

Security Implications of Transboundary Rivers in the 21st Century

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ABSTRACT

Transboundary rivers serve as both fault lines of conflict and lifelines of collaboration, making it one of the most contentious strategic resources of the twenty-first century. Nearly 263 rivers are transboundary and collectively sustain over 40 percent of the global population, but increasing demographic pressure, climate change, and inter-state competition are increasing their security stakes. This study critically examines hydro-politics dynamics of some selected basins: the Nile Basin (Egypt□Ethiopia□Sudan) that is defined by conflict over the Grand Ethiopian Renaissance Dam; the Indus Basin (India□Pakistan) that is marked by precarious cooperation despite a robust treaty regime; and the Tigris□Euphrates Basin (Turkey□Iraq□Syria) where downstream scarcity and volatility were compounded by upstream damming. Following Environmental Security Theory and paradigms of Resource Scarcity□Conflict, the study analyzes the linkage between water scarcity and food security, energy needs, migration, and regional stability. The findings indicate that collaborative institutions do exist but are vulnerable, reflecting the open nature of international river management to geopolitics. The contention of this paper is that strong hydro-diplomacy, robust treaties, and regional institutions are necessary in avoiding the security threat posed by shared rivers. It emphasizes the imperative significance of rethinking water not merely as a development issue but as the cornerstone upon which international peace and security must be constructed.

Keywords: Security, Transboundary Rivers, Hydropolitics, Conflict and Cooperation.

INTRODUCTION

Water, also referred to as the "blue gold," is increasingly being recognised as one of the strategic resources that significantly defines the twenty-first century geopolitics (UNESCO, 2020; Allan, 2011). Water has no substitutes, but hydrocarbons and rare earth elements might. Human life, food security, energy generation, industrialisation, and the preservation of ecological balance all depend on its sustainable use and fair distribution (Gleick, 2014; World Bank, 2019). Yet as the focus of international commentary long remained historically on oil and gas conflicts, commentators now predict that the most menacing security challenges of the next decades might have their genesis from water deficits and competition for mutual waters (Brauch, 2016; United Nations, 2023). The size of the challenge seems formidable. Nearly 4 billion people experience acute water scarcity at least once every twelve months of the year, and an additional 2.2 billion people are predicted to lack secure access to safe drinking water (WWAP, 2022). Calculating on the assumption of the World Bank (2021), aggregate water demand will exceed supply globally by 40% as far as the year 2030, with particularly acute shortages falling on Africa, on the Middle Eastern and South Asian continents (World Bank, 2016; OECD, 2012). The icing on the cake, with more than 263 lakes and river stretches stretching across international borders, bisecting on 145 nations and directly and indirectly endangering almost 40% of the world population (UN-Water, 2020; Wolf, Natharius, Danielson, Ward, & Pender, 1999), those waters□like for tens of millions of people the Nile, the Mekong, Indus, Euphrates-Tigris and the Amazon□like lifelines are also sources of potential interstate and intrastate conflicts (Zeitoun & Warner, 2006; Cascão & Zeitoun, 2010).

Transboundary waters also possess defining governance challenges. As much as the UN Convention on the Non-Navigational Uses of International Watercourses of 1997 provides for legal precedent, its use remains loose□with fewer than half of riparian states signing and ratifying the treaty (McCaffrey, 2019). Unilateralism,

on the other hand, prevails. Neighbors construct dams, divert for irrigation, or produce hydropower with scant regard for downstream effects (Zeitoun & Mirumachi, 2008; Dinar, Dinar, McCaffrey, & McKinney, 2007). Take Ethiopia building the Grand Ethiopian Renaissance Dam (GERD), and the tensions it has caused with Egypt and Sudan with their dependence on the Nile for more than 90% of their sources of freshwater (Swain, 2011; Cascão, 2009). In another context, the Mekong River Commission has not had an easy means of settling differences as China rapidly engages in constructing dams on the upper Mekong with negative effects on millions of downstream residents of Southeast Asia (Cronin, 2013; Eyler, 2019). These disagreements are reflective of the means power imbalances, poor governance, and divergent development agendas transform rivers from cooperation to sources of contention (Zeitoun & Warner, 2006; Allan, 2011).

