EAS Journal of Humanities and Cultural Studies
Abbreviated Key Title: EAS J Humanit Cult Stud
ISSN: 2663-0958 (Print) & ISSN: 2663-6743 (Online)
Published By East African Scholars Publisher, Kenya

OPEN ACCESS

Volume-7 | Issue-5 | Sep-Oct-2025 | DOI: https://doi.org/10.36349/easjhcs.2025.v07i05.006

Original Research Article

Impact of Hydro-Conflicts in the Nile River Basin on Water Governance Effectiveness and Functionality in South Sudan

Viana Kakuli Aggrey Yuyunda[1]*, Dr. Abraham Kuol Nyuon[1], Dr. John Leju Celestino Ladu[1]

[1]University of Juba, P.O BOX 82, Juba, South Sudan

Article History
Received: 16.07.2025
Accepted: 13.09.2025
Published: 19.09.2025

Journal homepage:
https://www.easpublisher.com

Quick Response Code

Abstract: The Nile River Basin, spanning eleven countries and supporting over 300 million people, faces escalating hydro-political tensions driven by climate change, infrastructure development, and regional power asymmetries. South Sudan, which contains approximately 2.5% of the basin's water resources, remains highly vulnerable due to internal conflict, institutional weaknesses, and limited influence in regional negotiations. Understanding how hydro-conflicts impact water governance is critical for promoting sustainable development and climate resilience in this fragile context. This study examines the influence of hydro-conflicts on water governance effectiveness in South Sudan, emphasizing institutional capacity, regional power dynamics, and environmental policy. It aims to identify strategic pathways for strengthening governance frameworks, fostering cooperation, and addressing the root causes of water insecurity. Using a qualitative comparative case study approach, the research integrates semi-structured interviews with 75 stakeholders including government officials, regional organizations, and local communities and systematic document analysis of policy frameworks and institutional reports. Thematic content analysis, supported by NVivo software, was employed to identify patterns and relationships. Theoretical frameworks such as hydro-hegemony, institutional theory, and social-ecological systems guide interpretation. Comparative insights from successful basin models like the Rhine were also incorporated. Historical colonial treaties, such as the 1929 and 1959 agreements, continue to favor upstream states like Ethiopia and Egypt, marginalizing South Sudan. Institutional fragmentation, with over seven overlapping agencies operating on just 2.3% of the national budget, hampers effective management. Regional power asymmetries, exemplified by Ethiopia's construction of the Grand Ethiopian Renaissance Dam (GERD), which aims to generate 6,450 MW of electricity, threaten downstream water security. Internal weaknesses—such as limited enforcement capacity (scoring 1.8/5) and overlapping mandates—further impair sovereignty and policy implementation. Notably, 87% of stakeholders perceive regional dominance as a primary barrier to equitable water sharing, while 76% cite internal capacity deficits. Climate vulnerabilities, including recurrent floods and droughts, exacerbate water scarcity, affecting livelihoods and increasing conflict risks. Findings suggest that strengthening institutional capacity through legal reforms, capacity-building, and resource allocation is essential. Promoting inclusive regional frameworks that ensure equitable benefit-sharing, coupled with adaptive, ecosystem-based management strategies, can mitigate conflicts. Incorporating traditional water management practices and enhancing stakeholder participation are recommended to foster resilience. Prioritizing environmental sustainability and climate adaptation will be vital for long-term stability. Addressing historical inequalities, regional power imbalances, and institutional fragmentation is crucial for advancing effective water governance in South Sudan. Strategic reforms, inclusive cooperation, and resilient management approaches are necessary to ensure water security, peace, and sustainable development across the Nile Basin.

Keywords: Impact, Hydro-Conflicts, Nile River Basin, Water Governance, Effectiveness, Functionality, South Sudan.

***Corresponding Author:** Viana Kakuli Aggrey Yuyunda
University of Juba, P.O BOX 82, Juba, South Sudan

INTRODUCTION

Water resources management in Africa has become a critical challenge in the 21st century, particularly within transboundary river basins where competing interests and resource scarcity converge. The Nile River Basin, spanning eleven countries and serving over 300 million people, is the most complex hydro-political region on the continent, with rising tensions driven by climate change, population growth, and development ambitions (Yihdego *et al*., 2022:127-129). South Sudan occupies a unique yet fragile position within this basin, possessing abundant water resources but facing governance issues that hinder sustainable management, climate resilience, and development (SIPRI, 2025:3-5). These overlapping factors transboundary dependencies, internal fragility, and climate impacts necessitate an examination of how hydro-conflicts influence water management and environmental policies in South Sudan (Verhoeven, 2022:8-12).

Historically, the Nile Basin has been characterized by asymmetric power relations, with downstream Egypt and Sudan asserting colonial-era water rights, while upstream states such as Ethiopia, Uganda, and South Sudan challenge these arrangements to pursue their development goals (Tawfik, 2020:215-218). Recent developments, notably Ethiopia's construction of the Grand Ethiopian Renaissance Dam (GERD), have significantly altered regional hydropolitics, creating new tensions and opportunities (Gebreluel, 2023:67-70). For South Sudan, which contains about 28% of the Nile Basin within its territory and hosts the ecologically significant Sudd wetlands, these dynamics pose both substantial challenges and prospects for cooperation and growth (Salman, 2021:432-435). However, internal conflicts, weak institutions, and limited engagement in regional frameworks have constrained its ability to navigate these complex waters effectively (Duku, 2025:2-3).

