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South Sudan Water Security and the Legacies of Colonial Treaties: A Critical Investigation of River Nile Conflict

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ABSTRACT : This study examines how colonial-era Nile treaties continue to shape South Sudan's water security and its position within contemporary hydro-political dynamics of the Nile Basin. Despite being strategically located along the White Nile and possessing extensive wetlands, South Sudan's ability to utilize the Nile is constrained by the 1929 and 1959 agreements, which granted Egypt and Sudan disproportionate control over the river. Formulated without the participation of upstream states, these agreements still influence regional water politics, limiting South Sudan's capacity to address its development needs in agriculture, energy, and environmental management. Using a descriptive research design, the study employed questionnaires and interviews with 50 respondents, complemented by secondary literature. The findings show that while regional institutions such as the Nile Basin Initiative (NBI) contribute to dialogue and cooperation, they lack binding authority and remain affected by power imbalances among member states. Respondents also indicated that South Sudan has not fully benefited from these platforms due to limited institutional and technical capacity. The study further reveals that water insecurity significantly affects South Sudan's economic development. It limits agricultural productivity, contributes to environmental degradation in the Sudd wetlands, and constrains industrial growth and hydropower potential. Climate variability, poor infrastructure, and weak water governance intensify these challenges, leading to food insecurity, health risks, and local conflicts over water resources. Geopolitically, South Sudan's water security is influenced by tensions among Egypt, Ethiopia, and Sudan, especially regarding the Grand Ethiopian Renaissance Dam (GERD). As a new state with limited negotiating power, South Sudan must carefully balance its relationships to safeguard national interests. The study concludes that improving water security requires a strong national water policy, enhanced institutional capacity, active participation in regional frameworks, and investment in sustainable water management. Strengthening diplomacy, promoting transparency, and expanding partnerships are essential for ensuring equitable utilization of the Nile and fostering long-term stability.

KEYWORDS: South Sudan, Water Security, Legacies, Colonial Treaties, River, Nile, Conflict

I. INTRODUCTION

Nile River Basin has been a source geopolitical tensions between riparian States as population growth, water scarcity and developmental goals increased. While influences and excessive interests of global powers and merging regional players redefine and attracted political entities to decolonize imbalanced treaties and the imposed ownership of the Nile River Basin. The four colonial treaties namely the Anglo-Italian Protocol of 1891, the Tripartite treaties between Britain, French and Italy in 1906 and the 1929 agreement between Egypt and Britain as well as 1959 agreement of Sudan and Egypt disproportionately outsource the upstream States from Nile River Basin politics. Though attempt were made by Upper riparian countries to encounter colonial treaties and Egypt's imposed hegemony through bilateral in 1993, Nile Basin Initiatives of 1999 and Cooperative Framework Agreement 2024, Nile River Basin remain as a sources for future conflicts between down and upstream countries. With the independence of South Sudan in 2011, South Sudan's water right in the Nile River was a major concern before the ratification of Cooperative Framework Agreement in October 2024. But the major concern for regional security and geopolitical tensions is 1929 and 1959 which placed downstream states to throne of Nile River leadership and the historical legacy on the Nile. South Sudan as a middle stream and as a country with swampy wetlands among the riparian countries, its sociopolitical stability and economic development heavily depends on access to the Nile River. Despites being a member of upstream states, South Sudan's ability to utilize Nile Waters is constrained by the colonial era treaties and regional power asymmetries. These agreements granted downstream countries unfounded fallacy to own the Nile and limiting the rights of upstream countries where Nile River originated to develop infrastructure and expand water usage. In addition to water security and influence over the Nile, South Sudan's internal conflicts and State building

Challenges and its quest for water security collides with entrenched geopolitical interests and legal precedents that continue to marginalize its needs. This research critically investigate how colonial treaties contribute to contemporary geopolitical dynamics, regional security and particularly shape South Sudan water security. It's aims to explore the nexus between historical injustice regional power imbalances South Sudan geostrategic importance in the Nile River politics and evolving conflicts surrounding the Nile River as well as Egypt and Sudan historical and hegemonic fallacy.

Background of the Study : Water security is a critical global issue, particularly in transboundary river basins where historical agreements continue to shape access and distribution. The Nile Basin exemplifies the challenges faced by nations in securing equitable water rights, as colonial-era treaties often favor downstream states. Scholars such as McCaffrey (2009) highlight that international water law has evolved to emphasize equitable and reasonable utilization, yet many agreements remain entrenched in historical power dynamics. The global discourse on water governance increasingly advocates for renegotiating outdated treaties to reflect contemporary needs and environmental sustainability (Olanya, 2017). The increasing impact of climate change has further exacerbated global water security concerns, particularly in regions dependent on shared water resources. Knobelsdorf (2021) argues that rising temperatures and erratic rainfall patterns threaten water availability, necessitating adaptive management strategies. The United Nations has emphasized the importance of integrated water resource management to mitigate conflicts and ensure sustainable access to freshwater (Mekonnen, 2010). As nations grapple with these challenges, international cooperation remains essential in fostering equitable water distribution. Beyond legal frameworks, technological advancements play a crucial role in addressing global water security. Innovations in desalination, water recycling, and efficient irrigation systems have emerged as viable solutions to water scarcity (Sakwa, 2015). However, the implementation of these technologies requires substantial investment and policy support. Scholars argue that bridging the gap between technological potential and practical application is key to achieving long-term water security (Knobelsdorf, 2021). Within the East African region, the Nile Basin remains a focal point of hydro-political tensions. The 1929 and 1959 Nile Water Agreements granted Egypt and Sudan disproportionate control over the river's flow, sidelining upstream nations such as Ethiopia, Uganda, and South Sudan. Scholars like Mekonnen (2010) argue that these agreements fail to accommodate the growing water demands of upstream states, leading to disputes over resource allocation. The Nile Basin Initiative (NBI) was established to foster cooperation, yet its effectiveness remains limited due to entrenched geopolitical interests (Sakwa, 2015).

Economic development in the region has intensified the demand for water resources, particularly for agriculture and hydropower projects. Ethiopia's Grand Ethiopian Renaissance Dam (GERD) has been a point of contention, with Egypt expressing concerns over reduced water flow (Knobelsdorf, 2021). The regional discourse on water security highlights the need for a more inclusive framework that considers the interests of all riparian states. Scholars advocate for a cooperative approach that balances economic growth with sustainable water management (Olanya, 2017). Despite challenges, there are emerging opportunities for regional collaboration in water governance. The African Union has encouraged dialogue among Nile Basin countries to develop a comprehensive water-sharing agreement (Mekonnen, 2010). Strengthening institutional mechanisms and promoting transparent negotiations can pave the way for equitable water distribution. As regional economies expand, fostering mutual trust and cooperation remains essential in ensuring long-term water security (Knobelsdorf, 2021). South Sudan faces unique challenges in asserting its water rights within the Nile Basin. The country's dependence on the Nile for agriculture, drinking water, and economic development underscores the urgency of renegotiating its position within regional agreements. Scholars such as Knobelsdorf (2021) emphasize that colonial-era treaties did not account for South Sudan's sovereignty, leaving it without formal recognition in water-sharing negotiations. Local policymakers and researchers advocate for integrating South Sudan's water security concerns into broader regional discussions, ensuring equitable access to resources (Mekonnen, 2010). Infrastructure limitations further complicate South Sudan's water security landscape. The lack of adequate water management systems has led to inefficiencies in distribution and utilization (Sakwa, 2015). Addressing these challenges requires investment in water infrastructure, including irrigation systems and purification facilities. Scholars argue that enhancing local capacity and governance structures is crucial in improving water access and sustainability (Knobelsdorf, 2021). Community engagement plays a vital role in shaping South Sudan's water security policies. Local stakeholders, including farmers and civil society organizations, have advocated for participatory approaches to water governance (Olanya, 2017). Empowering communities through education and resource management initiatives can enhance resilience against water scarcity. As South Sudan navigates its water security challenges, fostering inclusive decision-making processes remains key to sustainable development (Mekonnen, 2010).

Purpose of the Study : The purpose of this study is to critically examine the impacts of colonial-era treaties on South Sudan's access to Nile water resources. By assessing the legal, political, and environmental dimensions of the issue, this research aims to contribute to policy recommendations that support equitable water-sharing mechanisms within the Nile Basin.

Statement of the Problem: South Sudan faces significant challenges in securing its water rights within the Nile Basin. The country's exclusion from colonial-era treaties, such as the 1929 and 1959 Nile Water Agreements, has left it without formal recognition in regional water-sharing frameworks. This historical marginalization has resulted in limited access to the Nile's resources, despite the country's dependence on the river for agriculture, drinking water, and economic development. Additionally, South Sudan's fragile governance structures and ongoing political instability further complicate efforts to assert its water rights, as internal conflicts divert attention from critical resource management. Beyond legal constraints, environmental factors exacerbate water insecurity. South Sudan is highly vulnerable to climate change, experiencing frequent floods and droughts that disrupt water availability. The country ranks among the most flood-prone nations globally, with extreme weather events displacing thousands and damaging infrastructure. These environmental challenges, coupled with weak institutional capacity, hinder effective water governance and sustainable resource management. The root causes of South Sudan's water security challenges stem from historical, political, and environmental factors. Colonial-era treaties disproportionately allocated Nile waters to Egypt and Sudan, leaving upstream nations, including South Sudan, with minimal legal standing in water-sharing negotiations. This historical exclusion continues to shape regional diplomacy, as Egypt and Sudan resist efforts to renegotiate water agreements that could benefit South Sudan and other upstream states. Political instability and weak governance further contribute to water insecurity. Decades of conflict have undermined institutional development, resulting in fragmented water management policies and limited enforcement mechanisms. Corruption and mismanagement within government agencies impede efforts to implement effective water governance strategies. Additionally, inadequate infrastructure, including poor irrigation systems and lack of water treatment facilities, exacerbates inefficiencies in water distribution.

