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# FOSTERING A WATER, FOOD AND ENERGY SECURITY NEXUS DIALOGUE AND MULTI- SECTOR INVESTMENT IN THE SADC REGION



## TANZANIA WEF NEXUS NATIONAL DIALOGUE BACKGROUND PAPER

## Tanzania WEF Nexus National Dialogue Background Paper

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### Global Water Partnership Southern Africa

333 Grosvenor Street  
Hatfield Gardens, Block A  
Pretoria  
South Africa

T +2712 430 2121/7  
E [gwpafrika@gwpsaf.org](mailto:gwpafrika@gwpsaf.org)  
I <https://www.gwp.org/en/GWP-SouthernAfrica/>

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## LIST OF ABBREVIATIONS AND ACRONYMS

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AfDB	African Development Bank
ASDP	Tanzania Agriculture Sector Development Program
BWBs	Basin Water Boards
CAADP	Comprehensive Africa Agriculture Development Programme
COWSO	Community Owned Water Supply Organization.
CSA	Climate Smart Agriculture
CSOs	Civil Society Organization
DAWASA	Dar es Salaam Water and Sanitation Authority
EWURA	Energy and Water Utilities Regulatory Authority
FYDP	Five-Year Development
GHG	Greenhouse Gas Emission
SAGCOT	Southern Agricultural Growth Corridor
IWRM	Integrated Water Resources Management
JNHP	Julius Nyerere Hydropower Project
LGAs	Local Government Authorities
MAFC	Ministry of Agriculture Food Security and Cooperatives
MLFD	Ministry of Livestock and Fisheries Development
MoHCDGEC	Ministry of Health, Community Development, Gender, Elderly and Children
MIT	Ministry of Industry and Trade
NCCFP	National Climate Change Focal Point
NAPA	National Adaptation Programs of Action
NCCTC	National Climate Change Technical Committee
NCCSC	National Climate Change Steering Committee
NY	New York
OUV	Universal Outstanding Value
PFM	Participatory Forest Management

PSMP	Power System Master Plan
REA	Rural Energy Agency
RIDMP	Regional Infrastructure Development Master Plan
RUWASA	Rural Water Supply Authority
SADC	Southern Africa Development Cooperation
SAGCOT	Southern Agricultural Growth Corridor
SME	Small-Medium Enterprise
SSA	Sub-Saharan Africa
SDGs	Sustainable Development Goals
TCSAA	Tanzania Climate-Smart Agriculture Alliance
TAFSIP	Tanzania Agriculture and Food Security Investment Plan
TIIDS	Tanzania Integrated Industrial Development Strategy
TMA	Tanzania Meteorological Agency
TANAPA	Tanzania National Parks
TANESCO	Tanzania Electric Supply Company
TRC	Tanzania Railways Corporation
UN	United Nations
UN-DESA	UN-Department of Economic and Social Affairs
URT	United Republic of Tanzania
WEF	Water Energy Food
WAUA	Water Users Association
WSDP	Water Sector Development Programme
ZAMCOM	Zambezi Watercourse Commission

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## 1.0 Background and country overview



Figure 1. Map of Tanzania and its water resources

Source: *Atlas of the world Maps*

### 1.1 Overview of the country context

According to the Tanzania Economic Outlook (2020), Tanzania is one of the most dynamic countries in Sub-Saharan Africa (SSA) in terms of population growth, economic progress, urbanisation, and infrastructure development.

These developments have increased demand for and intensified the use of natural resources. However, the availability and accessibility of these resources, especially, water, energy, and food and their governance and management are highly complex, challenging, and multifaceted. Tanzania is endowed with nine river basins: pangani, Wami- Ruvu, Rufiji, Ruvuma Lake Nyasa, and Internal Drainage Basins- Lakes Rukwa, Tanganyika and Victoria (figure 1) Despite the abundance of water, 61% of Tanzania is classified as dryland. Renewable water resources per capita are declining from 5,695 cm<sup>3</sup>/ year in 1977 to 1,710 cm<sup>3</sup> in 2018. During the same period, renewable surface water remained stable at 92.3 billion cm<sup>3</sup>/year and renewable groundwater at 30 billion cm<sup>3</sup>/year. Tanzania is still water secure, but governance of its water resources is crucial. The energy sector is dominated by hydropower and 65% of water available is used for hydropower generation. Total installed capacity of hydropower by 2019 was 573.70MW [URT 2020]. However, constant droughts are affecting hydropower efficiency. In addition, population growth, land use and land use change, climate change, over-abstraction of water, and deforestation going on in the river basins are affecting water resources. To meet the growing demand for electricity, Tanzania is constructing the largest dam in East Africa- the Julius Nyerere Hydropower project with the capacity to generate 2,100 MW by 2022 (URT, 2020). Fuelwood and charcoal are the main sources of rural energy accounting for approximately 90% of Tanzania's overall energy supply (URT, 2015). This demand is putting a heavy pressure on the country's forests with a decrease in total forest cover of almost 30% in 2012 (URT, 2013), and the degradation is ongoing. This massive decrease in forest cover affects rainfall patterns and hydrological cycles, and the recharging of underground aquifers. A balanced management of the WEF resources is important for Tanzania if it is to attain its 2025. Development Vision. The Water Sector Development Strategy (WSDS II) of 2006, the Power Sector Master Plan of 2016, and the National Agriculture Policy of 2013 highlight the conflicts that occur between the water, agriculture, and energy sectors because of poor planning regarding production, access, and utilization of the WEF resources. With such intertwined sectoral challenges, Tanzania needs to re-examine its policy formulation process, and project planning and implementation. Policy coherence, institutional collaboration, and coordinating mechanisms between these sectors should be prioritized (Besada & Werner, 2015)

## 1.2 Importance of Nexus approach in Tanzania

The WEF Nexus provides a holistic and integrated approach for securing access to water, energy and food in the long term. The nexus approach strives to put water, energy and food needs, which are competing for the same scarce resources, on an equal footing. It also aims to balance interests in resource use, manage conflicts and identify synergies without compromising human wellbeing and healthy ecosystems. Summarily, the WEF Nexus helps to:

- Highlight complex interdependencies between the water, energy and agriculture sectors
- Provide a framework to determine trade-offs and synergies between the sectors and to reconcile multiple and often conflicting interests and needs
- Promote policy coherence and multi-sectoral and inclusive cooperation
- Provide a tool to achieve the Sustainable Development Goals

