implementation Action

Action	Budget (USD)
Remove or mitigate financial and economic barriers	40,055,000
Capacity building on Solar powered water technology	2,670,000
Awareness Raising on benefits of solar-powered water supply	1,920,000

Gender considerations

The TAP will strengthen women's capacity, develop female human resources to participate in the Solar-powered water technology processes. Involving girls, women and boys equally in decision-making, empower women water user associations, ensure gender balance in project teams, provide training and employment opportunities, and create a supportive environment through outreach and media efforts. Also, the TAP will monitor gender budget use for solar water technology to enhance women's pump access and ownership, track gender action plan progress.

2.1.2.6 Management planning

Risks and Contingency Planning

Stakeholders identified risks related to costs, schedules, capacity, and information for solar-powered water technology implementation. Contingency measures for each risk are shown in Table 9.

Table 16. Provide a detailed overview of identified risks and contingency plans

Activity	Risks	Contingency plan
Government funded Subsidies: Collaborate with the national and local governments to provide subsidies on solar-powered water supply systems.	The cost of activities may be higher than budgeted due to delays in the implementation of the TAP	Government should seek for support from development partners to speed up the implementation
Develop partnerships with banks to support solar powered water supply system.	Diversion of capital Likely unprofitability to banks.	Disbursing loans in kind

Provide capacity support for small and medium Enterprises.	Disinterest of SMEs to venture into solar powered water supply business.	Provide incentives for SMEs to engage solar powered water supply system.
Support community groups to access finance for solar powered water supply system.	Inadequate financial management capacity	Build capacity of committee leaders in financial management and governance

Next steps

The immediate requirements and critical next steps are summarized/presented in Table 17.

Table 17. Provide a summary of immediately requirement and critical steps

Immediate requirements	Increasing the diffusion and transfer of solar powered water supply system for climate change adaptation will entail the following immediate requirements: • Coordination between the Ministry of Water Resources and Irrigation (MWRI), Ministry of Housing, Physical Planning and Environment, Ministry of Local Government of South Sudan, and the Climate change unit to develop a joint solar powered water supply system strategy for specialized categories of users. • Mechanisms of engaging the private sector in a way that makes a business case to increase access to solar powered water supply system equipment.
Critical steps	Government and stakeholder to step up engagement of construction and water engineers and technicians in developing a solar powered water supply system strategy for ensuring provisions in house plans. Government to enact laws, guidelines, and incentives for the promotion solar powered water supply system.

Gender considerations

The TAP's capacity-building will increase women's involvement in solar-powered water pump maintenance and policy development through recruiting, offering flexible schedules, and providing incentives. Budgets will support workshops, scholarships, and services to ensure women's access to technical skills and decision-making roles. Monitoring will track progress with gender-disaggregated data. The TAP will promote gender equity by providing equal opportunities in technical and leadership positions. The TAP will also analyse policy gaps, conduct gender analysis, collect gender-disaggregated data, empower women in system design and management, and integrate gender-responsive elements in TAP implementation.

2.1.2.7 Reporting

Table 18. Promoting Solar-powered water supply system technology Overview Table.

TAP overview table								
Sector: Water sector								
Sub-sector: Water Supply and Distribution								
Technology: Solar-powered water supply system technology								
Ambition: By 2050, 600,000 households will be equipped with solar-powered water supply, and 20% of government institutions will use solar-powered water supply technology. Expanding the diffusion and penetration of solar-powered supply by providing community water supply from source to tap with zero energy costs and meagre running costs.								
Benefits: The technology will increase clean water supply, increased crop production, reduced production costs, lower CO_2 emissions, employment growth, and local economic boost.								
Action	**Activities to be implemented**	**Sources of funding**	**Responsible body**	**Time frame (years)**	**Risks**	**Success criteria**	**Indicators for M&E**	**Budget (USD)**
Action 1: Remove or mitigate financial and economic barriers	Activity 1.1 Preparation and implementation of a comprehensive Program of incentives for users and manufacturers.	GOSS, World Bank, AFBD, GIZ, UNICEF, UNDP, JICA	MWRI & Urban Water Cooperation, MHLP.	5	Insufficient funding. Political instability.	Securing funding, Registration & certification of procurement	Payment sheets Attendance sheets Training reports	4,000,000
	Activity 1.2 Government funded Subsidies: Collaborate with the	GOSS, World Bank, AFBD, GIZ, UNICEF, UNDP, JICA	MoFP, MoT, MoI	5	Insufficient Funding, Corruption	Adequate funding	Number users connected. Number of solar powered systems sold.	30,000,000

	national and local governments to provide subsidies on solar-powered water supply systems.							
	Activity 1.3: Subsidized Equipment Procurement: Negotiate bulk procurement deals with solar equipment suppliers to reduce costs for end users.	GOSS, World Bank, AFBD, GIZ, UNICEF, UNDP, JICA	MoFP, MWRI	4	Insufficient Funding, Misappropriation of funds. Corruption.	Availability of sufficient funding. Availability of subsidies to suppliers	Available record of suppliers	20,000,000
	Activity 1.4; Microfinance Solutions: Partner with microfinance institutions (MFIs) to offer low-interest loans or payment plans for HHs and small businesses	GOSS, World Bank, AFBD, GIZ, UNICEF, UNDP, JICA	MoFP, MWRI, Local Government.	5	Insufficient funding	Availability of Funding to MFIs	Number of households connected with solar powered water supply.	5,000,000

	Activity 1.5: Pay-As-You-Go (PAYGO) Models: Introduce PAYGO systems that allow households to pay for solar water systems in small, affordable instalments rather than upfront.	GOSS, World Bank, AFBD, GIZ, UNICEF, UNDP, JICA	MoFP, MAFs, MWRI, MoTI	4	Insufficient funding	Household successful adapt pay-As-You-Go (PAYGO) Models:	Number of households that secure solar water pump through PayGo model	1,000,000
	Activity 1.5: Tax Reductions and Exemptions: Advocate for the removal of import taxes on solar equipment to reduce costs for consumers.	GOSS, World Bank, AFBD, GIZ, UNICEF, UNDP, JICA	NLA, Council of State, State Assemblies, MoFP, MWRI, CSOs	3	Insufficient funding	Passing of tax exemption bill	Workshops Constitution review meeting conduct. Training conduct	55,000
Action 2: Capacity building on Solar	Activity 2.1 Training of trainers on Installation	GOSS, World Bank, AFBD, GIZ, UNICEF, UNDP, JICA	MWRI and MAFs	3	Insufficient funding Unqualified trainers	Sufficient number of trained solar power water	Number of technicians on water solar system.	800,000

powered water technology	and operations of Solar Powered water supply				Inadequate number of trainings.	supply technician.		
	Activity 2.2: Training of households/water management committees on operations and maintenance	Government, World Bank, AFBD, GIZ, UNICEF, UNDP, JICA	MWRI and partners.	3	Few trainers at the community level.	Sufficient number of trainers.	Numbers of people trained at the community level.	750,000
	Activity 2.3: Training of government operators on operations and maintenance	Goss, World Bank, AFBD, GIZ, UNDP& JICA	MWRI and partners	3	Unqualified trainers Inadequate number of trainings.	Sufficient number of trained solar power water supply technicians.	Number of technicians on water solar system.	500,000
	Activity 2.4: Building capacities of government institutes on regulations and policy framework	Government, World Bank, AFBD, GIZ, UNICEF, UNDP, JICA	MWRI and urban water.	3	Inadequate technical expertise.	Sufficient number with technical expertise trained.		250,000
	Activity 2.5: Develop a specialized curriculum focusing on	GOSS, World Bank, AFBD, GIZ, UNICEF, UNDP, JICA	MWRI in collaboration with the Ministry of Education	2	Lack of logistical facilitation	Solar powered water system courses integrated into curriculum.	No. extension workers trained	120,000

	solar-powered water supply systems. This should cover		and other partners.		to apply acquired knowledge			
Action 3: Awareness Raising on benefits of solar-powered water supply.	Activity 3.1 Establish demonstration facilities for the public and users.	GOSS, WB, AFBD, GIZ & UNDP	MWRI and SSWC	2	Insufficient funding	Sufficient number of public users trained.	Number of successful demonstration facilities established	250,000
	Activity 3.2 Design and implement an effective advertising program that can reach prospective and Potential users	GOSS, World Bank, AFBD, GIZ, UNICEF, UNDP, JICA	MWRI and other partners	3	Insufficient funding	Sufficient numbers of prospective and potential users reached	Number of effective advertising programs conducted	180,000
	Activity 3.3: Community Meetings and Forums: Organize community gatherings in rural and urban areas to explain the benefits of solar-powered	GOSS, World Bank, AFBD, GIZ, UNICEF, UNDP, JICA	MWRI, state local government	4	Low turn up of the community members	Sufficient number of community members in attendance	Number of community meetings and forums organized	300,000

water supply systems.							
Activity 3.4: Deploy trained community volunteers to conduct door-to-door awareness campaigns on solar-powered water systems	GOSS, World Bank, AFBD, GIZ, UNICEF, UNDP, JICA	MWRI, State local government	2	Changing mind-set and attitude takes a long time	Sufficient door-to-door campaigns made	Number of successful door-to-door awareness campaigns conducted	400,000
Activity 3.5 Set up live demonstrations where solar-powered water supply systems are installed.	GOSS, World Bank, AFBD, GIZ,	MWRI, State local government	2	Low turn up of dwellers	Sufficient community members in attendance	Number of demonstrations in central community areas	260,000
Activity 3.6 Launch a radio campaign highlighting solar-powered water systems' benefits and successful installations in rural and urban areas.	GOSS, World Bank, AFBD, GIZ, UNICEF, UNDP, JICA	MWRI	3	More than one radio station has to use thus increasing the cost.	Adequate funding	Knowledge well received by the listeners	200,000

	Activity3.7: Create clubs to educate students on solar technology's role in water supply, conservation, and sustainability.	GOSS, World Bank, AFBD, GIZ, UNICEF, UNDP, JICA	MWRI in collaboration with the Ministry of Education and other partners.	4	A few schools may form clubs	Adequate students educated on solar-powered water supply and sustainability.	Number of WASH clubs formed	580,000

Gender considerations

The TAP will prioritize gender inclusion by designing a user-friendly solar water pump for diverse communities, tracking gender-disaggregated data, promoting women's participation in various opportunities, and supporting their roles in the solar water technology sector. The TAP will assess women's, girls, boys and men needs and preferences with regard to solar powered water supply technology (e.g. size, financing, skills for operation, crop types, and water uses) while also assessing barriers, including power relations that prevent women's access to solar-powered water technology. Success will be measured qualitatively and quantitatively, ensuring transparency and enhancing gender equity for a sustainable future.

2.1.2.8 Tracking the implementation status of the TAP

Rationale, responsibility and content of TAP tracking

The Solar-powered water system will be tracked effectively with community involvement to ensure context-specific design and implementation. Monitoring includes assessing risk alerts, integrating traditional knowledge with scientific data, and gauging community responsiveness. Regular feedback and engagement are crucial for evaluating solar-powered systems' adaptability to climate-related water scarcity. Institutional responsibility for tracking the technology's diffusion falls under three main stakeholder categories: Ministry of Water resources and Irrigation (MWRI), Ministry of Agriculture and Food Security, Ministry of Energy (MAFs), and Ministry of Trade and Industry (MTI); interdisciplinary evaluation teams; and state-level local government bodies like CAD will be tasked with enforcing regulations and supporting system installation and maintenance.

Gender considerations

Integrate gender-specific criteria and targets into TAP implementation. Conduct needs assessments to gather gender-disaggregated data, identify barriers and opportunities for women's advancement. Ministry of Water Resources and Irrigation (MWRI) leads. Provide training, workshops with 50% women participation. Offer leadership, technical skills training to empower women, support policy development for women's leadership. Establish PPPs to back women-led businesses in solar-powered water supply technology which will be the responsibility of the Ministry of finance and Planning and Ministry of Trade and Industry.

2.2 Project Ideas for Water Sector

2.2.1 Brief summary of the project ideas for Water Sector

The solar-powered water pumping system can be used anywhere but it is appropriate for rural areas of South Sudan which are facing an energy crisis. Due to her geographical position, South Sudan has ample sunshine throughout the year which makes it ideal location for utilization of solar energy. With the installation of solar powered water system technology, both in rural and urban areas, households will have access to safe clean water for both domestic and industrial use. Small and large farms will have increased productivity in both crop and livestock enterprises respectively. By 2030, 200,000 households will be equipped with solar-powered water supply, and 20% of government institutions will use solar-powered water supply technology. Expanding the diffusion and penetration of solar-

powered supply by providing community water supply from source to tap with zero energy costs and meagre running costs.

2.2.2 Specific project ideas

Project title: Promoting solar-powered water system in South Sudan.

Background/Rationale

In South Sudan, 41% do not have access to safe water. Only 11% have access to improved sanitation (Mosello *et al*., (2026). 5.9M people are in need of basic water supply, sanitation and hygiene (WASH) services. Therefore, adopting solar powered water systems in South Sudan will increase the solar energy potential, risk reduction of interruptions in water supply, reduce operational costs, and improve return of investment and environmental sustainability. There are five steps in designing a solar powered water system and they include; calculating the daily water demand for the project, determining the yield of the water source available to the solar powered water system, determining the total dynamic head (TDH) of the water system at the chosen design flow, selecting a pump and motor a finally designing the PV system.

Objectives

- To construct community and public solar powered water system in both rural and urban areas to benefit 600,000 Household.
- To modernise and upgrade urban solar powered water system.
- To introduce and set standards for low-impact solar powered water system in the 10 states of South Sudan.
- To construct solar powered water system in Juba and other dry areas to improve the water situation include 20% government institutions.

Outputs

- Supply and installation of solar photovoltaic (PV) powered water pumping systems to replace the diesel-powered irrigation water pumping
- Financing model for the diffusion of solar powered water system technology strengthened through the development of guiding manual
- Increase in the infrastructure needed for setting up and managing the solar powered water system project both in rural and urban areas.
- Increasing demonstration pilots to strengthen the diffusion of solar powered water system at household level and government institutions.

Relationship to the country's sustainable development priorities.

With the escalating issue of lack of access to safe clean water in South Sudan, efforts will be made in exploring different solutions as well as formalizing the water sector in the country. South Sudan has started exploring public-private partnership projects to improve solar powered water system. The solar powered water system technology will be set up in

Juba and also in the 10 states. The South Sudan Water Policy focuses on water resources management and development water supply and sanitation in Southern Sudan.

However, the project will help South Sudan in fulfilling its commitments made in the Nationally Determined Contributions (NDC) as there is low water demand compared to South Sudan's neighbours, therefore, the proposed project will be in conformity with the sustainable development priorities of the country. MWRI and MoEF will be responsible for overall coordination, particularly regulatory aspects of water management in the country and in the process of developing an integrated strategy for water management in the country of which solar powered water system is a major component.

Project deliverables

Trained stakeholders by MWRI, MoEF, and University of Juba; experts to join MWRI network for solar PV discussions and disseminate skills to rural areas. Develop training programs for finance institutions, private developers. Install solar PV systems for rural water pumping to replace diesel engines. MoEF to support five demonstration pilots in Mozambique for solar PV water pumping. Private sector approach with enhanced operation and maintenance services. Establish favourable policies for private sector investment in solar PV water pumping.

Project Scope and Possible Implementation

The project scope will be comprehensive focusing on creating knowledge on technical aspects for both central and local level authorities. The technology demonstration will be in major cities beginning with Juba. The assessment study will be conducted evaluating the solar powered water system technology along with financing models for implementation, which will vary by city. The project will be undertaken in a way to contribute to the development of an integrated strategy for water management in South Sudan. The pilots for decentralized solar powered water system project will be undertaken in a few selected states or a beginning could be made in the city of Juba where this technology could be piloted.

The implementation possibility will be high as it will be directly being linked with the integrated strategy being developed for water management in South Sudan by MWRI and MoEF. There are ongoing programs also on exploring public private partnership models for water management by MoEF and UNDP South Sudan. The project has a strong linkage with these programs. Finally, the country will aim at developing Nationally Appropriate Mitigation Actions (NAMAs) for the water sector for which the findings of the proposed project idea would be highly useful.

Project activities

The project will be implemented by GOSS, primarily in collaboration with the private sector and Non-Government Organizations (NGOs), development partners and the beneficiaries.

The activities of the proposed project will include:

- Trainings that will be customized by MWRI, MoEF, and University of Juba for stakeholders. Trained experts will join MWRI's network for solar PV discussions. MWRI will spread knowledge to rural areas through follow-up trainings.
- Development of training programmes at various levels for finance institutions, service providers, private developers.
- Installation of solar PV systems for rural water pumping to supply water for domestic use and local farms. This will offset diesel fuel that is currently being used in diesel run engines to pump water.
- The Ministry of Environment and Forestry will support five demonstration pilots in South Sudan to prove the viability of solar PV for water pumping in rural areas.
- Showcasing a private sector led approach, which is linked to the strengthening of operation and maintenance services support.
- Establishment of a conducive policy and regulatory environment for private sector investment into the solar PV for water pumping.

Timelines

The timeline for the implementation of the solar-powered water system in South Sudan is projected to span a **total period of 5 years, specifically from 2025 to 2029**. This extended timeframe will allow for careful planning, execution, and evaluation of the project to ensure its success and sustainability.

Measurement/Evaluation

An assessment of stake holder participation shall be conducted; Processes towards development and implementation of legislation on solar powered water system; Assess carbon footprint; Process of selecting consultants; process of staff selection and Quality of staff trained; equipment selection process and integrity of education and training to stake holders.

Possible Complications/Challenges

Limited human resource in the MWRI for solar powered water system, this may slow down the process and thereby increase lag time; Delay in getting access to fund from domestic and international sources; a formal institutional structure for water management in the country is currently being designed in South Sudan, in absence of a proper institutional structure and assigned roles and responsibilities, there is likelihood of delay in implementation of above activities; Performance Measures; Public Education and Engagement; regulatory, control and role/responsibility; water services for institutional, commercial and industrial sector; water financing system; impacts of intensification; construction, renovation old water systems.

Responsibilities and Coordination

Ministry of Finance and Economic Planning will mobilize funds during the beginning, mid-term and towards end of the project, local Governments and State/City authorities will undertake the implementation of project activities from start to finish, MWRI will do the

monitoring and evaluation of the entire project and enforcement of by-laws and MOJ will undertake the inaction of laws on water management.

Chapter 3: Technology Action Plan and Project Ideas for Disaster Risk Management Sector

3.1 TAP for Disaster Risk Management Sector

3.1.1 Sector overview

South Sudan is a disaster-prone country, which has experienced disastrous flooding, with consecutive years of record-breaking rains and floods that covered two-thirds of the country up to 2022. This left many people without food or land to cultivate. The devastating flooding destroyed shelters, schools, crops and households' items, reducing access to safe water and humanitarian aid. Strengthening EWS was reiterated by the then minister for humanitarian affairs and disaster, Peter, Mayen Majongdit (2023), who stressed that such a warning system would monitor and mitigate disasters following the devastating floods during the 2019-2022 period, that displaced thousands of South Sudanese. This catastrophe affected mostly people in Jonglei state, Unity state and Upper Nile state.

In South Sudan, drought has also which caused shocks among communities. It was agreed that as a way to enhance drought disaster management in the country, Capacity Augmentation in Early Warning Systems and Disaster Risk Management Project be operational to enhance government institutional capacity support, increase awareness among the public on early warning risk information for early action and increase investment and cost-effective use of modern technologies in early warning systems (Relief Web, 2017).

3.1.2 Action plan for development and introduction of monitoring and early warning system technology

3.1.2.1 Introduction

An early warning system (EWS) is a hazard monitoring system that informs and prepares people and organizations for disasters. This includes risk assessment, forecasting, warning dissemination, and response coordination. The Steering Committee plans to invest in modern technologies for EWS, conduct field missions, provide training, support local networks, and document indigenous practices. They also aim to enhance technical capacity for famine prevention and response by collaborating with regional early warning forums.

3.1.2.2 Ambition for the TAP

Developing and upgrading the existing early warning system (EWS) to become an effective end to-end early warning system (EWS), which provides more effective, accurate and real-time disaster detection, warnings and strengthens national and local authorities including communities in states that are at risk of floods, drought and pest and disease to effectively and timely response to the warnings.

