# WATER MANAGEMENT AND RESILIENCE ANALYSIS IN SUB-SAHARA AFRICAN COUNTRIES: CAMEROON CASE STUDY

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**Abstract**

Integrated Water resource management is a comprehensive globally accepted framework for sustainable and inclusive management of water resources for social, economic and environmental needs. Its progress is monitored worldwide through four pillars. Though significant progress is observed, many sub-Sahara African countries are far from reaching the target of 90% by 2030. In order to accelerate the current low to medium scores, it is critical to assess the strength, weaknesses, opportunities and threat of current country framework to identify drawbacks, enablers and priority areas with the aim to accelerate integrated water resource management implementation. As climate shocks projected in the region may affect water resources and sectors differently, it should be included in such analysis. This paper brings climate resilience as the fifth pillar of IWRM analysis framework with Cameroon as a case study to identify and address key improvements areas for water resilient countries in IWRM low performing contexts.

**Key words**: *water management, SWOT, climate resilience, IWRM, Cameroon*

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## 1. INTRODUCTION

Water is a fundamental resource for human well-being and natural ecosystems. Global water demand is increasing by about 1% per year, driven by population growth, economic development and changing

consumption patterns (WWAP, 2018). The integrated water resource management (IWRM) Action Agenda (SDG 6.5.1), designed to encourage countries improving their water resource management, aims to establish a framework that considers policy objectives, physical state of water, land-use planning, and the sustainability of vital ecosystems. As the evaluation of the framework addresses multiple dimensions; United Nation for Environmental Protection (UNEP) and Global Water Partnership (GWP), set a monitoring scheme since 2017 based on four pillars: enabling environment, institutions and participation, management instruments and Financing.

According to African minister's council on water (AMCOW, 2018), more than 80 per cent of African countries have institutionalized IWRM but 70% have inadequate capacity to effectively implement most IWRM elements, and many activities are undertaken on an ad hoc basis with unsustainable limited financing. The 2023 global IWRM implementation report reveals that, in most developed countries, IWRM is fully implemented, while developing countries are still struggling to align with IWRM standards (Collado *et al.*, 2023). Although the aspirational global SDG target is to achieve 'very high' implementation (91-100%) by 2030, none of the African sub-regions are on track to meet this target (AMCOW, 2025). Despite the progress, 48% of countries (25) with low to medium IWRM implementation, are unlikely to make sufficient progress on the governance frameworks needed to sustainably manage and develop their water resources by 2030.

As 2030 deadline is fast approaching, more ambitious plans have to be set in less advanced countries, focusing on most pressing and impactful actions. Framework analysis is a comprehensive holistic approach used in social and business science to identify areas of improvement of systems. In this paper, SWOT (Strength, weaknesses, opportunities and Threats) analysis is used to assess the IWRM four pillars in order to identify key entry points for IWRM acceleration at country level, towards water-wise and water-resilient development. This blended approach is applied to a less advanced country in central Africa region, Cameroon, which scored 49% for its 2023 SDG 6.5.1 assessment (IWRM Data Portal - Country Reports).

## 2. MATERIALS AND METHODS

Previous works on SWOT analysis applied to IWRM shows that SWOT analysis helps to determine appropriate measures that reconcile the needs of people and the environment (Petousi *et al*., 2017), define and prioritize adaptation activities that increase resilience to climate change effects (Hamidreza, 2018), identify drawback factors hampering IWRM implementation (Collado *et al*., 2023), and analyze sustainability factors (Xueping *et al*., 2017). Data used for SWOT analysis relies on expert opinion complemented by secondary information derived from strategic or technical reports and literature.

SWOT analysis of the institutional and regulatory framework of IWRM covered institutional setting and all regulatory text in force in line with IWRM at national, transboundary and international levels. Information and data for participation, financing and management instrument were inspired by national reports about IWRM implementation, existing water related policy documents and literature. Based on the key findings field interviews were conducted with 21 key stakeholders involved in the development or management of water resources in Cameroon. These included policy makers, technical partners, finance institutions, sub-national public institutions and universities. The interview focused on their perspective of the IWRM framework and implementation for each of the four pillars of IWRM and the climate resilience preparedness.