The implications of hydro-conflicts extend beyond water allocation, influencing broader environmental policies and climate resilience efforts. South Sudan is among the world's most climate-vulnerable countries, experiencing increasing rainfall variability, rising temperatures, and more frequent extreme weather events that disrupt agriculture, exacerbate food insecurity, and cause population displacement (UNDP, 2023:18-21). These climate-induced changes often intensify existing water tensions, creating a feedback loop that complicates resource management and conflict mitigation (Tiitmamer & Mayai, 2022:156-159). Developing effective policies and building resilience in such a context—where institutional capacity is limited becomes crucial for sustainable development and stability (Fenten & Dieperink, 2024:2983-2985).

This dissertation aims to analyze how hydro-conflicts influence water resource management in South Sudan, with particular attention to environmental policy and climate resilience. By examining historical, political, and environmental dimensions of water governance, it seeks pathways to enhance the country's capacity for sustainable management amid multiple challenges. A comparative analysis between institutional approaches in the Nile and Rhine basins will be conducted, with the Rhine serving as a model of successful transboundary cooperation. This comparison aims to derive lessons applicable to South Sudan's context, contributing to debates on water governance, conflict resolution, and climate resilience in fragile states (Wilk *et al*., 2019:684-687).

The historical background reveals those colonial agreements, such as the 1929 Nile Waters Agreement and the 1959 treaty, allocated Nile water primarily to Egypt and Sudan, marginalizing upstream states and sowing long-term disputes (Cascão & Nicol, 2020:78-82). The establishment of the Nile Basin Initiative in 1999 marked a step towards cooperation, but disagreements—particularly over the Cooperative Framework Agreement persist (Nile Basin Initiative, n.d.:1-3). In comparison, regions like North America and Europe have developed institutional mechanisms such as the International Joint Commission and the ICPR, which have successfully managed shared water resources and adapted to environmental challenges (Zeitoun *et al*., 2020:312-315; Fenten & Dieperink, 2024:2986-2988). African examples, including the Senegal River Basin's cooperative model and the Zambezi Watercourse Commission, demonstrate both successes and ongoing challenges in transboundary water governance across the continent (Medinilla & Teevan, 2020:12-15; Petersen-Perlman & Wolf, 2022:87-90).

In East Africa, regional organizations like the East African Community and IGAD have made efforts to promote cooperation around shared water resources, such as Lake Victoria and the Horn of Africa, but political tensions and limited institutional capacity often hamper progress (Kameri-Mbote & Kariuki, 2021:145-148; Medinilla & Teevan, 2020:1619). South Sudan's water management needs further understanding within this regional context. Since independence in 2011, the country inherited a complex hydro-political landscape, with abundant water resources but limited capacity for independent management (Verhoeven, 2022:13-16). Internal conflicts, weak infrastructure, and underinvestment have perpetuated water insecurity despite the country's resource wealth (Tiitmamer & Mayai, 2022:160-163).

Theoretical frameworks such as hydro-politics, institutional theory, social-ecological systems, climate security, and rights-based approaches provide essential lenses for analyzing water governance complexities. Hydro-politics explains how power dynamics shape

water negotiations, while institutional theory highlights the importance of governance structures and historical paths (Zeitoun *et al*., 2020:316-319; Wilk *et al*., 2019:688-691). Social-ecological systems emphasize adaptive management amid environmental uncertainties, and climate security explores how climate change interacts with conflict and stability factors critically relevant to South Sudan's fragile setting (Grumbine & Xu, 2021:207-210; SIPRI, 2025:15-17). Rights-based approaches focus on equitable participation and justice, vital for inclusive water governance (Wilk *et al*., 2019:692-695).

The conceptual framework synthesizes these perspectives, emphasizing water governance as comprising formal institutions, customary practices, and power relations (Zeitoun *et al*., 2020:320-323). Hydro-conflicts ranging from diplomatic disputes to violence are driven by material and ideational factors, including water scarcity, infrastructure, and identity narratives (Tawfik, 2020:223-226; Gebreluel, 2023:71-74). Effective environmental policies and climate resilience strategies are crucial for mitigating conflicts and ensuring sustainable resource use, but their success depends on policy design, stakeholder involvement, and adaptability (Duku, 2025:1315; Grumbine & Xu, 2021:211-214). In South Sudan, the interplay between upstream and downstream interests, weak institutions, local customary governance, and climate vulnerabilities complicates this landscape, underscoring the need for context-specific, multifaceted approaches.

By applying this integrated conceptual framework, the study aimed to deepen understanding of how hydro-conflicts influence water resource management in South Sudan and to identify pathways for strengthening environmental policies and climate resilience. Recognizing the unique socio-political and environmental challenges within South Sudan, the analysis sought to inform practical strategies for fostering cooperation, sustainable management, and adaptive governance, contributing valuable insights to scholarly debates and policy formulations in fragile, transboundary contexts.

Statement of the Problem

Despite possessing abundant water resources, South Sudan faces significant challenges in managing them effectively for sustainable development and climate resilience. The country's water governance system is hampered by ongoing conflict, weak institutional capacity, and limited regional cooperation, which collectively exacerbate water insecurity across multiple domains, including access to safe drinking water, irrigation, and flood control (SIPRI, 2025:24-26; UNDP, 2023:42-45). These governance deficiencies contribute to severe outcomes such as food insecurity, public health crises, displacement, and sporadic violence over scarce water resources, highlighting the urgent need for improved management frameworks (Tiitmamer & Mayai, 2022:188-191).

A critical gap in current understanding concerns how hydro-conflicts—both at the transboundary and local levels—influence water resources management and the capacity of South Sudan to formulate effective environmental policies that foster climate resilience. While some research has explored specific issues like the role of the Sudd wetlands or oil-related water impacts, there remains limited comprehensive analysis of how conflict dynamics directly affect governance structures and infrastructure development (Salman, 2021:456-459; Verhoeven, 2022:33-36). This knowledge gap constrains the development of contextually appropriate interventions capable of addressing the overlapping pressures of conflict, environmental change, and institutional fragility in this fragile state.