Technology	Ambition
Development and introduction of monitoring and early warning system	The Ambition is to develop 5 end-to-end early warning systems (EWS) by 2030 to provide timely, accurate and effective warnings and enhance the adaptive and response capacity of national and sub

	national levels (County, Payam and Boma) that are at risk of floods, drought, and pest infestation

Gender considerations

The TAP will use gender-sensitive and transformative approaches in early-warning activities, focusing on participation, power dynamics, and decision-making for effective Early Warning Systems (EWS) for marginalized gender groups. Ensuring EWS works for all genders involves analysing community engagement, resource allocation, and information dissemination to address gender-based inequalities. Involving women and marginalized groups in decision-making will recognize their unique needs and promote gender equity within EWS, empowering communities in crisis preparation and response.

3.1.2.4 Actions and activities selected for inclusion in the TAP

Summary of bariers and measures to overcome barriers

This section outlines all the economic and non-economic barriers and measures that were identified during Phase II of the BA&EF to the enabling environment for the development and diffusion of the technology. Also, these measures were summarized to be more concentrated by the consultation process during this phase.

Table 19. Summary of barriers and measures to overcome barriers for the development of early warning technology

Categories	Identified barriers	Measures to overcome barriers
Economic and Financial	In 2021-2022, South Sudan's public budget for EWS had a 5% shortfall, highlighting imbalance in allocations.	• Enhance national budget for EWS through investment, effective budgeting, resource mobilization, donor cooperation, aid efficiency, and revenue growth.
	High investment cost of EWS:	• Reduce tax for importing EWS equipment and tools, enhance international cooperation and access to supports and Increase co-funding including public-private investment.
Non-financial	Insufficient Institutional capacity and human skills on EWS	• Increasing staff's knowledge and skills in all aspects of EWS: technical, financial-economic, legal and organizational framework, communication and response through trainings and various capacity buildings).
	Ineffective coordination amongst stakeholders	• Ineffective coordination amongst stakeholders and is to be overcome by Improving coordination amongst stakeholders, particularly by improvement and endorsement of the EWS standard operation procedure (SOP).

	Insufficient information and awareness	• Improving the information and awareness of the responsible organizations and communities at risk.
	Inadequate tools, basic infrastructure and facilities for the introduction and development of EWS	• Improving on the R&D of tools, basic infrastructure and facilities for EWS in South Sudan.
	Lack of clear policies and regulations for EWS hampers stakeholder responsibilities, integration with sectoral policies, and policy enforcement.	• Enhance South Sudan's legal framework, enforce EWS policies effectively by mainstreaming them in sectoral policies.
	Social, cultural and behavioral	• Strengthening disaster awareness through behavior change, linking management to recovery, creating manuals, early warning curriculum, and community education.
	Conflict and insecurity	• Reconciliation to be undertaken by government among all communities of South Sudan so that people can collective embrace EWS for the good of everybody.
	Inadequate basic early warning system infrastructure	• Conducting research to enhance hazards and risks, suitable EWS technologies, adaptive capacities of disaster-prone communities, financial feasibility, financing models, and funding sources will help overcome these challenges.

Actions selected for inclusion in the TAP

Action 1: Strengthen public and private investment in EWS through activities like reassessing financial needs, enhancing strategy, creating a resource mobilization plan, developing donor directories, submitting project proposals, and improving financial aid data management.

Action 2: Enhance capacity and resources through HR system development, recruitment, training, and network promotion for effective early warning system education and research.

Action 3: Enhance EWS tools and infrastructure, create disaster-resilient plans, implement weather monitoring software, install radar systems, set up hydrological stations, develop communication systems, and relocate at-risk communities.

Action 4: Increase information and awareness to be achieved by the following activities; Research about hazards and update their profiles, Study and identify best tools/technologies for (floods) monitoring and forecast, communication and response and Disseminate information and organise awareness campaign.

Action 5: Develop and enhance enforcement of policies or regulation on EWS and activities include; Develop policies or regulation on EWS and Enhance mainstreaming disaster risk reduction and EWS in ESIA system including M&E and inspection.
Action 6: Integration and development planning with activities of; Mainstreaming EWS to development program. I.e. Urban development initiatives and Link EWS to National Resilience Strategies.
Action 7: Prevention and mitigation, with activities of; Identification of hazards and Risk assessment.
Action 8: Technology and infrastructure development with activities of; Establishment of flood monitoring stations in flood prone areas and Installation of early warning technologies.ie Satellites systems and automated weather stations.
Action 9: Monitoring and Evaluation with activities of; developing Performance indicators to assess effectiveness of EWS and also Establishment of community Feedback mechanisms.

Actions to be implemented as project ideas

Action 3: Enhance EWS tools and infrastructure, create disaster-resilient plans, implement weather monitoring software, install radar systems, set up hydrological stations, develop communication systems, and relocate at-risk communities.
Action 4: Increase information and strengthening development and introduction of Early warning Warning system (EWS).
Action 5: Develop and enhance enforcement of policies or regulation on EWS and activities

3.1.2.4 Stakeholders and timeline for implementation of TAP

Overview of Stakeholders for the implementation of the TAP

The following key stakeholders and their proposed roles in this TAP are briefly described. The table below identifies their interaction with the various actions and activities previously identified.

Table 20. Stakeholders and timeline for implementation of TAP

Key Stakeholders	Overall mandates/roles	Relevant activities
Ministry of Humanitarian Affairs and Disaster Management (MHADM). GOSS	Take lead in seeking resources and assisting disaster response and recovery. Responsible for overseeing the overall disaster prevention and control, especially policies, resources mobilisation and matters that involved with multi-sectors and at national level.	• Develop policies or regulation on EWS • Develop resource mobilisation plan • Develop financial sources or donor director • Develop and submit financeable project proposals (to the government and donors) • Improve effectiveness of public and foreign financing aids data management, M&E and inspection system

Ministry of Environment and Forestry (MoEF) - GOSS	Ministry of Environment has the overall responsibility about natural resources and environmental hazards warnings and also coordinates with relevant sectors on EWS and facilitates implementation of emergency response.	• All activities, but following activities are not directly implemented or just coordinated by MoE and MWRI except: • Improve EWS education and research. • Re-survey, re-design and develop disaster resilient town plan and integrated land use plan for disaster risk areas and communities.
Ministry of Transport and Road - GOSS	Meteorological Department is responsible for weather, water and geo- hazards monitoring and warnings. MWRI handles handles with water related hazards: floods and drought and coordinates with relevant sectors.	• Develop telecommunication including IT systems for EWS. • Develop access roads to and in all areas at risk of hazards
Ministry of Defence and Veteran Affairs - GOSS	Take lead in assisting evacuation, rescue and disaster recovery.	• Re-survey, re-design and develop disaster resilient town plan and integrated land use plan for disaster risk areas and communities.
South Sudan Red Cross	Assists disaster recovery and response	• Develop resource mobilisation plan • Develop financial sources or donor directory • Develop and submit financeable project proposals (to the government and donors)
Other ministries and public organisations including MAF, MoE&D, MoFEP and MOH	Have a responsibility to inform and assist or response to warnings relevant to their sectors.	• Re-survey, re-design and develop disaster resilient town plan and integrated land use plan for • disaster risk areas and communities. • Develop telecommunication including IT systems for EWS.

		• Develop access roads to and in all areas at risk of hazards. • Re-locate the inevitable disaster risk communities
University of Juba, especially Faculty of Water Resources Engineering and Faculty of Environment Science	Provides education and research on floods early warning system.	• Improve EWS education and research Study and identify best tools/technologies for (floods) monitoring and forecast, communication and response
Development partners and donors (World Bank, JICA, ADB, EU, USAID, UNDP, FAO etc.	Provides technical and financial support for hazard and vulnerability assessment, response and disaster recovery.	• All activity
Private sector e.g., hydropower developers	Assess, monitoring, provide information and warnings about hazards that may affect their businesses and stakeholders	• Re-locate the inevitable disaster risk communities • Study and identify best tools/technologies for (floods) monitoring and forecast, communication and response

Scheduling and sequencing of specific activities

The activities, responsible stakeholders, and timelines for implementing each planned action in the TAP are outlined in Table 22.

Gender considerations

The TAP will develop gender-sensitive early warning systems for all stakeholders, ensuring effectiveness and inclusivity in the introduction and development of early warning technology. This will involves thorough gender-sensitive risk assessments to identify unique vulnerabilities. Collecting subnational gender data that is crucial for informed decision-making. The TAP will also conduct comprehensive stakeholder analysis to helps understand gender dynamics and address disparities. Valuing diverse perspectives, especially those of marginalized groups during the TAP implementation. Engaging stakeholders to promote equality, identify gender champions and rioritizing resources and tailoring strategies to enhance effectiveness of TAP implemenattion.

3.1.2.5 Estimation of resources needed for actions and activities

Estimation of capacity building needs

The key capacity building needs for the key actors involved in the implementation of the TAP are largely technical knowledge and skills in preparation of the detailed concept notes/ proposal targeting potential development and based on the proposal/concept formats as required by the development partner.

Estimations of costs of actions and activities.

The estimated cost for the actions and activities of the TAP (see Table 22) were determined by building on the earlier based economic asssessment undertaken as part of the process for preparation of the South Sudan BAEF Report, 2024. Besides, these were updated based on estimation of costs of inputs in the implementation of these actions and activities.

Gender considerations

The TAP will promotes gender equity through strategic capacity-building efforts for the diffusion of the early warning technology, utilizing approaches like early warning outreach, incentives, and flexible schedules to engage women, men, girls, and boys in technical and managerial roles. Training programs will focus on key areas and prioritize women's inclusion for enhanced leadership and diversity in early warning system. Allocated budgets will support gender-sensitive data collection and early warning disaster monitoring systems to ensure equitable outcomes.

3.1.2.6 Management planning

Risks and Contingency Planning

For the actions to be implemented successfully, risk and conyoemcy action must be determined. Table 21 gives a thorough summary of the risks that have been identified and contingency measures.

Table 21. Identified risks and contingency plans

Risk Items	Description	Contingency action
Cost risk	There may be a cost risk such as lower and higher costs which may result from unforeseen changes.	• Conduct regular M&E of the action plan implementation including budget use, and adjust as appropriate. • Increase awareness about risks and contingency • Spare 10% of the action plan budget as contingency budget.
Schedule risk	Schedule risk, or delay could happen as financial and human resources may not be secured right away following TAP approval. Furthermore, although the financial and resources are in place, the delay could happen due to other uncontrolled factors.	• Conduct regular M&E of the action plan implementation including budget use, and adjust as appropriate. • Enhance organisational capacity, staff skills, policy and decision procedure to be ready and clear for contingency response.
Performance risk	Implementation of the action plan may encounter performance risk, especially the goals of the actions are not attained, and benefits are	• Conduct regular M&E of the action plan implementation and identify measures to address the problems.

	not being delivered. These may result from uncontrolled factors, limited financial and technical capacity, lack of information, leadership and commitment and coordination or conflict of interest	• Enhance organisational capacity, staff skills, and commitment to perform the TAP and contingency measures. • Secure and utilise the contingency budget for improve performance and address performance risks.

Next Steps

Immediate requirements	• Strengthening coordination between the disaster response partners such as the Ministry of humanitarian affair a disaster management, Ministry of Interior, Ministry of defense and veteran affair, Ministry of Environment and Forestry (MoEF), Ministry of Local Government of South Sudan to develop a joint EWS strategy for all affected communities. • Develop Mechanisms of engaging GoSS, NGOs, donors and CSOs to increase access to EWS equipment to all disaster-prone communities.
Critical steps	Critical requirements include: • Engagement in availing EWS to all affected communities in South Sudan. • Developing and implementing laws, guidelines and incentives for promoting EWS.

Gender considerations

The TAP will addresses gender considerations by recognizing risks that could disproportionately impact women's participation in the early warnng system, such as unequal access to alerts, low participation, limited mobile phone access, and high costs of early warning tools. To mitigate these risks, the project includes Environmental and Social Management Plans (ESMPs) with stakeholder engagement will be conducted to ensure women's participation in early warning system decision-making. Monitoring efforts involve men and women stakeholders to prevent service disruptions in the diffusion of technology. The TAP will support local authorities and partners to ensure equitable climate change early warning information dissemination and promote gender equity through TAP implementation.

3.1.2.7 Reporting

Table 22. Development and introduction of monitoring and early warning systems technology overview table.

TAP overview table								
Sector: Disaster Risk Management sector								
Sub-sector:								
Technology: Development and introduction of monitoring and early warning systems								
Ambition: Developing and upgrading the existing EWS to become an effective end to-end early warning system (EWS), which provides more effective, accurate and real-time disaster detection, warnings and strengthen**s** national and local authorities including communities in states that are at risk of floods, drought and pest and disease to effectively and timely response to the warnings.								
Benefits:								
Action	**Activities to be implemented**	**Sources of funding**	**Responsible body and focal point**	**Time frame (years)**	**Risks**	**Success criteria**	**Indicators for Monitoring of implementation**	**Budget per activity (USD)**
Action 1. Increase public investment and resources mobilization for EWS	Activity 1.1 Assess the financial needs, funding sources and feasibility 1.2. Policy advocacy 1.3. Establish funding Mechanisms at national and local levels to allocate resources for EWS	Govt., JICA, WB, ADB, UNDP, GEF, GCF IOM, GIZ	MHADM, MoEF, MWRI MoR&B MOH, MoL&H	2	Insufficient and inaccurate information about disaster loss and damage, and limited access to donors' information	Financial needs, funding sources and feasibility information made available	The re-assessment carried out and reported	1,250,000

	Develop and submit financeable project proposals	Govt., JICA, WB, ADB	MHADM, MoEF	1	Limited information, financial and human resources to develop financeable project proposals	At least 2 project proposals accepted and funded between 2026 and 2027	Number of proposals developed, submitted and funded	100,000
Action 2: Increase institutional capacity and human resources (HR	Activity 2.1 Train and Educational programs for national and local authorities including communities at risk of disasters on EWS	JICA, UNDP	MHADM, MoEF	3	ineffective and insufficient due to lack of resource persons,	Staff are well trained and equipped for effective EWS.	Number of training plans, trainers contracted, trainings organized, and attendees.	1,700,000
	Activity 2.2: increase technical mobile team to facilitate the EWS	JICA, UNDP	MHADM, MoEF	3	insufficient mobile staff/team due to limited budget and skillful staffs	The EWS mobile team is well-trained to support the EWS, focusing on response.	Number of mobile teams established	500,000
	Activity 2.3: Promote EWS network, think-tank and civil organizations and information exchanges	JICA, UNDP	MHADM, MoEF	2	Could not mobilize resources for promotion and development of the think-tank, networking and exchange	Think-tank, networking and exchange platform are put in place and helpful supporting EWS development	Number of think-tanks, networking and exchange forums organised	900,000
	Activity 2.4: Improve EWS	Govt., WB, ADB	MHADM, South Sudan Red Cross. MoEF	3	Lack of resources hinders educational curriculum and	A practical EWS curriculum including	Number of teachers and	2,000,000

	education and research				research development.	educational materials put in place and proved to be more effective	researchers trained, and educational materials and curriculum developed	
	Activity 2.5. Strengthening institutional framework and coordination	Govt., WB, UNDP,	MHADM, All lines Ministries	3	Limited network/infrastructure connectivity that supports coordination in most parts of the country	Partners support in strengthening coordination, stakeholder readiness	Number of policies, strategies and legal instruments finalized	1,200,000
	Activity 3.1. Create early warning data sharing platform	Govt.	MHADM, All line Ministries	2	Limited financial and human resources for development and maintenance	All Line Ministries Informed on DRM issues	Platforms for Data sharing created	860,000
Action 3: Improve tools, infrastructure and facilities for EWS and monitoring including response	Improve weather numerical model (WNM) tools/ software	Govt., WB, UNDP,	MHADM, All line Ministries	3	Limited financial and human resources for development and maintenance	Tools/software are put in place	WNM tools/ software improved and applied	820,000
	Activity 3.4 Install weather radar systems in all the states in South Sudan	Gov., WB, UNDP	MHADM, All line Ministries	3	Limited financial and human resources for development and maintenance	Weather radar systems improved	Number of weather radar systems established	1,500,000
	Activity 3.5 Develop automatic	Gov., WB, UNDP	MHADM, All line Ministries	3	Limited financial and human	Automated stations and	Automatic rain gauges	1,700,000

	hydrological stations and gauge-to-gauge models for floods monitoring and forecast				resources for development and maintenance	models assist in hazard monitoring, forecasting, and warnings.	including models for floods and landslide monitoring and forecast developed	
	Develop operation centers including tools/software, equipment for EWS	Gov., WB, UNDP	MHADM, All line Ministries	2	Delayed or incomplete due to technical and financial constraints	EWS centers are put in place and helpful to improve EWS	EWS centers established	3,500,000
	Develop warning guidelines and SOPs for EWS	Gov., WB, UNDP	MHADM, All line Ministries	3	Delayed or inadequate funding and unclear stakeholder responsibilities hinder DRR and EWS.	Practical and effective SOPs for EWS put in place and proved to be effective	Developed SOPs for EWS	1,200,000
	Activity 3.6 Develop operation centers including tools/software, equipment for EWS	Gov., WB, UNDP	MHADM, All line Ministries	3	Delayed or incomplete due to technical and financial constraints	EWS centers are put in place and helpful to improve EWS	EWS centers established	2,000,000
Action 4: increase information and awareness	Activity 4.1 Research, downscale and improve hazard maps and profile	Gov. WB, ADB, SDC, JICA,	MoEF, MAHDM, UNDP,	2	Inadequate funds to recover /build back better	Availability of community established mechanisms	Research and downscaling hazard maps and profiles conducted	360,000

	Activity 4.1.2. Post Disaster needs assessment (PDNA)							
	Activity 4.2 Disseminate and organize awareness campaign Activity4.3 Training and awareness(Radio broadcasting, Newspapers, Signposts and others)	Gov. WB, ADB	MoEF, MAHDM, UNDP,	2	Delayed due to insufficient resources and experiences on DRR and EWS	EWS stakeholders show improved hazard response behavior.	No. of workshop and meetings organized, and stakeholders attended	500,000
	Activities 5.1: Develop policies or regulation on EWS	Gov. WB, GCF, GEF	MHADM	2	Delayed due to insufficient resources and experiences on DRR and EWS	Practical policies or regulation on EWS put in place	A policy or regulation on EWS formulated and implemented	350,000
Action 5: Develop and enhance enforcement of policies and regulation on EWS	Activities 5.2 Enhance mainstreaming DRR and EWS in developments and ESIA system	Gov., WB, UNDP	MHADM, All line Ministries	2	ESIA operational risk may persist when mainstreaming and enforcing EWS in the system.	Development projects need disaster risk reduction and early warning systems.	Disaster risk management and EWS integrated into development and ESIA system.	800,000
	Activity6.1 Mainstreaming EWS to	JICA, WB IOM	MHADM	2	Stakeholders conflict, Insufficient capacity and resources	Effective leadership, stakeholder	Percentage of communities	460,000

	development program. I.e. Urban development initiatives Activity6.2 Link EWS to national Resilience Strategies	USAID				engagement, and collaboration.	with disaster preparedness response plan	
Action 6: Integration and development planning	Activity7.1. Identification of hazards Activity.7.2 Risk assessment	JICA, WB IOM USAID	MHADM	2	Delayed or incomplete due to technical and financial constraints	Hazard-specific early warning systems developed	Number of hazards identified, Number of risk assessments conducted	60,000
Action 7: Prevention and mitigation	Activity 8.1. Establish flood monitoring stations in flood prone areas. Activity 8.2. Install early warning technologies, i.e. satellite systems and automated weather stations.	Gov., IGAD UNDP UNOPs	MWRI MoRB MHADM	3	Limited financial and human resources for development and maintenance	Tools/software are utilized for enhanced hazard monitoring, forecasting, and warnings.	Number of flood monitoring stations established. Number of satellites installed along flood prone areas.	6,000,000
Action 8: Technology and infrastructure development	Activity 9.1. develop Performance indicators to assess	Gov., IGAD UNDP UNOPs	MWRI MoEF MHADM	3	Inadequate staffing Lack of appropriate gadgets to give feedback	Staff are well-trained for effective EWS monitoring.	Proportion of Early warning incidences	250,000

	effectiveness of EWS Activity 9.2 Establishment of community Feedback mechanisms						No. of feedback desks established	

Gender considerations

The TAP will focus on integrating gender-disaggregated data into reporting, analyzing women's, girls, boys and men's roles, training, and participation in climate change related disaster early warning. The TAP will also encourage women's involvement through outreach and inclusive program designs. Impact evaluations will be undertaken to address gender issues for fair early warning system resource access, reducing burdens and documenting women's contributions to early warning information dissemination and response to share lesson learn on promoting equity and empowering women.