Data and information gathered were then structured for SWOT analysis by pillar, with the aim to identify areas of improvement. In order to assess the flexibility of governance, and its adaptation to future uncertainties, a brief analysis of IWRM implementation in sub-Saharan Africa, and climate hazards (recent and future) was carried out based on GCA (2022) and AMCOW (2025) reports. Key action points addressing both water security and climate resilience were then highligted and discussed.

## 3. RESULTS

### 3.1. IWRM implementation status in Sub-Sahara Africa

In Africa, most of north and south countries have Medium to High IWRM scores. While almost all Sub-Saharan countries have medium to low scores, some countries like Guinea Bissau, Liberia and Equatorial Guinea have the lowest scores. This low score seems to be associated to low investment as well as insufficient and unsustainable water infrastructures (figure 1). According to AMCOW (2025), none of the African sub-regions are on track to achieve a “very high” level of implementation (91–100%) of IWRM by 2030, as set out in the global SDG agenda. Despite this, most countries have still not set alternative official targets for IWRM implementation. Through the SDG 6.5.1 reporting process, 35 African countries suggested unofficial 2030 targets, of which 18 plan to attain high scores by 2030. These are: Niger, Mauritania, Sierra Leone, Senegal, Cameroon, Cote d’Ivoire, Sao-Tome-et-Principe, Burkina Faso, Ghana, Gabon, Liberia, Burundi, Togo, Democratic Republic of Congo, Chad, Central Africa Republic, Nigeria, and Congo).

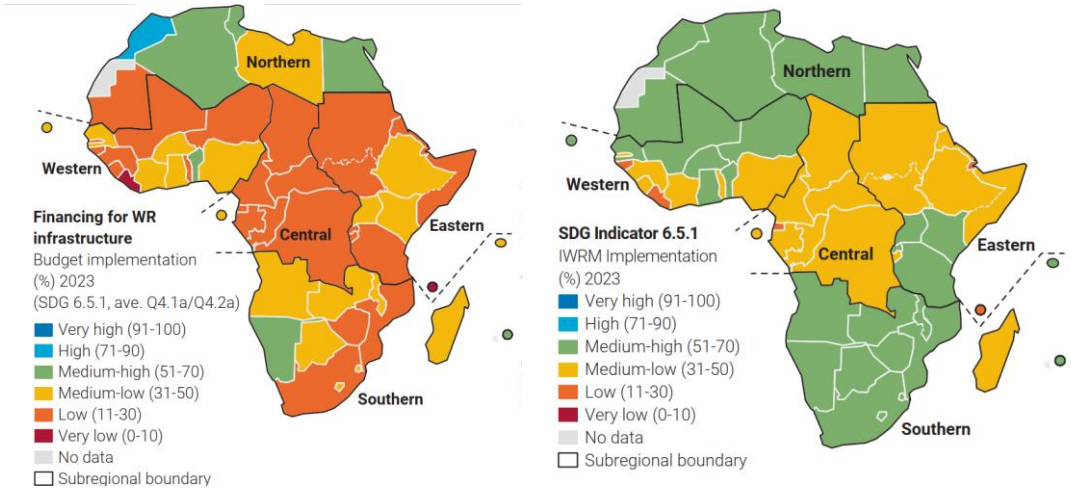


**Figure 2:** 2023 SDG 6.5.1 implementation and financing of water resource infrastructure in Africa (AMCOW, 2025)

To achieve the set objectives, AMCOW suggest three recommendations which include: development or strengthening cross-sector coordination mechanisms; mainstreaming water into other sector initiatives, actions and plans using an IWRM approach; development of implementation plans with realistic actions, timelines, responsibilities and budgets. Unfortunately, these recommendations are not sufficiently operational to induce concrete action and changes. Nevertheless, one key global recommendation is to liaise climate action and water resource management to mutualize energy and develop synergistic strategies for economic development and climate resilience. A recent dynamic to leverage private finance seems to be a lever which countries might consider to raise investments level into water development, management and protection.

### 3.2. Sub-Sahara climate hazards and trends

According to GCA (2022) Africa has been severely affected by natural disasters which are set to increase in severity and frequency, leading to population displacements in search of water. Major hazards identified are: landslide, storm, flood, sea level rise and drought. The latter three hazards affect an average of 0.3 to 1.2 million people yearly in Sub-Saharan Africa. Water-dependent sectors across Africa are already largely and negatively impacted by extreme variability (GCA, 2022). These hazards are expected to worsen, according to future projections indicated in table 1; leading to amplified extreme hydrological variability.

