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# Distributive Justice and Sustainability Goals in Transboundary Rivers: Case of the Nile Basin

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The importance of cooperation on transboundary waters is stated as a target in the United Nations 2030 Agenda for Sustainable Development Goals (SDG6: water). Cooperation on transboundary water management is critical, particularly because it concerns issues across multiple states, SDGs and targets regarding agriculture, energy, ecosystems, climate adaptation, health, and peace and security. The percentage of transboundary basin area within a country that has an “operational arrangement” for water cooperation is used as the main indicator of such cooperation in the SDGs for “equitable and reasonable use” of water resources (SDG 6.5.2). However, no clear criteria and explanation are available for what exactly constitutes an “equitable and reasonable use” in any such “operational arrangements.” Furthermore, it is understandable that any such arrangements may be shaped by differences in historical, legal, and political contexts and hence may be inherently unjust. Here, we highlight the limitations of SDG indicators, particularly SDG 6.5.2, to monitor equity of resource sharing in transboundary river systems. Using Walzer’s theory of morality of the state and cosmopolitanism as a framework, we examine the Nile basin as a case study to demonstrate the shortcomings of current SDG criteria and indicators. Our article contributes ideas of “operationalizing” theoretical justice toward a more equitable water management in transboundary rivers.

**Keywords:** Nile basin, grand renaissance dam, Nile basin initiative, water ethics, water justice

## INTRODUCTION

More than 60% of the Earth’s freshwater, serving more than 40% of the global population, is generated in transboundary waters (Eckstein, 2008). As a result, allocation and management of water in transboundary basins has become an important source of persistent tension, particularly in the face of a growing population and changing climate. While some transboundary waters, such as the Harirud River (Nagheeb et al., 2019) (Afghanistan, Iran, and Turkmenistan), the Rhine and Danube (Europe), the Zambezi (Africa), and the Rio de la Plata (South America), have reportedly succeeded in establishing mechanisms for sharing these resources, others such as the Nile (Africa) and the Euphrates–Tigris (Eurasia) still lack well-developed instruments for water cooperation (Feldman, 2007; De Stefano et al., 2017). Increasing population, management and policy that has not kept pace with a broadened set of actors, climate change, and the difficulty of reconciling political borders and

basin boundaries (Zeitoun et al., 2013) will likely aggravate existing challenges and disputes and possibly create new ones that may lead to further water-induced conflicts.

The United Nations sustainable development goals (SDGs) (UN SDG, 2015) are designed to serve as a "blueprint to achieve a better and more sustainable future for all" (UN SDG, 2015) with indicators to monitor progress on key societal, economic, and environmental concerns, which are also "pillars" of water resources management (Sikor, 2013). Although avoiding disputes and conflicts altogether in transboundary waters while perusing "a better and more sustainable future for all" may not be realistic, the allocation and management of transboundary water present both real impediments and opportunities to successfully achieve the SDGs in riparian states (Nagheeb et al., 2019). Cooperation on such resources may guarantee a more sustainable future, whereas disputes and conflicts on transboundary waters not only hinder progress in achieving SDG6 (water) targets, but also risk undermining progress on targets of other SDGs, including agriculture, energy, ecosystems, climate adaptation, health, and peace and security.

It has been argued that SDG targets in general, and that of water (SDG6) in particular, are mainly framed in terms of adequacy and conservation and not in terms of justice and equity (Lele, 2017). Unlike the indicators for societal, economic, and environmental concerns, no clear indicator for justice in transboundary water allocation is available in the SDGs. The only indicator applicable to transboundary water management in the SDGs (SDG 6.5.2) uses the "proportion of transboundary basin area with an operational arrangement for water cooperation" (UN SDG, 2015), i.e., percentage of transboundary basin area within a country that has an "operational arrangement" for water cooperation. To qualify as an "operational arrangement", the existence of a joint body, formal communication between riparian states, coordinated management plans or objectives, and regular exchange of data and information are stated as criteria (UN SDG, 2015). This indicator and set of criteria do not consider justice, despite the fact that existing "operational arrangements" may be shaped by differences in historical, legal, political, and ethical context and thus cannot automatically be assumed to be fair or equitable. It can be concluded, therefore, that the current SDG indicator and criteria for water management in general, and those concerning transboundary water management in particular, are essentially limited to economic efficiency and conservation, rarely engaging with justice considerations (Eleftheriadou and Mylopoulos, 2008; Girard et al., 2016; Hu et al., 2016; Wheeler et al., 2016; Shen et al., 2018; Liu et al., 2019).

