Water, Power, Conflict, and Frameworks:

Examining the Grand Ethiopian Renaissance Dam Through the Lens of Transnational Water Distribution

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ABSTRACT

Since the 20th century, international and regional actors have established frameworks to achieve hydrological cooperation between the Nile River Basin (NRB) states. The Grand Ethiopian Renaissance Dam (GERD), built on the Blue Nile in Ethiopia, has the potential to expand electricity access to millions and provide Egypt, Ethiopia, and Sudan with more measured water security in times of drought. Past research focuses on the lack of effective international law on transboundary freshwater bodies and resources or the history of water conflict and cooperation between NRB states. Bringing together different fields, this research highlights the challenges to collaboration on the Nile and what could be done to mitigate future disagreements through more robust regional frameworks. This work draws from literature on Nile Basin cooperation, bilateral and multilateral treaties, contemporary analyses of GERD developments, and hydrological and ecological data from the UN and regional organizations to highlight the limitations of current international law in guiding solutions. This paper demonstrates how the lack of specificity in frameworks concerning the Nile will continue to hinder development in the Basin. From 1999 to 2020, the three stakeholder states and international third parties held multiple framework meetings and expert working committees to address Sudanese and Egyptian concerns with GERD. Due to narratives around the dam fluctuating between technical, logistical, and political concerns and without standards set by international law, diplomatic rounds of negotiations since 2020 have failed to bring the three states into accord.

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INTRODUCTION

Despite its recent completion, the Grand Ethiopian Renaissance Dam (GERD) has already given birth to diplomatic conflict and cooperation as monumental as its name implies. Over the last decade, GERD has become the focal point in discussions surrounding the collaborative management of the Nile. On the one hand, GERD has the capability to bring cheap electricity to millions and help regulate water resources during times of drought for downstream countries. However, if managed while ignoring the concerns of its neighbors, the dam poses a serious risk to other Nile Basin states' environmental and economic stability.

GERD stands as a case study for the failures and potential improvements in regional frameworks and agreements. While eleven countries are in the Nile River Basin, GERD, built in Ethiopia, directly affects Sudan and Egypt. The Ethiopian government developed and unilaterally began construction without consulting these downriver states. As expanded upon later in this paper, the announcement of GERD came at a time of significant political and social unrest in the downstream countries, particularly Egypt. After the initial stages of dam construction, multiple belated working groups and technical meetings were organized between the three countries. These frameworks often included international experts, third parties, stakeholders, and scientists from the three main states. Though it is not clear why the more technical meetings of the early to mid-2010s failed to bring about better cooperation and trust on GERD projects between Egypt, Sudan, and Ethiopia, numerous potential steps toward more constructive mechanisms have crystallized through all developments since 2011. This paper will provide a chronological look at the main developments of GERD to 2024, with insights into how the stalemate in negotiations has been influenced by domestic social and political factors, military asymmetry, colonial treaties, vague international law, and the inclusion of third parties. This paper aims to identify how regional frameworks could be implemented and improved to increase cooperation regarding GERD between the three primary Nile Basin states—ensuring each country sustains itself in times of increased resource insecurity.

The structure of the paper is as follows: first, it will describe the paper's main arguments and the major issues impacting the dam. Second, the paper will present a background of the construction specifics and planned resource provisions around GERD. Then, the paper will exhibit a chronology of cooperative treaties and frameworks concerning the Nile from the beginning of the 20th century. Next, the paper will examine the limited international law surrounding transboundary freshwater resources. Fifth, it will discuss the context of the climate crisis around the region and dam. Sixth, it will briefly overview the scope of the relations of the three stakeholder states beyond GERD.

Following this, the paper will report on the key issues and sticking points of the GERD negotiations. Lastly, this article will provide recommendations based on existing scholarly research for how Nile Basin legal frameworks could be established and utilized.

DESCRIPTION OF ARGUMENTS AND MAJOR ISSUES IMPACTING GERD

The Grand Ethiopian Renaissance Dam (GERD) exemplifies the challenges of managing shared water resources in regions with limited legal and political frameworks for cooperation. Two major reasons GERD has brought about conflict in the region are water distribution and asymmetrical hydrological power. At its core, the GERD issue underscores the inadequacy of existing international and regional water agreements in addressing the complexities of transboundary river management in the Nile Basin. Despite attempts at regional collaboration, critical agreements have excluded key stakeholders, exacerbating the tensions. The meager legal and political frameworks governing the Nile are ill-equipped to navigate disputes over water allocation, resource sharing, and sustainable management, leaving countries like Egypt, Sudan, and Ethiopia at odds over GERD's construction and operation.

Political dynamics further complicate efforts toward cooperation, with GERD being both a symptom and a driver of regional tensions. Existing disputes—rooted in historical inequities, border disagreements, and competing national priorities—are exacerbated by the dam's geopolitical implications. Egypt views GERD as a direct threat to its water security due to its downstream location, amplifying long-standing power dynamics tied to geography. Ethiopia, situated upstream and seeking to assert its sovereignty and economic ambitions, frames the dam as a national imperative for energy and development. Sudan, caught between these two powers and having experienced periods of civil war and internal conflict for decades, grapples with the potential benefits of increased energy access and irrigation but also fears disruptions to its water needs. These dynamics have entrenched positions, making meaningful cooperation elusive and creating fertile ground for escalated tensions.