3.1.2.8 Tracking the implementation status of the TAP

Rationale, responsibility and content of TAP tracking

The proposed national process for early warning system technology will involve a detailed M&E framework and institutional responsibilities for tracking its implementation. Specific criteria and indicators will be set to monitor outcomes. The Ministry of Humanitarian Affairs and Disaster Management (MHAFDM) and partners like the South Sudan Red Cross will coordinate technology introduction, supported by local institutions and NGOs. Collaborations with international organizations and partnerships will enhance M&E capacity. The phased implementation, starting with pilot projects, spans 3 years. Key data to track includes adoption rates and hydro meteorological communication. Regular reporting and feedback systems will be adopted to ensure improvement and adoption of the technology.

Gender considerations

The TAP will incorporate gender-specific criteria and targets in early warning system development, recognizing diverse gender roles, needs, and contributions related to climate disasters. By including gender perspectives, these systems can enhance disaster preparedness, sustainability, and community well-being. Initial efforts involve gathering gender-disaggregated data to understand impacts on various groups and identify system gaps. Gender mainstreaming will ensure inclusive voices and actions. Impact assessments will reveal gender differences in early warning effects, guiding the development of tailored strategies to address dissemination challenges related to climate disasters. This approach aims to strengthen early warning systems and promote inclusive disaster resilience.

3.2 Project Ideas for Disaster Risk Management Sector

3.2.1 Brief summary of the project ideas for Disaster Risk Management Sector

South Sudan faces a number of hazard risks and including floods and drought. Flooding mainly occurs between July and September, when heavy rains fall in most parts of the country, leading to the flooding of the Nile River tributaries. During the flooding season, many parts of the country are left under water. Droughts are very common in South Sudan due to the hot and dry conditions experienced during the dry season. The occurrence of floods and drought is a critical issue to the economy of South Sudan, given that approximately 80% of the total population, which is at estimated 11.2 million (2020) people, lives in rural areas and works in agriculture. Climate variability is likely to negatively impact agriculture, while projected increases in rainfall intensity may increase the risk of floods and the spread of waterborne diseases such as malaria and bilharzias.

Knowledge about environmental and health risks in South Sudan is concentrated at national and county levels, with limited knowledge at the community level. Ongoing attempts are being made to develop a EWS for localized, inter-communal conflicts. The humanitarian system plays a critical role in risk monitoring, particularly the World Health Organization (WHO) for health-related risks, which has developed the Early Warning, Alert, and Response System "EWARS in a box," 1 a device and mobile application that support the monitoring and alerting of disease outbreaks. Warnings are generally communicated via broadcast radio messages. Preparedness for epidemics is in place. Medical supplies for malaria, cholera, measles, and

meningitis are pre-positioned, and some health workers have been trained in emergency preparedness and response. However, the national capacity to monitor floods and drought risks remains limited, and responses are often reactive. Further, many communities are reluctant to evacuate during floods due to fears of losing their land and property, which heightens their exposure to hazards. While health workers are trained and epidemic supplies are pre-positioned, many health facilities lack the necessary resources to fully implement preparedness protocols.

3.2.2 Specific project ideas

Project title: **Promoting Early Warning System in South Sudan.**

Background/Rationale

Early warning & planning systems are an important instrument in society for the reliable and early detection of undesirable developments or sudden and devastating events like floods, earthquakes, bushfires that disturb the planned development of a country. The system enables the more effective use of counter measures and helps to minimize societal and financial losses.

However, abnormally heavy seasonal flooding from 2019 to 2022 has devastated large areas of South Sudan, including Jonglei, Upper Nile, Warrap, Northern Bahr el Ghazal, Unity, Lakes, and Central and Eastern Equatoria, displacing about 900,000 people every year. Riverine and flash floods have caused widespread displacement and infrastructure destruction in areas with high vulnerabilities caused by acute malnutrition, food insecurity, conflict gender-based violence incidents including rape, other protection risks and access constraints.

Flooding is the main driver of new displacement in South Sudan, with 60 per cent of the population residing near riverbanks. Approximately half of the population lives in moderately flood-prone areas, while 25 per cent or 2.7 million people live in regions at high risk of severe floods. South Sudan already faces a severe health crisis, impacting 8.9 million individuals, particularly in Flood and conflict-affected areas characterized by population displacement and disease outbreaks. Malaria stands as the primary cause of mortality and morbidity, affecting half of the population.

Objectives

- To improve tools and develop infrastructure and facilities for EWS
- To increase information and awareness about EWS
- To develop and enhance enforcement of policies or regulation on EWS
- To increase institutional, organisational capacity and human resources on EWS

Outputs

- Disaster risk management mainstreamed in government institutions. The project will prepare and implement an institutional strengthening plan for Ministry of Humanitarian Affairs and Disaster Management of South Sudan. The plan will clearly articulate the roles of various departments and divisions under the ministry in pre- and post-disaster information management, planning and implementation, and their relationship with sector and geographic, provincial, and district agencies—preventing overlap or duplication.

- Capacity to manage natural hazards and minimize losses strengthened. The project will do disaster risk modeling and prepare hazard and disaster risk maps of different return periods and a digital atlas, inventory of assets at risk, and comprehensive national risk profile by carrying out a multi-hazard vulnerability and risk assessment leading to identification of areas of high, medium, low, and no risk.
- Road map for investments and sustainable financing developed. The project will prepare a 9-year investment plan (2025–2033) for DRM. The risk modeling work supported under output 2 will be used for risk-informed identification and prioritization of investments in the plan.
- Value added by ADB and WB assistance. ADB and WB are the leading development partners of GoSS. They have a diverse portfolio of investments including transport, energy, water resources, education, climate finance, and climate resilience.

Project deliverables

Stakeholder and public consultation and engagement plan, communication plan. This document will outline key stakeholders and opportunities and tactics for engagement. A separate Communications Plan, developed by Strategic Communications staff, complements the consultation plan and is a living document that identifies strategic objectives, key messages, and tactics to promote EWS Strategy to the public and stakeholders.

Current EWS profile. This report will document each aspect of South Sudan's EWS, including but not limited to programs, initiatives, and facilities. It will also provide the history of EWS in the country, and an overview of water policy and legislation, education and enforcement, and performance monitoring.

Needs assessment. This report will document South Sudan's EWS needs over the 30-to-50-year planning horizon. The Needs Assessment will consist of three components: Vision and Guiding Principles; projections; and gaps, challenges, and/or opportunities.

Identify options to address needs. Deliverables will include the development of a list of potential options covering the full range of the disaster management hierarchy, with a primary focus on EWS technology.

Detailed evaluation of options, identify recommended options and current system overlay. Specific evaluation methodology and criteria will be developed to include environmental criteria, social criteria, and financial criteria, which support a triple bottom line evaluation.

Strategy roadmap development. After the recommended list of options is compiled and combined with the current system, a "roadmap" for implementation will be developed.

Final strategy

The final step is the preparation of the long-term disaster management strategy, which will describe the identified options and will outline the preferred long term disaster management system. The disaster Strategy will fully document the process that will be undertaken in the above tasks, key information gathered, decisions to be made, and supporting rationale.

Project Scope and Possible Implementation

The project scope will be comprehensive focusing on creating knowledge on technical aspects for both central and local level authorities. The technology demonstration will be in all disaster affected communities of South Sudan. The assessment study will be conducted evaluating the EWS technology along with financing models for implementation, which will vary by community. The project will be undertaken in a way to contribute to the development of an integrated strategy for disaster management in South Sudan. The pilots for decentralized EWS project will be undertaken in a few selected communities.

The implementation possibility will be high as it will be directly being linked with the integrated strategy being developed for disaster management in South Sudan by Ministry of Humanitarian Affairs and Disaster Management. Finally, the country will aim at developing Nationally Appropriate Mitigation Actions (NAMAs) for the disaster sector for which the findings of the proposed project idea would be highly useful.

Project activities

The project will be implemented by MoEF - GOSS, primarily in collaboration with Non-Government Organizations (NGOs), development partners and the beneficiaries.

The activities of the proposed project will include:

Mass awareness through using print and electronic media and employing marketing agents. Implementation of policy and institutional framework of the donors for supporting sustainable disaster management in South Sudan.

Timelines

The early warning project is set to be implemented over a comprehensive period of three years, spanning from 2025 to 2029. This timeframe has been carefully chosen to ensure thorough planning, development, and execution of all necessary components to enhance the effectiveness of the project."

Estimated budget

The Project estimated budget is $**20,330,000** to be funded by international donors and funding agencies through grants and government co-financing.

Measurement/Evaluation

An assessment of stake holder participation shall be conducted; Processes towards development and implementation of legislation on EWS; Assess carbon footprint; Process of selecting consultants; process of staff selection and Quality of staff trained; equipment selection process and integrity of education and training to stake holders.

Possible Complications/Challenges

Limited human resource in the MHADM for EWS, this may slow down the process and thereby increase lag time; Delay in getting access to fund from domestic and international sources; a formal institutional structure for disaster management in the country is currently being designed in South Sudan, in absence of a proper institutional structure and assigned roles and responsibilities, there is likelihood of delay in implementation of above activities; Performance Measures; Public Education and Engagement; regulatory, control and role/responsibility.

Responsibilities and Coordination

GoSS through MHADM, MoEF and MoFP will mobilize funds during the beginning, mid-term and towards end of the project, local Governments and State/City authorities will undertake the implementation of project activities from start to the end, MHADM will do the monitoring and evaluation of the entire project and enforcement of by-laws and MOJ will undertake the inaction of laws on water management.

Cross-cutting issues

In South Sudan, various common barriers hinder EWS technology progress. Insufficient development and shared solutions exist. A consistent vision and government support are vital. Lack of state policies hinders disaster management progress. Stronger R&D institutions are crucial. Improved information and international collaboration are needed. National innovation integration is key.

Chapter 4. Technology Action Plan and Project Ideas for Energy Sector

4.1 TAP for energy sector

Micro hydropower offers an economical solution for the energy crisis in rural communities of northern South Sudan (Ater Y. Amogpai, 2024). Due to its natural topography, flowing water, and climatic conditions, Mini/micro hydropower can provide reliable and affordable energy. These plants can fulfil the electricity needs of small communities, businesses, and industries. Villages without grid access and with water flow exceeding 5 feet can benefit from low-cost rural electrification through MHPs. South Sudan has an estimated potential of 80,000 MW in micro hydropower, but currently, none of this potential has been utilized (Hu Irene Rong et al., (2023).

South Sudan needs to focus on the development of both mini/micro hydropower and large hydropower (LHP) to urgently improve access to electricity across the country, as highlighted by the World Bank (2023). The need for such initiatives is pressing, given that LHP investments are not only expensive but also require many years to construct before they can start generating power. In contrast, mini/micro hydropower systems can be deployed as a more immediate alternative to LHP developments. These smaller systems can be constructed in a significantly shorter time frame, enabling them to deliver electricity to remote locations in urgent need. Microbusinesses and small industries, as well as isolated local towns, stand to benefit immensely from the electricity provided by micro hydropower plants. By harnessing MHP technology, low-cost rural electricity can be made available to unconnected villages, particularly those with a water supply that flows at a head of more than five feet. This approach not only addresses the immediate energy needs but also fosters economic growth and enhances the quality of life in these underserved areas. Additionally, prioritizing the development of mini/micro hydropower could lead to more sustainable energy solutions that are adaptable to the unique geographical and socio-economic contexts of South Sudan.

4.1.1 Sector overview

South Sudan faces suppressed demand and a low access rate of 7.75% in 2021, with 70% relying on traditional biomass fuels (Samuel Thiak, Anil Hira, (2024). Grid power is expensive and limited, with total demand estimated at 300MW compared to a supply of only 130MW. The current electricity mix is thermal, but the country has significant untapped renewable energy potential, particularly in hydropower. Transitioning to zero-emission technology could reduce GHG emissions by an estimated 3.24 million tons of CO2 by 2030 (MoEF, 2021). In deploying small hydro-power technology, the South Sudan Electricity Corporation (SSEC), the national company on Alternative and Renewable Energy Sources, and the Ministry of Energy will coordinate measures. The Ministry of Environment will assess environmental impacts, and the Ministry of Humanitarian Affairs will conduct disaster risk assessments for proposed constructions.

Given rural populations' dispersed nature and low densities, electricity access requires a mix of grid extension, mini- and micro-grids, and stand-alone systems. An initial study has mapped population distribution in relation to the MHP grid network, characterized population

distribution by density, and identified those best served by grid extension, mini-grids, micro hydropower-grids, and stand-alone systems, powered by various energy sources.

4.1.2. Action Plan for Mini/micro Hydropower Technology

4.1.2.1 Introduction

Hydropower is one of the oldest power sources on the planet. The technology of harnessing energy from flowing water as it spins through a wheel or turbine has been used for energy generation because it is a highly efficient, readily available, and reliable source of energy. Mini/micro hydropower technology is quite a suitable renewable energy-based and affordable solution; The anticipated capital costs for mini/micro hydropower technology are around 3,470 USD/kW_e, 5,550 USD/kW_e, and 2,450 USD/kW_e, respectively, for the capacity of 0.3 kW_e, 1 kW_e, and 100 kW_e. This is a very good renewable energy-based and reasonably priced option.

Currently, South Sudan does not even have a single hydropower system functioning, and therefore the mini/micro hydropower technology is intended to help displace fossil fuel energy sources and limit global warming while satisfying the electricity demand. Micro hydropower technology plants often help decarbonize decentralized systems reliant on diesel-based generators or coal and biomass burning.

Additional social and economic benefits can be seen as rural residents move to clustered villages and gain access to modern amenities like internet and TV through small hydropower systems. This shift can discourage urban migration, boost revenue for small businesses, and increase GDP by exploiting water resources. Furthermore, it will enhance electricity access, create jobs, and foster development in small communities.

4.1.2.2 Ambition for the TAP

This technology is intended to establish installed power generation capacity of 120MW which is equivalent to 750,000MWh per year. Assuming that the majority of the people will be using 120kW per month, about 1,000,000 people can access electricity. The benefits that will be accrued from this effort include avoiding powering these off grid communities using diesel powered electricity. This will avoid about 0.378 megatons per year of CO_2 emission: minimising use of kerosene. At present no single micro hydropower is operational in the country, however, the government of South Sudan through the Ministry of Energy and Dam planned to install 2,729.5 MW of renewable energy power by 2030 for the provision of electricity both in rural and urban areas, with a general focus on micro small hydropower generation and particular attention on the development of the Fula dam hydropower project, located 33 km downstream of the South Sudan-Uganda border.

During preparation of TAP for small hydro-powers, priorities, time scale, stakeholders, key indicators, and funding were assessed. Targets include promoting private sector participation, issuing licenses, exploiting more sites, installing more Hydropower by 2030, improving legal frameworks, and financing through IPP negotiations. In addition to the above brief description of ambition in the energy sector in South Sudan and with reference to the document on national energy policy and strategy, below is the summary of prioritized ambition for the energy sector.

Table 23. Summary of ambition for the energy technology targets

Technology	Current orientation	Ambition
(Mini/micro hydropower)/small hydropower	Small hydropower opportunities have been inventoried, showing a high number of potential sites: about 4,860 MW including 58.68 MW are from 200 SHP sites located all over the country for which a preliminary design was tendered in 2013 and for a capacity of 9.3MWe by 2030 (Ministry of Environment and Forestry, 2018).	Installing 120MW by 2030 of Mini/micro hydropower generation and particular attention on the development of Bedden, Shukoli, Lakki and Fula dam hydropower project, located 33 km downstream of the South Sudan-Uganda border

Gender considerations

Promoting hydropower careers to women will be considered to addresses gender equality in the micro hydropower development and in the energy sector. Encouraging mentorship and role models inspires young women in this field. Men should actively support gender equality, integrating gender-responsive technology approaches. This empowers women, enhances energy access, and aligns with broader sustainability goals. The TAP strategy fosters an equitable, sustainable future, prioritizing women in energy decision-making for progress and innovation.

4.1.2.3. Actions and activities selected for inclusion in the TAP

Summary of barriers and measures to overcome barriers

The South Sudan TNA Report highlights economic, financial, and non-financial barriers in mini/micro hydropower plant diffusion. These barriers include high upfront costs, limited access to finance, and low consumer affordability. Overcoming financial barriers involves promoting soft-term credit lines to facilitate technology adoption.

The major non-financial barriers for micro hydropower plants include (i) inadequate policy and programs, (ii) poor quality of standards and non-existence of labeling on machinery and equipment, (ii) lack of information and awareness, (iv) limited market for micro-Mini/micro hydropower business because of lack of demand and non-availability of certified technicians for the technology, and (v) risk of disasters and water-flow variability because of fragility and climate change impacts. The measures to overcome barriers are to establish quality standards and labeling of micro hydropower plant machinery and equipment to ensure supply of good quality Mini/micro hydropower (MHP).

To increase public awareness, effective demonstration of MHP plants at potential sites can raise public awareness and boost capacity building. Training centers should offer basic instruction on market development and maintenance of MHP plants. Pre-installation feasibility studies and EIA help identify measures to prevent disasters. Barrier analysis and enabling framework (BAEF) highlight barriers and mitigation measures in Table 24.

Table 24: Overview of Barriers and Measures to overcome these for Mini/micro hydropower

Categories	Identified barriers	Measures to overcome barriers
Economic and Financial	• High initial capital cost due to absence of local industry for electronics and equipment machinery, equipment for hydro plants is imported. • Difficulties in accessing finance • Low consumer affordability • Low Participation of private sector in the energy sector in South Sudan, No private sector investment into small hydropower.	• Implement innovative financing mechanisms such as subsidies • Tax exemptions • Implement innovative risk mitigation mechanisms and promotion of micro-hydropower plant soft-term credit line • Enhancement instruments to provide comfort to lenders and access to loans • Develop financing schemes such as revolving funds • Setup fund for hydropower plants establishment at each of the ten states and administrative areas in South Sudan
Non-financial	• Inadequate legal and institutional framework • Lack of information and awareness. • Limited Market DevelopmentServices and • Risk of disasters or variable water-flow • Limited expertise for training the local trainees • Expected seasonal floods a damage of power plant in South Sudan	• GoSS should put in place proper institutional frameworks for micro hydropower development and investment • Establishment of quality standards andlabeling for micro hydropower plants. • Training and Awareness Raising. • Design of hydro plants require a multidisciplinary team; Design challenges for rivers and streams with unpredictable water levels; lack of familiar modeling tools. • Risk of disasters reduced by enforcingInitial Environmental Examination (IEE) and Environmental ImpactAssessment (EIA)

Actions selected for inclusion in the TAP

In consultation with Expert Working Group on Mitigation and assessment of measures, actions taken for promoting micro hydropower plants are described in Table 25:

Table 25. Actions selected for inclusion in the TAP

Categories	Identified measures to overcome barriers	Measures selected as actionsfor inclusion in TAP
Economic and Financial	• Promotion of soft term credit line • Develop business models to encouragedomestic manufacturing. • Organize funders to increase their support for small-scale hydropower technology pilot projects.	• Promotion of soft term credit line with low interest rate of 6%. • Coordinate donors to enhance support for small hydro-power technology pilot project initiatives.
Non-financial	• Production of accredited technicians andawareness raising (2) • Establishment of quality standards and labeling (4) • Capacity building training to enhance capacities of government bodies involved in small hydro-power research/observation. • Building technical capacity including awareness raising on the significant of micro hydropower in low emission electricity provision	• Production of accredited technicians and awareness raising. • Capacity building training for government bodies on small hydro-power research/observation. • Perform thorough and detailed environmental impact assessments at potential small hydropower construction sites in all the ten state and administrative areas • Implementing a long-term, planned public awareness and education campaign, which includes sharing knowledge about the necessary skill set

Activities identified for implementation of selected actions

The actions and activities that have been selected for inclusion in the TAP for Mini/micro hydropower plants are presented in this section. The basis of these actions are linked to the measures that were identified following detailed analyses of barriers facing the technology, as well as the enabling environment required to promote the technology detailed in the BA&EF report.