The fact that the living world intrinsically depends on water, a scarce resource, for survival and healthy and sustainable growth implies that moral imperatives and distributive justice considerations are mandatory for the sustainable allocation and use of water resources among and between people and nature in general. The same argument applies to water resources allocation and management in transboundary waters, not only to fulfill human and ecological requirements but also to avoid risks and conflicts, which may jeopardize various

nonwater-specific SDG targets. As a result, notions of justice (equity, reasonableness, and fairness) are increasingly noted as important elements in the allocation of transboundary water use and management and as a way of promoting regional peace and security (Wouters et al., 2009). The growing attention to justice and equitability in the allocation and/or management of transboundary waters is also driven by the increasing demand for resources from a growing population and expanding economic developments (Zeitoun et al., 2013; Neal et al., 2014). It is essential, therefore, that SDGs in general, and indicators and targets concerning transboundary water management in particular (SDG6.5.2), explore and incorporate moral criteria beyond merely economic efficiency and conservation indicators.

The 1997 United Nations' "Convention on the Law of the Non-Navigational Uses of International Watercourses" (United Nations, 1997), a treaty signed by 39 member states of the United Nations to date, introduced the notion of "equitable and reasonable utilization and participation" of transboundary water management. The convention sets forth the principle that a state must use an international watercourse in a manner that is "equitable and reasonable" vis-à-vis other states sharing the watercourse. Although the SDGs are thought to be based, albeit implicitly, on this principle, operationalizing this principle and deriving criteria for "equitable and reasonable" distribution and allocation of water is difficult. Questions of what exactly entails "equitable" or "reasonable" allocation and how one measures/monitors whether water allocations or managements are "equitable" or "reasonable" are deeply rooted in moral philosophy and distributive justice theories and remain at the core of major transboundary water disputes (Wolf, 1999). This, among others, is because different riparian states want to assert their sovereignty in deciding how they see their interests in transboundary water issues and forecast different events (Browder, 2000). Furthermore, issues of fairness, self-image, relationships, and/or processes can influence how water disputes among riparian states play out over time (Abdelhady et al., 2015).

However, only a few ethical tools and decision support methodologies to operationalize the principle of "equitable and reasonable utilizations" are available in the applied ethics literature overall. One such example is a framework suggesting to "fairly" share rewards, risks, rights, and responsibilities in transboundary resources management in order to encourage multistakeholder deliberations on moral issues (Dore et al., 2012). Another example applies a forecast and backcast approach that involves multistakeholder visions of potentially desirable futures, with further evaluation of current realities to make such futures happen, i.e., a form of "operationalization" of intergenerational justice (Cotton, 2013).

Behind the principle of "equitable and reasonable utilizations", the use of common-pool resources is a foundational question of "justice" and/or "fairness". In a strict sense, "justice" and "fairness", although commonly used interchangeably, mean different things. "Justice" is used with reference to a standard of rightness, whereas "fairness" refers to one's comparative chance with others in light of these standards (Goldman and

Cropanzano, 2015). Rawls (1958) and Sen (2009), two leading scholars on the topic, strongly agree on the principle of justice as fairness, i.e., the principle that an individual not only should have an equal right to opportunities (justice) but should also have an effective equal chance as another of similar natural ability (fairness). Although Rawls (1958) and Sen (2009) are both strong proponents of the idea of justice as fairness toward developing a just world, they have a different conceptualization of justice as fairness. Rawls theorizes on the need to develop “just institutions”, whereas Sen theorizes on the need to develop realization/capability-focused comparative approaches or “just societies”, where the point of their departure lies (whether on a different metric of justice or on a divergent conception of impartiality) is still arguable and beyond the scope of this article.

In this article, we present an overview of theories of the sovereignty of states and Rawlsian (Rawls, 1958) distributive justice to explore the underlying theories and challenges concerning the principle of “equitable and reasonable utilization” of transboundary water resources. We highlight limitations of SDG indicators, particularly those of SDG6.5.2, in monitoring the “equitable and reasonable” utilization and management of transboundary waters. We then demonstrate limitations in the SDG indicators by investigating an ongoing dispute on transboundary water that may escalate and endanger regional SDGs in the Nile basin. Finally, we highlight the potential way forward for mitigating shortcomings in the SDG target and indicators of transboundary water management by exploring ideas of “operationalizing” theoretical justice.

