

The long shadow of the 1959 Nile Waters Agreement

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ABSTRACT

Since 2011 Ethiopia, Egypt, and Sudan have been in continual negotiations over the filling and operation of the Grand Ethiopian Renaissance Dam and more fundamentally the future shape of economic development in the Nile basin. This paper examines two important ways that the terms of the 1959 Nile Waters Agreement continue to shape these negotiations. First, the 1959 Agreement codifies Egypt's historic water rights. Egypt's strategy of trying to protect these historic rights by preventing upstream water use in Ethiopia is increasingly putting its ability to maintain and expand its virtual water trade at risk. Thus, counterintuitively, treating its historic water rights as non-negotiable is putting Egypt's food security in jeopardy. Second, the 1959 Agreement created a strong disincentive for Sudan to participate in any new basin-wide water-sharing plan. It is in Sudan's interest to ignore any modest future water withdrawals by Ethiopia rather than join in a third-party negotiation to determine Ethiopia's share. The paper describes how the current impasse on the Nile may be transformed by either new ideas or events.

Key words: Nile, 1959 Nile Waters Agreement, Egypt, Sudan, Ethiopia, Grand Ethiopian Renaissance Dam

HIGHLIGHTS

- The 1959 Nile Waters Agreement created a strong disincentive for Sudan to participate in any new basin-wide water-sharing plan.
- It is in Sudan's interest to ignore any modest future water withdrawals by Ethiopia.
- Egypt's strategy of trying to protect these historic rights by preventing upstream water use in Ethiopia is increasingly putting its ability to maintain and expand its virtual water trade at risk.

INTRODUCTION

Sixty-four years have now passed since Egypt and Sudan, the two downstream Nile riparians, signed the 'Agreement Between the Republic of the Sudan and the United Arab Republic for the Full Utilization of the Nile waters' in Cairo on November 8, 1959. Known as the '1959 Nile Waters Agreement', it is a short document. The English version is only seven pages long including two brief Annexes. Although there have been several other agreements between some Nile riparians, the 1959 Nile Waters Agreement remains today the main pillar of the international legal framework accepted by Egypt and Sudan for governing their use of Nile waters. Not only has no comprehensive water-sharing agreement been signed that includes the other nine Nile riparians (Ethiopia, South Sudan,

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Kenya, Tanzania, Uganda, Rwanda, Burundi, Eritrea, and Democratic Republic of the Congo), but over the past 64 years the Nile riparians have not even attempted to negotiate a basin-wide water allocation agreement.

In this paper, we explore some of the reasons for the longevity of the 1959 Agreement. In an important sense, Tony Allan (2001) explained the overarching reason for the durability of the 1959 Agreement over two decades ago. He argued that Egypt's ability to import grain released the pressure on policymakers to expand the agricultural sector to feed the Egyptian population. The foreign exchange to purchase food imports came from cotton exports and industrial production facilitated by inexpensive hydropower from the High Aswan Dam (HAD) (Karakoç *et al.*, 2017). Allan argued that a reduction in its share of Nile waters would not be catastrophic to Egypt, but that it was politically dangerous for Egyptian leaders to acknowledge the country's dependence on food imports. I agree with Allan's broad argument about the importance of 'virtual water' to Egypt. However, I argue that although the structure of the 1959 Agreement has to date worked to accomplish Egypt's political objective to maintain the *status quo* water allocation in the Nile basin, its efforts to maintain this *status quo* are increasingly putting at risk the benefits that Egypt receives from the virtual water trade.

When Nile scholars reflect on the consequences of the 1959 Agreement, they typically focus on the fact that Sudan and Egypt reserved 100% of the river flow for themselves ('full utilization') and the tension in international water law between the competing principles of equitable and reasonable use and prior (historic) use (Waterbury, 2002; Cascao, 2009; MIT, 2014; Whittington *et al.*, 2014; Yihdego, 2017; Gari *et al.* 2020). The 1959 Agreement is the foundational legal document for Egypt and Sudan's claims based on prior use, codifying their historic water rights.

Since Ethiopia announced its intention to build the Grand Ethiopian Renaissance Dam (GERD) in 2011, Egypt, Sudan, and Ethiopia have been locked in a series of negotiations over the filling and operation of the GERD. In 2015, Egypt, Sudan, and Ethiopia signed the Declaration of Principles (DoP) in Khartoum. In the DoP, Ethiopia committed to not cause 'significant harm' to downstream riparians. For Egypt, both the 1959 Agreement and the DoP, as well as the 1929 Nile Waters Agreement and the colonial era treaties of 1902 and 1906 between Ethiopia and European powers, provide support for this principle of 'no significant harm'. Egypt sees the GERD and Ethiopia's upstream irrigation plans as threatening its historic water rights enshrined in the 1959 Agreement and 'causing significant harm'. Any adverse downstream consequences of filling the GERD are perceived as 'deficits' measured from its water share in the 1959 Agreement (Whittington, 2022).

Ethiopia and the other upstream riparians have never accepted the 1959 Nile Waters Agreement, and thus do not perceive that any reduction to Egypt's water share would be a 'loss' or 'significant harm' that must be avoided. Ethiopia argues that a new water-sharing agreement will be needed based on the principle of equitable and reasonable use. Some observers hoped that with the signing of the DoP, Egypt, Sudan, and Ethiopia would move to a new era of Nile cooperation in which the principle of equitable and reasonable water use would take precedence over the principle of prior use (Salman, 2016). However, as Helal & Bekhit (2023) discuss, this has not been the case. Despite agreement on the DoP, the ongoing dispute between Egypt and Ethiopia over the GERD and the use of Nile waters still revolves around different interpretations of the priority to be placed on these two principles of international law and more fundamentally Egypt's attempts to limit Ethiopian water withdrawals in the Blue Nile basin.

