

How the Countries Bordering the Nile River Collaborate to Manage It as an International Waterway

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Abstract

The Nile River is the longest river in the world and passes through eleven African countries, supporting irrigation, hydropower production, drinking-water supply, fisheries, and wider economic activity. Its governance remains politically complex because Egypt and Sudan depend heavily on Nile waters, while upstream states increasingly seek to develop hydropower, irrigation, and water-storage infrastructure. This paper examines how Nile Basin countries cooperate to manage the river as an international waterway. Using a qualitative approach based on literature review and document analysis, it analyses the historical agreements that shaped the basin's current legal order, the institutional role of the Nile Basin Initiative, and the legal principles governing transboundary water cooperation. The paper also examines practical cooperation mechanisms, including joint monitoring, data sharing, early-warning systems, and subsidiary programmes such as NELSAP and ENSAP/ENTRO. It argues that although cooperation has moved beyond declaratory diplomacy toward technical and project-based collaboration, it remains constrained by unresolved disputes over the GERD, the continued legal division around the Cooperative Framework Agreement, and growing pressures from climate change and population growth. The paper concludes that sustainable Nile governance requires stronger basin-wide institutions, a more inclusive legal framework, mandatory data sharing, climate-adaptation mechanisms, and greater political commitment to balancing upstream development with downstream water security.

Keywords

Nile River Basin, Nile Basin Initiative, Transboundary Water Governance, International Water Law, GERD, Ethiopia, Egypt, Sudan, Water Cooperation

1. Introduction

The Nile is widely regarded as the longest river in the world, extending for about 7000 km and draining a basin of more than 3 million km², which covers roughly one-tenth of the African continent. Its course and tributaries pass through eleven countries: Burundi, Rwanda, Tanzania, Kenya, Uganda, the Democratic Republic of the Congo, Ethiopia, Eritrea, Sudan, South Sudan and Egypt. **Figure 1** gives the spatial coverage of the basin and the States it links (Tayia et al., 2021). This basin serves millions of people through agriculture, production of hydropower, supply of drinking water, fisheries and economic activities, and wider economic activity. Because these uses cross national borders, the long-term management of the Nile requires coordination among states whose levels of dependence, development priorities and infrastructure capacities differ significantly.

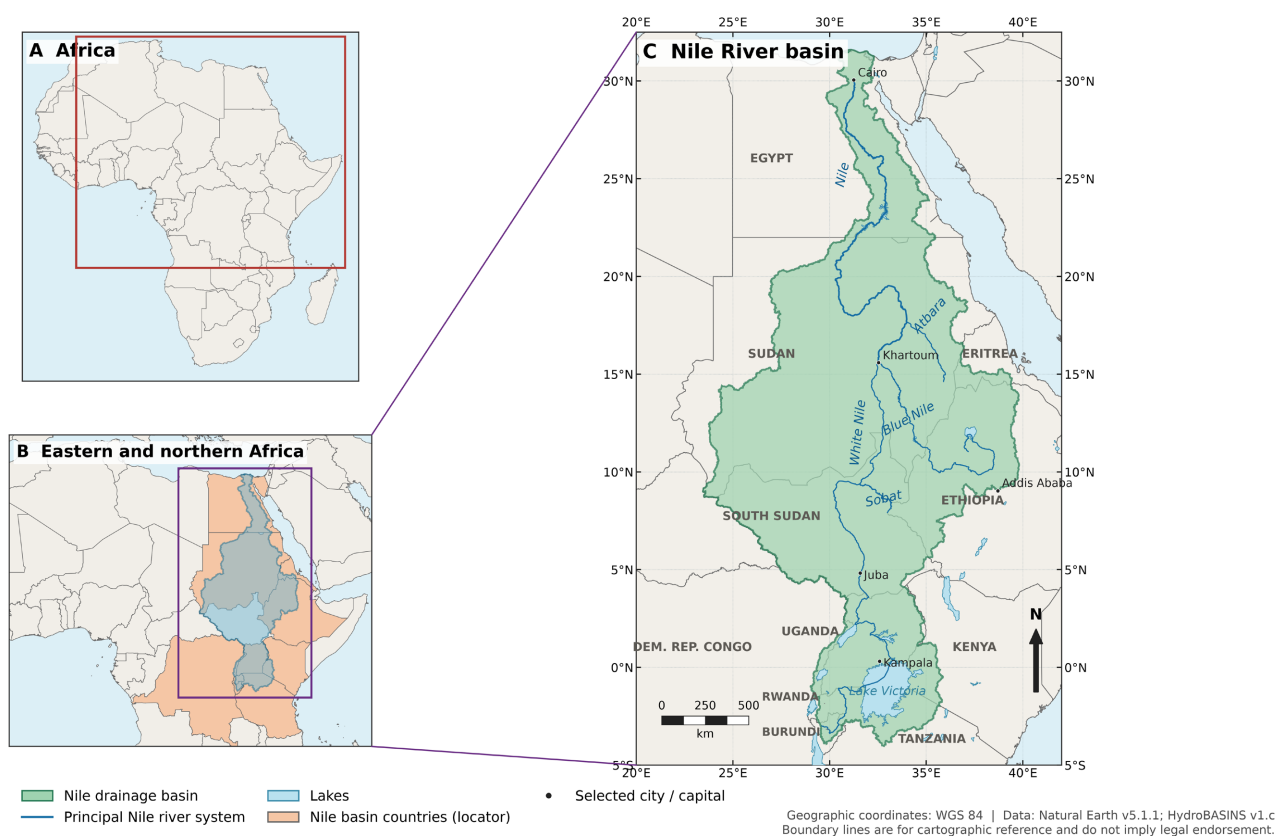


Figure 1. Geographic location and hydrographic setting of the Nile River basin: (A) Location within Africa; (B) Regional extent across eastern and northern Africa; (C) Detailed distribution of the Nile drainage basin, principal river system, major lakes, basin countries, and selected cities (Tayia et al., 2021).