Table 26. Summary of Actions and corresponding activities for Mini/micro hydropower plants

Action	Activities for Action Implementation
Action 1: Boost public investment and resources Mobilization for Mini/Micro hydropower	1. Explaining the financial needs, funding sources and environmental impact assessment 2. Prepare concept notes and project proposals to secure funding for micro hydropower plants 3. Develop incentives like subsidies and tax exemptions to reduce costs for mini hydropower projects.

	4. Sensitise policy makers on incentivizing electricity to compete with fossil fuels through incentives or subsidies.
Action 2: Develop specific regulations for simplifying permission mechanism	1. Simplify permission mechanism to promote private sector initiatives 2. Formation of a network of small size companies in hydropower subsector 3. Inventory of all companies involved in hydropower - Seminar and formation of an industrial association 4. Installation of a unit for assembly and production of hydropower components and machinery.
Action 3: Develop mechanism for provision of long-term and low-interest loans, as well as grants through state, private and international fund	1. Create easy access to affordable loans for private sector investment into the mini/micro hydropower plants development
Action 4: Develop and implement financial incentives for Mini/micro hydropower by The Ministry of Energy and Dams (MoED) and the South Sudan Electricity Corporation (SSEC)	1. Exempt taxes on all imported solar components 2. Subsidize interest rates 3. Conduct consultative meetings with financial institutions (FIs), and identify those which can cooperate in supporting the solar technology 4. Provide trainings to FIs to understand the solar business models 5. Set up a RE revolving fund to support the various stakeholders in the value chain including end-users; to be implemented by financial institutions 6. Develop an Inter-Ministerial Committee to oversee the activities of the different ministries in implementation of the financial incentives
Action 5: Formation of a network of small size companies in hydropower subsector	1. Inventory of all companies involved in hydropower -Seminar and formation of an industrial association 2. Installation of a unit for assembly and production of hydropower components and machinery.
Action 6 Increase institutional capacity human resource	1. Train nationals and local authorities including communities at risks for Mini/Micro hydropower (Fula Dam)

Actions to be implemented as Project Ideas

Action 1, 2, 3 and 4 will be implemented as a Project Idea (PI). During the barrier analysis and enabling framework workshop, stakeholders identified affordability as the main challenge for institutions and increasingly for manufacturers of hydropower. Stakeholders proposed development of financial incentives as a key measure in overcoming this barrier. All activities under this actions will be considered for the TAP.

Gender considerations

The TAP activities will empower women by improving energy access, reducing time spent on household tasks like collecting firewood, and creating job opportunities for economic growth. Reliable power will enhance productivity, income generation, and social service delivery. This holistic approach involves active participation, capacity building, and economic opportunities while respecting local cultural norms. Overall, these efforts will empower women, driving social and economic development and reduce emissions from households by producing electricity with fewer greenhouse gas emissions than other energy sources for a more equitable future.

4.1.2.4 Stakeholders and timeline for implementation of TAP

Overview of Stakeholders for the implementation of the TAP

Key stakeholders who will play a crucial role in the successful implementation of TAP include the following:

Table 27: Roles of stakeholders involved in the mini/micro hydropower technology

Stakeholder	Roles
The Ministry of Energy and Dams (MoED)	➢ Make policy amendments to Government to subsidize interest rates and set up a mini/micro hydropower revolving fund. ➢ Engage in dialogue with development partners ➢ Provide capacity building trainings on core of micro hydropower establishment, set up and maintenance ➢ Develop an Inter-Ministerial Committee to oversee the activities of the different ministries in implementation of the financial incentives ➢ Provide input to MoF on energy and electricity financial policy development.
Ministry of Investment	The Ministry of Investment should frame the national micro hydropower investment strategies, policies, and programmes for the diffusion and transfer of the technology
The South Sudan Electricity Corporation (SSEC)	➢ Support the development of a 120 MW micro hydropower plant and regional transmission lines. Assist in establishing small-scale hydropower plants nationwide for clean energy and climate change mitigation.
The Ministry of Finance and Economic Planning - GOSS	➢ The MoFE will handle activities like securing funds and engaging with donors, while the Ministry of Finance and Ministry of Investment will be involved. ➢ Develop financial incentives

Scheduling and Sequencing of Activities

The TAP's initiatives are scheduled to be implemented between 2025 and 2030, which will result in the development of a strong policy framework for the deployment of the priority hydropower technologies. This time frame corresponds with the completion of the draft energy policy and the start of the South Sudan Sustainable Energy for All initiative.

Gender considerations

The TAP implementation prioritizes strong gender inclusion, ensuring active participation of women in key roles. A gender analysis will shape a detailed action plan, guiding diversity promotion and enhancing technology sector perspectives. Stakeholder engagement, including women's groups, ensures diverse input for project success respecting cultural nuances. This commitment empowers women and fosters recognition in the technology field, driving innovation and equity.

4.1.2.5 Estimation of resources needed for action and activities

Estimation of capacity building needs

Collaboratively, the SSEC, Ministry of Energy, and Dam identified capacity needs for TAP's operations in the energy sector. This involves updating policy, providing technical training on hydropower operation, conducting feasibility studies, and addressing areas like project management, finance, and market growth where capacity lacks. The aim is to improve efficiency and effectiveness in implementing energy technologies.

Estimations of costs of actions and activities

The estimated costs were determined in partnership with these entities, with a focus on public-sector hydropower projects supported by international donors to strengthen the energy sector's framework. This funding covers direct expenses, consultants, and stakeholder engagements. The results of the analysis are shown in Table 29.

Gender considerations

The budget lines that include key provisions for supporting women’s participation in micro hydropower projects, separate training facilities and prioritized support for awareness activities. Practical measures like transport arrangements and timing flexibility are integrated to aid women’s involvement effectively, with continuous resource assessments for adjustments. This approach aims to value women’s contributions and promote lasting participation in climate change adaptation technology development.

4.1.2.6 Management planning

Risks and Contingency Planning

Micro hydropower can electrify rural areas, reduce greenhouse gas emissions, and combat global warming. As a cost-effective energy source, it operates without dams or water storage, though risks and contingency plans are detailed in Table 28.

Table 28: Overview of risk categories and possible contingencies for the development of micro hydropower’s in South Sudan

Risks	Contingency action
Delays in securing donor financing for Micro hydropower development and promotion	Government of South Sudan will undertake finance preparation of the human resources development plan.
Hydropower establishment and activities are expected to take longer to complete than what is now originally planned	Implementing agency to ensure proper implementation planning, allow for step-by-step slippage and identify critical path items early

Core hydropower Information not being provided in a timely manner or not available	Ensure high-level policy acceptance and support and establish a project steering committee to involve key institutions in the process.
Limited capacity of Ministry of Energy and Dam and the South Sudan electricity cooperation to implement action	Strengthen Lead Agency's capacity for project implementation, including ongoing assessments and consultations with other agencies having capacity in the country or region
The economic situation in South Sudan could worsen due to changes in exchange rates and interest rates.	Launch awareness and sensitization programs as well as capacity building of the stakeholders to enable them to sustain the market shocks.
Change in the revitalized Transitional Government of National Unity strategies and government policies.	Review and read just the program in the light of policy changes.
Risk of climate change/Variability and associated disasters such as flood that may affect the development of hydropower plants in some states in South Sudan	Undertake climate change resilient infrastructure and adaptation measures.

Next steps

The immediate requirements and critical next steps are summarized and presented below.

Immediate requirements	South Sudan's government, specifically the Ministries of Finance and Energy and Dam, along with the South Sudan Electricity Corporation, need to engage early with donors supporting the Energy Sector to secure funds promptly and meet activity deadlines effectively. The Ministry of Finance plays a crucial role in ensuring the RTGoNU Cabinet is informed and cooperates for swift decision-making and collaborations with other Energy sector institutions.
Critical steps	The Ministry of Energy and Dam, along with SSEC, should present proposals for micro hydropower promotion to the Ministry of Finance. Seek Cabinet approval and donor financing for implementation.

Gender considerations

The TAP for the micro hydropower development identifies and mitigates gender-related risks through proactive measures such as awareness campaigns and capacity-building initiatives to maintain gender priorities regardless of shifts in situation such as economic situation and insecurity. Performance risks are managed through continuous monitoring to ensure the micro hydropower system meets safety and accessibility standards for women and vulnerable groups. Additionally, capacity-building efforts will target women, equipping them with the necessary skills to participate in technical and leadership roles, ensuring an inclusive and equitable energy access throughout the implementation.

4.1.2.7 Reporting

Table 29. Mini/micro hydropower)/small hydropower technology overview table

TAP overview table								
Sector: Energy Sector								
Sub-sector:								
Technology: (Mini/micro hydropower)/small hydropower								
Ambition: Ambition: To install 120 MW of hydropower by 2030, with a general focus on mini/micro hydropower generation and particular attention to the development of Bedden, Shukoli, Lakki and Fula dam hydropower project, located 33 km downstream of the South Sudan-Uganda border.								
Benefits: micro hydropower offers numerous benefits including climate action, energy flexibility, reduced fossil fuel dependency, and enhanced water resource management, contributing significantly to a sustainable energy future.								
Action	**Activities to be implemented**	**Sources of funding**	**Responsible body and focal point**	**Time frame (years)**	**Risks**	**Success criteria**	**Indicators for Monitoring of implementation**	**Budget per activity**
Action 1 **Boost public investment and resources Mobilization for Mini/Micro hydropower**	**Activity 1.1:** Assess the financial needs, funding sources and environmental impact assessment	GoSS JICA WB AfDB UNDP GEF GCF	MoED MoFP SSEC	5	Population displacement, ecosystem changes or interference	Financial needs, sources, and environmental impact data provided.	The environment re-assessment and audition. record and report status of various components of the projects	175,237
	Activity 1.2: Prepare concept notes and project proposals to secure	Gov, AfDB, UNDP	MoED and MoFP and SSEC	2	Political (changes in political priorities)	Concept note submitted	number of concept notes developed on hydropower and submitted	900,000

	funding for micro hydropower plants							
	Activity 1.3: implementation of a comprehensive program of incentives for users and manufacturers of MHP spares and equipment	GoSS, AfDB, UNDP, GEF	MoED and SSEC	5	Delay in securing fund	Solid experience of incentive programs	No. of incentive program options	850,000
	Activity 1.4: Develop incentives like subsidies and tax exemptions to reduce costs for mini hydropower projects.	GoSS, AfDB, UNDP, GEF	MoED and SSEC	5	Delays in putting in place financial incentives policies	Incentives like subsidies and tax exemptions developed	Number of incentives developed like subsidies and tax exemptions to reduce	600,000
	Activity 1.5: Sensitize policy	GoSS, AfDB,	MoED and SSEC	5	Lack of political can impact the	Policy sensitization conducted	Number of sensitization session	100,000

	makers on incentivizing electricity to compete with fossil fuels through incentives or subsidies	UNDP, GEF			sensitization campaign			
Action 2: Develop specific regulations and rules to simplify permission mechanism.	**Activity 2.1:** Simplify permission mechanism to promote private sector initiatives	Government through the MoFP, ADB	MoED, SSEC	1-3	Delayed due to insufficient resources	Permission mechanism strengthens to promote private sector investment	No. of mechanism developed to promote private sector investment in micro hydropower	850,000
	Activity 2.2: The institutional framework both at the (national and state levels) and the Regulatory Agency of the electricity sector is strengthened.	GOSS and AfDB	MoED and SSEC	2	Legislative delay that may go beyond the project life span.	Institutional framework strengthened at national and sub national level	Number of national and sub national institution strengthened	240,000

	Activity 2.3: The development of regulations implementing the law of the electricity sector is supported	GOSS and AfDB	MoED and SSEC	2	Slow/delayed adoption of the new law and policy	efficient implementation of enforcement	Number of standards, regulation and law	250,000
	Activity 2.4: Formation of a network of small companies in hydropower subsector.	GoSS, AfDB, WB and GEF	MoED and SSEC	5	Inadequate funds to implement proposal	Network of small size companies strengthened	Number of small size network of hydropower	600,000
	Activity 2.5: A national diagnostic study is launched to support the establishment of a Legal, Fiscal and Administrative system of MHPP sector in South Sudan	GOSS, AfDB, UNDP	MoED, MoEP	5	Delay in securing funds	National diagnostic study on MHP is launched	Number of MHP diagnostic study launched	190,000

Action 3: Develop mechanism for provision of long-term and low-interest loans, as well as grants through state, private and international fund	**Activity 3.1:** Develop portfolio of opportunities by identifying and mapping micro hydropower plant sites	GoSS, ADB, WB	MoED and SSEC	1	Lack of actions due to bureaucracy		Number of portfolio of opportunities identified and map	245,000
	Activity 3.2: Develop credit programs and procedures including MIS and risk management system for micro hydropower plant	GoSS. ADB, WB and UNDP	MoFP	5	The high upfront MHP costs deter developers and operators.	Develop credit program adapted	Number of credits programs and procedures developed	980,000
	Activity 3.2: Create easy access to affordable loans for private sector investment into the mini/micro	GOSS, MoEP	MoFP and MoED	5	Changed the rates of loans before the end of contract;	Soft loans are made accessible	Number of people with accessible soft loans	230,000

	hydropower plants development							
	Activity 3.3: Recruitment of sales agents for promotion and facilitation in acquiring loans for the micro hydropower plants.	GOSS, MoEP	MoED, SSEC	2	Weak procurement capacity	Successful sales agent recruitment	Number of sales agents in the promotion and facilitation of loan acquisition	198,000
Action 4 Increase institutional capacity human resource	**Activity 4.1** Train nationals and local authorities including communities at risks for Mini/Micro hydropower (Fula Dam)	Govt. JICA WB AfDB UNDP GEF GCF	MoED MoEF MoFP SSEC Local gov't authorities	5	Security of the Location, political will, resources and accessibility	Financial needs, funding sources, and environmental impact data provided.	Training plans developed, trainers contracted, no. of training and participants attended	900,000
	Activity 4.2: The accredited technicians and	JICA WB AfDB	MoED, SSEC and Development partners	5	Government Commitment to opening up the Sector	Increased electrification rate in rural areas	Number of accredited technicians and awareness raising	1,800,000

	awareness raising of general public will pave the way for diffusion and dissemination of the micro hydropower plants.							
	Activity 2.3: Awareness raising through electronic, print and social media	GoSS, JICA WB AfDB UNDP GEF GCF	MoED and SSEC	5	Inadequate funds or human resource to run the facility	More than 50% have again knowledge through awareness raising	Number of awareness raise	850,000
	Activity 2.4: Identification of accredited training institutes to develop modules and conduct training as per local needs	GoSS, AfDB	MoED and the SSEC	5	Delay in securing funding	MHP training modules developed	Number of MHP modules developed for training of local expert	60,000

	Activity 2.5: Follow up training and lessons learnt.	GoSS, AfDB and the WB	MoED and SSEC	5	Proper stakeholder communication and follow-up.	Successful stories reported	Number of MHP training sessions, follow-up and lesson learnt	75,0000
Action 3 Improve tools, infrastructure and facilities for Mini/Micro hydropower	Pilot investments in selected small scale hydropower stations in rural communities	GOSS, AfDB and WB	MoED and SSEC	5	Delay in securing funding	Pilot investment in MHP initiated	No of small-scale Hydropower station constructed	6,000,000
	Activity 3.1. Procuring turbine, pump, waterwheel, generators or alternators, regulators and switchgear and associated protection system, cable wiring.	Govt. JICA WB AfDB UNDP GEF GCF	MoED MoEF MoFP SSEC Local gov't authorities	5	Security of the Location, political will, resources and accessibility	Financial needs, funding sources, and environmental impact data provided.	MHP equipped and spared are accessible	10,500,000
	Activity 3.2 Technical capacity	GoSS, UNDP, GEF, GCF	MoED and SSEC	5	Delay in securing funds	Technical assistance and skills transfer	Number of technical capacity	700,000

	building support for MoED Staffs, SSEC and other hydropower stakeholders					package for staffs in the MoED	building to stakeholder	
	Activity: Installation of a unit for assembly and production of hydropower components and machinery	GoSS, AfDB, WB and GEF	MoED and SSEC	5	Delayed adoption of new laws, non-implementation of existing laws.	Delay in securing funding	Number of units of Mini Hydropower installed	1,800,600

Gender Considerations

The TAP will conduct needs assessments to gather gender-disaggregated data, identifying barriers and opportunities to advance women in mini/micro hydropower. Understanding women's unique challenges, it aims to develop strategies for gender equality. Training and workshops will ensure at least 50% female participation, focusing on leadership and technical skills. Policies promoting women in leadership roles will be promoted. Feasibility studies will assess gender impacts; involving women in consultations is crucial. Women's participation in technical areas will enhance technology effectiveness for gender equality and sustainable development in small hydropower transfer.

4.1.2.8 Tracking the implementation status of the TAP

Rationale, responsibility and content of TAP tracking

The tracking system for the TAP implementation is designed to ensure effective monitoring of progress, timely identification of challenges, and achievement of targets for micro hydropower technology deployment in South Sudan. The deployment will be primary coordinated by the Ministry of Energy and Dam - GOSS, working in close collaboration with the South Sudan Electricity Corporation (SSEC) and other key stakeholders. The tracking process will be implemented through a three-tier system:

- National strategic level tracking: The MoED will oversee overall implementation and conduct quarterly reviews, maintaining a central database and providing annual reports to stakeholders.
- Project implementation unit level tracking: SSEC will monitor day-to-day technical progress, collecting monthly data and coordinating with local partners for accurate reporting.
- Sub national Level Tracking (State, County or Payam): Local authorities and partners will conduct field monitoring, providing monthly data to SSEC for analysis.

The tracking system will identify challenges, review progress monthly, assess barriers quarterly, create action plans, consult stakeholders, and maintain effectiveness through regular reviews for transparent monitoring and timely adjustments in TAP implementation.

Gender considerations

To monitor and enhance women's active involvement, the project will establish specific tracking criteria for their participation across various dimensions of the project. Metrics will focus on women in technical roles, participation in training programs, beneficiaries from female-headed households, and engagement in community consultations. This data analysis will recognize and value women's contributions, promoting inclusivity and empowerment.

4.2 Project Ideas for energy Sector

4.2.1 Brief summary of the project ideas for the energy sector

South Sudan has about 4,860 MW (all sizes) potential of micro hydropower plants according to the National Ministry of Environment and Forestry, 2018). The current gap between electricity demand and supply in South Sudan is more than 800 MW. The government of South Sudan has set a goal to increase access to electricity to 50% by 2030, and small hydropower plant will play a key role in achieving this goal. The government is working on several renewable energy projects, such as a small power project in Yei and a hydroelectric power project on the Nile River with the aim of improve the energy mix in favour of renewables.

The proposed project will provide 120 MW of hydropower to 650,000 households especially those living along the river Nile in South Sudan. The households will have access to the credit line for financing renewable energy projects including hydro at 6% interest rate that will be established by the Ministry of finance, Government of South Sudan

4.2.2 Project Idea: Promoting the development of mini/micro hydropower plants in South Sudan

b. Objective of the project

The objectives of the project are to create an enabling environment for the promotion of micro hydropower plants for reducing pressure on existing energy demand and supply gap and reduction of deforestation, soil erosion, siltation and GHG emission, conservation of forest and forest biodiversity; environmental pollution; increasing life of big dams; and reduction of country's fossil fuel import bills. The mitigation potential of the project is about 29 million tons of CO_2eq for 30 years.

c. Project Outputs and measurable

The project will provide 120 MW of hydropower to 650,000 households and build capacity of institutions and technicians for its installation. The households will have access to the credit line for financing renewable energy projects at 6% interest rate established by Minister of finance and economic planning and the Bank of South Sudan.

Relationship to the country's sustainable development priorities

South Sudan electricity Sector Strategy for South Sudan focuses on "reducing electricity demand supply gap by diversifying and optimizing energy generation mix". Therefore, the proposed technology is in conformity with the sustainable development priorities of the country. The project idea is in line with the energy policy, plans, the goal of the energy development programme is to increase access and consumption of clean energy

Project scope and possible implementation

The main aim of this project is to install 120 MW of hydropower to 650,000 households and build capacity of institutions and build up a body of national experts and skilled engineers in the field of hydropower development and management. The Ministry Energy and Dam (MoED) and the South Sudan electricity cooperation (SSEC) will be the main government institution responsible for this project.