Two major reasons underpin the importance of the nexus approach in Tanzania. Firstly, the global community is looking for new approaches and solutions to development challenges such as climate change, health, water, energy, and food security. The Rio + 20 Declaration, *'The Future We Want'* stresses the need for a balanced integration of economic, social, and environmental concerns into economic development. It also highlights the need to address food, water, and energy security in such a manner as to reduce the adverse impacts on the environment (United Nations, 2014). Tanzania's economy is natural resources dependent and the WEF sectors are earmarked as the key sectors for economic and human development. To achieve this vision, Tanzania needs to design the efficient and sustainable way of managing these sectors. Especially now that the country is building a competitive industrial economy, it needs to recognise the importance of understanding the interlinkage between water, energy and food production in the economy using the nexus approach. This will address the competing demands on these resources for development and assess the trade-offs and synergies between the sectors and facilitate adaptation to climate change (Howells et al., 2013). A review of the Tanzania Development Vision 2025 and of the past and present five-year development plans and other sectoral plans, including the National Climate Change Strategy, reveals that these plans have been prepared to meet sectoral goal because they are focusing on sectoral and project-based activities without consideration or coordination with the other sectors. Even where such consideration is given, the mechanisms or framework for collaboration and coordination are not provided.

## 1.3 Establishing the context and case for supporting WEF nexus investments

WEF Nexus investments are those investments that support the implementation of nexus solutions (De Laurentis et al. 2016). Nexus solutions are interventions that would benefit more than one sector, and they include interventions that reduce the pressure on ecosystems or the environment at large. Nexus solutions and investments arise from silo-breaking actions and directly or indirectly produce sustainable benefits in WEF sectors (Cairns & Krzywoszynska, 2016). Tanzania Development Vision 2025 guides Tanzania five-year development plans, and the country is currently implementing its third five-year development plan 2021/26 (FYDP II). According to Tanzania's Integrated Industrial Development Strategy (TIIDS) 2025, Vision 2025 is dependent on agricultural development and a resource-driven industrialisation strategy. Key resources driving this strategy are mainly water, energy, and food- agriculture. WEF solutions and investment are important in this regard to support the development pathway that Tanzania is taking and the impact on the natural environment and resource base. One of the objectives of the FYDP III is to "strengthen the relationship between the sectors endowed with natural resources with other economic and social sectors while ensuring sustainable use of natural resources". Further, the interlinkages and integrated nature of the



Sustainable Development Goals require WEF solutions and investments for their implementation. Specifically, SDG 2, 6, and 7 are directly related to sustainable use of land, food, water, and energy. WEF nexus approach was not adopted in framing the SDGs and therefore, the inherent trade-offs and synergies among the SDGs are not reflected in their implementation (UN-DESA, 2015),

## 1.4 Overall objective

The overall objective is to support the transformation required to meet increasing water, energy, and food security demand in the context of climate change in the SADC region by developing an integrated nexus approach.

## 1.5 Specific Objectives

The specific objective is to create an enabling environment that will drive cross-sectoral engagement and implementation of nexus investment projects that contribute to enhancing water, food, and energy security in the SADC region.

# 2.0 Governance and coordination mechanisms driving WEF Nexus investments

## 2.1 Institutional and legal frameworks at the national level

WEF nexus strategies and frameworks are mechanisms for assessing the WEF sectors simultaneously. They provide unified evidence on quantitative and qualitative relationships among sectors and eliminate the sectoral approach that is in practice. This requires a paradigm shift from the current 'siloed' institutions and governance structures to those aligned to 'nexus thinking' in the public and private sectors. In Tanzania, there is limited, if any application of the WEF nexus approach. There are efforts to provide WEF nexus solutions but the mechanisms for operationalising these solutions are lacking. Table 1 below shows how WEF nexus solutions in different institutions are presented. In all institutions, there are concerted efforts to work across sectors in the form of joint technical working groups, multistakeholder forums, joint supervision missions, and inter-ministerial committees. These nexus solutions are supposed to facilitate individual institutions to work within and across sectors knowing that such cross-sector engagements would address complex interlinked issues related to water, energy, and food security in an environmentally and socially sustainable way. However, these cross-sectoral and inter-departmental collaborations are not comprehensive or systematic. Most of these efforts end up at the planning stage of the program/projects. Sustained consultations, monitoring, and evaluation of the impact of the program/project on WEF sectors are not pursued.

At the SADC regional level, there are frameworks for supporting the WEF solutions to improve livelihoods, build resilience and enhance regional integration. However, these SADC frameworks do not provide mechanisms for operationalizing them at the national level. It is noted that SADC Regional frameworks such as the Zambezi Watercourse Commission (ZAMCOM), Regional Infrastructure Development Master Plan (RIDMP) and the Comprehensive Africa Agriculture Development Programme (CAADP). provide detailed coherent roadmaps at the regional level. However, at the national level sectoral policies still dominate and are not coordinated with the SADC frameworks. Climate-Smart Agriculture (CSA) within the Tanzania Agriculture Sector Development

Program (ASDP II, 2020) is designed to provide simultaneous benefits to multiple sectors (energy supply, agriculture, health, sanitation, environment, and gender) and links with the country's goals to reduce poverty and stimulate the growth of SMEs. However, its implementation is still sectoral, and the collaboration mapped out in ASDP II (table 1) is meant to help the Ministry of Agriculture formulate and implement the program. There is no clear indication of sectoral coordination at the implementation stage. There are also no mechanisms for CAS to engage with the Regional Agricultural Policy beyond mentioning it on paper, but all the while pursuing a sectoral approach. Equally, the Power Sector Management Program (PSMP), and Water Sector Development Program (WSDP II) are drawn up as sector-wide coordination mechanisms. However, these efforts do not go beyond forming cross-sectoral technical teams/working groups, steering committees, and stakeholders' platforms, which operate to support the implementation of the sectoral plan. Some member states are undergoing some level of institutional transition due to processes of policy and legislative review and/or water/energy/agriculture sector reforms. While this provides an important opportunity for shared WEF resources management, it also highlights key challenges that include lack of defined coordinating mechanisms, limited institutional and legal capacity and insufficient financial resources.