The Nile's flow is highly variable and is affected by seasonal floods, droughts and broader climatic changes, all of which influence water availability and allocation across borders. At the same time, Egypt and Sudan depend heavily on Nile waters, while upstream countries are increasingly pursuing hydropower, irrigation and water-storage projects to meet their development needs (Swain, 2011;

Whittington, 2024). These competing interests are closely connected to the legacy of earlier Nile agreements, especially the 1929 and 1959 arrangements, which gave strong legal and political weight to downstream claims while excluding most upstream states from formal allocation decisions (Swain, 2011; Whittington, 2024). If these competing interests are not managed through effective cooperation, they may intensify political tensions, increase environmental pressures and undermine the sustainable use of a shared river system¹.

Nile governance has become more urgent and more complex because of the Grand Ethiopian Renaissance Dam (GERD), increasing climate variability and population growth across the eleven riparian states (Conway, 2005; Swain, 2011). The GERD has become the most visible example of the wider tension between upstream development aspirations and downstream water-security concerns, particularly because Ethiopia views the dam as central to hydropower development while Egypt sees it as a potential threat to the reliability of Nile flows (Swain, 2011). Older bilateral agreements are therefore being tested by pressures for which they were not originally designed, while unresolved disagreements over water allocation and infrastructure operation continue to affect regional cooperation (Whittington, 2024). These tensions also raise the risk that water disputes may expand into broader political or diplomatic conflicts.

This paper therefore examines how countries in the Nile Basin cooperate to manage the river as an international waterway, and what institutional, legal and diplomatic changes could strengthen the sustainability of these arrangements. To answer this question, the paper examines three dimensions: the historical arrangements that shaped the current situation; the legal and institutional frameworks underpinning basin-wide cooperation; and the practical mechanisms that continue to support cooperation despite unresolved political disputes.

1.1. Methodology

In this paper, a qualitative research approach is applied, combining systematic literature review and document analysis. The study relies on primary sources, including intergovernmental treaties and agreements, official publications of the Nile Basin Initiative, African Union communiqués, and United Nations documents. It also uses secondary sources, particularly peer-reviewed scholarship on international water law, transboundary resource governance, hydro-politics, and African political economy.

To make the review process transparent and reproducible, documents were identified through a structured search strategy covering four main source categories: legal instruments, institutional materials, continental and international policy texts, and academic literature (Page et al., 2021). Legal materials were searched through official treaty repositories, United Nations documentation, and publicly available records of Nile-related agreements. Institutional sources

¹Nile Basin Initiative (NBI), 2025, Nile Cooperation: 25 Years of Benefits. Nile Basin Initiative Secretariat. https://nilebasin.org/sites/default/files/2025-10/NBI_benefits110925_lowres.pdf.

were collected from the Nile Basin Initiative, including policy documents, strategy papers, technical reports, project materials, and official communiqués. African Union and United Nations materials were identified through searches of official AU and UN databases and websites, focusing on texts related to transboundary water governance, regional cooperation, sustainable development, and conflict prevention (Bowen, 2009). Academic literature was identified through searches of scholarly databases and academic search platforms using combinations of keywords such as “Nile Basin cooperation”, “Nile River governance”, “transboundary water law”, “international watercourses”, “Nile Basin Initiative”, “Cooperative Framework Agreement”, “hydropolitics”, and “African regional water governance”.

Sources were selected according to their relevance to the paper’s core research questions, namely how countries bordering the Nile River cooperate to manage it as an international waterway, how legal and institutional frameworks shape that cooperation, and what political and practical challenges affect basin governance. Materials were included if they directly addressed Nile Basin cooperation, international water law, institutional arrangements, regional governance mechanisms, or the political economy of transboundary water management. Sources were excluded if they focused only on technical hydrological modelling, engineering design, or quantitative water-flow assessment without substantial engagement with legal, political, or institutional questions. Duplicate materials, outdated versions of documents superseded by later official texts, and sources lacking clear authorship or institutional credibility were also excluded.

The screening process was conducted in stages. First, titles, abstracts, executive summaries, and document headings were reviewed to determine initial relevance. Second, potentially relevant documents were read in full and assessed for their contribution to the historical, legal, institutional, and practical dimensions of Nile cooperation (Bowen, 2009; Page et al., 2021). Third, the selected materials were organized thematically into three analytical levels: historical context, institutional and legal frameworks, and practical cooperation mechanisms. This thematic screening allowed the study to compare formal legal commitments with institutional practice and political implementation across the basin (Braun & Clarke, 2006).

The analysis is therefore carried out on three levels: historical context, institutional and legal frameworks, and practical cooperation mechanisms. Modelling and empirical hydrological studies are not included in the scope of the paper because the emphasis is on the political, legal, and institutional aspects of basin governance. The paper proceeds from the argument that the main challenges to effective Nile cooperation are not only technical, but also political and institutional in nature.

1.2. Historical Background: Colonial Legacy and Early Agreements

The agreements of 1929 and 1959 constituted the legal framework which is still

the foundation for the current Nile debates. The 1929 Agreement between Egypt and Britain (on behalf of Sudan and East African territories) allowed Egypt to have a significant control over the river and stipulated that any development work would have to be approved by Egypt before it would be performed upstream of the state (Swain, 2011). The 1959 Nile Waters Agreement had decided to share the water on the Nile at 55.5 billion cubic meters per year for Egypt and 18.5 billion for Sudan, excluding the upstream states of Ethiopia, Uganda and Kenya. The agreement split the river's "utilizable flow" amongst two downstream states, which provided the legal precedent for Egypt and Sudan to assert historic and "prior water" rights to the river, a claim both governments have subsequently upheld (Whittington, 2024). The resentment that ensued did not go away, and was not formally accounted for in the drafting of the agreement, when there was no allocation to upstream countries, and no seat at the table. These states have been trying to develop hydropower and irrigation opportunities, but have been forced to bargain with entitlements that have been formulated without their consent. Ever since, the dispute between the downstream and upstream interests regarding historical claims and a "workable" allocation has haunted politics in the basin and has played directly into the more recent GERD controversy. Key agreements and institutions in the basin's institutional history are set out in Figure 2.