Further, this paper shows how climate change compounds these challenges, raising the stakes for all parties involved. The increasing variability in rainfall, intensifying droughts, and regional flooding patterns place additional pressure on Nile Basin states, making water resource management a critical and contentious issue. As climate crises intensify, the geographical asymmetries between upstream and downstream nations amplify existing power imbalances, heightening Egypt's vulnerabilities and Ethiopia's determination to secure water access for its growing population and energy needs. This environmental urgency underscores the need for robust regional frameworks capable of adapting to climate realities while fostering equitable and sustainable

cooperation.

Finally, key issues are highlighted in the GERD dispute that undermine negotiation efforts, including third-party involvement, threats of military action, and Egypt's concerns over reduced water flow. External mediators, while offering potential pathways to resolution, often introduce competing interests and complicate already fraught negotiations. Meanwhile, military threats and posturing further polarize stakeholders, moving the region closer to conflict. These elements and the dam's technical and operational uncertainties underscore the need for strengthened regional frameworks and trust-building measures to ensure that GERD becomes a catalyst for cooperation rather than conflict. This paper argues that addressing these multifaceted challenges requires prioritizing equitable agreements, leveraging regional organizations, and strengthening international legal mechanisms to mitigate future disputes.

BACKGROUND OF GERD

Completed, the Grand Ethiopian Renaissance Dam is the largest hydroelectric dam in Africa and one of the largest in the world (The Economist 2020). GERD is located on the Blue Nile in Ethiopia, about 30 kilometers upstream of the Sudanese-Ethiopian border.

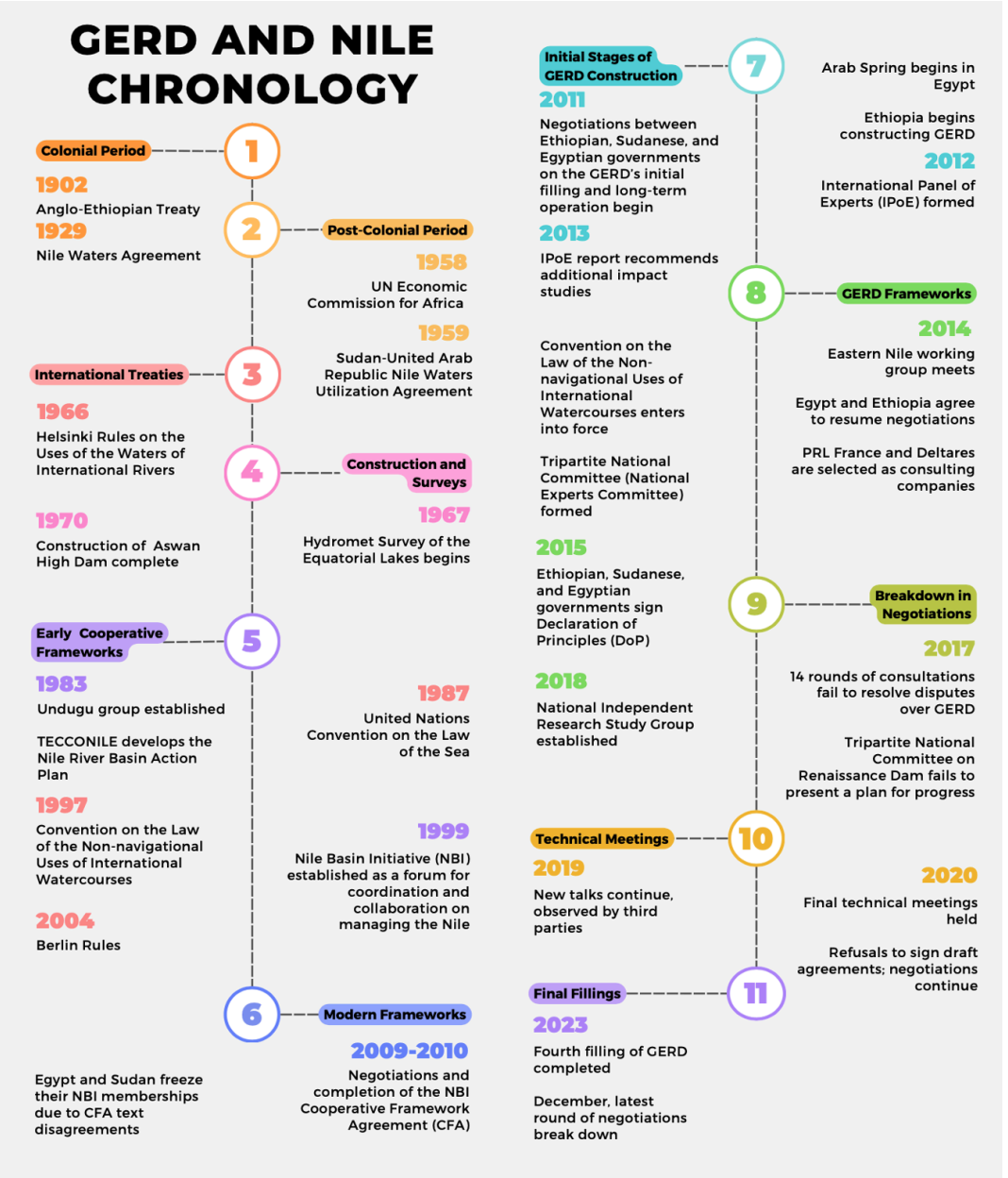
GERD Technical Specifications

Ethiopia announced the dam and began its construction in 2011. The dam is primarily funded domestically, with the government and people of Ethiopia paying for its construction through bonds and private donations. As of 2020, the dam was a $5 billion project. The dam has an installed capacity of 6,000 Megawatts (MW) to generate at peak power, with production of 15,692 Gigawatts (GW) per year (The Economist 2020; Liersch et al. 2017). GERD is 145 meters (m) high and 1,708 m wide, encompasses a 1,874 km^2 reservoir area, and has a 74 billion m^3 storage area (Maru 2020; Liersch et al. 2017).

