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WATER GOVERNANCE AND SDG 6
ACHIEVABILITY IN DEVELOPING
COUNTRIES: A CASE STUDY IN SOMALIA

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ÖZET

Gelişmekte Olan Ülkelerde Su Yönetişimi ve SKH 6'nın Ulaşılabilirliği: Somali'de Bir Vaka Çalışması

Bu çalışma, Somali özelinde gelişmekte olan ülkelerde su yönetişiminin mevcut durumunu ve Sürdürülebilir Kalkınma Hedefi 6'nın (SKH 6) ulaşılabilirliğini incelemektedir. SKH 6, herkesin su ve sanitoryona erişimini ve sürdürülebilir yönetimini sağlamayı amaçlayarak su ile ilgili sorunların ele alınmasında küresel ilerlemenin değerlendirilmesinde kritik bir gösterge olarak hizmet etmektedir. Bu çalışmada Somali'de su yönetişiminin etkinliğini ve SKH 6 hedeflerine ulaşma yolunda kaydedilen ilerlemeyi değerlendirmek için SKH 6 Politika Destek Sistemi (SKH-PSS) aracı, Su, Sanitasyon ve Hijyen Darboğazı Analiz Aracı (WASH BAT) ve OECD Su Yönetişimi Gösterge Çerçevesi gibi analitik araçlar kullanılmıştır. Bu değerlendirme, Somali'nin kendine özgü sosyal ve siyasi ortamının yanı sıra zorlu su kıtlığı sorununu da dikkate almaktadır. Araştırma, ülkedeki politika çerçeveleri ve kurumsal kapasite gibi su yönetişimi yapılarının çeşitli yönlerini kapsamlı bir şekilde incelemektedir. SKH-PSS aracı, ulusal politikaların SKH 6 hedefleriyle uyumunu değerlendirerek her bir göstergedeki ilerlemeyi ve boşlukları tespit etmektedir. Ayrıca, WASH BAT su, sanitasyon ve hijyen altyapısı ile ilgili darboğazları ve bunların nedenlerini tanımlamakta ve bu sorunların ele alınması için tavsiyeler sunmaktadır. Çalışmada ayrıca OECD Su Yönetişimi Gösterge Çerçevesi kullanılarak Somali'nin mevcut su yönetişimi sisteminin işlevselliği, OECD'nin su yönetişimine ilişkin on iki ilkesine göre incelenmiştir. Bu çalışmanın bulguları, Somali'de su yönetişiminin ne kadar iyi işlediğine, kaydedilen ilerlemeye ve SKH 6'ya ulaşmada karşılaşılan zorluklara ilişkin ayrıntılı ve doğru bir anlayış sağlamaktadır. Ayrıca çalışma, su yönetişimini güçlendirmek ve SKH 6 hedeflerine yönelik ilerlemeyi hızlandırmak için özel tavsiyeler sunmaktadır. Ayrıca çalışma, bu araçların kalitesini ve gelişmekte olan ülkelerdeki su yönetimi yöntemlerinin değerlendirilmesinde kullanılıp kullanılamayacağını incelemeyi amaçlamaktadır.

Anahtar Kelimeler: Su Yönetişimi, Somali Su Sektörü, Ulaşılabilirlik, Sürdürülebilir Kalkınma Hedefi (SKH 6), Gelişmekte Olan Ülkeler, Entegre Su Kaynakları Yönetimi.

ABSTRACT

Water Governance and SDG 6 Achievability in Developing Countries: A Case Study in Somalia

This study analyzes the current state of water governance and the feasibility of achieving Sustainable Development Goal 6 (SDG 6) in developing countries, with a specific focus on Somalia. SDG 6 is a critical indicator for assessing global progress in addressing water-related issues by aiming to guarantee universal access and long-term water and sanitation services management. This study used analytical tools such as the SDG 6 Policy Support System (SDG-PSS) tool, the Water, Sanitation, and Hygiene Bottleneck Analysis Tool (WASH BAT), and the OECD Water Governance Indicator Framework to assess the effectiveness of water governance and the progress made toward achieving SDG 6 targets in Somalia. This assessment takes into consideration Somalia's unique social and political landscape, as well as the challenging issue of water scarcity. The research extensively examines various aspects of water governance structures, like policy frameworks, and institutional capacity in the country. The SDG-PSS tool evaluates the alignment of national policies with SDG 6 objectives, identifying progress and gaps in each indicator. Additionally, the WASH BAT identifies bottlenecks and their causes related to water, sanitation, and hygiene infrastructure, and provides recommendations for addressing these issues. The study also used the OECD Water Governance Indicator Framework, to examine Somalia's existing water governance system functionality according to all of the twelve OECD principles on water governance. The findings of this study provide a detailed and accurate understanding of how well water governance is working, the progress made, and the challenges faced in achieving SDG 6 in Somalia. Furthermore, the study provides specific recommendations to strengthen water governance and speed progress toward SDG 6 objectives in Somalia. Moreover, the study aims to check the quality of these tools and whether they are applicable in evaluating water management methods in developing countries or not.

Keywords: Water Governance, Somalia Water Sector, Achievability, Sustainable Development Goal (SDG6), Developing Countries, Integrated Water Resources Management.

ABBREVIATION

ACTED	: Agency for Technical Cooperation and Development
AFDB	: African Development Bank
AICS	: Agenzia Italiana per la Cooperazione allo Sviluppo
BDP	: Baardheere Dam Project
DECC	: Director of Environmental and Climate Change
DRR	: Disaster Risk Reduction
EU	: European Union
FAO	: Food Agriculture Organization
FGS	: Federal Government of Somalia
FMS	: Federal Member States
FSNAU	: Food Security and Nutrition Analysis Unit
GDP	: Gross domestic product
GEF	: Global Environment Facility
GIZ	: Deutsche Gesellschaft für Internationale Zusammenarbeit
GLAAS	: Global Analysis and Assessment of Sanitation and Drinking Water
GWP	: Global Water Partnerships
HBV	: Hydrologiska Byrans Vattenbalansavdelning
HCF	: Health Care Facilities
HDI	: Human Development Index
HEC-HM	: Hydrological Engineering Centre - Hydrologic Modeling
HRUs	: Hydrologic Response Units
ICWE	: International Conference on Water and the Environment
IOM	: International Organization Migration
ITCZ	: Inter-Tropical Convergence Zone
IWRM	: Integrated Water Resources Management
JSR	: Joint Sector Review
M&E	: Monitoring and Evaluating
MDGs	: Millenium Development Goals
MoAI	: Ministry of Agriculture and Irrigation

MoECC	: Ministry of Environment and Climate Change
MoEWR	: Ministry of Energy and Water Recourse
MoF	: Ministry of Finance
MoL	: Ministry of Livestock
NDC	: Nationally Determined Contribution
NDP-9	: Ninth National Development Plan
NGO	: Non-Governmental Organizations
NWRS	: National Water Resource Strategy
OECD	: Organization for Economic Cooperation and Development
PPPs	: Public-Private Partnerships
PS	: Private Sector
SDG-PSS	: Sustainable Development Goal Policy Support System
SDGs	: Sustainable Development Goals
SIWI	: Stockholm International Water Institute
SWA	: Sanitation Water for All
SWALIS	: Somalia Water and Land Information System
SWAT	: Soil and Water Assessment Tool
SWDUC	: Somalia Water Development Union Company
SWM	: Stanford Watershed Model
UNDP	: United Nations Development Program
UNESCO	: United Nations Education, Science, and Culture Organizations
UNFCCC	: United Nations Framework Convention on Climate Change
UNICEF	: United Nations International Children's Emergency Fund
UNU-INWEH	: United Nations University, Institute of Nature, Water, Environment and Health
USAID	: United States Agency for International Development
WASH	: Water Sanitation and hygiene
WASH BAT	: Water Sanitation and Hygiene Bottleneck Analysis Tool
WGI	: Water Governance Initiative

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1. INTRODUCTION

Water is essential for achieving sustainable development since it serves as the basis for tackling significant global challenges including energy, food, health, peace and security, and poverty eradication (Bekele et al., 2021). However, the availability and suitability of water vary across countries, and even when accessible, its quality for human use remains uncertain (Pandit & Kumar, 2015). The combination of economic expansion and societal change is intensifying the strain on water and natural resources, leading to a global rise in water scarcity (Bintein et al., 2023). Water shortages, poor water quality, overexploitation, inadequate water and sanitation services, and pollution are major problems in developing countries, including Somalia. Various factors contribute to these challenges, such as climate change, population growth, rapid urbanization, lack of investment in water infrastructure, and weak governance. Some regions face water scarcity due to droughts, over-extraction of groundwater, and unequal distribution of water resources. The water demand exceeds its availability in many places, creating an imbalance that is expected to worsen in the future. Although national water policies prioritize meeting the water demands of households and industries, difficulties hinder water availability, resulting in water stress. Global climate change and land destruction further exacerbate this issue (Vairavamoorthy et al., 2008). Within global contexts, Somalia is notable for its predominantly arid environment, where water scarcity significantly impacts the productivity of all sectors. Furthermore, the majority of Somalis rely on water resources for their agricultural activities and livestock rearing, which are essential for their sustenance. Except for a limited number of regions that receive sufficient rainfall to sustain rain-fed agriculture, the majority of Somalia is characterized by dry and semi-arid conditions, making irrigation the only method supporting agricultural activities. Irrigated agriculture is predominantly carried out along the Juba and Shabelle rivers in the southern region, and to a lesser extent in the northern basins and natural oases (FAO-SWALIM). Like other developing countries, Somalia faces increasing water demand and shortages, leading to conflicts over water resources. Declining groundwater quantity caused by overuse, population growth, and pollution compounds these challenges (MoEWR, 2021a). Climate change further worsens the situation, causing repeated floods and droughts. Managing and delivering ongoing or potential water-related investment opportunities is challenging due to Somalia's poor water infrastructure and unclear responsibilities among entities involved in the

water sector (Mourad, 2020). To address pressing global development challenges and ensure sustainability, the United Nations has established the Sustainable Development Goals (SDGs). The challenge arising from the interdependence of water resources and human beings is a good example of the issues the Sustainable Development Goals (SDGs) aim to tackle. SDG 6 specifically aims to ensure access to clean water and proper sanitation for everyone by 2030. It includes objectives related to water quality, efficiency, management, collaboration, capacity building, and ecosystem health. While commendable, the feasibility of SDG 6, especially with ongoing initiatives to address global water concerns, remains uncertain (Lindamood, 2018). Achieving SDG 6 in developing countries, including Somalia, requires a comprehensive approach involving effective policy-making, adequate financing, and technical assistance. Efforts are underway to improve the situation by implementing new policies, investing in water and sanitation infrastructure, and collaborating with international organizations. Water governance has gained significance on a global scale and is recognized as an essential component for making substantial and lasting progress toward achieving the objectives of SDG 6. Due to the growing importance of sustainable development and resilience principles, there has been a notable change in the methods and systems used to manage and administer water resources and services. The present focus is on examining engineering- and technology-driven management systems, with a shift towards more integrated approaches that prioritize good governance (Jiménez et al., 2020). Understanding the complexities of water governance and the feasibility of achieving SDG 6, in developing countries is difficult context. This study focuses on analyzing the water governance of Somalia as a case study. The objective of the study is to pinpoint valuable information that may support the development of policies, and strategies, to enhance water security in comparable situations. This research seeks to examine the present condition of water governance in Somalia and evaluate the obstacles and advancements in attaining SDG 6 within the Somali context, considering the country's heavy dependence on water. Using analysis tools such as the SDG6 Policy Support System (SDG-PSS) tool, the Water, Sanitation, and Hygiene Bottleneck Analysis Tool (WASH BAT), and the OECD indicator framework on water governance the study aims to identify gaps and challenges in Somalia's water governance and provide recommendations for improving sustainable water management in Somalia.

2. GENERAL BACKGROUND

2.1 Sustainable Development Goals (SDGs)

In 2015, the United Nations officially established the Sustainable Development Goals (SDGs), also known as the Global Goals. The primary purpose of these goals is to create a global effort to eradicate poverty, protect the environment, and ensure peace and prosperity for all individuals by the year 2030 (UN, 2015b). The SDGs are a continuation of the Millennium Development Goals (MDGs), which outlined eight crucial objectives for global development. The MDGs were based on the UN Millennium Declaration's eight goals, signed in September 2000. The UN Member states approved the MDGs to achieve most of them by 2015. The MDGs had a primary focus on eliminating poverty and hunger, attaining universal primary education, decreasing child and maternal mortality rates, advancing gender equality, combating diseases such as HIV/AIDS and malaria, guaranteeing the sustainability of the environment, and building international collaborations for development. The UN acknowledges significant progress in reaching many of the MDGs, as mentioned by the UN General Secretary in 'The Millennium Development Goals Report 2015' (Ilyin et al., 2016). These goals played a crucial role in lifting over a billion people out of poverty, reducing hunger, increasing school attendance rates, protecting the environment, and promoting collaboration. However, it is essential to highlight that achieving the MDGs presented challenges and limited success in certain regions. Developed countries, landlocked nations, and small island states faced difficulties in making substantial advancements. Additionally, some MDGs related to reproductive health remain unfulfilled (UN, 2015a). Building upon the foundation set by the MDGs, Agenda 2030 introduced the SDGs as an interconnected framework for sustainable development. The SDGs contain 17 goals and 169 associated targets and aim to address various dimensions of development and tackle new global challenges and uncertainties. The SDGs emphasize the interdependence of their objectives, providing a framework for sustainability beyond 2015 (Ilyin et al., 2016). Sustainable Development Goal 6 (SDG6) focuses on ensuring universal access to safe and sustainable water and sanitation by 2030. SDG 6 is one of the 17 goals declared by the United Nations in 2015, recognizing the importance of water in development. SDG6 sets targets to improve water accessibility, sanitation facilities, water quality, water utilization efficiency, and the protection and restoration of water-related ecosystems as shown in Table 2.1 (UN, 2015b). This goal is also

crucial for attaining five other goals namely: SDG1 (eradicating poverty), SDG2 (eliminating hunger), SDG3 (promoting good health and well-being), SDG4 (ensuring quality education), and SDG15 (sustaining life on land).

Table 2.1. Targets and Indicators of Sustainable Development Goal 6 (UN General Assembly, 2017).

Targets	Indicators
6.1: By 2030, achieve universal and equitable access to safe and affordable drinking water for all.	6.1.1: Proportion of population using safely managed drinking water services.
6.2: By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations.	6.2.1a: Proportion of population using safely managed sanitation services.
	6.2.1b: Proportion of population with a handwashing facility.
6.3: By 2030, improve water quality by reducing pollution, eliminating dumping minimizing the release of hazardous chemicals and materials, halving the proportion of untreated wastewater, and substantially increasing recycling and safe reuse globally.	6.3.1: Proportion of domestic and industrial wastewater flows safely treated.
	6.3.2: Proportion of bodies of water with good ambient water quality.
6.4: By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity.	6.4.1: Change in water-use efficiency over time.
	6.4.2: Level of water stress: Freshwater withdrawal as a proportion of available freshwater resources.
6.5: By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate.	6.5.1: Degree of integrated water resources management.
	6.5.2: Proportion of transboundary basin area with an operational arrangement for water cooperation.
6.6: By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers, and lakes.	6.6.1: Change in the extent of water-related ecosystems over time.
6. a: By 2030, expand international cooperation and capacity-building support to developing countries in water- and sanitation-related activities and programmes, including water harvesting, desalination, water efficiency, wastewater treatment, recycling, and reuse technologies.	6.a.1: Amount of water- and sanitation-related official development assistance that is part of a government-coordinated spending plan.
6. b: Support and strengthen the participation of local communities in improving water and sanitation management.	6.b.1: Proportion of local administrative units with established and operational policies and procedures for participation of local communities in water and sanitation management.

2.2 Concept of Water Governance

Water governance, like governance in general, is constantly evolving. Currently, there is no widely accepted definition for water governance, and its ethical application and political aspects are subjects of discussion at both national and international levels. Water governance refers to the collective activities and relationships of different sociological, political, economic, and administrative institutions that are involved in the development and administration of water resources (Hamdy, 2012). The Global Water Partnership defines water governance as various political, social, economic, and administrative institutions that are in place to support the development and management of water resources as well as the provision of water services at all societal levels (GWP, 2003). Similarly, the UNDP defined water governance as a range of political, economic, and social processes and institutions that involve governments, civil society, and the private sector in decision-making about the most effective use, development, and management of water resources (UNDP, 2004). Additionally, the OECD defines water governance as a set of political, institutional, and administrative rules, practices, and processes that facilitate effective decision-making, allow stakeholders to express their concerns, and guarantee accountability for those in charge of water management (OECD, 2015b). Therefore, water governance refers to a range of systems that oversee the process of making decisions regarding the development and management of water resources. Its focus is on the decision-making process, particularly on who makes the decisions, how they are made, and the circumstances under which they are made, rather than on the decisions themselves (Moench et al., 2003). The management of water resources and related facilities is built upon fundamental pillars, which highlight the principles of good governance:

- Legitimacy of the institutions' capacity to rule;
- Transparency in decision-making processes;
- Accountability of individuals for fulfilling their responsibilities;
- Inclusiveness of various stakeholders;
- Equity in the provision and distribution of services;
- Incorporating water policymaking across different levels and sectors;
- Capacity of the institutions and individuals responsible for water management;
- Ability to adjust to a dynamic environment (Lockwood, 2008).

To effectively address present and future difficulties, it is essential to implement strong public policies that focus on specific goals within set timeframes, at a suitable level, with clearly defined responsibilities among relevant authorities, and regular monitoring and assessment. It prompts inquiries about the actions to be taken, the individuals responsible for those actions, the reasons behind them, and the specific level of government involved. The OECD emphasizes that for policy responses to water crises to be effective, they must be coherent, involve relevant stakeholders, have well-designed regulatory frameworks, provide sufficient and accessible information, and demonstrate adequate capacity, integrity, and transparency (Akhmouch, 2018). Water governance plays a significant role in developing and executing policies through collaboration among government levels, civil society, businesses, and various stakeholders. Their involvement is crucial in achieving the economic, social, and environmental advantages of effective water governance (OECD, 2015a). There is no one-size-fits-all solution to global water problems; instead, there is an extensive range of conditions inside and among countries. Governance solutions should be tailored to various territories, acknowledging that the setting greatly influences governance and it is crucial to align water policy with different locations. The OECD formulated twelve water governance principles through an innovative bottom-up approach that engaged a diverse range of stakeholders in a water governance effort. The twelve OECD Principles on Water Governance are presented in Table 2.2. These principles recognize that legal, administrative, and organizational systems around the world are not all the same. They are meant to help countries make policies that are real and have clear goals. The principles, which are based on three fundamental pillars drawn from various water governance concepts, seek to improve the development of tangible and results-driven public policies:

- **Effectiveness:** refers to the contribution of governance to establishing well-defined and sustainable water policy objectives and targets at all levels of government, implementing these objectives, and achieving expected targets.
- **Efficiency:** refers to how well governance contributes to maximizing the benefits of sustainable water management and welfare while minimizing costs to society.
- **Trust and Engagement:** refers to how governance contributes to establishing public trust and ensuring the involvement of all stakeholders through democratic legitimacy and fairness for the entire society. (OECD, 2015a).

Table 2.2.The OECD Principles on Water Governance (OECD, 2015a).

Enhancing the effectiveness of water governance	
Principle 1.	Allocate and distinguish roles and responsibilities for water policymaking, policy implementation, operational management, and regulation, and foster coordination across these responsible authorities.
Principle 2.	Manage water at the appropriate scale(s) within integrated basin governance systems to reflect local conditions, and foster co-ordination between the different scales.
Principle 3.	Encourage policy coherence through effective cross-sectoral coordination, especially between policies for water and the environment, health, energy, agriculture, industry, spatial planning, and land use.
Principle 4.	Adapt the level of capacity of responsible authorities to the complexity of water challenges to be met, and to the set of competencies required to carry out their duties.
Enhancing the efficiency of water governance	
Principle 5.	Produce, update, and share timely, consistent, comparable, and policy-relevant water and water-related data and information, and use it to guide, assess, and improve water policy
Principle 6.	Ensure that governance arrangements help mobilize water finance and allocate financial resources in an efficient, transparent, and timely manner
Principle 7.	Ensure that sound water management regulatory frameworks are effectively implemented and enforced in pursuit of the public interest
Principle 8.	Promote the adoption and implementation of innovative water governance practices across responsible authorities, levels of government, and relevant stakeholders
Enhancing trust and engagement in water governance	
Principle 9.	Mainstream integrity and transparency practices across water policies, water institutions, and water governance frameworks for greater accountability and trust in decision-making
Principle 10.	Encourage water governance frameworks that help manage trade-offs across water users, rural and urban areas, and generations
Principle 11.	Encourage water governance frameworks that help manage trade-offs across water users, rural and urban areas, and generations
Principle 12.	Promote regular monitoring and evaluation of water policy and governance where appropriate, share the results with the public, and make adjustments when needed

2.3 Integrated Water Resources Management (IWRM)

Integrated Water Resources Management (IWRM) is a comprehensive approach to utilizing and managing water resources. It was derived from the Dublin Statement on Water and Sustainable Development, which received endorsement on January 31, 1992, in Dublin, Ireland, during the International Conference on Water and the Environment (ICWE). The proclamation emphasized the scarcity and inappropriate utilization of global water resources as a substantial and growing threat to sustainable development and environmental preservation, impacting human health and welfare, food security, industrial advancement, and ecosystems. In Figure 2.1, the four key concepts that form the basis of IWRM, as stated in the statement, are illustrated. Unlike the traditional and fragmented approach, where different sectors independently undertake water projects, often with overlapping responsibilities, IWRM promotes a cohesive and sustainable approach to water resource management. It recognizes the limited availability of water resources and the detrimental impacts of external influences on these resources (SIWI, 2020). IWRM is a systematic approach that encourages the harmonized growth and control of water, land, and associated resources to optimize economic and social well-being fairly while also ensuring the sustainable future of essential ecosystems (GWP, 2000). It aligns with the wider concept of sustainable development and directly pertains to the ecological, social, and economic importance of water supplies. Many countries around the world, including those in the European Union and Turkey, are increasingly implementing IWRM in their water management strategies. This aligns with Sustainable Development Goal 6.5, which aims to implement IWRM at all levels by 2030. The EU Water Framework Directive (WFD) is an example of such a policy that promotes integrated management of water resources among its member states.

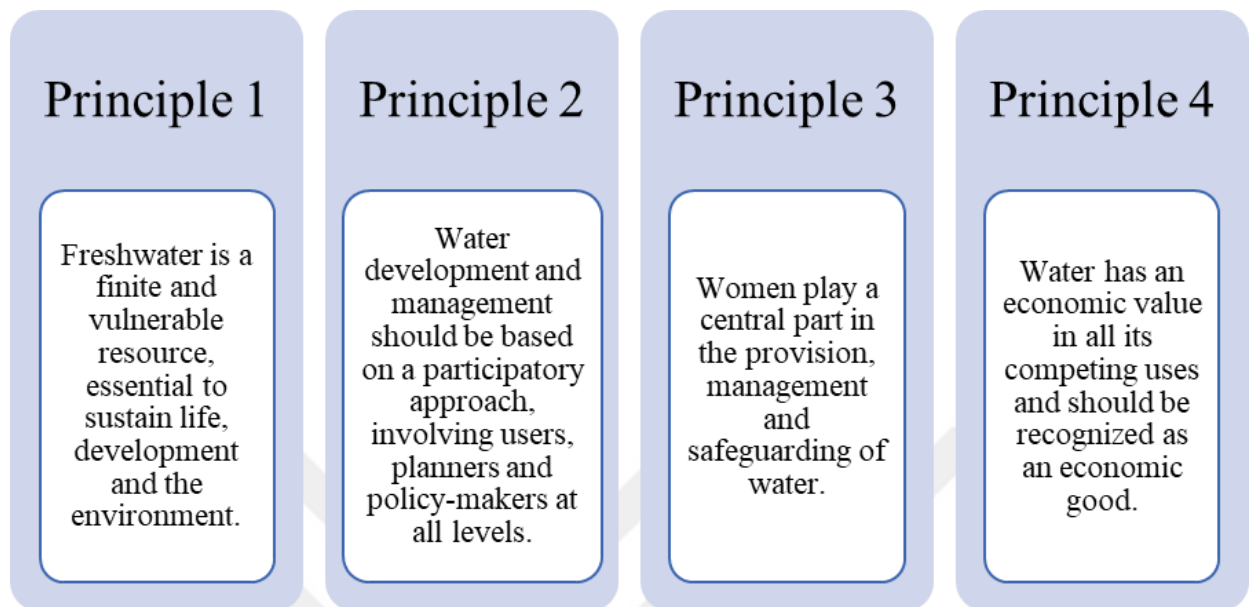


Figure 2.1. Integrated Water Resources Management (IWRM): Dublin Guiding Principles.

2.4 Tools Used for Water Management

2.4.1 Mathematical Models

2.4.1.1 Hydrological Models

Mathematical models are among the most advanced techniques for studying water resource issues. They are used to define hydrological characteristics and quality of water resources. Hydrological models are simplified representations of the natural processes that occur in the real world (Wheater et al., 2007). These models are essential for managing water and environmental resources. Each model is distinct and has unique features that help understand various hydrological processes and forecast system behavior. The best model is the one that provides outcomes that are close to reality while minimizing input parameters and model complexity. Several input factors determine the properties of each model, such as rainfall, air temperature, soil properties, terrain, vegetation, and hydrogeology. The variability of hydrological phenomena in all three spatial dimensions over time makes it impossible to predict the current system's outcomes accurately. Only a limited number of idealized examples have successfully incorporated the simultaneous analysis of all five sources of variation, namely randomness, three space dimensions, and time (Singh, 2018). Hydrologic models are now crucial for studying

hydrological processes and assessing the effects of human activity on the hydrologic system. Figure 2.2 shows the categorization of hydrologic models based on their features (Dwarakish & Ganasri, 2015).

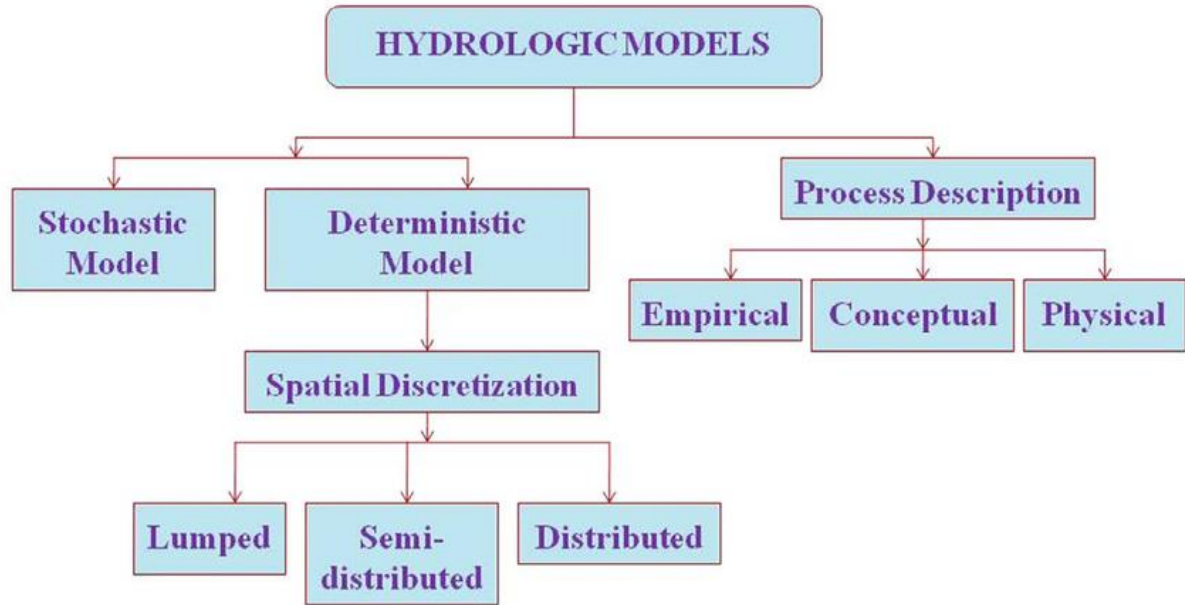


Figure 2.2. Classification of Hydrologic Models (Dwarakish & Ganasri, 2015).

The most important classifications of the hydrological models based on process description are the empirical models, conceptual models, and physically based models, their characteristics are shown in Table 2.3 and are briefly described below:

Empirical models, or data-driven models, are models that focus on observations and use existing data to gain insights about hydrological systems. These models are applicable only within certain boundaries and use mathematical equations generated from input and output time series. Commonly used empirical models in the studies of water resources include Artificial Neural Networks (ANN) autoregressive models, copula functions, and fuzzy logic models (Devia et al., 2015).

Conceptual or parametric models depict the hydrological processes in catchments, which are comprised of interconnected reservoirs filled by rainfall, infiltration, and percolation and emptied by evaporation, runoff, and drainage. These models rely on semi-empirical equations and calibration, requiring substantial meteorological and hydrological data. Nevertheless, this calibration necessitates the use of curve fitting, which adds complexity to comprehension and

hinders the ability to accurately predict the consequences of land use change. The Stanford Watershed Model IV (SWM) was the pioneering conceptual model, featuring 16–20 parameters (Singh, 2018).

Physically-based models, or mechanistic models, are mathematical representations of real processes that utilize measurable state variables and finite difference equations. These models do not necessitate large-scale hydrological and meteorological data to be adjusted, but they do necessitate an assessment of attributes such as soil moisture content, water depth, terrain, and river network dimensions. These models possess the capacity to provide extensive information that transcends boundaries and finds application in diverse scenarios. Examples of commonly used physically-based hydrological models include HEC-HM, SWAT, and MIKE SHE (Abbott et al., 1986; Devia et al., 2015).

Table 2.3. Characteristics of Empirical model, Conceptual model, and physically based model (Devia et al., 2015).

Empirical Model	Conceptual Model	Physically Based Model
Data-based or metric or black box model	Parametric or grey box model	Mechanistic or white box model
Involve mathematical equations to derive Value from available time series	Based on modeling of reservoirs and include semi-empirical equations with a physical basis.	Based on spatial distribution, evaluation of parameters describing physical characteristics
Little consideration of the features and processes of a system	Parameters are derived from field data and calibration.	Require data about the initial state of the model and morphology of the catchment
High predictive power, low explanatory depth	Simple and can be easily implemented in computer code.	Complex model Requires human expertise and computation capability.
Cannot be generated to other catchments	Require large hydrological and meteorological data	Suffer from scale-related problems
Ann, unit hydrograph	Hbv model, top model	She or Mike she models, swat
Valid within the boundary of a given domain	Calibration involves curve fitting makes difficult physical interpretation	Valid for a wide range of situations.

2.4.1.2 Quality Models

Water quality models are critical methods for managing water resources. These models combine mathematical expressions with scientific expertise, encompassing both process-based and data-based approaches. They are valuable for evaluating and forecasting the movement of pollutants in water systems, understanding pollutant behavior, predicting water ecosystem processes, and assessing changes in water quality over time and space. They are particularly useful for reducing the need for extensive, costly pollution scenario experiments in various water environments. Water quality modeling uses mathematical simulation techniques to estimate and predict water pollution. These models contain a series of formulations that describe the physical mechanisms controlling the position and movement of contaminants in a body of water. Mathematical water quality modeling is one of the most effective methods for assessing the current pollution load, pollutant transfer, and future cause-and-effect relationships between pollutant sources and water quality. Water quality modeling enables decision-makers and policymakers to select more technically strong options for water quality management (Ejigu, 2021). Water quality models can be categorized based on the following criteria:

- Type Classification of approach (empirical, conceptual, physically based)
- Pollutant substances (salts, sediments, nutrients, etc.)
- Scope of application (integrated, river system, groundwater, coastal waters, catchment)
- Nature (stochastic or deterministic)
- Analyzed state (steady-state or dynamic simulation)
- Spatial analysis (distributed, lumped)
- Dimensions (1-D or 2-D models)
- Data requirements encompass the need for extensive databases, minimum requirements models (Tsakiris & Alexakis, 2012).