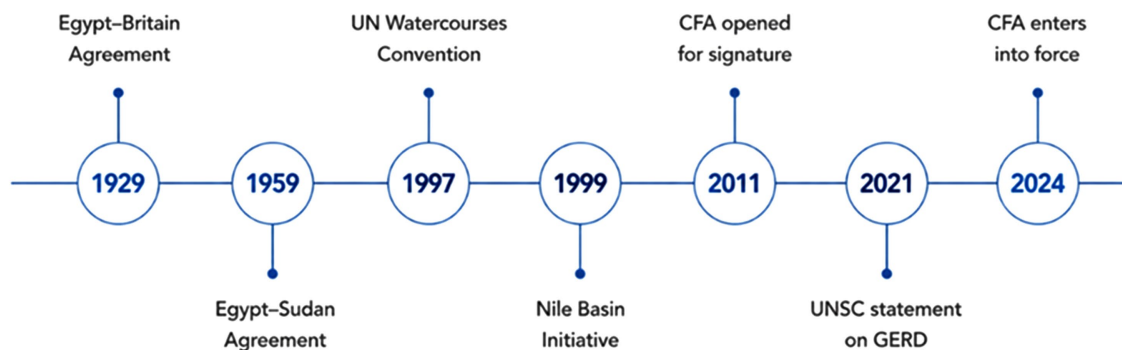


Figure 2. Timeline of key agreements and institutions.

1.3. Asymmetry in Water Control and the Rise of Upstream Countries

The distribution of water use and water control in the Nile Basin is unequal and the distance between the benefit of water users in the basin and the contribution from the basin is large. Egypt's position is based on decades of investment in large scale hydraulic infrastructure, most notably the High Aswan Dam, which provides Egypt with storage and distribution capabilities which are not matched by any other riparian state. Sudan's is much more restricted: its share under the terms of the 1959 agreement is large in theory, but it has failed to keep up with its water storage and distribution capabilities to match Egypt. The other problem is posed by the upstream countries, those that produce a lot of the water flowing in the Nile, but have historically lacked the infrastructure to harness this contribution

into a reliable supply of water and energy. Asymmetries in allocation and use of these across the basin are shown in **Figure 3**.

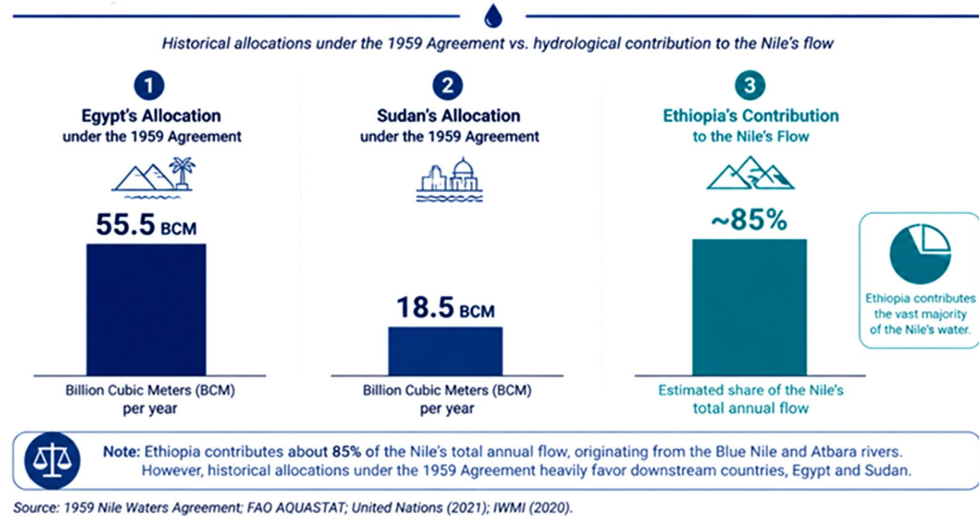


Figure 3. Water allocation chart.

More than any other recent development, the GERD has complicated Nile Basin politics. Egypt views it as a threat to water security, while Ethiopia sees it as an essential piece of infrastructure for national development. However, Sudan has had to navigate the middle path between the two. So awkward is its location in the basin that it is quite literally a pain in the ass. Between Ethiopia and Egypt, Sudan has conflicting interests both ways, and its foreign policy has reflected that. Initially it was against the GERD but has since become more accommodating, mainly because it has calculated that regulated Blue Nile flows will be beneficial for the Merowe and Roseires Dams and will help the agriculture industry in Sudan. While Sudan's storage and irrigation capacity has significantly increased in the last few decades, it is still not enough to make full use of the country's allocation in 1959, and therefore the need for maintaining workable relations with both Ethiopia and Egypt is not an option. Sudan's path in the GERD dispute warns us that geopolitics of the Nile is not a simple upstream-downstream affair, and any accord that fails to take into account the interests of the middle riparian states, with their sometimes competing and complicated, often conflicting, interests will be short-lived.

2. Key Collaborative Frameworks and Mechanisms: Formal and Informal Tools for Shared Management

There are several mechanisms for cooperation that are shared by riparian states in the Nile Basin: formal intergovernmental organizations, legally binding treaties, technical partnerships, and diplomatic forums, among others. In practice, these arrangements have a different purpose, some are intended to provide binding mechanisms to allocate resources, others to establish technical and political trust that binding arrangements need.