These sensitivities are amplified by climate change. Melting glaciers of the Himalayas threaten river flows for long periods, for instance, the Indus and Brahmaputra (Immerzeel, van Beek, & Bierkens, 2010), as Sahel and Middle Eastern variable rains and long-duration droughts strain water-scarce societies (UNEP, 2012; FAO, 2020). In the status quo, by 2050, the IPCC (2021) projects that more than fifty percent of the population will live in water-stressed areas. These stressors intensify food insecurity, compromise energy production, and, for at-risk states, accumulate risks of displacement, migration, and violent conflict (Barnett & Adger, 2007; Raleigh & Urdal, 2007). Indeed, the U.S. National Intelligence Council (2021) has highlighted water insecurity as a "threat multiplier" that will define global security environments for the next three decades.

This study discusses the geopolitical repercussions of 21st-century transboundary rivers and places water at the center of the wider resource geopolitics and international security agendas (Brauch, 2016; Allan, 2011). It takes account of the ways demographic pressures, climate change, and unbalanced development leap over political antagonisms and turn waters themselves from sources of conflict and instruments of cooperation (Wolf, Yoffe, & Giordano, 2003). In case illustrations of the Nile Basin, Indus Basin, and the Mekong River, it asks how far common rivers worsen interstate pressures or provide grounds for regional diplomacy and integration (Swain, 2011; Zeitoun & Mirumachi, 2008).

In the following section, the methodology and theoretical context and how political ecology and environmental security concepts guide the analysis are outlined. In section three, comparative case studies of key critical transboundary river basins and conflict dynamics and security are assessed. In the conclusion section, the implications for international water diplomacy and governance and the ability of regimes working together to avoid risk of conflict and turn their transboundary waters from sources of conflict to instruments of peace are outlined (Dinar et al., 2007; UN-Water, 2020).

METHOD AND MATERIALS

This study adopts a comparative case study research as its qualitative mode of study. Considering the historical and contextually specific character of transboundary river conflicts. Qualitative research permits the incorporation of historical, political, and socio-economic elements that are not as effectively quantified by quantitative data alone (Creswell, 2018). The sources used were earmarked selectively on the basis of relevance, credibility, recentness and relation to the political, environmental and security aspects of the four chosen basins, giving preference to peer-reviewed literature, official reports by institutions, treaties, basin level material and reliable international data sets. The selected sources were then analyzed using thematic and comparative analysis, where recurring themes such as water scarcity, interstate relations, conflicts, cooperation, livelihood, migration and regional security were identified. Text analysis of secondary sources constitutes the method, including peer-reviewed journals, policy briefs, international treaties, hydrological reports, and datasets from world organizations such as the United Nations Environment Programme (UNEP), World Bank, and Transboundary Freshwater Dispute Database (TFDD). From the sources, the study establishes patterns of hydro-political engagements and security interests on key river basins. Case studies are selected purposively—the Nile, Indus, and Tigris—Euphrates—due to their geopolitical salience, their conflict history, and persistent salience on global water security agendas.

This selection of methodology can also justified on practical as well as theoretical grounds. In the first place, remote access for primary data for other places of the world presents difficulties due to security and political sensitivities and logistical difficulties and so use of reputable sources of secondary material constitutes the best

bet. Secondly, qualitative comparative analysis provides for the exploration of conflict and cooperation promoters across diversified milieus and has implications for transferring basin-specific analyses to basin-generalizable findings of utility for informing globally relevant understandings of concerns regarding security more generally (George & Bennett, 2005). Case Study methodology also has appeal with the intention of drawing out generalizable findings from basin-specific river basins without losing their characteristic political and ecological milieus. For materials, international treaties (e.g., the Indus Waters Treaty), basin commission communiqués, and satellite-hydrological datasets are utilized for the purpose of triangulating narratives as well as establishing validity. Used on their own as well as collectively, these enable findings robustness while ground them with reference to the literature currently extant with reference to environmental security and hydro-politics.

LITERATURE REVIEW

This connection of environmental resources with security has been more forcibly brought into view for scholars as water has itself become an increasingly salient cause of interstate and intrastate war. Environmental Security Theory, as argued by scholars as diverse as Homer-Dixon (1999), provides a rich point of entry for descriptive account of how environmental stress, and indeed shortages of freshwater, engenders political instability and violent conflict. This model centers on the nexus between resource depletion, population pressure, and state failure, and insists that water shortages do not merely destroy livelihoods, but also ignite migration, destabilize state authority, and give rise to violent contests. In this regard, scholars are convinced that this dynamic is particularly worst-case for weak states with low institutional capability, and as such predisposes water disagreements most readily to spin out of control and catalyze broader insecurity (Matthew, Barnett, & McDonald, 2010).