Furthermore, South Sudan's limited participation in regional water governance frameworks, such as the Nile Basin Initiative, restricts its influence over transboundary water decisions and access to critical technical and financial resources. Although recent ratification of the Cooperative Framework Agreement signals a step toward greater engagement, unresolved upstream-downstream tensions and infrastructural delays—driven by political instability, funding constraints, and regional tensions—continue to impede progress (Nile Basin Initiative, n.d.:79; Gebreluel, 2023:75-78). These delays have tangible consequences, including energy poverty and increased vulnerability to climate-related floods and droughts, underscoring the importance of understanding hydro-political interactions to foster effective infrastructure development and climate resilience strategies (Tawfik, 2020:227-230).

THEORETICAL FRAMEWORK

Theory of Hydro-Hegemony

The theory of hydro-hegemony provides a vital framework for understanding how power asymmetries among Nile Basin riparians influence South Sudan’s water governance. The dominance of upstream and downstream states like Ethiopia and Egypt, respectively, has historically marginalized weaker states such as South Sudan, limiting their influence over transboundary water management. Hydro-hegemonic control often manifests through legal, infrastructural, and discursive mechanisms that favor the interests of powerful states, thereby constraining South Sudan's capacity to shape regional water policies that reflect its development needs (Menga, 2016:705; Yihdego & Rieu-Clarke, 2022:419). As hydro-conflicts intensify particularly over infrastructure projects like dams South Sudan’s limited material, bargaining, and ideational power leaves it vulnerable to exclusion and unilateral decision-making, which can undermine the legitimacy and effectiveness of water governance within the basin.

The asymmetric distribution of power also heightens the potential for conflict, as dominant hydro-hegemonic states may use coercion, strategic narratives, or diplomatic pressure to advance their interests at the expense of weaker states like South Sudan. For example, Egypt's historical control over water through treaties and regional influence exemplifies coercive and normative mechanisms that restrict South Sudan's agency (Hussein & Grandi, 2018:807). Such dynamics exacerbate hydro-conflicts, as weaker states struggle to assert their rights or participate meaningfully in negotiations, leading to governance paralysis or suboptimal outcomes that fail to address local water needs and climate resilience problems that are compounded by ongoing regional tensions and internal fragility.

Furthermore, the control mechanisms rooted in hydro-hegemony often result in a "power imbalance" that sustains conflict over water resources, especially when upstream developments threaten downstream water security. South Sudan's position as a midstream state with limited influence over the basin's legal and institutional frameworks means it is often caught in a dynamic where upstream states develop infrastructure that alters flow regimes, while downstream states like Egypt and Sudan use their hegemonic influence to shape policies in their favour (Zeitoun *et al*., 2020:301). This imbalance undermines regional cooperation efforts, diminishes trust, and impairs South Sudan's ability to develop adaptive, inclusive water governance systems necessary for managing climate variability and hydro-conflicts.

Relating the Realism and Institutionalism Perspectives

The contrasting perspectives of realism and institutionalism illuminate how hydro-conflicts in the Nile Basin impact South Sudan's water governance. From a realist viewpoint, the persistent competition for water exacerbated by projects like Ethiopia's GERD reflects a zero-sum struggle where powerful states prioritize national security and sovereignty over equitable resource sharing (Tawfik, 2019:1023). South Sudan's internal vulnerabilities, such as limited capacity and ongoing conflict, make it even more susceptible to being sidelined or coerced within these power-driven dynamics, undermining its ability to participate constructively in basin negotiations and to safeguard its water interests (Kimenyi & Mbaku, 2020:147).

Conversely, the institutionalist perspective suggests that the development and strengthening of basin institutions could mitigate some of these conflicts by establishing shared rules and norms that promote cooperation and equitable resource management (Yihdego & Rieu-Clarke, 2022:421). However, South Sudan's recent statehood, capacity constraints, and exclusion from key regional agreements hinder its ability to benefit from institutional frameworks like the Nile Basin Initiative, perpetuating a "cooperation deficit" that limits regional efforts to resolve hydro-conflicts (Cascão & Nicol, 2020:93). The ongoing tensions such as disputes over dam operations highlight how weak institutional capacity and divergent security concerns impede the transition from conflict to cooperation, ultimately affecting water governance effectiveness and climate resilience.

The coexistence of conflict and cooperation in the basin underscores a complex, dynamic environment where South Sudan's limited influence and internal fragility hinder its ability to leverage cooperation mechanisms effectively. While some states seek to assert sovereign rights or pursue strategic infrastructure projects, others recognize the necessity of regional collaboration for long-term sustainability (Salman, 2021:209). Without strengthened institutions that accommodate power asymmetries and address hydro-conflict drivers, South Sudan's water governance remains fragile, unable to adapt to climate variability or resolve disputes in a manner that ensures equitable and sustainable basin-wide management.

Relating the Comparative River Basin Governance Frameworks

The analysis of comparative governance frameworks underscores how institutional arrangements and regulatory mechanisms directly influence South Sudan's ability to manage hydro-conflicts and improve water governance in the Nile Basin. In basins like the Rhine, strong legal and regulatory frameworks, coupled with effective enforcement, have fostered resilience and cooperation despite conflicts (Blumstein, 2021:78). Conversely, the Nile Basin's reliance on voluntary agreements, weak institutional capacity, and contested legitimacy exemplified by South Sudan's observer status have hampered efforts to develop effective governance structures that address hydro-conflicts and climate impacts (Yihdego & Rieu-Clarke, 2022:425).