**Table 2 : Institutional and Legal Framework at the National Levels**

Institutions	Lead institution and key interest	Relevant institutions and key interests	Coordination mechanism (national level)	Coordination mechanism/ working relationship within the SADC Framework
Water development	<b>Ministry of Water</b> - Policy, strategy, guidelines, and regulations formulation; Coordination of IWRM and the provision of water supply	Basin Water Boards (BWBs), Local Government Authorities, (LGAs), Private Sector, Civil Society Organization (CSOs), Water Users Association (WAUAs), EWURA, RUWASA (RUWASA)	-Technical Working Groups, -Water Sector Development Programme (WSDP) -Joint Supervision Mission and -National multistakeholder forum for water resource management	The Regional Water Strategy for SADC aims to provide a strategic framework for sustainable, integrated and coordinated development, utilisation, protection, and control of national and transboundary water resources in the SADC region.
Water resources management	<b>Ministry of Water</b> - policy formulation for integrated water resources management	Department of water resources management -Basin Water Boards (BWBs), LGAs, Private Sector, CSOs, Water Users Association (WAUAs), and	-Technical Working Group and WSDP -Joint Supervision Mission	Existence of Zambezi Watercourse Commission (ZAMCOM) and National Stakeholders committee as well as Basin Wide Stakeholders committee
Energy development	<b>Ministry of Energy</b> – responsible for	Tanzania Electric Supply Company	Ministry of Energy provides for overall	Existence of SADC-Regional Infrastructure

	policy and programmes implementation and overall coordination for enhancing provision of adequate, reliable and affordable modern energy services to Tanzanians in a sustainable manner.	(TANESCO), Tanzania Petroleum Development Corporation (TPDC), the Rural Energy Agency (REA), the Energy and Water Utilities Regulatory Authority (EWURA), private sector Energy Fund (REF);	coordination mechanisms through National Energy Policy 2015 and the Power System Master Plan (PSMP) at the national level, & Inter-ministerial committees	Development Master Plan (RIDMP) -Energy Sector Plan, which proposed a regional coordination mechanism to support institutions for planning & project development
Food security/agricultural development	<b>Ministry of Agriculture, Food Security and Cooperatives</b> responsible for policy formulation and programme implementation	Agriculture Sector Lead Ministries (ASLMs) - Ministry of Agriculture Food Security and Cooperatives (MAFC), -Ministry of Livestock and Fisheries Development (MLFD), -Ministry of Industry and Trade (MIT), and the Prime Minister's Office- Regional Administration and Local Governments (PMO-RALG).	Tanzania Agriculture and Food Security Investment Plan (TAFSIP); multistakeholder forum -Inter-Ministerial Coordinating Committee for consensus and effective implementation of key policy and regulatory reforms	Comprehensive Africa Agriculture Development Programme (CAADP) as well as SADC Regional Agricultural Policy with potential for sectoral- synergies within CAADP
Forest, wetlands and ecosystem protection	Ministry of Natural Resources and Tourism- management of Natural, resources, implementation of sectoral policy strategies and plans	Resources and Tourism, -Tanzania National Parks (TANAPA), -Wildlife Division (WD)/ Tanzania Wildlife Management Authority (TAWA)	Ministry of Natural Resources and Tourism is responsible for overall coordination at the national level and Inter-Ministerial Coordinating Committee	SADC Programme for Trans-frontier Conservation Areas which proposed a coordination mechanism at all levels of the member states
Health	<b>Ministry of Health, Community Development, Gender, Elderly and Children</b> responsible for formulating policy and legislation, resource mobilisation, mobilising public	Tanzania Food and Nutrition Centre. - National Institute for Medical Research; DAWASA. -Meteorological Agency (TMA), -Ministry of Water, Ministry of Agriculture. Key	1. Local Government Authorities (LGAs); 2, the Prime Minister's Office - Regional Administration and Local Government (PMO-RALG) 3. The Ministry of Finance, 4.	The SADC health policies, plans and strategies.

health interventions, management of national hospitals, training, monitoring and evaluation, and research	interests:1) access to clean and safe water; 2) food self-sufficiency and food security	President's Office Public Service Management
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## 2.2 National WEF Policy coherence/alignment

The rate of increasing demand for water, energy and food and the associated pressures emerging through converging interdependencies emphasize the need for policy coherence and cross-sector coordination. A coherent policy is an important tool, because policy drives overall national and sectoral priorities as well as establishing the frameworks through which cross-sectoral collaborations are facilitated. Policy formulation needs horizontal coordination in addition to vertical coordination. Further, it is also important to have effective institutional structures in place (Di Gregorio et al. 2017). Tanzania like many countries in Sub-Saharan Africa, policy is developed through a sectoral approach, driven internally and externally by a combination of domestic and international interests. Efforts shown to promote coordination across government entities highlight the necessity to promote policy synergy for achieving objectives that straddle sector-specific boundaries. Policymaking collaboration in Tanzania is done through establishing committees involving multiple sectors and other stakeholders (table 2). However, the resultant policies do not reflect nexus principles, such as mechanisms for collaboration, trade-offs between sectors, and synergies in policy implementation. Stronger emphasis is placed on collaboration with sub-sectors within the same sector rather than formulating policies that cut across sectors (Table 2). Policy fragmentation can be seen in the sectors in table two: power generation in Tanzania, is mainly hydropower and is well coordinated vertically with the various subsectors related to power generation. However, it is the inter-ministerial committees that are responsible for horizontal coordination, which is not there in practice. Equally, the water sector is key to hydropower generation. However, the Water Policy and Energy Policy remain and operate as sectoral policies. Equally, the health sector is a key sector that directly absorbs the impacts of the activities undertaken in the WEF sectors. Insufficient water supply, food, and energy have direct impacts on public health and the environment. The Covid 19 pandemic demonstrated the need to collaborate with sectors outside the WEF sectors. The sectoral approach policies in Tanzania mask such dynamics with social, economic and environmental consequences. As indicated in the policy documents, there are no resources allocated for wider-sectoral coordination at the planning stage. This implies that the national policies are more reactive in nature rather than being proactive. There is no long-term planning, challenges are addressed as they occur.