Where does Sudan fall on this question of the competing principles of prior (historic) use ('no significant harm') versus equitable and reasonable use? In his seminal analysis of the hydrogeopolitics of the Nile, Waterbury (2002) called Sudan the 'master of the middle'. Sudan is not only the riparian in the middle of the river geographically, but it is also in the middle of the impasse between Egypt and Ethiopia on the principles of water allocation. At times, Sudan has sided with Egypt on the importance of historic use and 'no significant harm'. At other times, Sudan has supported the upstream riparians' argument that priority should be given to the principle of equitable and reasonable use.

During the first decade of the 21st century, the Nile riparians tried to reach an agreement on a set of principles for Nile water management called the ‘Nile Basin Cooperative Framework Agreement’ (CFA) (Salman 2013, 2019). Article 14 of the CFA reads: ‘Nile Basin States therefore agree, in a spirit of cooperation: (a) to work together to ensure that all states achieve and sustain water security; (b) not to significantly affect the water security of any other Nile Basin States’. Both Egypt and Sudan objected to the text of Article 14(b) and sought to clarify the term ‘water security’. Neither country has signed or ratified the CFA.

However, on July 8, 2024, the Republic of South Sudan voted to ratify the CFA. Six riparian countries had already signed the CFA (Ethiopia, Rwanda, Tanzania, Uganda, Kenya, and Burundi) and all but Kenya has also ratified the agreement. Thus, South Sudan’s action yielded the required six Nile basin countries for the CFA entry into force on October 6, 2024. This step will enable the Nile Basin Initiative to be replaced by a new Nile Basin Commission that at this point will not include Egypt or Sudan. For Egypt and Sudan, the 1959 Agreement remains the binding international water agreement governing Nile water allocation.

The next, second section of the paper provides a brief introduction to the negotiations that culminated in the 1959 Nile Waters Agreement, and how these two principles of international law – historic use versus equitable and reasonable use – entered into the discussions. The third section focuses on the provision in the 1959 Agreement that details how Egypt and Sudan proposed to deal with future water rights claims by upstream riparians. I argue that an underappreciated reason for the durability of the 1959 Agreement is the strong disincentive this provision created for Sudan to participate in any new basin-wide water-sharing plan. Instead, water claims of upstream riparians would precipitate complex negotiations between Sudan and Egypt. The fourth section summarizes some of the issues that would be involved in such bilateral negotiations and why they will be so difficult to resolve. In the fifth section of the paper, I speculate on how this long shadow of the 1959 Agreement could be disrupted and transformational change could occur. The sixth section offers concluding remarks.

BACKGROUND

The impetus for the 1959 Nile Waters Agreement was Egypt’s decision in 1952 to build the HAD. The reservoir behind the HAD would flood Sudanese territory south of the Egyptian–Sudanese border and displace approximately 50,000 Sudanese citizens living in Wadi Halfa and surrounding Nubian villages (Hassan, 2007; Scudder, 2016). When the World Bank was considering financing the HAD, it stipulated that Egypt reach an agreement with Sudan before proceeding with construction. Egyptian–Sudanese negotiations began in 1954 and continued even after the World Bank declined in 1956 to provide financing. It is unclear why the World Bank required that Egypt reach an agreement with Sudan but not with Ethiopia.

The negotiations occurred during a time of transition for Sudan from a British colony to an independent nation. At the time, Egypt dwarfed Sudan as a regional power. Nasser had successfully nationalized the Suez Canal in 1956 and was the undisputed leader of the Arab world. The Egyptian population was over three times the Sudanese population (23 million versus 7 million in 1954).

Elections were held in Sudan in October 1953, and a Sudanese Prime Minister and his cabinet took office on January 1, 1954. This transitional government, which lasted from January 1954 to December 1955, was immediately thrust into the negotiations that led to the 1959 Agreement. The Sudanese delegation to these negotiations consisted largely of Sudanese. The one exception was the British Irrigation Advisor who continued as a member of the delegation until January 1959 (Salman Salman, personal communication). During this period, the Sudanese people debated whether to become an independent country or to become part of Egypt. The Sudanese Parliament voted for independence, which occurred on January 1, 1956.

The parties approached the negotiations as a major overhaul of the 1929 Nile Waters Agreement, a product of negotiations between Egypt and Great Britain acting on behalf of Sudan and its other upstream colonies (Kenya,

Uganda, and Tanzania). Great Britain occupied Egypt in 1882 and its protectorate of Egypt did not end until 1952. Thus, in 1929, Egypt itself was still under the colonial influence of Great Britain, so the negotiations over the 1929 Nile Waters Agreement were not an arms-length negotiation between two sovereign nations. Great Britain's colonial administration was represented on both sides.

The HAD was an Egyptian project with only negative consequences for Sudan. However, Sudan had several objectives it wanted to accomplish in these negotiations. First, it sought a more equitable share of the Nile waters than the 4 billion cubic meters (bcm) it received in the 1929 Agreement. Second, the 1929 Agreement gave Egypt the right to veto the construction of any projects in Sudan that it felt would impede the flow of the river or reduce its historic rights. Sudan sought the removal of this Egyptian veto power on its irrigation and hydropower development. Third, Sudan sought compensation from Egypt for the losses it incurred from the flooding of Wadi Halfa and surrounding lands caused by the High Aswan Dam Reservoir (HADR).

The Sudanese delegation essentially argued that each country's share of the Nile should be based on the principle of equitable and reasonable use. Two possible approaches for determining equitable share were proposed (Abdalla, 1971). The first was to base each country's shares on the size of their respective populations. The second was to base their shares on the amount of land suitable for irrigation in the two countries. Both approaches would have resulted in a reduction of Egypt's allocation of 48 bcm in the 1929 Nile Waters Agreement, which unsurprisingly the Egyptian delegation would not contemplate.