The successful implementation of these models necessitates precise and accurate data sets collected from water resources and water-related sectors. However, obtaining such data is an essential challenge for the efficient use of these models.

2.4.2 Water Management Decision Support System (DSS)

A Decision Support System (DSS) is a complicated computer system that takes data as input, employs mathematical models for data processing, and produces outputs that assist decision-makers in making accurate decisions. The DSS consists of three primary components:

Data sources: the first step involves gathering data from primary or secondary sources, with heterogeneity being an important characteristic. The majority of data is derived from operational sources, although it may also encompass documentation and external vendors.

Data warehouses: the second step involves the extraction, processing, and storage of data into databases. The stored data serves as a basis for mathematical and analytical models, aiding decision-makers.

Knowledge management: the third step involves processing data using both standard models (such as mathematical and analytical models) and models obtained from external sources. To achieve the best possible results, decision support systems (DSS) employ mathematical models. Below are several important benefits of utilizing decision assistance systems:

- Expands the range of options available;
- Enhances understanding of issues and their consequences;
- Risk analysis and solutions to prevent them.

Many Decision Support Systems (DSSs) have been developed, each with its unique characteristics, models, and input data. However, the crucial aspect lies in accurately defining the issue (Arsene et al., 2020). Decision support systems for water management aid decision-makers in interpreting and effectively managing water resources across various scales. Despite its inclusion in management practices, DSS became widely employed in water resources management (Zeng et al., 2012). There are a variety of ways that water DSS are presented, including spreadsheet tools visualizations, and conceptual frameworks (Wardropper & Brookfield, 2022). The tools that are used in this study, the Sustainable Development Goals Policy Support System (SDG-PSS), the Water, Sanitation, and Hygiene Bottleneck Analysis Tool (WASH BAT), and the OECD water governance indicator framework serve as the DSS tools. They all support decision-makers make good decisions, enabling them to address water management challenges.

2.5 Somalia Country Context

2.5.1 Geographical Overview

Somalia is located on the eastern coastline of the Horn of Africa and spans a total area of 637,540 km². It has the longest coastline in mainland Africa, stretching over 3,333 km. This coastline extends from the Gulf of Aden in the north to the Indian Ocean in the east and south, covering approximately 1,000 km and 2,000 km, respectively. Somalia shares borders with Djibouti and the Gulf of Aden to the north, Ethiopia to the west, Kenya to the south, and the Indian Ocean to the east as shown in Figure 2.3. The land border with Djibouti is 61km, Ethiopia is 1,640 km, and Kenya is 684 km. The country spans approximately 1,550 km from north to south, between latitudes 12° N and 10° S, and 1,095 km from west to east, between longitudes 41° and 51° E. It is located in the Horn of Africa, near the Arabian Peninsula, and shares borders with both the Indian Ocean and the Red Sea (Federal Government of Somalia, 2018).



Figure 2.3. Map of Somalia

2.5.2 Population and Demographics

As of 2023, Somalia's population is approximately 18,143,380. The average life expectancy in the country is around 50 years. Over two-fifths of the population is under the age of 15, indicating a young population. The country has a high annual population growth rate of 3.05 percent. The population density is 28.92 persons per square kilometer, with variations across different regions. The literacy rate in Somalia is low at 41.03 percent, reflecting the challenges in providing education. Political instability and limited infrastructure have hindered progress in the education sector. Somalia also has a very low Human Development Index (HDI) of 0.285, as of 2010. However, due to the lack of data, it is difficult to estimate HDI values for different regions and socioeconomic groups (UNDP, 2012).

2.5.3 Climate Profile

Somalia exhibits a wide range of climatic variations, encompassing tropical, sub-tropical, dry, and semi-arid regions. The coastal regions of the country experience high temperatures and high humidity, whereas the inland portions are mainly characterized by hot and arid conditions. The country undergoes four distinct seasons: two periods of rainfall referred to as "Gu" and "Deyr," and two periods of dry weather known as "Jiilaal" and "Hagaa." The first rainy season, known as "Gu," occurs from April to June, whereas the dry season, known as "Hagaa," takes place from July to September. The second precipitation period, known as "Deyr," occurs from October to November. The most severe period of drought, known as "Jiilaal," occurs from December to March (ASCLME, 2012). Somalia has an average annual rainfall of 280 mm, although during years with excessive precipitation, the greatest reported rainfall can reach 500–600 mm. Over the last thirty years, the country's mean annual temperature has increased. The average yearly temperature in Somalia is around 30°C. The nation encounters various climate perils, including periodic droughts that transpire every 2-3 years and frequently result in catastrophic floods, especially in the southern region where the Shabelle and Jubba rivers are susceptible to intense rainfall from the Ethiopian highlands (Federal Government of Somalia, 2018).

2.5.4 Government Structure

Somalia gained independence in 1960 with the northern and southern regions achieving independence from British and Italian colonial rule, respectively, and united to form the Republic of Somalia (Government of Somalia, 2022). After gaining independence, Somalia engaged in a

war with Ethiopia and subsequently experienced a period of instability after the fall of its central authority in 1991. This significantly impacted various aspects of life and caused considerable damage to water systems (Jama & Mourad, 2019). Somalia is currently a Federal Republic with two levels of administration: the federal government and the Federal Member States (FMS), which include Puntland, Somaliland, Jubaland, Galmudug, Hirshabelle, and South West State (OECD/UCLG, 2022). The Federal Government of Somalia represents the executive branch, while the Federal Parliament serves as the legislative body. Somalia's Federal Republic has a bicameral parliament, with members elected every four years. (Federal Government of Somalia, 2022a). The President, as the head of state, is chosen by the Federal Parliament of Somalia in a joint session for a four-year term with a two-thirds majority vote. The President, with the parliament's approval, appoints the Prime Minister, who becomes the head of government and names the Cabinet Ministers. Ministerial systems related to water management in Somalia are explained in Section 2.8.1.

2.6 Somalia Water Resources

Somalia is experiencing water scarcity with approximately 377.52 m³ of total internal renewable water resources per capita as of 2020 which is far below the Falkenmark indicator or the water stress index recommended level of 1,000 m³ per capita per year. the internal renewable water resources per capita of Somalia gradually declined over time from 1,728 m³ per year in 1971 to 378 m³ per year in 2020 (FAO-AQUASTAT, 2020). This persistent decrease in the availability of freshwater has led to water resource competition in some areas of Somalia (MoEWR, 2021b). The majority of Somalia's water resources are primarily utilized for agricultural and livestock purposes, with only minimal amounts designated for personal use such as drinking and hygiene. Water quality is a significant concern in Somalia, high turbidity, elevated mineral content, and contamination from chemicals and biological agents affect the potability of available water sources (WASH Cluster, 2023). Access to clean and safe drinking water remains limited in many areas. The country's Water requirements are fulfilled through various sources, including rivers, springs, rainwater collection systems, shallow wells, and deep boreholes. Water shortages typically occur during the extended dry season, when the population must rely solely on the two permanent rivers and groundwater supplies (WASH Cluster, 2023).

2.6.1 Surface Waters

Somalia features nine main water basins, including the Gulf of Aden, Darror, Tug Der/Nugal, Ogaden, Shabelle, Juba, Lag Dera, Lag Badana, and the Central Coastal Basin, as shown in Figure 2.4. The Juba and Shabelle basins are the most extensive and significant in Somalia and have been considered the primary source of food production in the country (Jama & Mourad, 2019).

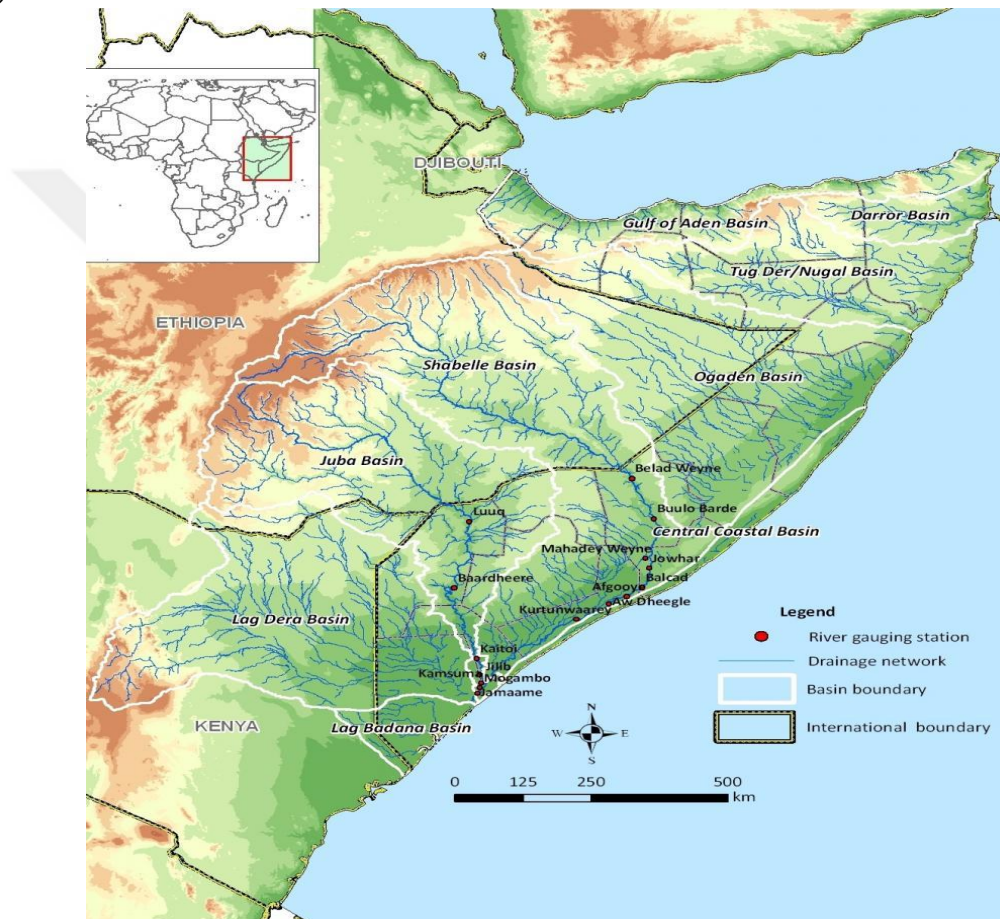


Figure 2.4. Drainage Systems of Somalia (FAO-SWALIM)

The total renewable water resources were estimated at 14.7 km³ which mostly comes from the two river basins, and the total withdrawal water for domestic, agricultural, industrial, and environmental purposes was estimated at 3.3 km³. Based on the Food and Agriculture Organization's (FAO) global information system on water resources and agricultural water management (FAO-AQUASTAT, 2020). The two rivers provide water which is mainly used for domestic, livestock, and agricultural purposes. Nearly 99% of the expected yearly water consumption is allocated to livestock and agricultural activities. The villages located near the

rivers use them as their primary source of surface water, while remote settlements mostly rely on rainwater harvesting and groundwater to meet their water needs (AfDB, 2015).

Shabelle River Basin: The Shabelle River basin originates from the Ethiopian Highlands, at an altitude of around 4,230 m above sea level. It covers a massive area of 297,000 km², with the majority (about 63.5%) of the basin located in Ethiopia, while the remaining is in Somalia. Its total length is approximately 2,526 km, with 1,290 km of its course within Ethiopia. Numerous smaller rivers and streams within Ethiopia contribute to the Shabelle's flow (Elmi Mohamed, 2012). After the river leaves the mountains of Ethiopia, it flows southeastward to the Somali border, as Figure 2.5 shows. Upon reaching the border, it veers southward toward Balcad, near Mogadishu; instead of flowing directly into the Indian Ocean, it usually reaches a low-lying area in southern Somalia, where it gradually seeps into the sand. This process nourishes the local ecology and replenishes groundwater aquifers. Only during extremely heavy rainfall does the Shabelle River break through to join the Juba River and eventually reach the Indian Ocean. Rainfall in the basin varies, with an annual average of 425 mm. Mountainous areas receive much more precipitation (over 1,500 mm), while border regions receive significantly less (around 200 mm) (Elmi, 2013). The river's mean annual runoff is substantial, with approximately 3,387 million m³ at Gode in Ethiopia and 2,384 million m³ at Belet-Weyne in Somalia. approximately 1,000 million m³ are lost in the arid Ogaden desert in eastern Ethiopia. Even when there is a large volume of water flowing, the river still contains a significant amount of salt. The river has periodic droughts and floods, because of its climate conditions, which pose significant challenges to the downstream Somali inhabitants (Elmi, 2013).

Juba River Basin: The three major tributaries, the Genale, Dawa, and Weyb, which originate in the Ethiopian Highlands, converge near the Somali border to form the Juba River within Somalia as Figure 2.5 shows. The Dawa River also serves as part of the Ethiopia-Kenya border and later marks the Ethiopia-Somalia border (Basnyat, 2009). The Juba River basin is extensive, covering 452,000 km², and it includes the Lag Dera sub-basin, mainly located in Kenya. Within the Lag Dera sub-basin in Somalia, various tributaries contribute to the river's flow, including the Ewaso Nyiro tributary from Mount Kenya (Elmi Mohamed, 2012). Notably, this sub-basin hosts a substantial transboundary aquifer called the Merti, which extends across the border between Kenya and Somalia. The Merti aquifer holds a significant amount of untapped groundwater,

estimated at around 84,000 million m³. The Juba River eventually reaches the Indian Ocean at Kismayo in southern Somalia, covering a total distance of 1,808 km. Of this length, 840 km are in Ethiopia, and 1,004 km are in Somalia (Elmi Mohamed, 2012). Rainfall near the river's source is relatively high, at about 1,600 mm annually. However, rainfall significantly decreases as it heads southward, with an average of approximately 200 mm annually near the border. On average, the entire Juba River basin experiences around 500 mm of annual rainfall (Basnyat, 2007).



Figure 2.5. Map Showing the Juba and Shabelle River Basins

2.6.2 Groundwater

Groundwater is crucial for providing water security for both humans and livestock in the country. Except for those residing near the Juba and Shabelle Rivers, the Somali population relies on groundwater sources for their domestic water needs, livestock, and small-scale farming.

The primary groundwater sources in Somalia predominantly comprise boreholes, shallow wells, and springs. Boreholes are crucial water sources in the country due to their consistent water supply year-round, even when other sources run dry (MoEWR, 2021b). FAO's SWALIM reports that the majority of boreholes in the country have depths ranging from 90m to 250m, with some exceeding 400m in some areas. Most of the shallow wells are lower than 20 meters. The water output from these sources varies based on the aquifer and differs from one region to another. Shallow wells typically produce 2.5 to 10 m³/hour, while boreholes usually yield between 5 and 20 m³/hour. Developing additional groundwater resources in Somalia has obstacles, with poor water quality being a significant issue. Most groundwater sources in the country have salt levels over 2,000 µS/cm, which exceeds the drinking water criterion. Several shallow wells are exposed to the outdoors, increasing their vulnerability to microbiological and other forms of pollution (Mourad, 2023).

2.7 Water Use Sectors

In 2020 the overall water withdrawal was predicted to be 3.298 k m³/year, with agriculture accounting for 99.5 percent of this amount as Table 2.4 shows. In rural areas, water supply is obtained from surface dams, water pans, boreholes, shallow wells, and springs. Groundwater serves as the primary source of water for domestic, municipal, and animal purposes throughout the dry season (Federal Government of Somalia, 2018).

Table 2.4. Water Uses in Somalia (FAO-AQUASTAT, 2020).

Water Withdrawal			
Total Water Withdrawal	2020	3.298	109 m ³ /yr.
-Agriculture	2020	3.281	109 m ³ /yr.
-Municipalities	2020	0.02	109 m ³ /yr.
-Industry	2020	0.00	109 m ³ /yr.
-Surface water and groundwater withdrawal	2020	3298	109m ³ /yr.
-as %of total actual renewable water resources	2020	22.32	%

2.7.1 Agricultural Use

Agriculture is a vital component of Somalia's economy, providing livelihoods for a significant portion of its population. The water demands for agricultural activities in Somalia primarily depend on the type of crops cultivated and the irrigation methods used. Given the predominantly rain-fed nature of agriculture, water availability is highly variable and susceptible to the country's irregular rainfall patterns. The floodplains of the lower Juba and middle Shabelle basins in South Somalia, along with the area between rivers in the Bay region, primarily host crop cultivation. Approximately 90% of crop production occurs in these areas. In the northern regions, where livestock raising serves as the primary economic activity, crop cultivation primarily takes place in natural oases with groundwater sources for irrigation (Basnyat, 2007). The primary agricultural products cultivated in the basins are maize and sorghum, with rice, cereals, bananas, vegetables, and fruit trees also prevalent. Based on the typical cropping patterns in the two basins, the average irrigation water demand is 11,000 m³/ha/year. At present, the estimated agricultural water usage in the two basins is 715 m³/ha/year. Although the Shabelle River has a lower volume of water, it has a higher rate of water extraction (550 m³/ha/year). This is due to the presence of infrastructure, gravity irrigation, and desirable soil features that make it easier to use the water for agriculture. In the two basins, a moderate growth projection predicts that agricultural needs will increase to 1155 m³/ha/year. On the Juba River, the demand is estimated to be 275 m³/ha/year, while on the Shabelle River, it is expected to be 880 m³/ha/year. The FAO/European Commission (2004) presented a joint assessment for the Juba and Shabelle basins, stating that the agricultural areas might expand up to 265,000 hectares. This expansion would require irrigation water of approximately 2915 m³/ha/year (Michalscheck et al., 2016). It is evident that the agricultural water demand will continue to increase in the region. To meet these increasing agricultural demands, it is important to manage the region's water resources effective and sustainable manner.

2.7.2 Livestock Use

Livestock plays a crucial role in the Somali economy, serving as a primary source of nutrition and income (Michalscheck et al., 2016). The sector is the primary source of income for the majority of the Somali population, with more than 65% involved in various aspects of it. Additionally, it serves as the main platform for marketing goods both within the country and for export purposes (FSNAU, 2010). The water needs of livestock in Somalia are a crucial factor, as

the sustenance of the bulk of the population relies on cattle. The water requirements for cattle, sheep, goats, and camels are 1.6, 12, and 25 L/day, respectively. The total daily water demand for livestock in the country is approximately 114,000m³. If the cattle numbers remain steady, the annual demand would be 41.6 hm³. Observations suggest an increase in livestock rearing and a growing population that requires more livestock-related products. Moreover, there are substantial variations in livestock populations in different regions as a result of pastoral migrations around the area in pursuit of suitable grazing lands and water supplies. Without up-to-date data, livestock estimates and projections have to rely on the comprehensive data set from the Ministry of Agriculture in 1988, as shown in Table 2.5 (Basnyat, 2007).

Table 2.5. Water Demand for Livestock in South-Central Somalia in 1988 (Basnyat, 2007).

	Cattle		Camel		Sheep/Goats		Total Demand (m ³ /day)
	Head	m ³ /d	Head	m ³ /d	Head	m ³ /d	
Total	2,962,180	74,055	2,614,020	31,368	5,321,50	8,514	113,937

2.7.3 Domestic Use

The estimated domestic water usage is 20 Lpcpd for rural areas and 50 Lpcpd for urban areas. These levels are relatively very low compared to Türkiye whose water consumption is 228 Lpcpd (Basnyat, 2007). Although the urban population accounts for only 38% of the total population, they consume 60% of domestic water. Moreover, according to data provided by the Ministry of National Planning in 1988 and UNDP in 2005, there is a clear pattern of urbanization. Between 1988 and 2005, there was a migration of 15% of the population from rural to urban areas. This corresponds to an annual increase of 0.88% in linear terms (Michalscheck et al., 2016).

2.8 Somalia Water Governance Structure

The Federal Government of Somalia has been working on the establishment of a functioning water governance framework under the guidelines of the National Water Resource Strategy (NWRS) which was recently developed by the Ministry of Energy and Water Resource (MoEWR). The NWRS presents strategic direction on the actions that are required to enhance

the water sector and facilitate the accomplishment of Somalia's ninth National Development Plan (NDP-9). However, it is crucial to stabilize the overarching governance frameworks to establish unity in national goals and facilitate standard approaches for enhancing water sector management and development. This governance structure provides uniform and logical guidance to the national, federal, and municipal water sectors. Essential areas that need attention are the completion of the National Water Act, the creation of a comprehensive policy to govern water resource management and development, and the establishment of an institutional framework to address concerns about regulations, roles, and responsibilities (MoEWR, 2021b).

2.8.1 Key Stakeholders and their Roles

Stakeholders are institutions that engage in or have an interest in the water sector, whether it be in decision-making, regulation, projects, or other aspects. At the national level, Somalia's water sector involves various categories of stakeholders, as illustrated in Figure 2.8.

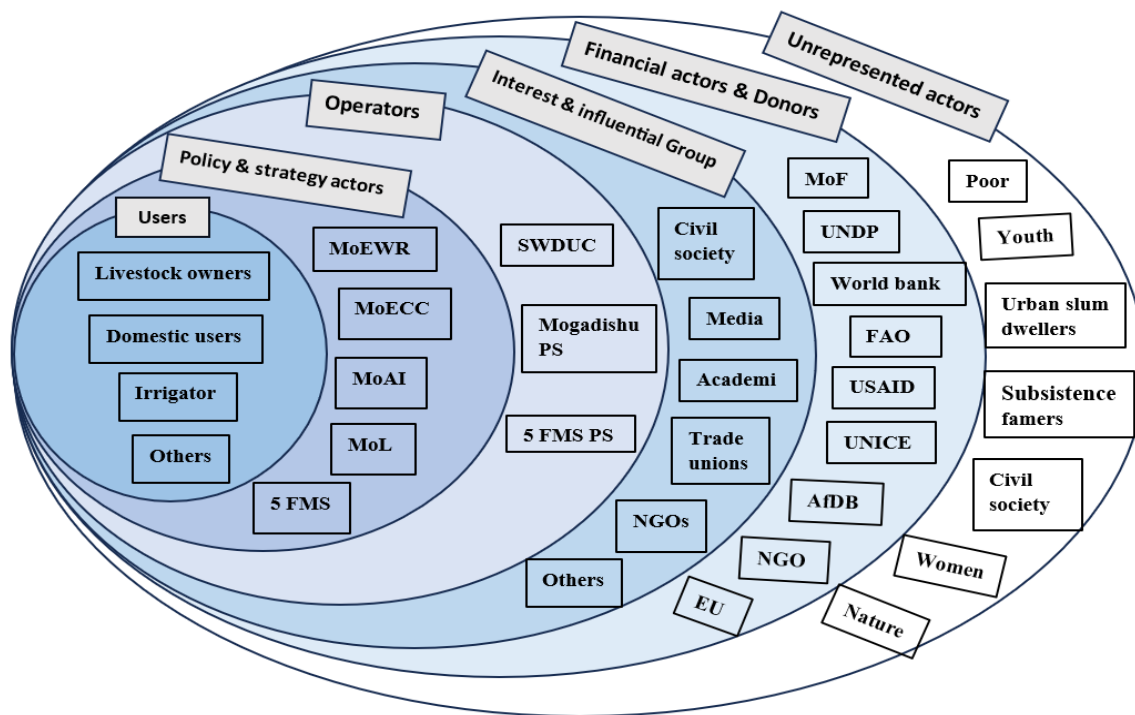


Figure 2.6. Somalia Water Sector Stakeholders Map - adopted from (OECD, 2018).

The most important stakeholders involved in Somalia's water sector can be categorized following groups based on their function and contribution to water management goals.

1. Federal Sectoral Ministries: The key ministries that have an important role in water sector management, are the federal ministries of Energy and Water Resources; Environment and Climate Change; Planning, Investment, and Economic Development; Finance; Agriculture; Livestock; Health; and Education as shown Figure 2.7 and their responsibility are briefly outlined below:

Ministry of Health (MoH): The Public Health Department of the Ministry of Health (MoH) is responsible for overseeing and assessing the monitoring and evaluation (M&E) efforts related to sanitation and hygiene indicators at healthcare facilities (HCFs).

Ministry of Education (MoE): The ministry ensures that schools have access to clean water, proper sanitation, and hygiene facilities, which is important for the health and well-being of students.

The Ministry of Agriculture and Irrigation (MoAI) is responsible for the preparation of irrigation policies, laws, and master plans for the development of the different river basins for the optimum utilization of irrigation, land, and water resource management, and also for promoting river basin management and flood control.

Ministry of Environment and Climate Change (MoECC): the ministry is responsible for formulating national policies geared towards protecting and improving the environment's quality, through sustainable development. And, to implement Government environmental policy. The ministry is also responsible for coordinating climate change initiatives and fostering sustainability.

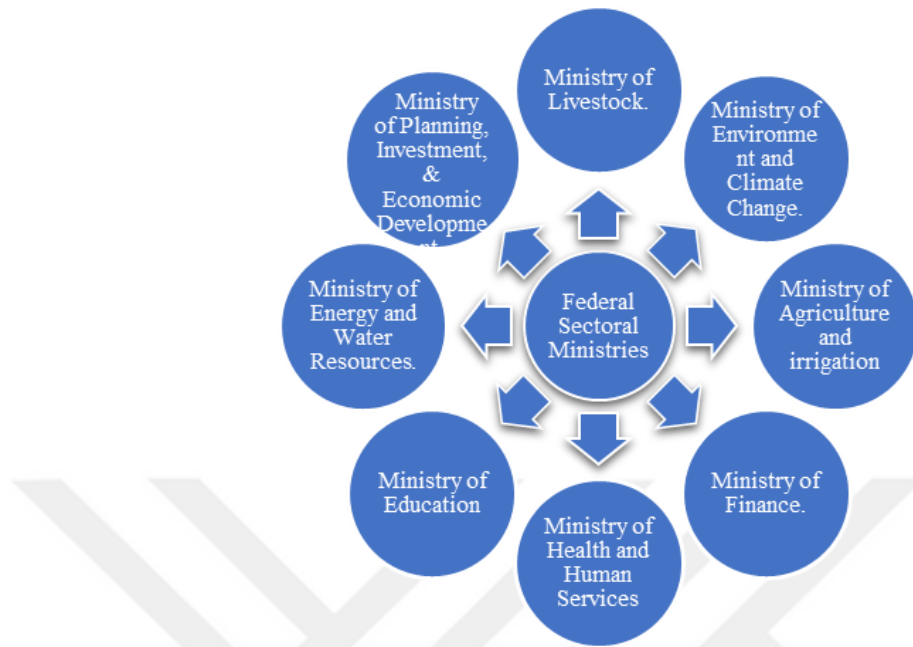


Figure 2.7. Federal Sectoral Ministries Involved in Water Management.

Ministry of Energy and Water Resources (MoEWR): is the leading institution responsible for formulating, directing, and coordinating national energy and water resources, their functions are listed below:

- Develop and implement water resource management policies and regulations.
- Oversees water resource allocation, supply system management, and quality monitoring, and invests in water conservation and reuse technologies.
- Coordination with state-level water authorities.

The Ministry is typically organized into departments or directorates responsible for specific water and energy management areas. Key Departments include Water, Energy, Administration and Finance, Policy and Planning, Maintenance and coordination, and Hydrometeorology as shown in Figure 2.9. The MoEWR oversees the Ministry's activities and reports to the federal government. The Department of Water, under the Ministry of Energy and Water Resources, is responsible for formulating and executing water resource management policies. Its main goal is to guarantee the fulfillment of water requirements for the population, agriculture, and industry while upholding environmental sustainability and economic feasibility (MoEWR, 2023).



Figure 2.8. Federal Ministries involved in Somalia water management, and their categories.

Figure 2.8 organizes Somali ministries according to their influence and interest in water-related policies. The Ministry of Environment and Climate Change, Ministry of Livestock, Ministry of Energy and Water Resources, and Ministry of Agriculture and Irrigation are classified as high power-high interest. All of these ministries play a significant role in the water governance system of the country as a result of their direct relationship to the management of natural resources, livestock health, and agricultural requirements, all of which are dependent on water. Among these ministries, the Ministry of Energy and Water Resources is the most powerful and influential because it is the leading institution responsible for formulating, directing, and coordinating national water resources responsible for the implementation of policies, and water management. Other ministries, including the Ministry of Planning, Investments, and Economic Development, Ministry of Education, Ministry of Finance, and Ministry of Health, are classified as high-power and low-interest. Their involvement in water policy is more indirect, as it pertains to strategic planning, funding allocations, and the health implications of water quality. Compared to ministries with a high level of interest, these ministries engage less directly with water issues, despite their influence.

2. Federal State Level: The Federal Member States (FMS), including Galmudug, Hirshabelle, Jubaland, Puntland, Somaliland, and Southwest State, have the authority and obligations to manage natural resources and address local environmental concerns. They are responsible for formulating and executing policies in their respective territories. Every FMS has a Ministry of

Energy and Water Resources (MOEWR) responsible for overseeing water resource matters. Each FMS through their MOEWRs has mandates and responsibilities for implementing water development projects in their respective regions. Although the precise mandates and tasks of these line ministries may vary slightly among the states, they all have responsibilities related to the water sector. The FMS-level water ministries are actively involved in various functions related to water infrastructure development and rehabilitation programs. While Puntland and Somaliland have made progress in delegating implementation functions to semi-autonomous water development agencies, the MOEWRs in other Federal Member States continue to handle a mix of policy-making, limited regulation, and implementation tasks (World Bank, 2021).

3. Private sector (PS) operators: are crucial players in Somalia's urban water sector. They manage privately owned groundwater-based (mostly boreholes) water supply systems that provide piped water access to urban areas. Some urban centers also have successful public-private partnerships (PPPs) that operate under public sector regulation with donor support. Successful cases include Farjanno in Jowhar, which reduced waterborne diseases and contributed to local development, and Mumin Global Service in Baidoa, which engages communities and influential residents in water supply management (AfDB, 2015).

4. International Organizations and NGOs: have played vital roles in supporting water management in Somalia for many years. They provide funding, technical expertise, and capacity building. They also advocate for policies, coordinate efforts, and engage in emergency response during crises. Their collaborative efforts aim to improve water access, sanitation, and sustainable management in the country. Some of the international organizations and non-government organizations working in Somalia's water sector are listed in Table 2.6.