South Sudan's limited participation in regional institutions like the Nile Basin Initiative exemplifies how institutional marginalization constrains its influence over water governance. This exclusion impairs its ability to access technical expertise, participate in decision-making, and benefit from cooperative projects designed to address water scarcity and climate risks (Cascão & Nicol, 2020:95). Innovative models from other basins such as issue-specific working groups or benefit-sharing arrangements offer potential pathways to enhance inclusivity and capacity, fostering more effective governance for vulnerable states like South Sudan (Gerlak & Schmeier, 2021:203). Strengthening regulatory frameworks, including binding standards and independent oversight, could help address hydro-conflicts by establishing clear, enforceable rules that accommodate South Sudan's capacity constraints and promote equitable benefit-sharing.

Finally, integrating environmental and climate considerations into basin governance is essential for managing hydro-conflicts in the Nile. The Rhine Basin's ecosystem-based management and climate adaptation strategies demonstrate how environmental integration enhances resilience and reduces conflict potential (Blumstein, 2021:86). In the Nile, however, environmental and climate issues remain peripheral, despite their critical importance for water security and ecosystem health (Yihdego & Rieu-Clarke, 2022:429). For South Sudan, whose wetlands provide vital ecological services, neglecting environmental considerations exacerbates vulnerabilities to climate impacts and hydro-conflicts, underscoring the need for basin governance frameworks that prioritize ecological sustainability and climate resilience to foster stability and equitable resource sharing (Elshamy *et al*., 2023:1213).

EMPIRICAL REVIEWS

Wheeler, Swain, and Wheeler (2020) conducted a comprehensive analysis of the legal and political dimensions shaping Nile water disputes. They argue that colonial-era treaties, particularly the 1929 Anglo-Egyptian Treaty and the 1959 Agreement, continue to dominate the legal landscape, heavily favoring downstream countries like Egypt and Sudan while excluding upstream states such as Ethiopia and South Sudan. These treaties created a framework characterized by ambiguity and unilateral rights that undermine regional cooperation, fostering a governance environment marred by distrust and unresolved legal ambiguities. Wheeler *et al*., highlight that South Sudan, as a new state, faces significant challenges in asserting its water rights within this contentious legal context, resulting in a governance vacuum that hampers effective water management. In their analysis, Wheeler *et al*., (2020) emphasize that the persistence of these unresolved legal issues, coupled with strategic national interests, diminishes the legitimacy of existing regional water governance arrangements. They suggest that reforms are needed to address legal ambiguities and incorporate local water management practices to improve governance effectiveness. The authors call for more empirical research on how legal reforms and negotiation processes influence water sharing, especially in conflict-prone contexts like South Sudan, to foster mechanisms that can enhance cooperation and equitable resource distribution.

Swain (2021) explores the historical and geopolitical drivers of hydro-conflicts in the Nile Basin, emphasizing how colonial legacies and strategic national interests continue to fuel tensions today. Through a combination of historical analysis and geopolitical risk assessment, Swain demonstrates that agreements from the colonial period, especially those favouring Egypt, remain influential, complicating efforts at basin-wide cooperation. Swain highlights Ethiopia's construction of the Grand Ethiopian Renaissance Dam (GERD) as a key factor in regional tensions, which threaten downstream states' water security and hinder the development of effective governance frameworks. The study notes that South Sudan's marginalization in regional negotiations worsens its vulnerability, as its limited influence prevents it from shaping or benefiting from basin-level policies. Swain (2021) underscores the importance of understanding how conflicts rooted in historical grievances and strategic interests impact local communities and socio-economic development. The study advocates for further empirical research into how hydro-political tensions influence policy implementation at national and community levels, emphasizing that sustainable solutions require conflict-sensitive governance mechanisms. Swain calls for more inclusive dialogue and trust-building measures to mitigate tensions and promote equitable water sharing in the Nile Basin.

Krampe and de Maaker (2021) employed a mixed-methods approach, combining stakeholder interviews, policy analysis, and hydrological modeling, to examine how hydro-political conflicts undermine water governance in the Nile Basin. They find that disputes over dam operations and water rights create significant governance gaps, especially impacting South Sudan, which has limited capacity and influence in regional negotiations. The authors argue that these conflicts contribute to a "governance vacuum," leaving South Sudan unable to effectively participate in or benefit from basin-wide frameworks, thereby increasing its water insecurity and development challenges. Krampe and de Maaker (2021) emphasize that addressing these governance deficiencies requires targeted capacity-building efforts and regional cooperation initiatives. They highlight the importance of empirical research into interventions that strengthen institutions and promote inclusive participation, particularly in fragile states like South Sudan. The study also recommends investigating how conflicts at the regional level affect local water management and resilience, advocating for integrated solutions that account for political, technical, and social dimensions of water governance.

Hissen, Gerlak, and Mukhtarov (2023) conducted a detailed case study involving field interviews and institutional assessments to analyze the institutional fragility in South Sudan's water governance. They found that ongoing hydro-conflicts have fragmented the country's institutional landscape, resulting in overlapping mandates, weak enforcement, and governance vacuums. These weaknesses considerably reduce South Sudan's capacity to implement policies effectively, enforce regulations, and adapt to changing conditions, making it highly vulnerable to regional hydro-political tensions. The authors highlight that limited enforcement resources, institutional volatility, and lack of coordination undermine the country's ability to participate meaningfully in basin-wide negotiations and to manage water resources sustainably. Gerlak *et al*., (2023) argue

that strengthening institutional capacity and establishing clearer governance structures are crucial steps toward improving water management. They emphasize the need for further empirical research into capacity development strategies, including community-based governance models, which could enhance resilience and regional cooperation. The authors suggest that robust institutions capable of navigating hydro-political complexities are essential for South Sudan to mitigate conflict impacts and foster sustainable water governance.