The negotiations were essentially at an impasse until November 1958 when a military coup replaced the elected government in Sudan. Egypt quickly recognized the new Sudanese military government, and the coup leaders promised to resolve the impasse in the negotiations with Egypt. The Sudanese negotiators then dropped Sudan's demand for a water allocation based on equitable use, and the negotiations on the 1959 Nile Waters Agreement were concluded on November 8, less than one year after the new military regime in Khartoum took power.

In three important respects, the negotiators settled on an unusual structure for the 1959 Nile Waters Agreement. First, Egypt and Sudan allocated 100% of the flow of the river between themselves, leaving nothing for the upstream riparians. Egyptian and Sudanese shares were thus contingent on no future upstream withdrawals.

Egypt and Sudan agreed to calculate their respective water allocations as increments to their shares in the 1929 Agreement, i.e., their historic rights in the 1929 Agreement were accepted as the baseline. Arguments about equitable use were only entertained with respect to the increments to baseline shares. These increments were calculations based on the assumption that the average annual flow of the Nile measured at Aswan was 84 bcm, the estimated mean of the observed 1901–1959 historical sequence. The parties assumed that 10 bcm would be lost to evaporation from the HADR, leaving 74 bcm to divide between them for the 'full utilization' of the river. They agreed on an Egyptian share of 55.5 bcm and a Sudanese share of 18.5 bcm, both measured at Aswan. Sudanese withdrawals upstream could be somewhat greater than 18.5 bcm because there would be evaporation and seepage losses between the points of Sudanese withdrawal and Aswan.

The Sudanese share of 18.5 bcm was a substantial increase in its allocation compared with its share of 4 bcm in the 1929 Nile Waters Agreement. Moreover, the 1929 Agreement had reserved all of the summer flow for Egypt during the period of peak Egyptian agricultural water demand; Sudan was restricted to withdrawals during the winter months of high Nile flows. The 1959 Agreement removed this restriction on the timing of Sudanese withdrawals. With the construction of the HADR, Egypt could release water from storage to meet its peak summer demands.

The parties acknowledged that the 84 bcm estimate of the average annual flow of the Nile measured at Aswan could change. If the average yield of the river were to increase, the 1959 Agreement specified that the difference between the new higher estimate and 84 bcm would be shared equally between Egypt and Sudan. In fact, the mean of different historical sequences varies substantially. For example, the mean of the historical sequence

from 1871 to 1999 was 91 bcm (Blackmore & Whittington, 2008).¹ However, the respective shares of Egypt and Sudan have never been adjusted to account for a different estimate of the long-term mean flow. An upward revision of the estimate of the long-term mean and a subsequent adjustment of Egypt's and Sudan's respective share would benefit Sudan.

In summary, the 1959 Agreement was erected upon the principle of the 'acquired rights' (i.e., historic use) in the 1929 Agreement. The net benefit of the HAD in terms of the increase in managed river flow was estimated to be 22 bcm, which was shared between Egypt (7.5 bcm) and Sudan (14.5 bcm) on a negotiated notion of equitable use. These increments were added to the parties' 'acquired rights' in the 1929 Agreement to reach their shares of 55.5 bcm (48 + 7.5) and 18.5 bcm (4 + 14.5), respectively.²

In retrospect, it is something of a puzzle how Sudan managed to negotiate such a large increase in its water share given its relative political weakness vis-a-vis Egypt. Waterbury (2002) has argued that Sudan's success was an early triumph of the principle of equitable and reasonable water use decades before the principle was codified in the 1997 Convention on the Law of Non-Navigational Uses of International Watercourses.

The second unusual aspect of the 1959 Agreement was that it gave Sudan a blank check to proceed with future water development projects. Egypt agreed to the construction of the Roseires Dam on the Blue Nile in Sudan and 'any other works which the Republic of the Sudan considers essential for the utilization of its share'.³ In exchange, Sudan explicitly gave its consent to the construction of the HAD, acknowledging that the HAD is 'the first link of a series of projects on the Nile for over-year storage'.

Third, Egypt and Sudan agreed in the 1959 Nile Waters Agreement to present a united front in any future negotiations with upstream riparians. The consequences of this provision of the Agreement are described in the next section.

PROVISION FOR DEALING WITH UPSTREAM RIPARIANS

Both Egypt and Sudan knew that the terms of the 1959 Nile Waters Agreement would be controversial even before they signed it. On September 23, 1957, Ethiopia sent an Aide Memoire to the Ministry of Foreign Affairs of the Republic of Egypt, officially informing Egypt that it had 'ascertained the fact that certain discussions have been taking place concerning the diversion of the water of the Nile'. The Ethiopian Aide Memoire proceeds to state that Ethiopia has not been consulted about these discussions and asserts Ethiopia's 'full measure of its freedom of action as regards discussions being pursued concerning the water flowing from its territory ...'. The Aide Memoire continues '... the utilization by Ethiopia of her resources in water will be effected strictly in accordance with the present and projected needs of her expanding population and economy as determined by scientific studies undertaken and constantly pursued by the Imperial Ethiopian Government'.

The key provision of the 1959 Nile Waters Agreement specifying how Egypt and Sudan would deal with the claims of upstream riparians is Article 12 of the Fifth Section (General Provisions) reads:

'As the riparian states, other than the two Republics, claim a share in the Nile waters, the two Republics have agreed that they shall jointly consider and reach one unified view regarding the said claims. And if the said consideration results in the acceptance of allotting an amount of the Nile water to one or the other of the said states,

¹ This higher long-term mean has been a benefit to Egypt because the entire flow remaining after Sudanese withdrawals flows downstream to Egypt.

² Despite this power imbalance, many Sudanese believe that the new military regime was ill prepared to effectively negotiate with its more experienced, powerful downstream neighbor during this period of political change, and that the 1959 Agreement was a bad deal for Sudan.