The consequences of South Sudan's water insecurity are far-reaching, affecting economic development, public health, and regional stability. Limited access to clean water has severe implications for public health, with a significant portion of the population relying on contaminated sources. Waterborne diseases, including cholera and typhoid, remain prevalent due to inadequate sanitation and hygiene infrastructure. The lack of reliable water supply also hampers agricultural productivity, threatening food security and livelihoods. Economically, water insecurity restricts South Sudan's ability to develop key sectors such as agriculture and hydropower. The country's vast wetlands and river systems hold potential for irrigation and energy production, yet political and infrastructural barriers prevent effective utilization. Furthermore, regional tensions over water rights contribute to diplomatic strains, as South Sudan struggles to assert its interests within the Nile Basin Initiative and other cooperative frameworks. Efforts to improve South Sudan's water security have focused on policy reforms, regional cooperation, and infrastructure development. The government has sought to strengthen its participation in Nile Basin negotiations, advocating for more inclusive water-sharing agreements. However, progress remains slow due to resistance from downstream states and internal governance challenges. International organizations and development partners have supported initiatives to enhance water infrastructure and governance. Projects aimed at improving water supply systems, sanitation, and climate resilience have been implemented to mitigate the effects of floods and droughts. Additionally, regional dialogues facilitated by the African Union and Nile Basin Initiative offer opportunities for South Sudan to negotiate more favorable water-sharing terms. Strengthening institutional capacity and promoting transparent governance remain critical in ensuring long-term water security.

Research Objectives

Broader Objectives : To analyze the historical treaties governing Nile water allocation and their implications for South Sudan.

Specific Objectives

- To investigate the role of regional institutions, such as the Nile Basin Initiative, in mitigating conflicts.
- To examine the impact of water insecurity on South Sudan's economic development and environmental sustainability
- To identify policy recommendations that enhance South Sudan's participation in water governance frameworks.
- To analyze geopolitical tensions among the Nile Basin Countries and the competing interests of Egypt, Sudan and Ethiopia.

Research Questions

- What are the roles of regional institutions, such as the Nile Basin Initiative, in mitigating conflicts?
- How does water insecurity impact South Sudan's economic development and environmental sustainability?
- What policy interventions can promote equitable water-sharing agreements for South Sudan?
- What are the major challenges and opportunities for South Sudan in asserting its waters interests amid competing regional interests and hydro-political tensions?

Justification of the Study : Understanding South Sudan's water security challenges is essential for shaping sustainable resource governance. The country's dependence on the Nile for agriculture, energy, and human consumption underscores the urgency of addressing legal and diplomatic constraints. Historical treaties, such as the 1929 and 1959 Nile Water Agreements, have long favored downstream states, leaving South Sudan with limited formal recognition in water-sharing negotiations. This study aims to highlight the structural barriers imposed by these agreements and explore pathways for equitable resource management.Beyond legal constraints, South Sudan's water security is increasingly threatened by climate change and population growth. Erratic rainfall patterns, prolonged droughts, and frequent flooding disrupt water availability, exacerbating existing vulnerabilities. As the nation's population expands, the demand for water-intensive sectors such as agriculture and industry rises, necessitating proactive governance strategies. This study provides a comprehensive analysis of how environmental factors intersect with legal and diplomatic challenges, offering insights into adaptive management approaches. Regional collaboration is crucial in addressing South Sudan's water security concerns. The Nile Basin Initiative (NBI) and other cooperative frameworks present opportunities for renegotiating outdated treaties and fostering inclusive water governance. By examining South Sudan's position within these regional mechanisms, this study contributes to policy discussions on transboundary water cooperation. Strengthening institutional capacity and diplomatic engagement will be key to ensuring long-term water security and sustainable development.

Significance of the Study : This research contributes to scholarly discourse on water governance and post-colonial resource management by examining South Sudan's position in Nile Basin politics. The legacy of colonial treaties continues to shape hydro-political dynamics, influencing negotiations and resource allocation. By analyzing these historical agreements, the study enhances understanding of their contemporary implications and the need for renegotiation. Scholars and policymakers can leverage these insights to advocate for more equitable water-sharing frameworks. In addition to historical analysis, the study provides recommendations for strategic diplomacy. South Sudan's engagement in regional water negotiations remains limited, often constrained by geopolitical sensitivities and governance challenges. By identifying key diplomatic strategies, this research supports efforts to strengthen South Sudan's participation in basin-wide discussions. Effective negotiation tactics and institutional reforms can enhance the country's ability to assert its water rights while fostering cooperative relations with neighboring states. Beyond South Sudan, the study contributes to broader discussions on transboundary water cooperation in Africa. Water security remains a critical issue across the continent, with many nations facing similar challenges in navigating historical agreements and regional diplomacy. By situating South Sudan's case within the wider African context, the research offers comparative insights that can inform policy development and international water governance frameworks.

Limitations and Delimitations

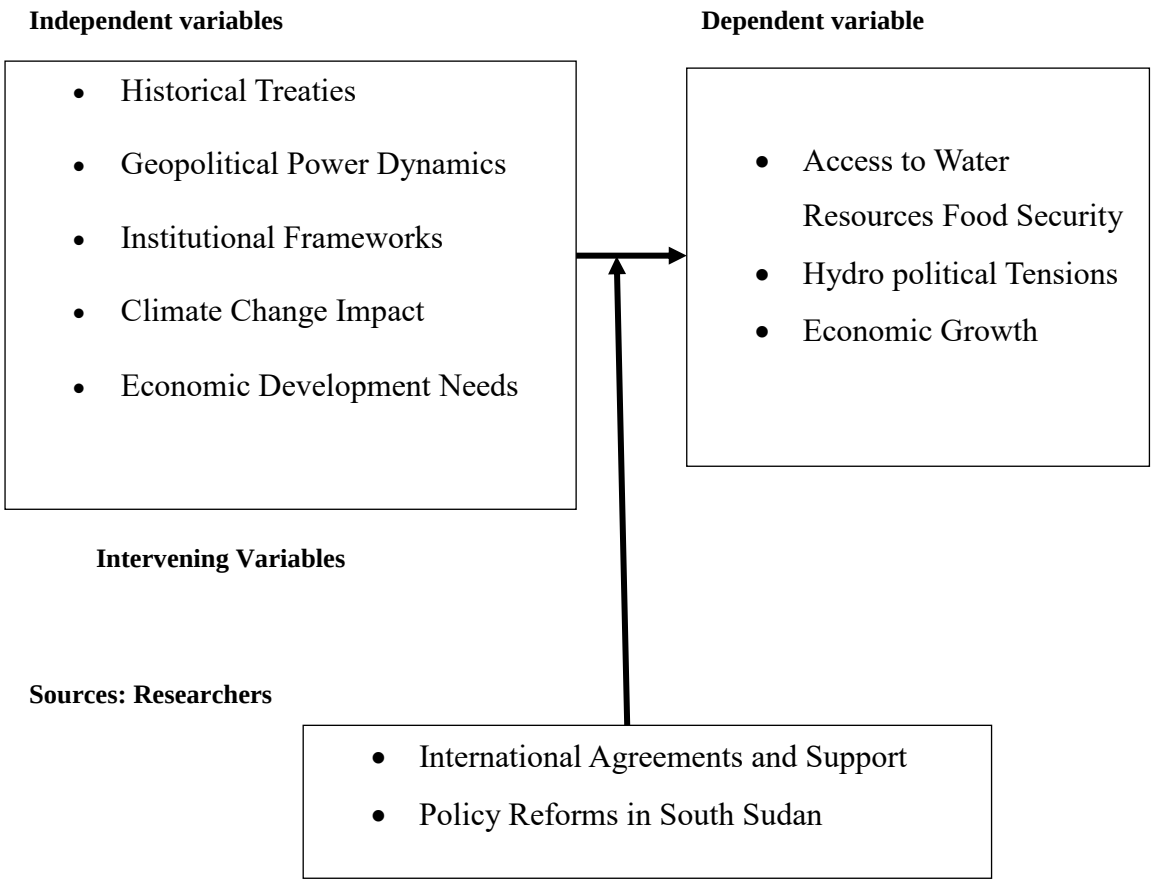
Limitations : One of the primary limitations of this study is the restricted availability of archival records on colonial treaties. Many historical agreements were documented under colonial administrations, and access to these records remains limited. This constraint may affect the depth of historical analysis, requiring reliance on secondary sources and expert interpretations. Despite these challenges, the study seeks to provide a comprehensive examination based on available literature and policy documents. Another limitation is the geopolitical sensitivity surrounding water negotiations. Water diplomacy in the Nile Basin is often influenced by national interests and strategic alliances, making it difficult to access firsthand policy discussions. Government officials and negotiators may be reluctant to disclose detailed information, limiting the scope of primary data collection. To mitigate this challenge, the study incorporates expert interviews and policy analyses to provide a well-rounded perspective. Additionally, the study acknowledges the complexity of water governance, which involves multiple stakeholders, including governments, international organizations, and local communities. While efforts are made to capture diverse viewpoints, certain perspectives may be underrepresented due to data constraints. The research aims to address this by synthesizing insights from various sources to ensure a balanced and informed analysis.

Delimitations : This study focuses specifically on South Sudan's Nile water security, excluding broader hydro-political dynamics outside the Nile Basin. While water governance is a global issue, the research maintains a regional scope to provide a targeted analysis of South Sudan's challenges and opportunities. This delimitation ensures a concentrated examination of the country's legal, diplomatic, and environmental concerns. While recognizing the role of environmental factors in water security, the study primarily emphasizes legal and diplomatic aspects of governance. Climate change and ecological considerations are acknowledged as influencing factors, but the core analysis remains centered on policy frameworks and negotiation strategies. This approach allows for a focused investigation into the structural impediments affecting South Sudan's water rights. Furthermore, the study does not extend to broader geopolitical conflicts beyond water governance. While regional tensions may intersect with water security, the research maintains a specific focus on transboundary water management. By delineating the scope in this manner, the study ensures a precise and actionable analysis that directly informs policy and governance discussions.