**Table 1 National WEF Policy coherence/alignment**

Policies	Lead institution and key interest	Relevant institutions and key interests	Coordination mechanism (national level)	Coordination mechanism/ working relationship within the SADC
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				Framework
<b>Water development and management</b>	<b>National Water Policy of 2002-</b> Ministry of Water-policy formulation and coordinating unit.	Water Supply and Sanitation Act 5 of 2019. Water Resources Management Act Water sector development programme WSDP II Water Supply and Sanitation Act The Energy and Water Utilities Regulatory Authority Act	Ministry of Water through the Technical Working Group, WSDP Joint Supervision Mission and National Multistakeholder forum for water resource management	The SADC Revised Protocol on Shared Watercourses (2000) -The SADC Regional Water Policy (2005) -The SADC Regional Water Strategy (2006) -The SADC Guidelines for Strengthening River Basin Organisations (2010)
<b>Energy development and management</b>	National Energy Policy 2015 Ministry of Energy and Minerals -	Electricity Act 2008, PSMP 2009 – 2033; Electricity Supply Industry Reform Strategy and Roadmap 2014 – 2025; the Energy and Water Utilities Regulatory Authority (2001), the Atomic Energy Act (2003); the Rural Energy Act (2005); Petroleum Act (2015);	Ministry of Energy provides for overall coordination mechanisms at the national level (vertical integration), and there are inter-ministerial committees for horizontal coordination	SADC Energy Sector Plan proposes a regional coordination mechanism to support institutions for planning & project development
<b>Food security/agricultural development</b>	National Agriculture Policy Ministry of Agriculture	National Agriculture Policy. Agriculture sector strategy. Agriculture Sector Development Programme ASDP II	Tanzania Agricultural Food Security and Cooperatives Investment Plan (TAFSIP) - Multistakeholder forum and Inter-Ministerial Coordinating Committee	The TAFSIP works under the framework of the CAADP developed by NEPAD to address the core national problems of poverty and food insecurity and on how to promote agricultural growth and food and nutrition security in Tanzania
<b>Forest, wetlands and ecosystem protection</b>	National Tourism Policy Wildlife Policy	National Tourism Policy Wildlife Policy Integrated Tourism Master Plan Participatory Forest Management (PFM) plan Water Resources Management Act no. 11 of 2009 Water Supply and Sanitation Act No. 5 of 2019	Ministry of Natural Resources and Tourism is responsible for overall coordination at the national level, and Inter-Ministerial Coordinating Committee is comprised of different stakeholders from line ministries, agencies, institutions, CSOs and private sector	SADC Programme for Trans-frontier Conservation Areas which proposes a coordination mechanism at all levels of the member states
<b>Health</b>	Tanzania National Health Policy- Ministry of Health, Community Development,	Tanzania Food and Nutrition policy; National Youth development policy; Tanzania Water Policy; Tanzania Food and Drugs Authority;	MoHCDGEC- formulates policies. Regional Health Administration Interprets policies into actions. District Health	The SADC health policies, plans and strategies.

Gender, Elderly and Children (MoHCDGEC)-	National environmental Policy; Community Development Policy	Administration Prepares Comprehensive District Health Plans and regular reporting on implementation;
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### 3.0 Identified WEF Nexus investments

#### 3.1 Existing/ongoing WEF programs and projects

There are five potential WEF programs as shown in table 3. The programmes are all ambitious in nature with the objectives of transforming the WEF sectors to efficiently deliver on the economy and provide environmental protection. However, the success of each of these programmes is highly dependent on the collaboration and coordination of policies pertaining to these WEF sectors. Except for the SAGCOT program, which is a public-private partnership, the rest of the programs are all under their respective ministries with sectoral objectives (table 3). Source of funding is also a challenge since external funding forms a large part of the programmes’ budgets. Either the funds may not be available or once external funding comes to an end the programmes might also stall. Institutional and sectoral coordination are all part of the programmes’ implementation approach and have a nexus potential. However, typical of all planning and policy formulation in Tanzania, coordination and collaboration remain on paper because there are no mechanisms or resources for implementing them. As a result, the nature and magnitude of the trade-offs within and across the sectors are neither known nor how they will be minimized is not defined. WEF Baseline data is not available to provide a basis for decision-making. All the intentions are there to plan and implement programs according to the WEF nexus principles, but the practical aspects are still missing.

Table 3 Existing/ongoing WEF programs and projects

No	Sectors	Programs/Projects	Main Objectives	Lead Organisation	Budget (USD)	Source of funds	Comment on Nexus Potential
1	Water Sector	Water Sector Development Programme II	Strengthening sector institutions for integrated water resources management and improving access to water supply and sanitation services	-Ministry of Water, Dar es Salaam Water and Sewerage Authority RUWASA	Total US\$ 230.00 million	Government & World Bank Group	Component one addresses water resource management and provides for New Priorities from IWRMD plans
2	Agriculture Sector	Agriculture Sector Development Programme II (ASDP)	To transform the agriculture	Ministry of Agriculture	5.979 billion	Government 41% Programme	The Programme has the

		II) 2018 -2028 led by the Climate Smart Agriculture Programme (CSA)	sector (crops, livestock & fisheries) towards higher productivity and commercialisation level; improve smallholder farmers' income, livelihood, food, and nutrition security. communities			development partners 53% Other stakeholders and Beneficiaries 6%	department of sector coordination, which will strengthen institutions and provide a coordination framework.
3	Agriculture sector	Southern Agricultural Growth Corridor (SAGCOT)	To transform the agricultural sector to higher productivity and improve smallholder farmer income and food security	Private-public partnership (PPP)	3.4 billion	National and international funding; Public and private sectors; and development partners	SAGCOT is part of CAADP for Tanzania
4	Energy sector	Power System Master Plan 2020 (PSMP).	Increase access to modern energy, enhance power supply availability, affordability, and reliability	Ministry of Energy	38,340.4 million	PPP & development partners (DPs)	PSMP planning was cross-sectoral (Finance, Energy, and Water)

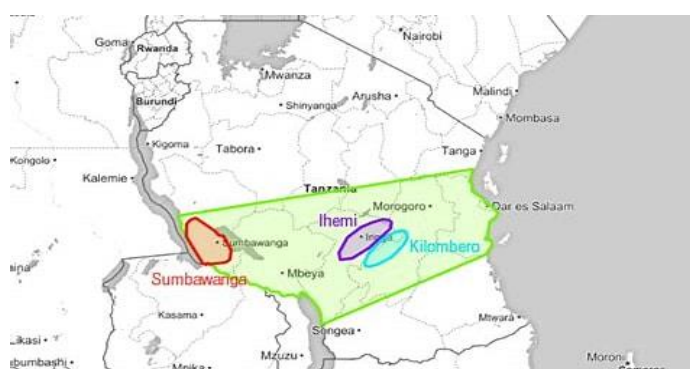
**Table 4 Multi-Objective Investments that enhanced WEF resources management**

No.	Project Name	Main Objectives	Responsible Institutions	Funding arrangements	Coordination Arrangement
1	SAGCOT (2010-2030)	Accelerate green agricultural growth	Government of Tanzania through the SAGCOT Centre	GoT, multilateral Banks Ireland, Norway, DFID, USAID, AGRA	SAGCOT operates within the dual, complementary frameworks of Kilimo Kwanza and ASDP II and District-level partnerships through District Agricultural Development Plans (DADP).
2	Climate-Smart Agriculture- CSA Programme (2015-2025)	To build the resilience of agricultural farming systems for enhanced food and nutrition security	Ministry of Agriculture, Food Security and Cooperatives and Vice President's Office Division of Environment of the Vice President's	\$32.158 Million over ten years by the GoT and development partners (DPs)	The NCCTC and (NCCSC) lead the coordination and implementation of CSA. The NCCTC provides technical advice to the NCCFP in the VPOs

			Office (VPO), Regional Administration and Local Government (PO-RALG),		Division of Environment, and the NCCSC provides policy guidance and ensures cross-sectorial coordination
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Two projects/programs are multi-objective investments that may enhance WEF resources management in Tanzania as discussed below.