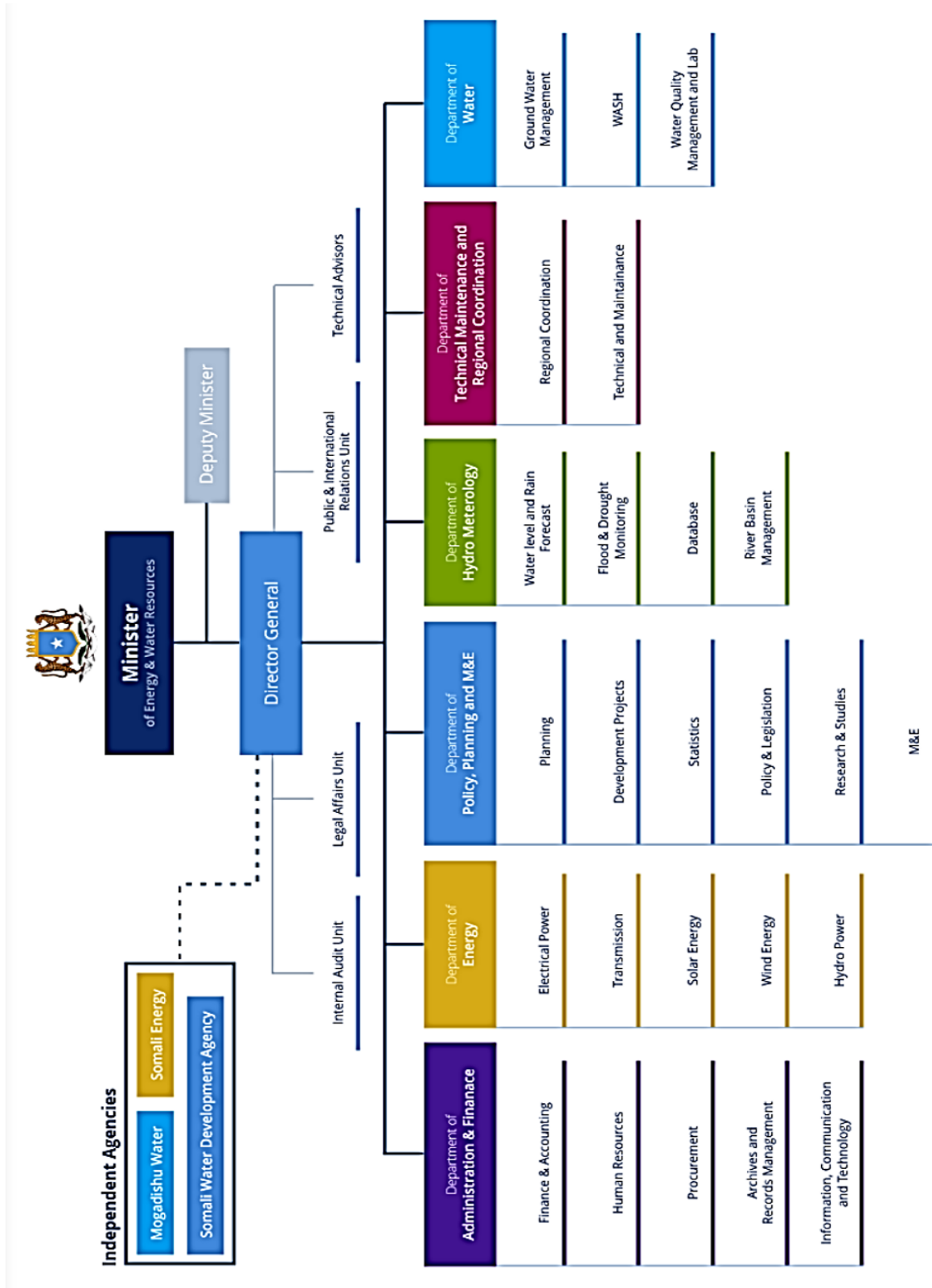


Figure 2.9. Organizational Structure of the Ministry of Energy and Water Resource (MoEWR,

Table 2.6. International Organizations and NGOs Working in Somalia Water Sector.

International Organizations
UNDP UNICEF FAO—Somalia Water and Land Information Management (FAO–SWALIM) World Bank Department for International Development (DFID)/ British Embassy Italian Agency for Development Cooperation (AICS) European Commission (EC) European Union (EU) German Development Agency (GIZ) International Organization for Migration (IOM) United States Agency for International Development (USAID)
Non-Governmental Organizations
Norwegian Refugee Council (NRC) Cooperation International (COOPI) Save Somali Women and Children (SSWC) Relief International (RI) Danish Refugee Council (DRC) Gargaar Relief Development Organization (GREDO) Zamzam Foundation Mercy Corps Somalia Country Water Partnership Programme (SCWPP)

2.8.2 Legal and Policy Framework

2.8.2.1 Legal Framework

The legal framework for environmental and natural resource management in Somalia is outlined in the 2012 Federal Government of Somalia (FGS) Constitution. The Constitution is the key legal instrument that guides all policies, plans, and legislations on the environment and other social issues. Here are several articles in the national constitution related to natural resource management, access to clean water, and environmental protection.

- Article 25 states that every Somali has the right to a healthy environment free of pollution and hazardous elements.

- Article 27 presents that every citizen has the right to access clean potable water.
- Article 44 reveals that the Federal Government and Federal Member States have crucial roles in safeguarding, conserving, and preserving the country's natural resources while ensuring their sustainability through effective management methods and negotiated allocations.
- Article 45 states the federal government must prioritize the protection, conservation, and maintenance of the environment. It is required to prevent any actions that may cause harm to natural biodiversity and ecosystems. The article further states that all individuals inside the Federal Republic of Somalia must protect and enhance the environment.

The Water Act in Somalia is not fully approved by the parliament yet. There are limitations in the constitutional and legal regulations governing social, economic, and environmental aspects of Somalia's water resources. Rural communities predominantly adhere to traditional Somali laws, while some regions are reinstating a juridical system to ensure equity in the management of natural resources. However, the majority of regions vested land and water ownership in clans, with specific territories belonging to specific clans. The Somali social organization law classifies water as a public asset, allowing for its utilization and control through administrative permissions (Federal Government of Somalia, 2018).

2.8.2.2 Policy Framework

In 1984, the Government of Somalia created a National Water Resources Law to control the usage of water resources. The draft legislation, which was never officially approved by Parliament, focused on water rights. The outstanding difficulties were resolved in the updated Water Law in 1990. The new Law was not fully approved and implemented due to the government collapsing in 1991. Since 2004, international assistance has been provided to Somaliland and Puntland to develop and implement water strategies for their regions (World Bank, 2020). The Federal Government of Somalia has recently created a National WASH Sector Policy and a Strategic Plan. The Strategic Plan outlines the foundation for the WASH sector and directs investments in the area from 2019 to 2023. The Plan aims to provide everyone with sufficient clean water, hygiene, and sanitation and establishes six key objectives (Federal Government of Somalia, 2019). Also, the MoEWR has created the NWRS for the 2021-2025 term, detailing strategies, goals, and actions in the water sector. The vision of the NWRS is to achieve sustainable, equitable, and secure water resources in alignment with nature for national

unity, growth, and well-being. This will be accomplished through three strategic goals: developing an effective water governance framework, operationalizing IWRM, and enhancing the provision of essential water services. (MoEWR, 2021b). Additionally, the NWRS Roadmap has been created to complement the NWRS. It offers clarity on main goals, supporting activities, roles, responsibilities, milestones, and targets (MoEWR, 2021a). Furthermore, the government aspires to integrate environmental concerns into all national development operations through the National Environment Policy. It attempts to effectively implement strategies to manage Somalia's water resources (Federal Republic of Somalia, 2019).

2.8.3 Coordination and Collaboration

Effective water governance requires capable institutions to coordinate water-related activities. In Somalia, there is a lack of effective cooperation in managing water resources between the Federal Line Ministries and Federal Member States, which has led to challenges in recognizing the broader significance of water. While water should be considered a strategic priority with extensive economic, social, and environmental benefits for the entire nation, these critical aspects often remain overlooked (Federal Government of Somalia, 2020). Although constitutional provisions mandate regular meetings between federal and state-level ministries to coordinate cross-state water management, the actual interactions within the MoEWR often occur irregularly or during specific project implementations. This sporadic nature of multilevel meetings has resulted in misalignments of priorities and needs assessments between the federal and state levels of the MoEWR. This disconnect hampers effective cooperation and integrated planning, further exacerbating the challenges in the water sector (World Bank, 2021).

2.9 Basins Level Management of Water Resources

2.9.1 Transboundary Issues of the Rivers.

Among the nine basins that Somalia has, three of them (Juba, Shabelle, and Lag Dera basins) share boundaries with the neighboring countries Ethiopia and Kenya as shown in Figure 2.4. Somalia has a longer history of irrigated agriculture and is a major water user in the river basins. However, Ethiopia holds a dominant position in the river basin due to several factors such as its larger basin area, higher river runoff, strategic geographic position, larger population, and greater economic and institutional power to drive development projects (Michalscheck et al., 2016). Kenya is situated within the Lag Dera basin; however, there is no documented surface flow from

this basin into the Juba River. Moreover, Kenya lacks direct access to the main river, resulting in the absence of significant interest in it. Table 2.7 shows that the two rivers constitute approximately one-third of the total geographical areas of each riparian country. Ethiopia and Kenya consider these basins to be the least developed regions. Conversely, in Somalia, the basins are located in densely populated and economically significant areas, necessitating substantial economic advancements in the future (Elmi, 2013).

Table 2.7. Land Share of the River Basins by Riparian Countries in km² (Elmi, 2013).

River Basins	Ethiopia	Somalia	Kenya	Total
Juba	143 650	66 300	11 000	221 000
Shabelle	188 700	108 300	0	297 000
Laag Dheera	17 000	34 000	180 000	231 000
Total, area	349 350	208 600	191 000	749 000
Total, %	46 %	28 %	26 %	100%

Somalia primarily uses the river's water resources and plans to expand its utilization, especially for irrigation in downstream areas. However, a major challenge is the limited availability of water resources relative to increasing demands. Economic and social development in the river basins is characterized by low levels, primarily relying on subsistence agriculture with low productivity. Security issues across the three countries have further complicated matters, hindering data collection and information gathering necessary for sustainable management and development (Elmi Mohamed, 2012). These challenges are aggravated by limited water flow and recurrent droughts in the region, affecting all countries and exacerbating issues related to agriculture, food security, and livelihoods, particularly for communities along the river basins. Ethiopia's infrastructure development, including the construction of dams and reservoirs along these rivers for hydroelectric power generation, has a significant impact on downstream water flow. This affects the availability of water resources for Somalia and underscores the need for coordinated management. The absence of a comprehensive and formal agreement between Somalia and Ethiopia regarding the shared use of the Juba and Shabelle rivers further compounds these challenges. Without clear guidelines and cooperative frameworks in place, tensions and

uncertainties over water access and usage persist, making it crucial for both countries to work together to address these transboundary water resource issues effectively. There is no existing international agreement among Ethiopia, Kenya, and Somalia on the sharing or use of the Shabelle and Juba rivers. As a country located upstream, Ethiopia does not disclose information or statistics regarding the current and planned water projects in the Juba and Shabelle rivers (Basnyat, 2007). There is no agreement on principles for sharing water between the two rivers, and there are no venues for the countries to address their issues. The Juba and Shabelle rivers have not seen any type of bilateral or multilateral collaboration. On the other hand, the countries have been involved in war and instability since the colonial powers departed the region in the 1960s (Elmi Mohamed, 2014). The World Bank's Cooperation in International Waters in Africa initiative collaborated with the African Development Bank (AfDB) and the European Union to facilitate productive discussions among the three riparian governments, particularly on transboundary water cooperation. No treaties regarding transboundary water resources have been finalized yet (Alhamshry, 2009). Somalia designated the Juba and Shabelle Rivers as its national rivers within its jurisdiction. Ethiopia's master plans aimed at maximizing the full potential of the two national rivers by developing their total water resources. These unilateral activities imply and embody policies that do not demonstrate cooperation (Elmi Mohamed, 2012). Several issues prevent these riparian countries from establishing river cooperation that emphasizes resource sharing and shared management including:

- the water scarcity in the riparian countries.
- historical conflicts.
- border disputes.
- absence of an effective and organized governing system in Somalia for twenty years.
- absence of an international agreement surrounding the water resources.

2.9.2 Developmental Aspects in the Juba and Shabelle River Basins.

Downstream development projects (Somalia):

The two rivers have an important role in crop production and support economic activities in southern Somalia. Numerous agricultural development projects, utilizing the water resources from these rivers, were initiated from the time of Somalia's independence in 1960 until the

collapse of the state in 1991. Before 1991, several Irrigation schemes as shown in Table 2.8 were constructed, along with one dam designed for river regulation, complete with irrigation canals. This infrastructure was put in place to manage irrigation across 161,58ha of land (Mbara C.J., 2007). During the 1987- 1988 cropping season, approximately 112,950ha of land along the rivers were being used for irrigated agriculture. In the case of the Shabelle River, no dam was constructed within Somalia's borders. However, numerous significant agricultural projects were developed along the river, making intensive use of the available water resources (Elmi Mohamed, 2012). Additionally, a separate facility was constructed near the town of Jowhar. This facility was specifically designed for off-stream use and can store up to 200 million cubic meters of water. The Jubba River has been utilized for various irrigation programs, including the Jubba Sugar Project (JSP), the Mugaambo rice irrigation project, and the Arare banana irrigation project. The Fanole Dam project, which stands as the sole dam in Somalia, was designed to serve multiple purposes, encompassing irrigation, hydropower generation, and flood control. Unfortunately, due to the civil war, all ten barrages, the Fanole dam, and the associated canals are currently non-operational and need significant recovery efforts to restore functionality (Basnyat, 2009).

Table 2.8. Barrages of the Shabelle and Juba Rivers in Somalia Before the Civil (Elmi, 2013).

Irrigation Scheme (Barrages)	Irrigation Area (hectare)	Year of construction
Fanole	15250	1970
Saabuun	50942	1970
Mashalaay	27 000	1986
Balcad	10 000	1967
Falkeerow	26800	1955
Janaale	67440	1927
Qoryooley	4 120	1955
Kurtunwaarey	5 000	1986
Hawaay	3 000	1970

Before the outbreak of the civil war in 1991, there were ambitious plans to further harness the water resources of the Juba and Shabelle rivers. These plans aimed to expand controlled irrigation significantly, with proposals to develop over 250,000 ha of irrigated land (Henry J, 1979). In the Shabelle basin alone, there were plans for irrigation schemes covering a total of 33,500 ha. The realization of these proposed irrigation projects required a substantial amount of water, approximately 1,175 million m³ (Henry J, 1979), which could be sourced from the river. These calculations did not take into account any irrigation developments in Ethiopia. In the Jubba River basin, Somalia completed the Jubba Valley development master plan in 1989. This master plan outlined the country's most ambitious development project to date, known as the Baardheere Dam Project (BDP). The BDP was considered crucial for achieving food self-sufficiency and energy production, and it received top priority in development planning. This multipurpose dam, along with its massive reservoir of 5,700 million m³, was designed to irrigate 120,000 ha, generate 140 MW of hydroelectric power, as shown in Table 2.9, and mitigate floods (Ministry of Juba Valley Development, 1990). Unfortunately, the BDP never materialized due to various reasons. Ethiopia raised objections to the BDP in 1987, arguing that the dam would significantly affect their interests, as they could control all the river discharges (Salman, 2011). Ethiopia's new plan for the Genale-Dawa now includes the construction of significant dams, similar to the BDP, that can store the entire yearly river discharge for irrigation and hydropower generation. This effectively eliminates the need for the BDP. Somalia's proposed irrigation developments in the Jubba basin require a substantial amount of water, approximately 4,654 million m³, while 75% of the natural stream flow provides 3,935 million m³ (Henry J, 1979). In Ethiopia, consumptive uses were estimated to be 2,400 million m³ of water (Elmi Mohamed, 2012).

Table 2.9. Proposed Projects on the Juba River in Somalia Before the Civil War (Elmi, 2013).

Project	Details
Baardheere Dam Project (BDP)	75 m high dam with storage capacity of 5 700 Mm ³ . Hydropower 140 MW.
Irrigation Schemes	120,000 ha irrigated land in downstream areas of Juba.
Homboy Irrigation	4 500 ha

Upstream Development Project (Ethiopia)

In Ethiopia, there are two significant water projects near the town of Gode, one of these projects is the Melka Wakana hydropower dam, which was built in 1988 and has a discharge capacity of 60 m³/s. This dam generates 153 megawatts of power and has a storage capacity of 763 million m³. The Gode irrigation project, which includes a 17-km canal, can provide irrigation to 17,000 hectares of land. The canal has a maximum capacity to release 46 m³/s of water; nevertheless, it utilizes a substantial quantity of water in the semi-desert region of Ogaden in eastern Ethiopia. This has a notable impact on downstream water flow to Somalia, reducing it by more than 60% (Elmi, 2013). The Ministry of Water Resources in Ethiopia intends to build substantial dams and irrigation systems along the Juba and Shabelle Rivers, in addition to the existing upstream river infrastructure and water withdrawals. The execution of these projects would impose strict regulations on the river currents downstream. According to the Ethiopian master plans, these projects will be a gradual reduction in flow crossing the border into Somalia along the Juba River, with percentage changes ranging from -10% to -20% between 2005 and 2038. Similarly, the Shabelle River will have a decrease in flow crossing the border into Somalia, with percentage changes ranging from -33% to -81% between 2005 and 2035 (Michalscheck et al., 2016).

Upstream development projects (Kenya)

On Kenya's dry side of the Lag Dera River basin, limited water use exists, primarily involving a small irrigation scheme using floodplain and groundwater methods. The Kenyan water usage in the basin focuses on groundwater use from the Merti aquifer for domestic purposes. Kenya seeks to develop river and groundwater resources for irrigation and domestic use, concentrating on the Lag Dera tributary. However, security concerns, potential Ethiopian projects impacting Kenyan initiatives, and regional challenges hinder these plans. Kenya also aims to further develop the Merti aquifer's groundwater, which currently serves rural communities.

3. METHODOLOGY

3.1 Data Collection

The UN-Water SDG 6 Data Portal was used to track the progress achieved toward each of the SDG 6 indicators in Somalia. Furthermore, information was gathered from the Global Analysis and Assessment of Sanitation and Drinking Water (GLAAS), and the Food and Agriculture Organization (FAO) AQUASTAT. These progress reports provide updates on achieving SDG6 as a whole and identify key areas for creating an environment that supports policy processes. Also, each of the three analysis tools used for this study which are the Sustainable Development Goal 6 Policy Support System (SDG 6 PSS), WASH Bottleneck Analysis Tool(WASH BAT), and OECD Water Governance Indicator Framework had questionnaires. The questionnaire of the SDG 6 PSS tool shown in Appendix A, was filled out by the officer from the Department of Water Management of the Ministry of Energy and Water Resources (MoEWR) in a face-to-face meeting. The officer also had access to the necessary information needed from the other sub-departments of the ministry. Officers from WASH Cluster partners (ACTED and Save Children), led by UNICEF in Somalia, completed the WASH BAT questionnaire as shown in Appendix B. The questions of each of the OECD water governance indicator frameworks were addressed using data collected through a comprehensive review of existing literature, scholarly publications, government reports, and open-source data.

3.2 Analysis Tools

3.2.1 SDG 6 Policy Support System (SDG6 PSS) Tool

The SDG 6 Policy Support System (SDG-PSS) is an online system that is freely available. It was developed by the United Nations University Institute for Water, Environment and Health (UNU-INWEH), in collaboration with the Ministry of Environment of the Republic of Korea, the Korea Environment Corporation (K-eco), the United Nations Office for Sustainable Development, and the National partners from Pakistan, Costa Rica, Ghana, and Tunisia (Fatima B et al., 2022). The creation of SDG-PSS was the main outcome of the project "Water in the World We Want" which aims to explore strategies for facilitating policy and decision-making in settings where there is a scarcity of data on water and sanitation. The SDG-PSS is a solution to the problem of

consolidating data and information from many international and national sources and converting them into a framework that is suitable for policy-making based on evidence. The SDG-PSS aims to facilitate the cooperation and generation of reliable national-level data on SDG 6 by government actors and stakeholders (UNU-INWEH, 2019).

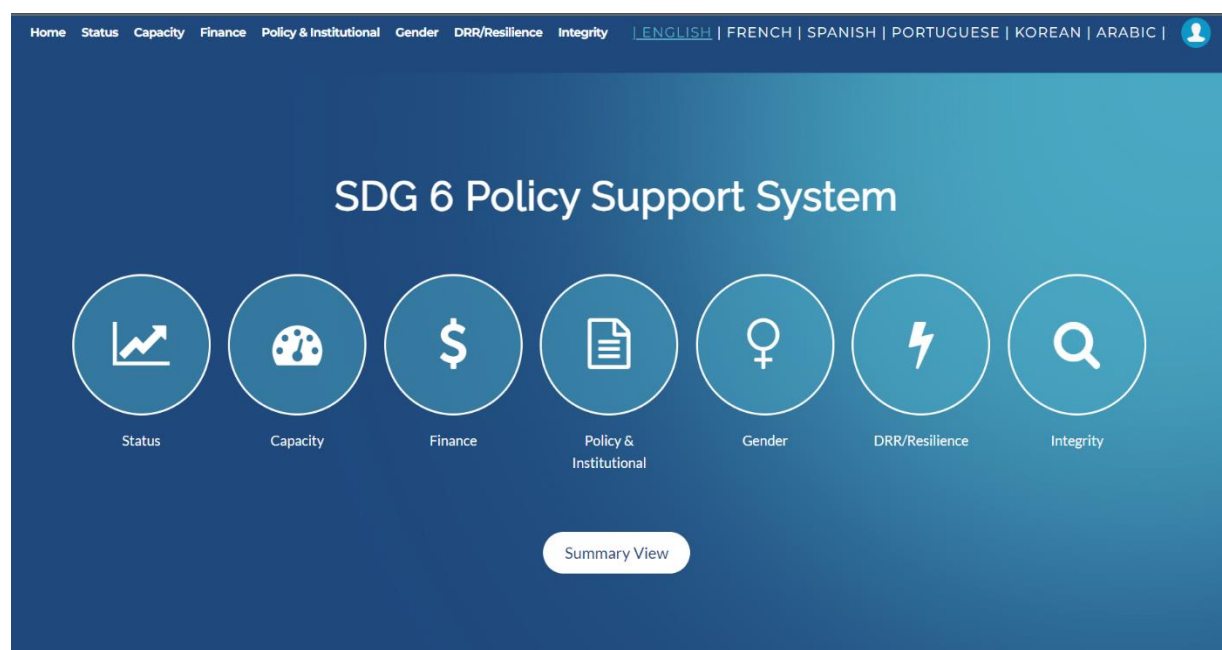


Figure 3.1. SDG 6 PSS Homepage (<https://sdgpss.net/en/>).

The SDG-PSS tool prioritizes six essential components to enhance the efficacy of policymaking. Every essential component offers a viewpoint on interconnected goals, requirements, and deficiencies to aid decision-makers. The SDG-PSS tool includes six components: Capacity Building Assessment, Finance Assessment, Policy and Institutional Assessment, Gender Mainstreaming, Disaster Risk Reduction (DRR)/Resilience Mainstreaming, and Integrity. These components are also shown on the homepage of the SDG-PSS tool in Figure 3.1. The SDG-PSS includes a general “Status” component that displays data and information on each SDG 6 objective and indicator, taking into account the 2030 aspirations (Fatima B et al., 2022). Each of these components has four essential elements: Resources, Questionnaire, Data, and Reporting. This system enables policymakers, scientists, and development actors to collect essential information, evidence, and data (if accessible) necessary for formulating and implementing national policies and actions to tackle water-related problems. The SDG-PSS tool operates with limited data conditions, requiring no additional numerical data (UNU-INWEH, 2019).

3.2.2 Water, Sanitation, and Hygiene Bottleneck Analysis Tool (WASH BAT)

The Water, Sanitation, and Hygiene Bottleneck Analysis Tool (WASH BAT) is a specialized tool created to assist those in charge of enhancing the Water, Sanitation, and Hygiene (WASH Cluster) sector. This tool is unbranded and customized for use by governments and development partners in any nation. The WASH BAT in Excel format was produced by UNICEF and worldwide sector partners in 2012. The online software version was developed by the Community Systems Foundation. The homepage and the address of WASH BAT are shown in Figure 3.2. The WASH BAT assists stakeholders in identifying the variables or obstacles that hinder the attainment of sustainable service delivery by national or subnational WASH objectives. It offers a methodical way to delineate tasks to eliminate the underlying causes of these obstacles. The updated online version of the WASH BAT is founded on the governance functions established by UNICEF and Stockholm International Water Institute (SIWI). These functions have been classified into five 'building blocks' that collectively represent the supportive framework for WASH service provision, as recognized by the Sanitation and Water for All collaboration, a global partnership aimed at achieving universal access to clean water and adequate sanitation for all.

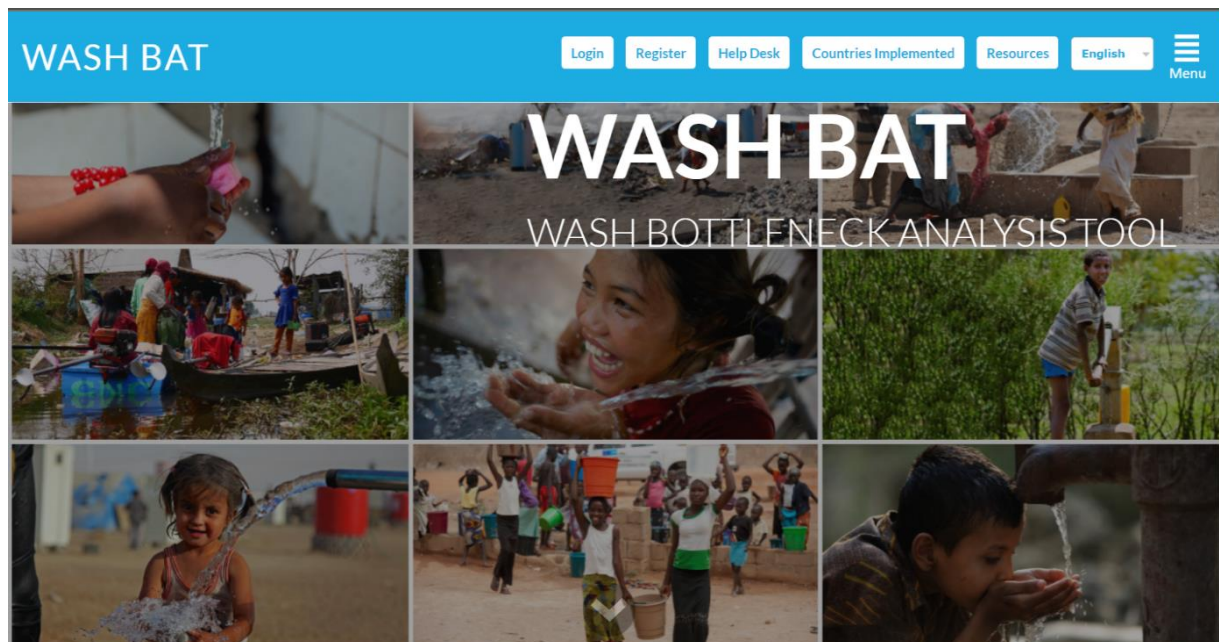


Figure 3.2. WASH BAT Homepage (<https://washbat.org/>).

The fundamental components encompassed in these building blocks as shown in Table 3.1 are policy and strategy, institutional structures, finance and budgeting, planning, monitoring and evaluation, and capacity development. The WASH BAT encompasses other factors beyond the WASH sector that impact the efficacy of the WASH sector, such as governmental prioritizing, decentralization, and social norms. There is a module included in the tool that allows for a more comprehensive evaluation of the challenges encountered by service providers. The WASH BAT questionnaire contains questions and indicators that are a part of the UN-Water Global Assessment and Analysis of Sanitation and Drinking Water (GLAAS) survey. The GLAAS monitoring system offers evidence to support the improvement of the sanitation and drinking water sector, using a consistent and methodical methodology (UNICEF, 2016).

Table 3.1. Building Blocks and Governance Functions that Provide the Structure for the WASH BAT (UNICEF & SIWI, 2023).

Building block	Governance functions
Sector policy & strategy	Sector policy & strategy
Institutional arrangements	Coordination
	Service delivery arrangements
	Accountability & regulation
Budgeting & financing	Budget & expenditure
	Financing
Planning, monitoring & review	Planning
	Monitoring, evaluation & learning
Capacity development	Capacity development
Broader enabling environment	Political leadership
	Decentralization
	Social norms
Service providers	Service providers

Steps of the WASH BAT Analysis:

- The tool provides governance functions and criteria for each building block. The user selects the governance functions and criteria they want to include in their analysis.
- The selected criteria are then assessed according to the level of progress made, categorized as 'No' (red), 'To some extent' (yellow), 'To a large extent' (green), and 'Yes' (blue). This scoring system helps identify and prioritize bottlenecks that need to be resolved in later modules.
- Based on the scores that are already given, the user identifies bottlenecks and causes of each of the criteria. Then activities are made to remove the causes of the bottlenecks (UNICEF & SIWI, 2023).

3.2.3 OECD Water Governance Indicator Framework

The OECD Water Governance Initiative (WGI) is a collaborative platform with over 100 individuals from the public, corporate, and non-profit sectors. The initiative has developed the OECD water governance principles to improve the effectiveness and inclusivity of water governance systems while promoting sustainability and integration. These principles are outlined in Figure 3.3. To facilitate their application, the OECD has created a framework of indicators for water governance (OECD, 2015a). This methodology specifically assesses the state of water governance policy frameworks, institutions, and procedures, as seen in Figure 3.4. The assessment consists of 36 water governance indicators, with three indicators assigned to each principle. These indicators evaluate the existence and degree of application of water governance principles across the specified parameters. The "Policy Framework" indicator assesses the existence and degree of implementation of policy frameworks. The "Institutional Setup" indicator assesses the presence and effectiveness of water-related institutions. The "Mechanism," indicator, assesses the presence and effectiveness of instruments and equipment used to accomplish the principle. In addition to these indicators, a checklist consisting of 106 questions allows for a more comprehensive analysis of governance topics not addressed by the three indicators. The checklist assesses the existence of policy, legal, and institutional frameworks and tools that can act as guiding instruments during the writing process. This study employs the OECD water governance indicator methodology to assess Somalia's water governance system and determine its alignment with the OECD water governance principles (OECD, 2018).

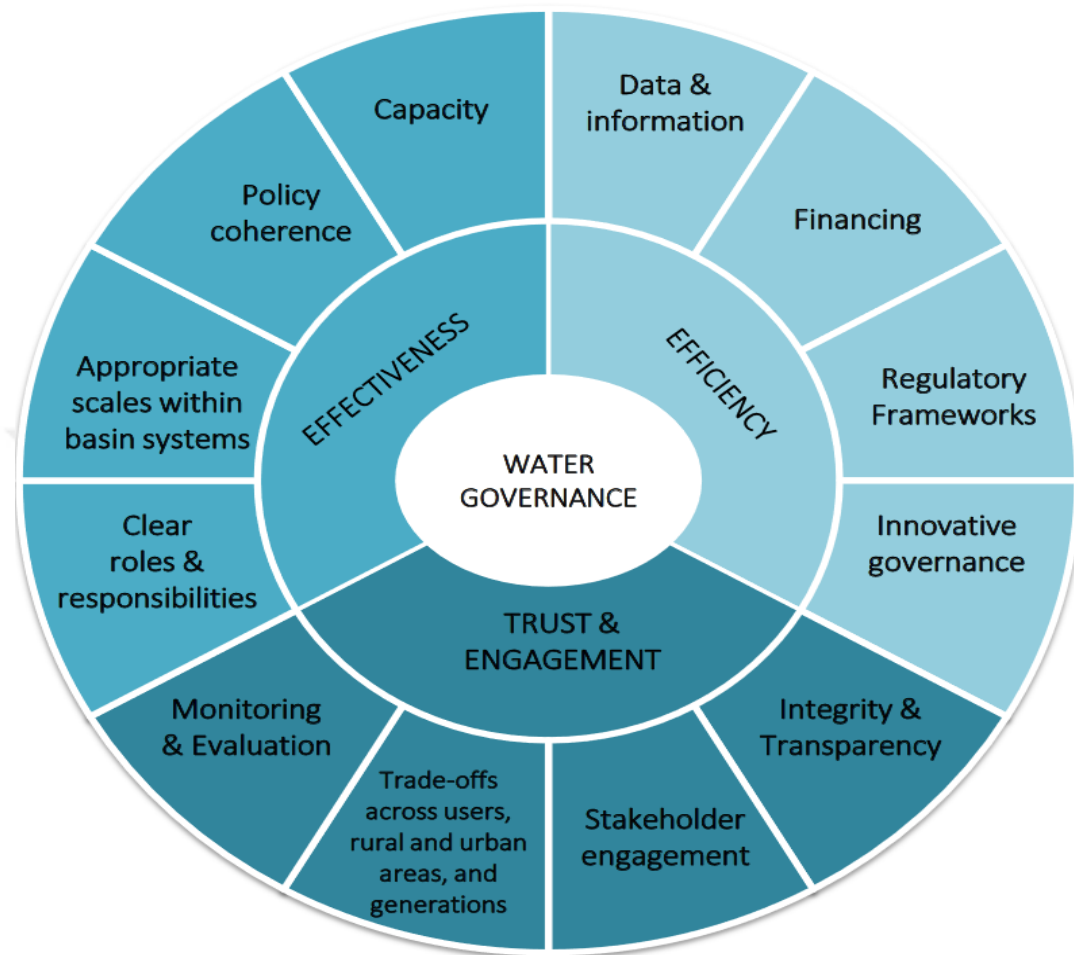


Figure 3.3. OECD Principles on Water Governance (OECD, 2015a).