Organization of the Study

This study is structured as follows: Chapter One introduces the research focus, outlining objectives, significance, and the conceptual framework. Chapter Two provides a literature review, exploring existing scholarship on Nile water governance and colonial treaties. Chapter Three details the research methodology, including data collection and analytical approaches. Chapter Four presents findings and discussions based on empirical analysis. Chapter Five offers conclusions and policy recommendations for South Sudan's water security.

Conceptual Framework



Sources: Researchers

II. LITERATURE REVIEW

Role of Regional Institutions in Mitigating Conflicts : Regional institutions play a pivotal role in mitigating conflicts by providing structured mechanisms for dialogue, mediation, and conflict resolution among member states or communities. These bodies such as the African Union (AU), the Intergovernmental Authority on Development (IGAD), and the East African Community (EAC) offer platforms for preventive diplomacy, early

warning systems, and peacekeeping missions. Their ability to mobilize collective action and apply peer pressure often serves as a stabilizing force, particularly in fragile or post-conflict states. Moreover, regional institutions contribute to conflict mitigation by addressing root causes such as political exclusion, economic marginalization, and weak governance. Through initiatives like cross-border development programs, electoral monitoring, and support for democratic institutions, they foster long-term peace and stability. In regions like the Horn of Africa and the Great Lakes, such interventions are particularly vital given the interconnected nature of security threats.

The Importance of Regional Water Governance Institutions : Regional water governance institutions like the Nile Basin Initiative (NBI) play a critical role in managing transboundary water resources and preventing conflict among riparian states. The NBI was formed in 1999 as a transitional mechanism to foster cooperation among Nile Basin countries by ensuring the sustainable and equitable use of the Nile's waters. Its core objectives include data sharing, cooperative development, and building mutual trust among member states. Through technical programs such as the Shared Vision Program (SVP), the NBI has facilitated joint planning and dialogue platforms which are crucial in transforming historically hostile water relations into collaborative ones (NBI, 2012).In conflict-prone regions such as the Nile Basin, the presence of a multilateral institution helps shift the discourse from unilateral national interests to shared regional goals. For example, countries like Kenya, Uganda, and Tanzania have utilized the NBI framework to implement joint water projects and hydrological monitoring systems. These cooperative activities not only enhance regional integration but also serve as peacebuilding mechanisms by aligning development interests. Studies have shown that such institutions reduce uncertainty, promote transparency, and create incentives for peaceful negotiations over shared resources (Sadoff & Grey, 2002). However, while the NBI promotes collaboration, its voluntary and non-binding nature limits its authority to enforce agreements, particularly when upstream and downstream interests diverge significantly. For example, Egypt, heavily reliant on the Nile for over 95% of its water, has historically insisted on maintaining its "historic rights," whereas upstream countries argue for equitable and reasonable utilization. This legal ambiguity has posed challenges to NBI's ability to function as an authoritative institution (Cascão, 2009). Despite this, the continued existence of the NBI reflects a significant institutional effort toward reducing water-related tensions.
For South Sudan, the NBI presents an opportunity to engage diplomatically in regional water governance and avoid future isolation. Since joining in 2012, South Sudan has shown intent to align with the cooperative goals of the NBI, but its participation has been hampered by internal conflict, limited human resource capacity, and weak institutional structures. These constraints make it difficult for the country to fully benefit from the technical and diplomatic platforms offered by regional organizations (Hussein & Grandi, 2017).

Limitations and Structural Weaknesses of Regional Institutions : Despite their potential, regional institutions such as the NBI face structural weaknesses that reduce their effectiveness in conflict mitigation. A major limitation is the unequal power relations between member states, where countries like Egypt and Ethiopia wield disproportionate influence. These asymmetries often hinder consensus-building and create an environment where stronger states can block or delay agreements that do not align with their national interests. As a result, regional mechanisms sometimes serve more as consultative forums than binding decision-making bodies (Zeitoun & Warner, 2006). Moreover, the NBI operates without a legally binding framework that all riparian countries have signed. The Cooperative Framework Agreement (CFA), introduced to replace the outdated 1959 Nile Water Agreement, has not been universally accepted. Egypt and Sudan, for instance, have refused to sign the CFA due to clauses that would alter their current water share. This impasse undermines the NBI's legitimacy and exposes its inability to resolve core disputes, especially when member states fall back on unilateral actions (Tawfik, 2016). In addition to legal and power asymmetries, the lack of financial independence is a critical structural weakness. The NBI relies heavily on international donors such as the World Bank and European Union for funding. This external dependence limits its autonomy and can influence the prioritization of projects based on donor preferences rather than regional needs. Consequently, member states may perceive the NBI as externally driven and not fully representative of local priorities (Swain, 2011). Furthermore, bureaucratic inefficiencies and overlapping mandates with other regional bodies like IGAD and the African Union contribute to institutional fatigue. Coordination gaps, coupled with the absence of enforcement mechanisms, mean that recommendations and action plans are often not implemented. For countries like South Sudan, navigating this fragmented institutional landscape becomes particularly challenging, thereby diluting the country's engagement in meaningful water diplomacy (Hussein & Grandi, 2017).

NBI and Peacebuilding Through Hydrodiplomacy : Hydrodiplomacy using water as a means to foster dialogue and build peace—has emerged as a key role for regional institutions like the NBI. By promoting joint management of transboundary waters, the NBI fosters trust and interdependence among its members. This approach has been particularly useful in de-escalating tensions between countries with conflicting interests, such as Ethiopia and Egypt. The regular exchange of data and meetings has enabled parties to understand each other's water needs and constraints (Zeitoun et al., 2011). One of the most successful elements of the NBI has been its focus on technical cooperation. The NBI's Eastern Nile Technical Regional Office (ENTRO) has carried out several hydrological studies and infrastructure development plans that benefit multiple countries. For example, the Eastern Nile Flood Preparedness and Early Warning Project has improved transboundary responses to flooding, reducing human and economic losses in Ethiopia and Sudan (ENTRO, 2014). These technical collaborations build confidence, even when political negotiations are stalled. In post-conflict states such as South Sudan, participation in such technical networks serves dual purposes: it supports capacity building and fosters reintegration into the regional system. Through NBI, South Sudanese engineers and policymakers have access to training, hydrological models, and shared data platforms, which are critical for national development planning. These engagements also provide the diplomatic exposure necessary for South Sudan to assert its water interests regionally (NBI, 2020). Despite these benefits, critics argue that hydrodiplomacy under the NBI is still constrained by nationalistic policies and limited political will. Without broader political buy-in from top leadership in each member country, the outcomes of technical diplomacy may not translate into durable political solutions. Thus, the role of regional institutions in peacebuilding remains conditional upon the commitment of national governments (Cascão & Zeitoun, 2010).

South Sudan's Participation and Future Prospects in Regional Water Institutions : South Sudan's entry into the NBI offers a critical opportunity to influence regional water governance, but the country faces several internal and external constraints. Internally, South Sudan struggles with limited institutional capacity, insufficient water infrastructure, and political instability. These factors inhibit its ability to engage meaningfully in NBI discussions or contribute technically to joint projects (Hussein & Grandi, 2017). Externally, South Sudan's late entry into the regional water discourse means it must navigate pre-existing tensions and alliances. With Egypt and Sudan closely aligned on water rights, and Ethiopia challenging those positions, South Sudan must adopt a carefully balanced foreign policy. Given its geographic location and the potential to contribute significant flow to the Nile system, South Sudan's alignment or neutrality could have long-term implications for regional power dynamics (Yacob Arsano, 2007). To enhance its participation, scholars recommend that South Sudan prioritize national water policy development, invest in institutional reforms, and seek capacity-building support through bilateral and multilateral partnerships. Aligning with the objectives of the CFA and cooperating on joint water development projects would further establish South Sudan as a constructive regional actor. Engagement with civil society and local stakeholders is also necessary to ensure that national water governance aligns with the country's development goals (Tawfik, 2016). Looking forward, South Sudan's full integration into regional water governance institutions like the NBI will depend on political stability, sustained investment in human capital, and strategic diplomacy. With the right policy choices, the country can transition from a marginal player to a central actor in shaping the future of the Nile Basin—a region where cooperation over shared waters is vital for peace, prosperity, and sustainability (Swain, 2011).

Impacts of Water Insecurity on South Sudan's Economic Development and Environmental Sustainability
The following are some of the impacts posed by water insecurity on South Sudan's economic development and environmental sustainability

Dependence on Water for Agricultural Productivity : Agriculture forms the backbone of South Sudan's economy, contributing significantly to GDP and employing the majority of the population. However, agricultural productivity is largely dependent on rainfall and the seasonal flow of rivers like the Nile. The lack of reliable irrigation systems makes the sector highly vulnerable to climate variability. Prolonged dry spells or floods often result in crop failure, undermining food security and rural livelihoods (FAO, 2020). The country's rain-fed agriculture is especially at risk during periods of drought, which have become more frequent due to climate change. The FAO notes that each year, thousands of hectares of farmland are rendered unproductive, contributing to spikes in malnutrition and hunger. For example, in Jonglei and Unity states, flooding has destroyed sorghum and maize crops, displacing thousands of farmers and forcing communities to rely on humanitarian aid (FAO, 2020). Furthermore, livestock farming, which is central to rural livelihoods, is also threatened by water insecurity. Reduced access to drinking water for animals, coupled with shrinking grazing lands due to water shortages, has triggered pastoralist conflicts and increased vulnerability in border regions. The seasonal migration of herders in search of water has often led to intercommunal tensions, compounding the

broader security and economic challenges (UN OCHA, 2019). With agriculture being the primary source of income and food, water insecurity severely undermines national development objectives. Without investment in water infrastructure such as dams, boreholes, and irrigation systems, the sector will continue to suffer from inefficiencies and poor resilience. As a result, poverty, food insecurity, and underdevelopment remain entrenched across much of rural South Sudan (World Bank, 2021).