The dam will bring $27 million annually, increase Ethiopia's electricity supply by 50%, save 20 billion cm^3 from evaporation, reduce sedimentation, and create a more stable water flow (Geneva Water Hub 2019). However, GERD will reduce the High Aswan Dam's (AHD) generation by 6%, reduce water flow by 3%, and significantly impact the vegetation and water quality of the Nile River Basin (Maru 2020).

NILE BASIN COOPERATION AND FRAMEWORK CHRONOLOGY

Figure 1: Chronological timeline of international law and conflict relating to the Grand Ethiopian Renaissance Dam



Source: Author's visualization

The timeline of the Nile and its management is divided into eleven distinct periods. It begins with the colonial era, when Britain controlled parts of the Nile Basin and dictated resource agreements like the 1902 Anglo-Ethiopian Treaty and the 1929 Nile Waters Agreement (Ullendorff 1967). After Sudan and Egypt gained independence, the post-colonial period saw new water management frameworks that often excluded other Nile Basin countries, such as the 1959 Nile Waters Agreement between Egypt and Sudan (United Nations 1959). The subsequent decades saw international treaties and the construction of key infrastructure like the Aswan High Dam, symbolizing Egyptian sovereignty. The 1980s introduced early cooperative frameworks, culminating in establishing the Nile Basin Initiative (NBI) in 1999 to foster collaborative water management (Basheer et al. 2021). However, the modern period has been dominated by tensions over the Grand Ethiopian Renaissance Dam (GERD), starting with Ethiopia's unilateral construction of the dam in 2011, leading to years of negotiations and agreements, such as the 2015 Declaration of Principles (DoP) (Habteyes et al. 2015; Basheer et al. 2021; von Meding 2022). Despite multiple frameworks and cooperation efforts, ongoing disputes over GERD's filling and operation, particularly among Egypt, Sudan, and Ethiopia, highlight the enduring challenges rooted in historical agreements and regional power dynamics.

Colonial Period

First, during the colonial period, Great Britain controlled parts of the Nile and Nile Basin region at the beginning of the 20th century. The 1902 Anglo-Ethiopian Treaty determined the border between Ethiopia and British-controlled Sudan and established the unimpeded flow of the Nile (Ullendorff 1967). The 1929 Nile Waters Agreement, or "Anglo-Egyptian Treaty," gave Egypt veto power on Nile River construction projects so there would be no water flow interference (Kimenyi and Mbaku 2016). Overall, this period was characterized by agreements that divided and managed Nile resources in ways that would benefit the great and colonial powers for economic and geopolitical gain.

Post-Colonial, UN Treaties, and Construction and Surveys Periods

After Sudan and Egypt became independent, management of the Nile entered the Post-Colonial Period. In 1958, the UN Economic Commission for Africa was established to promote the development and cooperation of states in post-colonial Africa (Okonkwo 2016). The 1959 Agreement Between the Republic of the Sudan and the United Arab Republic [Egypt] for the Full Utilization of the Nile Waters allocated all the Nile River water resources between the two countries, leaving out all other Nile Basin countries (United Nations 1959). During this period, though all parties were independent of colonial powers, Sudan and Egypt ignored many of the concerns of other nations regarding the use of Nile waters. In 1966, the Helsinki Rules on the Uses of the Waters of

International Rivers were adopted into international law (International Law Association 1966). Other important pieces of international law that apply to the circumstances of the Nile Basin states and GERD were the 1987 United Nations Convention on the Law of the Sea (UNCLOS), the 1997 Convention on the Law of the Non-navigational Uses of International Watercourses, and the 2004 Berlin Rules (United Nations 1982; United Nations 1997; International Law Association 2004). The Hydromet Survey of the Equatorial Lakes occurred between 1967-1992, established in response to regional flooding and drought (Matemu 2022). All Nile River states held member status, sans the DRC and Ethiopia, which were observers (Matemu 2022). In 1970, the construction of the Aswan High Dam ended after a decade, providing critical resources to Egypt and providing the country with a symbol of its power and independence.

Early Cooperative Frameworks

The fifth main period began in the 1980s with the early cooperative frameworks. In 1983, the Undugu group and Technical Cooperation Committee for the Promotion of Development and Environmental Protection of the Nile Basin (TECCONILE) were established to promote economic development and cooperation between Nile Basin states (Matemu 2022). TECCONILE created the Nile River Basin Action Plan (NRBAP), leading to the Nile Basin Initiative (NBI) Policy Guidelines (Basheer et al. 2021; Matemu 2022). The NBI was established in 1999 as a forum for coordinating and collaborating on Nile management. All these actions and organizations led to the Modern Frameworks of the 21st century (Basheer et al. 2021; Matemu 2022).