This will have a direct impact on water security in those countries as they will be severely threatened by insufficient/excessive, irregular, unpredictable and lower quality water resource with significant repercussions on food, energy, and economic security.

**Table 1:** Climate projections in Sub-Sahara Africa for 1.5 to 3°C warming

| **Storm** | Temperature | Precipitation | Sea level |
|---|---|---|---|
| **Central Africa** | **0.6°C, 1.1°C and 2.1°C warmer mean annual temperatures than the 1994–2005 average** | **Increased mean annual rainfall of 10–25% increasing intensity of extreme precipitation.** | **Rise of 0.3 m, 0.4 and 1.0 m by 2030** |
| **Western Africa** | **0.6°C, 1.1°C, and 2.1°C warmer mean annual temperatures than the 1994–2005 average** | **decrease in the west and increase in the east, with the magnitude of change increasing with higher warming levels increase in meteorological droughts from approximately two to four months** | **Rise of 0.3 m, 0.4 and 1.0 m by 2030** |
| **Eastern Africa** | **0.6°C, 1.1°C, and 2.1°C warmer mean annual temperatures than the 1994–2005 average** | **higher mean annual rainfall heavy rainfall events are expected to increase increase in Drought frequency, intensity and duration in West** decrease or static **Drought frequency, intensity in East** | **Rise of 0.3 m, 0.4 and 1.0 m by 2030** |

**Source**: GCA (2022)

Table1 shows that sub-Saharan Africa will experience overall climate warming, and more frequent and prolonged droughts. Heavier and more frequent rainfall is likely to happen in Central and East Africa. Sea-level rise is likely to happen in most African coastal areas, with an estimated increase of 0.3 to 1 m by 2030 (AGSS, 2022). Based on rapid climate risks assessment (RCRA) conducted in five cities, GCA (2022) suggest three actions: investing in water and sanitation infrastructure; restoring wetlands and ecosystems to reduce flood risks; and strengthening disaster evacuation planning. These actions require to address the four pillars of IWRM, with focus on improving preparedness, reducing vulnerability, and ecologically transitioning economies and policies through clear short-term actions.

### 3.3. SWOT analysis of IWRM pillars in Cameroon

Cameroon recently updated its national water policy and developed its climate action plan. Its action plan for IWRM is currently under review, as well as the law governing water resource development and management. Various private donors are willing to finance the water sector, in the context of

insufficient public finance and predominant international funding representing more than 80 % of investments. Decentralization is acted and effective with transfer of responsibilities on water resources management to local authorities since 2019 in Cameroon; Njikam (2021) considers this as a major strength shared with several other countries in Central Africa. Unfortunately, the transfer of associated financial resources is very low and slow. In the other hand, both in terms of dynamism and volume, international cooperation is gradually being leveraged to develop water investments at council level.

Despite an enabling environment, knowledge and application of existing laws, regulations and programs remain limited due to inadequate training, funding, and operational mechanisms. As a result, existing policies and plans fail to induce concrete actions, desired changes and stronger capacities.

**Table 2** highlights strong monitoring and evaluation mechanisms for project implementation, budget use and IWRM implementation in Cameroon with institutions monitoring water resource (CRECC, ONACC, division of meteorology), water statistics (INS & UNICEF), regularly updated country profiles (UNEP, UNICEF, UN-HABITAT, World Bank, African Development Bank, Islamic Development Bank) and national water information systems. Thus, ensuring accountability and providing a guide for future planning. Technical and financial support from UN agencies and development banks are critical to advance water sector in countries through existing pipelines. Though national institutions are well set and equipped with inclusive mechanisms progressively embedding gender sensitive budgeting, subnational platforms are still far from the required mechanism to implement IWRM principles. Unfortunately, despite a financial scheme structured around a national water fund, an investment fund for local authorities, and financing mechanisms for multilateral and bilateral funding, the investment gap remains huge, and only a few sectors are funded (project-based funding): drinking water, hydropower, drainage, and irrigation.