Project activities

- Promotion of private sector participation in Mini/micro hydropower production at small scales level in all the ten state of South Sudan by 2030.
- Awareness and capacities among local partners (communities, institutions artisans) raised and developed micro hydropower.
- The delivery of licenses for small hydropower projects.
- Exploitation of higher number of Mini/micro hydropower sites and ensure installation of 120 MW of hydropower.
- Promoting the legal and regulatory frameworks of micro-hydropower and mini grids under the monitoring of the South Sudan Electricity Corporation (SSEC) and the Ministry of electricity and Dam.

Timelines

The estimated timeline for providing comprehensive support to the project is set to commence at the beginning of 2025, with plans to extend over a duration of five years. This timeline has been carefully considered to ensure that all necessary resources and expertise are allocated effectively throughout the project's lifespan.

Budget/Resource requirements

The estimated time for the successful implementation of the technology is expected to be 3-5 years with the implementation budget of US $26,968,837. The project will be funded by Government of South Sudan and Development Partners.

Measurement/Evaluation

- Measurement/Evaluation
- Minutes of stakeholders
- meetings
- Minutes of Inter-Ministerial
- Committee meetings
- Policy document development - Development of policy document on financial incentives for hydropower in South Sudan
- Progress reports -

Possible Complications/Challenges

Challenges include absence of a cohesive energy policy, conflict-related instability, limited backing for micro hydropower, funding obstacles, and differing stakeholder energy priorities.

Responsibilities and Coordination

Private sector plays a major role in the establishment and operation of this project. However, the role of government bodies will be very important in facilitating the setting up of the project.

- **Ministry of Energy and Dam (MoEF)**: Executing body
- Financing Sources, private sector: finance mechanism
- Local committees, NGOs, CBOs: beneficiaries
- South Sudan electricity cooperation (SSEC) for training and scientific backup

Chapter 5: Technology Action Plan and Project Ideas for Waste management sector

5.1 TAP for Waste management sector

5.1.1 Sector overview

In South Sudan, poor waste collection ratios stem from the lack of a solid waste management system; only 2.6% of daily solid waste is collected in many towns in South Sudan including capital city Juba (JICA. (2018). Most waste is illegally dumped or burned due to underdeveloped treatment facilities. South Sudan faces environmental challenges due to rapid population growth, inadequate infrastructure, and ineffective policies. While efforts are made to improve waste management, on-ground action is lacking. Waste reduction is a priority for climate change mitigation and adaptation, aiming to cut emissions by 19% by 2030. Urban areas face waste burning and lack recycling facilities, with a significant need for solid waste management infrastructure. Increasing population, urbanization, and economic growth contribute to rising waste generation and inadequate management practices, highlighting the need for effective waste management strategies in South Sudan.

Regulations and Government Bodies: The Ministry of Environment and Forestry oversees waste management, working with municipal bodies like Juba City Council. Key laws, such as the Environmental Management Act of 2012, guide waste management efforts. Additional regulations, like the National Environmental Policy and National policy on medical waste management, support environmental protection. However, enforcing these rules is hindered by limited resources and capacity.

5.1.2 Action Plan for Reduce, Reuse, Recycle (3Rs) Technology

5.1.2.1 Introduction

The 3Rs initiative, developed in the early 2000s, helps countries reduce waste going to landfills by promoting waste reduction, reuse, and recycling. Implementing the 3Rs requires efficient waste management coordination. It involves addressing waste generation, encouraging reuse, and reducing consumption. Recycling is crucial for managing various waste products, supported by established recycling processes for items like furniture and textiles. Embracing the 3Rs technology in South Sudan can reduce pollution, create jobs, and lower greenhouse gas emissions, benefiting the country economically and environmentally.

Waste that is not recycled ends up in landfills, posing environmental and health risks such as toxic mixtures and methane emissions. Implementing waste recycling and reuse practices in South Sudan can help mitigate these issues, create job opportunities, and reduce greenhouse gas emissions. Citizens, particularly the youth, can be encouraged to learn and engage in up-cycling activities to convert waste into valuable products for income generation.

5.1.2.2 Ambition for the TAP

The ambition is that by the year 2030, South Sudan aims to implement a comprehensive and integrated solid-waste management system (ISWM) across all ten states in South Sudan, including the capital city of Juba. This initiative is designed not only to reduce waste generation but also to significantly improve the overall waste management processes while addressing pressing environmental and public health concerns. Transitioning to a sustainable waste

management framework involves enhancing recycling rates, reducing landfill dependence, essential policy reforms, modern waste processing facilities, citizen engagement for financial and environmental sustainability. Emphasis on 3R strategy for effective waste management, emission reduction, and a cleaner future in South Sudan, involving local communities to ensure program success and longevity through citizen empowerment and awareness promotion.

Reduce: this concept refers to the process of minimizing or creating smaller amounts of waste. The government of South Sudan will encourage citizens to shop wisely by buying economy-size or concentrated products to reduce packaging and lower costs, avoiding over-packaged items to ease recycling and save money, refraining from disposable goods to reduce waste and expenses, and opting for durable items that come with good warranties, saving money and landfill space.

Reuse: Reuse involves using items again, whether for their original purpose or in a new way, benefitting both financially and environmentally by encouraging creativity and promoting awareness. The South Sudanese Government will boost consciousness on solid waste reuse, educating public for eco-friendly habits, aiming to cultivate a recycling culture nationwide.

Recycle: Recycling involves converting waste into new material for products, with steps like buying recycled items, collecting recyclables, and taking them to centers. South Sudan educates on the 3Rs to reduce waste, reuse items, recycle, and avoid emissions. Enforcement is key in managing non-recyclable waste to prevent disasters. The government in South Sudan is planning to sort and recycle waste, like plastics and glass, inspired by Swaziland's approach. Biodegradable waste will be sent to landfills for energy through 3Rs technology. Vehicles will be provided for waste transportation.

Gender considerations

The TAP will focus on empowering women, girls, boys, and men in recycling and waste management through employment, education, and capacity-building programs. It seeks to increase women's involvement in decision-making roles, promote gender equality in waste and recycling services, address gender-specific challenges, and reduce emissions and environmental pollution. Specifically targets women for behavior change in household waste management, leads the adoption of for 3R technology for waste, and raises awareness on circular economy, climate change, and adaptation strategies.

5.1.2.3 Actions and activities selected for inclusion in the TAP

Summary of barriers and measures to overcome barriers

Key barriers and measures for mitigation-prioritized technologies were identified during the TNA at the expert meetings, and discussions with the Expert Working Group on Waste Management. A major issue discovered was the inadequacy and improper location of waste collection points, as well as the irregular waste collection services in South Sudan's major cities, such as Juba. The challenges faced by waste collectors and the lack of proper waste collection routes were areas of common concern among technical working group members. The frequency of waste collection was highlighted as a significant problem in most municipalities across South Sudan, due to the lack of basic resources for sustaining regular services.

Table 30: Overview of 3Rs Barriers and Measures for the Reduce, Reuse, Recycle (3Rs) Technology

Category	Barrier dimension	Main barriers	Measures
Economic and financial barriers	Cost	Lack of financial resources	Strengthen the promotion of soft term Credit line.
Non-financial barriers	Institutional and legal instruments.	Ambiguity in terms of sector ownership, roles and responsibilities.	Work with the key stakeholders to further define the roles and responsibilities of key constituencies.
	Technical	Lack of proper recycling technology	Setup standards recycling technologies in Juba and other cities.
	Institutional and organizational capacity	Insufficient capacity of provincial and district level staffs Lack of public and private partnership (PPP)mechanism	Accredited technician production and awareness-raising
	Information and awareness	Inadequate public knowledge about the health impacts of uncontrolled solid waste.	Utilizing TV, social media, and other platforms to interact with larger audiences and communities.

Actions selected for inclusion in the TAP

The selected actions in the TAP for Reduce, Reuse, Recycle are based on measures identified through analyses of technology barriers and the necessary enabling environment detailed in the BA&EF report.

Table 31. Summary of Actions and corresponding activities for Reduce, Reuse, Recycle (3Rs) Technology

Action	Activities for Action Implementation
Action 1: Improved economic livelihood through strengthening of waste management practice The Action will support all individuals, including women, men, youth, and people with disabilities, by enhancing their skills in waste management, emphasizing the 3Rs and backyard gardening for sustainable living.	1. Train youth in waste collection and eco-friendly production to improve community well-being. 2. Train youth and women in the reuse of waste as a source of income (up-cycling) and as a source for local food production (composting kitchen waste for cultivating permaculture backyard gardens). 3. Building two waste recycling centres in capital city, Juba 4. Public awareness campaigns based on a public IEC strategy. Activities will, for instance, include promotion of the RRR-slogan

Action 2: Strengthening the provision of a soft credit line to boost diffusion and implementation of 3Rs technology. South Sudan aims to establish a credit line (<5%) through banks for promoting 3Rs. Detailed project proposals are required for funding. Banks must create credit policies, supervision, and documentation for successful 3Rs initiatives, aligning with South Sudan's growth and environmental objectives.	1. Identification of key institutions and stakeholders 2. Determine the scope for the concept notes for securing funding 3. Develop workable and practical approaches for implementation
Action 3: Production of Accredited Technicians and Awareness raising. Training institutions will collaborate with accrediting bodies to develop modules, select participants, and conduct training at national and district levels.	1 Awareness raising through electronic, print, and social media. 2 Identification of accredited training institutes to develop modules and conduct training as per local needs. 3 Follow up of trainings and lessons learnt
Action 4: Market based instruments including tariffs, levies, and incentives and business facilitation	1. Begin to conduct Trials of Improved Practices (TIPs) for key behaviours and willingness/ability to pay 2. Develop ways to enhance safety, income, and living conditions for waste workers, establishing policy standards for livelihood support.
Action 5: Establishment of quality standards and labelling Currently, no 3R quality standards and labelling in South Sudan currently. Local manufacturers need training and technology transfer for compliance after labelling is established.	1. Drafting of quality standards and labelling procedures. 2. Development of legal framework to support standardization and labelling and its approval from competent forum. 3. Development of laboratory facilities. 4. Labelling and its accessories available in the market. 5. Training and awareness of the producers and consumers on standards and labelling.

Actions to be implemented as Project Ideas

Actions 1,2 and 4 above in table 31 will be implemented as a Project Idea (PI). During the barrier analysis and enabling framework workshop, stakeholders identified high upfront costs as the major obstacle for wider spread uptake of 3Rs technology. The stakeholders proposed development of financial incentives and a key measure in overcoming this barrier. All activities under the actions will be considered.

Gender considerations

To achieve meaningful gender outcomes, TAP will incorporate gender-sensitive actions into the gender-sensitive Reduce, Reuse, Recycle (3Rs) Technology. In order to promote a diversity of viewpoints, this will entail actively including women and girls in waste 3R activities planning and decision-making, with at least 50% of them taking part. The TAP will empower women and change their roles in mitigating climate change by offering gender-responsive leadership and 3Rs-focused technical skills training. TAP encourages environmental stewardship, lowers emissions in the garbage industry, and advances gender equality by improving women's knowledge and abilities.

5.1.2.4 Stakeholders and timeline for implementation of TAP

Overview of Stakeholders for the implementation of the TAP

The following key stakeholders and their proposed roles in this TAP are briefly described. The table below identifies their interaction with the various actions and activities previously identified.

Tables 32. show key stakeholders for successful 3R technology implementation.

Action	Responsible stakeholders
1. Improved economic livelihood through strengthening of waste management practice	MoEF & Ministry of Land, Housing and Urban Development MoEF, NNGOs, Local NGOs
2. Develop and implement a financial incentive scheme	MoFP and the MoEF and town municipalities council at each state, MoFP and Central Bank of South Sudan MoEP, Bank of South Sudan, and private Sector actors
3. Develop and put into action a comprehensive 3R technology training program	MoEF and Juba City Council and all the tens state capitals and private Sector actors
4. Market-based instruments including tariffs, levies, and incentives and business facilitation	MoFP, MoEF and the Ministry of Land, housing &urban development,
5. Develop enabling 3R policies and regulatory framework	MoEF & the Ministry of Land, housing &urban development,
6. Establishment of minimum 5 plastic recycling facility in South Sudan that has pre-sorting, sorting and recycling technologies by 2030	MoEF & Minister of Land, housing &urban development, JICA, UNDP and the Private sector
7. Develop the downstream use of separated waste	MoEF, Juba City Council, Minister of Land, Housing & Urban Development, and private sector actors

Scheduling and sequencing of specific activities

The TAP's initiatives are scheduled to be implemented between 2025 and 2030, which will result in the development of a strong policy framework for the deployment of the priority in waste reduction, Reuse, and Recycling (3Rs) technologies. This time frame corresponds with key national policies related to development priorities and climate change mitiagtion for the

attainment of South Sudan waste management sector and correspond with the solid Waste Management Master Plan in Juba City 2021-2030 initiative.

Table 34 shows the timeframe for implementing activities, the institution(s) responsible for preparation and implementation, and the cost and potential sources of funding available for each Activity related to the deployment of waste 3R technology.

Gender considerations

By engaging stakeholders in promoting equal access to waste recycling and reuse resources, technologies, workforce training, and private-sector participation for both men and women, the 3R TAP will guarantee gender equity. PPPs and financial models will make it possible for women-owned enterprises to obtain capital for the recycling and reuse of garbage. Women, girls, boys and men will be actively recruited by training programs that offer flexible scheduling and incentives. Women's voices will be incorporated into key waste policies, guaranteeing that waste governance and management meet their demands. Women's responsibilities will be lessened by social and environmental assessments that address gender-specific effects. In order to ensure inclusive governance and project management, institutional frameworks will encourage women to take the lead in waste management decision-making at the state level.

5.1.2.5 Estimation of resources needed for action and activities

This section discusses the capacity-building elements of the TAP, as well as an estimation of its implementation cost

Estimation of capacity building needs

Collaboratively, the Ministry of Environment and Forestry (MoEF) will identify capacity needs for TAP's operations and technologies in the energy sector. They pinpointed areas like project management, finance, trade, investment, and market growth lacking sufficient capacity.

Estimations of costs of actions and activities

The estimated costs were determined in partnership with these entities, with a focus on public-sector hydropower projects supported by international donors to strengthen the energy sector's framework. This funding covers direct expenses, consultants, and stakeholder engagements. The results of the cost of action and activities shown in the overview table below (Table 34).

Gender considerations

The TAP’s capacity-building efforts will ensure gender equity by offering waste reduction, Reuse, and Recycling (3Rs) outreach, incentives, and flexible schedules to encourage women’s participation in waste planning and decision making as well as managerial roles. Training activities on 3R funding access, policy development, and waste recycling operations will actively include women, promoting leadership and workforce inclusion. Budgets will support women and girl’s mentorship, coaching and gender-sensitive data collection, ensuring inclusive consultations and policies reflecting women’s needs. Monitoring will track gender-disaggregated outcomes, ensuring capacity-building efforts provide equal opportunities for both women, girls, boy and men.

5.1.2.4 Management planning

Risks and Contingency Planning

Risk and contingency plans must be identified to effectively implement the actions identified. Table 33 provides a detailed overview of identified risks and contingency plans

Table 33. Overview of risk categories and possible contingencies for promoting 3R technology

Risk item	Description	Contingency action
Cost	An activity costs more than originally planned.	A quarter of the budget must be set aside to cover price hikes and the volatile local currency.
Scheduling	An activity takes longer to complete than originally planned.	The equipment being of advanced technology will require the manufacturer to do the installation and commissioning.
Performance	A technology or human resource does not perform as planned or environmental and social benefits not being delivered.	The equipment must come with performance guarantees and the stability of the supplier must be assessed for project completion.
The socio-economic situation of South Sudan might deteriorate (e.g. change in exchange rate, rate of interest etc.).	Fragile economic conditions may result in change of interest rate and may impact negatively on programs and projects.	Launch awareness and sensitization programs as well as capacity building of the stakeholders to enable them to sustain the market shocks.
Change in government policies.	With change of government usually the priorities also change. Now that the SPLM took over in South Sudan, policies on waste management have to be updated or new ones drafted.	Review and readjust the program in the light of policy changes.
Risk of climate change and associated disasters.	South Sudan is subjected to vulnerabilities due climate change.	Undertake climate change resilient infrastructure and adaption measures.

Next steps

The immediate requirements and critical next steps are summarized and presented in below.

Immediate requirements	To kick-start 3Rs technology, deploy technical experts to assist national and sub-national governments in developing concept notes and proposals for securing donor funding to implement 3Rs technology components. Prepare concept notes, project proposals, and collaboration teams, establish linkages with stakeholders, organize international funding for awareness, improve downstream waste uses, and develop waste policies and regulation

Critical steps	Encourage corporate and private sectors to support Waste and 3R technology diffusion, developing a service network for easier consumer access, promoting sustainable waste management and resource conservation.

Gender considerations

The TAP will identify critical gender issues by undertaking a comprehensive end-gendering assessment within the waste value chain. This assessment aims to pinpoint specific barriers and challenges that women face in this sector while concurrently identifying effective strategies to enhance women's economic empowerment in the waste and recycling industry. A key component of this initiative will be establishing robust data on women's roles and contributions throughout the waste value chain, which will serve as a foundation for informed decision-making and policy development.

Furthermore, the TAP will mitigate gender disparities by developing inclusive gender training programs designed to build the capacity of all individuals involved in the waste sector—this includes men, women, girls, and boys. Such training will not only raise awareness of gender issues but will also promote collaboration and understanding among all stakeholders. Additionally, the TAP will advocate for solid waste recycling and reuse management plans that are inclusive and equitable, ensuring that women's roles and perspectives are adequately represented and valued across the entire waste value chain. By implementing these strategies, the TAP aims to create a more equitable and sustainable waste management sector that empowers all participants, particularly women.