Modern Frameworks

The events of 2009-2010 highlight the sixth main period of Modern Frameworks. During this time, negotiations were held between Nile Basin states, resulting in the completion of the NBI Cooperative Framework Agreement (CFA), also known as the Entebbe Agreement, to establish a permanent legal and institutional setup for Nile cooperation (von Meding 2022). While Ethiopia fully signed onto the CFA, Egypt and Sudan froze NBI memberships due to disagreements over the CFA text. Their issues stemmed from Article 14B in the text: "Nile basin states therefore agree, in a spirit of cooperation, not to significantly affect the water security of any other Nile Basin States" (Abate 2022). Egypt and Sudan proposed a text that kept water use rights closer to their historical levels of almost total control of Nile waters. Despite these official disagreements, the two countries have actively participated in the NBI and CFA since 2010 (Basheer et al. 2021). Similar to the situation with international law, though some frameworks exist, they have not been sufficient to manage GERD.

Initial Stages of GERD Construction

The seventh main period centers around the initial stages of GERD construction.

In 2011, Ethiopia announced and began building GERD without consulting any downstream Nile states. At the same time, Egypt experienced serious social and political upheaval with its Arab Spring. The confluence of these events marks the beginning of the pattern of how the combination of internal and external political strife, unilateral action, violent conflict, and other factors made negotiations and communication regarding GERD difficult. Though the region faced domestic instability, negotiations between Ethiopian, Sudanese, and Egyptian governments on GERD's initial filling and long-term operation were held and organized for future dates. In 2012, the three countries agreed that an International Panel of Experts (IPoE) should be formed to study the construction of GERD. The Panel included two experts each from Egypt, Ethiopia, Sudan, and four other international experts (Basheer et al. 2021). By 2013, Sudan had returned to full NBI membership, and IPoE released reports with recommendations to undertake additional engineering, technical sustainability, and socio-economic impact studies (El Tawil 2020). The early reports and collaboration provided a foundation for the following frameworks and negotiations on GERD.

GERD Frameworks

In 2014, frameworks were developed to support GERD work. As the Convention on the Law of the Non-navigational Uses of International Watercourses entered into force, the Eastern Nile working group met to discuss how GERD would impact regional development. Egypt and Ethiopia agreed to resume negotiations over GERD. The three countries then created the Tripartite National Committee (National Experts Committee), made up of their own hydrological and related field experts, with PRL France and Deltares brought in as outside consulting companies (El Tawil 2020; Basheer et al. 2021). In 2015, the Ethiopian, Sudanese, and Egyptian governments signed the Declaration of Principles (DoP) outlining how the construction of and collaboration around the GERD should be implemented (Basheer et al. 2021). The ten principles are as follows (Declaration of Principles 2015):

1. Principle of Cooperation
2. Principle of Development, Regional Integration, and Sustainability
3. Principle of Not Causing Significant Harm
4. Principle of Impartial and Suitable Use
5. Principle of Cooperation in the First Filling and Management of the Dam
6. Principle of Trust Building
7. Principle of Information and Data Circulation
8. Principle of Dam Safety
9. Principle of Sovereignty and Unity of the State's Region
10. Principle of Peaceful Settlement of Conflicts

While the DoP and prior collaborative works helped demonstrate the spirit

of cooperation between the three states and parties, the Principles and other GERD agreements would be more effective if they were turned into technical guidelines, similar to the arrangement of the US-Canadian Columbia River Treaty and its cooperative bilateral Permanent Engineering Board (US Army Corps of Engineers 2024).

In 2018, the National Independent Research Study Group was established by water, foreign, and intelligence ministers of Egypt, Ethiopia, and Sudan to discuss the filling, operation, and impact of GERD (International Crisis Group 2020).

Breakdown in Negotiations

After the mid-2010s, work on GERD was characterized by numerous breakdowns in negotiations. In 2017, 14 rounds of consultations failed to resolve disputes over GERD. In addition, the Tripartite National Committee on Renaissance Dam failed to present a plan for progress (El Tawil 2020).

Technical Meetings

The negotiations over the Grand Ethiopian Renaissance Dam entered a new phase of technical meetings following earlier breakdowns in talks. In 2019, three technical meetings were held, rotating between Egypt, Ethiopia, and Sudan, with the World Bank and the US Department of Treasury as observers (International Crisis Group 2020). A fourth technical meeting occurred in Ethiopia in 2020, followed by a delegates' meeting in Washington, DC (El Tawil 2020). This meeting resulted in an agreement outlining six provisions and a timetable for filling GERD's reservoir, accounting for drought periods.

Final Fillings

Despite continued negotiations in February and April 2020, Ethiopia declined to sign a draft agreement, instead proposing its own version, which Sudan and Egypt rejected. From the 2010s to the 2020s, the issue of GERD became increasingly politicized, with domestic concerns in each country overshadowing technical discussions and negotiations (Embassy of Egypt 2022). The most recent phase of negotiations coincided with Ethiopia's completion of the dam's four final fillings. The latest round of talks, concluding in December 2023, ended without significant progress (Al Jazeera 2023; AP News 2023).

APPLICABLE INTERNATIONAL LAW, TREATIES, AND GERD NEGOTIATIONS

Treaties and international laws on water, especially freshwater resources, are limited; they often leave much of the world's oceans and seas in gray spaces. Multilateral and regional agreements on transboundary freshwater resources

are even fewer and far between. This section of the paper will detail five treaties and cases: the Helsinki Rules on the Uses of the Waters of International Rivers (Helsinki Rules), the United Nations Convention on the Law of the Sea (UNCLOS), the Convention on the Law of the Non-navigational Uses of International Watercourses (UN Watercourses Convention), the 2004 Berlin Rules, and the Gabčíkovo–Nagymaros case.