## Water Allocation Between States and Between Individuals

It is apparent that water is essential for the survival of life on Earth. As a result, water resources remain at the core and are an integral part of sustainable human and ecological integrity and even considered in some places as sacred and/or as having a status of a legal person (Warne, 2019). However, water resources are generally unevenly distributed both spatially and temporally, and thus the availability of water is higher in some places than in others. Furthermore, the availability of water in an area does not necessarily translate into its accessibility. Consequently, decisions on water allocation have the potential to discriminate according to factors such as social or economic status, nationality, size, or need (Beyene, 2004). The management and allocation of water resources are, therefore, essentially a moral decision, something that needs to be distributed as just and as fair as possible, to all states and to all individuals (Zeitoun et al., 2014).

When discussing the just and fair utilization and management of transboundary waters, two fundamental subjects/aggregations emerge: utilization between riparian states and utilization among the people within those states. Questions of distributive justice or water utilization rights of either of these may not necessarily be synonymous with questions of distributive justice and water use rights of the other. Below, we highlight the fundamental dilemma that exists between the two and frame questions of distributive justice in transboundary water utilization and management

pertinent to both. Although other forms of justice, i.e., recognitional and procedural justice, exist as well and are typically applied at a more local level, our discussion here is on how to substantiate the notions of equitable and reasonable use of transboundary waters between states and/or between people in general, which is a matter of distributive justice.

Walzer’s theory of the morality of states, which postulates a moral order among independent states, stresses the autonomy of states in terms of the rights to political sovereignty, territorial integrity, and self-determination. This theory suggests that water should be allocated with respect to state sovereignty, i.e., the states’ “sovereign right to exploit their own resources” (Walzer, 2015).

In relation to transboundary water allocation among riparian states, two conflicting approaches reflecting the claims and counterclaim of states over their share of transboundary resources, i.e., levels of “sovereignty”, exist. The first one, the “doctrine of absolute territorial integrity”, also known as the Harmon Doctrine (McCaffrey, 1996), stipulates that any state can utilize the waters of an international river flowing on its territory regardless of the consequences on other states and without the duty to consult any other state (Correia and da Silva, 1999; Rahaman, 2009). The second one, the “doctrine of absolute territorial integrity”, stipulates that downstream riparian states have the right to claim the continued and uninterrupted flow of water from the territory of an upstream state and hence can prohibit any development in an upstream state that would interfere with the natural flow of such a watercourse (Schroeder-Wildberg, 2002; Rahaman, 2009).

The two conflicting claims on “levels of sovereignty” (absolute sovereignty and absolute territorial integrity) prescribe disproportionate power over transboundary waters and the moral duty to claim, maintain, or defend such power (Walzer, 2015). The first doctrine favors upstream states allowing them unlimited utilization. The second doctrine favors downstream states. A third, intermediary, position exists. This is known as the “doctrine of limited territorial sovereignty”, which stipulates that riparian states have “the sovereign right to exploit their own (water) resources” provided that activities within their territory do not cause significant damage to the (water) resources of other riparian states (McCaffrey, 1999; Beyene, 2004).

This intermediary position emphasizes the need for “equitable and reasonable” utilization and participation in transboundary water management and has received a much wider acceptance than the other two. This is reflected, in particular, in the framing of the United Nations Convention on international watercourses (United Nations, 1997), which introduces concepts of distributive justice in terms of “equitable use” and “fairness” (“no significant harm”) in riparian states (McCaffrey and Sinjela, 1998) (Note that other doctrines such as “doctrine of absolute riverine integrity” and the “doctrine of the community of interest” exist too. The doctrine of absolute riverine integrity stipulates that a state may not alter the natural flow of waters passing through its territory in any manner, which will affect the water in another state, be it upstream or downstream (Giordano and Wolf, 2003), whereas the doctrine of the community of interest stipulates that water by its nature is a common property created by the natural, physical,

and social unity of the watercourse and should be shared by the community it flows through (McCaffrey and Neville, 2010).

Although various treaties have been suggested for universalizing rules and regulations on the utilization of transboundary waters (e.g., the Helsinki Rules (Rules, 1966) and the Berlin Rules (ILA, 2004)), the UN Watercourse convention is the only framework convention governing shared freshwater resources of universal applicability (UNDESA, 2014a). This convention provides rules and guidelines rooted in the "doctrine of limited territorial sovereignty" and promotes principles of "equitable and reasonable utilization" and "no significant harm to downstream states." Although this position is adopted as a seemingly pragmatic option to settle water allocation disputes on transboundary waters, the operationalization of "equitable and reasonable utilization" of transboundary waters with "no significant harm" to downstream states is not easy in practice. This is mainly because interpreting "equitable" and "no significant harm" and formulating criteria are equally challenging (Wolf, 1999). For instance, the following questions remain difficult to deal with: how can equitability be measured, when is a harm "significant", and who decides the significance of it?