Water Insecurity and Environmental Degradation : South Sudan is home to one of Africa's most important ecosystems the Sudd wetlands, a massive freshwater swamp formed by the White Nile. This ecosystem is vital for biodiversity, water filtration, and climate regulation. However, increasing water insecurity and poor governance are accelerating environmental degradation in the region. The drying up of streams, pollution, and the destruction of wetlands are now common phenomena (UNEP, 2018). Human activities such as logging, oil extraction, and unregulated agriculture are placing immense pressure on the wetlands. These activities, when combined with erratic water flows caused by upstream damming and changing rainfall patterns, have led to habitat loss for key species and increased greenhouse gas emissions due to wetland drying. The Sudd's delicate ecological balance is being lost due to insufficient environmental protection policies (UNEP, 2018). Cross-border water infrastructure projects, particularly Ethiopia's Grand Ethiopian Renaissance Dam (GERD), also affect the downstream flow into South Sudan. Altered flow regimes can reduce seasonal flooding that supports the Sudd wetlands' health and productivity. As Ethiopia prioritizes hydroelectric power generation, downstream ecosystems, including South Sudan's biodiversity hotspots, may be irreversibly harmed without adequate environmental safeguards (Cascão, 2009). Moreover, the lack of a national environmental policy that integrates water conservation with development planning is a major challenge. Environmental impact assessments (EIAs) are either absent or poorly enforced, allowing harmful development to proceed unchecked. This undermines both environmental sustainability and the resilience of local communities who depend on natural ecosystems for survival (Hussein & Grandi, 2017).

Economic Consequences of Water Insecurity : Water insecurity is a significant impediment to South Sudan's economic transformation. The country has substantial potential for agricultural commercialization, hydropower development, and fisheries but these sectors remain largely untapped due to inconsistent and inadequate water supply. This creates a vicious cycle of low productivity, limited employment opportunities, and overreliance on subsistence farming (World Bank, 2021). Hydropower is a critical area where water security can directly impact economic growth. South Sudan has several rivers capable of supporting small- and medium-scale hydroelectric projects, yet the lack of planning and investment has kept electricity access extremely low. Only 1–2% of the population has access to electricity, limiting industrial development and service delivery in rural areas (AfDB, 2020). Additionally, poor access to clean water and sanitation negatively impacts health outcomes. Waterborne diseases such as cholera and typhoid remain common, particularly in urban slums and internally displaced person (IDP) camps. The resulting public health burden reduces labor productivity and increases healthcare costs for the government and families alike (WHO, 2021). Grey and Sadoff (2007) argue that water security is not only foundational for economic development but also for peace and political stability. Where water is scarce, competition intensifies, leading to local and regional conflicts. Therefore, for South Sudan to achieve sustainable growth, it must prioritize investment in integrated water resource management (IWRM), infrastructure, and water diplomacy (Grey & Sadoff, 2007).

Health, Human Security, and Social Stability : Water insecurity also poses significant risks to human security and public health in South Sudan. In areas lacking clean water, communities are forced to rely on contaminated sources such as ponds, rivers, and open wells, which expose them to waterborne illnesses. The World Health Organization reports that thousands of people, particularly children, die each year due to diseases linked to poor water quality (WHO, 2021). The situation is worsened by the displacement caused by floods and droughts, which often destroy water infrastructure and sanitation facilities. IDPs in camps or host communities experience acute water shortages, overcrowded facilities, and insufficient hygiene. This leads to frequent disease outbreaks and creates conditions ripe for malnutrition and gender-based violence, especially affecting women and girls who bear the burden of water collection (UNICEF, 2020).Water scarcity also intersects with social instability. In many pastoral communities, conflicts erupt over access to water points during the dry season. These localized water-related disputes often escalate into violent clashes, especially in regions where state authority is weak or absent. This undermines peacebuilding efforts and worsens the security situation, particularly in Lakes, Jonglei, and Upper Nile States (IGAD, 2020). To mitigate these challenges, South Sudan must treat water as a critical security issue. This means not only expanding access to safe water and sanitation but also integrating water management into broader policies related to climate adaptation, conflict prevention, and rural development.

Such a holistic approach is essential to achieving long-term peace and human development (Hussein & Grandi, 2017).

Policy Recommendations for Enhancing South Sudan's Participation in Water Governance Frameworks
Some of policy recommendations to enhance South Sudan's participation in Water Governance Frameworks are outlined below, as discussed deeply;

Strengthening National Water Policy and Institutional Capacity : South Sudan's participation in regional water governance is hampered by the absence of a comprehensive national water policy. Unlike older Nile Basin members, South Sudan lacks a clearly defined legal framework that articulates its water rights, usage priorities, and development plans. A robust policy is essential to guide water resource management, define responsibilities among institutions, and integrate national plans with regional obligations (Hussein & Grandi, 2017). A well-formulated national water policy should address issues such as transboundary water rights, irrigation development, urban water supply, sanitation, and climate resilience. It should also provide clear provisions for stakeholder participation and data transparency. This would enable South Sudan to align its domestic water agenda with regional frameworks such as the Cooperative Framework Agreement (CFA) and the Nile Basin Initiative's Strategic Action Program (NBI, 2020). Institutionally, the Ministry of Water Resources and Irrigation in South Sudan is underfunded and understaffed. There is a lack of qualified personnel, research infrastructure, and budgetary support to enable effective policy implementation. Building institutional capacity therefore involves not just training, but also restructuring ministries and agencies to allow for better coordination, monitoring, and planning (World Bank, 2021). Without addressing these gaps, South Sudan risks becoming a passive participant in regional discussions. A strong institutional framework at home will empower national representatives to negotiate from an informed and credible position within the Nile Basin and other international water platforms (Zeitoun & Mirumachi, 2008).

Capacity Building and Technical Empowerment : To effectively participate in transboundary water governance, South Sudan must invest in the technical capacity of its water professionals and diplomats. Many of the discussions within the Nile Basin Initiative are technical in nature, involving hydrology, legal instruments, and integrated water resource management (IWRM). Without skilled personnel in these areas, South Sudan remains at a disadvantage in regional negotiations (Cascão & Zeitoun, 2010). Training programs should target engineers, policy analysts, legal advisors, and environmental scientists. These professionals need knowledge in areas such as international water law, GIS mapping, climate modeling, and basin-wide planning. Academic institutions and training centers across Africa including in Egypt, Ethiopia, and Kenya can be leveraged for regional exchanges and scholarships (Swain, 2011). Moreover, developing local research capacity is crucial. South Sudan lacks baseline data on water usage, hydrological patterns, and infrastructure mapping. Universities, research institutes, and civil society organizations must be supported to generate, store, and disseminate data that informs policy and negotiations. This also ensures evidence-based planning, a critical aspect of long-term water governance (Tawfik, 2016). International partners, such as the United Nations Development Programme (UNDP), GIZ, and the African Development Bank, can be engaged to support institutional strengthening through technical assistance, funding, and long-term mentorship programs. By equipping its technical cadre, South Sudan can play a more assertive and informed role in shaping regional water strategies (Zeitoun & Mirumachi, 2008).

Regional Cooperation and Diplomacy : South Sudan's success in water governance depends heavily on strategic regional diplomacy. Given the complex politics surrounding Nile Basin water allocation particularly the standoff between Egypt, Sudan, and Ethiopia over the Grand Ethiopian Renaissance DamSouth Sudan must craft a neutral but proactive diplomatic position. By playing a bridging role, South Sudan could become a mediator or coalition-builder in future water talks (Arsano, 2007). Engaging actively in the Nile Basin Initiative's institutional organs such as the Nile Technical Advisory Committee (Nile-TAC) and the Council of Ministers of Water Affairs (Nile-COM) enables South Sudan to voice its concerns, contribute to basin-wide planning, and defend its water interests. This also enhances the country's visibility and relevance in regional discussions (NBI, 2020). In addition, regional bodies such as IGAD and the African Union offer platforms for multilateral water cooperation beyond the NBI. For example, IGAD's Drought Resilience and Sustainability Initiative can be aligned with South Sudan's national development goals. These bodies can help coordinate transboundary infrastructure, share early warning systems, and provide political backing for negotiations (IGAD, 2019). Furthermore, water diplomacy should be linked to broader foreign policy strategies, including trade, peacebuilding, and regional integration. Stronger diplomatic representation in Cairo, Addis Ababa, and

Khartoum is necessary for real-time engagement. South Sudan's diplomats should be trained in both political negotiation and technical water issues to ensure a well-rounded foreign policy approach (Grey & Sadoff, 2007).

Inclusive Policy Reforms and Stakeholder Engagement : Effective water governance must be inclusive and participatory. In South Sudan, water-related decision-making has historically been top-down, often excluding local communities, civil society, and private stakeholders. For the country to effectively manage its water resources and engage regionally, it must adopt policies that incorporate diverse voices, especially those directly affected by water scarcity or flooding (UNEP, 2018). Rural communities, women, and pastoralists are particularly vulnerable to water insecurity. Their input is essential in identifying sustainable solutions and ensuring policies are socially equitable. Community water user associations, NGOs, and faith-based groups can serve as key partners in implementing decentralized water management systems that respond to local realities (UNICEF, 2020). Decentralized governance also enables the integration of traditional knowledge systems into modern water management practices. Many communities along the Nile and its tributaries have long-standing water conservation techniques that, if recognized and supported, can complement scientific approaches. This inclusive approach enhances ownership, accountability, and sustainability of policies (Tawfik, 2016).Finally, policy reforms must also ensure transparency, legal clarity, and accountability. Clear mechanisms for dispute resolution, water licensing, environmental safeguards, and public reporting should be integrated into water laws. These reforms not only promote domestic effectiveness but also enhance South Sudan's credibility in transboundary water negotiations (Zeitoun & Warner, 2006).