Firstly, the Helsinki Rules on the Uses of the Waters of International Rivers (Helsinki Rules) presents regulatory guidelines for using terrestrial rivers and groundwaters that cross state boundaries (International Law Association 1966). These rules were adopted in 1966 in Helsinki, Finland, by the International Law Association (ILA). Helsinki calls for the "Equitable utilization" and "substantial utilization" of shared transboundary freshwater resources. Treaty negotiators did not define what "equitable" or "substantial" use means, nor do the rules lay out strong enforcement mechanisms (Chellaney 2013). While the vagueness of the terms and treaty language were strategically implemented to allow stakeholders to agree while papering over disagreements, contemporary Nile Basin diplomats have been unable to use it as a foundation for genuinely cooperative frameworks.

While the 1982 United Nations Convention on the Law of the Sea (UNCLOS) focuses on the world's oceans and seas, it is part of the legacy of water treaties (United Nations 1982). It also presents learning opportunities for present and future international law. A "constitution of the oceans," UNCLOS seeks to govern and adjudicate these bodies of water through a comprehensive international legal framework. Egypt, Ethiopia, and Sudan have all signed UNCLOS. As with many other examples of international law, it has been difficult to apply in instances of non-compliance.

The Convention on the Law of the Non-navigational Uses of International Watercourses (UN Watercourses Convention) is a flexible global framework instrument adopted by the UN in 1997 (United Nations 1997). Although Egypt, Ethiopia, and Sudan are UN members and have not consistently opposed the Convention, they have not yet acceded to this international law. It governs all international watercourses' management, protection, and use. Along with oceans and seas, the Watercourses Convention applies to the Nile concerning the conservation and use of surface and groundwater. The Convention was meant to be more inclusive than past frameworks, following the model of Helsinki Rules (Okonkwo 2016). Most importantly, it introduced the "Obligation not to cause significant harm," which requires member states utilizing a transboundary watercourse within their territories to take all appropriate measures to prevent significant harm to other watercourse states and to compensate them for any harm caused.

These provisions are similar to the 2004 Berlin Rules. This set of laws further

establishes that states that share water must make reasonable efforts not to harm the other due to their individual uses of that water resource (International Law Association 2004). In addition, a nation may restrict water navigation within its jurisdiction for security purposes. Again, however, "reasonableness" in both cases is not defined. Under these laws, upstream Nile Basin countries must consider any actions they take to affect the river's flow.

The Gabčíkovo–Nagymaros Dam case offers further insights relevant to GERD. In short, this case resulted from a disagreement over constructing a dam on the Danube River between Hungary and Slovakia. In 1997, the International Court of Justice ruled that each country must compensate the other for damages suffered (Hungary v Slovakia 1997). All parties were told to engage in good-faith negotiations and take all necessary measures to ensure cooperation (Baranyai and Bartus 2016). This paper applies the Gabčíkovo–Nagymaros case to GERD in several ways. The ICJ ruled that the dam should and could continue to be constructed, supporting Ethiopia's continued building, filling, and use of GERD. However, Ethiopia must consider the ICJ case rulings that states who suffer damages are entitled to payment, collaboration in the dam process is necessary, and parties must negotiate in good faith.

Altogether, these laws and cases guide how Egypt, Sudan, and Ethiopia should have proceeded in the past. While only partially successful so far, these treaties and agreements provide a foundation for implementing collaborative work in the future for regulatory purposes of GERD.

CONTEXT OF CLIMATE CRISES

The Grand Ethiopian Renaissance Dam, located in a region already facing significant climate challenges, holds the potential to either mitigate or exacerbate these issues. Climate change further complicates the negotiations around GERD, worsening political tensions and insufficient legal frameworks. The dam is expected to generate over 6,000 MW of electricity, which could transform Ethiopia's energy landscape, reduce reliance on biomass and fossil fuels, and contribute to climate change mitigation efforts (Maru 2020). By regulating the flow of the Blue Nile, it offers a buffer against extreme weather events like droughts and floods. However, climate change could also reduce river flow in the Nile basin, increasing tensions between Ethiopia, Sudan, and Egypt over water allocation and potentially worsening water scarcity in downstream nations (Berga 2016). The Horn of Africa, mainly Ethiopia, faces severe climate challenges such as erratic rainfall, prolonged droughts, and increasing temperatures, exacerbating water scarcity and threatening agricultural productivity. These climatic changes are projected to worsen, making water management and energy security critical issues for the region (Cole et al. 2014; Geneva Water Hub 2019).

Hydropower from GERD could help reduce carbon emissions, contributing to global climate goals. Compared with fossil fuels, hydropower is a cleaner energy source, and the dam's ability to store water can help manage the fluctuating water availability caused by climate change (Berga 2016). Additionally, the reservoir created by the dam can serve as a buffer against droughts, ensuring a more stable water supply for irrigation and other uses (Cole et al. 2014). However, if poorly managed, the dam could lead to uneven water distribution, disrupting agriculture and drinking water supplies, particularly for Egypt, which relies heavily on the Nile for over 90% of its water (Haftendorn 2000). These environmental and social costs associated with large dams, in addition to the displacement of communities and changes in local ecosystems, must be carefully managed to avoid exacerbating existing vulnerabilities.