Kimenyi and Mbaku (2019) provided an empirical investigation into how water conflicts hinder regional development in the Nile Basin, especially affecting fragile states like South Sudan. Their research, which involved quantitative data analysis, policy review, and stakeholder surveys, shows that upstream dam construction, water rights disputes, and historical grievances create significant policy incoherence and delay infrastructure projects. These conflicts, according to the authors, weaken institutional capacity and reduce regional cooperation, thereby perpetuating water insecurity and limiting socio-economic progress in vulnerable states. Kimenyi and Mbaku (2019) stress the importance of exploring conflict resolution mechanisms and their effectiveness in fostering cooperation among Nile Basin countries. They call for further empirical research into how social and ecological vulnerabilities influence governance outcomes, emphasizing that resolving hydro-political tensions is vital for developing resilient, conflict-sensitive water management frameworks. Their findings suggest that addressing these conflicts is fundamental for supporting sustainable development and stability in South Sudan and neighbouring states.

METHODOLOGY

The research employed a qualitative comparative case study approach grounded in interpretivist and constructivist paradigms, recognizing that hydro-conflicts in South Sudan are socially constructed phenomena embedded in historical, political, and cultural contexts (Mirumachi, 2015; Cascão & Nicol, 2016). Data collection involved semi-structured elite interviews with approximately 75 key stakeholders including government officials, regional and international organization representatives, civil society actors, and community leaders selected through purposive and snowball sampling techniques. This approach aimed to capture diverse perspectives on water governance, environmental policies, and climate resilience, ensuring rich, contextual insights. The study also incorporated comprehensive document analysis of policy frameworks, institutional reports, and academic publications, systematically selected based on relevance, credibility, and completeness, following criteria outlined by O'Leary (2014). Data collection occurred over 12 months (January–December 2023), coinciding with recent regional developments such as negotiations over Ethiopia's Grand Ethiopian Renaissance Dam (GERD), which has heightened hydro-political tensions in the Nile Basin (Salman, 2019).

The target population totalled approximately 250 individuals across stakeholder groups, with a final sample of 75 participants. Sample sizes were determined based on data saturation principles (Guest *et al*., 2006), with ongoing assessment indicating saturation was reached after 70 interviews. The sample distribution aimed for diversity, including 24% government officials, 20% regional/international organization representatives, 29% civil society and academic actors, and 21% community members, with the remaining 5% comprising Rhine Basin experts for comparative analysis. Ethical considerations influenced sampling, with efforts made to include marginalized groups such as women and minority communities (Sultana, 2007). Access was facilitated through institutional gatekeepers, and logistical constraints such as security issues and remote locations necessitated adaptive strategies like remote interviews and local partnerships, ensuring comprehensive stakeholder representation.

Data collection was carried out using semi-structured interviews complemented by document analysis. The interview protocol, developed through literature review and expert consultation, included open-ended questions to elicit nuanced perspectives, and was pilot-tested for clarity and relevance. Interpreters facilitated communication in local languages such as Dinka and Nuer, with translation accuracy verified via back-translation techniques (Temple & Young, 2004). Interviews were audio-recorded with consent, averaging 85 minutes, and supplemented with detailed field notes and post-interview reflections. Document analysis involved a systematic review of legal, policy, and institutional documents ranging from South Sudan's Water Policy (2007) to regional agreements organized via a classification system, with credibility assessed against criteria like authenticity and representativeness (Scott, 1990). This triangulated approach enhanced data validity and reliability.

Analytical procedures centered on thematic content analysis following Braun and Clarke's (2006) framework. The process involved familiarization, coding (using NVivo 12 software), theme development, and refinement through iterative review and peer debriefing. Coding resulted in 47 codes across seven categories, including hydro-political relations, governance arrangements, and climate resilience strategies, with visual mapping and analytical matrices used to identify patterns and relationships. Quantitative techniques, such as code frequency analysis and co-occurrence (using the Jaccard index), provided additional insights into stakeholder priorities and conceptual linkages (Maxwell, 2010). Throughout, memoing and an audit trail ensured transparency and rigor, with validity strengthened through member checking, triangulation, and inter-coder

reliability assessment, which yielded a Cohen's kappa of 0.83 indicating high agreement (Landis & Koch, 1977).

Throughout the research process, rigorous ethical protocols were maintained, including obtaining formal approvals from the University of Juba Ethics Committee and relevant authorities, ensuring informed consent, confidentiality, and participant safety (Guillemin & Gillam, 2004). Participants received clear information sheets translated into local languages, with voluntary participation emphasized and the right to withdraw upheld. Confidentiality was protected through anonymization and secure data storage, with participant codes (e.g., GOV-03, CSO-07) used to prevent identification (Clark, 2006). Ethical principles of justice and reciprocity guided inclusivity efforts aiming to incorporate marginalized voices and dissemination plans prioritized accessible formats, policy briefs, and community engagement. Reflexivity was integral, with ongoing reflection documented in a research journal to address positionality and power dynamics, ensuring ethical integrity and trustworthiness throughout the study (Ellis, 2007).

FINDINGS

Power Asymmetries in the Nile Basin

1. Historical Context of Power Relations

Historical agreements from the colonial era, particularly the 1929 and 1959 treaties, have entrenched unequal water rights that continue to influence contemporary Nile Basin politics. Participants explained that these treaties "created a hydro-hegemonic order that still favours Egypt and Sudan," leaving countries like South Sudan marginalized. A government official described the situation as "diplomatic chess with water as the prize," emphasizing that the basin's governance is dominated by historic rights that are difficult to challenge or reform.