Cognate with this model is the Resource Scarcity and Conflict Model which suggests lack—resulting from physical deficiencies, unequal access, or constraint of access—multiplies existing political tensions (Gleditsch et al., 2006). For instance, the United Nations calculates that by the year 2050, more than 40% of the world population will reside in places of extreme water stress (UN-Water, 2020). The prevailing dynamics have enough cause for alarm: an estimated 2.2 billion lack access to safely managed drinking water (WHO/UNICEF, 2021). These statistics raise the structural dynamics with the potential of converting transboundary water management from technical matter to peace and security concerns. Expanding literature of hydro-politics has also further enriched this debate with investigations of political state behavior on common river basins. Allan (2001) first ventured the notion of “virtual water,” which suggests international trade of water-intensive commodities potentially will lessen direct conflict risk. Yet others acknowledge there are 263 transboundary river basins covering 145 nations and supporting an estimated 40% of the world population (Wolf et al., 2003). That interconnectivity at the same time supplies water as both cooperation opportunity and spark of rivalry. For instance, the Mekong River Commission exemplifies there are cooperation processes reducing disagreements, while conflicts from the Nile Basin, between Ethiopia, Sudan, and Egypt, represent the means water projects destabilize regional stability.

Empirical studies of surveyed basins further shed light on these processes. The Nile Basin conflict intensified with Ethiopia's initiation of the Grand Ethiopian Renaissance Dam (GERD), with Egypt framing the situation as an existence risk given its reliance on the Nile for more than 95% of its supplies (Swain, 2011). In the same vein, the Indus River Treaty for Pakistan and India—though portrayed as one of the oldest water-sharing agreements—is still subjected to strain due to river flow variability driven by climate and wider political antagonisms (Mustafa et al., 2013). In the Mekong context, Chinese upstream hydropower initiatives have stirred alarm among downstream nations like Vietnam and Cambodia, with fishing-dependent societies suffering livelihood vulnerability due to unstructured flow regimes (Sithirith, 2016). In the Jordan context, prolonged conflict environments undermine water accords, with Israel, Jordan, and the Palestinian Authority stuck with intricate and unequal water-sharing regimes. In Africa, shrinking of Lake Chad—having reduced by more than 90% since the 1960s—has intensified livelihood catastrophes, encouraged forced migration, and ignited insurgencies like Boko Haram (Okpara et al., 2015).

Notwithstanding the richness of basin-oriented scholarship, there are three crucial gaps in the literature. First, much of the scholarship has been localized at the geographical level, with case studies often being bounded at

the level of the singular river basin, constraining comparative interpretations at higher levels of analysis. Second, if the literature now characteristically recognizes climate change as a multiplier of threats, fewer pieces systematically relate transboundary water shortages with global security dynamics—such as terrorism, state failure, and forced migration. Third, much of the hydro-politics literature examines interstate conflicts, and intrastate and subnational forms—such as community-level conflicts regarding irrigation or migration-forced conflicts—are undertreated. In order to get beyond these gaps, this paper instead attempts to frame transboundary water conflicts as part of a global security agenda, and thus identify how local conflicts at nodes such as the Nile, Indus, and Lake Chad are related with higher-level geopolitical competitions, migration challenges, and humanitarian crises.

Theoretical Considerations

The debate on the security implications of transboundary rivers is best situated within the grand debate of Environmental Security Theory, which argues that environmental stresses such as natural resource scarcity can pose threats to state stability and global peace. Homer-Dixon (1994) was one of the first scholars explicitly to link environmental change and violent conflict, showing how scarcity of resources becomes entangled with poverty, population pressures, and poor institutions to increase insecurity. Natural resource degradation typically acts as a "threat multiplier," augmenting existing social and political tensions, Matthew (2002) states. For transboundary rivers, theory of environmental security offers an effective analytical lens with which to understand how diminishing water supplies, driven by industrial demand, population increase, and climate change, become conflict over sovereignty, space, and survival. The perspective justifies the argument that water insecurity is neither a localized environmental question nor a local but rather an international security issue.

Most directly related is the Hydro-Political Security Framework, widely discussed under the broader umbrella of hydro-politics and water diplomacy. Under this approach, transboundary rivers are not only ecological systems but are also deeply embedded in the political and strategic interest of riparian states (Wolf, 1998). Against the background of environmental security theory, where scarcity is emphasized as a causal origin of conflict, hydro-politics narrows down to power disparities, bargaining dynamics, and political structures that determine whether water can be a site of cooperation or conflict (Zeitoun & Warner, 2006). For instance, the concept of "hydro-hegemony" explains how upstream countries have the ability to manage water flows to the disadvantage of lower riparians, e.g., in the Nile Basin between Egypt and Ethiopia or the Indus between Pakistan and India (Cascão, 2009). Thus, hydro-politics positions water not only as a natural asset but also as an instrument of geopolitical influence.