This study investigated how well several of the current water governance practices fit the OECD Twelve Principles on Water Governance. By examining how well a collection of current frameworks provides conditions for the successful application of the OECD principles, it will be possible to discover elements that support or limit the development of various water governance systems. This examination of the factors that affect the application of OECD principles serves as a foundation for additional advice regarding water resources and water services. All relevant literature was gathered for data collection using various databases institutions, international organizations, and NGOs. Additionally, the content of Somalia National Water Resource Strategy (NWRS) 2021–2025 was also reviewed, and then all collected data and information was used to

examine whether Somalia's water governance aligns with the twelve principles of water governance.

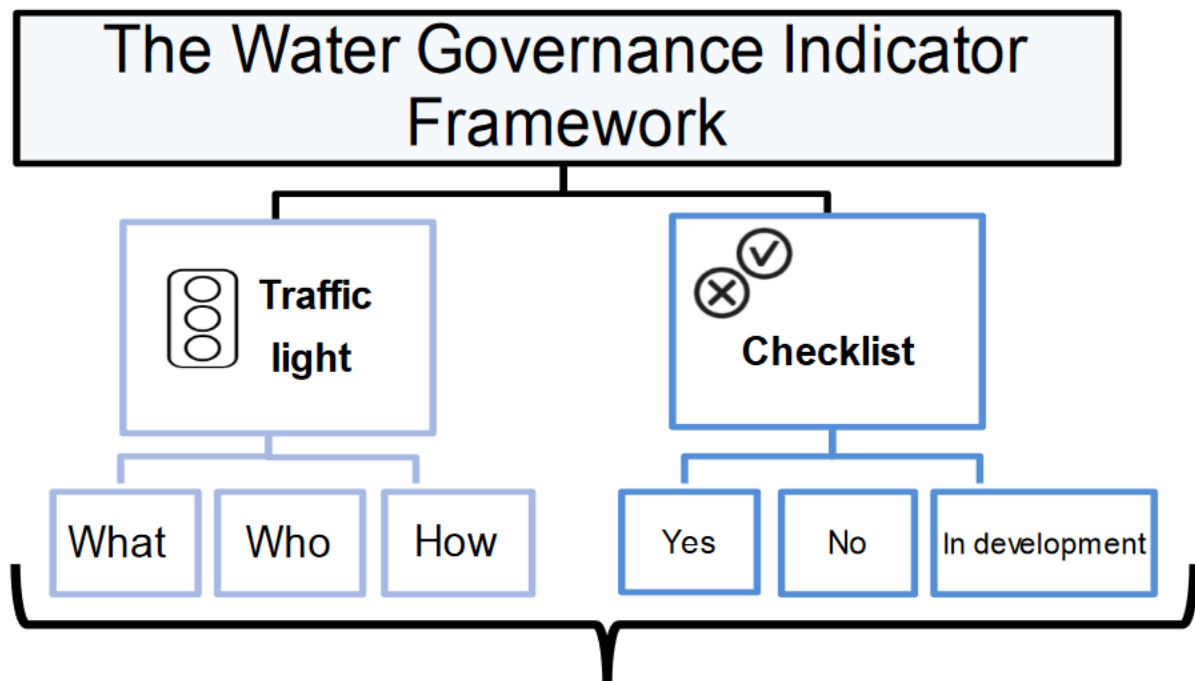


Figure 3.4. Water Governance Indicator Framework (OECD, 2018).

The three indicators (Policy Framework, Institutional Setup, and Governance Mechanism) were used to evaluate each of the twelve principles. The results were displayed using a color wheel that represented the evaluation. The traffic light color-coding system is presented and described in Table 3.2.

Table 3.2. Traffic light color-coding system (OECD, 2018).

Traffic light baseline	Description
In place, functioning	The governance aspect being examined is complete and relevant in all aspects, no major concerns are noted.
In place, partly implemented	The governance aspect being examined is in place, but the level of implementation is not complete.
In place, not implemented	The governance aspect being examined is in place, but it is not implemented.
The framework under development	The governance aspect being examined does not exist yet but the framework is under development.
Not in place	The governance aspect being examined does not exist and no plans or actions are taken to develop it.
Not applicable	The governance dimension being examined is not applicable to the self-assessment context.

3.2 Limitations of the Research Methodology

Collecting accurate data on water management issues in Somalia was incredibly challenging. Although numerous international organizations and national agencies are actively involved in collecting water-related data in Somalia, it's still problematic to obtain precise up-to-date data. Also consolidating country-specific monitoring literature has been difficult due to a lack of understanding about SDG 6. Monitoring SDG 6 in Somalia has been limited to only in few case studies, which means that the recommendations are based on general themes that may not fully reflect situations in all areas. Additionally, the virtual nature of interviews has made it challenging to probe issues and gather comprehensive information.

4. RESULTS AND DISCUSSIONS

4.1 Progress and Challenges Towards SDG 6 in Somalia

4.1.1 Progress Towards SDG 6.

To achieve universal access to safe and accessible drinking water by 2030, Somalia must allocate funds toward the development of sufficient infrastructure, sanitation facilities, and public hygiene measures. Although there is significant funding in the water and sanitation sector from NGOs, multilateral development banks, and the private sector, the possibility of gaining access to clean and sufficient water supplies in Somalia by 2030 is low (Federal Government of Somalia, 2022b). Currently, according to the official reporting of the UN-Water SDG6 data portal, 58% of the population has access to basic drinking water services, and there was no data reported for the proportion that has access to safely managed drinking water. Sanitation services (SDG 6.2.1a) are safely managed for 33% of the population, and 25% have access to handwashing facilities (SDG 6.2.1b) with soap and water at home. Domestic wastewater (SDG 6.3.1) is not safely treated, and water bodies lack good ambient water quality (SDG 6.3.2). There were no reported data for both water-use efficiency (SDG 6.4.1) and transboundary cooperation (SDG 6.5.2). For SDG 6.4.2 only 25% of the renewable water resource is being withdrawn, indicating moderate water stress. There has been 22% progress in implementing IWRM (SDG 6.5.1). For SDG 6.6.1, 25% changes in the quantity of water in lakes, rivers, estuaries, and artificial water bodies were reported, these changes encompass both increases and decreases in the surface water area which correlate to instances of flooding and droughts. In general, Somalia encounters substantial difficulties in delivering clean drinking water, sanitation, and maintaining water resources in an eco-friendly manner. Despite some improvements in specific areas, there's a considerable amount of effort required to guarantee that everyone has access to clean water and to safeguard the environment. Effective teamwork between the government, international organizations, and local communities is vital to tackle these issues and continue advancing towards the Sustainable Development Goals in Somalia.

4.1.2 Challenges in Achieving SDG 6.

Achieving SDG 6 in Somalia by 2030 is a complex task marked by multifaceted challenges. This analysis delves into the major obstacles hindering progress, including pollutants, lack of

infrastructure, transboundary issues, climate factors, and lack of information and data. These are briefly explained below:

Water Pollution: The primary water source in Somalia is groundwater, which unfortunately faces significant pollution due to various factors. These factors include the widespread use of pit latrines and shallow underground tanks, high prevalence of open defecation, sharing of water points by livestock and humans, and improper disposal of wastewater.

Lack of infrastructure: Somalia has struggled with political instability for several decades, profoundly impacting all facets of its existence. Significantly, this instability destroyed most water systems, resulting in substantial consequences for water resource management and a weaker governance structure (Jama & Mourad, 2019). Most government-run water utility networks have become non-functional. Public-private partnerships (PPPs) play a crucial role in providing safe drinking water to the population. The absence of essential infrastructure hinders the effective administration and fair allocation of water resources, affecting both urban and rural regions (Mourad, 2023). International organizations are pivotal in supporting water and sanitation projects in Somalia, focusing on infrastructure development, maintenance, and improving water quality and sanitation services. They also facilitate sustainable funding mechanisms and support the development of water supply systems and sanitation facilities (AfDB, 2015). The private sector also has a crucial role in the Somali water governance structure. Most sector-related services including Operating and Monitoring are provided and managed directly by the Private Sector and beneficiary communities in rural areas (AfDB, 2015). The limitations in the public's supply of water services result in a significant need for more service delivery, which is mostly filled by the private sector, incorporating it as a fundamental component of the water sector in Somalia (World Bank, 2021). Certain urban areas also have strong public-private partnerships (PPPs) that work within the framework of government oversight. Successful examples include Mumin Global Service in Baidoa, which involves communities and powerful locals in water supply management, and Farjanno in Jowhar, which decreased waterborne diseases and promoted local development (AfDB, 2015).

Transboundary issues: The development of hydraulic facilities on transboundary water resources sometimes presents obstacles to collaboration and increases the probability of disputes over these resources (Hussein et al., 2022). Somalia is characterized by the Juba and Shabelle rivers, which

run across the nation's southern region, originating from Ethiopia and ultimately reaching the Indian Ocean. The rivers receive almost 90% of their water flow from Ethiopia, with a smaller portion originating from Kenya. The lack of a legally enforceable agreement and the possibility of disputes about water resources that cross national boundaries act as obstacles to water infrastructure projects (Mourad, 2020).

Climate change factor: Climate change increases the difficulties in the water cycle by causing intense and irregular precipitation, resulting in floods. Conversely, it diminishes precipitation, leading to disruptions in the hydrological cycle and consequent droughts.

Lack of Information and Data: The lack of information and data on the status of water resources further complicates water planning and governance.

4.2 Case Study Examples of Successful Water Projects

Although there are lots of problems in the water sector as explained in the above section. In recent years, Somalia has made progress in solving its water problems by starting some projects to make it easier for people to get clean water and use sanitation facilities. These projects, supported by partnerships and funding sources, show that people all over the country want to improve the well-being of communities. Therefore, this section summarizes some completed water projects in Somalia that have helped improve and protect water supplies for people in urban as well as rural areas.

1. Improving Access to Water and Sanitation Services in Somalia Project:

The overall objective of the project was to improve access to water and sanitation services in rural areas of Somalia (\$11 million project (2016 -2020)). Involved Partners were “the Ministry of Energy and Water Resources, the African Development Bank (AfDB), the UK Department for International Development, and the International Organization for Migration (IOM)”. The project was focused on the two main components:

- capacity development and
- water supply infrastructure (AFDB, 2016).

2. Kismayo Baidoa Urban Water Supply and Sanitation Project:

The primary goal of the Kismayo-Baidoa Urban Water Supply and Sanitation Project was to enhance access to clean water and upgraded sanitation facilities in the towns of Kismayo in the Jubbaland state and Baidoa in the southwest state. This project, which was executed between 2019 and 2023, had an estimated budget of \$11.8 million. The main objective was to enhance the efficiency of water and sanitation service delivery. Involved partners were “the Federal Ministry of Finance, the Federal Ministry of Energy and Water Resources, Municipalities of Kismayo and Baidoa, water agencies in South West and Jubbaland, the International Organization for Migration, and the African Development Bank”. The project aimed to enhance the quality of life, inclusivity, and resilience by providing sustainable water supply and sanitation services. The project has concentrated on the following:

- Provision of clean, safe drinking water by restoring, enlarging, and establishing long-lasting urban water systems;
- To promote economic growth by creating both immediate and long-term employment opportunities for those who benefit from the initiative;
- To strengthen institutional capacity and enhance water management services.

Project Beneficiaries: The urban and peri-urban communities in Kismayo and Baidoa have an estimated population of around 200,000 individuals. In general, both Jubbaland and South West states will also benefit from the assistance provided throughout the execution of the infrastructural projects. (AfDB, 2019).

3. Support for Integrated Water Resources Management (IWRM) Project:

The IWRM project, with a total expenditure of US\$78.575 million for the period of 2019–2023, is intended to enhance water accessibility and reduce water-related disasters for Somali pastoralists. The project focuses on the following four specific sectors:

- National policy reform and development of IWRM.
- Enhancing the ability to develop and strengthen skills and resources at the national, state, district, and local levels.
- Establishing the necessary infrastructure to enhance climate and water monitoring.
- Collecting and sharing of best practices on IWRM.

Involved partners were “The Ministry of Energy and Water Resources, Office of Prime Minister, Directorate of Environment and Climate Change, Global Environment Facility (GEF), and Somalia UNDP” (UNDP, 2019b).

4. Project for Pastoralist Communities to Access Scarce Water Resources and Adapt to Climate-Related Droughts and Floods:

In November 2019, Somalia and the United Nations Development Programme (UNDP) initiated a project with a total cost of US\$10 million. The project received a total funding of US\$8.8 million from the Least Developed Countries Fund of the Global Environment Facility and an additional US\$1.5 million from the UNDP. It aimed to help rural communities gain reliable access to diminishing water resources. By implementing sustainable water management practices, over 360,000 farmers and pastoralists have benefitted from this project. The activities accomplished within the project:

- Establishment of National Hydro-Meteorological and Monitoring Service,
- Installation of automatic weather stations and monitoring devices throughout the country.
- Expansion of Somalia’s flood and drought prediction and early warning systems.

The project was initiated by Somalia's Directorate of Environment and Climate Change (DECC), under the Office of the Prime Minister, and executed by the Ministry of Energy and Water Resources. (UNDP, 2019a).

5. Somalia Water for Agropastoral Productivity and Resilience Project

From 2019 to 2023, the World Bank implemented the US\$42 million project for Somalia Water for Agropastoral Productivity and Resilience. The objective of the project was to enhance water and agricultural resources in arid regions of Somalia, specifically targeting agropastoralist communities. Through the following activities;

- Enhancing access to multiple-use water resources;
- Increasing sustainable landscape management;
- Promoting productivity-enhancing innovations in rural communities.

The project benefited around 250,000 agropastoralists in Galmudug, Puntland, South West State, and Somaliland, including 140,000 women. The project improved water sources for household

use, livestock, agriculture, and horticulture. It strengthened livelihood resilience, provided livestock and crop extension services, and taught adaptive knowledge (Richey, 2023). These projects had multiple benefits including improving access to clean water, enhancing sanitation facilities, and strengthening resilience to water-related challenges in the region. It also empowered the local communities through capacity building, and collaborative learning helping them manage their water resources effectively

4.3 Application of the SDG-PSS Tool

The SDG-PSS tool was used to analyze six critical components: capacity building, finance, policy and institutions, gender, disaster risk reduction (DRR)/resilience, and integrity, for each SDG-6 indicator. The progress of each indicator was assessed as adequate, in development, inadequate, or with no available data or information by the officer from the Department of water management of Ministry of Energy Water Resource. The outcome of each of the component is explained in the following sections.

4.3.1 Capacity Building

The achievement of SDG 6 is based on the capabilities of individuals, organizations, and societies. In the absence of laws, policies, strategies, and procedures that provide support, along with efficient organizations and knowledgeable individuals, national government agencies and institutions are unable to effectively plan, execute, and evaluate evidence-based development initiatives (WHO, 2014). In recent years, Somalia has significantly supported capacity development within water sector institutions. The focus has been on assisting with academic, professional, and vocational training to enhance the long-term development of institutions and improve the effectiveness of water sector organizations (MoEWR, 2021b). (MoEWR, 2021b). The outcome of the capacity assessment conducted using the SDG-PSS tool reveals a mixed situation in Somalia. Progress has been made in placing suitable mechanisms for capacity-building at the national level, as shown in Figure 4.1 the majority of SDG 6 indicators have adequate mechanisms for capacity-building at the national level, demonstrating a commitment to the goals of access to clean water and sanitation. However, indicator 6.3.1 (safely treated wastewater) and indicator 6.5.2 (transboundary) are currently not progressing toward the implementation of effective methods for enhancing national-level capabilities. Solving these

problems is essential for accomplishing SDG 6 goals. Also, challenges remain in terms of strengthening institutions or leading ministries' capacities, as shown in Figure 4.2 the institutions or lead ministries are progressing admirably in developing vital capabilities for SDG 6 indicators. Although indicator 6.5.1 is considered adequate, most indicators “i.e. 6.1.1, 6.2.1, 6.3.2, 6.4.1, and 6.4.2” are still in progress. To provide a thorough approach to attaining SDG 6, there is a pressing necessity for data collection and reporting procedures for indicators 6.3.1, 6.5.2, and 6.6.1. Efforts are needed to build the technical expertise of key stakeholders, improve data collection and analysis capabilities, and reinforce institutional structures. Strengthening capacities at various levels will empower local authorities to implement and monitor SDG 6 initiatives effectively.

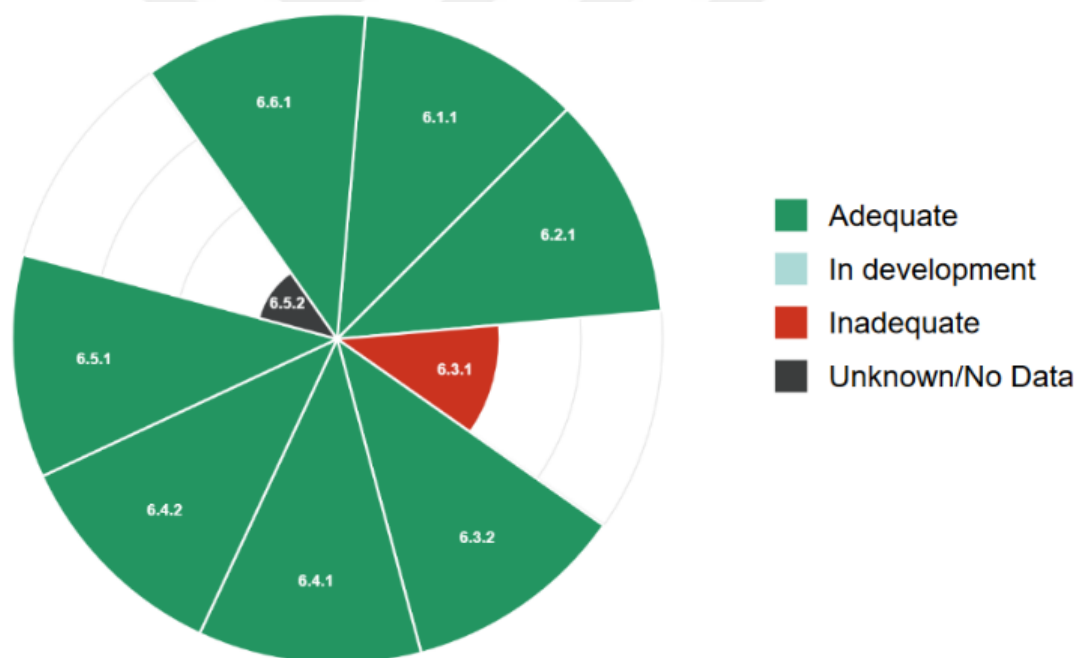


Figure 4.1 Mechanisms addressing capacity building at the national level for SDG 6 indicators.

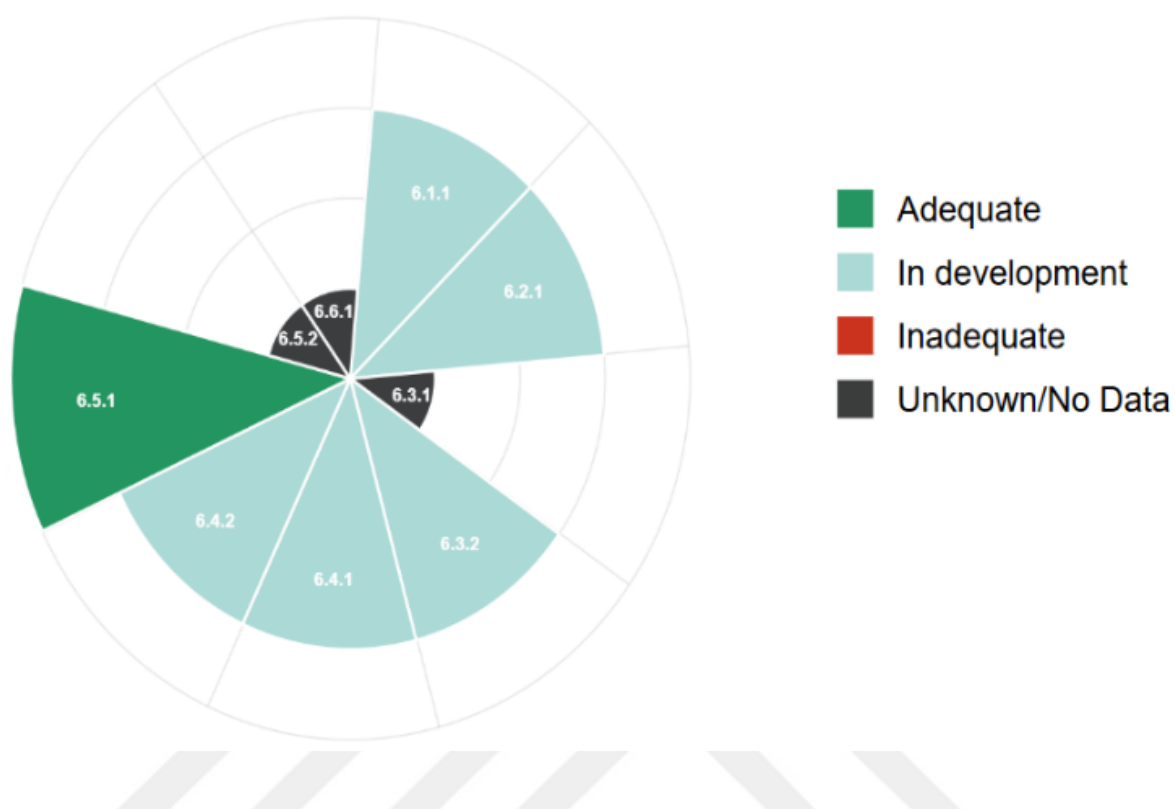


Figure 4.2. Lead ministries/institutions on track to build critical capacity to support action plans for SDG 6 indicators.

4.3.2 Finance

The implementation of SDG 6 needs funding and financing mechanisms that will support its capability to improve financial sustainability. In Somalia, insufficient government budgetary allocations pose a significant challenge to the water sector and the country's water sector finance mostly relies on development assistance and humanitarian aid from various international partners. However, this support is provided in an uncoordinated manner, with some aid using the Somali country systems while much of it doesn't. This makes it challenging for the government to effectively direct budgetary resources toward national and state-level priorities (MoEWR, 2021a). The assessment of financing the SDG 6 goals in Somalia indicates a lack of financial sustainability that hampers progress on multiple SDG 6 indicators as Figure 4.3 indicates the finance and expenditure strategies are adequate for half of the indicators “i.e. 6.1.1, 6.2.1, 6.3.2, and 6.5.1” reflecting a commitment to SDG 6 objectives. However, the absence of data for indicators 6.3.1, 6.4.1, 6.4.2, 6.5.2, and 6.6.1 highlights the need for more openness and reporting

to guarantee thorough progress toward these objectives. Which lines with the country's National Water Resource Strategy (NWRS). Figure 4.4 also illustrates how civil society is taken into account in the budgeting for SDG 6 targets. The process is operating effectively for indicator 6.5.1 (IWRM), demonstrating dedication to water and sanitation measures. However, there is space for development in indicator 6.3.2 (water quality), where there is less robust civil society engagement, particularly in addressing problems with water quality. But there is a lack of data for all other indicators (6.1.1, 6.2.1, 6.3.1, 6.4.1, 6.4.2, 6.5.2, and 6.6.1). This implies that there is no true understanding of how civil society is involved in these areas of financial planning. To ensure that civil society plays a significant role in accomplishing these goals, there is a need to improve reporting and data collection. Innovative financing mechanisms, public-private partnerships, and donor collaboration are key strategies to ensure sustained funding for water and sanitation projects. Effective financial planning and management are vital for achieving long-term success.

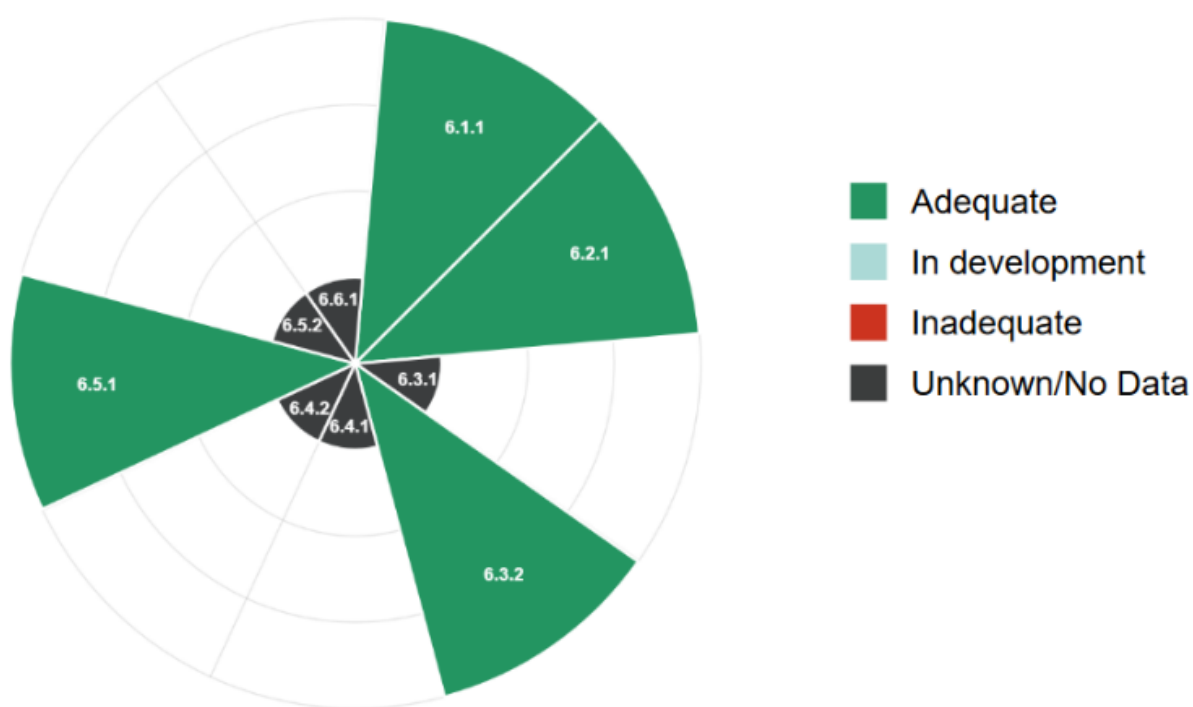


Figure 4.3. Financing and Expenditure Plans Developed and Publicly Available for SDG 6 Indicators.

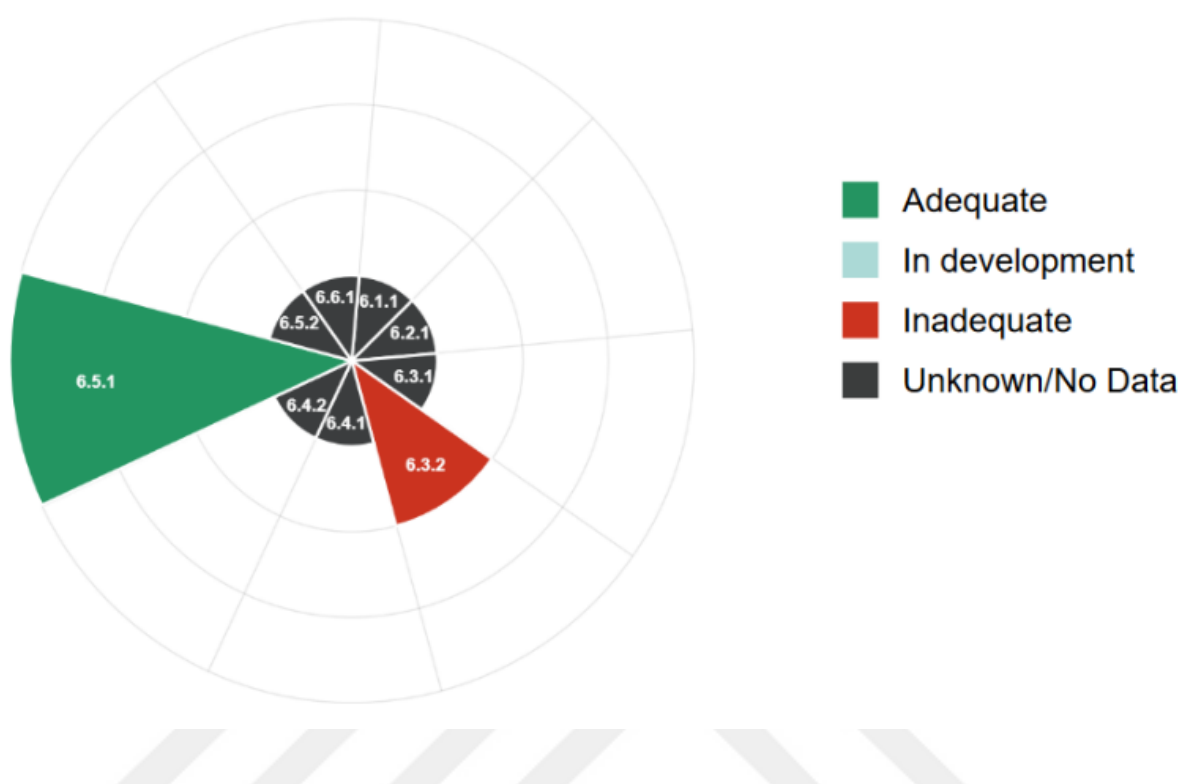


Figure 4.4. Mechanisms for Including Civil Society in the Financial Planning Process for SDG 6 Indicator.

4.3.3 Policy and Institutions

The government of Somalia has made substantial progress in improving policy, legal, and institutional frameworks for water resource management in recent years. A national WASH sector policy and strategic plan have been established by the government. The Strategic Plan serves as a comprehensive framework for the WASH sector and guides investments from 2019 to 2023. The Plan aims to ensure sufficient and secure access to water, as well as proper hygiene and sanitation for everyone and establishes six key goals (Federal Government of Somalia, 2019). Additionally, the National Water Resources Strategy (NWRS) was developed which outlines a comprehensive framework of plans, objectives, and activities for the water sector from 2021 to 2025. The vision of this NWRS is to achieve sustainable, equitable, and secure water resources that promote national unity, economic progress, and well-being for all while maintaining balance with nature, this will be accomplished through three strategic goals: “ (i) Developing effective Water Governance Framework; (ii) Operationalizing IWRM; and (iii)

Enhancing the delivery of essential water services” (MoEWR, 2021b). In addition to the NWRS, a NWRS Roadmap has been created to offer clear guidance on important goals and the necessary activities, roles, and duties, as well as specific milestones and targets (MoEWR, 2021a). The government also plans to include environmental considerations in all development efforts in Somalia through the National Environment Policy (2019), as part of this policy, the government intends to implement strategies for managing the country's water resources (Federal Republic of Somalia, 2019). Somalia also committed to following a low-emission, climate-resilient growth strategy in its updated Nationally Determined Contribution (NDC) for 2021-2030, focusing on resilience due to the country's economic and population vulnerability to climate change-related impacts. The outcome of policy analysis using the SDG-PSS tool, also shows that the Federal Government of Somalia has made progress, particularly with the reforms undertaken in the national policies implementation planning process with improving policies, strategies, and laws that need amendment, harmonization, and alignment to SDG 6. The improvement of SDG 6 indicators reflects the effectiveness of policy implementation plans. Most indicators, national policies, and implementation plans are already in place and considered adequate. Except for indicators 6.5.2 (transboundary) and 6.6.1 (ecosystems), which plans are currently in development, justifying a positive trajectory in terms of national policies and implementation plans for most indicators, showing a commitment to ensuring access to clean water and sanitation as shown in Figure 4.5. Yet gaps persist in the level of cooperation and the exchange of information with other countries for SDG 6 indicators as Figure 4.6 shows indicators 6.1.1, 6.4.2, and 6.5.1, and cooperation is in development. However, the other remaining indicators are not on track for cooperating and exchanging information with other countries. Since 1960, political instability in the region has restricted Somalia and its neighboring countries from cooperating or exchanging data and information.