2.1. Formal Intergovernmental Organizations (IGOs): The Backbone of Structured Collaboration

The Nile Basin Initiative (NBI): A Multilateral Platform for Cooperation

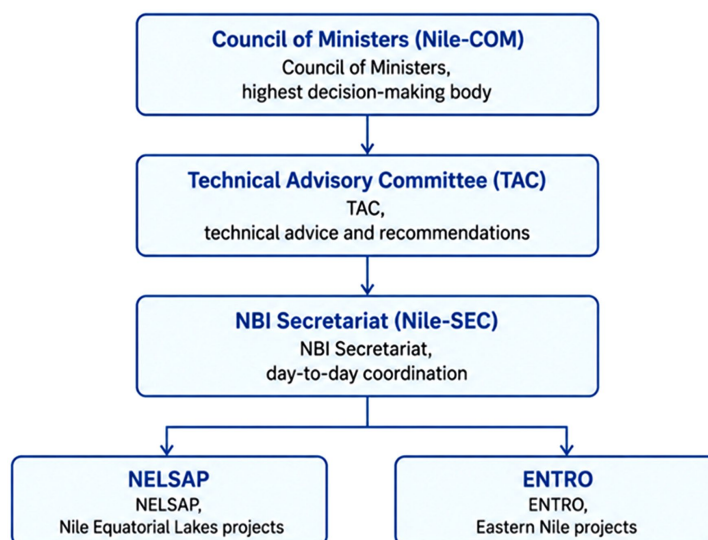


Figure 4. NBI organizational structure.

Figure 4 shows the organizational structure of the NBI. It was founded in 1999 as the main cooperation mechanism for the riparian states of the Nile. At its establishment, the NBI comprised nine member states: Burundi, Democratic Republic of the Congo, Egypt, Ethiopia, Kenya, Rwanda, Sudan, Tanzania and Uganda, with Eritrea participating as an observer (Jungudo, 2018). South Sudan was not a founding member because it became independent in 2011; it joined the NBI in 2012². The NBI therefore currently comprises ten member states: Burundi, Democratic Republic of the Congo, Egypt, Ethiopia, Kenya, Rwanda, South Sudan, Sudan, Tanzania and Uganda, with Eritrea as an observer. It aims for equitable and sustainable management of shared water resources through dialogue, collaborative technical initiatives and coordinated investment (Onencan & Van de Walle, 2018). The NBI has been moving away from unilateral river management to more concerted basin-wide management, albeit at a slow pace³. The NBI consists of three bodies:

Council of Ministers (CoM): Is the highest decision-making body, which consists of the minister of each member state, usually the minister of water who meet annually to fix strategic direction, approve budgets and mediate amongst themselves in case of any dispute, with the chairperson rotating amongst the members⁴.

²Nile Basin Initiative, n.d.-b, History. Nile Basin Initiative.

³Nile Basin Initiative, 2024, "Nile Cooperation: 25 Years of Benefits".

https://nilebasin.org/sites/default/files/2025-10/NBI_benefits110925_lowres.pdf.

⁴Nile Basin Initiative. Nile Council of Ministers Adopts Pioneer Plan to Guide Management of Nile River Basin.

<https://nilebasin.org/content/nile-council-ministers-adopts-pioneer-plan-guide-management-nile-river-basin>, 2022, August 26.

For example, in 2022, the CoM approved a regional drought response plan for Kenya, South Sudan and Sudan, which is a typical operational decision it considers, when conditions are conducive to political will⁵.

- **Technical Advisory Committee (TAC):** The TAC is made up of technical experts from each member state to provide recommendations to the CoM on water availability, environmental effects of infrastructure development and sustainable water use. Each state has two senior officials and the committee meets twice a year to review evidence and make recommendations for NBI activities and CFAs (Mohammed, 2025). The TAC also manages the Nile Basin Decision Support System (NBDSS), an electronic tool that combines information related to water flow, rainfall and climate, providing a common empirical foundation for negotiators and planners who are missing it in purely political debates.
- **The NBI Secretariat (Nile-SEC):** On the practical level, the NBI Secretariat (Nile-SEC) in Entebbe, Uganda supports the CoM and TAC with technical and administrative assistance, coordinates regional projects and facilitates implementation of the CoM policy decisions. It monitors progress under the Shared Vision and Subsidiary Action Programs and oversees financial management (Okoth, 2009). The funding comes from international donors, such as the World Bank and UNDP, as well as riparian state funding. The NBI's project work is then broken up into two action programs as subsystems reflecting geographic and political distinctions between the eastern and equatorial portions of the basin.

Project work is structured into two geographically based secondary programs;

Nile Equatorial Lakes Subsidiary Action Program (NELSAP): NELSAP focuses on the upstream Equatorial Lakes areas of Burundi, DRC, Kenya, Rwanda, Tanzania and Uganda for the purposes of hydropower, irrigation and environmental management. It has produced the most concrete result so far, the Rusumo Falls hydropower project, in which the three countries of Burundi, Rwanda and Tanzania have teamed up to generate 80 MW of electricity, shared between the three countries (Dombrowsky & Hensengerth, 2018)⁶. The second major programme, the Lake Victoria Basin Water Resources Management Project, addresses the interrelated issues of pollution, overfishing and habitat loss in a lake on which communities throughout the sub-region are directly dependent. Both projects are examples of the complexity of NELSAP's work, and its place in a civic space that lies neither in the realm of the technical nor the realm of the political.

- **The Eastern Nile Subsidiary Action Program (ENSAP)** was established within the NBI framework to support cooperative planning and investment in the Eastern Nile sub-basin. At its inception, ENSAP involved Egypt, Ethiopia and Sudan; South Sudan was not included as a founding participant because it

⁵Nile Basin Initiative, 2022, Tanzania To Host the Annual Nile Basin Council of Ministries (COM) Meeting.