The two theories align in their recognition that water scarcity and availability are not just technical issues but core security issues. They differ in emphasis. For instance, the Environmental Security Theory emphasizes blame on ecological stress as the origin of insecurity, while Hydro-Political Security focuses more on the role of states, institutions, and diplomacy in shaping outcomes. In the interest of this research, Environmental Security Theory is assumed to be the primary conceptual framework because it most clearly characterizes internationality in water scarcity as a security threat in the 21st century (Homer-Dixon, 1999; Matthew, 2002). Nevertheless, hydro-political knowledge informs the analysis by acknowledging states' strategic behavior in controlling—or competing for—shared rivers (Zeitoun & Warner, 2006; Wolf, 1998). Critical examination of the above theories reveals that while no single framework fully explains the complexities of water conflicts, their complementarity provides a full spectrum of transboundary river security issues.

Transboundary River Conflict Case Studies

The selection of the Nile, Indus, Lake Chad, and Tigris-Euphrates basins is due to the fact that the regions represent varied hydro-political/security situations in Africa, Asia, and the Middle East. In addition, through the analysis of the regions, it is possible to gain insights into varied experiences of interstate conflict, resource depletion, environmental destruction, livelihood insecurity, and regional cooperation related to shared water systems. Additionally, the inclusion of the Lake Chad region is meant to add an element of human and regional security because of the connection between water scarcity, environmental degradation, displacement, and extremism.

The Nile Basin

The Nile Basin is one of the most geopolitically disputed water systems in the world, spanning 11 riparian countries and directly supporting an estimated 250 million people, with over 400 million others indirectly benefiting in the region (Swain, 2011). The center of the modern disputes revolves around the construction of the Grand Ethiopian Renaissance Dam (GERD) as a required project to produce power and national development, as seen by Ethiopia. The GERD, with a planned output of over 6,000 MW of electricity, transforms Ethiopia into a regional energy exporter but also creates existential security concerns in downstream Egypt that depends more than 90% of its freshwater resources on the Nile (Cascao & Nicol, 2016). The dependence asymmetry creates a structural security dilemma since Egypt perceives any upper riparian dominance as a direct threat to its food security as well as social-political stability. Sudan, the middle state, has a balancing act: it welcomes the irrigation and flood control benefits of the GERD but does not want to get entangled in the rising geopolitical competition.

The key causes of conflict along the Nile are population pressure, agricultural dependence, colonial treaties, and competing national development interests. The 1929 and 1959 Nile Waters Agreements allocated the bulk of Nile waters to Egypt and Sudan against upstream nations like Ethiopia, Uganda, and Kenya (Tawfik, 2016). Their abolition by upstream countries through the Cooperative Framework Agreement (CFA) heightened tensions. In addition, climate change projections suggest reduced rainfall variability in the Blue Nile basin and increased drought frequency, threatening the long-term sustainability of water flow (Sutcliffe & Parks, 1999). Such environmental pressure coincides with political rivalries, adding to the securitization potential of the Nile waters.

The security implications are profound. For Egypt, reduced water supply corresponds directly to food security threats because it is already significantly food-import dependent and vulnerable to growing world grain prices (Wheeler et al., 2018). For Ethiopia, it places GERD as a right of sovereignty and economic emancipation, linking water politics to nationalism and regional power projection. The risk is that rising rhetoric leads to full-blown confrontation. Although diplomatic negotiations have continued under the aegis of the African Union and third-party mediators like the United States, the Nile dispute is a contentious issue, and water diplomacy has oscillated between cooperation and conflict (Yihdego, Rieu-Clarke & Cascao, 2016).