**Figure 2 Southern Agricultural Growth Corridor of Tanzania**



SAGCOT is a multi-objective investment that is designed to address food insecurity, poverty reduction and enable sustainable natural resources use. SAGCOT was initiated in 2010 as a public-private partnership with the aim of developing the Tanzania agriculture sector in the southern corridor (figure 2). The Corridor is heavily populated with an estimated 11.1 million people, predicted

to increase to 16 million people by 2025. The corridor cuts through the fertile valley of the Rufiji basin and its major tributaries, the Kilombero and the Great Ruaha. (DFID. 2012). At the same time, the largest hydropower project- the JNHP project- is going on in the SAGCOT corridor. Both projects/programs are dependent on the Rufiji River tributaries of Kilombero and the Great Ruaha. SAGCOT programme occupies a land area of 31 million ha, and 110,000 ha are under commercial cultivation (SAGCOT, 2014). Sugar cane, rice, tea, horticulture, and teak are the major crops grown in the corridor. SAGCOT is a natural resources intensive programme and there is already high pressure on key WEF resources. The main cash crops grown in the corridor are water intensive crops. With an annual increase of 11,000 ha/year of irrigable land over the whole corridor (Milder, et al. 2012) and the hydropower dam, water resources management is critical. Further, agriculture intensification in the corridor and the projected increase in planted acreages will likely increase pesticide and herbicides use with effects on water quality, human and animal health, aquatic ecosystems, and soils. Legal and policy framework do exist in Tanzania to safeguarding natural resources access and utilization. However, their implementation is poor due to a weak capacity for enforcement, a low level of awareness among policy makers and other key stakeholders, and conflicting policies and legislation. SAGCOT is also a public private multistakeholder program in its design structure. However, its implementation structure does not reflect the coordination of key WEF sectors in accordance with the WEF principles of policy coherence and sectoral coordination. Natural resources management is still a challenge in this regard, but Since the project is ongoing, there is room for applying the WEF Nexus principles.

### **Climate smart agriculture (CSA)**

Tanzania’s efforts to advance and promote CSA adoption has been notable, as evident in the numerous policies, strategies and programs that the government has put in place. CSA is a multi-objective agriculture programme that is designed to sustainably increases productivity and income in the agriculture sector, facilitate the adaptation and build community resilience to climate change,



and enhance food and nutrition security while achieving mitigation co-benefit in line with national development priorities. In Tanzania, agricultural production is dominated by smallholder farmers, with an average farm size ranging between 0.2 and 2 ha. Dependence of agriculture on rainfall increases exposure of farmers to frequent droughts, periodic flooding and food insecurity. Only 2.3% of a total of 15.8 million ha of land suitable for irrigation is irrigated by small-scale farmers. Lack of finances and technical know-how impact full exploitation of irrigation opportunities for small-scale farmers. Weather variability and climate change have further diminished water in many water bodies with adverse impacts on smallholder agriculture exacerbating food insecurity. CSA technologies and practices present opportunities for addressing the problem of food insecurity; water scarcity; cheap, clean, and sustainable energy production (through biogas digesters) to vulnerable households; reduce deforestation and soil degradation; as well as economic growth. Support through government programmes, international organisations and NGOs, as well as traditional knowledge have enabled the implementation of various CSA practices in some parts of the country with remarkable success (DFID. 2012). The number of institutions involved in promoting CSA in Tanzania is shown in table 4. With all its potential, policy and institutional alignment and coordination have yet to be fully achieved in the implementation of CSA. Notable is the absence of a functional mechanism to incentivise and enhance collaboration among different sectors and actors. On one hand the government is promoting large-scale farming in the SAGCOT corridor and on the other promoting climate smart agriculture without any coordination and collaboration between the two programmes. CSA is under the ministry of agriculture and SAGCOT is a PPP under the SAGCOT centre. Conflicting policies guiding the two are hampering the proper implementation of both programmes. The Tanzania Climate-Smart Agriculture Alliance represents a critical opportunity to provide such space for dialogue; therefore, more efforts to support the operation of such a platform, both financially and technically, are needed.

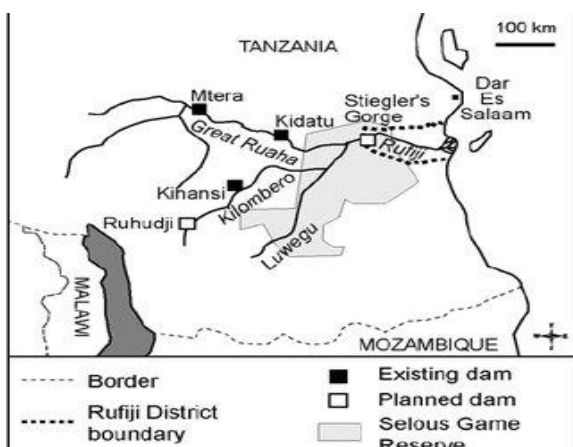
## 4.0 Country case study

### 4.1 Background

#### Julius Nyerere Hydropower Project (JNHP)- Stiegler’s Gorge

**Figure 2** JNPH- Stiegler’s Gorge on Rufiji River

*Source: GoT (2017)* In 2017, the government of Tanzania launched the Julius Nyerere Hydropower Project (JNHP) at Stiegler’s Gorge on the Rufiji River to be completed in 2022. This will include a 134-metre dam height with a reservoir storage capacity for 34bn litres of water. An estimate for the land inundated by the resulting reservoir behind the dam is 1,200 km<sup>2</sup>, meaning it would be the largest reservoir in East Africa, the fourth largest in Africa and the ninth largest in the world. Additionally, four saddle dams<sup>1</sup> totalling 14 km are under construction upstream to confine the