⁶Hydropower and Dams International, 2019, Rusumo Falls Hydro-electric Power Development Project.

did not exist as an independent state in 2001⁷. Following South Sudan's independence in 2011 and subsequent accession to the NBI in 2012, it became part of the contemporary Eastern Nile institutional framework. Today, ENTRO implements ENSAP for Egypt, Ethiopia, South Sudan and Sudan⁸; the initiative aims at regulating shared water resources in the basin with special emphasis on the Blue Nile which supplies the major portion of the annual discharge of the Nile (Belachew & Mekonen, 2014). While NELSAP centers on investment in development, ENSAP's mandate is more directly influenced by the competing demands between water security and aspirations for upstream infrastructure development. ENTRO is the operational arm of the organization, ensuring coordination in the field with regard to hydropower, irrigation and river management on the Eastern Nile system. This work is expanded to disaster risk reduction, construction of monitoring, forecast and emergency response capacities in flood-prone sub-basins through a dedicated Flood Preparedness and Early Warning project with a concrete objective of minimizing flood casualty and damage in time by providing timely and reliable warnings (Mamo et al., 2017).

Both ENTRO and NELSAP-CU operate at sub-basin level, which's where most of the Nile's operational management takes place. Since 1999, NELSAP-CU has been based in Kigali, and it has been coordinating national and transboundary projects in the Equatorial Lakes region, while ENTRO is focusing on the Eastern Nile system. Both institutions operate as a crosscutting team with the themes of power development, natural resource management, regional planning, feasibility studies and stakeholder engagement. Their value is more in how they help turn political statements into projects and the projects into budgets, schedules and outputs rather than what they are specifically mandated to do⁹.

Comparatively, these four mechanisms have produced different but complementary forms of cooperation in the Nile Basin. The NBI's main achievement has been institutional: it has created a regular basin-wide platform for dialogue where all the Riparian countries of the Nile River have expressed their commitment to work for a joint initiative over the utilization of the Nile River water resources (Swain, 2011), technical exchange, data sharing, joint planning, and the preparation of bankable regional investment projects. However, its limitation is that it remains largely voluntary and consensus-based, and therefore cannot by itself resolve binding allocation disputes or compel compliance by member states. The Cooperative Framework Agreement represents the most important legal advance because it translates the principles of equitable and reasonable utilization, no sig-

⁷World Bank Group, 2008, Project Information Document: Eastern Nile Watershed Management Project. World Bank.

<https://documents1.worldbank.org/curated/en/367241468202818154/pdf/Project0In-form1pt0Stage1210August07.pdf>

⁸Nile Basin Initiative, n.d.-b, Eastern Nile Technical Regional Office (ENTRO). Nile Basin Initiative. <https://nilebasin.org/center/entro>

⁹United Nations, 1997, United Nations Convention on the Law of the Non-Navigational Uses of International Watercourses. United Nations Legal Affairs.

nificant harm, and cooperation. The CFA indicates further that where significant harm nevertheless is caused to another Nile Basin state, the states whose use causes such harm shall, in the absence of agreement to such use, take all appropriate measures, having due regard for the provisions of the CFA on equitable and reasonable utilization, in consultation with the affected state, to eliminate or mitigate such harm and, where appropriate, to discuss the question of compensation (Salman, 2013), and data exchange into a treaty framework and provides for the establishment of a permanent Nile River Basin Commission. Its limitation, however, is political and legal fragmentation, since Egypt and Sudan remain outside the agreement and continue to rely on the 1959 arrangement. NELSAP has delivered the most concrete project-level outcomes, especially in the Nile Equatorial Lakes region, including regional hydropower, power interconnection, watershed management, and environmental projects, with the 80 MW Rusumo Falls Hydropower Project shared by Burundi, Rwanda, and Tanzania standing out as a practical example of benefit-sharing (Dombrowsky & Hensengerth, 2018). Nevertheless, NELSAP remains limited by project financing, implementation delays, and the fact that sub-basin investment success does not settle wider basin-wide allocation disputes. ENSAP, through ENTRO, has strengthened cooperation in the politically sensitive Eastern Nile by supporting flood preparedness, early-warning systems, watershed planning, and technical exchange among Egypt, Ethiopia, Sudan, and South Sudan. Its first joint initiative, the Integrated Development of the Eastern Nile (IDEN), includes sub-projects on flood management, power interconnection, irrigation, watershed management, multipurpose water development, and modeling¹⁰. Yet its effectiveness remains constrained by the GERD dispute and by the difficulty of converting technical cooperation into a binding agreement on dam filling, operation, and drought management. Taken together, these mechanisms show that Nile Basin cooperation has moved beyond declaratory diplomacy toward practical technical and investment cooperation, but it has not yet achieved a fully accepted, enforceable, and basin-wide legal order.

2.2. Legal and Normative Principles

The principles of Nile Basin governance are derived from the UN Watercourses Convention of 1997 which came into force in 2014¹¹. It is the only universal treaty that applies to transboundary freshwater resources, offering a shared legal basis for transboundary river management, the principles of equitable and reasonable use, the need to avoid significant harm, the need to notify, environmental protection, and the need to cooperate. Prior to the Convention, there had been a variety of bilateral and regional water agreements and arrangements, which lacked a unified framework; the Convention had provided riparian states with a more unified basis for negotiation (Kikoyo & Patricia, 2026). The Cooperative

¹⁰Nile Basin Initiative, n.d., "Nile Equatorial Lakes Subsidiary Action Program Coordination Unit (NELSAP-CU)".

<https://nilebasin.org/nile-equatorial-lakes-subsidiary-action-program-coordination-unit-nelsap-cu>.

¹¹United Nations, 1997, United Nations Convention on the Law of the Non-Navigational Uses of International Watercourses. United Nations Legal Affairs.