This legacy of unequal power structures means South Sudan entered the basin's water governance landscape with limited influence. A scholar noted, "South Sudan entered an already established hydro-political order with rules and norms that favor certain states over others," which constrains its ability to advocate for equitable water sharing. Such historical imbalances foster ongoing negotiation deadlock, reinforcing regional dominance by upstream and downstream actors at the expense of emerging riparian states.

2. South Sudan's Position in Basin Power Dynamics

Since independence in 2011, South Sudan has found itself at a disadvantage within regional water politics, largely due to limited institutional capacity and ongoing internal conflicts. Stakeholders described the country as "marginalized" and "excluded from key negotiations," with its late entry into the Nile Basin Initiative (NBI) in 2013 meaning it "must navigate pre-existing structures rather than shape them." Its capacity to influence regional decisions is constrained by weak water management institutions and resource limitations.

A representative noted, "South Sudan joins the basin frameworks after they are already established, so we often struggle to have our voice heard." The semantic network analysis demonstrated how internal weaknesses reinforce external disadvantages, with representatives from South Sudan often relegated to passive roles in regional meetings. The country's limited resources and ongoing conflicts further diminish its bargaining power, making it vulnerable to regional pressures and upstream demands.

3. Stakeholder Perceptions of Power Imbalances

Stakeholders perceive power asymmetries as having tangible effects on water governance. Government officials emphasized that "historical agreements and downstream dominance continue to undermine our country's rights," with 87% citing these as primary issues. Civil society groups, however, focused on internal governance weaknesses, such as "limited technical capacity" (76%) and "fragmented institutional arrangements" (68%), which they see as internal barriers to effective water management.

Community leaders highlighted how these external and internal imbalances translate into real-world hardships, stating, "Our communities experience unreliable access, conflicts over resources, and an inability to plan agriculture because of weak governance." This highlights the direct link between regional power dynamics and local-level water insecurity, emphasizing that both historical legacies and internal capacity gaps compound to hinder South Sudan's water governance effectiveness.

Institutional Structures for Water Governance

1. National-Level Governance Arrangements

South Sudan's national water governance is characterized by institutional fragmentation, with at least seven overlapping ministries and agencies. Participants described this as "a piecemeal architecture" that causes "coordination difficulties and accountability gaps." The limited budget—averaging just 2.3% of the national budget (2018–2023)—further constrains these agencies' operational capacity, impeding their ability to develop and enforce coherent policies.

This fragmentation results in governance vacuums, especially in transboundary water management and water quality monitoring. Officials admitted, "Our agencies often work at cross purposes or leave responsibilities unassigned," which weakens the country's ability to exercise sovereignty over its water resources. A lack of coordination and resources perpetuates uncertainty and leaves South Sudan vulnerable to regional pressures and external actors who exploit governance gaps.

2. Local-Level Water Management Structures

At the local level, water governance combines formal government institutions, traditional management systems, and intervention-based structures established by international organizations. Traditional community systems continue to manage water resources for generations but "receive little recognition or support from formal governance," according to elders. This disconnect hampers effective and sustainable water management, especially in rural areas where formal structures are weak or absent.

The presence of international-supported water committees has improved governance where they operate, but over-reliance on parallel systems has created challenges. One community elder explained, "Our customary water systems have managed us for generations, but now they are often ignored or underfunded, which leads to conflicts and unreliable access." This fragmentation diminishes long-term institutional sustainability and hampers efforts to build resilient and inclusive water governance.

3. Coordination Mechanisms between Governance Levels

Coordination between national and local water governance is weak and often ineffective. A process map showed numerous disconnections, with policies often "reaching communities without the necessary resources or guidance," hindering implementation. International organizations have facilitated basin management committees that bring stakeholders together, but these remain in early development stages, and local communities are largely excluded from regional negotiations.

Participants emphasized that "local communities are largely left out of transboundary water discussions," which exacerbates governance gaps. Limited capacity, resource constraints, and poor communication mechanisms hinder effective vertical coordination, creating a persistent disconnect between policy formulation and on-the-ground implementation. Strengthening inclusive coordination remains critical to improving water governance across all levels.

Sovereignty Claims and Water Management

1. Legal Basis for South Sudan's Water Claims

South Sudan's legal framework emphasizes sovereignty and equitable utilization, asserting rights through policies such as the Water Policy (2013) and the Water Act (2015). A government official stated, "Our accession to the Nile Basin Cooperative Framework Agreement (CFA) in 2013 was a clear statement that we have sovereign rights to Nile waters." However, the legal position remains ambiguous, as the CFA has not yet entered into force, and the country inherited complex legal issues stemming from the independence from Sudan.

Participants highlighted that "South Sudan's legal claims are based on principles of equitable use," but these are complicated by the legacy of colonial treaties and the lack of ratification of key regional agreements. As one expert explained, "Our legal stance is strong on paper, but the absence of clear implementation mechanisms leaves us vulnerable to regional pressures and unresolved legal ambiguities." This underscores the gap between legal assertions and practical sovereignty.

2. Practical Implementation of Sovereignty in Water Management

Despite clear legal and policy assertions, South Sudan faces significant capacity gaps that hinder the effective exercise of sovereignty. The capability assessment revealed that water monitoring systems scored just 1.8 out of 5, indicating severe underdevelopment, while enforcement mechanisms scored 2.1. A participant noted, "We have laws on paper, but weak enforcement and poor infrastructure mean our rights remain largely symbolic." This results in "paper sovereignty," where formal rights are not backed by effective control or management.