The Indus Basin

The Indus River Basin between Pakistan and India is another case where transboundary water politics are mixed with historic geopolitical rivalries. Affecting a surface area of around 1.1 million km², the Indus sustains over 300 million people, making it one of the most highly reliant river systems globally (Wolf, 1999). Unlike the Nile, the Indus Basin is governed by an old legal instrument, the Indus Waters Treaty (IWT) of 1960, brokered by the World Bank. The IWT allocates the three western rivers (Indus, Jhelum, Chenab) to Pakistan, and the three eastern rivers (Ravi, Beas, Sutlej) to India. In a remarkable turn of events, the treaty has survived several wars between the countries as a singular precedent of water diplomacy in conflict (Zawahri, 2009). Despite this institutional arrangement, tensions continue. India's construction of upstream dams and hydroelectric installations on the western rivers has been continually criticized by Pakistan for fear that India would employ water flows as a strategic instrument. The Kishanganga and Baglihar dams have particularly been contentious, with Pakistan arguing that these violate the intent of the IWT by reducing water flows critical to agriculture in Punjab and Sindh (Mustafa, 2010). Climate change adds another layer of complexity to this issue. Indus system is heavily dependent on Himalayan glaciers, which are melting at alarming rates due to global warming. An estimated loss of 40% glacial mass by the 21st century will jeopardize water flow stability in the basin (Immerzeel et al., 2010). The volatility introduces new uncertainties that are not foreseen in the IWT.

Security implications are two-faced. Agriculture employs approximately 42% of Pakistan's workforce and contributes over 19% to its GDP, and thus river flow interruptions pose an immediate threat to livelihoods and food security (Qureshi, 2011). Water scarcity also plays a part in the broader Indo-Pakistani rivalry, where water increasingly becomes securitized in nationalist rhetoric. Words of Indian politicians at moments of military crisis have at times implied tapping water as a strategic tool, heightening Pakistan's anxiety (Price et

al., 2014). The IWT also indicates the resilience of institutionalized water-sharing mechanism, in contrast. Despite deep mistrust, the treaty has remained operational for over six decades, suggesting that water, unlike other contested issues, can serve as a bridge for dialogue rather than conflict escalation.

The Tigris□Euphrates Basin

The Tigris□Euphrates Basin, coursing through Turkey, Syria, Iraq, and to a lesser extent Iran, is the classic upstream□downstream axis of transboundary water conflict. Both rivers rise in Turkey and course through Syria and Iraq as lifelines for irrigation, drinking water, and power. Iraq, traditionally "land between rivers," depends on the Tigris□Euphrates system for over 80% of its freshwater resources (Kibaroglu & Sayan, 2016). But Turkey's ambitious Southeastern Anatolia Project (GAP)□a cascade of 22 dams and 19 hydroelectric power plants□has altered the hydrological calculus in the basin to the revolutionary extent. While the GAP will generate 7,500 MW of electricity and irrigate 1.7 million hectares of southeastern Turkey, it reduces downstream flows, subjecting Syria and Iraq to extreme water stress (Kaya, 2020).

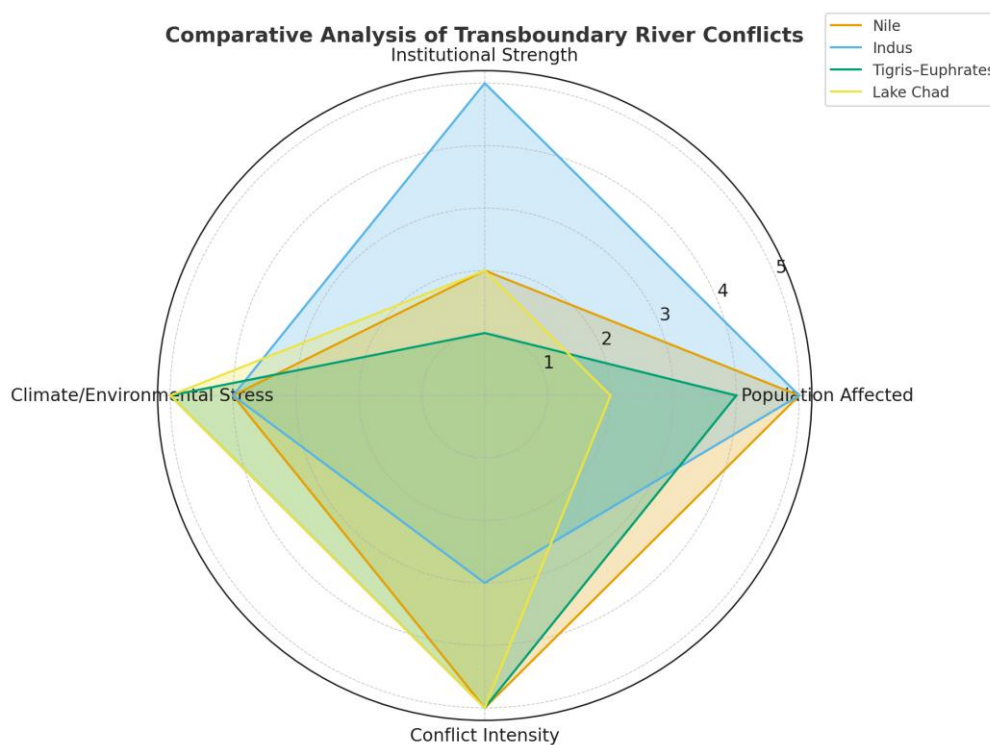
Regional instability aggravates the hydro-politics in this context. War-torn Syria and Iraq have limited political influence to negotiate with Turkey. Absence of a master water-sharing agreement also fans the flames because each country proceeds with single-country water development plans in the absence of regional planning. Climate change also contributes to the malady: the Middle East can anticipate mid-century temperature increases of 2□4°C, with less rainfall. Havoc caused by such harmony will cut river flows by up to 25%, aggravating deficits in Iraq and Syria (UNESCO, 2014). The security implications are dire. Diminished water flows are mainly to blame for destroyed agricultural crops in Iraq, a country where nearly 30% of its labour force is involved in agriculture. Water shortage has fueled rural□urban migration, inflating cities like Baghdad and Basra and inducing socio-political instability (Mason & Calow, 2012). In Syria, severe drought between 2006 and 2010 displaced over 1.5 million people, adding to factors that created civil war and violence (Gleick, 2014). Water scarcity has been accused of stoking sectarian grievances, even the recruitment of terrorists, rendering the Tigris□Euphrates basin a textbook case of environmental pressure bleeding into violent conflict (Selby et al., 2017). Securitization of the rivers reflects the mirror image of broader regional power asymmetries with Turkey controlling upstream flows by using water as an instrument of development and as a geopolitical lever.