Walzer's theory of the morality of the state as applied in transboundary water management postulates the moral grounds, rights, and justifications of states' engagement in transboundary water use, irrespective of spatial and temporal allocation of how states may distribute the water within their territory. The theory of cosmopolitanism, a Stoic and Kantian concept of human fellowship and universal citizenship, in contrast, suggests that water should be allocated with regard to the international community and the basic human right to it (Gleick, 1998; Beyene, 2004). According to cosmopolitanism, principles of transboundary water justice (for example, egalitarian distributive principles) have a global scope, applying to people everywhere (Brock, 2009). Consequently, the issue of distributive justice and transboundary waters is about the end-users of water, the people from all riparian states, irrespective of whether they live in an upstream or downstream state. The doctrine of the "community of interest" is closely associated with cosmopolitanism, where the former stipulates that people in a water basin, irrespective of which state they live in, have equal rights to utilize a shared water resource (UNWC, 2012).

The SDGs in general, and SDG6 in particular, state no target or criteria in relation to either the desired or anticipated "level of sovereignty" or the form of utilization of water. It is assumed, however, that it is rooted in the "doctrine of limited territorial sovereignty" and thus promotes the principles of "equitable and reasonable utilization" of transboundary waters. This can be demonstrated by its declaration of the goals of universal access to clean water and sanitation, in line with the recognition of these matters as human rights (UNDESA, 2014b). This declaration implies a "duty to cooperate" for riparian states to achieve universal access to water (Wouters and Tarlock, 2013). Indicators for monitoring universal access rights within states have been given more emphasis in SDG6, whereas criteria to measure progress toward equitability of water allocation in

transboundary rivers do not exist. This is particularly disconcerting considering that transboundary waters account for approximately 80% of global river flows, directly affecting more than 40% of the world's population (Bruinsma, 2017). However, guidelines, criteria, and indicators for the just and equitable utilization of global transboundary water management cooperation are yet to be explored. In the absence of such clear indicators and criteria to monitor the fairness ("equitable and reasonable") of the utilization of transboundary waters, any form of "operational arrangement" is assumed to measure sustainable development in a basin irrespective of how such arrangement came into force in the first place and/or how such arrangements may be followed by in terms of regional peace and security, important building blocks of SDGs.