While GERD has the potential to significantly improve energy security and contribute to climate change mitigation in Ethiopia, it also presents challenges that need to be addressed through careful management and regional cooperation—neither of which seems likely in the near future. Egypt and Sudan, both of which depend heavily on the Nile for freshwater, worry that Ethiopian control over GERD's water releases could reduce downstream flow, particularly during drought periods, exacerbating their existing vulnerabilities to water scarcity. Balancing the benefits of renewable energy generation with the potential impacts on water availability and downstream communities is crucial for ensuring that the dam contributes positively to the region's climate resilience.

SCOPE OF EGYPT-SUDAN-ETHIOPIA RELATIONS BEYOND AND INTERTWINED WITH GERD

The relationships between Ethiopia, Egypt, and Sudan extend beyond the Grand Ethiopian Renaissance Dam dispute, encompassing historical, political, and regional dynamics. Here is an overview of their broader relationships:

Historical Context

The interactions between these countries have deep historical roots. Ethiopia and Egypt have had a long relationship characterized by both harmony and discord, often centered around religious issues and access to Nile water (Carlson 2013).

Regional Power Dynamics

Egypt has traditionally been considered a dominant power in the region, particularly in the area of Nile water management. However, Ethiopia's recent economic growth and development initiatives, including GERD, have begun to challenge this established order (Mbaku 2020). This shift in power dynamics

has contributed to tensions beyond just water issues.

Border Disputes

Sudan and Ethiopia have been embroiled in a border dispute over the Fashaga region. This fertile border area has been a source of conflict, with recent outbreaks of violence (Mohyeldeen 2021). The dispute has added another layer of complexity to the regional relationships, potentially affecting the dynamics of GERD negotiations.

Diplomatic and Military Alliances

Egypt has been actively seeking to strengthen its position in the region through diplomatic and military means. For instance:

1. Egypt has secured a military base in Somalia, which is seen as a strategic move in the context of regional power dynamics (Yibeltal 2024).
2. Egypt has also been cultivating military and political support from Arab states, framing GERD as a broader regional concern (Soliman and Horner 2023).

Economic Ties

Despite the tensions, there are economic ties between these countries. Ethiopia and Sudan have had a bilateral trade agreement since 2002, which has increased free trade by promoting competition and removing trade barriers. Further, all three states are members of the Common Market for East and Southern Africa (COMESA), which promotes economic prosperity via regional integration (Ebaidalla 2016). Sudan has shown interest in the potential benefits of GERD, such as regulated water flow and reduced flooding, which could positively impact its agricultural sector. Ethiopia sees GERD as crucial for its economic development, potentially providing electricity to millions of households and supporting industrial growth (Yibeltal 2024).

Regional Stability

The relationships among these countries also have significant implications for regional stability. The ongoing civil war in Sudan has further complicated the regional dynamics, with Egypt, Ethiopia, and other regional actors supporting different factions (Woldemariam and Donnellon-May 2024). Further, the potential for conflict over water resources has raised concerns about broader regional stability, prompting international mediation efforts.

Though the GERD dispute is a significant factor in the relationships between Ethiopia, Egypt, and Sudan, it is part of a broader context of historical, political, and economic interactions. The changing power dynamics, border disputes, and regional alliances all play crucial roles in shaping the complex relationships

among these three countries.

KEY ISSUES IN GERD NEGOTIATIONS

Over the last decade, several key issues have emerged concerning the process and content of GERD negotiations. Among the process issues is the participation of third parties and the various venues for their engagement. Regarding content, core sticking points reveal what Egypt, Sudan, and Ethiopia are each concerned about, what has been discussed during negotiations, and how far apart each party is from reaching a shared agreement. A threatening issue looming over the conflict is the possibility of military action when diplomacy breaks down.

Third-Party Participation in GERD Negotiations

Third parties have been actively involved in GERD negotiations throughout the dam construction. These third parties include other regional and non-regional governments, non-state organizations, and international experts. Non-stakeholder state experts were included after the International Panel of Experts was established to discuss the design and review impact reports of GERD in 2012. In addition to six scientists from Egypt, Ethiopia, and Sudan, four additional experts from outside these states were included (Basheer et al. 2021). Including outside experts has been important to the technical side of GERD discussions. In October 2014, the three countries selected PRL France and Deltares as consulting companies to help implement the recommendations established by the International Committee of Experts in August (El Tawil 2020).

After several working groups convened and multiple rounds of negotiations failed to reach a collective solution, the US Treasury and World Bank began observing the resumed talks between Sudan, Egypt, and Ethiopia on GERD in 2019 (International Crisis Group 2020). While these external actors played valuable roles in their respective capacities, their involvement has not resulted in concrete progress in the negotiations or working group meetings.

Besides including individuals and organizations who were not direct stakeholders, multiple meetings and negotiations concerning GERD occurred outside these states and the region. Notably, in 2014, the Eastern Nile working group convened at MIT to discuss how GERD will impact regional development (Basheer et al. 2021). In January 2020, the delegations of Sudan, Egypt, and Ethiopia met in Washington, D.C. to decide on a primary agreement to fill the dam (El Tawil 2020). Altogether, none of the meetings and working groups hosted or overseen in other states or by third parties could facilitate environments that fostered a collaborative agreement on the management of GERD.

Sticking Points

Overall, the three states disagree on how the Nile waters should be used and how GERD should be managed. Egypt asserts that GERD will harm it due to the state's great reliance upon the Nile for agriculture, energy, and other societal and economic needs. Further, it contends that the dam violates previous treaties (Maru, 2020). Ethiopia sees the dam as a national point of pride and a crucial tool to guarantee electricity to much of its population. Although the dam may increase domestic farming production, Sudan also has serious concerns about the altered outflow of the Nile with GERD in place for its own agricultural, energy, and other sectors.