<sup>1</sup> A saddle dam is an auxiliary dam constructed to confine the reservoir created by a primary dam either to permit a higher water elevation and storage or to limit the extent of a reservoir for increased efficiency.

reservoir. The Rufiji River, where the (JNHP) is located, its basin covers a fifth of the country, providing an estimated mean annual runoff of 20.58 billion m<sup>3</sup> at the potential dam site of the Stiegler's Gorge, some 230 km upstream of the river mouth (Mdee, 2017). Above the gorge, the three main tributaries (the Great Ruaha, Kilombero, and Luwegu) meet and form the headwaters of the lower Rufiji basin. Below the gorge are the floodplain and the delta of the lower Rufiji. The Gorge itself is about 8 km long and 100 m deep. Further, the Gorge sits in the Selous Game Reserve, one of the World's largest protected and most significant wildlife areas. The reserve was made a UNESCO World Heritage Site for the Outstanding Universal Value (OUV) of its unique ecology in 1982. The Rufiji produces half of Tanzania's river flow, supplying water for over 4.5 million people, as well as for irrigation and livestock and for generating hydropower. In addition to the JNHP project, The government has identified large basin areas for developing commercial agriculture over the next two decades as part of an initiative called the Southern Agricultural Growth Corridor of Tanzania (SAGCOT). JNHP project intersects with the SAGCOT programme in the Kilombero and the Great Ruaha tributaries of the Rufiji Basin both competing for water resources. JNHP project is a cross-sectoral project involving the water, energy, agriculture, tourism and forestry sectors. JNHP project successful implementation and sustainability require collaboration and harmonization of policies from all these sectors.

## 4.2 Case study evaluation

The project is set to become the role model of a multi-objective project in the Rufiji Basin that will combine hydropower development with food security, environmental sustainability, economic development and poverty reduction. These will be achieved through the provision of cheap and reliable hydropower, large-scale irrigation, and an industrial base to support agricultural production. Analysis of the project document reveals a promising WEF project but still wanting in many aspects. The development of this project focuses mainly on the site of the project- that is- the direct impacts related to building the dam, the dam itself, and the resulting reservoirs (URT, 2020). There is no discussion on the cumulative impacts on/of other planned projects (other hydropower dams, irrigation schemes, and agriculture programmes) on flows, water quality, and the potential impacts on the users downstream. Historical and baseline data on how much water was and is available and how much is reserved for irrigation and how much is released downstream for the hydropower dams is non-existent. The decisions taken to develop two major project (JNHP and SAGCOT) to run concurrently seem to be arbitrary and cannot be scientifically defended. The wider impacts beyond the physical inundation of 1,200 km<sup>2</sup> of land and the dam's construction site must be considered. Further, there are no mechanisms/frameworks for guiding how the implementation of the JNHP project will directly and indirectly affect the sectors to which it is linked. As previously noted, planning in Tanzania is sectoral and therefore, JNHP project lacks coherent policies to guide its implementation. The ministerial committees and technical groups, without proper planning and financing, cannot deliver on the project. Furthermore, the last few decades have seen frequent droughts and growing variability in rainfall. Long term global forecasts predict increasing rainfall for East Africa but also indicate that extreme floods and droughts will also increase (IPCC AR6, 2021). Droughts and seasonally extreme river flows are already taking place in the Rufiji basin, The major Rufiji River tributaries (Kilombero and the Great Ruaha) are facing hydrological challenges due to over-abstraction, environmental degradation, and climate change. Deforestation in key habitats is the leading cause of soil erosion, and water resources degradation. Inadequate structures and systems for integrated planning, and incoherent sub-sector specific master plans to guide the sustainable implementation of the project are some of the many challenges facing the JNHP project (Kashaigili 2021).

### 4.2.1 Water

The storage capacity of a reservoir at Stiegler's Gorge is 34,000,000,000m<sup>3</sup>. At 134 m high and a catchment of 1,200km<sup>2</sup>, the reservoir could store about 1- 1.5 years' average runoff. These metrics will depend on the availability of water, which will also depend on future climatic, environmental and the ongoing economic socio-economic developments. What will happen in the other related and interconnected sectors will also have an impact on the sustainable availability of water for the hydro project. Lack of historical data to enable the projection of how the ecosystems will behave in future is a notable drawback. Current policies do not provide space for cross-sectoral collaboration and coordination to facilitate the implementation of projects that are multisectoral in nature, such as the JNHP project.

### 4.2.2 Energy

The Stiegler's Gorge hydropower will add a large volume of megawatts which could end power crises in Tanzania. The JNHP will more than double the current total generation capacity and by itself supply more energy than Tanzania currently consumes. However, there are some doubts about the potential for such a project to effectively solve Tanzania's power issues. Broader cross-sectoral questions over the reliability of its output and vulnerability to long-term climatic changes have already been pointed out in para 4.2. As pointed out in the government's Power System Master Plan (PSMP) of 2016, and in the National Energy policy of 2015, maximum electricity output will not reach the many scattered households in Tanzania rural areas. Energy mix approach that comprises of solar power, wind power, geotherm energy and biogas would be more efficient and practical for rural settings. In addition, the provision of sufficient cheap electricity is not a panacea for development, and electricity alone will not be able to produce economic transformation from a primary resource-driven economy to one with a strong service and industrial sector. Wider political, environmental, infrastructural, institutional, educational, and path-dependent factors must also be addressed to unleash industrial and economic growth in Tanzania (URT,2016).