The Lake Chad Basin

In Nigeria, Niger, Chad, and Cameroon transboundary Lake Chad Basin is a case in point of the interconnectedness of water scarcity, environmental degradation, and violent extremism. Lake Chad, one of the largest freshwater lakes in Africa, has lost over 90% of its original size since the 1960s due to climate variability, over-exploitation of water resources, and weak basin management (FAO, 2018). The basin supports over 30 million livelihoods founded primarily on livestock, agriculture, and fishing. Degeneration of the lake has therefore ruined these livelihoods, leading to competition for scarce resources. Hydro-politics are controlled by poor transboundary coordination between the Lake Chad Basin Commission (LCBC). Despite its creation in 1964 to oversee the shared water body, the LCBC has been undermined by resource scarcity, poor coordination, and political divisions between its member states. As the lake receded, it forced communities that depend on it into increased mobility, precipitating pastoralist□farmer clashes and fueling inter-ethnic tensions. The crisis was also exploited by Boko Haram, who recruited members along the lines of local grievances that were connected with marginalization, poverty, and environmental degradation (Onuoha, 2008). Water scarcity in the Lake Chad Basin has thus transformed from an environmental problem to a formidable security threat.

Security threats in the Lake Chad Basin are national and external. Locally, water scarcity exacerbates hunger, displacement, and conflict, with some 10 million people already requiring humanitarian assistance (UNOCHA, 2021). Regionally, forced migration due to water scarcity and livelihood loss has caused mass influxes of refugees into neighbouring countries. Internationally, the link between eco-stress and terror in Lake Chad has attracted global attention to security since the region's instability is bound to have spillover consequences beyond Africa. Crisis solutions such as the proposed inter-basin water transfer from the Congo River are contentious on the basis of cost, environmental risk, and geopolitical feasibility.

The comparison of the Nile, Indus, Tigris–Euphrates, and Lake Chad basins is characterized by stark similarities in hydro-political processes underlying transboundary river disputes. All four examples illustrate how asymmetries of power between downstream and upstream states shape bargaining options and security interests. Upstream countries (Ethiopia and Turkey) use their location to formulate mega-dam projects in the Nile and Tigris–Euphrates basins, and downstream countries (Egypt, Iraq, and Syria) foresee existential threats to water security. This is a hydro-political structural configuration in which geography meets development aspiration and produces securitization discourses that convert water management into a matter of technical to national survival. The Indus Basin, though comparatively more institutionalized in the Indus Waters Treaty, manifests the same asymmetry, India's upstream schemes having been perceived by Pakistan as possible coercive tools in spite of legal guarantees. Lake Chad is distinct in its hydro-political hue but displays the same security spiral, environmental despoliation undermining state capacity and planting the seeds of violent extremism. Therefore, whether through unilateral damming or environmental collapse, the securitization of water and its entanglement with other geopolitics and socio-political insecurities is the underlying common denominator. See Figure 1.1 below:



Meanwhile, the comparative analysis also gestures to outstanding institutional capacity and governance arrangement disparities between the basins. The Indus Treaty is a testament to resilience, demonstrating how a robust, externally mediated institutional agreement can survive even high levels of geopolitical rivalry. On the other hand, the Nile Basin Cooperative Framework Agreement is contested, which reflects the difficulty in renegotiating colonial agreements under present power asymmetries. In the Tigris–Euphrates, the basin-wide agreement has been the absence of one, whereby unilateralism and downstream weakness have been consolidated. In Lake Chad, newly established regional institutions such as the Lake Chad Basin Commission have not been able to prevent environmental degradation and decrease insecurity. These variations underscore that, while the hydro-political setting sets the stage for potential conflict, institutional resilience and longevity determine whether asymmetries are converted into cooperation or escalated into insecurity. Robust legal regimes, confidence-building measures, and third-party mediation stand out as important discriminating variables separating comparatively stable ones like the Indus from unstable ones like the Nile and Tigris–Euphrates.

Finally, population pressure and climate change are cross-cutting drivers in all four cases, amplifying latent tensions and demonstrating the limits of current approaches to governance. In the Indus and Himalayan-fed basins, the melting of glaciers represents a long-term water supply threat, introducing new uncertainties into otherwise stable treaties. In the Nile and Tigris–Euphrates, erratic rainfall and rising temperatures inflate risks

of diminishing flows, entrenching nationalist and securitized discourses of water sovereignty in place. Lake Chad provides the most stark evidence of environmental breakdown, where climate-induced austerity has already brought humanitarian emergencies, displacement of populations, and terror. Comparative analysis thus discloses transboundary river wars as not regional conflicts but manifestations of global stressors—climate change, population growth, and corruption—that target vulnerable river basins. It underscores the need to develop adaptive governance institutions beyond zero-sum nationalism to seek cooperative, multi-scalar water diplomacy solutions.

FINDINGS AND DISCUSSION

The case studies reveal the reality that transboundary river conflicts are not necessarily conflicts over water but are also entangled with asymmetry of power, local-level politics, and variations in perceptions regarding development. The Nile Basin, the Indus Basin, and the Tigris–Euphrates system illustrate how rivers become sources of exposure as well as instruments of geopolitical flexibility. Despite differing geographical and historical settings, the three cases validate the same conclusion: water conflicts are rarely due to sheer scarcity of water but more likely due to differential control and access. It validates Homer-Dixon's (1999) environmental scarcity thesis that it is less a shortage of resources but unequal access and impaired governance that provides security threats. Thus, hydro-politics is a matter of power and legitimacy, establishing if rivers are a space for cooperation or spaces of instability. The Nile Basin is an example of how hydropower ambitions run into past hegemony. Egypt's reliance on the Nile has been a cornerstone of its national identity and agricultural security over centuries. Ethiopia's Grand Ethiopian Renaissance Dam (GERD), however, is a redefinition of basin politics: upstream titans bent on an end to Egyptian hegemony for a century (Cascão & Nicol, 2016). The GERD dispute shows how infrastructure is an instrument of development and a geopolitical tool. While Ethiopia frames the project as regional development and energy security, Egypt sees it as an existential threat to water supply. Sudan, centrally, vacillates between supporting and being nervous, depending on national and local politics. The key observation is that hydropower projects have the potential to generate asymmetric threat perceptions—what one state perceives as a right of sovereignty is experienced as a zero-sum loss by another. This war shows the "securitization" of water, where resources management is translated from technical negotiating to rhetoric about national survival.

The Indus Basin is still another contrasting but illuminating example, wherein an institutional framework—the Indus Waters Treaty (1960)—has been widely hailed as the exemplary resilient institution in a conflict-ridden world. The treaty has survived Indian–Pakistan wars and crises, harmonizing allocations between eastern and western tributaries. As this study illustrates, the treaty's resilience however conceals in it structural fault lines. Climate change, population growth, and technological changes are straining infrastructure founded on mid-20th-century conditions (Wolf & Yoffe, 2019). India's development of upper hydroelectric installations on the western rivers has shaped Pakistani thinking about water manipulation, adding validity to the narrative of vulnerability in an already securitized relationship. The continuation of such tensions supports a broader observation: treaties can forestall immediate war but can also trap unequal divisions in, solidifying conflicts into position. Cooperation agreements will thus need to adapt in order to be compatible with altered ecological and political circumstances, lest they become sources of future insecurity.