Framework Agreement (CFA) was negotiated to address this legal gap by establishing a common framework for the cooperative management and development of the Nile Basin. The majority of upstream states have signed the CFA, while Egypt and Sudan have objected because they consider that it does not sufficiently protect their existing allocations and legal rights under the 1959 Nile Waters Agreement. This disagreement has produced a persistent legal and political divide between upstream demands for equitable utilization and downstream claims based on historical use (McCaffrey, 2001). The legal status of the CFA changed significantly in October 2024, when the Agreement entered into force. Under Article 43 of the CFA, the Agreement enters into force on the sixtieth day after the deposit of the sixth instrument of ratification or accession with the African Union, which acts as the depositary. Nile Basin states officially announced that the CFA entered into force on 13 October 2024, following ratification or accession by six states, paving the way for the establishment of the Nile River Basin Commission (Chelkeba, 2018). This entry into force means that the CFA is no longer only a political or aspirational framework for those states, but now has binding treaty effect among its State Parties. For those parties, it creates legal obligations relating to equitable and reasonable utilization, prevention of significant harm, cooperation, information exchange, environmental protection, and participation in the institutional framework of the future Nile River Basin Commission. Egypt and Sudan, however, are not parties to the CFA and continue to rely on the 1959 Nile Waters Agreement. The outcome is a dual legal framework in which different sets of legal obligations apply to the same river system, depending on the states concerned. Claims by non-party states may therefore conflict with decisions taken under the CFA, while no agreed basin-wide mechanism currently exists to resolve such conflicts. Closing this divide would require Egypt and Sudan to negotiate a settlement that moves beyond the fixed allocations of the 1959 Agreement, while upstream states would also need to provide sufficient guarantees to make such a settlement politically acceptable. To date, neither condition has been achieved.

2.3. Practical Forms of Collaboration

Practical cooperation in the Nile Basin operates through technical, institutional and project-based mechanisms that allow riparian states to manage shared risks even when broader legal and political disputes remain unresolved. Unlike the legal principles discussed in Section 2.2, these mechanisms focus on operational cooperation, including joint monitoring, data sharing, early-warning systems, technical planning, and coordinated investment projects. Their value lies in translating general commitments to cooperation into everyday practices that can improve transparency, reduce uncertainty and support trust among basin states^{12,13}.

¹²Nile Basin Initiative, 2009, "Nile Basin Data and Information Sharing and Exchange Interim Procedures". Nile Basin Initiative.

¹³Nile Basin Initiative, 2023, "Nile Basin Decision Support System: Technical Brochure". Nile Basin Initiative.

One important form of practical collaboration is joint monitoring and hydrological data exchange. Through the Nile Basin Initiative and its technical organs, member states have developed platforms for collecting, analyzing and sharing information on river flow, rainfall, climate variability, water demand and planned infrastructure development. The Nile Basin Decision Support System is particularly significant because it provides a shared technical basis for assessing basin conditions and comparing alternative management scenarios. By enabling countries to work from a common evidence base, such tools help reduce mistrust and prevent negotiations from being shaped only by unilateral claims or politically selective interpretations of hydrological data.

Early-warning and disaster-risk-reduction activities provide another important area of cooperation. In the Eastern Nile, ENTRO has supported flood preparedness and early-warning initiatives aimed at improving forecasting, communication and emergency response in flood-prone sub-basins. These mechanisms are essential because floods and droughts move across national borders and can produce severe downstream consequences when information is delayed or incomplete. Cooperation in forecasting, warning and emergency preparedness therefore offers a practical and less politicized entry point for collaboration, especially in a basin where larger questions of allocation and dam operation remain contested (Mamo et al., 2017; Tellman et al., 2018).

Project coordination is also central to practical cooperation in the Nile Basin. Through NELSAP and ENSAP/ENTRO, riparian states have coordinated feasibility studies, investment preparation, environmental assessments, stakeholder consultations and implementation planning for hydropower, irrigation, watershed management and water-resource projects. The Rusumo Falls hydropower project, involving Burundi, Rwanda and Tanzania, demonstrates how sub-basin cooperation can generate shared benefits when states coordinate planning, financing and benefit-sharing. Similarly, activities under the Lake Victoria Basin Water Resources Management framework show how pollution control, ecosystem protection and livelihood concerns can be addressed more effectively through multi-country cooperation than through isolated national interventions (Dombrowsky et al., 2014; Dombrowsky & Hensengerth, 2018).

These practical mechanisms do not resolve the deeper political disagreements surrounding the GERD, historical water allocations or the Cooperative Framework Agreement. However, they create channels through which cooperation can continue despite legal and diplomatic deadlock. Joint monitoring, data sharing, early warning and coordinated project development build habits of technical cooperation, improve transparency and generate tangible benefits for participating states. For this reason, practical cooperation should be understood as a necessary complement to legal reform: it does not replace basin-wide agreement, but it helps sustain dialogue, reduce risks and demonstrate the benefits of shared management in practice (Dombrowsky & Hensengerth, 2018).

3. Emerging Challenges: Climate Change and Population Growth

The Nile Basin is under pressure from two sides by climate change and population growth. Changes in rainfall and temperature are causing water availability to become more variable from year to year, and less available, which has exacerbated existing interstate tensions regarding water allocation. The basin is reported to be highly sensitive to climatic variation and climatic changes are expected to significantly increase the disparity between basin supply and demand (Conway, 2005). In the Nile context, this pressure is not only hydrological but also political: when rainfall becomes less predictable and droughts become more frequent, downstream states such as Egypt and Sudan become more concerned about the reliability of annual flows, while upstream states such as Ethiopia, Uganda, Rwanda and Tanzania face stronger domestic pressure to expand irrigation, hydropower and water-storage infrastructure (Mumbi & Fengting, 2020). Climate variability therefore changes the bargaining environment by increasing the perceived risks of both action and inaction (Basheer et al., 2023). For example, disagreement over the filling and long-term operation of the GERD is closely linked to how water should be managed during dry years and prolonged droughts, when the timing of reservoir releases becomes as politically sensitive as the total annual volume of water (Wheeler et al., 2020).