³ The Roseires Dam (Salman Salman, personal communication) was completed in 1966. It is located north of the Ethiopian-Sudanese border and is used to generate hydropower and supply water to the Rahad and Roseires irrigation schemes.

the accepted amount shall be deducted from the shares of the two Republics in equal parts, as calculated at Aswan’.

Thus, Egypt and Sudan agreed to act as partners in future negotiations and decide together whether to accept an upstream riparian’s claims. As [Salman \(2016\)](#) notes, the parties gave themselves the right to decide if any of the upstream Nile riparians were entitled to a share of the Nile waters. Moreover, the 1959 Agreement established a Joint Technical Commission, one of whose responsibilities would be to design and supervise any projects that Egypt and Sudan approved in the upstream riparian countries ...

‘The Joint Technical Commission shall after consulting the authorities in the Governments of the States concerned, draw all the technical execution details and the working and maintenance arrangements.

And the Commission shall, after the sanction of the same by the Governments concerned, supervise the carrying out of the said technical agreements’. [Section 5, Article 1]

Ethiopia rejected these and all other provisions of the 1959 Agreement at the time and has rejected them ever since ([Whittington et al., 2014](#)).

To date, Egypt and Sudan have never invoked the 1959 Agreement in their relations with Ethiopia, and thus, the implementation of this provision of Article 12 has never been attempted. In the event that Ethiopia did claim a share of Nile waters and this claim was accepted by Egypt and Sudan, the anticipated calculation of the reduction in Egypt’s and Sudan’s shares was envisaged as straightforward. For example, if Egypt and Sudan jointly agreed to an allocation of 10 bcm for Ethiopia (measured at Aswan), Egypt and Sudan would each reduce their original allocation by 5 bcm. Egypt’s new allocation would be 50.5 bcm (55.5–5) and Sudan’s new allocation would be 13.5 bcm (18.5–5).⁴

Although the calculation itself is straightforward, the provision created three problems. First, this provision of the 1959 Agreement is understandably silent as to what would happen if an upstream riparian withdrew water upstream without an agreement with Egypt and Sudan. Of course, Egypt and Sudan would not want to reveal in advance what they would do if they rejected an upstream riparian’s claim and the upstream riparian proceeded to withdraw water anyway. Egypt and Sudan could decide to act jointly to stop such ‘unauthorized’ water withdrawals. Or they might accept the withdrawals as a *fait accompli*. In the latter case, a plausible interpretation of the 1959 Agreement is that Egypt and Sudan would reduce their respective shares equally, as if there had been an agreement with the upstream riparian. But this is not clearly specified in the 1959 Agreement.

Second, in any future negotiations with upstream riparians, Article 12 makes it much more difficult for Sudan to agree to a new allocation for upstream riparians than for Egypt. Any reduction in its allocation under the 1959 Agreement will be much larger proportionally for Sudan than for Egypt. Thus, it would be much harder for Sudan to adapt to such a reduction in its water allocation. For instance, in the above example that assumed a new 10 bcm allocation for Ethiopia, Egypt’s allocation would fall by 9% (of 55.5 bcm) while Sudan’s allocation would fall by 27% (of 18.5 bcm). As long as Egypt and Sudan continue to abide by the ‘united front’ negotiation strategy specified in Article 12, Egypt need not worry that Sudan will become a weak or ‘soft’ negotiating partner. Egypt is assured that it is in Sudan’s self-interest to maintain a hardline in any negotiations over new water allocations for upstream riparians.

However, Egypt cannot take for granted that Sudan will continue to be a partner in this united front. Ever since the negotiations over the 1959 Agreement, Sudan has oscillated between support for the principle of prior use and

⁴ An alternative approach to sharing a reduction due to an upstream riparian’s share would have been to reduce Egypt’s and Sudan’s shares by an equal percentage, i.e., in proportion to their initial shares. Such an approach would have been in Sudan’s interest, resulting in a smaller absolute reduction in its water allocation.

the principle of equitable and reasonable use.⁵ In 1991, Ethiopia and Sudan signed the ‘Ethiopia-Sudan Peace and Friendship Khartoum Declaration’ (Salman, 2019). One of its key articles expressed support for the principle of equitable and reasonable use: [Sudan and Ethiopia] ‘affirm equitable entitlements to the uses of the Nile Waters without causing appreciable harm to one another’. On December 4, 2013, despite Egyptian objections, Omar El-Bashar, then President of Sudan, announced Sudan’s support for the GERD.⁶ On the other hand, throughout the negotiations over the Nile Basin Cooperative Framework Agreement, Sudan did maintain a more or less ‘united front’ with Egypt during the negotiations with upstream riparians (Salmon, 2013, 2019).⁷

Third, Article 12 created a dynamic for any future water-sharing negotiations with upstream riparians that has not been widely appreciated by Nile scholars. When Egypt and Sudan negotiated the 1959 Agreement, it may have seemed plausible that the upstream riparians might someday claim the majority of the flow of the river. In this case, the two downstream riparians would need a ‘united front’ strategy to protect their ‘historic rights’ against any large claims of upstream riparians based on the principle of equitable and reasonable use. If Ethiopia could conceivably withdraw, say, 30 bcm (measured at Aswan), this would pose a grave threat to the agricultural sectors of both Egypt and Sudan. Thus, confronted with an Ethiopian claim of 30 bcm, it would make sense for these downstream riparians to negotiate jointly to avoid such an outcome.

However, if Ethiopia only wanted to withdraw 5 bcm measured at Aswan, the incentives for Sudan and Egypt are quite different. In this instance, because the consequences of invoking Article 12 would result in a greater proportional loss to Sudan than to Egypt, it would be in Sudan’s interest to ignore such modest future water withdrawals by upstream riparians rather than join in a third-party negotiation to determine Ethiopia’s share. This is because, if there is no new water-sharing agreement with Ethiopia and Article 12 is thus not invoked, Sudan could plausibly claim that it had the right to continue to withdraw its 18.5 bcm share as specified in the 1959 Nile Waters Agreement. Because Sudan is upstream of Egypt, if it continued to withdraw 18.5 bcm, the entire reduction in the flow of the river that resulted from Ethiopia’s water withdrawals would fall on Egypt.