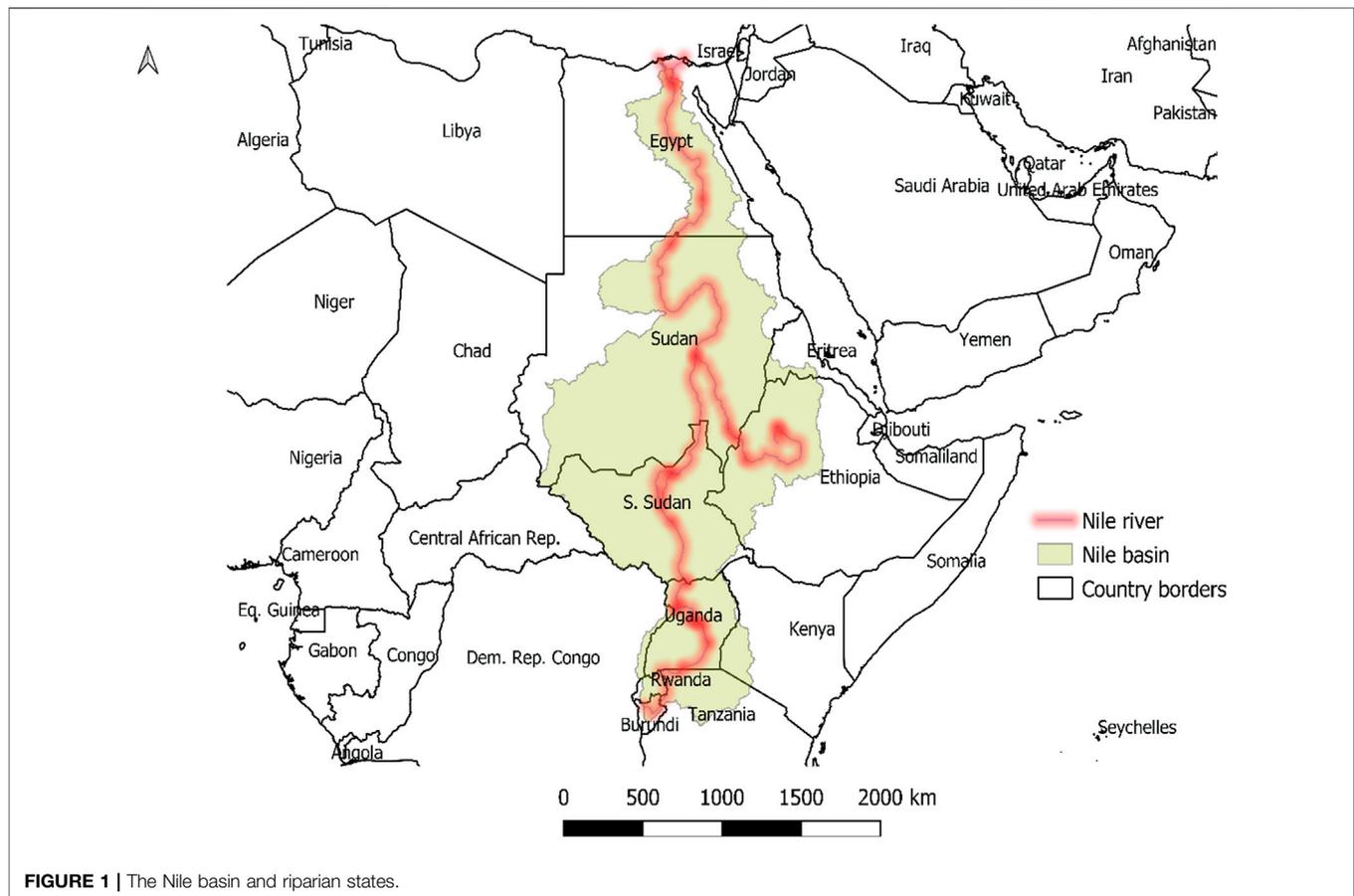
In the following section, we examine the ongoing water management dispute in the Nile basin as a case to demonstrate the shortcomings of the current set of SDG criteria relating to transboundary water management (SDG 6.5.2). We also examine the inadequacy of current SDGs using the frameworks of the theories of the morality of the state and cosmopolitanism (or any variants of them) for addressing transboundary boundary water management challenges. Finally, we explore the potential role of distributive justice toward the clarification and operationalization of the "equitable and reasonable utilization" of transboundary waters and potential criteria for measuring progress toward distributive justice in the cooperation and arrangements of such.

## Treaties for the Nile

The Nile basin connects 11 riparian states in Africa: Burundi, DR Congo, Egypt, Ethiopia, Kenya, Rwanda, South Sudan, the Sudan, Tanzania, Uganda, and Eritrea. It is the largest basin in the world in terms of the number of riparian states. All states except Eritrea, which has an observer status, are members of a common cooperative platform, the Nile Basin Initiative (NBI), which was founded more than 20 years ago. More than 487 million people, about 40% of the population of the African continent, live in the Nile basin countries (Yihdego et al., 2017). The Nile is the confluence of the Blue Nile and the White Nile tributaries. The Blue Nile, often referred to as the Eastern Nile basin, covers Ethiopia, Sudan, and Egypt. The White Nile is shared by nine countries in the basin, except Ethiopia and Eritrea (**Figure 1**). The Blue Nile, which originates from Ethiopia, contributes about 86% to the annual water flow of the Nile. With no operational arrangement and uncertain modalities for cooperation thus far, Nile basin states in general and the Eastern Nile basin states in particular are facing enduring disputes over the Nile water use and management.

Historically, Egypt, with signed agreements with Sudan, both downstream states, claims a veto power over water use of the Nile, with much of the water used in Egypt coming from the Nile (Swain, 2008).

The earliest known treaty in the basin between upstream and downstream states, or perhaps more appropriately, their colonial "protectors", was the protocol signed in 1891 between Great Britain and Italy for the demarcation of their respective spheres of



**FIGURE 1** | The Nile basin and riparian states.

influence in Eastern Africa (Arsano, 2011; Sanderson, 1964). Of the many treaties signed on the Nile between riparian states, three agreements are particularly consequential (see Supplementary Table S1 for a full list of major treaties and legal arrangements in the Nile basin). The first major treaty is the 1929 Nile water agreement between Egypt and the United Kingdom (Crabittès, 1929), the latter representing Uganda, Kenya, Tanganyika (now Tanzania), and Sudan. This 1929 agreement gave Egypt the right to veto upstream projects that might affect Egypt's water share. Supplementing this, a second treaty was signed in 1959 between Egypt and a newly independent Sudan. This second treaty allocated the entire average annual flow of the Nile to be shared among Egypt and Sudan at 55.5 and 18.5 billion cubic meters, respectively (the remaining 10 billion cubic meters that make up the total Nile flow was considered to account for water loss due to evaporation).