Geopolitical Tensions among Nile Basin Countries: Competing Interests of Egypt, Sudan, and Ethiopia
Below are key tensions and competing interest's factors in Nile Basin Countries;

Egypt's Historical Dominance and National Security Concerns : Egypt has historically maintained a dominant position in Nile Basin politics, viewing the Nile River as a matter of existential importance. Over 95% of Egypt's population lives along the river, and the country depends on the Nile for almost all of its freshwater needs. Colonial-era treaties, particularly those signed in 1929 and 1959, granted Egypt substantial water rights 55.5 billion cubic meters annually while excluding upstream states from meaningful participation (Waterbury, 2002). These agreements, signed without the involvement of Ethiopia or other upstream riparian nations, entrenched a perception of entitlement in Egyptian policy and strategic thinking. Egypt has long considered any reduction in Nile water flow as a direct threat to its national security. This view has been reinforced by successive Egyptian leaders, including President Anwar Sadat, who warned that any interference with the Nile waters would be a casus belli (Swain, 2011). Egypt's opposition to the Grand Ethiopian Renaissance Dam (GERD) stems from fears that the dam will reduce the flow of water during the filling period, harming its agricultural sector and leading to potential water shortages. Despite Ethiopia's reassurances that GERD is intended solely for hydropower and not for irrigation, Egypt remains skeptical and insists on a legally binding agreement that guarantees minimum annual flows (Tawfik, 2016). Cairo has sought international mediation from bodies such as the African Union, United Nations, and the United States. However, these mediation attempts have yet to yield a comprehensive solution. Egypt's diplomatic strategies have also involved leveraging its historical and political alliances to pressure Ethiopia into concessions, further intensifying regional tensions (Yacob Arsano, 2007).

Ethiopia's Hydropower Ambitions and Sovereign Rights : Ethiopia, the source of over 85% of the Nile's water through the Blue Nile, has historically been marginalized in the distribution of Nile waters. The construction of the Grand Ethiopian Renaissance Dam (GERD), initiated in 2011, marks Ethiopia's effort to assert its rightful share of Nile resources for national development. The dam is expected to generate over 6,000 MW of electricity, transforming Ethiopia into a key regional energy exporter (Yacob Arsano, 2007). For Ethiopia, GERD symbolizes both economic progress and national pride. The project has been largely self-financed through public contributions and bonds, reflecting widespread domestic support. Ethiopian leaders have consistently framed GERD as a sovereign right to develop natural resources, emphasizing that it will bring benefits not only to Ethiopia but also to downstream neighbors through regulated water flow and reduced flooding (Cascão & Zeitoun, 2010). Despite these claims, Ethiopia's decision to proceed with filling the dam before reaching a final agreement with Egypt and Sudan has triggered alarm. Egypt has accused Ethiopia of acting unilaterally, while Ethiopia argues that negotiations have been stalled by unreasonable demands. This deadlock has exposed the limitations of existing water governance frameworks like the Nile Basin Initiative, which lack enforceable legal mechanisms (Swain, 2011). Nevertheless, Ethiopia maintains that GERD will not cause significant harm and that modern engineering techniques ensure downstream flow can be managed safely. Ethiopia's emphasis on equitable and reasonable use is in line with international water law, yet without a

mutually agreed timetable for filling the reservoir and conflict resolution protocols, trust among the parties remains fragile (Tawfik, 2016).

Sudan's Shifting Position and Geostrategic Dilemmas : Sudan holds a complex position in the Nile Basin dispute, geographically and politically situated between Egypt and Ethiopia. Initially supportive of GERD, Sudan highlighted the benefits of reduced flooding, improved water regulation, and access to cheap electricity. Sudan's Roseires and Sennar dams, for instance, could operate more efficiently due to the regulated flow from GERD (International Crisis Group, 2020). However, as the project progressed, Sudan became more cautious—especially over concerns regarding dam safety, lack of data sharing, and coordination on water release. The absence of binding agreements on dam operation and emergency protocols raised fears that unilateral actions by Ethiopia could jeopardize Sudan's own water infrastructure and national security (IGAD, 2019). Adding to the complexity is Sudan's internal political instability, with frequent leadership transitions and competing centers of power. The transitional government has struggled to maintain a consistent foreign policy, oscillating between aligning with Egypt and pursuing independent cooperation with Ethiopia. This ambiguity reflects broader regional pressures and the need to balance short-term interests with long-term security (Tawfik, 2016). Sudan's potential role as a mediator in the dispute has also been limited by its domestic crises and lack of diplomatic leverage. While it stands to gain from enhanced regional integration, its position remains largely reactive. To safeguard its interests, Sudan has emphasized the need for legally binding mechanisms governing GERD operations and regional consensus on water-sharing principles (Yacob Arsano, 2007).

South Sudan's Role and the Need for Strategic Neutrality : South Sudan, although not directly involved in the GERD dispute, occupies a crucial geographic and political position in the Nile Basin. As a newly independent state and a contributor to the White Nile's flow, South Sudan's water interests intersect with those of the broader region. However, the country's limited institutional capacity and ongoing political instability hinder its active participation in regional water diplomacy (Hussein & Grandi, 2017). Aligning too closely with any one party Egypt, Sudan, or Ethiopia could have significant geopolitical and economic repercussions. Egypt has historically supported South Sudan diplomatically and through development aid, while Ethiopia is a key regional player in IGAD and peace processes. As such, South Sudan's best approach is to adopt a strategic neutrality that emphasizes cooperation, dialogue, and mutual benefit (Tawfik, 2016). South Sudan has the potential to serve as a neutral platform for conflict resolution and technical collaboration. Its involvement in the Nile Basin Initiative and support for the Cooperative Framework Agreement (CFA) could enhance regional cohesion and reinforce the principle of equitable and reasonable use of water resources. Such an approach would also help South Sudan build diplomatic capital and secure development assistance (Grey & Sadoff, 2007). To achieve this, South Sudan must invest in institutional capacity, water diplomacy training, and regional engagement. By positioning itself as a consensus-builder rather than a competitor, the country can contribute to long-term peace and cooperation in the Nile Basin. This strategic engagement is not only in the national interest but also essential for the stability of the region (Swain, 2011).

Summary of Literature and Research Gap : The existing literature on water governance in the Nile Basin extensively discusses the interplay of institutional frameworks, hydropolitics, and resource management. Scholars have acknowledged the significance of regional bodies like the Nile Basin Initiative (NBI) in promoting cooperation among riparian states through dialogue, data sharing, and joint projects. These institutional mechanisms are vital in diffusing tensions and supporting collective water management. However, the NBI's non-binding nature and lack of enforcement capacity have limited its effectiveness, particularly in high-stakes political disputes such as those involving the Grand Ethiopian Renaissance Dam (GERD). A central theme in the literature is the persistent power asymmetry among Nile Basin states, particularly the dominance of Egypt and the rising assertiveness of Ethiopia. Egypt's historical claims, rooted in colonial-era treaties, clash with Ethiopia's emphasis on equitable utilization of water for development. Sudan's shifting position—oscillating between alignment with Egypt and cautious cooperation with Ethiopia—further illustrates the complexity of regional dynamics. These tensions are amplified by diverging national interests, weak regional legal instruments, and limited dispute resolution mechanisms.

While the geopolitical dimensions of Nile water governance have been extensively examined, most studies tend to focus disproportionately on the trilateral relations among Egypt, Sudan, and Ethiopia. As such, the discourse often neglects the perspectives and policy needs of newer or smaller riparian states like South Sudan. Despite being a recognized member of the NBI since 2012, South Sudan is often treated as a peripheral actor in both policy discussions and academic literature, largely due to its relatively recent statehood and fragile political and

economic institutions. Few scholarly works explore South Sudan's strategic positioning, its domestic water governance challenges, or the potential roles it could play in shaping regional outcomes. This underrepresentation in academic and policy analyses is a critical gap, especially considering South Sudan's geographic importance as a contributor to the White Nile and its emerging potential in hydropower and agriculture. Moreover, given South Sudan's vulnerability to climate change, internal displacement, and food insecurity all of which are closely linked to water access its exclusion from broader water diplomacy discussions is both problematic and unsustainable. Additionally, the literature lacks comprehensive assessments of South Sudan's institutional readiness, diplomatic engagement strategies, and technical capacity in the context of transboundary water governance. There is limited research on how the country could strengthen its national water policy, integrate into regional legal frameworks like the Cooperative Framework Agreement, or leverage regional institutions for technical and diplomatic support. These omissions create a blind spot in understanding the full spectrum of governance challenges and opportunities in the Nile Basin. This study seeks to fill this gap by shifting the analytical lens toward South Sudan's role in the Nile Basin. It aims to provide context-specific insights into the country's participation in regional water governance, its strategic options amid geopolitical rivalries, and actionable policy recommendations. By foregrounding South Sudan in the discourse, this research contributes to a more inclusive and comprehensive understanding of Nile Basin dynamics and highlights the importance of equitably involving all riparian states in transboundary water decision-making.

III. RESEARCH METHODOLOGY

Research Design : According to Cooper and Schindler (2014), the research design refers to the overall strategy that the researcher will use to integrate the different components of the study in a coherent and logical way, while ensuring the research problem is effectively addressed. This is a formal study where the researcher adopts a descriptive research design.

Population and Sampling Design

Population : According to Cooper and Schinder (2014), population is the total collection of elements about which researcher wish to make some inference. The target population of the study will comprise of both female and male respondents.

Sampling Type : The study will employ stratified sampling technique as a sampling type. This will ensure that all sub- groups in the population will include in the study. Stratified random sampling technique is cited as having increased sample's statistical efficiency and provides adequate data for analyzing the various sub population (Cooper and Schinder, 2014).

Sample size : Sample size refers to the number of units that are chosen from gathered population. The sample size of this study is 50 respondents randomly selected from the target population. The sample size is calculated using the questionnaire and the interview, according to Taro Yemen the formula of sample size is given by

$n=N/(1+N(e)2$) Where

n is the sample size

N is the population

e is the margin error

Let the margin area be at the confident interval of 90%

100% - 90% = 10%, where 10% is 0.1

$n=85/(1+70(0.1)2$)=85/(1+70(0.01)) n=85/(1+0.7)=85/(1.7)= 50 =50

Data Collection instruments : The methods of data collection will be primary and secondary data to be used for study.