In a situation in which Sudan ignored Ethiopian water withdrawals, the burden would be on Egypt to initiate negotiations with Sudan to share this reduction in river flow caused by the new Ethiopian withdrawals. This would be a bilateral negotiation between Egypt and Sudan, not a ‘united front’ third-party water-sharing negotiation with Ethiopia. As described in the next section, such a bilateral negotiation with Egypt is likely to be much more advantageous for Sudan.

POTENTIAL BILATERAL NEGOTIATIONS BETWEEN EGYPT AND SUDAN OVER ETHIOPIAN WATER WITHDRAWALS

In a bilateral negotiation about a possible reduction in their respective water shares, Egypt and Sudan would have to agree on whether the 1959 Agreement addressed this issue of ‘unauthorized’ upstream withdrawals. As noted above, the Agreement is arguably ambiguous on this point. If Egypt and Sudan did agree that they should reduce

⁵ In 1958 (during the negotiations), Sudan unilaterally raised the level of the Sennar reservoir, effectively repudiating a key provision of the 1929 Nile Waters Agreement (Abdalla, 1971).

⁶ In 1993, Ethiopia also signed a bilateral agreement with Egypt, entitled ‘Framework for Regional Cooperation between Ethiopia and the Arab Republic of Egypt’. This Framework Agreement states that the issue of Nile waters shall be worked out ... ‘on the basis of the rules and principles of International Law’. But as Salman (2019) notes, Egypt and Ethiopia seem to have had in mind different interpretations of the relevant elements of international law.

⁷ Egypt insisted that the text of Article 14(b) clearly specify that ‘water security’ means current uses, which would include the portion of the Sudanese allocation under the 1959 Agreement that Sudan has failed to use. However, Sudan insisted on the word ‘rights’ because this referenced its allocation under the 1959 Agreement, not its current use. However, the other riparians refused to agree to modify the text of the Article 14(b) to include either ‘uses’ or ‘rights’ (or both).

their respective shares, they would then need to agree on (1) how much water upstream riparians were withdrawing and (2) how much these withdrawals would reduce the flow at Aswan. Neither of these would be simple matters to resolve. In the absence of an agreement, the upstream riparian(s) is (are) unlikely to provide Egypt and Sudan information on their withdrawals or assist with the second calculation.

Remote sensing techniques could be used to approximate information on upstream withdrawals (see [Blackmore & Whittington \(2008\)](#) for an example of such a calculation for Sudanese irrigation withdrawals), but estimates would be uncertain, temporally variable, and likely disputed. The smaller the amounts withdrawn upstream, the more challenging these water withdrawals would be to measure. Not only would Ethiopia be incentivized to minimize the magnitude of these withdrawals, but so would Sudan.

Calculations of the effects of upstream withdrawals on reliable releases from the HAD are also complicated. [Murgatroyd et al. \(2024\)](#) estimate that a cubic meter withdrawn upstream of an Ethiopian Blue Nile cascade would reduce reliable HAD releases by approximately 0.5 cubic meters. But such calculations depend on the location of the withdrawals in Ethiopia, the number of dams in the Blue Nile cascade, the operation of the HAD, Sudanese dams, and dams in the Blue Nile cascade, and a variety of other factors. It would be difficult to negotiate a final parameter.

Such a bilateral negotiation would be further complicated by the history of disagreements between Egypt and Sudan over the interpretation of other provisions of the 1959 Agreement. Three disagreements in particular would likely increase the complexity of such a future bilateral negotiation over upstream withdrawals. First, the current magnitude of Sudanese water withdrawals is already controversial. These occur at multiple locations along both the White, Blue, and Main Nile in Sudan. It is not easy for Egypt to verify the precise quantities of water withdrawn in Sudan ([Khalifa et al., 2023](#)). Water withdrawals from many pumping stations are only estimated roughly; some pumping stations are not monitored at all. Based on detailed hydrological modeling, some Nile scholars believe that Sudanese withdrawals are currently approaching Sudan's 18.5 bcm share specified in the 1959 Agreement ([Wheeler et al., 2020](#)). On the other hand, Sudan contends that its current withdrawals are much lower, e.g., 12 bcm.

Second, the 1959 Nile Waters Agreement specified the estimated evaporation losses from the HADR, but not from existing Sudanese reservoirs. Sudan and Egypt disagree on how to account for evaporation losses from both existing and new Sudanese reservoirs. Evaporation losses existing at the time of the signing of the 1959 Agreement are assumed to be part of baseline conditions and should not be deducted from Sudan's water share of 18.5 bcm. But should evaporation losses from new reservoirs (e.g., Merowe Dam, inaugurated in 2009) be deducted from the Sudanese share?

The most consequential disagreement over evaporation losses concerns the Jebel Aulia Reservoir on the White Nile 40 km upstream of the confluence of the Blue and White Niles north of Khartoum. Agreement to build the Jebel Aulia was part of the negotiations over the 1929 Nile Waters Agreement, and it was completed in 1937. The purpose of the Jebel Aulia Dam was to provide additional summer water supplies for Egypt's cotton crop. With the completion of the HAD in 1970, the Jebel Aulia Dam became obsolete.⁸

The annual evaporation losses from the Jebel Aulia Dam Reservoir are very high, estimated to be about 3.45 bcm ([Blackmore & Whittington, 2008](#)). However, Sudanese irrigation schemes have been developed nearby that depend on pumping water from the reservoir. So, decommissioning the Jebel Aulia Dam presents a political problem for Sudan because these Sudanese irrigators want the level of the reservoir to stay high.