**Table 2:** Strengths and opportunities of water resource management framework in Cameroon

| Pillars | Strengths | Opportunities |
|---|---|---|
| **Enabling environment** | - National development plan considers water as a key lever<br>- Right to water and environment protection Is stated in the constitution<br>- Systematic inclusive consultative processes for climate and water planning and high-level decision-making processes<br>- Specialized research institutions for climate and water (CRECC, ONACC, DMN)<br>- Law transferring responsibility of water resource management and protection to regions and councils (2019) | - Eligibility of Cameroon to the Water forward initiative<br>- Cameroon is a member of several basin organizations (ICCOS, LCBC, NBA) and signatory of international and Cross-border agreements<br>- UNDP is designated as the climate green fund for Cameroon<br>- Cameroon country programs for most bilateral and multilateral donor include climate, food and water security |
| **Management instruments** | - National water policy (2023)<br>- Updated IWRM action plan (under review)<br>- Strong but incomplete monitoring framework (SDG 6.5., 6.4, AIP score, WASH Trackfin, SITREP, WASSMO, National Compact, National water information system)<br>- Extension of the water resource monitoring system with satellite and remote weather recording devices | - Regional strategic development plans include programs for water resource protection<br>- International agencies offer technical and financial assistance for water and climate framework monitoring and reporting |
| **Institutions and Participation** | - Functional WASH sub-sector regional coordination unit with a national cluster<br>- Informal national water partnership under GWP<br>- National Water Committee (NWC) stated by a decree since 2001<br>- National hydrological committee set up in progress<br>- Progressive considerations of gender sensitivity and gender equality in budgetary processes and budget allocation<br>- Ongoing process of establishment of Sanaga basin agencies for better management of funds and more efficient allocation with the region development master plans (only internal basin). | - Expertise and commitment of diverse stakeholders to contribute to IWRM and climate resilience at national and subnational levels.<br>- Gender sensitive approach progressively included in the budgeting process for public expenditures |
| **Financing** | - Emergency response cluster of bilateral and multilateral donors<br>- Existence of a special fund for water development (mainly used for water and sanitation so far)<br>- Existence of a national funds to support council's local investment which include water | - Multilateral programs to improve access to water, sanitation, electricity in all regions under discussion<br>- Existing multilateral Donor platform led by world bank<br>- multi-phase programmatic approaches for financing projects promoted by development banks<br>- International finance tension and crisis reducing internal finance flow towards less developed countries |
| **Climate resilience** | - Climate Action plan (2025)<br>- NDC 3.0 under review<br>- National Adaptation plan under review<br>- Recent set up of a pipeline for carbon market | - International agencies supporting climate resilient investment and interventions (ex. GWP, UNEP, UNDP) |

Cameroon, with technical and financial support from international agencies, is preparing to address challenges of climate finance through its several strategic plans (Climate Action Plan, NDC 3.0, National Adaptation Plan, IWRM 2026-2030) and its recent entry into carbon market. Among the most climate vulnerable sectors concerned, water is one of the five key sectors.

Cameroon preparedness for water resilience is hampered by inoperative coordination bodies, overlap of roles, slow decision making, ineffective funds, and mis-alignment of budgets with investments gaps. Existing management instruments fail to ensure proper data informed decision due to inadequate observation system, low capacities and ineffective operating mechanisms, specifically at subnational level.

The international policy environment, cooperation priorities and difficulties in accessing climate finance are challenges that Cameroon, as well as all Sub-Saharan Africa must face, beside the current and future potential climate shocks. This context is marked at national level by weak inter-institutional coordination and collaboration among various institutions, low awareness of existing policy, law and regulations by stakeholders, as well as absence of mechanism for private sector finance harnessing (table 3).