5.1.2.7 Reporting

Table 34. Reduce, Reuse, Recycle (3Rs) Technology Overview Table

Sector	Waste Management							
Technology	Reduce, Reuse, Recycle (3Rs) Technology							
Ambition	The Ambition is that by 2030 all the ten states in South Sudan have developed an integrated solid-waste management to reduce increasing generation of solid waste and its improper management that imposed daunting impacts. Developing an integrated solid-waste management (ISWM) plan for all the ten states, including Juba city, based on an overview of the existing system and practices, including the gaps in the entire value chain. A paradigm shift from business-as-usual scenario to an ISWM approach will be recommended. Proposed strategies aim to boost recycling, reduce landfill use in Juba. Reforms for waste reduction, segregation, recycling facilities planned and citizens' willingness to pay reflects waste management costs.							
Benefits	1. Carbon footprint of pilot building is reduced 2. Cost of operation of government buildings reduced 3. Livelihoods and quality of life of energy impoverished households and communities improved 4. Institutional and human skills capacity improved for the operation and maintenance of 3Rs technology							
Action	Activities to be implemented	Sources of funding	Responsible body	Time frame (years)	Risks	Success criteria	Indicators for Monitoring of implementation	Budget per activity (USD)
1. Improved economic livelihood through strengthening of waste	Train youth in waste collection and eco-friendly production to improve community well-being.	GoSS, UNDP, GEF, WB	MoEF, City council, Private sector	5	Inability to secure fund	Successful waste collection for recycling and reuse	Number of youth trained in waste collection and eco-friendly production	900,000

management practice	Youth and women trained in up-cycling waste for income and composting kitchen waste to grow local food.	GoSS, UNDP, GEF, WB, GIZ, AfDB	MoEF, City council, Private sector	5	Unable to obtain funding	Effective garbage collection for reuse and recycling	Number of Youth and women trained on reuse of waste as source of income	800,000
	Public awareness campaigns based on a public IEC strategy. Activities will, for instance, include promotion of the RRR-slogan	GoSS, UNDP, GEF, WB, GIZ, AfDB	MoEF, City council, Private sector	5	Funds not secured promptly.	Waste recycling and reuse adapted	Number of awareness campaigns undertaken both at the national and state level	900,000
2. Develop and Implement a financial incentive scheme	Set-up a body to solicit funds for waste management	World Bank, African Development Bank and NGOs	Ministry of Finance and Planning, local Govt. and City authorities.	5	High cost of consultancy	Economically viable	Report to be completed on schedule Options implemented	600,000
3**. Develop and put into action a comprehensive 3R technology training program.**	Produce training programs on use of waste products targeting different stakeholders	World Bank	MoEF	5	High cost of training materials	Program designed and implemented	Number of persons trained Institution equipped to conduct training	800,000

4. Market-based instruments including tariffs, levies, and incentives and business facilitation	Begin to conduct Trials of Improved Practices (TIPs) for key behaviors and willingness ability to pay	GoSS, UNDP, GEF, WB, GIZ, AfDB	MoEF	5	High cost of consultancy	contribute to the reduction of GHG	Reduce carbon footprint	1,500,000
5. Develop enabling 3R policies and regulatory framework	4.1 Develop a new policy on waste management to encourage reuse, recycle, up cycle and waste to energy technologies	GOSS, AfDB, WB, GCF, GEF	MoEF	2	Delays because Ministry of Justice have other legislative priorities	Appropriate legal framework in place	Monitor processes towards development of legislation	200,000
	4.2 Improve local implementation and enforcement of laws, policies, and regulations	GOSS., GIZ, JICA, WB	MoEF	2	Delays due to legislative priorities and low participation by key stakeholders	Regulatory framework and waste strategies developed	Develop strategy to Motivate stakeholder participation	200,000
6. Establishment of minimum 5 plastic recycling facility in South Sudan that has	Evaluate feasible technology solutions for future programs or	GoSS, UNDP, GEF, WB, GIZ, AfDB	MoEF, City council, Private sector	2	Fund acquisition hindered by various government	locally viable technology and infrastructure	Report on the locally viable technology and infrastructure solutions	160,000

pre-sorting, sorting and recycling technologies by 2030	local/international decision support.				and donor priorities.	solutions assessed		
	Construct 5 plastic recycling facility in South Sudan that has presorting, sorting and recycling technologies by 2030	GoSS, UNDP, GEF, WB, GIZ, AfDB	MoEF, City council, Private sector	5	Delay in securing funds	Plastic recycling operational	Number recycling facility in South Sudan	2,950,000
	Establish policy standards for living wages, benefits, and working conditions to support livelihoods.	GIZ, JICA, UNDP, GEF, GOSS and WB	MoEF and Private sector	1-2	Delay in undertaking the waste policy due to several priorities	Policy developed and approved by the government	Number of acceptable 3R policy standards developed and in use	180,000
7. Develop the downstream use of separated waste	6.1 Engage consultant to identify possible downstream uses of separated waste	GOSS and UNDP	MoEF and Private sector	5	Non-exhaustive identification	Most relevant downstream uses of waste identified	Make sure that all current and future possibilities of waste use is covered	340,000
	6.2 Produce training programs on use of waste Products targeting	GoSS, UNDP	MoEF	5	Failure to attract quality programme developers	Good training programs developed	Monitor process of selecting consultants	800,000

	Different stakeholders							
	6.3 Provide education and training to targeted stakeholders on downstream uses of separated waste	GoSS, UNDP, GEF, WB, GIZ, AfDB	MoEF	5	Inadequate education and training conducted	Appropriately educated and trained stakeholders	Monitor integrity of education and training	1,000,000

Gender considerations

The TAP will prioritize gender inclusion by designing waste solutions based on gender-inclusive research and customizing technology for women. It will embed gender needs in planning and local government processes, tracking gender-disaggregated data for insights. Empowering women in 3Rs initiatives enhances their roles in sustainable waste management. Assessing demographic needs for technologies and addressing barriers to women's access to waste reduction, reuse, and recycling are key. By enabling women to grow waste management businesses, TAP promotes economic empowerment and gender equality in the waste sector.

5.1.2.8 Tracking the implementation status of the TAP.

Rationale, responsibility and content of TAP tracking

The technology for reduce, reuse, recycle (3Rs) will be closely monitored with community involvement to ensure tailored design and implementation. This monitoring process includes assessing proposals for waste collection involving all genders. It merges traditional knowledge with scientific data for a comprehensive understanding of community needs. Gathering feedback and engagement from locals is crucial to assess the 3Rs initiatives' impact on reducing emissions and climate change effects. The Ministry of Environment and Forestry (MoEF) and state-level local governments oversee the diffusion of this technology, enforcing regulations and supporting its implementation. State governments must align their waste management plans with the Technology Action Plan (TAP) for effective 3R practices that benefit both the environment and community.

Gender considerations

In South Sudan, women and girls face structural barriers hindering their earning potential and chances for advancement. Due to limited access to credit and training, many end up working in the informal waste sector, facing lower income, safety risks, and gender-based violence. The TAP will incorporate gender-focused measures, including needs assessments for gathering data, identifying obstacles, and creating opportunities for women in waste reduce, reuse, recycle (3rs) technology. The Ministry of Environment and Forestry will lead these efforts, providing workshops with significant female participation, empowering women with skills training, and supporting policy development for their leadership. The TAP aims to create an inclusive waste sector, fostering gender equality through partnerships promoting women-led enterprises in the waste technology realm, overseen by the Ministries of Finance and Planning, and Trade and Industry.

5.2 Project Ideas for Waste Sector

5.2.1 Specific project ideas

Project title: Promoting waste reduce, reuse, recycle (3Rs) of waste for climate change mitigation in South Sudan

5.2.2 Brief summary of the project ideas for the Waste Sector

Rapid urbanization in South Sudan results in a surge of waste generation due to high population growth and shifting consumption patterns, leading to pressing environmental concerns. The government urgently needs to address solid waste management issues, especially since the waste sector contributes 11% of greenhouse gas emissions with a significant rise in solid waste disposal emissions (UNFCCC, 2015). Implementing 3R technology can efficiently manage waste across urban areas. The proposed project aims to introduce and promote 3R technology through the Technology Needs Assessment process to address the country's environmental and economic issues. It emphasizes economically viable techniques, evaluating necessary infrastructure, and establishing pilot projects via public-private partnerships to enhance waste management practices and secure a sustainable future for South Sudan's cities**.**

5.2.3 Specific project ideas

Introduction/Background

In South Sudan, rapid urbanization, migration, shifting consumption, and high population growth have caused a surge in waste generation and disposal issues. The waste sector contributes 11% of GHG emissions, with a notable increase in solid waste disposal emissions. The government must address solid waste management through new strategies, as there is no specific law for this in South Sudan. Employing 3R technology can aid in managing waste efficiently across all cities.

In line with the country's current situation, the proposed project aims to utilize 3R technology for development and diffusion within the TNA process. It builds on previous work to address barriers to waste project development in South Sudan by promoting economically viable 3R techniques, evaluating necessary infrastructure, and establishing pilot decentralized projects through public-private partnerships for effective waste management.

Objectives

The project objective is to enhance waste management by implementing the 3Rs framework: Reduce, Reuse, and Recycle. It seeks to empower the community with knowledge and skills for responsible waste handling, fostering sustainability and inspiring active participation for a cleaner future and in the context of reducing emissions.

What are the outputs and are they measurable?

Output 1: Improved economic livelihood through strengthening of Reduce, Reuse, and Recycle management practice

Output 2: Increasing the reuse and recycling of building materials through the construction of 3R infrastructures

Following measurable outputs would be attained after the end of the program

- A guidebook on 3R techniques and financing models for promoting Reduce, Reuse, and Recycle at decentralized and centralized level A better understanding of the kind of support infrastructure needed for setting up and managing.
- An assessment of support infrastructure needed for setting up and managing 3R projects
- Pilots for demonstration for a decentralized reduce, reuse and recycling technology at household level.

Relationship to the country's sustainable development priorities (How does it relate to the mission and key strategies? Is it a new development?)

With the growing issue of solid waste generation and disposal, efforts will be made in exploring different solutions as well as formalizing the waste management sector in South Sudan. South Sudan has started exploring public-private partnership projects to improve solid waste management systems and even for setting up composting projects. The 3R technologies will be set up in Juba and there will be plans for setting up the same in other urban towns. South Sudan National Sustainable Development Strategy focuses on "sustainable management of solid waste in urban and rural settlements". Moreover, the project will help South Sudan in fulfilling its commitments made in the Nationally Determined Contributions (NDC), therefore, the proposed project will be in conformity with the sustainable development priorities of the country. MoEF will be responsible for overall coordination, particularly regulatory aspects of waste management in the country is in the process of developing an integrated strategy for waste management in the country of which 3R is a major component.

Project Deliverables

1. **Stakeholder and public consultation and engagement plan, communication plan.** The document will highlight key stakeholders and engagement tactics. A separate Communications Plan, created by Strategic Communications staff, complements the consultation plan by detailing strategic objectives and messages to promote the waste 3Rs strategy for climate change mitigation.
2. **Current waste management profile.** This report will detail Juba city's waste management system, covering existing 3R programs, initiatives, facilities, history, policy, legislation, education, enforcement, and performance.
3. **Needs assessment.** This report will document the Juba city's waste management needs over a 30-to-50-year planning horizon. The Needs Assessment will consist of three components: Vision and Guiding Principles; projections; and gaps, challenges and/or opportunities.
4. **Identify options to address needs.** Deliverable 4 will include the development of a list of potential options covering the full range of the waste management hierarchy, with a primary focus on the first 3Rs.
5. **Detailed evaluation of options, identify recommended options and current system overlay.** A detailed evaluation method will be created covering environmental, social, and

financial aspects for a comprehensive assessment. It ends with suggested viable options for Juba city.

6. **Strategy roadmap development.** After the recommended list of options was compiled and combined with the current system, a "roadmap" for implementation was developed.
7. **Final strategy.** The final step will involves preparing the Long-Term Waste Management Strategy, which outlines identified options and the preferred waste management system. This strategy fully documents the tasks, key information, decisions, and rationale.

Project Scope and Possible Implementation

The project will comprehensively focus on creating technical knowledge for central and local authorities, starting with a technology demonstration in major cities like Juba. An assessment study will evaluate various 3R technologies and financing models tailored to each city, contributing to an integrated waste management strategy in South Sudan. Pilot decentralized 3R projects will be initiated in selected cities, with Juba as a starting point for testing different techniques. High implementation possibility is ensured through direct linkage with the MoEF's waste management strategy, complementing existing public-private partnership initiatives with the MoEF and UNDP. The project aligns closely with the country's goal of developing NAMAs for the waste sector, leveraging its outcomes effectively.

Project activities

The project will be implemented by Juba city primarily in collaboration with the private sector and Non-Government Organizations (NGOs), development partners and the beneficiaries.

The activities of the proposed project include:

- Promote and educate on material reuse and recycling. Mass awareness through using print and electronic media and employing marketing agents and credit portfolio.
- Establish temporary storage facilities for reuse materials from private or public demolishing sites.
- Implementation of policy and institutional framework of the banks for supporting sustainable waste management in Juba.

Timelines

The project will be implemented by the Ministry of Environment and Forestry (MoEF) in collaboration with the private sector, Town Council authorities and Non-Government Organizations (NGOs), development partners and the beneficiaries to carry out a project with various activities supported, including workshops, awareness campaigns, and specialized training, all aimed at waste reduction. The total project budget is **USD 6,150,000** with detailed breakdown in the Table below

	Activity	Duration (years)	Budget (USD)	Main actors
1	Engage consultant to identify possible downstream uses of 3R technology	1	250,000	MoEF, City council, MoH
2	Prepare a list of possible 3R technologies and implementation models (e.g. decentralized, centralized, hybrid). With particular focus on techniques applicable at household level.	1	160,000	MoEF, City council and Local govt.
3	Undertake a cost benefit analysis of each technology/model	1	80,000	MoEF and
4	Describe implementation mechanism for each technique, identifying roles of involved agencies.	1	50,000	MoEF and Local govt.
5	Analyze possible financing models for different techniques of composting. Explore potential of PPP models, incentive schemes from municipalities for households to promote household level composting etc.	1	190,000	MoEF, City council, MoFP and State local govt.
6	Train youth in waste collection and eco-friendly production to improve community well-being.	5	400,000	MoEF, City council and Local govt.
7	Youth and women trained in up-cycling waste for income and composting kitchen waste to grow local food.	5	500,000	MoEF, City council and Local govt.
8	Public awareness campaigns based on a public IEC strategy. Activities will, for instance, include promotion of the RRR-slogan	5	600,000	MoEF, City council and Local govt.
9	Set-up a body to solicit funds for waste management	0.5	180,000	MoEF
10	Produce training programs on use of waste products targeting different stakeholders	5	230,000	MoEF
11	Begin to conduct Trials of Improved 3R Practices (TIPs) for key behaviors and willingness/ability to pay	2	260,000	MoEF, City council and Local govt.
12	Develop a new policy on waste management to encourage reuse, recycle, up cycle and waste to energy technologies	2	300,000	MoEF, City council and Local govt.
13	Improve local implementation and enforcement of laws, policies, and regulations	5	270,000	MoEF, MoJ and Local Government
14	Assess potential, locally viable technology and infrastructure solutions that may be recommended in future program years or support local/international decision making	2	80,000	MoEF, and Local govt.

15	Construct 5 plastic recycling facility in South Sudan that has presorting, sorting and recycling technologies by 2030	5	2,200,000	MoEF, City council and Local govt.
16	Develop minimum acceptable policy standards that support livelihoods, including living wage/benefits and working conditions standards	2	40,0000	MoEF, City council and Local govt.
Total			**6,150,000**	

Measurement/Evaluation

An assessment of stakeholder participation will be conducted; Processes towards development and implementation of legislation on reduce, reuse, recycle (3Rs); Assess carbon foot print; Process of selecting consultants; process of staff selection and Quality of staff trained; Land accessed for land fill; equipment selection process and integrity of education and training to stake holders.

Possible Complications/Challenges (What are the potential challenges and complications?)

Limited human resources in waste management processes can slow down progress, potentially causing delays in funding access and institutional structuring. Establishing clear roles and responsibilities is crucial to avoid implementation setbacks in waste management activities, including reduction and reuse, facility management, waste diversion, performance monitoring, education, regulation, and disposal. Addressing factors such as waste financing, recovery technologies, processing capacities, energy costs, and construction waste is essential for an effective waste management system.

Responsibilities and Coordination (Who does what, when and how?)

The Ministries of Environment and Forestry, Ministry of Finance and Planning will provide funding at different project stages, local authorities will carry out project activities, MoEF will monitor and enforce laws, Ministry of Justice and state local government will handle waste management laws, and MoEF will identify suitable landfill sites.

Cross-cutting issues

In South Sudan, common barriers hinder climate change mitigation technologies. A consistent waste management vision is lacking with no state agency dedicated to development. Fiscal support mechanisms and R&D institutions are crucial for successful technology dissemination. Strengthening international cooperation and improving access to technology information are also vital. Overall, a comprehensive national innovation system is needed for better collaboration between education, research, and businesses in South Sudan.

Chapter 6: Technology Action Plan and Project Ideas for Agriculture, Forestry, and Other Land Use (AFOLU) sector

6.1 TAP for Agriculture, Forestry, and Other Land Use (AFOLU) sector

6.1.1 Sector overview

Forests in South Sudan cover 30% of the land area, offering critical ecosystem services for livelihoods and local economies (Ministry of Environment, 2016). Resources like timber and plants support job creation and trade, but potential remains untapped. Documenting and analysing successful forest enterprises is crucial for informed policy decisions. Equipping forest communities with skills is essential for sustainable resource management and reducing dependency on forests for income.

Local farmers and forest communities have a good understanding of forest-based enterprises and farmers' associations reduce costs by sharing seedling production expenses and can handle maintenance. These enterprises offer socio-economic benefits, job opportunities, and specialized training for South Sudanese stakeholders. Communities can also benefit from nutritious forest products like fruits, honey, and mushrooms. For example, beekeeping is a profitable venture in the Jur Bele community, providing income with minimal space required for bee hives. Edible insect farming is another sustainable way to produce food rich in protein and nutrients, offering financial rewards and habitat preservation opportunities (MoEF,2024). Fruit tree cultivation and ecotourism are also recommended as profitable activities within forest-based enterprises in South Sudan.

6.1.2 Action Plan for Forest based enterprises technology

6.1.2.1 Introduction

Forest-based enterprises established in buffer zones and protected forests should minimize negative impacts by promoting restoration and conservation while enhancing livelihoods of adjacent communities. Communities manage the technology after receiving necessary training to generate various forest products for income and food security, reducing reliance on forest resources. Urgent intervention is needed from relevant authorities in South Sudan, including MoEF, local governments, private sector, and CSOs, to strengthen forest-based enterprises. Collaboration with Ministry of Wildlife Conservation and Tourism and South Sudan Wildlife Services is essential, especially for communities near national parks. Involvement of commercial tree companies and private growers is crucial to promote forest-based enterprises and engage surrounding communities effectively.

6.1.2.2 Ambition for the TAP

By 2030, The ambition is to deploy forest-based enterprise (FBEs) technology across nine forest areas in South Sudan through strategic planning and investment. Pilot projects will be established, with strong support from the Ministry of Environment, to address deforestation trends and

implement recommendations from the South Sudan Forests assessment report. Thus, ten forest landscapes chosen as entry points for advancing FBE b: 1) Boma Jonglei; 2) Didinga and Imatong Mountains; 3) Nangondi, Yaboa, and Mborizanga in Western Equatoria State; 4) Adjuong Thok in Pariang County; 5) Ifwoto land; 6) Doro Camp in Maban County; 7) Karich forest, lake state; 8) Kagelu land (Yei); 9) Kinaite Catchment, Eastern Equatoria; 10) Western Bahr el (Namatina), Khor-Abonge.

Forest adjacent local communities in the target landscape will be supported to actively engage in government initiatives to combat deforestation sustainably. Establishing forest enterprises is vital for livelihoods, conservation, and innovation. The Ministry of Environment and Forestry plans to introduce technologies like beekeeping, insect farming, fruit tree cultivation, and ecotourism as pilot projects before wider implementation. The Forest-Based Enterprises project intends to benefit 10,000 households (around 600,000 people), emphasizing women and youth participation. It aims to restore 100,000 hectares, equal to 5% of the land for restoration, enhancing carbon absorption, local employment, ecosystem conservation, and community livelihoods. These efforts align with South Sudan's forestry priorities, including NDC adaptation and national programs, supporting sustainable development and environmental stewardship.

Gender Considerations

In South Sudan, women, girls, and boys play vital roles but face challenges like restricted access to forest products and skewed income ownership (Nyathon Hoth et al, (2018). Women encounter barriers such as limited credit access, impacting economic opportunities and climate change adaptation. The TAP will empower women by providing knowledge and skills for active participation and leadership roles. Involving women's voices in decision-making and considering their needs in forest policy formulation. Gender-responsive data collection methods will be used for inclusive and unbiased data gathering. The TAP prioritizes gender inclusivity for a more equitable and sustainable forest sector in South Sudan.

6.1.2.3 Actions and activities selected for inclusion in the TAP

Summary of barriers and measures to overcome barriers

To achieve the stated ambition (in Section 6.1.1.2) for the transfer of technology, the major obstacles and actions that have been identified and previously recorded in the barrier analyses and enabling environment report for the Forest based enterprises technology (South Sudan BAEF Report, 2024), are shown in Table 35.

Table 35. Summary of barriers and measures to overcome barriers in Forest based enterprises technology.

Barrier category	Critical barrier	Measure to address the barrier
Economic and Financial	**Poor road network.** Bad roads in South Sudan affect economic	Regular maintenance and new road openings in these communities ease

	growth, access to essential services and social cohesion.	transportation of forest products, reducing transport charges.
	Limited access to credit facilities Limited financial access hinders enterprise development in forest-dependent communities.	Ensuring strong business institutions aid forest-based enterprises access services, certifications, and upgrade operations. Incentives or soft loans to the communities involved in forest-based enterprises and developing mechanisms such as microfinance, venture capital, and credit guarantee schemes to support their financial needs.
Non- financial	**Market availability.** Forest communities face challenges due to distant markets and high transport costs for selling their produce, impacting livelihoods**.**	Strengthening collaboration and networking among forest product value chain actors and venture communities boosts knowledge sharing and network formation.
	Quality and standard of products. South Sudan lacks the mandate to align products and services with local and international standards.	Enforce quality regulations and policies for forest-based enterprise products by sensitizing farmers to meet national and international standards.
	Lack of technical skills and knowledge. Limited technical skills hinder use of modern equipment for extracting honey, silk, or fruit juice, affecting storage, packaging, and value addition by local communities.	Communities should be trained in forest product handling to improve quality for markets. Training programs on entrepreneurship, management, marketing, and financial literacy with relevant skills to boost competitiveness.
	Insecurity. Political instability in South Sudan hampers support for forest-based enterprise development, hindering long-term investment planning for businesses and investors.	The Government must provide security for communities living near and relying on forests, safeguarding against vandalism by conflicts and theft.