Secondary data : Secondary data will be gathered from studies, surveys, or experiments that had been ran by other people or from another research. Typically, a researcher will begin a project by working with secondary data. This allows time to formulate questions and gain an understanding of the issues being dealt with before the more costly and time-consuming operation of primary data

Primary data : Primary data that is collected by a researcher from first- hand source, using methods like survey, interview, or experiments. It is collected with the research project in mind, directly from data collection method as a mean gathering findings. Therefore, primary data have the following components, there two ways used in collecting data for research study these will be as follow: Questionnaire and Interview

Interview : This was a conversation held with a person whose views were being sought on a certain subject matter. This entailed asking questions, seeking opinions, idea and thought as regards the subject matter and receiving answers for the question as well as expressing ideas and opinions. Though the interview, the interview would be able to deduce the extent of reliance on what the interview was saying his interest and expression. Interview was therefore used as a method of collection data in this research work, for it was very effective and efficient way of communication as it was only first- hand information that was passed in the course of the interview.

Questionnaire : Researcher will use questionnaire interviews and face- to- face structured interview that would verify baseline information gathered from the civil population. The secondary data, which are collected from the textbook, journals, seminars and others, are used in chapter two. Data will be collected by means of structured questionnaire and interview with close- ended and open- ended questions a total of 50 questionnaire will be distributed.

Piloting of Research Instruments. : This involves the checking of the suitability of the questionnaires and interview guide. The quality of research instruments determines the outcome of the study. Alan and Emma (2011) point out that the quality of research outcome is determined by the quality of instruments. Mugenda and Mugenda (2003) states that a relatively small sample of 10 to 20 respondents can be chosen from the population during piloting which is not included in the sample chosen for the main study. The pilot group will be acquired through random sampling. Mugenda and Mugenda (2003) suggest that the piloting sample should be 10% of study sample depending on sample size. Piloting helps in revealing questions that are vague to allow for their review. The pre-test also allows the researcher to check on whether the variables collected could easily be processed and analyzed. Hence 10% of the 200 respondents will be 20 respondents. The 20 respondents who will be used for piloting will be picked from the within University of Juba. After the piloting, the questions in the questionnaire will be assessed and those that are found not to be clear will be polished for clarity.

Measurement of Validity and Reliability of Research Instruments

Measurement of Validity : According to Oso and Onen (2008), validity refers to the extent to which research results can be accurately interpreted and generalized to other populations. It was the extent to which research instruments measure what they are intended to measure. To control the quality and ensure validity of the study, the researcher will be distributing questionnaires to different groups at different times, and the results obtained thereafter shall be measured in order to ascertain consistency which will entail that the results obtained can be generalized to other populations or other group settings.

Measurement of Reliability : Bell (1999) defined reliability as an extent to which a questionnaire, test, observation or any measurement procedure produces the same results on repeated trials. To control the quality and ensure reliability of the study, the researcher piloted a test-retest by distributing questionnaires repeatedly at different times, and the results obtained thereafter was compared if they were similar. Measuring instrument is said to be reliable if it produces consistent results when administered to the same individuals Research Procedures To ensure compliance with ethical issues in relation to research, permission will be sought, where a full disclosure of all activities concerning the study are to be explained to the concerned parties indicating the purpose of the study. The questionnaires will be administered and to enhance confidentiality, the researcher will not require the respondents to indicate their names in the questionnaire. Respondents respond to the questionnaires on a voluntary basis. Confidentiality will be observed.

Data Analysis Methods : Data analysis is the process of systematically searching, organizing, and breaking data into manageable units then synthesizing the data to search for patterns. Data will be collected from the respondent will first be checked for completeness and comprehensiveness. It is then to be coded to classify the answer to a question into meaningful categories so as to bring out their essential pattern. The data will be analyzed using both quantitative and qualitative techniques which involved creating description of the statistics i.e. percentages and frequencies. Data will be presented in- graphs and tables where necessary. Summary responses will be weighed against the research objectives and some meaning derived. The researcher will use statistical software, to do data analysis. The analysis will help the researcher in making valid inferences about the topic under study.

IV. RESULTS AND DISCUSSIONS

Demographic Information

Table 4.1**: Age of Respondents**

Age	**Frequency**	**Percentage (%)**
18-25	10	20
26-35	20	40
36-45	12	24
46-55	5	10
56 and above	3	6
Total	50	100

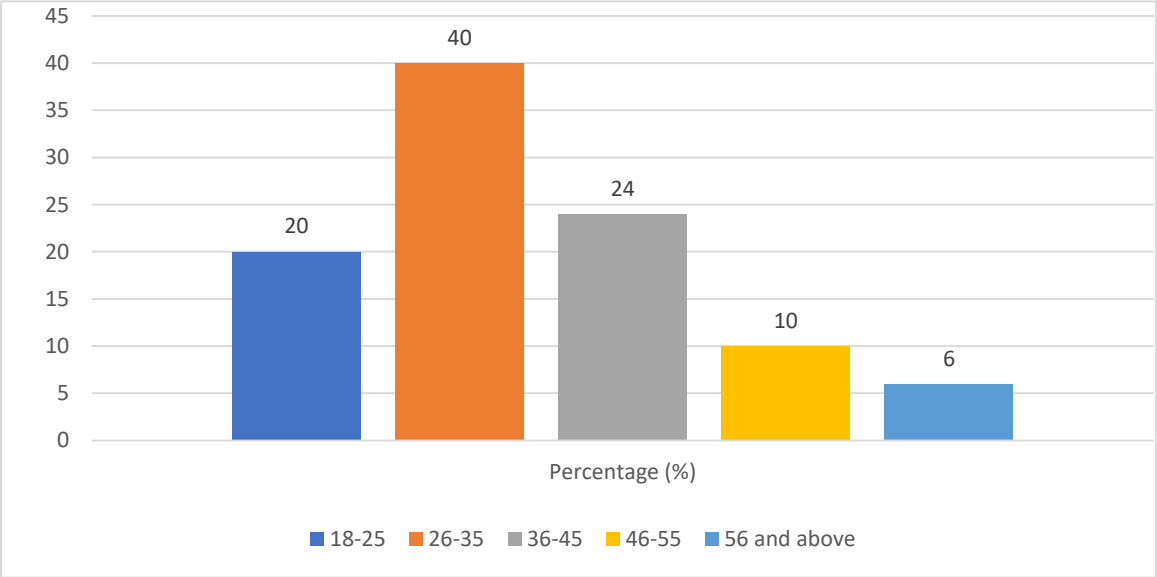


Figure 4.1: Age of Respondents

The table shows that 20 respondents (40%) were aged 26-35, 12 (24%) were 36-45, 10 (20%) were 18-25, 5 (10%) were 46-55, and 3 (6%) were 56 and above. This demonstrates that the majority of respondents were young adults, implying that the younger population is more engaged in discussions on water security in South Sudan.

Table 4.2**: Gender of Respondents**

Gender	**Frequency**	**Percentage (%)**
Male	30	60
Female	20	40
Total	50	100

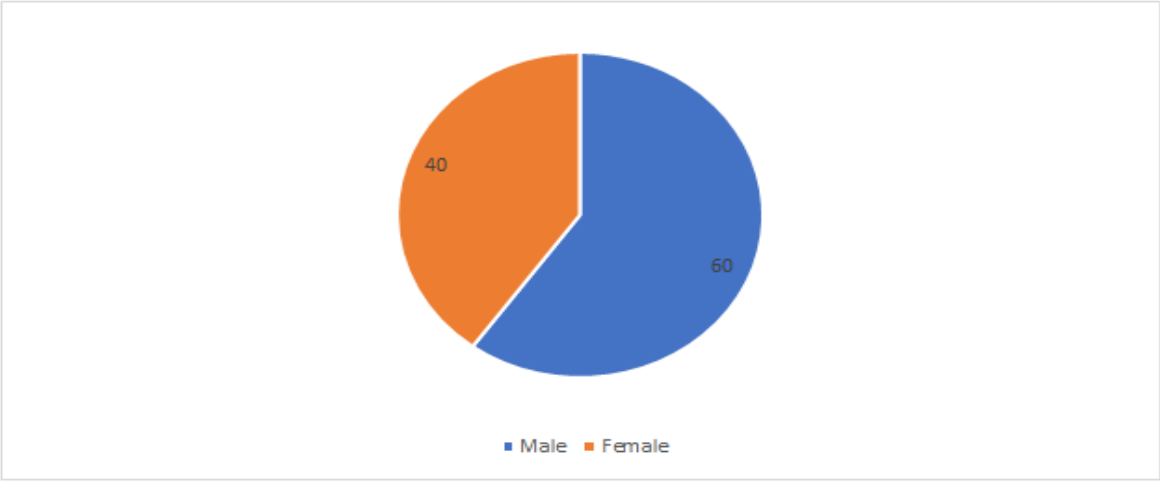


Figure 4.2: Gender of Respondents

The table shows that 30 respondents (60%) were male, while 20 (40%) were female. This demonstrates that the majority of respondents were male, implying that men dominate discussions and decision-making regarding water security in the study area.