⁸ This was acknowledged in Article 8 of Provision 2 of the 1959 Agreement: 'It is understood that when the Sudd el Aali [HAD] is fully operated for over-year storage, the United Arab Republic will not require storing any water at Gebel Aulia Dam. And the two contracting parties will in due course, discuss all matters related to this renunciation'.

This is the assumption underlying the design of the pumping stations supplying their schemes. But another problem with decommissioning the Jebel Aulia Dam is that the 1959 Nile Waters Agreement is not clear as to who should benefit from the resulting evaporation savings. Egypt can argue that Article 1 of Section 3 (entitled 'Projects for the Utilization of Lost Waters in the Nile Basin') applies. Article 1 reads,

'The net yield of these projects shall be divided equally between the two Republics and each of them shall also contribute equally to the costs'.

From the Egyptian perspective, decommissioning the Jebel Aulia Dam would be a project for utilizing 'lost waters in the Nile Basin', in this case evaporation losses, and these evaporation savings should be shared 50/50. On the other hand, Sudan can argue that all the evaporation savings should accrue to Sudan, that Article 1 of Section 3 was never intended to apply to existing Sudanese dams and that the costs of decommissioning Jebel Aulia would fall on Sudanese farmers.

Third, the 1959 Agreement gave Egypt the option of taking a 'water loan' from Sudan [Annex 1 is entitled, 'A Special Provision for the Water Loan Required by the United Arab Republic'.]

Sudan has extended this idea of a 'water credit' to the fact that it has not been using its full allocation under the 1959 Agreement, and that its unused amount is being stored in the HADR. Obviously, Sudan cannot 'retrieve' its water stored in the HADR. Rather it could argue that in the future it can withdraw more than its annual share of 18.5 bcm because in the past it did not withdraw its full share of 18.5 bcm. Sudan could argue that Egypt has benefited from the fact that Sudan has not used its full allocation, and thus Sudan can use more water in the future.

The bottom-line is that Sudan would likely expect to fare better in such a bilateral negotiation with Egypt than in a third-party water-sharing negotiation that included Ethiopia or a basin-wide negotiation that included all upstream riparians. If Sudan remains locked into negotiating as Egypt's partner, it has little hope of expanding its water share in a basin-wide negotiation. It thus has no incentive to participate.

Sudan might agree to enter negotiations for a basin-wide, water-sharing agreement if all parties agreed to set aside the 1959 Nile Waters Agreement and start afresh. But this would be an anathema to Egypt, which would do everything in its power to hold Sudan to the 'united front' strategy in the 1959 Agreement. The path of least resistance for Sudan would be to implicitly acknowledge Ethiopia's right to withdraw modest amounts of water and continue to withdraw its full share of 18.5 bcm under the 1959 Nile Waters Agreement.

POSSIBILITIES FOR TRANSFORMATIVE CHANGE

I have no crystal ball to see how the long shadow of the 1959 Nile Waters Agreement on Nile water-sharing will change in the future. As [Allan & Mirumachi \(2010\)](#) observed, as transboundary water conflict becomes more intense and politicized, responsibility for the conflict passes to the foreign ministry and then to the shadow state and security services. Even understanding what is happening today is very challenging for scholars, much less seeing into the future. However, as the economist [Stein \(1989\)](#) observed, 'if something cannot go on forever, it will stop'. In this section, I speculate on how the current impasse on the Nile between the competing claims based on the principles of historic rights (and 'no significant harm') and equitable and reasonable use might be transformed by either new ideas or events.

(1) Peace (cooperation) is necessary to maintain and expand the flows of virtual water into the Nile Basin

From the perspective of hydro-hegemony theory, it is not a surprise that a water-sharing agreement that allocates the majority of the flow of a river to the hegemon is durable or that the impasse we describe between the two principles of international law continues ([Zeitoun & Warner, 2006](#); [Cascao, 2009](#); [Daoudy, 2008](#); [Woodhouse & Zeitoun, 2008](#); [Zeitoun & Allan, 2008](#)). Indeed, the long simmering tensions in the ongoing negotiations

over the GERD are predicted by hydro-hegemony theory. Allan & Mirumachi (2010) argued that conflictual relations with upstream riparians are needed for domestic political purposes; that it was necessary for the Egyptian state to appear to be taking a hardline on its water rights.

However, the risks of this strategy of continuing conflictual relations for domestic political reasons have not been fully appreciated. An important risk of not reaching an agreement on an operating policy for the GERD and eventually a basin-wide water-sharing agreement is the problems this strategy poses for the virtual water trade. Egypt's dependency on imported agricultural production, especially cereals (wheat and maize) is well known (Zeitoun *et al.*, 2010). The United Nation's Food & Agriculture Organization (2020) reported that Egypt's cereal import dependency was 42% by approximately 2012. Nikiel & Eltahir (2021) estimated that during the current decade Egypt's imports of agricultural products will have embedded virtual water that exceeded Egypt's allocation of 55.5 bcm in the 1959 Nile Waters Agreement.

The continuation of conflict over the GERD threatens the virtual water trade in three ways. First, the long simmering conflict contributes to the poor investment climate in the basin. It makes it harder to attract international capital and to diversify the riparians' economies. This in turn restricts the financial resources available to states to purchase grain on world markets and expand the virtual water trade to keep up with population growth. Without diversified economic growth, it is difficult to see how the riparians will be able to feed their growing populations. Fighting over a limited blue water supply in a region with a high population growth rate will not solve the food security problems of any of the Nile riparians.

Second, the lack of progress on the GERD negotiations has prevented the development of a regional water, energy, and food policy. For decades, planners have envisaged that Sudan could become a breadbasket for the Middle East, but this has never happened (Haynes & Whittington, 1981; Waterbury, 2002). A contributing factor has been the failure to move beyond the impasse over the operation of the GERD and Nile water allocation.