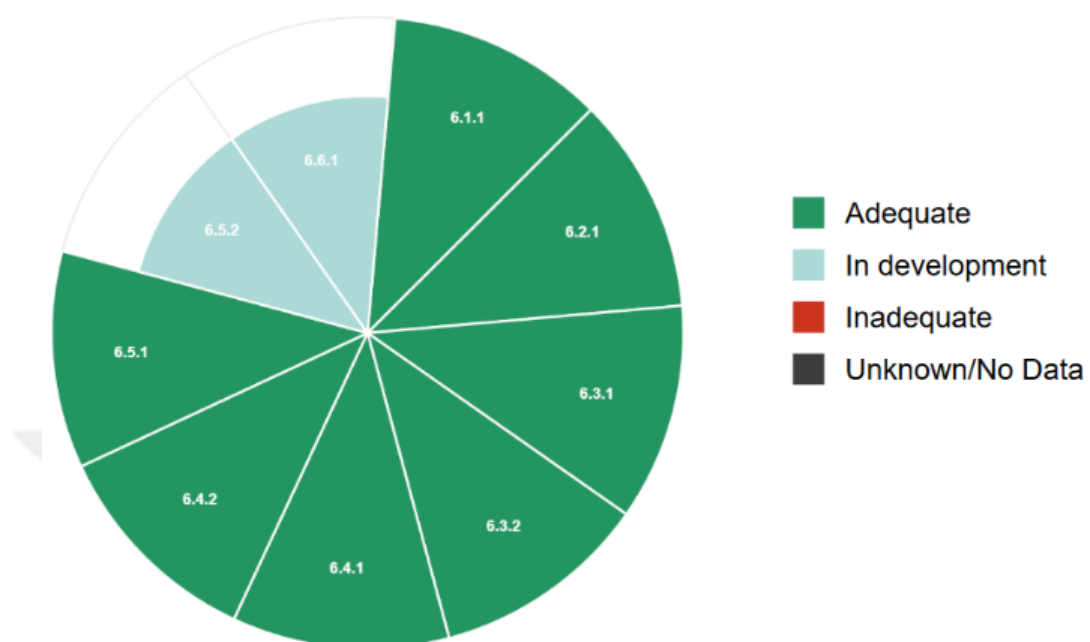


Figure 4.5. National policy and implementation plan for SDG 6 indicators.

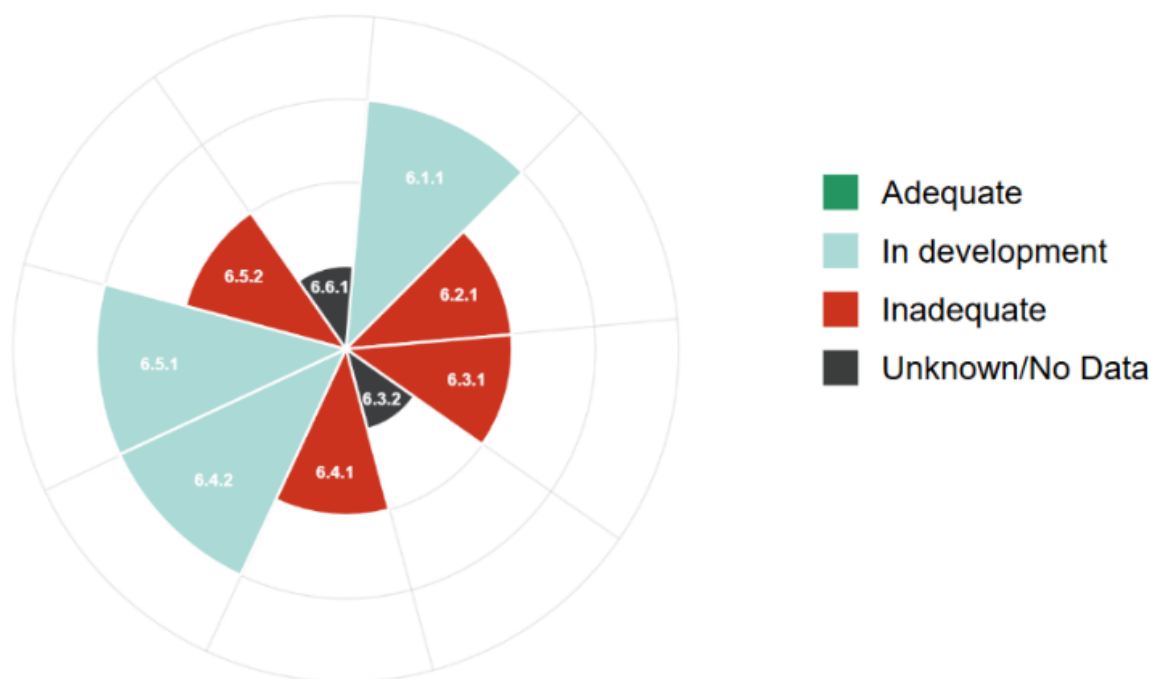


Figure 4.6. Level Of Cooperation and Exchange of Information with other Countries for SDG 6 Indicators.

4.3.4 Gender Mainstreaming

Gender mainstreaming in SDG 6 has shown positive outcomes in Somalia, recognizing the role of women in water resource management and sanitation. Figure 4.7 assesses the involvement of gender specialists in decision-making processes for SDG 6 indicators. It's indicated that for indicators 6.1.1, 6.2.1, and 6.4.1, there are adequate efforts to promote gender-inclusive decision-making in clean water and sanitation initiatives. Indicators 6.4.2 and 6.5.1 are in development. However, there is a lack of improvement in involving gender specialists in transboundary water-related studies, and there is no available data for indicators 6.3.1, 6.3.2, and 6.6.1, pointing out the need for gender specialist inclusion in areas of wastewater treatment, reuse, water quality, and water-related ecosystems. Figure 4.8 also presents a generally positive picture of gender equality awareness training within lead ministries/institutions in Somalia. For most indicators, the training is considered adequate, indicating a commitment to promoting gender equality within key institutions involved in clean water and sanitation efforts. Furthermore, indicator 6.3.2 is in development pointing to ongoing efforts to enhance gender equality training in water quality, which is a promising sign of progress. However, it's concerning that the training is inadequate for indicator 6.5.2 (transboundary) related studies highlighting the need for stronger efforts to promote gender equality awareness within the lead ministries/institutions related to this goal. In comparing the results of the evaluation of the involvement of gender specialists in decision-making processes for SDG 6 indicators in Somalia to a study in Tunisia that also evaluated gender mainstreaming using the SDG 6 PSS tool in 2021. The study shows that Tunisia has significant progress in gender-inclusive decision-making for most SDG 6 indicators, including 6.2.1, 6.3.1, 6.3.2, 6.4.1, 6.4.2, 6.5.1, and 6.6.1. However, progress was not adequate for indicator 6.1.1 (drinking water), which does not yet consider gender. Both countries have made efforts towards gender inclusion in sanitation and water use efficiency. Notably, Somalia has shown adequate gender inclusion in drinking water, while Tunisia has comprehensive gender mainstreaming in wastewater treatment, water quality, and water-related ecosystems, areas where Somalia lacks data and involvement (Olfa Mahjoub, 2021).

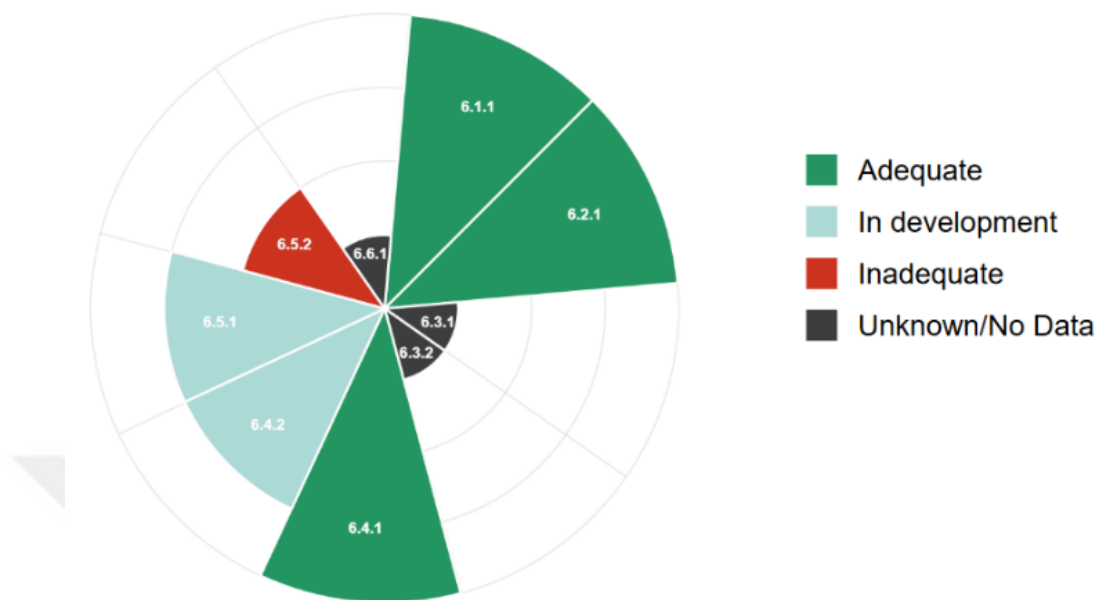


Figure 4.7. Inclusion of Gender Specialists in Decision-Making Processes for SDG 6 Indicators.

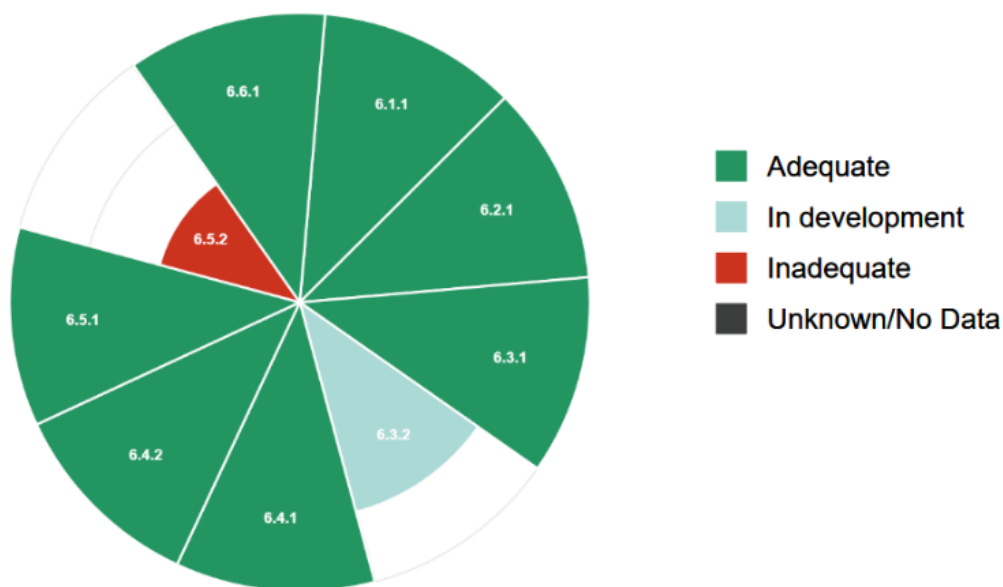


Figure 4.8. Training to Raise Awareness on Gender Equality Within Leading Ministries /Institutions for SDG 6 Indicator.

4.3.5 Disaster Risk Reduction (DRR)/Resilience

Somalia faces inherent vulnerabilities to climate-related disasters and water-related emergencies like drought and flood. Periodic droughts are a frequent occurrence in Somalia, happening relatively every 3-4 years, and significantly every 7-9 years, with significant impact on both the human population and livestock. The nation has had significant drought emergencies in the last ten years, with the most recent being in 2022. In 2011, a total of 3.7 million individuals experienced food insecurity, resulting in 260,000 deaths. During the year 2016-2017, more than 2.9 million individuals experienced a state of food insecurity at a crisis-to-emergency level, together with a shortage of access to safe drinking water, and losses in the livestock sector were estimated at USD 2 billion. In 2022, Somalia experienced a severe drought, which had a detrimental impact on 4.5 million individuals, resulting in the displacement of 671,000 people (Reliefweb, 2022). Disaster risk reduction and resilience planning have gained importance, with the integration of climate-smart practices in water resource management. To promote sustainable development, Somalia has committed to a low-emission and climate-resilient development path through its updated Nationally Determined Contribution (NDC) for 2021-2030, which was developed under the Paris Agreement. The revised NDC highlights the significance of adaptation as a response to the country's susceptibility to climate change-induced shocks, taking into account the vulnerability of its economy and population. The climate change adaptation priorities for Somalia from 2021 to 2030 are determined through baseline assessments and by referring to national and local adaptation plans and policies that concentrate on climate change and the sustainable utilization of natural resources (Federal Government of Somalia, 2022a). The Somali government is actively progressing towards fulfilling its obligations under the Sendai Framework for Disaster Risk Reduction by implementing national policies and plans for disaster risk management (Federal Government of Somalia, 2022a). Figure 4.9 illustrates national disaster reduction risk strategies in alignment with the Sendai Framework for SDG 6 indicators. Strategies for indicators 6.1.1, 6.2.1, and 6.4.1 are effective, demonstrating a proactive approach to addressing water-related disasters. Strategies for indicators 6.4.2 and 6.5.2 are considered inadequate. There was a lack of data for indicators 6.3.1, 6.3.2, 6.5.1, and 6.6.1 signaling a need for improved monitoring, and a comprehensive assessment of disaster risk reduction efforts in water quality, safely treated wastewater, IWRM, and water-related ecosystems. Continuous

evaluation and clarification of strategies are important for improving disaster risk reduction in the water sector.

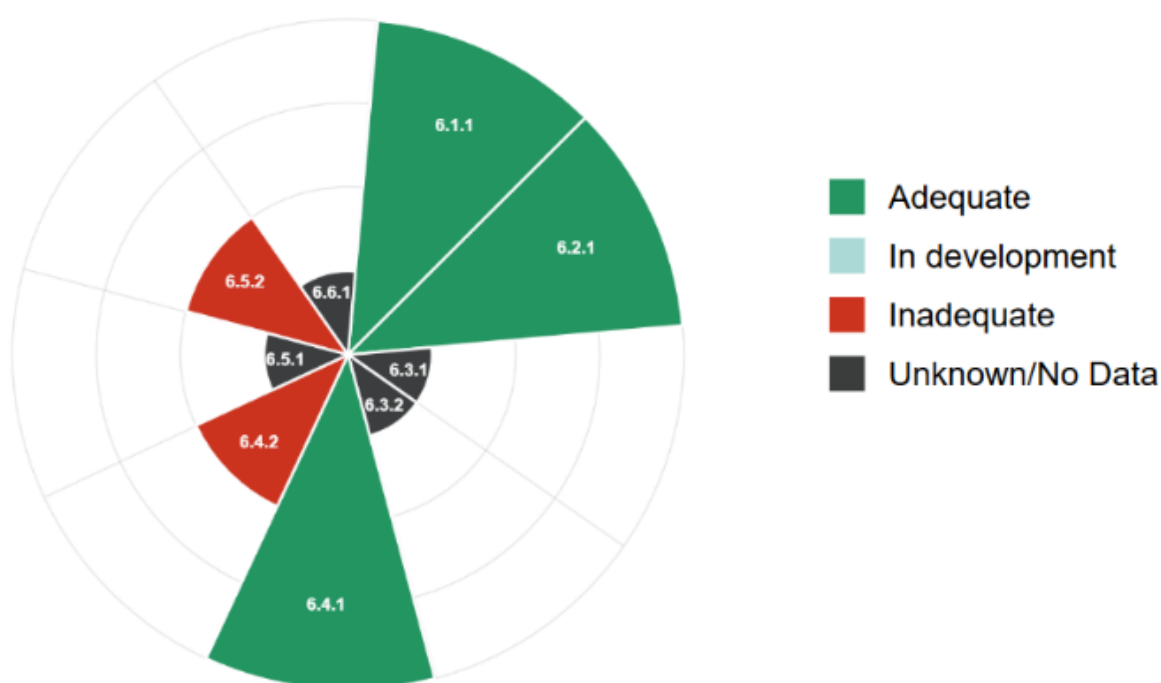


Figure 4.9. National DRR Strategies are Adopted in Line with the Sendai Framework for SDG 6 Indicators.

4.3.6 Integrity/Transparency

Integrity is important for building trust between donor countries, organizations, and the Somali government. To strengthen the trust between the partnerships it is necessary to clarify how the funds and resources are used. The assessment of integrity and transparency in SDG 6 initiatives in Somalia analyzed by the SDG-PSS reveals positive developments in anti-corruption action plans for SDG 6, particularly for indicators 6.6.1 (ecosystem) and 6.4.2 (water stress). However, inadequacies are noted in plans for indicators 6.1.1, 6.2.1, 6.3.1, 6.3.2, and 6.4.1, indicating the need for improved strategies in addressing corruption related to water availability, efficiency, quality, and integrated resources management. Furthermore, the absence of data for Indicators 6.5.1 (IWRM) and 6.5.2 (transboundary) points out the necessity for enhanced transparency and data collection in combating corruption within water-related ecosystems and infrastructures as

shown in Figure 4.10. Collaboration is vital to ensuring the success of anti-corruption efforts aligned with SDG 6.

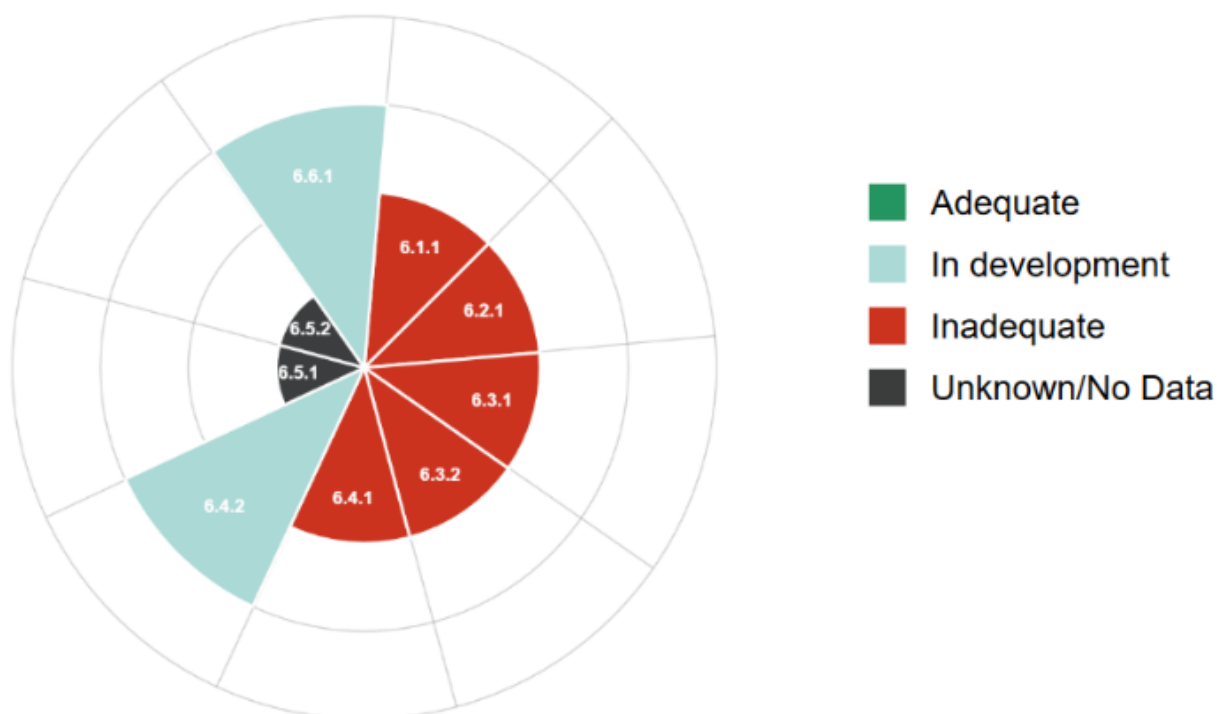


Figure 4.10. Anti-Corruption Action Plans Shared Between Government and Donors for SDG 6 Indicator.

4.4 Application of Wash Bottleneck Analysis Tool (WASH BAT)

Based on the questionnaire of the tool filled with the officials from the Somalia WASH cluster partners (especially ACTED and Save Children organizations) which is led by Unicef, the criteria presented in WASH BAT were analyzed by scoring and identifying bottlenecks, and their causes. Activities were recommended to remove the causes of the bottlenecks across each of the selected functions: “Sector Policies and Strategies, Institutional Arrangements, Budgeting and Financing, Planning, Monitoring and Review, Capacity Development, and Service Providers” as shown in Appendix B. The outcome of this analysis is presented below:

Sector Policies and Strategies

Somalia's water policy and legal frameworks exist but are fragmented and weak, lacking clear guidelines and strategies. The policy is based on evidence and collected information but lacks nationwide data. The framework also lacks clear roles and responsibilities, service norms, and

standards. Although the policy includes coverage and service targets, it lacks human resources and financial capacity. Financial resource allocation and priority-setting provisions are weak, lacking a targeting strategy. The operational and financial sustainability of services is not well defined, resulting in limited sustainable water sector investment. The environmental sustainability services, particularly climate-resilient development, are inadequate, and there is a lack of accountability mechanisms among users, service providers, and the government. The water policy and legal framework have not been fully implemented, revealing legal and institutional gaps. To remove the causes of the bottleneck the following activities are recommended:

- Establish an inclusive legal framework.
- Develop adequate data nationwide.
- Develop strong financial capacity and prioritize pragmatic approaches for progressive financing.
- Ensure that policy aligns with accountability mechanisms.
- Establish or strengthen water governance institutions.

Institutional Arrangement

The institutional arrangements building block of the tool has functions of coordination, accountability, and regulation.

For the coordination function, one of the most critical criteria is the unclarity of institutional roles and accountabilities lines definition and the operationalization of these roles and responsibilities. The bottleneck identified was the lack of clarity on the roles and responsibilities of stakeholders. The cause identified was the conflicting roles and responsibilities within the Government. To remove the causes of the bottleneck following activity is recommended:

- Clarify and operationalize stakeholder roles and responsibilities.

For Accountability and Regulation, the most critical bottleneck identified was the absence of an independent regulatory body that can act as an authoritative referee and impose positive or negative consequences based on performance, for both service providers and the government. Currently, all regulatory bodies are directly controlled by the government. Moreover, there is a

lack of feedback and complaints systems in place due to insufficient response and follow-up activities. To remove the causes of the bottleneck the following activities are recommended:

- Inclusions of an independent regulatory body.
- Develop a proper complaint mechanism.

Budget and Financing

The budget and financing for water are inadequate for several reasons. There is a lack of effective budget allocation, clear reporting, sufficient tariffs, capital expenditure, budget allocations, and financial needs. Although the private sector is encouraged to provide funds for the development of water infrastructure, there is not enough investment in sustainable water infrastructure. Public allocations towards water are insufficient due to economic challenges, limited resources, reliance on external aid, and inadequate infrastructure. To remove the causes of the bottleneck the following activities are recommended:

- Establish effective budget allocation.
- Increase transparency and implement cost recoveries.
- Develop and implement a water sector resource mobilization strategy.
- Strengthen finance systems and promote water sector investment.
- Institutionalize national water financial accounts to track the flow of financial resources.

Planning, Monitoring, and Review

The National water plans are not fully put into practice due to lack of budget, clear responsibilities, and financial plans. The government-led monitoring system is in place but has limited functionality. Monitoring feedback systems are insufficient due to limited resources and coordination among stakeholders. Annual joint sector reviews are insufficient due to inadequate institutional capacity and resource constraints. Service providers internal service standard monitoring is lacking due to limited regulatory capacity, transparency, and coordination. To remove the causes of the bottleneck the following activities are recommended:

- Enhancing effective communication.
- Developing an investment plan.
- Enhancing government-led monitoring system.

- Enhancing feedback system for effective decision-making.
- Building institutional capacity and promoting responsibility.

Capacity Development

For the capacity development function, there has been very limited progress in meeting the criteria related to the institution's ability to carry out sector tasks and responsibilities effectively, especially for long-term service delivery on a large scale. This includes having the required structures, tools, training, and incentives in place. The bottleneck identified was the insufficient institutional capacity to fulfill water sector roles and responsibilities to sustainably deliver services. The cause identified among others was the limited technical knowledge. To remove the causes of the bottleneck the following activity is recommended:

- Build institutional capacity in management, human resources, finances, and relevant technical skills by setting up proper programs to cover such needs.

Service Providers

The most crucial criteria for the service provider function were that the business model lacks financial sustainability and does not incorporate comprehensive operations and maintenance (O&M) services to assure continuous water supply and safety. The basic service levels it provides are too expensive for low-income and vulnerable groups. Also, there is inadequate accountability and a lack of compliance. Additionally, there is a lack of decentralized activity, poor accounting standards, and inadequate follow-up on policies and practices. To remove the causes of the Bottleneck the following Activities are recommended:

- Development of a comprehensive business model with a clear public-private partnership policy.
- Improvement and updating of national policies.

4.5 Application of OECD Water Governance Indicator Framework

Although the OECD water governance indicator framework is generally considered to perform effectively in economically developed countries with stronger institutions, however, in this study, it was examined whether these principles can be applied successfully in Somalia, a developing country that has a lot of challenges in managing its water sector. The evaluation aimed to identify

the aspects of effective water governance by examining three primary indicators from the OECD framework: Policy Framework, Institutional Setup, and Governance Mechanism, for each of the twelve principles. By reviewing the existing literature and government reports, the questions that this tool had were answered, then the results of this analysis are presented below and summarized in Figures 4.11-4.13.

Principle 1: Roles and Responsibilities

The three indicators defined by OECD which are outlined in Table 4.1 were used to assess principle one. The first indicator, 1.a, concerns water law in Somalia, and reveals a significant gap between policy formulation and implementation. Although a water law exists, its full implementation has not been achieved. The second indicator 1.b, which focuses on institutions with core water-related responsibilities for policy-making in Somalia, indicates that the institutions are in the stage of development. But the third, indicator 1.c, points out the absence of water governance mechanisms to review roles and responsibilities, identify gaps, and make necessary adjustments, which is a notable weakness identified in the assessment.

Table 4.1. Principle 1: Clear roles and responsibilities

Indicator 1. a: WHAT Existence and level of implementation of a water law	In Place, Not Implemented
Indicator 1. b: WHO Existence and functioning of the ministry, line ministry, a central agency with core water-related responsibilities for policy making.	Under Development
Indicator 1. c: HOW Existence and implementation of mechanisms to review roles and responsibilities, to diagnose gaps, and adjust when need be.	Not In Place

Principle 2: Appropriate scales within basin systems

The second principle has been applied in Somalia, and the three OECD indicators listed in Table 4.2 were used for its assessment. The first indicator, 2.a, assesses the presence and level of implementation of integrated water resources management (IWRM) policies and strategies. It

was found that Somalia has policies and strategies for IWRM in place, but they are only partially implemented. The second indicator, 2.b, focuses on institutions responsible for water management at the hydrographic scale. It has been observed that the institutions responsible for water management at a hydrographic scale are currently under development. The analysis revealed the absence of indicator 2.c, which concerns cooperation mechanisms for water resource management across various scales, from local to basin, regional, national, and upper scales. Effective cooperation is crucial for addressing transboundary water issues, resolving conflicts, and promoting sustainable water management practices. The study also examined IWRM using the SDG PSS tool, which yielded mostly positive outcomes for all its components compared to the OECD indicator framework. This difference could be due to various factors, such as the design, focus, methodology, and specific indicators used in each tool.

Table 4.2. Principle 2. Appropriate scales within basin systems

Indicator 2. a: WHAT Existence and level of implementation of integrated strategies water resources management policies and strategies.	In Place, Not Implemented
Indicator 2. b: WHO The existence and functioning of institutions managing water at the hydrographic scale	Under Development
Indicator 2. c: HOW Existence and level of implementation of cooperation mechanisms for the management of water resources across water-related users and upper scales.	Not In Place

Principle 3: Policy Coherence

The third principle was evaluated using all three indicators defined by OECD as shown in Table 4.3. The first indicator 3.a of this principle indicates the existence and level of implementation of cross-sectoral policies and initiatives that promote the alignment of policies between water and other significant sectors such as environment, health, energy, and agriculture, revealed that while these policies exist, it is not effectively implemented. Indicator 3.b which is related to institutions indicated the absence of a functioning inter-ministerial body or institutions for horizontal coordination across water-related policies. Similarly, indicator 3.c, regarding mechanisms for

reviewing barriers to policy coherence revealed that there is a lack of methods for evaluating obstacles to policy consistency, as well as locations where water and associated actions, policies, or regulations are not in harmony.

Table 4.3. Principle 3. Policy Coherence

Indicator 3. a: WHAT Existence and level of implementation of cross-sectoral policies and strategies promoting policy coherence between water and key related areas, in particular environment, health, energy, agriculture, land use, and spatial planning.	Under Development
Indicator 3. b: WHO Existence and functioning of an inter-ministerial body or institutions for horizontal coordination across water-related policies.	Not In Place
Indicator 3. c: HOW Existence and level of implementation of mechanisms to review barriers to policy coherence and/or areas where water and related practices, policies or regulations are misaligned.	Not In Place

Principle 4: Capacity

This principle was also assessed using the three OECD indicators outlined in Table 4.4. The first indicator 4.a, which is about the existence and level of implementation of hiring policies, based on a merit-based and transparent professional, and the assessment revealed that there are hiring policies in place for water professionals in Somalia. However, the implementation of these policies has not been effectively executed. The second indicator 4.b, which assesses the capacity of the institutions, and it was found that there are no current mechanisms to identify and address capacity gaps in water institutions. Similarly, the third indicator 4.c the assessment has identified the absence of educational and training programs for water professionals in Somalia as a significant gap.

Table 4.4. Principle 4. Capacity

Indicator 4.a: WHAT Existence and level of implementation of hiring policies, based on a merit-based and transparent professional and recruitment process of water professionals independent from political cycles.	In Place
indicator 4.b: WHO Existence and functioning of mechanisms to identify and address capacity gaps in water institutions.	Not In Place
Indicator 4.c: HOW Existence and level of implementation of educational and training programmes for water professionals.	Not In Place

Principle 5: Data and Information

The application of this principle in Somalia using the OECD indicators is shown in Table 4.5. The first indicator 5.a which is about the existence and functionality of updated, water information systems. This indicator shows that updated, timely, shared, consistent, and comparable water information systems do not exist in Somalia. While access to accurate and comprehensive water data is fundamental for informed decision-making and effective water governance.

Table 4.5. Principle 5. Data and Information

Indicator 5. a: WHAT Existence and functioning of updated, timely shared, consistent, and comparable water information systems	Not In Place
Indicator 5. a: WHO Existence and functioning of public institutions, organizations, and agencies in charge of producing, coordinating, and disclosing standardized, harmonized, and official water-related statistics	Under Development
Indicator 5. c: HOW Existence and level of implementation of mechanisms to identify and review data gaps, overlaps, and unnecessary overload.	Not In Place

Concerning the second indicator 5.b, which is about the institutions for producing, coordinating, and disclosing standardized, harmonized, and official water-related statistics, it is evident that these institutions are in their early stages of framework development. The third indicator 5.c, which is related to mechanisms and highlights that there are no mechanisms in place to identify and review data gaps, overlaps, and unnecessary overload, which is a notable weakness in the current water governance systems.