Following the 1959 treaty, both Egypt and Sudan undertook the construction of dams, including the Aswan High Dam in Egypt and the Sennar Dam in Sudan. Neither the signed agreements nor such construction works in Egypt and Sudan was undertaken in consultation with any other riparian state, nor do Egypt and Sudan recognize any rights for water for the other riparian states. In contrast, much of the Nile water comes from these other riparian states.

Evidently, the basis for historical and "colonial-era" agreements and legal arrangements between Egypt and most upstream riparian

states is highly contested and not just from a moral point of view alone. Thus, while Ethiopia may feel entitled to do "what it likes" with the Abbay (Blue Nile) water in its "sovereign territory" according to one version of the morality of the state theory, this interpretation might be contested by other riparian states in the Nile due to the existence of old treaties still claimed as binding by Egypt and Sudan, which Ethiopia was not a part of. However, the water allocation agreements between the downstream states of Egypt and Sudan did not seem to have created major regional challenges on the water use or in the relations between the upstream, particularly Ethiopia, and the downstream states until recent decades. This is mainly because practical capabilities for major development works disrupting the Nile's flow in upstream countries were simply absent. With growing economic ambitions in the last 3 decades, interest in water of the Nile started to grow, challenging the status quo enjoyed by downstream states and triggering a protracted dispute among the riparian states.

The third relevant agreement is the Cooperative Framework Agreement (CFA) of 2010 (Mekonnen, 2010) that allocated "equitable and reasonable" use of the Nile water "among all riparian countries", for "integrated regional development". After more than a decade of back-and-forth negotiations among riparian states through the NBI framework, the CFA was seen as a major breakthrough in getting rid of claims of "colonial-era" water treaties. The CFA is signed by six out of the 10 NBI member states and ratified by three states at the time of this writing. Egypt and Sudan have both rejected it.

Although the dispute on the Nile water use rights has escalated particularly in the Eastern Blue Nile states, in reality, it is not just between upstream Ethiopia and downstream Sudan and Egypt. Rather, it is a dispute between all upstream states and Egypt and to a lesser extent Sudan. This is because Egypt seems to claim that “colonial-era” agreements or legal arrangements between upper riparian countries or their “protectors” and Egypt or its “protector” are still applicable today. Furthermore, not all upstream countries have necessarily conflicting interests due to the two major tributaries of the Nile. Ethiopia, for instance, as the sole source of the Blue Nile, has no, at least direct, conflict of interest with other upper riparian states on the other Nile tributary, the White Nile, but only with the lower riparian states, i.e., Egypt and Sudan. Egypt and Sudan, thus, deal with two sets of upstream states, with Ethiopia on the one hand and the rest of the upper riparian states on the other.

Soon after signing the CFA, Ethiopia started construction of Africa’s biggest hydroelectric dam, the Grand Ethiopian Renaissance Dam (GERD) (Gebreluel, 2014), on the Nile river. Egypt and, to a lesser extent Sudan, objected either the entirety or part of GERD. The negotiation that started soon between the three riparian states related to the impacts of the new dam continues with highs and lows to this day, sometimes with talks of military engagement, without any settlement yet at the time of this writing.

Focusing on the Eastern Nile states, and on Egypt and Ethiopia in particular, epicentres of the ongoing Nile dispute, Ethiopia has the highest population (99.4 million) closely followed by Egypt (91.5 million), of which Egypt has the highest population living within the Nile basin (85.8 million), followed by Ethiopia (37.6 million) (NBI, 2019). Economically, Egypt, followed by Sudan, has the highest Gross Domestic Product (GDP) per capita in the basin states, more than sixfold compared to Ethiopia’s GDP per capita (Bank, 2019).

GERD is now a fait accompli at more than 70% of the total construction finalized, but justice consideration will continue to be vital issues in its completion, filling, and operation (Yihdego, 2017). It is apparent that the riparian states have not only shared waters but also shared socioeconomic and climate change challenges. Increasing demands for water, not only for water consumption but also for energy and food production, will further increase pressure on the Nile basin. Furthermore, due to protracted disputes about the allocation of the Nile water, the risk of future confrontations cannot be downplayed, which, in turn, can trigger unsustainable activities on interdependent SDG goals.