Table 4.3: Education Level of Respondents

Education Level	**Frequency**	**Percentage (%)**
Diploma	8	16
Bachelor Degree	30	60
Ph.D	5	10
Others	7	14
Total	50	100

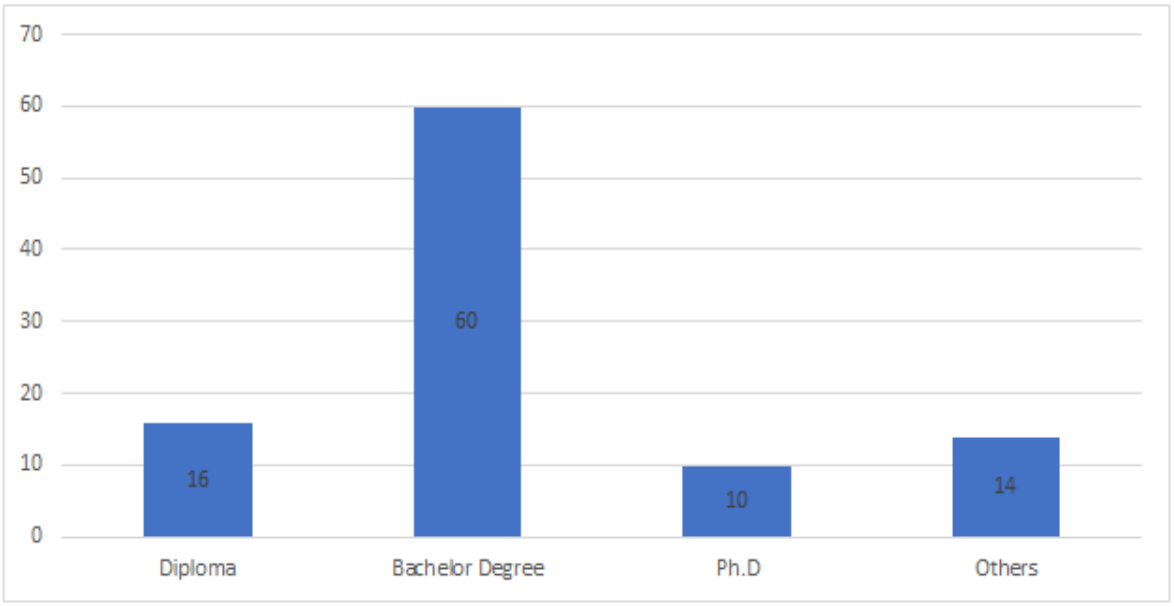


Figure 4.3: Education Level of Respondents

The table shows that 30 respondents (60%) had a Bachelor's degree, 8 (16%) had a Diploma, 5 (10%) had a Ph.D., and 7 (14%) had other qualifications. This demonstrates that the majority of respondents were Bachelor's degree holders, implying that the study relied on educated individuals with knowledge relevant to water security issues.

Table 4.4: Occupation of Respondents

Occupation	**Frequency**	**Percentage (%)**
Government employee	15	30
Private sector	10	20
Civil society	8	16
Student	12	24
Unemployed	5	10
Total	50	100

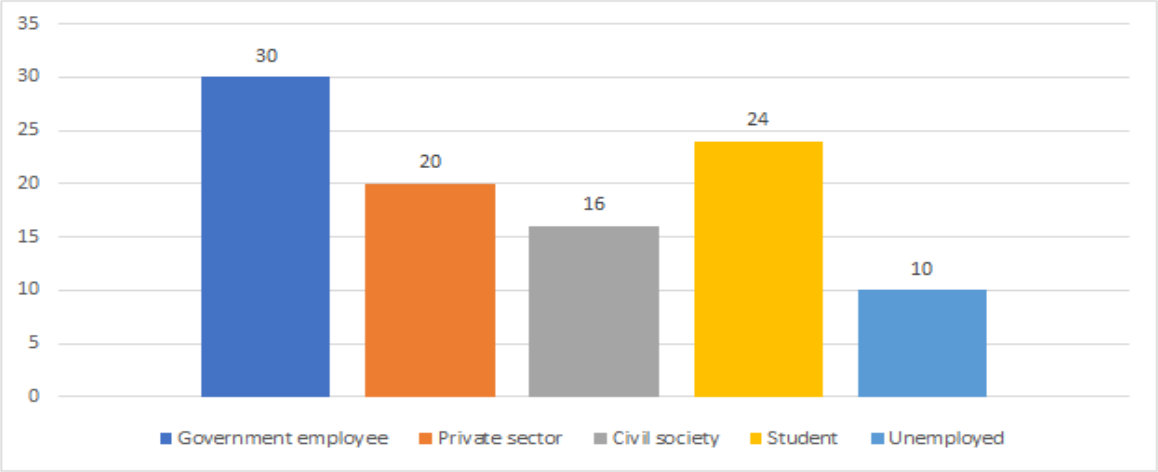


Figure 4.4: Occupation of Respondents

The table shows that 15 respondents (30%) were government employees, 12 (24%) were students, 10 (20%) were in the private sector, 8 (16%) were in civil society, and 5 (10%) were unemployed. This demonstrates that the majority of respondents were government employees, implying that public sector perspectives are critical in discussions on water governance.

Role of Regional Institutions (NBI) in Mitigating Conflicts

Table 4.5: NBI Effectiveness in Mediating Water Disputes

Response	**Frequency**	**Percentage (%)**
Strongly Agree	18	36
Agree	17	34
Neutral	5	10
Disagree	6	12
Strongly Disagree	4	8
Total	50	100

The table shows that 18 respondents (36%) strongly agreed and 17 (34%) agreed that the NBI effectively mediates disputes, while 5 (10%) were neutral and 10 (20%) disagreed or strongly disagreed. This demonstrates

that the majority of respondents believe that NBI is effective in resolving water conflicts, implying confidence in its mediation role.

Table 4.6: NBI Enhances Cooperation

Response	**Frequency**	**Percentage (%)**
Strongly Agree	16	32
Agree	20	40
Neutral	5	10
Disagree	6	12
Strongly Disagree	3	6
Total	50	100

The table shows that 20 respondents (40%) agreed and 16 (32%) strongly agreed that NBI enhances cooperation, while 5 (10%) were neutral and 9 (18%) disagreed or strongly disagreed. This demonstrates that the majority of respondents perceive NBI as improving cooperation, implying that regional institutions play a vital role in reducing conflict risks.

Table 4.7: NBI Provides Adequate Platforms

Response	**Frequency**	**Percentage (%)**
Strongly Agree	15	30
Agree	20	40
Neutral	7	14
Disagree	5	10
Strongly Disagree	3	6
Total	50	100

The table shows that 20 respondents (40%) agreed and 15 (30%) strongly agreed that NBI provides adequate platforms for dialogue, while 7 (14%) were neutral and 8 (16%) disagreed or strongly disagreed. This demonstrates that the majority of respondents believe that NBI facilitates negotiation among Nile Basin countries, implying that the initiative is an effective forum for dialogue.

Table 4.8: South Sudan Benefits from NBI Initiatives

Response	**Frequency**	**Percentage (%)**
Strongly Agree	12	24
Agree	15	30
Neutral	8	16
Disagree	10	20
Strongly Disagree	5	10
Total	50	100

The table shows that 15 respondents (30%) agreed and 12 (24%) strongly agreed that South Sudan benefits from NBI, while 18 (36%) were neutral or disagreed. This demonstrates that the majority of respondents do not fully perceive South Sudan as benefiting from NBI, implying that utilization of regional initiatives is still limited.

Table 4.9: NBI Conflict Resolution Transparency

Response	Frequency	Percentage (%)
Strongly Agree	10	20
Agree	18	36
Neutral	10	20
Disagree	8	16
Strongly Disagree	4	8
Total	50	100

The table shows that 18 respondents (36%) agreed and 10 (20%) strongly agreed that NBI's mechanisms are transparent, while 12 (24%) disagreed or strongly disagreed. This demonstrates that the majority of respondents perceive partial transparency in NBI processes, implying that inclusivity remains a concern.

Impacts of Water Insecurity on Economic Development and Environmental Sustainability

Table 4.10: **Water Scarcity and Agricultural Productivity**

Response	Frequency	Percentage (%)
Strongly Agree	22	44
Agree	18	36
Neutral	4	8
Disagree	5	10
Strongly Disagree	1	2
Total	50	100

The table shows that 22 respondents (44%) strongly agreed and 18 (36%) agreed that water scarcity negatively affects agriculture, while 10% disagreed and 8% were neutral. This demonstrates that the majority of respondents believe that water scarcity significantly impacts agricultural productivity, implying urgent attention is needed for water management in farming sectors.

Table 4.11: Limited Access to Clean Water and Industrial Growth

Response	Frequency	Percentage (%)
Strongly Agree	20	40
Agree	18	36
Neutral	5	10
Disagree	5	10
Strongly Disagree	2	4
Total	50	100

The table shows that 20 respondents (40%) strongly agreed and 18 (36%) agreed that limited water access hinders industrial growth, while 10% disagreed and 10% were neutral. This demonstrates that the majority of respondents perceive water insecurity as a major constraint to industrial and economic development in South Sudan.

Table 4.12**: Water Insecurity and Environmental Degradation**

Response	**Frequency**	**Percentage (%)**
Strongly Agree	21	42
Agree	19	38
Neutral	4	8
Disagree	5	10
Strongly Disagree	1	2
Total	50	100

The table shows that 21 respondents (42%) strongly agreed and 19 (38%) agreed that water insecurity contributes to environmental degradation, while 12% were neutral or disagreed. This demonstrates that the majority of respondents link water scarcity directly to environmental problems, implying that poor water management worsens ecological conditions.

Table 4.13**: Seasonal Droughts and Water Availability**

Response	**Frequency**	**Percentage (%)**
Strongly Agree	20	40
Agree	21	42
Neutral	3	6
Disagree	4	8
Strongly Disagree	2	4
Total	50	100

The table shows that 20 respondents (40%) strongly agreed and 21 (42%) agreed that seasonal droughts reduce water availability, while 12% were neutral or disagreed. This demonstrates that the majority of respondents experience or perceive droughts as a major factor limiting water resources, implying the need for effective drought mitigation strategies.

Table 4.14: Poor Water Management and Social Stability

Response	**Frequency**	**Percentage (%)**
Strongly Agree	18	36
Agree	20	40
Neutral	5	10
Disagree	5	10
Strongly Disagree	2	4
Total	50	100

The table shows that 18 respondents (36%) strongly agreed and 20 (40%) agreed that poor water management increases social tension, while 14% were neutral or disagreed. This demonstrates that the majority of

respondents perceive inadequate water governance as a source of social instability, implying that proper water management policies are essential for peace and security.

Policy Recommendations to Enhance South Sudan's Participation

Table 4.15**: Active Participation in Regional Platforms**

Response	**Frequency**	**Percentage (%)**
Strongly Agree	17	34
Agree	19	38
Neutral	5	10
Disagree	6	12
Strongly Disagree	3	6
Total	50	100

The table shows that 17 respondents (34%) strongly agreed and 19 (38%) agreed that South Sudan should participate actively in regional water governance, while 18% were neutral or disagreed. This demonstrates that the majority of respondents support active engagement in regional platforms, implying that such participation could protect national water interests.