**Table 3:** Weaknesses and threats of water resource management framework in Cameroon

| Pillars | Weaknesses | Threats |
|---|---|---|
| **Enabling environment** | - National water committee not operational<br>- National Hydrological committee not existing<br>- Inoperative regional coordination units<br>- Overlap of responsibilities in the sector with government institutions | - Misalignment of budget, priorities and vision with gaps in water resource investments<br>- Transboundary instability and internal political crisis<br>- Slow decision-making processes<br>- Ineffective operation of the water fund created in 2001 with national water committee |
| **Management instruments** | - Outdated Law on water resources management (under review)<br>- Weak implementation of ratified international conventions or existing regulatory framework<br>- Inadequate and limited norms and standards<br>- No specific instrument at subnational level<br>- No clear strategy for water resource planning, development and protection in strategic planning document at council level<br>- Few economic instruments to incentivize water finance and investment | - Conflicting roles between government, region and councils institutions<br>- Inadequate or ineffective operating mechanism of existing management instruments<br>- Insufficient compliance with international standards<br>- Lack of operational agencies and tools for the management of waters and watersheds at subnational level.<br>- inadequate capacities and systems for surface and groundwaters of monitoring<br>- Insufficient adequate and reliable data and information for decision-making. |
| **Institutions and Participation** | - Low awareness of existing policy, law and regulations by stakeholders<br>- Inadequate or unfunctional operating mechanism for inclusive participation<br>- Weak inter-institutional coordination and collaboration among various institutions and agencies | - Insufficient funds to hand multiple institutions needed for coordinated and efficient development of improved water governance |
| **Financing** | - Low budget allocated to IWRM (it is not sufficiently integrated into public budgets) mainly external financing | - No mechanism for local private sector finance harnessing<br>- Inadequate and weak competences in financial engineering for water investments |
| **Climate resilience** | - No financial and institutional framework operational<br>- Few climate resilient investments (sole example in hydro-electricity)<br>- Disconnection between climate and water coordination mechanisms<br>- Lack of an integrated climate resilient national investment plan and financing strategy for water sector | - Climate shocks already happening with potential increase in frequency and magnitude<br>- Complexity of climate finance mechanisms<br>- Reduced international funding with global crisis |

## 4. DISCUSSION

According to SIWI (2020), successful IWRM requires strong policy, laws and regulation; inclusive and transparent participation of competent stakeholders; efficient water use serving people and nature rights as well as wise and sustainable ecosystem management. Looking at the situation for Cameroon

in central Africa, most of those requirements are met. Main priorities shall be on green/eco-friendly investment, improve data driven decision making, functional institutions and operating mechanisms.

From this analysis, adding climate resilience to the existing 04 pillars of IWRM would help bridge climate security with water security, and ensure integration for synergistic actions. Below are some clear key actions for each pillar are:

- **Enabling environment**: improving the legal and institutional framework, reinforce training, funds and operational mechanisms to boost implementation of existing agreement, plans, regulation and programs.
- **Management instruments**: Update planning documents to include the water resource management role of subnational institutions and develop tailored tools for efficient and sustainable planning of water resource development; implement IWRM set up, mechanisms and principles at all levels.
- **Institutions and Participation**: Improve coordination and monitoring of the water sector at all levels; development of human resources of public, private institutions and partners; Capacity building and knowledge transfer to local administrations and develop inclusion considering human rights and environmental safeguard.
- **Financing**: Diversify financing instruments, tools and mechanisms for the water sector; prioritize climate resilient water investments; improve enabling conditions to access green funds for water resources and services; green existing mechanisms and program to leverage more climate funds for water sector.
- **Climate resilience:** finalize climate adaptation planning, and develop climate resilient investment strategies, while greening investments and working towards more investments for climate action in water sector both at national and subnational level.

It can be concluded that most sub-Saharan countries are threatened by potential more severe climate shocks for the upcoming years with limited preparedness and coping capacity due to inadequate water management framework, insufficient finance and increasing exposed people, services and assets. Some of the actions identified for the Cameroon case based on the five pillars SWOT analysis may be beneficial to other less advanced countries. Indeed, it is crucial for target 6.5.1 to be met by 2030, in sub-Sahara Africa, despite climate shocks, that similar comprehensive analysis is conducted for each country, in order to build and implement necessary reforms and programs which might strengthen countries capacities to withstand climate shocks while progressing on development objectives.

## 5. CONCLUSION

SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis is a valuable tool for improving IWRM reporting, monitoring, and planning. It provides a structured assessment of each IWRM pillar

beyond progress reporting. This helps in identifying persistent challenges, dedicate adequate action points and plan strategic development, protection or management of existing water resources. Over these four regular pillars, considering climate resilience as a fifth pillar helps account for climate variability and preparedness of countries to projected climate shocks. This helps define adequate no-regret investment with long lasting and stable positive impacts on people, nature and economies.

Consequently, SWOT analysis conducted with contribution from multiple stakeholders on the five IWRM pillars can improve engagement and collaboration between different government agencies, the private sector, and civil society. It could also set a comprehensive analysis of where priorities shall be to accelerate climate and water security for resilient socio-economic development. This analysis conducted for Cameroon highlights some key areas for improvement common to many less advanced sub-Saharan countries, which include: regulatory framework, coordination, smart investment, strong participation and monitoring, as well as sub-national focus.

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## 7. CONFLICT OF INTEREST

No conflict of interest

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