Actions selected for inclusion in the TAP

The most vital measures for addressing the major barriers advancing adaptation in the forestry sector through FBEs as prioritized during the BAEF identification phase of the Technology Needs assessment for the forestry sector include the following:

- Enhancing access to inputs and services supporting of forest-based enterprise (FBEs)

- Strengthening institutional capacity for forest-based enterprises (FBE) development
- Reinforce policy implementation and enforcement to facilitate the transfer of FBEs
- Strengthening information and awareness creation about Forest based enterprise (FBEs)

Activities identified for implementation of selected actions

The three measures selected as actions for the promoting forest-based enterprises (FBEs) were detailed into specific activities, as outlined in Table 36.

Table 36. Summary of actions and corresponding activities for promoting forest-based enterprises under each measure

Action	Activities for Action Implementation
Action 1: Enhancing access to inputs and services supporting of forest-based enterprise (FBEs)	1. Improve access by men, women and youth to market infrastructure and information. 2. Improve access by women and men, youth to transport forest-based enterprises products and services agro- forestry, products and services to the market. 3. Promote the saving culture by the forest adjacent communities and their organizations, (including men, women, and youth) for investment in FBEs. 4. Provide entrepreneurship funds to boost economic activities for forest adjacent communities targeting women and youth. 5. Conduct training, awareness & advisory meetings on financial management targeting women, youth with the forest landscape. 6. Providing linking between the women & youth to financial institutions for continuous provision of financial services. 7. Providing trainings involving key actors at community level;
Action 2: Strengthening institutional capacity for forest-based enterprises (FBE) development	1. Advance community & mass awareness creation on impacts of bush burning & stray livestock grazing. 2. Work with cultural institutions to change mind-set, behaviour and attitudes linked to bush burning and stray livestock grazing. 3. Promoting awareness about existing policies and laws, which provide for and protect these rights and obligations
Action 3: Reinforce policy implementation and enforcement to facilitate the transfer of FBEs	1. Update/review of outdated policies-laws – for discouraging bush burning and stray livestock grazing 2. Strengthen enforcement of forestry & land policies, laws and guidelines through proactive stakeholder

	engagement and standards for quality at different scales. 3. Strengthen local extension services for effective agriculture and forestry support to communities, including women, youth, and men, focusing on forest-based enterprises. 4. Strengthen implementation/enforcement of bush burning & livestock grazing bylaws and ordinances where they exist.
Action 4: Strengthening information and awareness creation about Forest based enterprise (FBEs)	1. Enhance capacity of community institutions, like forest management groups, by signing collaborative agreements for effective forest enterprise management. 2. Strengthen institutional capacity (limited resources allocation) of mandated institutions (e.g. Local Governments, MoEF and MAFs to effectively promote FBEs in all the states. 3. Facilitate visioning, planning for forest management groups and enterprises. Enhance forest-based enterprise value chains. 4. Strengthen leadership skills of the collaborative forest management group leaders. 5. Enhance business skills within community and forest management groups, involving men, women, and youth. 6. Promote access to structured training, exposure and mentoring- targeting and involving men, women and youth. 7. Improve organization & coordination capacity by the forest adjacent communities through bulk production and marketing. 8. Provide training, mentoring, and support for forest adjacent communities on establishing and managing forest enterprises. 9. Strengthen knowledge of women youth and men and skills for mobilization and management of savings and credit schemes by forest adjacent communities and their organizations.

Actions to be implemented as Project Ideas

The selected actions to be implemented as project ideas are actions 1,2,3 and 4 for many reasons. Tthese actions are selected because they represent the core pillars needed to establish, operate, and

sustain the forest-based enterprises: feasibility, financing, and capacity. Together, they address the project's key risks and opportunities.

Table 37. Action to be implemented as Project ideas

S/N0	Action to be implemented as Project ideas
Action 1	Enhancing access to inputs and services supporting of forest-based enterprise (FB
Action 2	Strengthening institutional capacity for forest-based enterprises (FBE) development
Action 3	Reinforce policy implementation and enforcement to facilitate the transfer of FBEs
Action 4	Strengthening information and awareness creation about Forest based enterprise (FBEs)

Gender considerations

The TAP activities will focus at achieving significant gender outcomes by developing income-generating initiatives tailored for women, promoting economic independence and community empowerment. Capacity building will strengthen associations advocating for women's rights, enabling them to challenge inequalities and drive social change. Increasing women's engagement in forest enterprise will encourage participation in decision-making groups, supported by comprehensive training in forest management. This enhanced participation is vital for sustainable forest management and empowering women in policy-making processes, fostering a more equitable and inclusive future.

6.1.2.4 Stakeholders and timeline for implementation of TAP

Overview of Stakeholders for the implementation of the TAP

Overview of Stakeholders the roles of the main stakeholders for the implementation of the TAP for forest based enterprise are given in Table 38.

Table 38. Showing overview of Stakeholders for the implementation of the TAP

Action to be implemented	Key Roles of the stakeholder
Enhancing access to inputs and services supporting of forest-based enterprise (FBEs)	Ministry of Environment and Forestry (MoEF), Ministry of Agriculture and food Security (MAFs) Ministry of Road and Bridge, Ministry of Wildlife and Conservation, South Sudan wildlife Services, State level local government, County Directorate of Agriculture and Forestry (CAD) and Private tree growers/ members of the South Sudan Timber Growers, Association).
Strengthening institutional capacity for forest-based enterprises (FBE) development	Ministry of Environment and Forestry (MoEF), State Ministry of Agriculture and forestry, State Ministry of local government t; CSOs; NNGOs, and County Directorate of agriculture and forestry.

Reinforce policy implementation and enforcement to facilitate the transfer of FBEs	Ministry of Environment and Forestry (MoEF), State Ministry of Local Government, Cultural institutions – Council of local chief, County Directorate of Agriculture and Forestry.
Strengthening information and awareness creation about Forest based enterprise (FBEs)	

Scheduling and sequencing of specific activities

The detailed activities for each of the actions, the associated responsible key stakeholders who will be involved in the planning and implementation; and the sequencing and timelines for implementation of each of the planned activity in the TAP is detailed in Table 40.

6.1.2.5 Estimation of resources needed for action and activities

Estimation of capacity building needs. Key actors need solid technical knowledge for developing forest-based enterprises, preparing proposals, and meeting partners' requirements to secure funding. Capacity building for all stakeholders is crucial, enhancing their competencies to address challenges, seize opportunities, and support the diffusion of the technology for climate change adaptation.

Estimations of costs of actions and activities

Building on the previous based economic evaluation conducted as part of the process for preparing the South Sudan BAEF Report, 2024, the projected cost for the TAP's actions and activities (see Table 40) was established. Additionally, these were revised in light of the estimated costs of the inputs used to carry out these activities and actions.

Gender Considerations

The TAP will launch a gender-responsive capacity-building initiative in forest-based enterprises, focusing on inclusivity and empowering marginalized groups. This includes revising community forestry plans to be gender-responsive, addressing the needs of both women and men for equal empowerment in managing forest-based resources. By integrating gender interests into technology capacity-building, the goal is to provide fair access to opportunities and resources for sustainable practices. Training programs will equip both men, women, girls and boy with skills for success in forest enterprises, promoting economic independence and a diverse workforce. The overarching aim is to boost productivity and create a more inclusive and equitable future for all community members in forest-based enterprises.

6.1.2.6 Management planning

Risks and Contingency Planning

Table 39 outlines contingency planning as a reaction to mitigate the risks that have been identified. Together with the TAP, the contigency plan's operations ought to be carried out. Planning for Emergencies

Table 39. Risks and Contingency Planning

Activity	Risk	Contingency plan
Enhancing access to inputs and services supporting of forest-based enterprise (FBEs)		

Increased availability of market infrastructure and information for women, men, and young people	Some women and youth may lack access to market information due to affordability constraints.	Encourage the Directorate of forestry to share market information for forest-based products with forest-adjacent communities.
Improve access by women and men, youth to transport forest-based enterprises products and services agro-forestry, products and services to the market	Government priorities for transport infrastructure investments may differ, potentially leading to delays in project timelines.	Advocating for transportation infrastructure development in forest-based enterprise areas is essential to enhance market access, sustainable practices, and economic growth in these regions
Promote the saving culture by the forest adjacent communities and their organizations,	The savings can be used for several other uses	Training on forest adjsut acommunities on saving culture and financial management
Provision of various alternative livelihood options and services	The decision to adapt/ adopt and or practice the alternative livelihood options is with the beneficiaries application	Raising community awareness enables informed decision-making on adopting sustainable livelihoods, fostering economic resilience through diverse opportunities and education.
Strengthening institutional capacity for forest based enterprises (FBE) development		
Inadequate access to forest extension services	Inadequate allocation and unclear sharing of budgets and roles both at the national and sub national level slow down the diffusion of the technology	The project will contribute towards delivery of forest extension services in the areas where project interventions will be implemented.
Conduct 10 state level and administrative areas studies on forest based enterprises	Inadequate reliable information on the actual situation of forest based products	Conduct a field study to understand forest based product enterprises potential of each of the ten states.
Mobilise and form a FBEs management committee at the Payam and Boma level adjacent to forest.	Unwillingness of community members to serve on committee. Inactive committee members and politicizing the irrigation association.	Clarifying the significance of a committee; offering non-financial benefits; Careful screening of committee members; Defining committee duties and responsibilities
Set up information sharing hub (a desk at the state level office in coordination with the state MoEF	Inadequate funds to run the hub and low utilisation of the E information E options	Update information regularly Customise info for different users. Use radio which is widely

	limited by inadequate access to phones.	available to provide information updates
Reinforce policy implementation and enforcement to facilate the transfer of FBEs		
Forest policy formulation and update/review of outdated policies-laws ordinances- bylaws	Policy development, review and formulation takes longer period of time	Project stakehlder should also advocate for practices change in the development and formulation of policies and laws Among key actors
Strengethening information and awareness creation about Forest based enterprise		
Work with cultural institutions to change mindset, behavior and attitudes on bush burning and stray livestock grazing	Changing mindset and attitude take a long time, thus generations.	Targeted, responsive and continous awareness creation will be implemented through the project right from inception upto the end

Next steps

For purposes of achieving a sharpened focus of the TAP in respect to mobilizing the required appropriate resources to advance implementation of the TAP, the following immediate and critical requirements.

Immediate requirements	Government to immediately help a meeting with key actors involved in TAP implementation. The Ministry of Environment will coordinate with the Forestry Directorate to invite stakeholders. The goal is to engage relevant directors and achieve specific objectives. Government need to immediately translate TAP into program concept, note for funding agencies, integrate TAP actions into plans, identify resource needs, find financing opportunities, engage stakeholders for input.
Critical steps	Key steps include engaging with top leadership at National MoEF, particularly the Directorate of Forestry, for guidance and support. This involves presenting the program concept note to Ministry leaders and relevant sector working groups for approval, as well as starting interactions with funding agencies for practical advice on preparing proposal documents.

Gender considerations

The TAP will focus on identifying and mitigating gender issues during forest-based enterprise technology implementation by preparing a gender action plan and assessment to identify and analyze where gender issues are relevant to the project, identify the potential beneficiaries and examine men and women's ability to participate in the forest-based enterprises development. Consider the participants' motivation, knowledge, and skills and how the project could integrate

into their culture. It will develop a Gender Action Plan outlining strategies to address gender inequalities and diverse needs. A gender assessment will be conducted to identify relevant gender areas and promote inclusivity. The goal is to create an equitable framework for successful technology implementation.

6.1.2.7 Reporting

Table 40. Promoting the Forest Based Enterprises Technology Overview Table

Sector	Water and Environment							
Sub-sector	Forestry							
Technology	Promoting Forest based enterprises e.g. bee keeping							
Ambition	Promote climate change adaptation forest-based businesses to 200,000 households across 10 South Sudanese forest landscapes by 2030.							
Benefits	Forest-based products aid in carbon emission reduction, bolstering sustainability through shared ecological stewardship with communities for mutual benefits like improved nutrition, health, biodiversity, and resilience, fostering sustainable livelihoods and environmental health.							
Action	**Activities to be implemented**	**Sources of funding**	**Responsible body and focal point**	**Time frame (years)**	**Risks**	**Success criteria**	**Indicators for Monitoring of implementation**	**Budget per activity (USD)**
1) Enhancing access to inputs and services supporting of forest-based enterprise (FBEs)	Increased availability of market infrastructure and information for women, men, and young people	GOSS, AfDB, World Bank, JICA and other development partners	MoEF, CAD, MAFs, state local government	5	60% of women and youth lack affordable market information access.	At least 50% of young women benefit from improved market access.	Number of men and youth benefited from improved market access and information.	4,500,000
	Enhance access for women, men, and youth to transport forest-based products and agro-forestry services to the market.	GOSS, JICA, UNDP, GCF, AfDB, World Bank	MoEF, MAFs and CAD, CSOs and NNGOs	5	Government priorities can vary, causing delays in transportation projects.	At least 50% of women, and youth benefit from improved transport for forest	Number of youth, women and better access to transport for forest-based enterprises products and services.	3,000,000

						products in agro-forestry.		
	Promote the saving culture by the forest adjacent communities and their organizations,	GOSS, JICA, UNDP, GCF, AfDB, World Bank	State MoEF, Local bank and South Sudan Microfinance Development Facility; INGOs and CSOs	5	The savings can be used for several other uses	50% of men, women, and youth in forest communities engage in financial savings.	Number of individuals engaged in financial saving activities in forest adjacent community organizations.	2,700,000
	Promote access and control to financial management training through collaboration with financial institutions	GOSS, JICA, UNDP, GCF, AfDB, World Bank and other development partners	State MoEF, County Directorate of agriculture and forestry, INGOs, CSOs	5	The decision to apply and or practice the knowledge is with the trained beneficiaries	At least 50% of farmers trained applying the knowledge & skills on financial management	Number of men, women and youth that have benefited from financial management training through collaboration	600,000
	Provision of various alternative livelihood options and services	GOSS, JICA, UNDP, GCF, AfDB, World Bank and other development partners	State Community Development Officer, SFO; CSOs	5	The decision to adapt/ adopt and or practice the alternative livelihood options are with the beneficiaries	At least 50% of beneficiary farmers practicing alternative livelihood options	Number of men, women and youth that have benefited from various alternative livelihood options and services	900,000
	Promoting alternative gender responsive	GOSS, JICA, UNDP, GCF, AfDB, World	MAFs, MoEF and County Directorate of	5	Operating and maintaining	50% women, men, and youth using	Number of Women, men, and youth use	1,200.000

	technology for easing land clearing and opening for agricultural production	Bank among other development partners	agriculture and forestry, CSOs		the equipment may require extra skills not found in the community.	gender-responsive tech for land clearing and agriculture production like tractors, oxen ploughs, and minimal tillage.	gender-responsive technology for agricultural production, including tractors and oxen ploughs.	
2) Strengthening institutional capacity for forest-based enterprises (FBE) development	a) Strengthen institutional capacity community-based institution	GOSS, JICA,UNDP and other development partners	MAFs, MoEF and County Directorate of agriculture and forestry	5	Capacity building involves continuous learning and the effective utilization of skills by beneficiaries.	100 % of the community-based institutions institutional capacity built effectively to managed forest- based enterprises	Number of community-based institutions that have benefited from institutional capacity building	320,000
	b) Strengthen institutional capacity of mandated institutions to effectively support/ promote forest-based enterprise	GOSS and Development partners	MAFs, MoEF and County Directorate of agriculture and forestry	5	Capacity building is a continuous engagement and the application of the acquired knowledge and skills are	100 % of the mandated institutions which benefited from capacity building interventions supporting/	Number of mandated institutions that have benefited from capacity building interventions targeted at providing	280,000

					largely dependent on the beneficiaries	promoting forest-based enterprise	effective support/ promotion of forest- based enterprise	
	c) Support visioning, action and business planning for the collaborative forest management groups and associated forest-based enterprises	GoSS and Development partners	MAFs, MoEF, CSOs, NNGOs and the CAD	5	i) Decision to apply and or practice the knowledge is with the trained beneficiaries. ii) Trained leaders can be taken up/ recruited into other leadership position in the community	100% collaborative forest management groups and associated forest-based enterprises associations applying visioning, action and business planning engagements	Number of collaborative forest management groups and associated forest-based enterprises associations that have benefited from visioning, action and business planning engagements	380,000
	d) Strengthen leadership skills of the collaborative forest management group leaders	GOSS and Development partners like UNDP	MAFs, MoEF, CSOs, NNGOs and the County Directorate of Forestry (CDF)	5	The trained leaders can potentially be taken up/recruited into other leadership position in the community	100% collaborative forest management groups leaders applying leadership knowledge and skill	Number of collaborative forest management group leaders that have benefited from leadership skills and knowledge enhancement	400,000

	e) Strengthen organizational and business skills among forest adjacent community organizations	GoSS and Development partners	MAFs, MoEF and County Directorate of Forestry	5	Capacity building involves continuously applying acquired knowledge and skills, which is largely dependent on the beneficiaries	At least 50% of community-based and forest adjacent organizations applying organizational and business skills.	Number of Community and forest adjacent organizations benefited from organizational and business skills engagements.	500,000
	f) Promote access to structured training, exposure and mentoring-targeting and involving men, women and you	GoSS and Development partners	MAFs, MoEF	5	Capacity building is a continuous engagement and the application of the acquired knowledge and skills are largely dependent on the beneficiaries	At least 50% of men, women and youth applying the knowledge and skills from structured training, exposure and mentoring	Number of men, women and youth that have benefited from structured training, exposure and mentoring	700,000
	g) Improve organization & coordination capacity by the forest adjacent	GoSS and Development Partners	MAFs, CSOs	5	The various actors along the value chain value different	At least 50 engagements in respect to bulk production	Number of engagements in respect to bulk production and marketing	340,000

	communities – through bulk production and marketing				interest and expectations, which will not all the addressed by the intervention	and marketing conducted by the forest adjacent communities in a coordinated manner	conducted by the forest adjacent communities in a coordinated manner	
	h) Conduct targeted trainings, mentoring and backstopping in forest-based enterprise	GoSS and Development partners	MoEF; MAFs Officer, CSOs	5	Inadequate forest extension staff at Local Government	At least 50% of the trained forest adjacent communities apply the knowledge & skills in forest-based enterprises	Number of trainings, mentoring and backstopping engagements conducted in forest- based enterprise	420,000
	i)Strengthen knowledge and skills on savings and credit schemes by forest adjacent communities and their organizations	GoSS and Development of	MAF; MoEF County Directorate of Forestry and Environmental Protection	5	Capacity building is continuous and the application of the acquired knowledge and skills are largely dependent on the beneficiaries	At least 50% of the trained women youth and men apply the knowledge & skills for mobilization and management of savings	Number of women youth and men who have benefited from skills and knowledge in savings and credit schemes by forest adjacent communities	300,000

						and credit schemes		
3) Reinforce policy implementation and enforcement to facilitate the transfer of FBEs	a) Update/review of outdated policies-laws – ordinances-bylaws For discouraging bush burning and stray livestock grazing	GoSS, MAFs and Development partners such as UNDP, AfDB and World Bank	MoEF, MAF; County Directorate of agriculture, livestock, State local Government	5	Policy reviews and formulation takes longer period of time	At least 5 outdated policies/laws reviewed to come up with strategies for discouraging bush burning and stray livestock grazing	Number of outdated policies/laws reviewed to come up with strategies for discouraging bush burning and stray livestock grazing	250,000
	b) Strengthen enforcement of forestry & land policies, laws and guidelines	GoSS, MAFs and Development partners such as UNDP, AfDB and World Bank	MoEF, MAFs, Local Government	5	Inadequate forest extension staff at Local Government	At least 50% of cases flouting land policies, laws and guidelines that have been reported and reprimanded	Number of cases flouting land policies, laws and guidelines that have been reported and reprimanded	340,000
	c) Strengthen the agriculture and forestry extension services at the local Government levels for effective service deliver	GoSS, MAFs and Development partners such as UNDP, AfDB and World Bank	MoEF, MAF; County Directorate of agriculture, livestock (CAD) State local Government	5	Inadequate forest extension staff at Local Government	At least 80% of community members and farmers (including women, youth &	Number of Community members and farmers, including women, youth, and men, access local government	600,000

						men) managing forest-based enterprises effectively	services for forest-based enterprise management.	
	d) Strengthen enforcement of guidelines and standard	GOSS and Development partners	MoEF, State Ministry of Local Government and the CAD	5	Inadequate capacity of the Uganda National Bureau of Standards	At least 50% of cases flouting standards and guidelines reported & reprimanded	Number of cases flouting standards and guidelines reported & reprimanded	450,000
	e) Strengthen implementation/ enforcement of bush burning & livestock grazing bylaws and ordinances where they exist	GoSS and Development partners	MoEF, MAFs and Ministry of Wildlife and Tourism and the state	5	Inadequate forest extension staff at Local Government	At least 50% of cases flouting bush burning & livestock grazing bylaws and ordinances that have been reported and reprimanded	Number of cases flouting bush burning & livestock grazing bylaws and ordinances that have been reported and reprimanded	160,000
4**) Strengthening information and awareness creation about Forest based enterprise (FBEs)**	a) Advance community & mass awareness on bush burning & stray livestock grazing	GoSS and Development partners	State Ministry of Local government and MoEF, NNGOs and CSOs	5	Changing mindset and attitude takes a long time, thus generation	At least 10 community and mass awareness events on bush burning & stray	Number of community and mass awareness creation events on bush burning & stray livestock	350,000

						livestock grazing conducted	grazing conducted	
	b) Work with cultural institutions to change mindset, behavior and attitudes on bush burning and stray livestock grazing	GOSS, JICA,UNDP and other development partners	State Ministry of Local government and MoEF, NNGOs and CSOs	5	Changing mindset and attitude takes a long time, thus generations	100 % of Cultural institutions worked to changed community attitudes and behaviors on bush burning and livestock grazing.	Number of cultural institutions engaged targeted at changing the mind-set, behavior and attitudes	300,000
	c) Promote targeted awareness on policies and laws, on these rights and obligation	GOSS, UNDP, AfDB and other development partners	MoEF, CSOs; NNGOs and state local government	5	Changing mindset and attitude takes a long time, thus generation	At least 50% of the forest adjacent community households have received information on policies and law	Number of forest-adjacent community households who have received information on policies and laws	600,000

Gender considerations

Gender considerations in TAP reporting for forest-based enterprises include gender-disaggregated indicators to monitor women's participation in capacity-building programs, employment, and decision-making. Reports will emphasize gender-specific outcomes like improved transport access and women's involvement in steering committees. Success criteria will evaluate how technology enhances social equity, benefiting women and vulnerable groups. Capacity building reports will track women's technical training involvement, promoting equitable skill development.