Table 4.16**: Clear National Water Policies**

Response	**Frequency**	**Percentage (%)**
Strongly Agree	20	40
Agree	18	36
Neutral	5	10
Disagree	5	10
Strongly Disagree	2	4
Total	50	100

The table shows that 20 respondents (40%) strongly agreed and 18 (36%) agreed that clear national water policies improve South Sudan's influence, while 14% were neutral or disagreed. This demonstrates that the majority of respondents emphasize the importance of robust policy frameworks, implying the need for legislative and strategic reforms.

Table 4.17**: Capacity Building for Officials**

Response	**Frequency**	**Percentage (%)**
Strongly Agree	16	32
Agree	20	40
Neutral	6	12
Disagree	5	10
Strongly Disagree	3	6
Total	50	100

The table shows that 20 respondents (40%) agreed and 16 (32%) strongly agreed that capacity building strengthens officials' participation, while 16% were neutral or disagreed. This demonstrates that the majority of respondents value training and capacity enhancement, implying that human resource development is key to effective water governance.

Table 4.18**: Collaboration with NGOs and International Agencies**

Response	**Frequency**	**Percentage (%)**
Strongly Agree	15	30
Agree	21	42
Neutral	6	12
Disagree	5	10
Strongly Disagree	3	6
Total	50	100

The table shows that 21 respondents (42%) agreed and 15 (30%) strongly agreed that collaboration with NGOs improves South Sudan's voice, while 16% were neutral or disagreed. This demonstrates that the majority of respondents support partnerships with external agencies, implying that cooperation can strengthen influence in regional water management.

Table 4.19**: Policy Reforms for Transparency and Inclusivity**

Response	**Frequency**	**Percentage (%)**
Strongly Agree	18	36
Agree	19	38
Neutral	5	10
Disagree	6	12
Strongly Disagree	2	4
Total	50	100

The table shows that 18 respondents (36%) strongly agreed and 19 (38%) agreed that reforms should prioritize transparency, while 18% were neutral or disagreed. This demonstrates that the majority of respondents value inclusive and accountable governance, implying that reforms are needed for better water management outcomes.

Geopolitical Tensions among Nile Basin Countries

Table 4.20**: Conflicting Interests of Egypt, Sudan, and Ethiopia**

Response	**Frequency**	**Percentage (%)**
Strongly Agree	22	44
Agree	18	36
Neutral	4	8
Disagree	5	10
Strongly Disagree	1	2
Total	50	100

The table shows that 22 respondents (44%) strongly agreed and 18 (36%) agreed that Egypt, Sudan, and Ethiopia have conflicting interests affecting water sharing, while 12% were neutral or disagreed. This demonstrates that the majority of respondents recognize competing claims in the Nile Basin, implying that geopolitical tensions are a major factor influencing water security in South Sudan.

Table 4.21**: Impact of Geopolitical Tensions on South Sudan's Water Security**

Response	**Frequency**	**Percentage (%)**
Strongly Agree	20	40
Agree	19	38
Neutral	5	10
Disagree	4	8
Strongly Disagree	2	4
Total	50	100

The table shows that 20 respondents (40%) strongly agreed and 19 (38%) agreed that geopolitical tensions influence South Sudan's water security, while 12% were neutral or disagreed. This demonstrates that the majority of respondents perceive regional conflicts as directly affecting the country's access to and management of water resources.

Table 4.22**: Historical Claims and Upstream/Downstream Competition**

Response	**Frequency**	**Percentage (%)**
Strongly Agree	18	36
Agree	20	40
Neutral	5	10
Disagree	5	10
Strongly Disagree	2	4
Total	50	100

The table shows that 20 respondents (40%) agreed and 18 (36%) strongly agreed that historical claims and upstream/downstream competition undermine cooperation, while 14% were neutral or disagreed. This demonstrates that the majority of respondents believe historical and positional tensions affect regional collaboration, implying that past agreements continue to influence present water politics.

Table 4.23**: Effectiveness of International Diplomatic Interventions**

Response	**Frequency**	**Percentage (%)**
Strongly Agree	15	30
Agree	19	38
Neutral	8	16
Disagree	5	10
Strongly Disagree	3	6
Total	50	100

The table shows that 19 respondents (38%) agreed and 15 (30%) strongly agreed that international diplomatic interventions help reduce tensions, while 21% were neutral or disagreed. This demonstrates that the majority of respondents perceive international interventions as somewhat effective, implying that external actors play a supportive but limited role in resolving water conflicts.

Table 4.24**: Water Disputes and South Sudan's Development**

Response	**Frequency**	**Percentage (%)**
Strongly Agree	20	40
Agree	18	36
Neutral	4	8
Disagree	5	10
Strongly Disagree	3	6
Total	50	100

The table shows that 20 respondents (40%) strongly agreed and 18 (36%) agreed that water disputes among Nile Basin countries impact South Sudan's economic and environmental development, while 16% were neutral or disagreed. This demonstrates that the majority of respondents recognize that regional water conflicts hinder national development, implying a critical need for cooperative water management.

V. CONCLUSIONS

The study examined the geo-strategic significance of South Sudan in the context of Nile Basin cooperation, focusing on the country's participation in regional institutions, the impact of water insecurity, and the influence of geopolitical tensions. Findings from the demographic analysis showed that most respondents were educated young adults working in the public sector. This indicates that the responses were informed by individuals with a fair understanding of water management, governance, and policy frameworks. Their perspectives provided a credible foundation for analyzing South Sudan's engagement in regional water diplomacy and domestic water governance. The findings on the role of regional institutions such as the Nile Basin Initiative (NBI) demonstrated that these organizations play a vital role in promoting dialogue, conflict prevention, and cooperative management of shared water resources. However, it became evident that South Sudan has not fully harnessed the benefits of its membership due to limited capacity, inadequate institutional presence, and low participation in decision-making processes. This implies that while regional cooperation offers great opportunities for South Sudan, the country must enhance its institutional capability and strengthen representation to ensure equitable benefit-sharing from the Nile Basin's resources. Water insecurity emerged as a major challenge affecting South Sudan's economic, environmental, and social sustainability. The study confirmed that inadequate access to water significantly hampers agricultural productivity, industrial growth, and environmental protection. Droughts, poor infrastructure, and weak management practices exacerbate vulnerability and fuel competition over scarce resources. This calls for integrated water resource management approaches that combine policy reform, investment in infrastructure, and community-level participation to ensure resilience and sustainable development across sectors.

The research also emphasized the necessity of clear policy frameworks and enhanced participation in regional water governance mechanisms. Respondents consistently highlighted the importance of active engagement in the Nile Basin Initiative and other multilateral platforms. South Sudan's ability to influence decisions and safeguard its interests depends largely on the strength of its domestic institutions, technical expertise, and transparency in water governance. Therefore, building institutional capacity and fostering collaborations with development partners are essential for achieving effective and inclusive water management. Geopolitical dynamics within the Nile Basin were identified as a critical factor shaping South Sudan's access to water and regional stability. The long-standing tensions between Egypt, Sudan, and Ethiopia over the utilization of Nile waters continue to define regional power relations. As a relatively new and strategically located member, South Sudan must navigate these tensions through diplomacy, neutrality, and strategic partnerships. Its role as both a downstream and midstream state provides a unique opportunity to serve as a mediator that promotes equitable resource distribution and regional cooperation.

The findings also suggest that international interventions, though helpful, have limited capacity to resolve deep-seated political disputes within the Nile Basin. Sustainable solutions require African-led dialogue, trust-building, and long-term development planning. For South Sudan, balancing internal priorities with external partnerships will be vital in transforming water resources into tools for peace, cooperation, and sustainable development. Strengthening its foreign policy stance and aligning it with regional integration goals will enable the country to play a more influential role in future Nile Basin initiatives. In conclusion, the study underscores that water security is not only a developmental issue but also a strategic pillar for South Sudan's political stability and regional influence. Addressing water insecurity through policy reform, institutional strengthening, and regional cooperation will promote sustainable growth and peace within the Nile Basin. By adopting inclusive governance models and active diplomatic engagement, South Sudan can move from a passive participant to an active contributor in shaping the future of transboundary water management in the region.

VI. RECOMMENDATIONS

Based on the study's findings, the following actionable recommendations are proposed:

For the Government of South Sudan

- Develop and implement clear national water policies that prioritize transparency, inclusivity, and sustainability.
- Invest in capacity building for government officials and stakeholders involved in water governance.
- Strengthen diplomatic engagement with Nile Basin countries to secure equitable water access.
- Promote collaboration with NGOs and international agencies to enhance technical and financial support.
- Implement strategic monitoring and evaluation systems to track water resource management and policy effectiveness.

For Regional Institutions (NBI)

- Ensure mechanisms are fully inclusive, allowing all member states, including South Sudan, to benefit equally.
- Provide technical and financial support to build national capacities for water governance.
- Facilitate regular dialogue platforms to resolve disputes and strengthen regional cooperation.
- Promote transparency in decision-making to enhance trust among member states.
- Conduct periodic assessments of regional initiatives to measure effectiveness and adapt strategies.

For Communities and Civil Society

- Engage actively in advocacy and awareness campaigns regarding water conservation and rights.
- Participate in regional and national forums to represent local interests and challenges.
- Support community-based water management projects to improve sustainability and resilience.
- Collaborate with government and NGOs to implement water-related initiatives effectively.
- Document and report local water-related challenges to inform policy decisions.

For International Partners

- Provide technical assistance and funding to support South Sudan's water governance capacity.
- Facilitate multilateral negotiations and conflict resolution among Nile Basin countries.
- Support research and data collection on water resource management and sustainability.
- Promote knowledge-sharing programs and training for local stakeholders.
- Encourage regional cooperation frameworks that integrate both environmental and socio-economic considerations.

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