The other side of the pressure is population growth, urbanization and agricultural expansion, which are increasing demand for water, food and energy beyond the existing capacity of the basin (Mumbi & Fengting, 2020). This demand is especially important because Nile Basin negotiations are not simply about preserving river flows; they are also about how riparian states can meet rising domestic needs without undermining the security of their neighbors. Ethiopia's hydropower development, Sudan's irrigation ambitions, Egypt's dependence on the Nile for agriculture and drinking water, and the Equatorial Lakes countries' growing demands for energy and food production all create competing claims on the same river system (Mumbi & Fengting, 2020; Wheeler et al., 2020). Population growth therefore makes allocation more contentious, because fixed historical allocations become increasingly difficult to defend when upstream states argue that their present and future development needs were excluded from earlier agreements (Mumbi & Fengting, 2020).

The two dynamics reinforce one another, making this hard to control. Population growth leads to land conversion, increased withdrawals, and increased emissions, while climate change leads to reduction in agricultural production, decline in arable land, and increased flood and drought frequency. The poorest and least adaptive communities bear the brunt of the costs in the basin. The poorest and least adaptive communities bear the greatest costs in the basin. In practical terms, these pressures increase the need for joint management mechanisms that can adjust to changing hydrological conditions rather than relying only on fixed volumetric claims (Basheer et al., 2023). Effective cooperation now

requires basin-wide data sharing, drought-management rules, coordinated reservoir operation, flood early-warning systems and investment planning that links upstream development with downstream water security (Wheeler et al., 2020). Institutions such as the NBI, ENTRO and NELSAP are therefore important not merely as diplomatic forums but as technical platforms for generating shared evidence, building trust and reducing uncertainty among riparian states (Teshome, 2008; Dombrowsky & Hensengerth, 2018). However, the GERD dispute and the continuing division around the CFA show that technical cooperation remains politically fragile when states do not agree on the legal principles governing allocation and infrastructure operation (Salman, 2013; Cascão & Nicol, 2016). Climate change and population growth thus deepen the core governance problem of the Nile Basin: how to reconcile equitable development for upstream states with water-security concerns in downstream states under conditions of increasing hydrological uncertainty (Wheeler et al., 2020; Basheer et al., 2023).

4. Diplomatic Efforts and the Role of International Institutions

Diplomatic efforts have played a pivotal role in cooperation among Nile Basin countries, particularly with regards to the Grand Ethiopian Renaissance Dam (GERD). The African Union (AU) has been the main platform for engagement, bringing together the three parties to negotiate, including the extraordinary joint AU Bureau meetings of 22 June 2020¹⁴ and 20 July 2020¹⁵, and the subsequent AU-led ministerial process, which both reaffirmed the commitment of the parties to dialogue regarding filling and operation of the dam¹⁶. The GERD location and impact diagram (Figure 5) illustrates the strategic location of the dam and its effects on the Nile Basin cooperation.

The United Nations has been behind this diplomatic process, most recently via a presidential statement issued by the United Nations Security Council on 15 September 2021, calling on the three countries to resume negotiations under the auspices of Africa's most influential body and to seek an agreement that is "mutually acceptable and binding"¹⁷. The GERD has reached its fourth, and last, filling phase, and by 2025, its reservoir will be fully operational. Ethiopia has started producing electricity, fulfilling a part of its aspiration to be a significant regional energy exporter. Even so, a comprehensive, legally binding document about how the

¹⁴African Union, 2020, June 26, Communiqué of the Extraordinary African Union (AU) Bureau of the Assembly of Heads of State and Government Meeting on the Grand Ethiopian Renaissance Dam (GERD).

¹⁵African Union, 2020, July 24, Communiqué of the 2nd Extraordinary African Union (AU) Bureau of the Assembly of Heads of State and Government Meeting on the Grand Ethiopian Renaissance Dam (GERD).

¹⁶African Union, 2020, October 28, Statement on the Virtual Ministerial Meeting of the Negotiating Parties of the Ethiopian Renaissance Dam (GERD) held on 27 October 2020.

¹⁷United Nations Security Council, 2021, Statement by the President of the Security Council: S/PRST/2021/18. 15 September 2021.

dam will be operated, filled and drip during a drought period between Ethiopia, Sudan and Egypt has not yet come to fruition. The African Union-peace talks, which have been sporadic, have also been blocked because of disagreements over water rights, the enforceability of any eventual agreement, and the use of international arbitration in disputes. Egypt insists that the dam is being operated unilaterally and poses a threat to its national water security, whereas Ethiopia says it operated the dam in good faith and in line with international norms. Current co-operative arrangements are fragile, as the operation of one of Africa's largest infrastructure projects is not legally binding, but is merely based on a tripartite deal that has not been signed.