Principle 6: Financing

The application of this principle in the context of Somalia, according to the three indicators specified by the OECD in Table 4.6 for its evaluation, it was found that finance is one of the most neglected aspects of water administration in Somalia. The assessment for the first indicator 6.a, revealed that there is a lack of governance arrangements for revenue collection, which are necessary to enforce water institutions and promote water-conserving and effective actions. Similarly, the second indicator 6.b, indicates that there are no institutional entities in place responsible for collecting water revenues and distributing them at the appropriate level. Concerning the third indicator 6.c, showed that there is a lack of mechanisms to evaluate investment and operating requirements in the short, medium, and long term, which hinders the availability and viability of financial resources.

Table 4.6. Principle 6. Financing

Indicator 6. a: WHAT Existence and level of implementation of governance arrangements that help water institutions collect the necessary revenues to meet their mandates and drive water-sustainable and efficient behaviors.	Not In Place
Indicator 6. b: WHO Existence and functioning of dedicated institutions in charge of collecting water revenues and allocating them at the appropriate scale	Not In Place
Indicator 6. c: HOW Existence and level of implementation of mechanisms to assess short-, medium-, and long-term investment and operational needs and ensure the availability and sustainability of such finance.	Not In Place

Principle 7: Regulatory Frameworks

The assessment of Somalia's water governance functionality on the regulator principle, using the OECD indicators outlined in Table 4.7. The first indicator 7.a which is about analyzing the existence and level of implementation of a water management regulatory framework in Somalia. it has revealed that the government is now in the process of developing its regulatory structure. The second Indicator 7.b which evaluates the presence and effectiveness of institutions that are responsible for regulatory functions. The assessment found that there are specialized public institutions responsible for overseeing crucial regulatory functions regarding water services and water resource management. However, their implementation is not yet completely operational. The third indicator 7.c emphasizes the lack of regulatory mechanisms aimed at enhancing the quality of regulatory procedures for water management at all levels.

Table 4.7. Principle 7. Regulatory Frameworks

Indicator 7.a: WHAT Existence and level of implementation of a sound water management regulatory framework to foster enforcement and compliance, achieve regulatory objectives in a cost-effective way, and protect the public interest.	Under development
Indicator 7.b: WHO Existence and functioning of dedicated public institutions responsible for ensuring key regulatory functions for water services and resources management.	In Place, Not Implemented
Indicator 7.c: HOW Existence and level of implementation of regulatory tools to foster the quality of regulatory processes for water management at all levels.	Not In Place

Principle 8: Innovative Governance

The eighth principle of water governance, which is about innovation in the water governance system does not align with the Somalia context as the country is still in the process of establishing and building a water governance foundation. However, the OECD defines indicators for its evaluation as shown in Table 4.8. All three indicators, 8.a, 8.b, and 8.c, which were used

to assess the existence and level of implementation of policy frameworks, institutions, and mechanisms are not in place. Currently, there are no policy frameworks in place to promote the development of new and creative methods and systems for managing water. Additionally, no institutions and mechanisms are supporting bottom-up efforts, dialogue, sharing of information, and experimentation in water management at different levels.

Table 4.8. Principle 8. Innovative Governance

Indicator 8. a: WHAT Existence and level of implementation of policy frameworks and incentives fostering innovation in water management practices and processes.	Not In Place
Indicator 8. b: WHO Existence and functioning of institutions encouraging bottom-up initiatives, dialogue, and social learning as well as experimentation in water management at different levels.	Not In Place
Indicator 8. c: HOW Existence and level of implementation of knowledge and experience-sharing mechanisms to bridge the divide between science, policy, and practice.	Not In Place

Principle 9: Integrity and Transparency

The evaluation of the ninth principle on each of the indicators defined by OECD is shown in Table 4.9. Regarding indicator 9.a, which is related to the existence and level of implementation of legal and institutional frameworks on integrity and transparency. The assessment indicates that Somalia is working on developing legal and institutional frameworks to enhance integrity and transparency, primarily in water management. However, both indicator 9. b, and indicator 9.c, which are used to assess institutional and mechanisms for integrity and transparency. The assessment indicates that the country lacks an autonomous judiciary and ultimate oversight bodies that can adequately assess water-related violations and protect the public interest. Additionally, the findings show that Somalia does not have mechanisms in place to identify possible causes of corruption, weaknesses in water-related institutions across all levels, and other integrity and transparency deficiencies.

Table 4.9. Principle 9. Integrity and Transparency

Indicator 9. a: WHAT Existence and level of implementation of legal and institutional frameworks (not necessarily water-specific) on integrity and transparency which also apply to water management at large.	Under Development
Indicator 9. b: WHO Existence and functioning of independent courts (not necessarily water-specific) and supreme audit institutions that can investigate water-related infringements and safeguard the public interest.	Not In Place
Indicator 9. c: HOW Existence and level of implementation of mechanisms (not necessarily water-specific) to identify potential drivers of corruption and risks in all water-related institutions at different levels, as well as other water integrity and transparency Gaps.	Not In Place

Principle 10: Stakeholder Engagement

This principle was also assessed for each of the three OECD indicators as shown in Table 4.10. Concerning the first indicator 10.a which is about the existence and level of implementation of legal frameworks to engage stakeholders. The assessment indicated that the legal frameworks to involve stakeholders in the development and execution of water-related decisions, policies, and projects are not in place in the country. But indicator 10.b, reveals there are existing institutional frameworks and accountable entities to involve stakeholders in the formulation of water-related policies and decisions which are currently under development. For indicator 10.c, yet, there are no methods in place to recognize, oversee, and assess the difficulties, procedures, and results of stakeholder involvement.

Table 4.10. Principle 10. Stakeholder Engagement

Indicator 10.a: WHAT Existence and level of implementation of legal frameworks to engage stakeholders in the design and implementation of water-related decisions, policies, and projects.	Not In Place
Indicator 10.b: WHO Existence and functioning of organisational structures and responsible authorities to engage stakeholders in water-related policies and decisions.	Under Development
Indicator 10.c: HOW Existence and level of implementation of mechanisms to diagnose and review stakeholder engagement challenges, processes and outcomes.	Not In Place

Principle 11: Trade-offs between Users, Places, and Generations

The evaluation of the eleventh principle in Somalia using the three indicators defined by the OECD outlined in Table 4.11.

Table 4.11. Principle 11. Trade-offs between Users, Places, and Generations

Indicator 11.a: WHAT Existence and level of implementation of formal provisions or legal frameworks fostering equity across water users, rural and urban areas, and generations.	Not In Place
Indicator 11.b: WHO Existence and functioning of an Ombudsman or institution(s) to protect water users, including vulnerable groups.	Not In Place
Indicator 11.c: HOW Existence and implementation of mechanisms or platforms to manage trade-offs across users, territories, and/or overtime in a non-discriminatory, transparent, and evidence-based manner.	Not In Place

Indicator 11.a assesses the existence of formal provisions or legal frameworks, which showed that Somalia lacks official rules or laws promoting fairness between water users, rural and urban areas, and generations. Additionally, for indicator 11.b, there are no institutions in place to protect water users, especially vulnerable groups. Furthermore, for indicator 11.c, there are no tools or platforms available to transparently and accurately handle trade-offs between users, regions, and/or periods.

Principle 12: Monitoring and Evaluation

The assessment of the twelfth principle according to the three OECD indicators outlined in Table 4.12. Regarding the first indicator 12.a, for analyzing this principle which is about the existence and level of implementation of policy frameworks promoting regular monitoring and evaluation of water policy and governance. It reveals the absence of policy frameworks that facilitate the systematic monitoring and evaluation of water policy and governance in Somalia. Similarly, the second indicator 2.b, which is related to the institutions in charge of overseeing and assessing water policies and practices, as well as making necessary adjustments. Currently, these institutions are inactive. The final indicator 12.c, is about the existence of monitoring and evaluation mechanisms, and it reveals that there is a lack of monitoring and evaluation methods to assess the effectiveness of water policy and determine if water governance structures align with their intended goals.

Table 4.12. Principle 12. Monitoring and Evaluation

Indicator 12. a: WHAT Existence and level of implementation of policy frameworks promoting regular monitoring and evaluation of water policy and governance	Not In Place
Indicator 12. b: WHO Existence and functioning of institutions in charge of monitoring and evaluation of water policies and practices and help adjust where need be	Not In Place
Indicator 12. c: HOW Existence and level of implementation of monitoring and evaluation mechanisms to measure to what extent water policy fulfils the intended outcomes and water governance frameworks are fit-for-purpose	Not In Place

The overall analysis of the twelve principles of the current water governance system in Somalia revealed weaknesses in the Policy Framework and Institutional Framework and lacked a Governance Mechanisms Framework for implementation as shown in Figures 4.11-4.13. Although this is a tool for economically developed countries, it gives insight and pinpoints the important areas that need improvement in Somalia’s water governance.

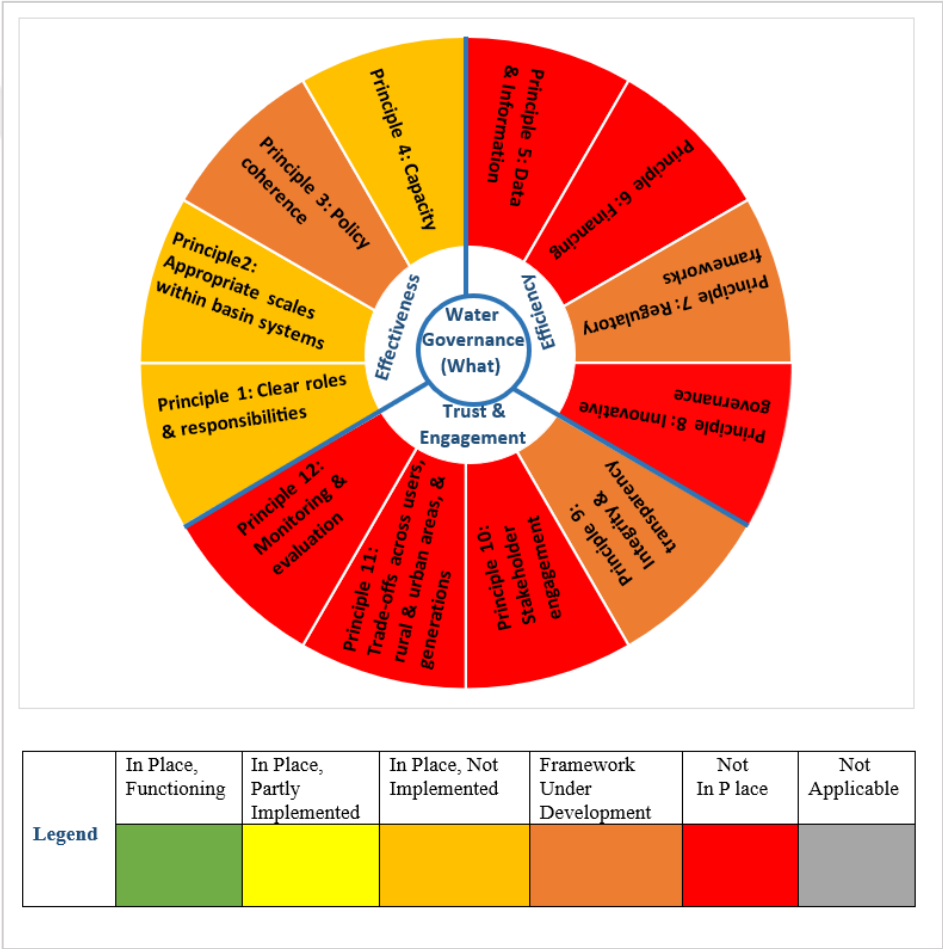


Figure 4.11.Water Governance Policy Frameworks (What) for Somalia.

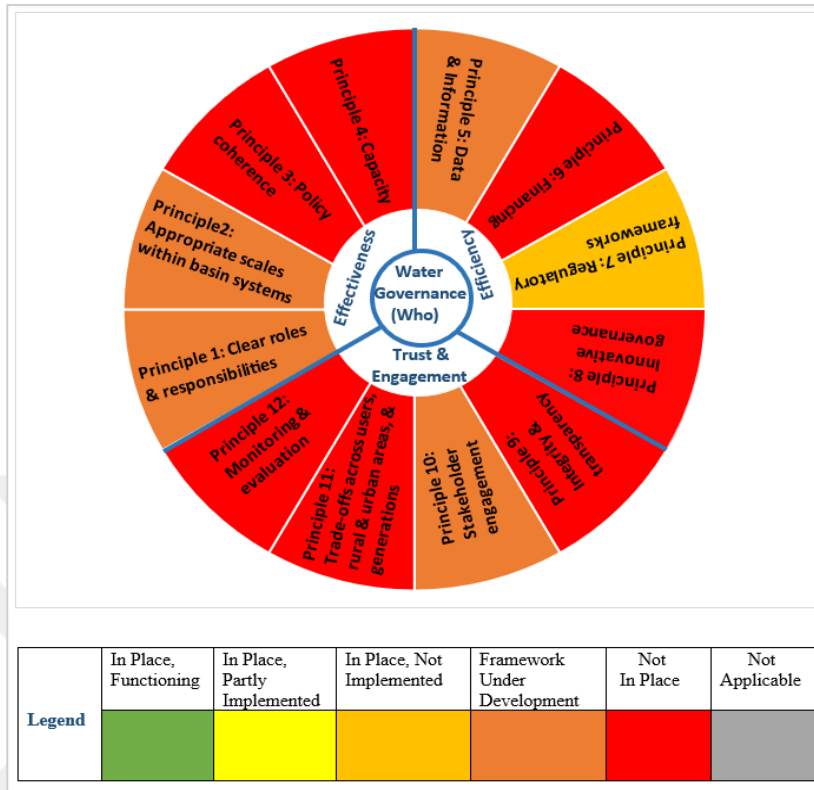


Figure 4.12.Water Governance Institutional Setup (Who) for Somalia.

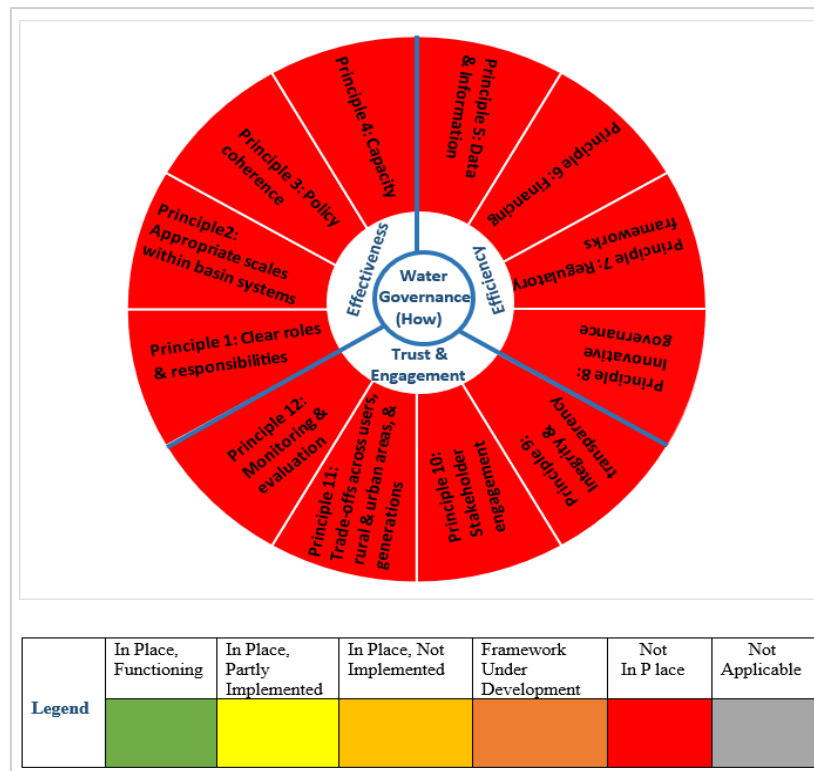


Figure 4.13.Water Governance Mechanisms (How) for Somalia

4.6 Similarities and Differences among the Evaluation Tools

4.6.1 Similarities Across the Tools

The SDG 6 Policy Support System, the WASH Bottleneck Analysis Tool, and the OECD principles on water governance aim to evaluate water governance performance. These tools assess water governance holistically, considering policy frameworks, institutional structures, capacity, transparency, and integrity. They recognize the importance of policies and institutions in shaping water governance and emphasize the need for harmonized policies. The tools evaluate the efficiency and sustainability of the governance framework, identifying areas that may require attention or improvement. By providing a comprehensive perspective, these tools enable a thorough understanding of the interconnected elements that shape water governance. Capacity building is a common and crucial theme in all three tools. The tools emphasize the need for skilled professionals, transparent hiring policies, and mechanisms to address capacity gaps within water institutions. The recognition of the pivotal role of human resources underscores the importance of expertise in effective water governance. Policy significance is highlighted in the SDG-PSS, WASH BAT, and OECD Principles. They emphasize the importance of aligning water policies with national development goals and ensuring consistency across sectors. Transparency and integrity are fundamental principles echoed in all evaluations. Whether promoting transparency through legal frameworks in the SDG-PSS, addressing corruption risks in the OECD Principles, or advocating for legal and institutional frameworks for integrity in WASH BAT, ethical governance is a shared goal.

4.6.2 Differences Across the Tools

The tools differ in their scope and focus, the SDG-PSS focuses on aligning national policies with Sustainable Development Goal 6 (SDG 6) on clean water and sanitation. While the WASH BAT delves specifically into water, sanitation, and hygiene, the OECD Principles offer a wider view of water governance. The WASH BAT provides a detailed, criterion-based assessment, pointing out bottlenecks, causes, and recommendations for specific activities for bottleneck removal of each building block. On the other hand, the SDG-PSS and OECD Principles provide more high-level, overarching evaluations. The SDG-PSS and OECD Principles, while relevant to water governance, are more adaptable to broader policy considerations. The WASH BAT may be adapted for regional or specific contextual use within the water sector. In contrast, the SDG-PSS and OECD Principles are designed for broader applicability, potentially across various regions

and sectors. The SDG-PSS directly aligns with the global agenda of sustainable development, influencing national policies based on international benchmarks. The OECD Principles, while global, are not tied to a specific global goal but provide a framework for good water governance. The tools mainly examine similar components to control water management effectiveness, but their focus and scope differ, as shown in Figure 4.14. The OECD Principles provide a broad framework with a focus on governance methods, the WASH BAT gives a sector-specific, in-depth analysis, and the SDG-PSS sets the global background and overarching goals. Using information from all three tools together gives a complete picture for improving water management.

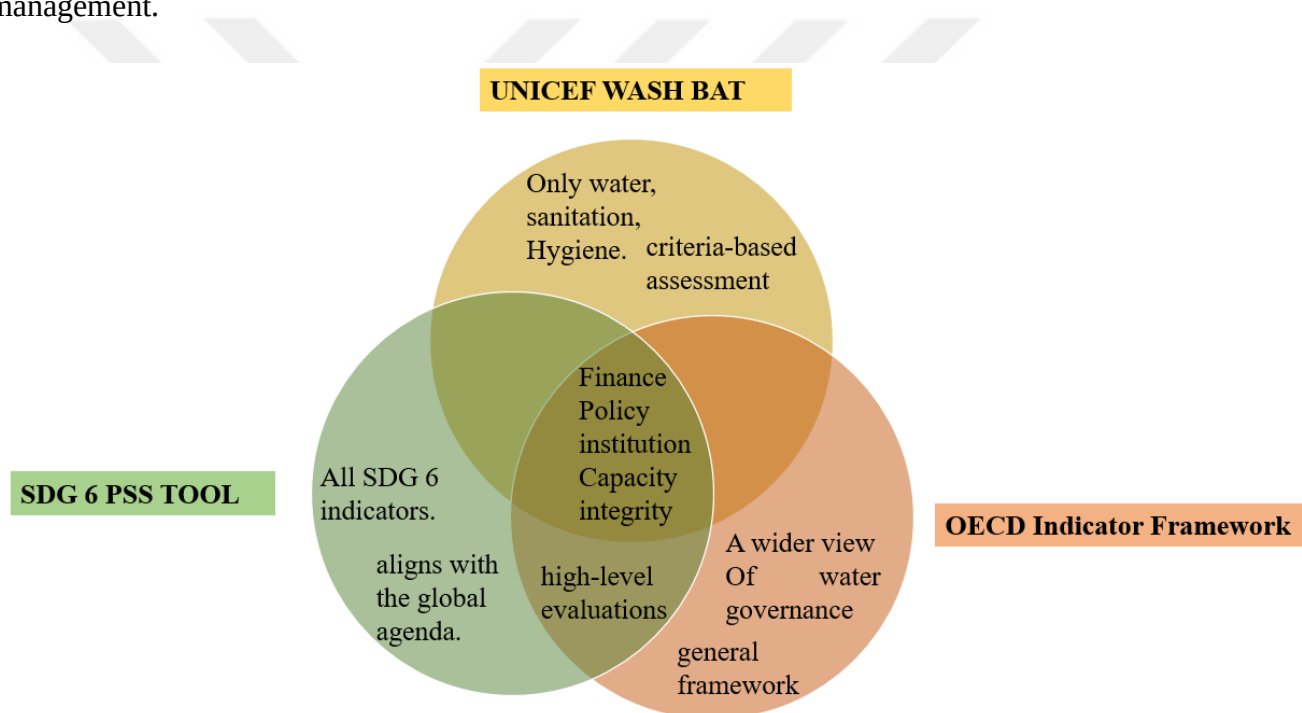


Figure 4.14. Similarity and Differences Between the Tools

5. CONCLUSION

The study employed three different tools, the SDG 6 Policy Support System (SDG-PSS), the Water, Sanitation, and Hygiene Bottleneck Analysis Tool (WASH BAT), and the OECD Water Governance Indicator Framework to comprehensively assess the performance of water management in Somalia. This section concludes the key findings from each tool and explores both their similarities and differences. By comparing these evaluations, the study aims to provide a thorough examination of Somalia's present water governance framework, and the achievability of SDG 6 highlighting the progress made, and challenges and identifying areas that need improvement.

The assessment of Somalia's progress toward Sustainable Development Goal 6 (SDG 6) using the SDG-PSS tool shows a mixed situation across critical components. In terms of capacity building, there is notable progress at the national level, although challenges persist in some of SDG 6 indicators like safely treated wastewater and transboundary issues. Financial sustainability remains a concern due to insufficient government budgetary allocations, pointing to the need for coordinated international support and innovative financing mechanisms. Policy development and institutional frameworks have improved, but cooperation gaps with other countries still exist. Somalia has made efforts to improve gender involvement in decision-making processes for SDG 6 indicators. Most of the SDG6 indicators show positive outcomes, but some require further inclusion of gender specialists. Disaster risk reduction and resilience planning are critical for Somalia, given its vulnerabilities to climate-related disasters. While certain strategies are effective for some of the indicators, others need improvement, requiring enhanced monitoring and assessment. Integrity and transparency in SDG 6 initiatives are motivated taking into account anti-corruption action plans. However, some indicators show inadequacies, emphasizing the importance of improved strategies and collaboration between the government and donors. Overall, the findings from the SDG-PSS tool point to the need for continuation of the ongoing efforts, data collection, and strategic improvements to ensure the successful implementation of SDG 6 in Somalia.

The key findings from the analysis of the Somalia water sector using the Wash Bottleneck Analysis Tool (WASH BAT) reveal significant challenges across all governance functions under the “building blocks” module of the tool, which includes sector policies and strategies,

institutional arrangements, budgeting and financing, planning, monitoring and review, capacity development, and service providers. The findings indicate weak water policies, unclear roles and responsibilities among the institutions related to the water sector, limited budgeting and expenditure, incomplete planning and ineffective monitoring, and inadequate capacity development. Key recommendations to address these bottlenecks include establishing inclusive legal frameworks, clarifying stakeholder roles, increasing budget transparency, developing an independent regulatory body, enhancing monitoring systems, and strengthening institutional capacity.

The evaluation of OECD principles on water governance in Somalia reveals multiple weaknesses in the country's water management structure. The assessment reveals the policy frameworks for water law, IWRM and capacity policies, which correspond to principles one, two and four, respectively are in place, while frameworks for the remaining principles are currently in the process of being developed or do not currently exist. Similarly, the study found that the current system for "institution frameworks" also lacks sufficient institutions to carry out water governance functions, except for principle seven, "Regulatory Frameworks," all other water governance principles either do not exist or are under development. In addition, the study reveals that the current water governance system lacks methods to address the OECD water governance characteristics in the "Mechanism Frameworks" category.

Putting together the results of all of these tools shows a picture of a complex landscape with a mix of challenges and opportunities. The reviews all agree on how important it is to get more stakeholders involved, make sure policies are followed more closely, build strong regulatory systems, and make coordination better. Also, the idea of "capacity building" has come up a lot, which shows how important it is to have skilled professionals and training attempts. All the tools have a common aim which is to analyze the effectiveness of water governance through a holistic approach, considering factors like policy frameworks, institutional structures, capacity, transparency, and integrity. They highlight how significant it is for policies to be consistent with water governance and look at how effective and long-lasting governance structures are. Capacity building is emphasized as important in all three tools, highlighting the need for skilled workers and ways to fill in gaps in capacity. Transparency and integrity are important in all reviews because they encourage good government through different means, like law systems, and reduce

the risk of corruption. Also, the tools differ from each other in their scope and focus. The SDG-PSS evaluates all the SDG 6 indicators. While the WASH BAT focuses on water, sanitation, and hygiene, and the OECD indicator framework intends to analyze the current condition of water governance policy, institutions, and mechanisms frameworks. The WASH BAT provides criteria to pinpoint bottlenecks, determine their causes, and establish Activities to eliminate the bottlenecks that limit the WASH sector and prevent the provision of sustainable WASH services. While the SDG-PSS directly aligns with global sustainable development goals, influencing national policies based on international benchmarks. The OECD indicator framework is structured to be relevant at several levels of governance (local, basin, national) and for different water-related purposes. Looking more closely, it's clear that these tools are focused on different areas, but they do cross on some topics, which shows how water management is linked. These combined findings help to better understand the problems Somalia is having in managing its water resources and make it easier to start collaborative and targeted projects. A list of areas that need improvement and the researcher's recommendations for their improvements for each tool are presented:

SDG 6 Policy Support System (SDG-PSS)

Areas Need Improvements:

1. **Capacity Building:** Challenges in safely treated wastewater and transboundary water management.
2. **Financial Sustainability:** Insufficient government budget allocations for water projects.
3. **Policy Development and Institutional Frameworks:** Gaps in cooperation with other countries.
4. **Gender Mainstreaming:** Inadequate inclusion of gender specialists in water management.
5. **Disaster Risk Reduction and Resilience:** Need for enhanced monitoring and assessment of climate-related disaster strategies.
6. **Integrity and Transparency:** Some indicators reveal inadequacies in anti-corruption strategies.

Recommended Improvements:

- Enhance national capacity-building programs.
- Seek coordinated international support and explore innovative financing mechanisms.
- Strengthen policy development and cross-border water management cooperation.
- Integrate gender specialists into all levels of water governance.
- Implement comprehensive disaster risk reduction and resilience planning.
- Improve integrity and transparency through better collaboration between government and donors.

Water, Sanitation, and Hygiene Bottleneck Analysis Tool (WASH BAT)

Areas Need Improvements:

1. Sector Policies and Strategies: Presence of weak water policies.
2. Institutional Arrangements: Unclear roles and responsibilities.
3. Budgeting and Financing: Limited budgeting and expenditure.
4. Planning, Monitoring, and Review: Incomplete plans and ineffective monitoring.
5. Capacity Development: Inadequate capacity development for water sector governance.
6. Service Providers: Challenges in service delivery models.

Recommended Improvements:

- Establish inclusive legal frameworks for water governance.
- Clarify roles and responsibilities among water sector institutions.
- Increase budget transparency and financial sustainability.
- Develop an independent regulatory body for water governance.
- Enhance monitoring and evaluation systems.
- Strengthen institutional and service provider capacities.

OECD Principles on Water Governance

Areas Need Improvements:

1. Policy Frameworks: Limited existence of comprehensive water policies for effective water governance.
2. Institutional Frameworks: Shortage of institutions for effective water governance.
3. Mechanism Frameworks: Absence of governance mechanisms to address OECD principles on water governance.

Recommended Improvements:

- Develop and implement comprehensive water policies.
- Establish institutions capable of performing water governance functions effectively.
- Create mechanisms for better governance, including regulatory frameworks, accountability measures, and stakeholder engagement processes.

By addressing these areas and implementing the suggested improvements, Somalia can enhance its water governance framework, making strides toward achieving SDG 6 and ensuring sustainable water and sanitation for all.

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APPENDIX A. SDG6 Policy Support System (SDG6 PSS) Tool Questionnaire.

A.1. Capacity-Questionnaire

Target 6.1: By 2030, achieve universal and equitable access to safe and affordable drinking water for all

Indicator 6.1.1 Proportion of population using safely managed drinking water services

6.1.1.1 Do national policy and implementation plans have mechanisms to address capacity building for this indicator?

Yes No Unknown In Development

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6.1.1.2 What capacity is available at the national level to achieve the agreed aspiration for this indicator?

Adequate Capacity No Capacity Unknown Inadequate Capacity

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6.1.1.3 Are lead Ministries/Institutions on track to build critical capacity for implementation of action plans for this indicator?

Yes No Unknown In Development

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Target 6.2: By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations

Indicator 6.2.1 Proportion of population using safely managed sanitation services, including a hand-washing facility with soap and water

6.2.1.1 Do national policy and implementation plans have mechanisms to address capacity building for this indicator?

Yes No Unknown In Development

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6.2.1.2 What capacity is available at the national level to achieve the agreed aspiration for this indicator?

Adequate Capacity No Capacity Unknown Inadequate Capacity

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6.2.1.3 Are lead Ministries/Institutions on track to build critical capacity for implementation of action plans for this indicator?

Yes	No	Unknown	InDevelopment
☐	☐	☐	☒

Target 6.3: By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally

Indicator 6.3.1 Proportion of wastewater safely treated

6.3.1.1 Do national policy and implementation plans have mechanisms to address capacity building for this indicator?

Yes	No	Unknown	In Development
☐	☒	☐	☐

6.3.1.2 What capacity is available at the national level to achieve the agreed aspiration for this indicator?

Adequate Capacity	No Capacity	Unknown	Inadequate Capacity
☐	☒	☐	☐

6.3.1.3 Are lead Ministries/Institutions on track to build critical capacity for implementation of action plans for this indicator?

Yes	No	Unknown	In Development
☐	☐	☒	☐

Indicator 6.3.2 Proportion of bodies of water with good ambient water quality

6.3.2.1 Do national policy and implementation plans have mechanisms to address capacity building for this indicator?

Yes	No	Unknown	In Development
☒	☐	☐	☐

6.3.2.2 What capacity is available at the national level to achieve the agreed aspiration for this indicator?

Adequate Capacity	No Capacity	Unknown	Inadequate Capacity
☐	☐	☒	☐

6.3.2.3 Are lead Ministries/Institutions on track to build critical capacity for implementation of action plans for this indicator?

Yes	No	Unknown	In Development
☐	☐	☐	☒

Target 6.4: By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity

Indicator 6.4.1 Change in water-use efficiency over time

6.4.1.1 Do national policy and implementation plans have mechanisms to address capacity building for this indicator?

Yes	No	Unknown	In Development
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6.4.1.2 What capacity is available at the national level to achieve the agreed aspiration for this indicator?

Adequate Capacity	No Capacity	Unknown	Inadequate Capacity
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6.4.1.3 Are lead Ministries/Institutions on track to build critical capacity for implementation of action plans for this indicator?