### 4.2.3 Food

The impacts of the hydropower dam on the environment will have important implications for food security (FAO. 2012a). The river's annual irrigating and fertilising floods create a rich area of farmland below the park. Typically, this supports recession agriculture that takes place in the dry season. People living in the valley also utilise lakes which are replenished by annual floods. Therefore, proper planning is required so that changes that the dam will generate will not negatively impact people's livelihoods downstream. Another anticipated key impact is on fishing in the Rufiji River delta. The impacts of building the Stiegler's Gorge Dam on fisheries around the Rufiji delta is not yet clear. The proposed large-scale irrigation on the 80,000-ha proposed for the downstream floodplain may or may not be economically viable. Duvail et al. (2014) assert that irrigation infrastructure may be difficult to maintain due to frequent destructive Rufiji River floods, even with the dam. Quantitative historical and current data on water resources in the valley would help to predict how the future scenario will be like and determine the amount of irrigation that can be undertaken

#### 4.2.4 Environment

The Selous Game Reserve, where the dam is built is one of the world's largest and significant protected areas. The area's collective ecological importance is highlighted by being designated a RAMSAR site.<sup>2</sup> The dam's construction will constitute 2.2% of the Selous Game Reserve and so will have a limited effect or no impact at all on the environment. However, Pandey and Shrestha (2017) point out that by the nature of ecosystems, there are no defined or definite boundaries. Accordingly, activities in the designated 2.2% area of the Game reserve, their impacts will be felt far in and beyond the Rufiji basin. Evaluation of the long-term impacts of the dam- which are lacking should consider these ecosystem dynamics. The dynamics of the Rufiji River make the area downstream of the gorge the richest habitat area with the largest concentration of fauna and flora in the world. The wetlands around the river are ecological hotspots. The six large ox-bow lakes<sup>3</sup> outside the reserve provide rich habitat. These lakes are only reconnected to the river in seasonal floods and often remain unconnected in years of drought. The delta region is supported by the seasonal river, primarily because it brings quantities of sediment which maintain the delta against sea erosion. This factor will increase in importance with the predicted sea-level rise (IPCC, AR6, 2021). Building the dam across the gorge can disrupt the connectivity of habitats to the Rufiji delta with consequences for the ecosystem

#### 4.2.5 Other Relevant Sectors

The Stiegler's Gorge hydropower is a good project for WEF nexus solutions and nexus investment because the JNHP project implementation lies at the critical juncture of the WEF sectors- water, energy, food, environment, climate change, and livelihoods. Other sectors interacting with the building of the dam include the agriculture, forestry, tourism, transport, and wildlife sectors, which are supported by the Rufiji basin ecosystem (refer section 4.2). Any negative change in the Rufiji ecosystem will have impact on other sectors. The planned agriculture in the Rufiji basin may lead to land use and land use change that may have negative impacts on the forest sector and lead to deforestation and degradation of water resources. The planned large-scale irrigation can also bring about pathogens, which are harmful to humans, as a result of large flooded areas. Large scale agriculture also entails uncontrolled large-scale use of pesticides and herbicides that are dangerous to humans and the environment. The impacts of the dam maybe more far reaching than what is known and therefore collaboration and coordination with other sectors will fulfil the multi-objective nature of the JNHP project. Greater policy coherence is critical in this project. When the interactions and feedback between sectors in the project area are understood and considered, policies can reduce negative effects and create co-benefits within sectors

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<sup>2</sup> The Ramsar Convention was adopted in the Iranian city of Ramsar in 1971 and came into force in 1975.

<sup>3</sup> An oxbow lake is a U-shaped Lake that forms when a wide meander of a river is cut off, creating a free-standing body of water.

## 5.0 Investment constraints and enablers

### 5.1 Constraints

### 5.2 Enablers

**Table 5**

Constraints	Enablers
Fragmented policy and regulatory frameworks and institutional silos	Mechanisms for multidiscipline cross-sectoral stakeholder platforms for planning and policymaking
Absence of data and information on WEF resources dynamics and trade-offs	Research-Science-policy dialogue. Science should inform policy and not vice versa
Heavy transaction costs of coordinating and collaborating	Incentives to collaborate should be identified at the planning stage
Political will and power relations	Cross-sectoral capacity building on WEF to change mindsets

Food, water, and energy systems are inextricably linked. The production of food requires water and energy. The supply and distribution of clean water require energy and land-based ecosystems. The production of energy requires water and land. Choices about food production affect energy and water use, while choices about water and energy supplies affect land use. These interdependencies are dynamic. Therefore, policies and actions must be decided collaboratively, integratively, and coherently. In this regard, efforts should be geared towards policy integration through multistakeholder platforms across the scale. Further, WEF nexus decisions should be guided by the outcome of engagements between researchers, scientists, and policymakers. Science should inform policy and not vice versa and should be the basis for decision-making. Collaboration and coordination across scales require regular consultations, monitoring and evaluation of the decisions made. This is costly in terms of finances and time. Incentives for collaboration should be clearly defined, be part of the planning process, and should be provided for. To overcome a sectoral approach can be a challenge due to egos and lack of understanding of the wider benefits that could be realised through collaboration. Capacity building on what WEF nexus is and what it can do in the long run for the sustainability of WEF resources should be undertaken across all to achieve a change in mindset. Sometimes, even where the intention for collaboration is real, the mechanisms or frameworks for facilitating cross sectoral collaboration and coordination are lacking.

## 6.0 Recommendations for enhancing WEF Nexus investments

### 6.1 Around WEF coordination at national and SADC regional levels

Policy formulation is key in influencing the direction of the WEF sectors coordination at national and SADC regional levels. Building an enabling environment to strengthen cross-departmental and multi-sectoral mechanisms will allow cooperation and communication between the sectors of WEF on different levels. Multi-stakeholder platforms are important and necessary for facilitating intersectoral dialogue and support collaboration between researchers, policymakers, civil society and the private sector. There should be efforts to work with public institutions, such as planning /environmental ministries or transboundary river basin commissions, with an overarching mandate to bring different actors together and find incentives for different actors to cooperate. In addition, multi-stakeholder engagement will ensure participation and enable trust, equity, accountability and transparency to create partnerships with shared visions among the different stakeholders. Interregional/international exchange of experiences on using the nexus approach in planning and policymaking are important (England et al. 2017). Case studies/good practices which can be scaled up to other national/regional contexts are crucial. Some degree of collaboration and coordination of policies is evident in Tanzania. However, projects and programs implementation remain fragmented with consequences for WEF and other related sectors. Such fragmentation is a result of governance problems that do not provide mechanisms and frameworks for coordination, leading to unintended social, economic, and environmental consequences. As such, there is a need to increase the integration of policies especially for the WEF sectors so that policies from one sector consider components from more than one WEF system. Further, in order to ensure an informed decision-making process in line with the WEF Nexus approach, quality, reliable and disaggregated data needs to be accessible and shared by relevant stakeholders. Hence, data should inform policy in order to understand the interactions and feedback in WEF sectors (Weitz, et al. 2017).