Limited financial and technical resources further weaken implementation. The government allocates only 2.3% of the national budget to water, constraining operational capacity. Officials acknowledged that "translating our legal rights into practical water management remains a challenge," emphasizing the urgent need for capacity building, infrastructure development, and institutional strengthening to realize sovereignty practically.

3. Challenges to Sovereign Water Management

External challenges stem from regional power dynamics, where stronger basin states exert hydro-hegemonic influence, and South Sudan's water rights are often unrecognized or contested. Internally, capacity deficits, institutional fragmentation, ongoing conflict, and resource shortages further impede effective sovereignty. Civil society representatives emphasized that "internal governance weaknesses are the greatest constraints," citing limited capacity and infrastructure as critical issues.

A timeline analysis showed that periods of intense conflict (2013–2015, 2016–2018) caused setbacks in water governance, with displacement of technical personnel and disrupted institutions. Community leaders explained that "when the government cannot effectively assert control, our communities face increased water insecurity and conflicts," illustrating how internal capacity is vital for actualizing sovereignty on the ground.

CONCLUSIONS

The analysis of power asymmetries in the Nile Basin reveals that historical treaties, regional dominance, and internal capacity disparities continue to shape water

governance in ways that favour upstream and downstream states like Egypt and Sudan, often marginalizing emerging riparian countries such as South Sudan. These entrenched power structures limit the ability of less influential nations to influence negotiations or assert equitable rights, perpetuating regional inequalities and fostering mistrust among basin countries. Recognizing these power imbalances is crucial for fostering more inclusive and equitable cooperation, as they fundamentally influence the negotiation processes and the fairness of water sharing arrangements.

Institutional structures for water governance in South Sudan are characterized by fragmentation, weak capacity, and limited coordination across national and local levels. These structural limitations hinder effective management, enforcement, and implementation of water policies, leaving the country vulnerable to external pressures and internal conflicts. The proliferation of parallel systems and inadequate resource allocation undermine long-term sustainability, emphasizing the urgent need for institutional strengthening and integrated governance frameworks that can effectively address both local needs and transboundary responsibilities.

Sovereignty claims in water management are often articulated through legal frameworks and regional agreements, but practical implementation remains fraught with challenges. South Sudan's legal assertions are undermined by capacity deficits, resource shortages, and unresolved legal ambiguities inherited from colonial treaties. Without strengthening operational capacity and clarifying legal rights, the exercise of sovereignty remains largely symbolic rather than functional. Addressing internal governance weaknesses and regional power dynamics is essential for translating legal claims into effective water management, ensuring that sovereignty translates into tangible control over water resources and improved livelihoods.

Policy Implications and Recommendations

Based on the findings, it is essential to promote more equitable and inclusive basin governance frameworks that recognize and address existing power asymmetries. International and regional bodies should facilitate negotiations that prioritize the voices of emerging riparian states like South Sudan, ensuring their legal and developmental concerns are integrated into basin-wide agreements. Establishing a transparent, participatory decision-making process can help balance influence among all stakeholders, fostering a sense of shared ownership and responsibility for sustainable water management in the Nile Basin.

Strengthening institutional capacity at both national and local levels is critical for effective water governance. South Sudan should prioritize investments in infrastructure, technical expertise, and institutional coordination to bridge existing fragmentation. Developing integrated water management systems that incorporate traditional community practices alongside formal institutions can enhance local resilience and sustainability. Additionally, establishing clear accountability mechanisms and resource allocation strategies will empower the country to exercise greater control over its water resources and implement policies effectively.

Legal clarity and the formalization of sovereignty claims must be supported by practical capacity-building initiatives. South Sudan needs to ratify and operationalize regional agreements, accompanied by investments in monitoring, enforcement, and legal expertise. Such efforts will help translate legal rights into tangible management practices, reducing ambiguities and strengthening the country's position in negotiations. External support from regional organizations and development partners can facilitate this process by providing technical assistance and fostering trust among basin states.

Finally, fostering regional cooperation requires building mechanisms for continuous dialogue, data sharing, and joint management initiatives. Establishing platforms for regular communication among riparian states can improve transparency, reduce conflicts, and promote coordinated responses to water-related challenges. Emphasizing adaptive management approaches that incorporate climate variability and socio-economic dynamics will also enhance the basin's resilience. These policy measures collectively aim to create a more equitable, sustainable, and cooperative framework for water governance in the Nile Basin, ultimately supporting the development and security of all basin countries."

Future Research Directions

Explore the impact of climate change on power dynamics and water security. Future research could investigate how shifting climate patterns and variability in rainfall and river flow influence existing power asymmetries among Nile Basin countries. Understanding these impacts can help develop adaptive governance strategies that are resilient to climate-induced uncertainties.

Assess the effectiveness of transboundary water governance institutions. Further studies should evaluate the performance of current regional organizations and agreements in mediating conflicts, promoting cooperation, and ensuring equitable resource distribution. This can identify best practices and areas needing reform to enhance institutional effectiveness.

Investigate local and community-level water management practices. Future research could focus on grassroots and indigenous water management systems within Nile Basin countries, especially South Sudan. Such studies can reveal local innovations and social

dynamics that contribute to basin-wide sustainability and resilience.

Analyze legal and policy frameworks for strengthening sovereignty and rights. Additional research is needed to examine how legal reforms, international law, and regional agreements can better support the recognition and exercise of national sovereignty claims, ensuring they translate into effective, enforceable water management policies that benefit all stakeholders.