The three parties disagree over the following elements: water security in terms of dam impoundment stages and volume stored, dam safety, water quality, and definitions of 'drought' (Maru 2020). Ethiopia wanted to complete the construction of GERD and use the dam without input from Egypt and Sudan. Ethiopia has been fully successful; the country completed GERD construction in 2023. Egypt and Sudan wanted a legally binding agreement outlining the filling of GERD's reservoir, the dam management, and the process for responding to droughts with GERD (Mbaku 2020). Specifically, the two states want a regimented, longer timeframe for the dam to be filled; Ethiopia has countered with demands that it has flexibility in making decisions on drought management with GERD. These negotiations are further complicated because the three parties have not joined all the key water treaties, such as the 1997 United Nations Convention on the Law of the Non-Navigational Uses of International Watercourses (Al Banna 2020).

In the most recent rounds of talks in 2023, Ethiopian negotiator Seleshi Bekele said the countries had "exchanged constructive ideas on various outstanding issues" and added that his country remained "committed to continuing the negotiations" (AP News 2023). However, statements released by Egypt later in the year reported that Ethiopia opposed compromises with technical arrangements formulated by international experts. At least publicly, negotiations as of 2024 are static.

Possible Military Action

Though calls to bomb the dam have largely been blown out of proportion, this paper will dedicate a short section to analyzing the military capabilities of Ethiopia, Sudan, and Egypt. Egyptian Foreign Minister Sameh Shoukry raised the possibility of military action in 2020 because the dam "potentially threatens the welfare, wellbeing, and existence of millions of Egyptian and Sudanese citizens." However, in a July speech of the same year, Egyptian President Abdel Fattah el-Sisi opposed military force to stop GERD construction, emphasizing his commitment to peaceful negotiations (Dunne 2020). This was a step back

from former President Mohamed Morsi's 2013 statement that building GERD was a "declaration of war" and, in his first administration, US President Trump's suggestion that Egypt blow up the dam (Al Jazeera 2020). Historically, Egypt had the upper hand in controlling the Nile through military force and agreements made with former colonial powers and colonies. Egypt's military, especially its air force, vastly supersedes Ethiopia's (Dunne). Furthermore, according to Global Firepower, while Sudan and Ethiopia have different capacities in manpower, airpower, and naval power as of 2024, they are comparable overall. While the Egyptian Armed Forces (EAF) and Sudan's military appear superior when combined to Ethiopia's, any use of force to partially or wholly destroy the GERD would be logistically challenging and difficult to justify for several reasons. These include the distance of GERD as a target from any potential launching base in Egypt, the dam's proximity to the Sudanese border, and the fact that any attack would jeopardize the integrity of the Nile, which rules out nearly all potential large-scale or precision operations. As of 2024, none of the Nile Basin states seem to be seriously considering using force to establish dominance over the river.

RECOMMENDATIONS

The Grand Ethiopian Renaissance Dam has the capacity to work in favor of all countries of the Nile River Basin, not only Ethiopia. Following this paper's review of historical context, international law, and court cases, GERD and Ethiopia can comply with international law if Egypt, Sudan, and Ethiopia have negotiations in good faith to build consensus on the management of GERD. Actions such as openly sharing data about water flow, dam operations, and potential impacts would demonstrate sincerity and address the conflicts and issues surrounding the dam mentioned previously in this paper. It is in the best interest of all that Ethiopia ensures GERD and actions by the government in Addis Ababa do not negatively affect the sovereignty of the downriver states and the integrity of their systems of reliance upon the Nile.

Utilization and Strengthening of Regional Cooperative Organizations and International Frameworks

The following proposals build upon Haftendorn's 2000 article, "Water and International Conflict," adapting and expanding its recommendations to address the specific context of the Grand Ethiopian Renaissance Dam.

Cooperative Management Frameworks: One of the primary recommendations Haftendorn and others suggested is establishing a cooperative management framework for the Nile basin that includes all riparian states (2000; Geneva Water Hub 2019). As explained in previous sections, a plethora of organizations and frameworks are supposed to connect and foster cooperation between Nile Basin states. However, all these institutions and their structures need to

be revitalized. Revitalization would broadly include refunding and allocating resources to past and new hydrological management programs, and dedication to new written agreements. The International Hydrological Programme's NILE FRIEND-Water program could be expanded and integrated into current efforts to facilitate resolutions and partnerships between Nile River states. The FRIEND-Water program was mainly active in the 2000s and has since been relatively inactive and has not contributed to GERD negotiations. It can benefit the region by organizing projects that collect data on the Nile and how its waters are used and hosting workshops to bring together regional experts. Next, it is in all stakeholders' best interests for Sudan and Egypt to fully sign onto the Nile Basin Cooperative Framework Agreement. As the centerpiece of the NBI, the CFA could be further fleshed out to benefit stakeholders and recognize all the resource management concerns of Ethiopia, Sudan, and Egypt. Along with mechanisms to resolve disputes, the Nile Council of Ministers (Nile-COM), as the highest governing and political organ of the NBI, needs to have the authority to finalize water allocation and management agreements between the Nile Basin states. Zeitoun et al. suggest critically evaluating the processes that establish and maintain water arrangements, especially where power asymmetries between actors are structural (2020).