### 6.2 For creating an enabling policy environment for WEF nexus investments

To create an enabling policy environment for WEF nexus investments, the entry point is first to analyze the political systems, stakeholders, and existing power relations within the WEF sectors. Restructure institutions so that they become effective, accountable, and inclusive to enable access to information, rule of law, and regulations, and provide rule-based regulatory/legal environments. Next, build effective, accountable, and inclusive institutions at all levels for the uptake of WEF nexus investments. It is also important to encourage a participatory and citizen-oriented implementation of projects and programmes related to the WEF sectors. Further, integrate institutions, build and strengthen them into policymaking bodies for facilitating WEF-nexus investments. Indeed, support horizontal and vertical coordination in planning for WEF-Nexus relevant investments and strengthen the capacity of national decision-makers relevant to the WEF sectors. Strive to build on existing structures and mechanisms as much as possible and seek new avenues for collaboration. In the end, strengthen participatory approaches and address power differences regarding implementing WEF-related investments at the local level and keep fostering multistakeholder dialogues at all levels with a wide variety of partners, including the private sector.

## 6.3 For enhancing projects having one sectoral objective into Nexus Projects

To enhance projects that have one sectoral objective into nexus projects, explore the possibilities and plan for the implementation of the project so that it can be a nexus project. First design cross-sectoral inter-ministerial and local government coordination framework, which means to develop an inter-ministerial communications strategy; promote biannual joint planning and review session between inter-ministerial team and the country government officials; build the capacity of national, regional, and local government staff in cross-sectoral planning and implementation; enhance policy review and analytical capacity at the national and local levels. Secondly, promote partnerships with the private sector and civil society organisations. Engage the private sector through consultative meetings on the planning and implementation of the project to identify investment opportunities; identify appropriate incentives to catalyse private sector and CSO to invest in the project; Publicise the project to the private sector and CSOs to identify areas for their participation; establish communication channels for consultations between the private sector and CSOs in the programmatic planning and implementation of the project activities at the national and local levels. Thirdly, strengthen programmatic coordination with development partners

## 6.4 Capacity development in support of identified WEF nexus investments or projects

It is important to build capacity of people, institutions, organisations, and both the public and private sectors through trainings and awareness raising. WEF Nexus capacity development fosters informed decision-making and the ability for a holistic and critical thinking, in order to prioritise the most sustainable solutions in decision-making processes. Additionally, the transfer of sector-specific knowledge to other sectors, and the translation of scientific research into practice can be supported by capacity building. Specific institutional and individual capacity building programs need to be developed in the context of the WEF Nexus with a focus on creating competencies in dialogue facilitation, conflict resolution, data management and analysis. This will also ensure policy coherence and integration of policies and institutions, improve synergies, and reduce trade-offs between the WEF sectors. There needs to be a stronger focus on creating institutional partnerships, with the key agencies making sure that policy design and implementation is coordinated and thus can be completed

## 6.5 WEF nexus awareness to support financing for identifying WEF nexus investments or projects

To generate WEF nexus awareness to support financing for identifying WEF investments or projects, an investment plan and strategy are very important. Furthermore, a WEF Nexus framework, governed by the science and data tools, must be developed to quantify the interlinkages between the WEF sectors. This will help identify existing and potential resource hotspots at multiple scales; account for expected trade-offs in resource allocation strategy choices; inform important dialogue at the policy level, a dialogue which identifies and clarifies existing synergistic opportunities for cooperation; and finally, account for allocation of resources. Emphasis should be on the efficiency gains and the conflict prevention potential of the Nexus approach, despite higher upfront costs of inter-sectoral coordination and planning. It is also important to highlight that WEF Nexus-related investments contribute substantially to achieving all SDGs, and these investments are promoted in

the agendas of international development finance institutions. Develop knowledge platforms for WEF, informed by data at the appropriate scale. The WEF nexus approach is expected to face significant challenges in tapping into financial resources provided by local, national, and international financing institutions due to the existing fragmentation by narrowly defined sectors and activities. Efforts should be made to align financing with government plans of actions

## 6.6 WEF nexus investment identification, planning, programming and implementation

To identify, plan, program, and implement WEF investment, it is important to unpack the WEF components first to understand the synergies between them. Existing WEF Nexus indicators, methodologies and guidelines should be applied in selecting WEF Nexus investments and projects. This ensures an equitable consideration of both economic and natural resources development. Furthermore, environmental and social assessment studies should be undertaken. Cooperation with the private sector should be promoted by communicating co-benefits created with projects that follow the WEF Nexus approach. This is necessary because the idea of integrated WEF management is based on the ways individual securities for each of the three components interact to form WEF security (De Laurentiis et al. 2016). Each component of WEF stems from a combination of access, utilisation, and availability. To identify interventions for optimising and balancing the three, it is important to examine them individually and then assess their relationships with each other. This should also include understanding the contributions of natural and built systems and intermediate institutions, processes, and mechanisms that help or hinder the access and supply of WEF. It is also important to outline goals, actions, policies, and investments to understand how WEF security will be ensured in the future. This will require dialogues between research scientists and policymakers. Science should inform policy for appropriate management of the WEF resources. Stakeholder involvement is an essential component for it helps strengthen the resulting strategies, investments, policy relevance, and legitimacy

## 6.7 Broadening the dimensions of WEF nexus investments to link more strongly to the environment, health, and other related sectors, for broader beneficiation and sustainability

Water, energy, and food security are recognised as SDGs in their own right; however, achieving most of the SDGs is directly related to the sustainable use of resources such as land, food, water, and energy. The WEF Nexus approach can help implement the SDGs through identifying potential trade-offs at the policy design stage; support the identification and development of solutions that positively benefit multiple SDGs; better linking SDGs in their implementation through a process that avoids the silo approach (SEI 2014). Implementation of the WEF nexus approach demands the proper management of ecosystem goods and services. WEF sectors are closely linked to these ecosystem goods and services. By extension, mismanagement of the ecosystems will result in WEF insecurity. There are also interlinkages between the WEF nexus and climate change (Rasul & Sharma 2016). Energy and agricultural production are major drivers of climate change, and at the same time, agriculture and water are among the most climate-vulnerable sectors. Climate policies can improve WEF security (e.g., through afforestation, soil carbon sequestration and renewable energy), but they can also negatively impact WEF resources. For instance, promoting renewable energy that consumes water might lead to CO<sub>2</sub> reduction and an unsustainable increase in water demand. Similarly, diminished water availability due to climate conditions might limit the renewable energy-related



climate strategies. At the same time, policies and practices related to the WEF sectors—such as those included in climate-smart agriculture and smarter energy solutions, can offer solutions to climate change mitigation and adaptation. Finally, WEF Nexus knowledge platforms and stakeholder dialogues can serve as bridging institutions for different stakeholders in achieving the SDGs (including SDG 17— Partnerships for the Goals).

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