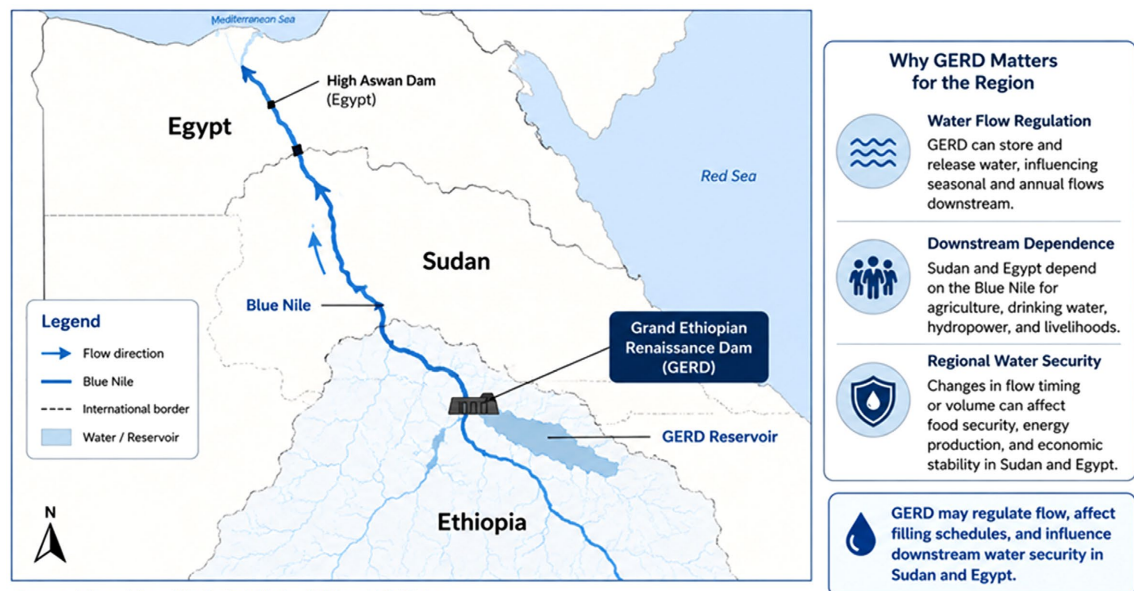


Figure 5. GERD location and impact diagram.

From a legal point of view, the transboundary water dispute has not yet been before the International Court of Justice (ICJ), but the ICJ's case law in transboundary water disputes has strengthened several elements of the international water law, such as cooperative action, the necessity of avoiding significant transboundary damage, and the regulation of shared watercourses under the body's general principles of international law. These principles offer an important legal basis in the Nile River Basin context for further negotiation and for the development of a stable and rules-based approach for the fair management of shared water resources.

5. Policy Recommendations

The foregoing analysis suggests the following policy recommendations to increase cooperation between the Nile River Basin riparian states:

First, the 11 riparian states should redouble their efforts in achieving a more rapid transition to a permanent Nile River Basin Commission that has a well-de-

defined legal mandate, binding decision-making powers, and an independent mechanism for resolution of disputes. Despite the value of the current NBI, it is a voluntary system and does not have legal force to ensure compliance of member states.

Secondly, Egypt and Sudan should be urged to be actively involved in the Co-operative Framework Agreement. Their history of water rights is legitimate but the implementation of the CFA without their involvement could leave them out of the current legal framework of the basin. The development of a negotiated protocol which recognizes current allocations and incorporates the CFA's principles on equity could offer a way to achieve universal adherence.

Third, a Nile Basin Climate Adaptation Fund may be created, using funds from the states along the Nile and from international donors, to support basin-wide actions to drought, flooding and long-term basin-level hydrological changes. The need to address climate variability is a shared issue that cutting across all political divisions among riparian states, and climate finance is a potential space for less politicized, and technical cooperation.

Fourth, the requirements of data sharing must be made mandatory throughout the basin and all riparian states must be obligated to share real-time hydrological, meteorological and infrastructure data with the NBI Secretariat. The necessary trust and confidence for better political cooperation can only be achieved if there is transparent and timely information sharing in the first place, which is essential to effective joint planning.

Fifth, there is a need to formalize civil society involvement in the NBI's governance processes, which should include structured and meaningful roles for local communities, women's groups, environmental organizations and other non-state actors in the process of water management decision-making at basin-wide level.

Limitations

This study has several limitations. First, its analysis is based primarily on documentary sources, including treaties, institutional reports, policy documents, official communiqués, and peer-reviewed literature. As such, it evaluates the formal legal, institutional, and political architecture of Nile Basin governance rather than directly testing how riparian states behave in practice (Bowen, 2009). Second, the study does not employ interviews with policymakers, negotiators, technical experts, or civil society actors, which limits its ability to capture informal bargaining, behind-the-scenes diplomatic dynamics, and perceptions among key stakeholders (Harvey, 2011). Third, the paper does not use process tracing or quantitative basin-level hydrological and socio-economic data to measure causal relationships between institutional arrangements, state behavior, climate variability, and water-allocation outcomes (Wheeler et al., 2020; Basheer et al., 2023). These limitations mean that the findings should be interpreted as an institutional and legal analysis of cooperation rather than a comprehensive empirical assessment of state conduct. Future research could strengthen this analysis by combining documentary

review with elite interviews, systematic process tracing, and quantitative basin data on water flows, withdrawals, infrastructure operation, climate variability, and demographic pressure.

6. Conclusion

The management of the Nile is at a turning point. In the last 100 years, riparian states have progressed, albeit slowly, from a colonial-imposition and bilateral-exclusivity model of shared governance to a more multilateral and institution-based model. The Nile Basin Initiative, the Cooperative Framework Agreement and the diplomatic efforts enabled by the African Union are all steps in the right direction. The entry into force of the CFA in 2024 also marks an important legal development for participating states and creates a stronger basis for the future Nile River Basin Commission. However, the unresolved conflict over the GERD, the continuing legal fragmentation caused by Egypt and Sudan remaining outside the CFA, and the growing pressures of climate change and population growth show how much more remains to be done.

Although the GERD is highly controversial, it also represents the possibility of a new type of Nile cooperation. Coordinated hydropower management, flood control and joint drought response could benefit Ethiopia, Sudan and Egypt. Practical mechanisms such as data sharing, joint monitoring, early-warning systems and coordinated reservoir operation are therefore essential for reducing uncertainty and building trust among the riparian states. Political courage and a commitment to regional stability will be required to transform the dam from a symbol of conflict into a bridge of cooperation, and the material rewards of such cooperation could be substantial.

Ultimately, it is the political will of the Nile's riparian states that will shape the future of the river, not hydrology alone. Sustainable management of the Nile cannot be divorced from the peace, prosperity and ecological health of the entire region. This can only be achieved by strengthening basin-wide institutions, developing a more unified legal framework, improving mandatory data sharing, supporting climate-adaptation mechanisms, ensuring genuine involvement of civil society and recognizing that the Nile is not the exclusive territory of one nation, but a common lifeline to be shared.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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