International Mediation and Arbitration: All frameworks within the NBI must be binding and enforceable on Ethiopia, Egypt, Sudan, and any other stakeholder party, including the ministers in charge of water affairs in all member states of the Nile River Basin. Haftendorn suggests that a binding arbitration mechanism could also offer a neutral resolution to future conflicts (2000). Third-party involvement, such as from the African Union or United Nations, could help mediate any disputes and ensure that agreements are respected. Regional organizations not specifically focused on the Nile could also be more proactively leveraged to facilitate cooperation along the river. While the UN Economic Commission for Africa and the African Union have taken some steps to mediate between Egypt, Ethiopia, and Sudan, they could focus on the creation of dedicated working groups and spaces to negotiate on Nile issues, putting the onus and power in negotiations near-exclusively in the stakeholder countries' hands. While third parties may be helpful and utilized at times, meetings should be held in the affected states, with experts primarily from the region.

Hydrological Information Sharing: Transparency in sharing data related to water flows, dam operations, and drought forecasting is essential. This would improve trust and allow all parties to plan and mitigate risks.

Compensatory Mechanisms: Egypt and Sudan could be compensated for any losses they incur due to water flow or storage changes. Such mechanisms might include financial aid, water-saving technologies, or even the sharing of electricity generated by GERD.

Linkage Strategies: The conflict resolution could be linked to broader economic or political issues, creating a framework where the countries collaborate on projects beyond the dam, such as infrastructure, trade, and energy sharing, allowing for mutual benefits. Regarding the multiple factors and levels of conflicts between the countries, Zeitoun et al. advise against environmental determinism and suggest considering complex, interrelated factors in environmental conflicts rather than focusing solely on environmental determinants (2020).

Sustainable Development Agreements: Integrating sustainable development goals that balance Ethiopia's need for economic growth with Egypt and Sudan's water security could result in a compromise. This could involve Ethiopia adjusting the rate at which it fills the dam, allowing for controlled and less disruptive water release downstream. With agreements like these, Zeitoun et al. emphasize the importance of addressing the structural inequities underlying transboundary water governance arrangements (2020).

Transformative Analysis and Holistic Approaches

Considering current and future regional resource issues, Zeitoun et al.'s proposed "transformative analysis" method would be a proactive framework to support efforts in transforming inequitable and unsustainable transboundary water arrangements (2020). The transformative analysis emphasizes addressing the root causes of political tensions by reframing conflicts in terms of equity, inclusion, and shared benefits rather than zero-sum competition (Zeitoun et al. 2020). In the context of GERD, this approach could reduce tensions by fostering trust and collaboration through transparent data sharing, joint decision-making, and equitable resource distribution. Policy tools might include regional water-sharing agreements, adaptive management frameworks, and third-party mediation by entities like the African Union, ensuring all stakeholders' concerns are considered and integrated into sustainable solutions. All three countries—especially Egypt and Ethiopia—need to abandon the political rhetoric of the dam with identity politics and arguments based on "natural historical rights." The United Nations General Assembly explicitly recognizes the human right to water as integral and the foundation for realizing all other human rights in UN Resolution 64/292 and General Comment No. 15 (2010; 2002). Under this resolution and comment, states and international organizations are called upon to provide financial resources and means to expand access to safe, clean, and affordable water for all. Following the detailed model of UNCLOS, all treaties and agreements between these countries and other Nile Basin partners should be as comprehensive and tailored to regional problems and environments as possible.

In general, each country's ministries and government officials must end their use of unproductive and hostile rhetoric toward others and GERD and the Nile

as a political tool to gain domestic support. Coordination between GERD and Aswan High Dam (AHD) will help gauge the flow and use of the Nile at both upstream and downstream ends. When composing future agreements, it will be helpful for scientists, drafters, and diplomats to use technical and specific language to ensure all parties are on the same page and held accountable for the steps explicitly laid out. Interdisciplinary approaches and a comprehensive understanding of the Nile's ecological, social, and economic significance are essential for fostering equitable and sustainable solutions. By prioritizing collaboration over conflict, the region can transform the Nile from a source of tension into a model of shared prosperity and resilience.

CONCLUSION

The Grand Ethiopian Renaissance Dam has profound implications for the Nile Basin, affecting millions of lives across Ethiopia, Sudan, and Egypt. Beyond its environmental and resource significance, it provides a case study of the application and limits of international law and regional frameworks. Even though treaties and working groups have convened over decades, agreements ensuring equitable water management remain elusive. The overall failure of current and past frameworks highlights the difficulty of reconciling the developmental needs of one nation with the resource concerns of others.

As of 2024, GERD is operationally complete and has begun producing some energy, but it awaits cooperative management protocols. Ethiopia cannot unilaterally control the Nile's flow without impacting downstream livelihoods, just as Sudan and Egypt cannot feasibly obstruct the dam's contributions to regional energy security. The intertwined nature of these issues emphasizes the necessity for collaborative solutions underpinned by legal and institutional frameworks.

The Grand Ethiopian Renaissance Dam illustrates key challenges in managing transnational water distribution, highlighting the persistent tension between development and conservation, the need for inclusive governance, and the critical role of water in fostering regional stability. These challenges reflect broader issues in the literature on transboundary water governance, particularly the difficulty of balancing sovereignty with shared resource stewardship. However, GERD also presents an opportunity to develop innovative frameworks for cooperative water management, encouraging technological advancements, transparent negotiations, and stronger regional institutions. If approached constructively, the dispute surrounding GERD could serve as a model for sustainable and equitable transboundary water governance, demonstrating how collaborative solutions can transform conflict into long-term stability and shared prosperity.

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