6.1.2.8 Tracking the implementation status of the TAP

Rationale, responsibility and content of TAP tracking

The proposed process for tracking the implementation of the TAP includes a comprehensive Monitoring and Evaluation (M&E) Framework that meticulously outlines clear institutional responsibilities, timelines, and the specific information to be tracked. This framework will be strategically designed to monitor key outputs and overall progress, ensuring that all activities align seamlessly with established transport policies and Public-Private Partnerships (PPPs). By establishing a robust framework, the TAP aims to facilitate transparency and accountability in the execution of transport initiatives. The proposed timeline for this critical initiative spans a period of five years, commencing in 2025 and concluding in 2030. This extended timeframe allows for thorough assessments and adjustments as necessary to optimize effectiveness. Institutions such as the Ministry of Environment and Forestry will play a pivotal role in leading the development of guidelines, procedures, and tools for M&E. They will be responsible for ensuring that a comprehensive M&E framework exists, which will allow for confident and accurate reporting against all indicators, thereby enhancing the overall impact and sustainability of the TAP initiatives. The involvement of various stakeholders throughout this process is essential for fostering collaboration and ensuring that the objectives of the TAP are met effectively and efficiently.

Gender considerations

The TAP will integrate and use a gender-responsive evaluation approach to gather inputs from diverse socio-economic groups, including both women and men. This will enhance understanding of the project's impact through comprehensive feedback mechanisms and mid-term evaluations. A dedicated gender specialist will oversee gender-related aspects, ensuring thorough gender integration, analysis and empowerment activities for women. The TAP will monitor progress with gender-sensitive indicators and conduct social assessments, including consultations with women and/or groups engaged in the forest-based enterprise (FBEs). Gender equality goals will be explicit objectives, supported by gender-specific safeguards and due diligence processes during the TAP implementation.

6.2 Project Ideas for Agriculture, Forestry, and Other Land Use (AFOLU) sector

6.2.1 Specific project ideas

Project title: Promoting climate-friendly forest-based enterprise in South Sudan for climate change mitigation.

6.2.2 Brief summary of the project ideas for the Waste Sector

Forests play a crucial role in mitigating climate change by sequestering carbon dioxide and promoting biodiversity. However, unsustainable logging practices and inefficient value chains often contribute to deforestation and greenhouse gas emissions. Forest-based enterprises are at risk of getting depleted during to deforestation. This project aims to address these challenges by promoting sustainable forest-based enterprise practices and establishing climate-friendly value chains for forest products in Boma Jonglei, Didinga and Imatong Mountains forest landscape. Implementing forest-based enterprises will help mitigate climate change by undertaking activities such as sustainable forest management, nature-based solutions, and forest-based bio economies. Non-timber forest products producers and processors may be supported to produce forest-based products such as shea butter, herbal medicines, honey, gums, resins, oils, spices, and foods/fruits). This enterprise can help reduce greenhouse gas emissions and improve the quality of life in local communities

5.2.3 Specific project ideas

Introduction/Background

South Sudan's forests cover 30% of the land, playing a crucial ecological role. These forests provide vital services for people and Indigenous communities, offering food, medicine, materials, supporting biodiversity, and sequestering carbon. Challenges like climate change-induced desertification contribute to deforestation. Economic decline and conflicts drive charcoal production as a livelihood, accelerating forest decline. Deforestation factors include illegal logging, agriculture, settlement encroachment, and unsustainable practices. Infrastructure development threatens forests. Effective management is crucial to avoid irreversible damage to South Sudan's forest heritage and future Forest-based enterprises. Therefore, the demand and pressure exerted on forest resources call for a concerted effort to invest in the raising of stock to support forest-based enterprise development.

In line with the country's current situation, the proposed project idea aims to promote sustainable forest-based enterprises, establish climate-friendly value chains for forest products, empower local communities through environmentally responsible methods, and raise awareness about the importance of preserving forest ecosystems for long-term economic and environmental sustainability.

Objectives

The project objective is to promote sustainable forest management; increase benefits from forests and contribute to net Greenhouse Gas (GHG) Emission reductions in selected target forest landscape in South Sudan. The project will strengthen sustainable forest-based enterprise practices and establish climate-friendly value chains for forest products. The project will have

aimed to promote non-timber forest-like beekeeping, basketry, wood carving, fruit tree growing, medicinal herbs, and many more. Women and youth, and the general communities adjusted to the forest will be involved to take an opportunity to develop these FBEs. Honey and other bee products, Green charcoal briquettes, basketry, fruit tree growing, and herbal medicine will be the specific forest-based enterprise.

What are the outputs and are they measurable?

Output 1: Improve the livelihood of forest dependent poor people through community-based forest enterprises and green jobs

Output 2: Improve and expand community local forest management

Strengthening forest management, conservation, and business development

Output 2: Promote sustainable forest-based livelihood and enterprise in forest dependent communities

Following measurable outputs would be attained after the end of the program

- Adoption of sustainable forest management practices by forest owners and forest-based entrepreneurs, resulting in reduced deforestation rates and increased carbon sequestration.
- Improved efficiency and reduced emissions in the forest product value chains, contributing to climate change mitigation efforts.
- Enhanced capacity of local communities, government agencies, and forest-based industries players to implement sustainable forestry practices.
- Increased consumer awareness and demand for climate-friendly forest-based products, driving market transformation towards sustainability.
- Strengthened collaboration among stakeholders, fostering a supportive forest-based enterprises for climate-friendly forest product value chains.

Relationship to the country's sustainable development priorities (How does it relate to the mission and key strategies? Is it a new development?)

Forests are not only vital for environmental sustainability but also play a critical role in the socio-economic development of South Sudan. This is particularly true for the rural population, which heavily relies on forests for various non-timber forest resources, including medicinal plants, fruits, and other materials that are essential for their daily livelihoods. These forests also provide numerous job opportunities, supporting local economies and attracting investments that can foster long-term growth. The proposed project aims to significantly contribute to the achievement of South Sudan Nationally Determined Contributions (NDC) targets through the implementation of sustainable forest management practices. By enhancing carbon capture potential, introducing energy-efficient technologies, and facilitating development and investment in rural communities, the project will promote inclusive green jobs that benefit the local workforce. Additionally, it will work to reduce the risk of climate-driven forest fires, which pose a significant threat to both ecosystems and communities. Furthermore, developing local capacities to address these risks is essential for ensuring resilience and sustainability in the face of climate change challenges. Such initiatives underscore the interconnectedness of environmental stewardship and socio-economic advancement, ultimately leading to a more sustainable future for South Sudan

Project Deliverables

1. Successful conducted coaching and training of forest based MSMEs and forest owners to develop and implement forest management models and approaches
2. Potential community-based forest enterprises according to the availability of resources and market identify and report submitted.
3. Forest Enterprises and green job creation groups established in the target forest landscape
4. Forest based small and medium forest enterprises (SMFEs) entrepreneurs are trained to effectively management forest resources.
5. Workshop and seminar on best practices and lesson learn on community forest management practices conducted.
6. Forest enterprises groups and cooperatives trained and legal register and link to stable market for their forest based products.
7. Entrepreneurship and business skill development training conducted and business plan for each group finalised
8. Training/workshop on sustainable forest management and community-based enterprises completed in all the target forest landscape
9. Market-based value chain analysis for the forest-based products conducted, and report submitted.

Project Scope and Possible Implementation

The project will comprehensively focus on creating technical knowledge for central and local authorities, starting with a technology demonstration in major cities like Juba. An assessment study will evaluate various 3R technologies and financing models tailored to each city, contributing to an integrated waste management strategy in South Sudan. Pilot decentralized 3R projects will be initiated in selected cities, with Juba as a starting point for testing different techniques. High implementation possibility is ensured through direct linkage with the MoEF's waste management strategy, complementing existing public-private partnership initiatives with the MoEF and UNDP. The project aligns closely with the country's goal of developing Sustainable Forestry Sector, leveraging its outcomes effectively.

Project activities

The project will be implemented by National Ministry of Environment and Forest (MoEF), State Minister of Agriculture, Environment and Forestry primarily in collaboration with the private sector and Non-Government Organizations (NGOs), development partners and the beneficiaries.

The activities of the proposed project include:

- Coaching and train forest based MSME and forest owners to develop and implement forest management models and approaches
- Identification of potential community-based forest enterprises according to the availability of resources and market.
- Establishment of Forest Enterprises and green job creation groups in each of the target forest landscape
- Training forest based small and medium forest enterprises (SMFEs) entrepreneurs in effectively in forest management
- Dissemination seminar on best practices and lesson learn on community forest management practices

- Training on establishing forest enterprises and cooperatives legal registration, sustainable management and establishing the stable market
- Conduct entrepreneurship and business skill development Training
- Organised training/workshop on sustainable forest management and community-based enterprises
- Conduct market-based value chain analysis for the forest-based products
- Development of Business Plan for the forest-based enterprise entrepreneurs
- Support the establishment of forest-based Enterprises in all the target forest landscape

Timelines

The project will be implemented by the Ministry of Environment and Forestry (MoEF) in collaboration with the private sector, State local government, CAD, private sector, The South Sudan Wildlife Service (WLS), traditional leaders and Non-Government Organizations (NGOs), development partners and the beneficiaries to carry out a project with various activities supported, including workshops, awareness campaigns, and specialized training, all aimed at waste reduction. The total project budget is **USD 2,610,000** with detailed breakdown in the Table below.

Activity	**Duration (years)**	**Budget (USD)**	**Main actors**
Coaching and train forest based MSME and forest owners to develop and implement forest management models and approaches	2	100,000	MoEF and Local Govt SSWLS), state Directorate of forestry and CAD
Conduct a diagnostic study on small and medium sized forest-based enterprises	1	30,000	MoEF and Local Govt.,
Identification of potential community-based forest enterprises according to the availability of resources and market.	5 months	40,000	MoEF and State Local Government
Establishment of Forest Enterprises and green job creation groups in each of the target forest landscape	5 months	20,000	MoEF and State Local Government
Training forest based small and medium forest enterprises (SMFEs) entrepreneurs in effectively in forest management	2	80,000	MoEF and Local Govt. and NGOs and UN agencies
Dissemination seminar on best practices and lesson learn on community forest management practices	2	25,000	MoEF and Local Govt., NGOs, and private sector
Training on establishing forest enterprises and cooperatives legal registration, sustainable	1	35,000	MoEF and Local Govt., MAFS, NGOs, and private sector

management and establishing the stable market			
Conduct entrepreneurship and business skill development Training	2	30,000	MoEF and Local Govt., NGOs, and private sector
Organised training/workshop on sustainable forest management and community-based enterprises	2	25,000	MoEF and Local Govt., NGOs, and private sector
Conduct market-based value chain analysis for the forest-based products	5 months	25,000	MoEF and Local Govt
Development of Business Plan for the forest-based enterprise entrepreneurs	5 months	8,000	MoEF and Local Govt., NGOs
Support the establishment of forest-based enterprises in all the target forest landscape	2	28,000	MoEF and Local Govt., NGOs
Develop market linkages between forest-based producers and industry	2	18,000	MoEF and Local Govt. and companies
Conducting analysis and producing report on customary law and social norms in the target forest landscape that will be identified	3	20,000	MoEF and Local Govt, Local Traditional leaders
Conduct awareness concepts and practices on sustainable forest management issues at community level	3	600,000	MoEF and Local Govt., Local Traditional leaders
Support Law Enforcement to maintain Forest Integrity Through Analysis and Action Planning	2	600,000	MoEF and Local Govt. SSWLS), state Directorate of forestry and CAD
Facilitated workshop and meeting private sector engagement for market-based forest conservation friendly value chains.	1	12,000	MoEF and Local Govt., private sector like companies
Analysis to identify training needs and content for the environmental justice system	2	30,000	MoEF and Local Govt., private sector
Training local villagers on multiple functional utilization of forest and developing substitute energy to relieve the pressure on forest	3	750,000	MoEF and Local Govt., private sector like companies and NGOs
Update/review of outdated policies-laws – ordinances- bylaws. For discouraging bush burning and stray livestock grazing	1	50,000	MoEF and Local Govt.
Enforce forest management guidelines, including bush burning	2	18,000	MoEF, State local government

& livestock grazing bylaws where applicable.			
Advance community & mass awareness on bush burning & stray livestock grazing	2	14,000	MoEF and Local Govt. SSWLS), CAD
Work with cultural institutions to change mindset, behavior and attitudes on bush burning and stray livestock grazing	2	22,000	MoEF and Local Govt.
Raise awareness of forest community rights and obligations through policy and law campaigns.	2	30,000	MoEF, State local government
Total		**2,610,000**	

Measurement/Evaluation

This project will be measured and evaluated by assessing the hectares of degraded forests that have been restored within the targeted forest landscapes. Additionally, The Project will track the number of climate change mitigation actions and innovative technologies that have been successfully implemented in both natural and plantation forests throughout the forest landscape. By monitoring these key indicators, we aim to gain a comprehensive understanding of the project's impact on forest restoration and climate change mitigation.

Possible Complications/Challenges (What are the potential challenges and complications?)

The community, stakeholders, and the forest landscapes have high expectations for the project, but these may not be fully addressed by the planned interventions. Building climate resilience is complex, requiring continuous effort, adaptation, and consideration of various factors like climate change and community capacity. It is crucial to understand that resilience is dynamic and influenced by changing conditions. A multifaceted approach involving community engagement and adaptive strategies is vital for long-term climate resilience.

Responsibilities and Coordination (Who does what, when and how?)

The Ministry of Environment and Forestry (MoEF), Directorate of Forestry will lead the development of the project concept note and proposal to be submitted to a development Partner for funding. A meeting will be organized by the national Directorate of Forestry in the MoEF to engage key stakeholders at different levels and achieve the following objectives: convert project ideas into a concept note for funding agencies, incorporate project actions into existing development plans, address resource needs, and align stakeholders for unified project implementation and idea enhancement.

Chapter 7: Cross-cutting issues

In South Sudan, there are several cross-cutting issues that constitute common barriers for all technologies considered and prioritized under the TNA process. These issues result in insufficient development of climate change mitigation and adaptation technologies and in many cases have also got common remedies to overcome them. The following policies and actions can effectively address the numerous barriers that hinder technology implementation across various sectors, particularly in climate change adaptation and mitigation.

One critical approach is the capacity building of frontline government officers in prioritized climate change sectors. A common barrier for technology transfer and diffusion in both adaptation and mitigation sectors is inadequate technical capacity for providing advisory support. Therefore, it is essential that sector-specific officers receive training in participatory approaches. These approaches are vital since the prioritized technologies demand sustained engagement with communities. Officers need to empower these communities to collectively install, operate, and manage the technologies while providing feedback for further improvements.

There is also general lack of practical information about the selected technologies including their principles of operation, costs and benefits, operation and maintenance guidelines and selection criteria. Strengthening of R & D institutions could partly address this problem, through the dedicated data repositories and websites, as well as more knowledgeable experts. conducting research to understand the context and assess the feasibility of technologies is crucial. Strengthening the diffusion of climate change adaptation and mitigation technologies to local contexts—and responding to evolving climatic scenarios—requires robust research support. Context maps play a pivotal role in making necessary adjustments in the way technologies are transferred and diffused, which in turn enables the provision of appropriate technical support. It is important to note that technologies are not one-size-fits-all; understanding variations in biophysical, social, and economic conditions facilitates the (re)designing of technologies and the engagement of the right stakeholders, increasing the likelihood of adoption.

Strengthening the adaptation and mitigation capacity of community groups is essential. Technologies often necessitate a collective approach, which is contingent upon strong and functional local organizations. Such organizations empower communities to access services and negotiate effectively, ensuring that technologies work to their benefit. Strong, inclusive, and accountable local organizations also enable communities to diversify innovations surrounding the technology and build networks around related enterprises, ultimately enhancing their resilience to shocks and uncertainties.

Building robust partnerships with the private sector on climate change adaptation and mitigation sectors is another vital strategy. These partnerships create opportunities for co-investment in technology transfer and diffusion, expanding reach beyond the communities served by public entities alone. The private sector plays a significant role in contributing to the sustained functionality of installations through the supply of equipment, accessories, and technical services. Furthermore, private involvement can catalyze the evolution of enterprises

surrounding technologies, thereby creating demand. Partnerships with private entities that provide financial services also assist communities in overcoming short-term cost barriers, making the transition to new technologies more feasible.

Awareness creation is an additional key measure for all prioritized technologies. It is crucial to build awareness about climate change adaptation and mitigation technologies, how they operate, and their potential benefits. This effort should not be limited to disseminating information; it should also involve demonstrating how technologies work in practice, exposing potential users to successful case studies, and fostering dialogue about what it might take to integrate Technology Needs Assessment into local contexts, including exploring potential benefits and trade-offs.

Discussions and own analysis during the project implementation have highlighted the need for further development of comprehensive national innovation system (NIS) to assure better interaction of educational and research institutions with businesses and to promote innovation for the benefit of the local industry and to the extent possible based on South Sudan resources.

Creation of Technology Parks, Centres of Excellence or Technology Transfer Centres for information storing and sharing, knowledge, and know-how transfer, and for the support of cooperation between higher education schools, R & D institutions and business is an important part of such a system. Addressing legal and financial aspects of innovation and developing the national strategy for innovation are also essential steps in this direction although beyond the scope of this TNA project.

Finally, establishing coordination between public sectors and non-governmental entities is vital. Creating avenues for inter-sectoral dialogue and planning helps to reduce wasteful duplication and fosters coherent messaging for users. Monitoring and evaluation processes are essential in understanding whether the technologies are effectively contributing to climate change adaptation. Developing harmonized methods and structures for achieving this across sectors will ensure that partnerships are strengthened and that outcomes are optimized, ultimately leading to enhanced resilience and adaptive capacity within communities.

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