Third, the long smoldering tensions over the GERD could lead to military conflict (Barnaby 2009; Borgomero *et al.*, 2021). This would both reduce the financial resources available to pay for grain imports and possibly lead to the targeting of ports and ships that transport grain.

Eltahir (2019) has argued that (1) the long-term increase in Nile flows due to climate change will be approximately 7 bcm and (2) a water allocation of 7 bcm would be sufficient for future irrigation in Ethiopia. Thus, Ethiopia's irrigation requirements could be met without reducing the current allocations to Egypt and Sudan in the 1959 Agreement. However, an expansion of irrigated agriculture of this magnitude in Ethiopia (or elsewhere in the basin) would do little to improve basin-wide food security in the long term if current population growth rates continue. On the other hand, resolving the long-standing controversy over the GERD and eventually Nile water allocation would be a major step toward protecting the food security of all riparians if it improved the investment climate and economic growth. This positive feedback loop between reaching a GERD agreement and being able to pay for increases in the virtual water trade is often not recognized.

(2) *Egypt acknowledges Ethiopia's right to an equitable and reasonable share of Nile water, but Ethiopia does not withdraw much water*

From an economic perspective, Ethiopia can better achieve its national development objectives by using its Blue Nile water resources to generate hydropower, a largely non-consumptive use, rather than by consuming it in the Ethiopian highlands upstream of a Blue Nile cascade (Guariso & Whittington, 1987; Whittington *et al.*, 2005, 2014; Jeuland & Whittington, 2014; Murgatroyd *et al.*, 2024). Looking at the Nile basin from a systems perspective, in the long run, water use in Egyptian agriculture will likely have a higher economic value than using

water for irrigation upstream in Sudan or Ethiopia. This is because irrigation water used in Egypt can also generate hydropower in all three countries.⁹

Thus, one transformational possibility would be for Egypt to acknowledge that Ethiopia is entitled to an equitable and reasonable share of Nile waters, and for Ethiopia to acknowledge that it actually needs only small quantities of water for irrigation upstream of dams on the Blue Nile. This possibility might happen by default, without such explicit acknowledgements by Egypt and Ethiopia. If Ethiopia continues to develop small irrigation schemes in the Blue Nile basin, and to irrigate with groundwater where possible, Egypt and Sudan may realize that water withdrawals for these schemes do not have the catastrophic consequences that they feared.¹⁰ In this case, the long shadow of the 1959 Agreement would diminish because it would no longer reflect the facts on the ground.

(3) *Ethiopian altruism in a prolonged drought*

Another possible transformative event might occur during a prolonged drought. At some point in the drought, it is likely that storage in the GERD will be high, while storage in the HADR is low and Egypt begins to experience water deficits. In this eventuality, even in the absence of a GERD operating agreement, Ethiopia could unilaterally release water from GERD storage to assist downstream riparians.

While this might seem implausible given current tensions, there are several reasons why Ethiopia might decide to do this. Ethiopians may truly want to help their downstream neighbor. Moreover, such a decision would not cost Ethiopia much in terms of lost hydropower. In fact, a supplementary release may align with Ethiopia's own hydropower generation plans. Also, such a goodwill gesture might go a long way to defuse any accusations that Ethiopia was deliberately trying to inflict harm on the downstream riparians (Wheeler *et al.*, 2023).

(4) *An agreement on GERD operating policy, but not basin-wide water sharing*

A related possibility for transformational change is that Egypt, Sudan, and Ethiopia reach an agreement on GERD operation that does not address the issue of Ethiopia's right to withdraw Nile water, i.e., agreement on GERD operation policy is separated from a water-sharing agreement. Such an agreement on GERD operation policy would need to include a provision on supplemental releases from the GERD during a prolonged drought to assist Egypt and Sudan. The achievement of such a formal agreement on GERD operations could be an important first step toward reducing tensions and would have many of the same benefits of an altruistic gesture by Ethiopia. The ability of Ethiopia to harm Egypt through its GERD operating policy is small and any such adversarial policy would run counter to Ethiopia's financial self-interest to generate hydropower.

A formal agreement on GERD operating policy may not be politically feasible for the Egyptian government. Given current controversies in civil society in Egypt over the dangers posed by the GERD, an agreement that would not guarantee Egypt's historic rights may be perceived by the government as too risky. In this case, an 'implicit agreement' with Ethiopia and Sudan about what would happen in the event of a prolonged drought might be a useful interim step. In this case, like Sudan, Egypt may find it in its interests to simply decide to ignore small Ethiopian irrigation withdrawals.

(5) *Sudan abandons the 'united front' strategy*

Another possibility is that the eventual winner of the ongoing civil war in Sudan decides that Sudan's economic development requires more than its 18.5 bcm allocation under the 1959 Nile Waters Agreement, i.e., that the

⁹ Egypt is also closer to Europe and has lower transport costs for export crops.

¹⁰ Ethiopia's successful filling of the GERD without adverse consequences for Egypt may reinforce this point.

status quo ‘united front’ strategy is no longer viable. Sudan already has numerous new irrigation schemes on the drawing boards and has made land deals with oil-states that would require large quantities of irrigation water (Lomerry & Banak, 2010; Jagerskog *et al.*, 2012; Keulertz, 2012, 2013; Wheeler & Hussein, 2021). The civil war in Sudan will undoubtedly delay the completion of new irrigation schemes, but such plans may reemerge, possibly with a new sense of urgency.

If Sudan proceeded with these new irrigation projects at the same time that Ethiopia continued to expand small-scale irrigation in the Blue Nile basin, Egypt would face a series of difficult choices. If Sudan simply refused to engage with Egypt in the bilateral negotiations described above, this would be a transformational moment in the current impasse between the competing principles of historic rights and equitable and reasonable use on the Nile.