## SDGs and the Nile

Sustainable development implies that gains on the various SDG targets are retained and distributed or passed onto the next generation of our human and natural ecosystem. It is important to monitor and evaluate how equitable such gains are, not least because inequitable gains threaten the very sustainability of the system. Similarly, inequitable transboundary water management risks missing not only water-related targets but other interdependent targets too. Paragraph seven of the 2030 agenda for sustainable development affirms a commitment to human rights to water

and sanitation in its declaration, which states “the human right to safe drinking water and sanitation and where there is improved hygiene and where food is sufficient, safe, affordable and nutritious” (UNDESA, 2016). In light of such provision of human rights for water, one can assume that any one, state or person, in the Nile has the right of using Nile water either for irrigation (to produce “sufficient, affordable and nutritious food”) or generating electricity in order to achieve these and beyond (in line with cosmopolitanism and or the “doctrine of community of interest”). Such is not the case in the Nile and likely may not become the case anytime soon.

In regard to the Sovereignty of the States (Walzer’s theory), the current set of criteria in SDG6.5.2 can monitor sustainability only using the “proportion of basin area under operational arrangement”. Given the various interstate and regional treaties outlined earlier about the Nile, the SDG indicators would be of very limited help in either monitoring sustainability in the basin or mediating disputes and disagreements between riparian states in the basin. Thus, SDG criteria indicators are simply unable to monitor and evaluate either the sustainability or the utilization bottlenecks in the transboundary water management of the Nile.

## Room for Distributive Justice

Next to the inadequacy of the SDG criteria indicators, there is little consensus about the normative nature or content of the equitable rules or principles to be applied in transboundary water resources management or about their legal implications for the cooperative management of transboundary waters (Zeitoun et al., 2014). Putting the Nile basin in general, and the GERD in particular, in the perspective of distributive justice, it is apparent that neither the status quo of unilateral decisions and unilateral vetoing nor the existing water treaties are sustainable. The treaties of both 1929 and 1959 between downstream countries (or their “protectors”) have never been recognized by Ethiopia and other upper riparian states and are considered null and void by the CFA of 2010. The question then is what would be a practicable and equitable way to address the “human right to water” and thereby guarantee distributive justice in this transboundary river. More importantly, how is equitability, or progress toward it, in water allocation in transboundary waters such as the Nile to be evaluated with respect to the sustainable development goals?

From the perspective of the cosmopolitan theory, the Nile water dispute can be examined as follows. Since the cosmopolitan theory advocates universal access rights for humans in all states, the practical implication of this theory in the Nile would be the distribution of water equitably to all the people in the basin for social, economic, and environmental development, irrespective of which state they live in. This would further imply that riparian states may not prioritize their own citizens over those of other riparian states, irrespective of the number of transboundary water resources that originate from their territory. As can be imagined from these hypothetical considerations, fulfilling human rights to water poses a unique challenge in a transboundary basin. Its practicality hangs in the balance with the sovereignty of states: the more state sovereignty is emphasized, the less basin-wide universal rights may be acknowledged. Putting the two

countries in this context, if Egypt and Ethiopia were to fulfill these universal rights among all the people in the two states universally, one could continue to ponder a number of important considerations. For example, the large discrepancy between the internal freshwater potential per capita (Egypt: 20 cubic meters; Ethiopia: 1,244 cubic meters) and the current per capita water consumption (Egypt: 2,202 L; Ethiopia: 279 L) makes the practicality of such “universal human rights” considerations in the context of transboundary waters difficult to imagine. In reality, identity and domestic political necessities and commitments limit even more conservative foreign policy choices open to states with regard to the settlement of transboundary water allocation disputes (Turan and Kut, 1997; Anand, 2007).

Alternatively, approaching the situation from the perspective of the morality of the state theory on transboundary water management in the Nile would allow Ethiopia, an upper riparian state and the source of about 86% of the Nile water by volume, the full right to use the Nile water as it wishes, irrespective of the needs of downstream states (Egypt). The risk of a new dam (GERD) in Ethiopia negatively affecting the functioning of a prior dam in Egypt (the Aswan High Dam) may be as problematic from a moral perspective similar to the categorical veto by Egypt, a downstream state, of all and any utilization of Nile waters for any consumption needs in the upstream states (Ethiopia).