Yes	No	Unknown	In Development
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Indicator 6.4.2 Level of water stress - freshwater withdrawal as a proportion of available freshwater resources

6.4.2.1 Do national policy and implementation plans have mechanisms to address capacity building for this indicator?

Yes	No	Unknown	In Development
☒	☐	☐	☐

6.4.2.2 What capacity is available at the national level to achieve the agreed aspiration for this indicator?

Adequate Capacity	No Capacity	Unknown	Inadequate Capacity
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6.4.2.3 Are lead Ministries/Institutions on track to build critical capacity for implementation of action plans for this indicator?

Yes	No	Unknown	In Development
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Target 6.5: By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate

Indicator 6.5.1 Degree of integrated water resources management implementation (0-100)

6.5.1.1 Do national policy and implementation plans have mechanisms to address capacity building for this indicator?

Yes No Unknown In Development



6.5.1.2 What capacity is available at the national level to achieve the agreed aspiration for this indicator?

Adequate Capacity No Capacity Unknown Inadequate Capacity



6.5.1.3 Are lead Ministries/Institutions on track to build critical capacity for implementation of action plans for this indicator?

Yes No Unknown In Development



Indicator 6.5.2 Proportion of transboundary basin area with an operational arrangement for water cooperation

6.5.2.1 Do national policy and implementation plans have mechanisms to address capacity building for this indicator?

Yes No Unknown In Development



6.5.2.2 What capacity is available at the national level to achieve the agreed aspiration for this indicator?

Adequate Capacity No Capacity Unknown Inadequate Capacity



6.5.2.3 Are lead Ministries/Institutions on track to build critical capacity for implementation of action plans for this indicator?

Yes No Unknown In Development



Target 6.6: By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes

Indicator 6.6.1 Change in the extent of water-related ecosystems over time

6.6.1.1 Do national policy and implementation plans have mechanisms to address capacity building for this indicator?

Yes	No	Unknown	In Development
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6.6.1.2 What capacity is available at the national level to achieve the agreed aspiration for this indicator?

Adequate Capacity	No Capacity	Unknown	Inadequate Capacity
☐	☐	☒	☐

6.6.1.3 Are lead Ministries/Institutions on track to build critical capacity for implementation of action plans for this indicator?

Yes	No	Unknown	In Development
☒	☐	☐	☐

A.2. Finance-Questionnaire

Target 6.1: By 2030, achieve universal and equitable access to safe and affordable drinking water for all

Indicator 6.1.1 Proportion of population using safely managed drinking water services

6.1.1.1 What is the estimated proportion of funds available compared with funds needed for this indicator? (%)

6.1.1.2 Are there financing and expenditure plans developed and publicly available for the achievement of this indicator?

Yes	No	Unknown	In development
☒	☐	☐	☐

6.1.1.3 Are there mechanisms for including civil society to represent the interests of citizens in the financial planning for this indicator?

Yes	No	Unknown	In development
☐	☐	☒	☐

6.1.1.4 Are there established financial accountability mechanisms for this indicator?

Yes	No	Unknown	In development
☒	☐	☐	☐

6.1.1.5 Are there mechanisms to secure different funding sources (e.g. official development assistance (ODA), tariffs, public allocations, taxes) to support agreed goals for this indicator?

Yes	No	Unknown	In development
☐	☐	☒	☐

6.1.1.6 Do public incentives for environmentally sustainable and efficient technologies exist in financial plans for this indicator?

Yes	No	Unknown	In development
☐	☒	☐	☐

Target 6.2: By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations

Indicator 6.2.1 Proportion of population using safely managed sanitation services, including a hand- washing facility with soap and water

6.2.1.1 What is the estimated proportion of funds available compared with funds needed for this indicator? (%)

6.2.1.2 Are there financing and expenditure plans developed and publicly available for the achievement of this indicator?

Yes	No	Unknown	In development
☒	☐	☐	☐

6.2.1.3 Are there mechanisms for including civil society to represent the interests of citizens in the financial planning for this indicator?

Yes	No	Unknown	In development
☐	☐	☒	☐

6.2.1.4 Are there established financial accountability mechanisms for this indicator?

Yes	No	Unknown	In development
☐	☐	☒	☐

6.2.1.5 Are there mechanisms to secure different funding sources (e.g. official development assistance (ODA), tariffs, public allocations, taxes) to support agreed goals for this indicator?

Yes	No	Unknown	In development
☐	☐	☒	☐

6.2.1.6 Do public incentives for environmentally sustainable and efficient technologies exist in financial plans for this indicator?

Yes	No	Unknown	In development
☐	☒	☐	☐

Target 6.3: By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally

Indicator 6.3.1 Proportion of wastewater safely treated

6.3.1.1 What is the estimated proportion of funds available compared with funds needed for this indicator? (%)

6.3.1.2 Are there financing and expenditure plans developed and publicly available for the achievement of this indicator?

Yes No Unknown In development

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6.3.1.3 Are there mechanisms for including civil society to represent the interests of citizens in the financial planning for this indicator?

Yes No Unknown In development

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6.3.1.4 Are there established financial accountability mechanisms for this indicator?

Yes No Unknown In development

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6.3.1.5 Are there mechanisms to secure different funding sources (e.g. official development assistance (ODA), tariffs, public allocations, taxes) to support agreed goals for this indicator?

Yes No Unknown In development

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6.3.1.6 Do public incentives for environmentally sustainable and efficient technologies exist in financial plans for this indicator?

Yes No Unknown In development

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Indicator 6.3.2 Proportion of bodies of water with good ambient water quality

6.3.2.1 What is the estimated proportion of funds available compared with funds needed for this indicator? (%)

0.33

6.3.2.2 Are there financing and expenditure plans developed and publicly available for the achievement of this indicator?

Yes No Unknown In development

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6.3.2.3 Are there mechanisms for including civil society to represent the interests of citizens in the financial planning for this indicator?

Yes No Unknown In development

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6.3.2.4 Are there established financial accountability mechanisms for this indicator?

Yes No Unknown In development

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6.3.2.5 Are there mechanisms to secure different funding sources (e.g. official development assistance (ODA), tariffs, public allocations, taxes) to support agreed goals for this indicator?

Yes No Unknown In development

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6.3.2.6 Do public incentives for environmentally sustainable and efficient technologies exist in financial plans for this indicator?

Yes No Unknown In development

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Target 6.4: By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity

Indicator 6.4.1 Change in water-use efficiency over time

6.4.1.1 What is the estimated proportion of funds available compared with funds needed for this indicator? (%)

0

6.4.1.2 Are there financing and expenditure plans developed and publicly available for the achievement of this indicator?

Yes No Unknown In development

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6.4.1.3 Are there mechanisms for including civil society to represent the interests of citizens in the financial planning for this indicator?

Yes	No	Unknown	In development
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6.4.1.4 Are there established financial accountability mechanisms for this indicator?

Yes	No	Unknown	In development
☐	☐	☒	☐

6.4.1.5 Are there mechanisms to secure different funding sources (e.g. official development assistance (ODA), tariffs, public allocations, taxes) to support agreed goals for this indicator?

Yes	No	Unknown	In development
☐	☐	☒	☐

6.4.1.6 Do public incentives for environmentally sustainable and efficient technologies exist in financial plans for this indicator?

Yes	No	Unknown	In development
☐	☐	☒	☐

Indicator 6.4.2 Level of water stress - freshwater withdrawal as a proportion of available freshwater resources

6.4.2.1 What is the estimated proportion of funds available compared with funds needed for this indicator? (%)

6.4.2.1 Are there financing and expenditure plans developed and publicly available for the achievement of this indicator?

Yes	No	Unknown	In development
☐	☐	☒	☐

6.4.2.2 Are there mechanisms for including civil society to represent the interests of citizens in the financial planning for this indicator?

Yes	No	Unknown	In development
☐	☐	☒	☐

6.4.2.3 Are there established financial accountability mechanisms for this indicator?

Yes	No	Unknown	In development
☐	☐	☒	☐

6.4.2.4 Are there mechanisms to secure different funding sources (e.g. official development assistance (ODA), tariffs, public allocations, taxes) to support agreed goals for this indicator?

Yes No Unknown In development

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6.4.2.5 Do public incentives for environmentally sustainable and efficient technologies exist in financial plans for this indicator?

Yes No Unknown In development

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Target 6.5: By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate

Indicator 6.5.1 Degree of integrated water resources management implementation (0-100) What is the estimated proportion of funds available compared with funds needed for this indicator? (%)

45

6.5.1.1 Are there financing and expenditure plans developed and publicly available for the achievement of this indicator?

Yes No Unknown In development

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6.5.1.2 Are there mechanisms for including civil society to represent the interests of citizens in the financial planning for this indicator?

Yes No Unknown In development

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6.5.1.3 Are there established financial accountability mechanisms for this indicator?

Yes No Unknown In development

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6.5.1.4 Are there mechanisms to secure different funding sources (e.g. official development assistance (ODA), tariffs, public allocations, taxes) to support agreed goals for this indicator?

Yes No Unknown In development

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6.5.1.5 Do public incentives for environmentally sustainable and efficient technologies exist in financial plans for this indicator?

Yes	No	Unknown	In development
☒	☐	☐	☐

Indicator 6.5.2 Proportion of transboundary basin area with an operational arrangement for water cooperation

6.5.2.1 What is the estimated proportion of funds available compared with funds needed for this indicator? (%)

0

6.5.2.2 Are there financing and expenditure plans developed and publicly available for the achievement of this indicator?

Yes	No	Unknown	In development
☐	☐	☒	☐

6.5.2.3 Are there mechanisms for including civil society to represent the interests of citizens in the financial planning for this indicator?

Yes	No	Unknown	In development
☐	☐	☒	☐

6.5.2.4 Are there established financial accountability mechanisms for this indicator?

Yes	No	Unknown	In development
☐	☐	☒	☐

6.5.2.5 Are there mechanisms to secure different funding sources (e.g. official development assistance (ODA), tariffs, public allocations, taxes) to support agreed goals for this indicator?

Yes	No	Unknown	In development
☐	☐	☒	☐

6.5.2.6 Do public incentives for environmentally sustainable and efficient technologies exist in financial plans for this indicator?

Yes	No	Unknown	In development
☐	☐	☒	☐

Target 6.6: By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes

Indicator 6.6.1 Change in the extent of water-related ecosystems over time

6.6.1.1 What is the estimated proportion of funds available compared with funds needed for this indicator? (%)

0

6.6.1.2 Are there financing and expenditure plans developed and publicly available for the achievement of this indicator?

Yes No Unknown In development

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6.6.1.3 Are there mechanisms for including civil society to represent the interests of citizens in the financial planning for this indicator?

Yes No Unknown In development

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6.6.1.4 Are there established financial accountability mechanisms for this indicator?

Yes No Unknown In development

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6.6.1.5 Do public incentives for environmentally sustainable and efficient technologies exist in financial plans for this indicator?

Yes No Unknown In developme

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A.3. Policy & Institutional-Questionnaire

Target 6.1: By 2030, achieve universal and equitable access to safe and affordable drinking water for all

Indicator 6.1.1 Proportion of population using safely managed drinking water services

6.1.1.1 Are national policies and implementation plans in place for achieving this indicator?

Yes No Unknown In Development

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6.1.1.2 Do national policies and implementation plans have mechanisms to reach specific population groups (e.g., ethnic minorities, women and girls, indigenous populations, etc.) for this indicator?

Yes	No	Unknown	In Development
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6.1.1.3 Are there mechanisms in place for the allocation of clear responsibilities among lead Ministries/Institutions for this indicator?

Yes	No	Unknown	In development
☒	☐	☐	☐

6.1.1.4 Are there mechanisms being adopted in policy and implementation plans to improve information and data collection systems for this indicator?

Yes	No	Unknown	In Development
☐	☐	☐	☒

6.1.1.5 Do national policies and implementation plans support cooperation with the private sector for the achievement of this indicator?

Yes	No	Unknown	In Development
☒	☐	☐	☐

6.1.1.6 Do national policies and implementation plans support cooperation with development partners (international organizations, donors, NGOs, etc.) for the achievement of this indicator?

Yes	No	Unknown	In development
☒	☐	☐	☐

6.1.1.7 What is the level of existing international cooperation to exchange information and learn from each other's experiences in achieving this indicator?

Very High	Significant	Low	Unknown
☐	☒	☐	☐

6.1.1.8 Are there public awareness campaigns to inform citizens on challenges and progress for this indicator?

Yes	No	Unknown	In Development
☒	☐	☐	☐

Target 6.2: By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations.

Indicator 6.2.1 Proportion of population using safely managed sanitation services, including a hand-washing facility with soap and water.

6.2.1.1 Are national policies and implementation plans in place for achieving this indicator?

Yes No Unknown In Development

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6.2.1.2 Do national policies and implementation plans have mechanisms to reach specific population groups (e.g., ethnic minorities, women and girls, indigenous populations, etc.) for this indicator?

Yes No Unknown In Development

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6.2.1.3 Are there mechanisms in place for the allocation of clear responsibilities among lead Ministries/Institutions for this indicator?

Yes No Unknown In development

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6.2.1.4 Are there mechanisms being adopted in policy and implementation plans to improve information and data collection systems for this indicator?

Yes No Unknown In Development

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6.2.1.5 Do national policies and implementation plans support cooperation with the private sector for the achievement of this indicator?

Yes No Unknown In Development

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6.2.1.6 Do national policies and implementation plans support cooperation with development partners (international organizations, donors, NGOs, etc.) for the achievement of this indicator?

Yes No Unknown In development

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6.2.1.7 What is the level of existing international cooperation to exchange information and learn from each other's experiences in achieving this indicator?

Very High Significant Low Unknown

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6.2.1.8 Are there public awareness campaigns to inform citizens on challenges and progress for this indicator?

Yes	No	Unknown	In Development
☒	☐	☐	☐

Target 6.3: By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally

Indicator 6.3.1 Proportion of wastewater safely treated

6.3.1.1 Are national policies and implementation plans in place for achieving this indicator?

Yes	No	Unknown	In Development
☒	☐	☐	☐

6.3.1.2 Do national policies and implementation plans have mechanisms to reach specific population groups (e.g., ethnic minorities, women and girls, indigenous populations, etc.) for this indicator?

Yes	No	Unknown	In Development
☐	☐	☒	☐

6.3.1.3 Are there mechanisms in place for the allocation of clear responsibilities among lead Ministries/Institutions for this indicator?

Yes	No	Unknown	In development
☐	☐	☐	☒

6.3.1.4 Are there mechanisms being adopted in policy and implementation plans to improve information and data collection systems for this indicator?

Yes	No	Unknown	In Development
☐	☐	☒	☐

6.3.1.5 Do national policies and implementation plans support cooperation with the private sector for the achievement of this indicator?

Yes	No	Unknown	In Development
☐	☐	☒	☐

6.3.1.6 Do national policies and implementation plans support cooperation with development partners (international organizations, donors, NGOs, etc.) for the achievement of this indicator?

Yes	No	Unknown	In development
☒	☐	☐	☐

6.3.1.7 What is the level of existing international cooperation to exchange information and learn from each other's experiences in achieving this indicator?

Very High	Significant	Low	Unknown
☐	☐	☒	☐

6.3.1.8 Are there public awareness campaigns to inform citizens on challenges and progress for this indicator?

Yes	No	Unknown	In Development
☒	☐	☐	☐

Indicator 6.3.2 Proportion of bodies of water with good ambient water quality

6.3.2.1 Are national policies and implementation plans in place for achieving this indicator?

Yes	No	Unknown	In Development
☒	☐	☐	☐

6.3.2.2 Do national policies and implementation plans have mechanisms to reach specific population groups (e.g., ethnic minorities, women and girls, indigenous populations, etc.) for this indicator?

Yes	No	Unknown	In Development
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6.3.2.3 Are there mechanisms in place for the allocation of clear responsibilities among lead Ministries/Institutions for this indicator?

Yes	No	Unknown	In development
☐	☐	☒	☐

6.3.2.4 Are there mechanisms being adopted in policy and implementation plans to improve information and data collection systems for this indicator?

Yes	No	Unknown	In Development
☐	☐	☐	☒

6.3.2.5 Do national policies and implementation plans support cooperation with the private sector for the achievement of this indicator?

Yes	No	Unknown	In Development
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6.3.2.6 Do national policies and implementation plans support cooperation with development partners (international organizations, donors, NGOs, etc.) for the achievement of this indicator?

Yes	No	Unknown	In development
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6.3.2.7 What is the level of existing international cooperation to exchange information and learn from each other's experiences in achieving this indicator?

Yes	No	Unknown	In Development
☐	☐	☐	☒

6.3.2.8 Are there public awareness campaigns to inform citizens on challenges and progress for this indicator?

Yes	No	Unknown	In Development
☐	☐	☒	☐

Target 6.4: By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity

Indicator 6.4.1 Change in water-use efficiency over time

6.4.1.1 Do national policies and implementation plans support cooperation with development partners (international organizations, donors, NGOs, etc.) for the achievement of this indicator?

Yes	No	Unknown	In development
☐	☐	☐	☒

6.4.1.2 What is the level of existing international cooperation to exchange information and learn from each other's experiences in achieving this indicator?

Very High	Significant	Low	Unknown
☐	☐	☒	☐

6.4.1.3 Are there public awareness campaigns to inform citizens on challenges and progress for this indicator?

	Yes	No	Unknown	In Development
	☐	☐	☐	☒

6.4.1.4 Are there mechanisms being adopted in policy and implementation plans to improve information and data collection systems for this indicator?

	Yes	No	Unknown	In Development
	☒	☐	☐	☐

6.4.1.5 Do national policies and implementation plans support cooperation with the private sector for the achievement of this indicator?

	Yes	No	Unknown	In Development
	☐	☐	☐	☒

6.4.1.6 Do national policies and implementation plans support cooperation with development partners (international organizations, donors, NGOs, etc.) for the achievement of this indicator?

	Yes	No	Unknown	In development
	☐	☐	☐	☒

6.4.1.7 What is the level of existing international cooperation to exchange information and learn from each other's experiences in achieving this indicator?

	Very High	Significant	Low	Unknown
	☐	☐	☒	☐

6.4.1.8 Are there public awareness campaigns to inform citizens on challenges and progress for this indicator?

	Yes	No	Unknown	In Development
	☐	☐	☐	☒

Indicator 6.4.2 Level of water stress - freshwater withdrawal as a proportion of available freshwater resources

6.4.2.1 Are national policies and implementation plans in place for achieving this indicator?

	Yes	No	Unknown	In Development
	☒	☐	☐	☐

6.4.2.2 Do national policies and implementation plans have mechanisms to reach specific population groups (e.g., ethnic minorities, women and girls, indigenous populations, etc.) for this indicator?

Yes	No	Unknown	In Development
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6.4.2.3 Are there mechanisms in place for the allocation of clear responsibilities among lead Ministries/Institutions for this indicator?

Yes	No	Unknown	In development
☒	☐	☐	☐

6.4.2.4 Are there mechanisms being adopted in policy and implementation plans to improve information and data collection systems for this indicator?

Yes	No	Unknown	In Development
☒	☐	☐	☐

6.4.2.5 Do national policies and implementation plans support cooperation with the private sector for the achievement of this indicator?

Yes	No	Unknown	In Development
☒	☐	☐	☐

6.4.2.6 Do national policies and implementation plans support cooperation with development partners (international organizations, donors, NGOs, etc.) for the achievement of this indicator?

Yes	No	Unknown	In development
☒	☐	☐	☐

6.4.2.7 What is the level of existing international cooperation to exchange information and learn from each other's experiences in achieving this indicator?

Very High	Significant	Low	Unknown
☐	☒	☐	☐

6.4.2.8 Are there public awareness campaigns to inform citizens on challenges and progress for this indicator?

Yes	No	Unknown	In Development
☐	☐	☐	☒

Target 6.5: By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate.

Indicator 6.5.1 Degree of integrated water resources management implementation (0-100)

6.5.1.1 Are national policies and implementation plans in place for achieving this indicator?

Yes No Unknown In Development

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6.5.1.2 Do national policies and implementation plans have mechanisms to reach specific population groups (e.g., ethnic minorities, women and girls, indigenous populations, etc.) for this indicator?

Yes No Unknown In Development

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6.5.1.3 Are there mechanisms in place for the allocation of clear responsibilities among lead Ministries/Institutions for this indicator?

Yes No Unknown In development

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6.5.1.4 Are there mechanisms being adopted in policy and implementation plans to improve information and data collection systems for this indicator?

Yes No Unknown In Development

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6.5.1.5 Do national policies and implementation plans support cooperation with the private sector for the achievement of this indicator?

Yes No Unknown In Development

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6.5.1.6 Do national policies and implementation plans support cooperation with development partners (international organizations, donors, NGOs, etc.) for the achievement of this indicator?

Yes No Unknown In development

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6.5.1.7 What is the level of existing international cooperation to exchange information and learn from each other's experiences in achieving this indicator?

Very High Significant Low Unknown

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6.5.1.8 Are there public awareness campaigns to inform citizens on challenges and progress for this indicator?

Yes	No	Unknown	In Development
☒	☐	☐	☐

Indicator 6.5.2 Proportion of transboundary basin area with an operational arrangement for water cooperation

6.5.2.1 Are national policies and implementation plans in place for achieving this indicator?

Yes	No	Unknown	In Development
☐	☐	☐	☒

6.5.2.2 Do national policies and implementation plans have mechanisms to reach specific population groups (e.g., ethnic minorities, women and girls, indigenous populations, etc.) for this indicator?

Yes	No	Unknown	In Development
☐	☐	☒	☐

6.5.2.3 Are there mechanisms in place for the allocation of clear responsibilities among lead Ministries/Institutions for this indicator?

Yes	No	Unknown	In development
☐	☐	☐	☒

6.5.2.4 Are there mechanisms being adopted in policy and implementation plans to improve information and data collection systems for this indicator?

Yes	No	Unknown	In Development
☒	☐	☐	☐

6.5.2.5 Do national policies and implementation plans support cooperation with the private sector for the achievement of this indicator?

Yes	No	Unknown	In Development
☐	☒	☐	☐

6.5.2.6 Do national policies and implementation plans support cooperation with development partners (international organizations, donors, NGOs, etc.) for the achievement of this indicator?

Yes	No	Unknown	In development
☐	☐	☒	☐

6.5.2.7 What is the level of existing international cooperation to exchange information and learn from each other's experiences in achieving this indicator?

Very High	Significant	Low	Unknown
☐	☐	☒	☐

6.5.2.8 Are there public awareness campaigns to inform citizens on challenges and progress for this indicator?

Yes	No	Unknown	In Development
☐	☒	☐	☐

Target 6.6: By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes

Indicator 6.6.1 Change in the extent of water-related ecosystems over time

6.6.1.1 Are national policies and implementation plans in place for achieving this indicator?

Yes	No	Unknown	In Development
☐	☐	☐	☒

6.6.1.2 Do national policies and implementation plans have mechanisms to reach specific population groups (e.g., ethnic minorities, women and girls, indigenous populations, etc.) for this indicator?

Yes	No	Unknown	In Development
☐	☐	☒	☐

6.6.1.3 Are there mechanisms in place for the allocation of clear responsibilities among lead Ministries/Institutions for this indicator?

Yes	No	Unknown	In development
☐	☐	☒	☐

6.6.1.4 Are there mechanisms being adopted in policy and implementation plans to improve information and data collection systems for this indicator?

Yes	No	Unknown	In Development
☒	☐	☐	☐

6.6.1.5 Do national policies and implementation plans support cooperation with the private sector for the achievement of this indicator?

Yes No Unknown In Development

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6.6.1.6 Do national policies and implementation plans support cooperation with development partners (international organizations, donors, NGOs, etc.) for the achievement of this indicator?

Yes No Unknown In development

☐ ☐ ☒ ☐

6.6.1.7 What is the level of existing international cooperation to exchange information and learn from each other's experiences in achieving this indicator?

Very High Significant Low Unknown

☐ ☐ ☐ ☒

6.6.1.8 Are there public awareness campaigns to inform citizens on challenges and progress for this indicator?

Yes No Unknown In Development

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A.4. Gender-Questionnaire

Target 6.1: By 2030, achieve universal and equitable access to safe and affordable drinking water for all

Indicator 6.1.1 Proportion of population using safely managed drinking water services

6.1.1.1 Are there gender mainstreaming objectives considered by lead Ministries/Institutions for this indicator?

Yes No Unknown In development

☒ ☐ ☐ ☐

6.1.1.2 Has gender analysis been undertaken to inform national policies for this indicator?

Yes No Unknown In development

☒ ☐ ☐ ☐

6.1.1.3 Do national-level stakeholders (government, donors, civil society, and research agencies) incorporate gender dimensions on studies for this indicator?

Yes No Unknown In development

☒ ☐ ☐ ☐

6.1.1.4 Are there capacity and financial resources allocated to implement gender mainstreaming goals for this indicator?

Yes No Unknown In development

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6.1.1.5 Are gender specialists included in decision-making for this indicator?

Yes No Unknown In development

☒☐☐☐

6.1.1.6 Is there training to raise awareness on gender equality concerns within lead Ministries/Institutions?

Yes No Unknown In development

☒☐☐☐

Target 6.2: By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations

Indicator 6.2.1 Proportion of population using safely managed sanitation services, including a hand-washing facility with soap and water

6.2.1.1 Are there gender mainstreaming objectives considered by lead Ministries/Institutions for this indicator?

Yes No Unknown In development

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6.2.1.2 Has gender analysis been undertaken to inform national policies for this indicator?

Yes No Unknown In development

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6.2.1.3 Do national level stakeholders (government, donors, civil society, and research agencies) incorporate gender dimensions on studies for this indicator?

Yes No Unknown In development

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6.2.1.4 Are there capacity and financial resources allocated to implement gender mainstreaming goals for this indicator?

Yes No Unknown In development

☐☐☐☒

6.2.1.5 Are gender specialists included in decision-making for this indicator?

Yes	No	Unknown	In development
☒	☐	☐	☐

6.2.1.6 Is there training to raise awareness on gender equality concerns within lead Ministries/Institutions?

Yes	No	Unknown	In development
☒	☐	☐	☐

6.2.1.7 What is the number of female and male paid staff in lead Ministries/Institutions for this indicator?

Target 6.3: By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally

Indicator 6.3.1 Proportion of wastewater safely treated

6.3.1.1 Are there gender mainstreaming objectives considered by lead Ministries/Institutions for this indicator?

Yes	No	Unknown	In development
☐	☐	☒	☐

6.3.1.2 Has gender analysis been undertaken to inform national policies for this indicator?

Yes	No	Unknown	In development
☐	☐	☒	☐

6.3.1.3 Are there capacity and financial resources allocated to implement gender mainstreaming goals for this indicator?

Yes	No	Unknown	In development
☐	☐	☒	☐

6.3.1.4 Are gender specialists included in decision-making for this indicator?

Yes	No	Unknown	In development
☐	☐	☒	☐

6.3.1.5 Is there training to raise awareness on gender equality concerns within lead Ministries/Institutions?

Yes	No	Unknown	In development
☒	☐	☐	☐

6.3.1.6 What is the number of female and male paid staff in lead Ministries/Institutions for this indicator?

Indicator 6.3.2 Proportion of bodies of water with good ambient water quality

6.3.2.1 Are there gender mainstreaming objectives considered by lead Ministries/Institutions for this indicator?

Yes No Unknown In development

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6.3.2.2 Has gender analysis been undertaken to inform national policies for this indicator?

Yes No Unknown In development

☐ ☐ ☒ ☐

6.3.2.3 Do national level stakeholders (government, donors, civil society, and research agencies) incorporate gender dimensions on studies for this indicator?

Yes No Unknown In development

☐ ☐ ☒ ☐

6.3.2.4 Are there capacity and financial resources allocated to implement gender mainstreaming goals for this indicator?

Yes No Unknown In development

☐ ☐ ☒ ☐

6.3.2.5 Are gender specialists included in decision-making for this indicator?

Yes No Unknown In development

☐ ☐ ☒ ☐

6.3.2.6 Is there training to raise awareness on gender equality concerns within lead Ministries/Institutions?

Yes No Unknown In development

☐ ☐ ☐ ☒

Target 6.4: By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity

Indicator 6.4.1 Change in water-use efficiency over time

6.4.1.1 Are there gender mainstreaming objectives considered by lead Ministries/Institutions for this indicator?

Yes	No	Unknown	In Development
☒	☐	☐	☐

6.4.1.2 Has gender analysis been undertaken to inform national policies for this indicator?

Yes	No	Unknown	In Development
☒	☐	☐	☐

6.4.1.3 Do national level stakeholders (government, donors, civil society, and research agencies) incorporate gender dimensions on studies for this indicator?

Yes	No	Unknown	In Development
☐	☐	☐	☒

6.4.1.4 Are there capacity and financial resources allocated to implement gender mainstreaming goals for this indicator?

Yes	No	Unknown	In development
☐	☐	☐	☒

6.4.1.5 Are gender specialists included in decision-making for this indicator?

Yes	No	Unknown	In development
☒	☐	☐	☐

6.4.1.6 Is there training to raise awareness on gender equality concerns within lead Ministries/Institutions

Yes	No	Unknown	In development
☒	☐	☐	☐

Indicator 6.4.2 Level of water stress - freshwater withdrawal as a proportion of available freshwater resources

6.4.2.1 Are there gender mainstreaming objectives considered by lead Ministries/Institutions for this indicator?

Yes	No	Unknown	In development
☐	☐	☐	☒

6.4.2.2 Has gender analysis been undertaken to inform national policies for this indicator?

Yes	No	Unknown	In Development
☐	☐	☐	☒

6.4.2.3 Do national level stakeholders (government, donors, civil society, and research agencies) incorporate gender dimensions on studies for this indicator?

Yes	No	Unknown	In development
☒	☐	☐	☐

6.4.2.4 Are there capacity and financial resources allocated to implement gender mainstreaming goals for this indicator?

Yes	No	Unknown	In development
☐	☐	☐	☒

6.4.2.5 Are gender specialists included in decision-making for this indicator?

Yes	No	Unknown	In development
☐	☐	☐	☒

6.4.2.6 Is there training to raise awareness on gender equality concerns within lead Ministries/Institutions?

Yes	No	Unknown	In development
☒	☐	☐	☐

Target 6.5: By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate

Indicator 6.5.1 Degree of integrated water resources management implementation (0-100)

6.5.1.1 Are there gender mainstreaming objectives considered by lead Ministries/Institutions for this indicator?

Yes	No	Unknown	In development
☒	☐	☐	☐

6.5.1.2 Has gender analysis been undertaken to inform national policies for this indicator?

Yes	No	Unknown	In development
☒	☐	☐	☐

6.5.1.3 Do national level stakeholders (government, donors, civil society, and research agencies) incorporate gender dimensions on studies for this indicator?

Yes	No	Unknown	In development
☒	☐	☐	☐

6.5.1.4 Are there capacity and financial resources allocated to implement gender mainstreaming goals for this indicator?

Yes	No	Unknown	In development
☒	☐	☐	☐

6.5.1.5 Are gender specialists included in decision-making for this indicator?

Yes	No	Unknown	In development
☐	☐	☐	☒

6.5.1.6 Is there training to raise awareness on gender equality concerns within lead Ministries/Institutions?

Yes	No	Unknown	In development
☒	☐	☐	☐

6.5.1.7 What is the number of female and male paid staff in lead Ministries/Institutions for this indicator?

Indicator 6.5.2 Proportion of transboundary basin area with an operational arrangement for water cooperation

6.5.2.1 Are there gender mainstreaming objectives considered by lead Ministries/Institutions for this indicator?

Yes	No	Unknown	In development
☐	☐	☒	☐

6.5.2.2 Has gender analysis been undertaken to inform national policies for this indicator?

Yes	No	Unknown	In development
☐	☐	☒	☐

6.5.2.3 Do national level stakeholders (government, donors, civil society, and research agencies) incorporate gender dimensions on studies for this indicator?