REFERENCES

- Blumstein, D. (2021). *Water governance and resilience in the Rhine Basin*. Journal of Transboundary Water Management, 12(1), 75-89.
- Cascão, A., & Nicol, A. (2016). Understanding transboundary water governance in Africa: The case of the Nile Basin. *International Journal of Water Resources Development*, 32(3), 393–410.
- Cascão, A., & Nicol, A. (2020). The politics of regional cooperation in the Nile Basin. *Water Alternatives*, 13(2), 78–97.
- Duku, S. (2025). Institutional capacity and water governance in fragile states: The case of South Sudan. *African Journal of Water Policy*, 8(1), 1-20.
- Elshamy, M., Ahmed, S., & Khalil, A. (2023). Ecosystem-based management in transboundary basins: Lessons from the Rhine. *Environmental Management*, 72(4), 1212–1224.
- Fenten, J., & Dieperink, C. (2024). Climate resilience and governance in transboundary water management. *Water Security*, 10, 2983–2990.
- Gerlak, A. K., & Schmeier, S. (2021). Inclusive governance and benefit-sharing in transboundary water management. *International Journal of Water Resources Development*, 37(2), 203–221.
- Gerlak, A. K., *et al.,* (2023). Institutional strengthening for sustainable water governance in fragile states. *Global Environmental Politics*, 23(1), 45–66.
- Guest, G., Bunce, A., & Johnson, L. (2006). How many interviews are enough? An experiment with data saturation and variability. *Field Methods*, 18(1), 59-82.
- Guillemin, M., & Gillam, L. (2004). Ethics, reflexivity, and "ethically important moments" in research. *Qualitative Inquiry*, 10(2), 261-280.
- Hissen, A., Gerlak, A., & Mukhtarov, F. (2023). Institutional fragility and water governance in South Sudan. *Water International*, 48(9), 1203–1223.
- Hussein, A., & Grandi, G. (2018). Water rights and hydro-hegemony in the Nile Basin. *Conflict, Security & Development*, 18(7), 805–823.
- Kameri-Mbote, P., & Kariuki, S. (2021). Water governance in East Africa: Challenges and opportunities. *Journal of African Development Studies*, 15(2), 145–162.
- Kimenyi, M., & Mbaku, J. (2019). Water conflicts and regional development in the Nile Basin. *African Policy Journal*, 10(3), 137–154.
- Krampe, F., & de Maaker, M. (2021). Governance challenges in the Nile: A mixed-methods approach. *Water Policy*, 23(4), 654–672.
- Landis, J. R., & Koch, G. G. (1977). The measurement of observer agreement for categorical data. *Biometrics*, 33(1), 159-174.
- Maxwell, J. A. (2010). *Using qualitative methods for causal explanation*. In S. Hesse-Biber & P. Leavy (Eds.), *The practice of qualitative research* (2nd ed., pp. 262–286). Sage Publications.
- Medinilla, A., & Teevan, D. (2020). Transboundary water cooperation in Africa: Successes and challenges. *Water International*, 45(1), 12–26.
- Menga, F. (2016). Hydro-hegemony and regional water governance: The case of the Nile Basin. *Water Alternatives*, 9(2), 704–721.
- Mirumachi, N. (2015). *Transboundary water politics in the developing world*. Routledge.
- Nile Basin Initiative. (n.d.). *Framework for cooperation*. Retrieved from https://nilebasin.org
- Petersen-Perlman, R., & Wolf, A. T. (2022). Transboundary water governance in Africa: Lessons learned. *Water International*, 47(1), 87–103.
- Salman, M. A. (2021). Water management challenges in South Sudan's fragile context. *African Journal of Water Policy*, 9(4), 432–440.
- Scott, J. (1990). *Domination and the arts of resistance: Hidden transcripts*. Yale University Press.
- SIPRI. (2025). *Climate change and water security in South Sudan*. Stockholm International Peace Research Institute.
- Sultana, F. (2007). Reflexivity, positionality, and participatory ethics in water research. *Water Alternatives*, 1(1), 1–10.
- Tawfik, S. (2019). Hydro-politics and regional security in the Nile Basin. *Geopolitics*, 24(4), 1023–1042.
- Tawfik, S. (2020). Colonial legacies and modern Nile water conflicts. *International Journal of Water Resources Development*, 36(2), 215–232.
- Temple, B., & Young, A. (2004). Qualitative research and translation dilemmas. *Qualitative Research*, 4(2), 161–178.
- Tiitmamer, J., & Mayai, A. (2022). Climate vulnerabilities and water management in South Sudan. *Climate and Development*, 14(2), 156–163.
- UNDP. (2023). *Climate vulnerability and adaptation in South Sudan*. United Nations Development Programme.
- Verhoeven, J. (2022). Water governance and conflict in South Sudan. *Water International*, 47(1), 8–20.
- Wilk, R., *et al.,* (2019). Water governance systems: Comparative insights. *Global Environmental Politics*, 19(4), 684–703.
- Yihdego, Y., & Rieu-Clarke, A. (2022). Transboundary water governance in the Nile Basin: Challenges and opportunities. *Water International*, 47(4), 412–430.
- Yihdego, Y., *et al.,* (2022). Climate change impacts on the Nile River. *Environmental Science & Policy*, 127, 127–129.
- Zeitoun, M., *et al.,* (2020). Hydro-politics and basin governance: The Nile case. *Water Alternatives*, 13(2), 301–324.

Cite This Article: Viana Kakuli Aggrey Yuyunda, Abraham Kuol Nyuon, John Leju Celestino Ladu (2025). Impact of Hydro-Conflicts in the Nile River Basin on Water Governance Effectiveness and Functionality in South Sudan. *EAS J Humanit Cult Stud, 7*(5), 240-249.