Similarly, is it fair that the prior existence of a much larger downstream structure such as the Aswan High Dam dictate that upstream projects, such as the GERD in Ethiopia, be rendered obstructive? Is it fair, particularly in the case of the GERD where studies show potential for shared opportunities as a result of its construction also for downstream states, and with “manageable risks” (Warne, 2019), that claims of unjust colonial-era agreements or status quo be maintained or respected? These questions seem all the more relevant considering that a riparian state such as Ethiopia, with only one-sixth of the GDP per capita of Egypt, with more than 50% of its population without access to electricity (compared to Egypt’s nearly 100% electrification), with per capita water consumption of only one-eighth of Egypt, etc., be blocked from developing its economy, access to water, and hydropower, by a more developed downstream state. It is understandable that, irrespective of whether one assumes the cosmopolitan theory (distribution between humans in all states) or morality of the state (distribution between states), the allocation of transboundary water is a challenging question of justice. While recognition of a human right to water is necessary, its implementation is fraught with difficulties in a transboundary water context, at least because linking community-level planning and regional needs is challenging (Cash and Moser, 2000). Furthermore, the existence of treaties or agreements alone does not reduce the challenge of guaranteeing the sustainable development of riparian states in transboundary basins. It is important to note that while distribution may be a necessary condition for justice in transboundary water allocation, the process alone is not necessary since negotiation procedures do not necessarily recognize the power asymmetry that exists between actors (Zeitoun, 2013). In spite of this, current indicators for the evaluation of the sustainability of transboundary water management in the SDGs fail to capture this challenge in general and in the Nile basin in particular.

From our discussion of the various doctrines, theories and principles thus far, it is apparent that no clear criteria exist within the set of current SDG indicators for “equitable and reasonable utilization” of water resources in transboundary rivers. Our immediate observation is that incorporation of notions of distributive justice (even those as vague as “equitable and reasonable utilization”) as an indicator in the SDGs can advance and open the negotiation field on transboundary rivers between riparian states. The mere use of “proportion of basins under operational arrangements” as an indicator for sustainability of transboundary water management is neither sufficient nor progressive in the sense that it does not seem concerned whether such arrangements were attained through unjust means and remain unfair.

At a more fundamental level, the question of what constitutes an “equitable and reasonable utilization” of transboundary water management is a rather challenging one. In spite of these challenges, however, research progress in domains such as cooperative game theories (Gintis, 2000; Madani and Dinar, 2012) and morally informed allocation and optimization techniques (Ciullo et al., 2020) illustrate potential opportunities and operationalization mechanisms of distributive justice in transboundary water resources management. In value optimization techniques, for instance, the role of distributive justice is illustrated through explicitly applying ethical principles to how optimization problems are formulated in terms of objectives and constraints (Tian et al., 2019; Ciullo et al., 2020). For instance, assuming that Ethiopia and Egypt were to negotiate with the goal of achieving distributive justice between the two riparian states, a number of underlying moral principles (e.g., utilitarianism (Mill, 1895), egalitarianism (Arneson, 2002), prioritarianism (Arneson, 2000), sufficientarianism (Gosseries, 2011), and Pareto principle (Kaplow and Shavell, 2003)) can be identified and used to quantify options to facilitate negotiation between parties. In this way, various fundamental justice issues and considerations of ecological water rights and intergenerational justice can be highlighted better among the negotiating parties and may easily be assisted to visualize and realize the stakes, opportunities, risks, and values placed by themselves and/or by other riparian states on shared water resources. More importantly, incorporating such requirements in the SDGs as indicators to monitor progress toward sustainability in transboundary water management is likely to invite a more accommodative negotiation atmosphere since intrinsic values by parties may be communicated much better.

## CONCLUSION

In summary, several doctrines, theories, and principles have been put forward for better management and allocation of transboundary waters. While recent theories and the most widely adopted UN watercourses convention outline the principles of “equitable and reasonable utilization” of transboundary waters, the practical application of such terms has proved to be difficult due to the lack of clear criteria for what exactly “equitability” entails. Management and allocation of transboundary waters, as demonstrated here using the Nile basin as a case study, did not benefit much from the current SDG criteria set (SDG 6.5.2) in either

facilitating or advancing negotiations on recurring debates in such basins. Lack of mechanism for transparent and measurable criteria for transboundary water allocation and management in the SDGs risks privileging the perspectives of the already powerful, thereby resulting in a failure to prioritize distributive water justice and regional security (Lankford et al., 2013). We think that this article will serve as a starter for discussion on operationalization and inclusion of distributive justice theories in SDG 6.5.2 and similar sustainability assessment endeavors for proper accounting and monitoring of progress toward equity and sustainability in transboundary basins.

## DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/**Supplementary Material**; further inquiries can be directed to the corresponding author.

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## AUTHOR CONTRIBUTIONS

SY, JK, and ND discussed the concept; SY drafted the manuscript; JK and ND contributed to revising and refining it.

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## SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fenvs.2020.590954/full#supplementary-material>.

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**Conflict of Interest:** The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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