Yes	No	Unknown	In development
☐	☒	☐	☐

6.5.2.4 Are there capacity and financial resources allocated to implement gender mainstreaming goals for this indicator?

Yes	No	Unknown	In development
☐	☒	☐	☐

6.5.2.5 Are gender specialists included in decision-making for this indicator?

Yes	No	Unknown	In development
☐	☒	☐	☐

6.5.2.6 Is there training to raise awareness on gender equality concerns within lead Ministries/Institutions?

Yes	No	Unknown	In development
☐	☒	☐	☐

6.5.2.7 What is the number of female and male paid staff in lead Ministries/Institutions for this indicator?

Target 6.6: By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes

Indicator 6.6.1 Change in the extent of water-related ecosystems over time

6.6.1.1 Are there gender mainstreaming objectives considered by lead Ministries/Institutions for this indicator?

Yes	No	Unknown	In development
☒	☐	☐	☐

6.6.1.2 Has gender analysis been undertaken to inform national policies for this indicator?

Yes	No	Unknown	In development
☒	☐	☐	☐

6.6.1.3 Do national-level stakeholders (government, donors, civil society, and research agencies) incorporate gender dimensions on studies for this indicator?

Yes	No	Unknown	In development
☐	☐	☒	☐

6.6.1.4 Are there capacity and financial resources allocated to implement gender mainstreaming goals for this indicator?

Yes	No	Unknown	In development
☐	☐	☒	☐

6.6.1.5 Are gender specialists included in decision-making for this indicator?

Yes	No	Unknown	In development
☐	☐	☒	☐

6.6.1.6 Is there training to raise awareness on gender equality concerns within lead Ministries/Institutions?

Yes	No	Unknown	In development
☒	☐	☐	☐

A.5. DRR/Resilience-Questionnaire

Target 6.1: By 2030, achieve universal and equitable access to safe and affordable drinking water for all

Indicator 6.1.1 Proportion of population using safely managed drinking water services

6.1.1.1 Have national DRR strategies been adopted and implemented for this indicator in line with the Sendai Framework for DRR 2015-2030?

Yes	No	Unknown	In development
☒	☐	☐	☐

6.1.1.2 Have climate change adaptation been integrated into national strategies for this indicator

Yes	No	Unknown	In development
☒	☐	☐	☐

6.1.1.3 Are there national funding mechanisms to address DRR in support of achieving this indicator?

Yes	No	Unknown	In development
☒	☐	☐	☐

6.1.1.4 Are there independent reviews being conducted on the implementation of DRR strategies relevant to this indicator?

Yes	No	Unknown	In development
☐	☐	☒	☐

6.1.1.5 Are hazard and risk data accessible and available to the public for this indicator?

Yes	No	Unknown	In development
☐	☐	☐	☒

6.1.1.6 What is the predicted economic loss, based on risk assessments completed, due to damage or destruction of critical infrastructure from disaster impact for this indicator? ('000,000 USD)

6.1.1.7 What amount of funding is allocated towards post-disaster infrastructure reconstruction for this indicator? ('000,000 US

Target 6.2: By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations

Indicator 6.2.1 Proportion of population using safely managed sanitation services, including a hand-washing facility with soap and water

6.2.1.1 Have national DRR strategies been adopted and implemented for this indicator in line with the Sendai Framework for DRR 2015-2030?

Yes	No	Unknown	In development
☒	☐	☐	☐

6.2.1.2 Have climate change adaptation been integrated into national strategies for this indicator?

Yes	No	Unknown	In development
☐	☐	☐	☒

6.2.1.3 Are there national funding mechanisms to address DRR in support of achieving this indicator?

Yes	No	Unknown	In development
☐	☐	☒	☐

6.2.1.4 Are there independent reviews being conducted on the implementation of DRR strategies relevant to this indicator?

Yes	No	Unknown	In development
☐	☐	☒	☐

6.2.1.5 Are hazard and risk data accessible and available to the public for this indicator?

Yes	No	Unknown	In development
☐	☐	☒	☐

6.2.1.6 What is the predicted economic loss, based on risk assessments completed, due to damage or destruction of critical infrastructure from disaster impact for this indicator? ('000,000 USD)

0

6.2.1.7 What amount of funding is allocated towards post-disaster infrastructure reconstruction for this indicator? ('000,000 USD)

0

Target 6.3: By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally

Indicator 6.3.1 Proportion of wastewater safely treated

6.3.1.1 Have national DRR strategies been adopted and implemented for this indicator in line with the Sendai Framework for DRR 2015-2030?

Yes

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No

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Unknown

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In development

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6.3.1.2 Have climate change adaptation been integrated into national strategies for this indicator?

Yes

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No

☐

Unknown

☒

In development

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6.3.1.3 Are there national funding mechanisms to address DRR in support of achieving this indicator?

Yes

☐

No

☒

Unknown

☐

In development

☐

6.3.1.4 Are there independent reviews being conducted on the implementation of DRR strategies relevant to this indicator?

Yes

☐

No

☒

Unknown

☐

In development

☐

6.3.1.5 Are hazard and risk data accessible and available to the public for this indicator?

Yes

☐

No

☐

Unknown

☐

In development

☒

6.3.1.6 What is the predicted economic loss, based on risk assessments completed, due to damage or destruction of critical infrastructure from disaster impact for this indicator? ('000,000 USD)

0

6.3.1.7 What amount of funding is allocated towards post-disaster infrastructure reconstruction for this indicator? ('000,000 USD)

0

Indicator 6.3.2 Proportion of bodies of water with good ambient water quality

6.3.2.1 Have national DRR strategies been adopted and implemented for this indicator in line with the Sendai Framework for DRR 2015-2030?

Yes	No	Unknown	In development
☐	☐	☒	☐

6.3.2.2 Have climate change adaptation been integrated into national strategies for this indicator

Yes	No	Unknown	In development
☐	☐	☒	☐

6.3.2.3 Are there national funding mechanisms to address DRR in support of achieving this indicator?

Yes	No	Unknown	In development
☐	☐	☒	☐

6.3.2.4 Are there independent reviews being conducted on the implementation of DRR strategies relevant to this indicator?

Yes	No	Unknown	In development
☐	☐	☒	☐

6.3.2.5 Are hazard and risk data accessible and available to the public for this indicator?

Yes	No	Unknown	In development
☐	☐	☒	☐

6.3.2.6 What is the predicted economic loss, based on risk assessments completed, due to damage or destruction of critical infrastructure from disaster impact for this indicator? ('000,000 USD)

0

6.3.2.7 What amount of funding is allocated towards post-disaster infrastructure reconstruction for this indicator? ('000,000 USD)

0

Target 6.4: By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarce

Indicator 6.4.1 Change in water-use efficiency over time

6.4.1.1 Have national DRR strategies been adopted and implemented for this indicator in line with the Sendai Framework for DRR 2015-2030?

Yes No Unknown In development

☒ ☐ ☐ ☐

6.4.1.2 Have climate change adaptation been integrated into national strategies for this indicator?

Yes No Unknown In development

☒ ☐ ☐ ☐

6.4.1.3 Are there national funding mechanisms to address DRR in support of achieving this indicator?

Yes No Unknown In development

☐ ☐ ☒ ☐

6.4.1.4 Are there independent reviews being conducted on the implementation of DRR strategies relevant to this indicator?

Yes No Unknown In development

☐ ☐ ☒ ☐

6.4.1.5 Are hazard and risk data accessible and available to the public for this indicator

Yes No Unknown In development

☐ ☐ ☒ ☐

6.4.1.6 What is the predicted economic loss, based on risk assessments completed, due to damage or destruction of critical infrastructure from disaster impact for this indicator? ('000,000 USD)

0

6.4.1.7 What amount of funding is allocated towards post-disaster infrastructure reconstruction for this indicator? ('000,000 USD)

0

Indicator 6.4.2 Level of water stress - freshwater withdrawal as a proportion of available freshwater resources

6.4.2.1 Have national DRR strategies been adopted and implemented for this indicator in line with the Sendai Framework for DRR 2015-2030?

Yes No Unknown In development

☐ ☒ ☐ ☐

6.4.2.2 Have climate change adaptation been integrated into national strategies for this indicator?

Yes No Unknown In development

☐ ☐ ☒ ☐

6.4.2.3 Are there national funding mechanisms to address DRR in support of achieving this indicator?

Yes No Unknown In development

☐ ☐ ☒ ☐

6.4.2.4 Are there independent reviews being conducted on the implementation of DRR strategies relevant to this indicator?

Yes No Unknown In development

☐ ☒ ☐ ☐

6.4.2.5 Are hazard and risk data accessible and available to the public for this indicator?

Yes No Unknown In development

☐ ☒ ☐ ☐

6.4.2.6 What is the predicted economic loss, based on risk assessments completed, due to damage or destruction of critical infrastructure from disaster impact for this indicator? ('000,000 USD)

0

6.4.2.7 What amount of funding is allocated towards post-disaster infrastructure reconstruction for this indicator? ('000,000 USD)

0

Target 6.5: By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate

Indicator 6.5.1 Degree of integrated water resources management implementation (0-100)

6.5.1.1 Have national DRR strategies been adopted and implemented for this indicator in line with the Sendai Framework for DRR 2015-2030?

Yes No Unknown In development

☐ ☐ ☒ ☐

6.5.1.2 Have climate change adaptation been integrated into national strategies for this indicator?

- | | | | | |
|--|-----------------------|-----------------------|----------------------------------|-----------------------|
| | Yes | No | Unknown | In development |
| | ☐ | ☐ | ☒ | ☐ |
- 6.5.1.3 Are there national funding mechanisms to address DRR in support of achieving this indicator?
- | | | | |
|-----------------------|-----------------------|----------------------------------|-----------------------|
| Yes | No | Unknown | In development |
| ☐ | ☐ | ☒ | ☐ |
- 6.5.1.4 Are there independent reviews being conducted on the implementation of DRR strategies relevant to this indicator?
- | | | | |
|-----------------------|-----------------------|----------------------------------|-----------------------|
| Yes | No | Unknown | In development |
| ☐ | ☐ | ☒ | ☐ |
- 6.5.1.5 Are hazard and risk data accessible and available to the public for this indicator?
- | | | | |
|-----------------------|-----------------------|----------------------------------|-----------------------|
| Yes | No | Unknown | In development |
| ☐ | ☐ | ☒ | ☐ |

Indicator 6.5.2 Proportion of transboundary basin area with an operational arrangement for water cooperation

- 6.5.2.1 Have national DRR strategies been adopted and implemented for this indicator in line with the Sendai Framework for DRR 2015-2030?
- | | | | |
|-----------------------|----------------------------------|-----------------------|-----------------------|
| Yes | No | Unknown | In development |
| ☐ | ☒ | ☐ | ☐ |
- 6.5.2.2 Have climate change adaptation been integrated into national strategies for this indicator?
- | | | | |
|-----------------------|----------------------------------|-----------------------|-----------------------|
| Yes | No | Unknown | In development |
| ☐ | ☒ | ☐ | ☐ |
- 6.5.2.3 Are there national funding mechanisms to address DRR in support of achieving this indicator?
- | | | | |
|-----------------------|----------------------------------|-----------------------|-----------------------|
| Yes | No | Unknown | In development |
| ☐ | ☒ | ☐ | ☐ |
- 6.5.2.4 Are there independent reviews being conducted on the implementation of DRR strategies relevant to this indicator?
- | | | | |
|-----------------------|----------------------------------|-----------------------|-----------------------|
| Yes | No | Unknown | In development |
| ☐ | ☒ | ☐ | ☐ |
- 6.5.2.5 Are hazard and risk data accessible and available to the public for this indicator?

Yes No Unknown In development

☐ ☒ ☐ ☐

6.5.2.6 What is the predicted economic loss, based on risk assessments completed, due to damage or destruction of critical infrastructure from disaster impact for this indicator? ('000,000 USD)

0

6.5.2.7 What amount of funding is allocated towards post-disaster infrastructure reconstruction for this indicator? ('000,000 USD)

0

Target 6.6: By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes

Indicator 6.6.1 Change in the extent of water-related ecosystems over time

6.6.1.1 Have national DRR strategies been adopted and implemented for this indicator in line with the Sendai Framework for DRR 2015-2030?

Yes No Unknown In development

☐ ☐ ☒ ☐

6.6.1.2 Have climate change adaptation been integrated into national strategies for this indicator?

Yes No Unknown In development

☐ ☐ ☒ ☐

6.6.1.3 Are there national funding mechanisms to address DRR in support of achieving this indicator?

Yes No Unknown In development

☐ ☐ ☒ ☐

6.6.1.4 Are there independent reviews being conducted on the implementation of DRR strategies relevant to this indicator?

Yes No Unknown In development

☐ ☐ ☒ ☐

6.6.1.5 Are hazard and risk data accessible and available to the public for this indicator?

Yes No Unknown In development

☐ ☒ ☐ ☐

A.6. Integrity-Questionnaire

Target 6.1: By 2030, achieve universal and equitable access to safe and affordable drinking water for all

Indicator 6.1.1 Proportion of population using safely managed drinking water services

6.1.1.1 Do lead Ministries/Institutions have accountability mechanisms to detect and prevent corruption for this indicator?

Yes	No	Unknown	In development
☐	☐	☐	☒

6.1.1.2 Do all stakeholders have fair and equitable access to the processes of development and implementation of policies for this indicator?

Yes	No	Unknown	In development
☒	☐	☐	☐

6.1.1.3 Are regulatory processes kept simple and transparent for this indicator?

Yes	No	Unknown	In development
☐	☐	☐	☒

6.1.1.4 Do the government and donors share an anti-corruption action plan designed towards the implementation of international commitments for this indicator?

Yes	No	Unknown	In Development
☐	☒	☐	☐

6.1.1.5 Do the government use systems such as public financial management and procurement to detect and prevent corruption in the funding of this indicator?

Yes	No	Unknown	In development
☐	☐	☒	☐

Target 6.2: By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations

Indicator 6.2.1 Proportion of population using safely managed sanitation services, including a hand-washing facility with soap and water

6.2.1.2 Do all stakeholders have fair and equitable access to the processes of development and implementation of policies for this indicator?

Yes	No	Unknown	In development
☒	☐	☐	☐

6.2.1.3 Are regulatory processes kept simple and transparent for this indicator?

Yes	No	Unknown	In development
☐	☐	☐	☒

6.2.1.4 Do the government and donors share an anti-corruption action plan designed towards the implementation of international commitments for this indicator?

Yes	No	Unknown	In development
☐	☒	☐	☐

6.2.1.5 Do the government use systems such as public financial management and procurement to detect and prevent corruption in the funding of this indicator?

Yes	No	Unknown	In development
☐	☐	☒	☐

Target 6.3: By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally

Indicator 6.3.1 Proportion of wastewater safely treated

6.3.1.1 Do lead Ministries/Institutions have accountability mechanisms to detect and prevent corruption for this indicator?

Yes	No	Unknown	In development
☐	☐	☐	☒

6.3.1.2 Do all stakeholders have fair and equitable access to the processes of development and implementation of policies for this indicator?

Yes	No	Unknown	In development
☐	☐	☐	☒

6.3.1.3 Are regulatory processes kept simple and transparent for this indicator?

Yes	No	Unknown	In development
☐	☐	☒	☐

6.3.1.4 Do the government and donors share an anti-corruption action plan designed towards the implementation of international commitments for this indicator?

Yes	No	Unknown	In development
☐	☒	☐	☐

6.3.1.5 Do the government use systems such as public financial management and procurement to detect and prevent corruption in the funding of this indicator?

Yes	No	Unknown	In development
☐	☐	☒	☐

Indicator 6.3.2 Proportion of bodies of water with good ambient water quality

6.3.2.1 Do lead Ministries/Institutions have accountability mechanisms to detect and prevent corruption for this indicator?

Yes	No	Unknown	In development
☐	☐	☒	☐

6.3.2.2 Do all stakeholders have fair and equitable access to the processes of development and implementation of policies for this indicator?

Yes	No	Unknown	In development
☐	☐	☒	☐

6.3.2.3 Are regulatory processes kept simple and transparent for this indicator?

Yes	No	Unknown	In development
☐	☐	☒	☐

6.3.2.4 Do the government and donors share an anti-corruption action plan designed towards the implementation of international commitments for this indicator?

Yes	No	Unknown	In development
☐	☒	☐	☐

6.3.2.5 Do the government use systems such as public financial management and procurement to detect and prevent corruption in the funding of this indicator?

Yes	No	Unknown	In development
☐	☒	☐	☐

Target 6.4: By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity

Indicator 6.4.1 Change in water-use efficiency over time

6.4.1.1 Do lead Ministries/Institutions have accountability mechanisms to detect and prevent corruption for this indicator?

Yes	No	Unknown	In development
☐	☐	☐	☒

6.4.1.2 Do all stakeholders have fair and equitable access to the processes of development and implementation of policies for this indicator?

Yes	No	Unknown	In development
☒	☐	☐	☐

6.4.1.3 Are regulatory processes kept simple and transparent for this indicator?

Yes	No	Unknown	In development
☐	☐	☐	☒

6.4.1.4 Do the government and donors share an anti-corruption action plan designed towards the implementation of international commitments for this indicator?

Yes	No	Unknown	In development
☐	☒	☐	☐

6.4.1.5 Do the government use systems such as public financial management and procurement to detect and prevent corruption in the funding of this indicator?

Yes	No	Unknown	In development
☐	☒	☐	☐

Indicator 6.4.2 Level of water stress - freshwater withdrawal as a proportion of available freshwater resources

6.4.2.1 Do lead Ministries/Institutions have accountability mechanisms to detect and prevent corruption for this indicator?

Yes	No	Unknown	In development
☒	☐	☐	☐

6.4.2.2 Do all stakeholders have fair and equitable access to the processes of development and implementation of policies for this indicator?

Yes	No	Unknown	In development
☒	☐	☐	☐

6.4.2.3 Are regulatory processes kept simple and transparent for this indicator?

Yes	No	Unknown	In development
☐	☐	☐	☒

6.4.2.4 Do the government and donors share an anti-corruption action plan designed towards the implementation of international commitments for this indicator?

Yes	No	Unknown	In development
☐	☐	☐	☒

6.4.2.5 Do the government use systems such as public financial management and procurement to detect and prevent corruption in the funding of this indicator?

Yes	No	Unknown	In development
☐	☐	☒	☐

Target 6.5: By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate

Indicator 6.5.1 Degree of integrated water resources management implementation (0-100)

6.5.1.1 Do lead Ministries/Institutions have accountability mechanisms to detect and prevent corruption for this indicator?

Yes	No	Unknown	In development
☒	☐	☐	☐

6.5.1.2 Do all stakeholders have fair and equitable access to the processes of development and implementation of policies for this indicator?

Yes	No	Unknown	In development
☒	☐	☐	☐

6.5.1.3 Are regulatory processes kept simple and transparent for this indicator?

Yes	No	Unknown	In development
☐	☐	☐	☒

6.5.1.4 Do the government and donors share an anti-corruption action plan designed towards the implementation of international commitments for this indicator?

Yes	No	Unknown	In development
☐	☐	☒	☐

6.5.1.5 Do the government use systems such as public financial management and procurement to detect and prevent corruption in the funding of this indicator?

Yes	No	Unknown	In development
☐	☐	☒	☐

Indicator 6.5.2 Proportion of transboundary basin area with an operational arrangement for water cooperation

6.5.2.1 Do lead Ministries/Institutions have accountability mechanisms to detect and prevent corruption for this indicator?

Yes	No	Unknown	In development
☐	☒	☐	☐

6.5.2.2 Do all stakeholders have fair and equitable access to the processes of development and implementation of policies for this indicator?

Yes	No	Unknown	In development
☐	☒	☐	☐

6.5.2.3 Are regulatory processes kept simple and transparent for this indicator?

Yes	No	Unknown	In development
☐	☒	☐	☐

6.5.2.4 Do the government and donors share an anti-corruption action plan designed towards the implementation of international commitments for this indicator?

Yes	No	Unknown	In development
☐	☐	☒	☐

6.5.2.5 Do the government use systems such as public financial management and procurement to detect and prevent corruption in the funding of this indicator?

Yes	No	Unknown	In development
☐	☐	☒	☐

Target 6.6: By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lake

Indicator 6.6.1 Change in the extent of water-related ecosystems over time

6.6.1.1 Do lead Ministries/Institutions have accountability mechanisms to detect and prevent corruption for this indicator?

Yes	No	Unknown	In development
☐	☐	☐	☒

6.6.1.2 Do all stakeholders have fair and equitable access to the processes of development and implementation of policies for this indicator?

Yes	No	Unknown	In development
☐	☐	☐	☒

6.6.1.3 Are regulatory processes kept simple and transparent for this indicator?

Yes	No	Unknown	In development
☐	☒	☐	☐

6.6.1.4 Do the government and donors share an anti-corruption action plan designed towards the implementation of international commitments for this indicator?

Yes	No	Unknown	In development
☐	☐	☐	☒

6.6.1.5 Do the government use systems such as public financial management and procurement to detect and prevent corruption in the funding of this indicator?

Yes	No	Unknown	In development
☐	☒	☐	☐

APPENDIX B. WASH Bottleneck Analysis Tool (WASH BAT) Questionnaire.

Table 1. Color-coded Basis for Scoring Criteria

No – criterion has not been achieved	Criterion achieved to some extent	Criterion achieved to a large extent	Yes – Criterion has been fully achieved

Table 2. WASH BAT: Bottlenecks/Causes and Activities for the Somalia Water Sector

Building Blocks	Criteria	Scores	Bottleneck	Causes	Activity for bottleneck removal
Sector Policy & Strategy	Water policy and legal framework exist.		there is, a weak legal framework addressing national service norms, equity, and social norms	fragmented governance, political instability, and conflict	establish an inclusive legal framework.
Sector Policy & Strategy	Policy is informed by evidence (e.g. coverage data, service quality, available financing, population impacts of poor services, and equity issues).		there is inadequate data across the country	limited provision of accurate data within the stakeholders	develop adequate data across the country
Sector Policy & Strategy	The policy and legal framework have a set of supporting documents and implementing decrees that provide clarity of roles and		fragmented and weak legal framework	there are no united guidelines and strategies to follow	establishing a common legal framework at the national level

	responsibilities, service norms, and standards.				
Sector Policy & Strategy	Water policy includes coverage and service targets, including those aligned with 'safely managed' drinking water services (SDG target 6.1).		there is poor capacity in address 6.1	lack of human resources and financial capacity	strong financial capacity
Sector Policy & Strategy	The policy and legal framework include provisions for financial resource allocation and priority-setting.		weak financial resource allocation and priority setting	lack of targeting strategy to have priorities.	having enough budget. prioritize and work on pragmatic approaches to water sector developments to enable progressive financing
Sector Policy & Strategy	The policy and legal framework include provisions for the operational and financial sustainability of services.		operational and financial sustainability of services are not well defined.	limited sustainable water sector investment	develop a sustainable system that operates in the water sector
Sector Policy & Strategy	The policy and legal framework include provisions for the environmental sustainability of services, including climate-resilient development.		poor, environmental sustainability services, including climate-resilient development	lack of environmental/ climatic resilient development	the system must be in line with the policy and strategy.
Sector Policy & Strategy	The policy and legal framework include		there are no accountability	lack of accountability	the policy must line with accountability

	provisions for accountability mechanisms between users, service providers, and the government.		mechanisms between users, service providers, and government	systems and mechanisms	mechanisms.
Coordination	A coordination body or mechanism for water exists.		there is weak coordination.	insufficient mechanism for water exists.	develop sufficient mechanisms
Coordination	Institutional roles and accountabilities are clearly defined and operationalized.		the roles are clearly defined, but still, it's not operationalized	insufficient resources	allocate sufficient resources
Coordination	Well-functioning body coordinates stakeholders and meets as needed.		regular communication and information-sharing	effective leadership within the coordination	informed policy development.
Coordination	Mandated government agency leads water stakeholders				
Coordination	The existence of one government-led plan		there is a plan, but it's not harmonized each state	lack of a clear plan	establish clear coordination mechanisms.
Accountability & Regulation	Government monitoring and verification systems for water are in place at multiple levels.		poor mechanisms for government monitoring water systems	lack of supervision from the government sides	provide supervision and monitoring
Accountability & Regulation	Lead institutions have a clear role and		government and institutions have a role and	institutional weaknesses and capacity	building strong monitoring and review systems,

	responsibilities and have a performance appraisal system.		responsibilities and performance appraisal systems are underdeveloped	limitations	encouraging government agencies, civil society groups, and to work together
Accountability & Regulation	“There are clear and effective mechanisms for consumer feedback and complaints”.		inadequate feedback and complaints systems are in place,	lack of knowledge, response, and follow-up activities	accountability must be addressed
Accountability & Regulation	There exists an institution with clear regulatory functions				
Accountability & Regulation	sufficient resources and capacity exist to implement the regulations.		there are resources available, but they may be slightly insufficient.	lack of allocations and resources	proper utilization of available resources.
Accountability & Regulation	The regulatory body is sufficiently independent of service providers and the government to act as a valid referee and provide performance-based incentives and/or sanctions.		there is no independent regulatory body all regulatory bodies are under control of the government	strategies are not in place.	inclusions of an independent regulatory body.
Budget & Expenditure	The budget is disaggregated by water and expenditure is tracked.		no budget is tracked	there is no effective budget allocation	establish effective budget allocation
Budget &	The budgets and		no publicly	no clear reports	the reports should

Expenditure	expenditure reports are publicly available.		shared reports		be publicly available to increase transparency.
Budget & Expenditure	Tariffs are sufficient to provide adequate delivery of water services according to national standards, including O&M.		no national standards tariffs are used for water delivery services	no available national and state-level tariffs	cost recoveries should be in place in all states
Budget & Expenditure	There is enough capital expenditure to meet water sector investment targets.		there is no enough capital expenditure	lack of capital expenditure	invest in sustainable water infrastructures.
Budget & Expenditure	Multi-year budget allocations are provided and long-term commitments are known.		there is a poor budget allocation	lack of clear budget allocations	allocate a sufficient budget and planning
Financing	The financial needs for water are known and the legal and institutional frameworks for resource mobilization are in place”		the financial needs for water are known but resource mobilization is not in place	lack of resource mobilization	establish effective resource mobilizations
Financing	“The private sector is incentivized to invest in water infrastructure and service delivery”		insufficient investment in water infrastructure	lack of investment in sustainable water infrastructure.	invest in sustainable water infrastructures
Financing	“Public allocations to water as % GDP are sufficient”.		public allocations to water are insufficient	economic problems, limited resources, dependence on	improve institutions, promote economic growth, and ensure sustainable water

				external aid, and poor infrastructure.	management
Financing	The existence of financing institutions and mechanisms to raise additional finances for water (e.g domestic bond market)		limited financing institutions	economic instability and infrastructure issues.	to strengthen finance systems and to promote investment in the water sector.
Planning	National water plans state clear targets, activities, indicators, timelines, and budgets		there are national water plans, exist but it's incomplete	lack of budget	establish national water plans, targets, and indicators in advance
Planning	Plan contains clear responsibilities and accountabilities				
Planning	Plan is developed in consultation with and validated by stakeholders		consultation on validated stakeholders' underdevelopment	lack of communication/consultations	improve effective communications
Planning	Plan is backed with financial and investment plan		there is an inadequate investment plan	lack of investment plans	improve on having an investment plan
Monitoring, Evaluation, and Learning	Government-led monitoring system on water is in place		there is a government-led monitoring system in place but its functionality is limited	limited access to some areas and problems in collecting data	improve government-led monitoring system

Monitoring, Evaluation, and Learning	Established monitoring feedback system(s) to improve decision-making across different levels.		insufficient monitoring feedback system.	limited resources, technical capacity, and coordination among stakeholders	improve the feedback system for more effective decision-making
Monitoring, Evaluation, and Learning	Annual joint sector review (JSR), or similar mechanism, regularly assesses progress against targets and sets priority activities for following year(s)		there are annual joint sector review but its effectiveness is limited	inadequate institutional capacity, resource constraints,	continuing to support building up institutions' capacity, encouraging responsibility, and involvement by everyone
Monitoring, Evaluation, and Learning	Service providers report the results of their internal monitoring against required service standards to the regulatory authority and reports trigger timely corrective action		lack of service providers report	limited regulatory capacity, transparency, and coordination	establish regular sharing of service provider's report
Capacity Development	Government-led overarching capacity development plan for water based on needs assessment		weak capacity development plan for water	poor institutional capacity, data gaps, and inadequate information, funding limitations	strengthen institutional capacity, improve data collection mechanisms
Capacity	A human resources		a weak human	limited training	develop training and

Development	strategy exists that identifies the problems and capacity gaps and actions to develop and manage human resources for water supply		resources strategy exists	in water utility staff and specialized expertise	capacity-building programs for water utility staff, government officials, and community members involved in water management.
Capacity Development	“Implementation is progressing against capacity development plans”.		limited progress in implementing capacity development plans	lack of training programs, technical assistance, and infrastructure development projects	strengthening the skills and capabilities of local stakeholders
Capacity Development	Private sector capacity exists to deliver safely managed water services in an efficient matter		the private sector has limited capacity to deliver safely managed water services	lack of technical expertise, regulatory challenges,	strengthen the regulatory framework, provide capacity-building support, promote public-private partnerships,
Capacity Development	Capacity exists to monitor services against indicators defined by national standards.		capacity doesn't exist to monitor services	service providers not qualified	provide training to enhance monitoring and evaluation skills. improve governance structures and coordination among relevant agencies.

Service Providers	There exist water provider(s) who have the mandate or have accepted responsibility for providing water services		water providers exist but they don't fully accept responsibility for providing water services	lack of decentralized activity	enhancement to decentralized at the national level
Service Providers	The business model is financially sustainable and includes full operations and maintenance (O&M) services to ensure water continuity and safety while ensuring minimum service levels are affordable to poor and vulnerable groups		Insufficient service provider business model.	lack of the capacity and expertise to effectively manage water services,	developing comprehensive business model with clear public-private partnership policy
Service Providers	Service providers keep accounts according to national accounting standards and audits are conducted according to national guidelines.		there is poor accountability on service providers	lack of compliance and accountability	to improve and keep national accounts up to date
Service Providers	Policies and practices, including pricing, account for source protection, conservation, and waste management.		there is no update on policies and practices.	lack of updating and there is no follow-up	to improve and upgrade the policies

CURRICULUM VITAE (CV)

Sadia Isse Farah

EXPERIENCE

Practical Train Buruuj Construction Company - Mogadishu, Somalia
01/2018 - 02/2018

- Providing technical advice and solving problems on-site
- Ensuring that health, safety, and stability policies

Volunteer Mateen Engineering Service - Mogadishu, Somalia
07/2018 - 12/2018

- Building Designs
- Bill of Quantity (BOQ).

Volunteer Naado Group of Companies - Mogadishu, Somalia
01/2017 - 01/2018

- Liaise with clients to identify their requirements.
Summaries scientific and engineering principles in an easy-to-understand

SKILLS

- Problem-solving
- Teamwork
- Self-motivated
- Honest
- Hard-working
- Fast decision-making

LANGUAGES

- Somalia: Native
- English: Advance
- Turkish: Intermedia

CUSTOM SECTION

- DATA Collection and Mapping for Mogadishu Trunk Drainage Master Plan and Road Connectivity Assessment and Analysis of historic flood levels and existing stormwater catchment Capacity at UNDPS and Benadir Region Administration.
- Building Construction for Construction Supervisors at UN-Habitat for a better urban future.
- Economic Growth in Urban Areas in South Central Somalia at UN-Habitat for a Better Urban Future.
- Participating in the Cultural Heritage Archiving database at Urban Heritage Center.
- Infrastructure Problem in Somalia (Roads, Drainage & Sewer system) at Mogadishu University.
- Auto CAD and ArchiCAD design Software at Top Center Academic.
- Training Course Multi-Stakeholders Platforms for Water Governance.

EDUCATION

- Master of Science in Environmental Engineering: Institute of Pure and Applied Science
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- Bachelor of Science in Civil Engineering: Engineering
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