(6) *A water panic in Egypt*

During a prolonged drought, storage in the HADR will fall and Egypt could experience water deficits (Wheeler *et al.*, 2020). This was always a possibility even before the construction of the GERD. Egypt has always feared that Ethiopia could halt the flow of Nile River (Erlich, 2001). Egyptian civil society could be swayed by misinformation that Ethiopia was intentionally operating the GERD to inflict harm on Egypt (Wheeler *et al.*, 2023). Optimistically, such a water panic might force policy makers to clarify for civil society in Egypt, Sudan, and Ethiopia the issues at stake and inject an urgency into Nile negotiations. In effect, Egyptian policymakers would need to acknowledge the country’s dependence on food imports and more openly discuss the reality of the virtual water trade. As noted above, in such a circumstance, the water stored in the GERD potentially could be released to reduce Egypt’s deficits.

(7) *Sharing water, not benefits*

For 25 years, the participants in Nile Basin Initiative and many in the international community have been arguing that the Nile riparians should focus on their ‘water security’, not water rights, and that they should share benefits, not water (Sadoff & Grey, 2002, 2005; United Nations, 2008; Wolf, 2010; Postel, 2011; Tawfik & Dombrowsky, 2017). It is time for the international community to acknowledge that this attempt to reframe the hydrogeopolitics of transboundary water around the concepts of ‘water security’ and ‘benefit sharing’ in order to overcome the impasse between the principles of prior use and equitable and reasonable use has not been successful, at least in the Nile basin. The international community might decide to reengage with the Nile riparians not on the basis of facilitation and terminology, but with the commitment of large, transformational amounts of money.

For deep psychological and evolutionary reasons, people and states do not like trading water for money, especially in the context of transboundary water negotiations (Whittington, 2016). Money was not a sufficient inducement to keep Ethiopia from walking away from the GERD negotiations in Washington, DC. However, international finance on a scale necessary to transform the regional economy of the Nile Basin has never been on the table.

There are other, long-term technological and demographic trends that could disrupt the long shadow cast by the 1959 Agreement. The supply and demand of agricultural water use in Egypt could change due to technological innovations in solar energy and desalination that make it cheaper and easier to use desalinated water for irrigating high-value crops. Increases in sea-level rise, urbanization, and soil salinization could all lead to declines in the need for agricultural water in the Nile Delta. The huge population increases forecast for the Nile basin could fail to materialize if Nile riparians experience the kind of demographic shifts now occurring in high-income countries and in countries with rapidly rising incomes, such as China. Climate change could lead to

changes in the availability of river flows that would force changes in the estimation of the long-term mean assumed in the 1959 Agreement (Conway, 2017; Hissen *et al.*, 2017; Siam & Eltahir, 2017). Continental drying (Rodell *et al.*, 2018; Rodell & Li, 2023) could make the assumptions upon which the 1959 Agreement was constructed obsolete.

DISCUSSION

A better understanding of the various mechanisms by which the structure of the 1959 Agreement contributes to its durability may lead to an appreciation of the risks associated with the unresolved negotiations over the GERD. As described in this paper, there are two main reasons that the provisions of the 1959 Nile Waters Agreement continue to affect the riparians' ongoing negotiations regarding the operation of the GERD and future upstream development.

First, as is widely acknowledged, the 1959 Agreement quantified Egypt's historic water rights. These historic rights have been and continue to be a redline for Egyptian negotiators and civil society because Egypt's water allocation is perceived to be tied to both national security and identity (Zeitoun *et al.*, 2019a, 2019b). Article 44 of the [Egyptian Constitution \(2013\)](#) explicitly says ...

'The State shall protect the River Nile, *preserve Egypt's historical rights thereto* [italics added], rationalize and maximize its use, and refrain from wasting or polluting its water'.

For decades, Nile scholars have described Egypt as the hegemon on the Nile, largely able to impose its power on upstream riparians (Cascao, 2009). But having the power of a hegemon and deploying it successfully are two different things (Strange, 1990). Egypt's strategy of trying to protect its historic rights by preventing upstream water use in Ethiopia is increasingly putting its ability to maintain and expand its virtual water trade at risk. Thus, counterintuitively, treating its historic water rights as non-negotiable is putting Egypt's food security in jeopardy.

Second, Section 5, Article 12 of the 1959 Nile Waters Agreement disincentivizes Sudan to participate in any basin-wide water-sharing negotiations. The original purpose of Article 12 was to ensure that Egypt and Sudan should establish a joint negotiating position vis-à-vis upstream riparians. However, in actuality, Article 12 has incentivized Sudan to ignore modest upstream withdrawals, and to deal with such an eventuality in bilateral negotiations with Egypt. Its bargaining position in these bilateral negotiations is strengthened because it is the upstream riparian with respect to Egypt and because there are numerous areas of contention with Egypt regarding the interpretation of other Provisions of the Agreement. The 1959 Agreement thus profoundly shapes the way Sudan approaches negotiations with both Egypt and Ethiopia, which contributes to the durability of the Agreement.

The tragic civil war in Sudan has moved the Nile down the list of Sudanese priorities. But someday, when the civil war is settled, Sudan will refocus on its interests in Nile water. Perhaps these interests will have changed as a result of the outcome of the civil war. Until then, Egypt, Ethiopia, and the international community should continue to try to reduce the risks associated with a multiyear drought in the Nile basin and engage in serious planning for transformational investments in the regional economies of the riparian states.

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DATA AVAILABILITY STATEMENT

All relevant data are included in the paper or its Supplementary Information.

CONFLICT OF INTEREST

From 2006 to 2009, Dale Whittington was a member of the Eastern Nile Scoping Study Team, funded by the World Bank. From 2021 to 2023, he advised the United Arab Emirates on Nile management issues.

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