The Tigris–Euphrates Basin is one case of the destabilizing effect of hegemony in the upstream basin (Bilgen, 2023). Turkey's Southeastern Anatolia Project (GAP) is an enormous dam and irrigation scheme that has fundamentally changed the hydrology of the basin, significantly lowering flows to lower downstream Syria and Iraq. The hydraulic project is a manifestation of Turkey's development agenda but also of how control of the headwaters equates to political power. Iraq, traditionally suffering from the ravages of war and internal collapse, has been facing serious water shortages that exacerbate food insecurity and spark internal migration. Syria, embroiled in civil war, has failed to successfully resist Turkish upstream dominance. The result is a bitter example of how hydrological asymmetry enhances fragility as upstream potential and downstream vulnerability meet with earlier political instability to form complex security challenges (Kibaroglu, 2019). The research identifies that water conflict rarely happens on its own; rather, it intersects with ethnic grievances, state failure, and interstate rivalry to form multi-layered insecurity.

In these cases, there are certain cross-cutting trends that emerge. The first of them is hydro-hegemony sharpening water conflicts—where powerful or upstream states negotiate terms of access and weak or downstream states possess minimal bargaining power (Zeitoun & Warner, 2006). Ethiopia and Turkey reveal emerging hydro-hegemony pushing against old or geographical vulnerabilities of downstream states. Second, while institution-based solutions like the Indus Waters Treaty can provide stability, their very rigidity precisely can make them maladaptive to the dynamics of climate change and shifting demand. Third, securitization generates feedback loops: if water is securitized and turned into an issue of national security, states are less inclined to negotiate, and cooperative solutions are harder to be realized. These results indicate that war is not unavoidable but conditionally very likely depending on institutions of statehood, trust shortages, and local geopolitics.

The study also discusses the broader security aspects of hydro-political rivalry. Food security is even jeopardized when agriculture is affected by low flows of water, like in Iraq or Egypt. Energy security is compromised in Ethiopia where the GERD can supply millions with power, yet threatened by Egypt on the grounds of an existence threat. Migration is also a factor of explanation, since Lake Chad and Tigris—Euphrates aridification fuels rural displacement and, in some cases, requires insurgent recruitment (UNDP, 2021). Finally, regional security is compromised when river conflict exacerbates already fragile political orders and makes local grievances become interstate competitions. These nested insecurities confirm the hypothesis that transboundary water conflicts are not "environmental problems" per se but comprehensive security issues of human, national, and regional nature. Comparative evidence suggests that the trajectory of hydro-politics over the next few decades will be governed less by hydrological circumstances than by institutional and diplomatic choices exercised by states. Where cooperative institutions can adapt, as on the Indus, conflict can be managed by deep animosity. Where there is hegemonic domination, as on the Tigris—Euphrates, insecurity gathers pace. And where power structures are reconfiguring, as on the Nile, sovereignty and identity contestation frame the dialogue. Hence, the key conclusion is that transboundary rivers reflect larger political structures: they may reinforce insecurity when nested in adverse relations, or induce cooperation when embedded in adaptive and inclusive patterns of governance.

Implications and Recommendations

The above findings point clearly to the fact that transboundary water governance transitioned from the margins of environmental discourse into being a principal maker of security in the 21st century. Experience in the Nile, Indus, Tigris-Euphrates, and Lake Chad basins indicates that political distrust, asymmetrical power, and scarcity of water directly influence food security, energy stability, migration patterns, and even the likelihood of armed conflict. This implies that policymakers reformulate water management as a security strategic problem instead of an environmental or technical issue. Policy-wise, three suggestions stand out: one, the entrenchment of basin-level institutions with legally binding procedures to discourage unilateralism; two, linking climate adaptation action with water-sharing agreements to future-proof cooperation; and three, stepped-up multilateral diplomatic effort and regional integration to reverse asymmetric power relations between downstream and upstream nations. Ultimately, effective hydro-diplomacy requires that states, institutions, and civil society eschew viewing water as a zero-sum good but as a common security good that can deliver cooperation rather than conflict.

CONCLUSION

It can be safely concluded based on the foregoing that the governance of transboundary waters is founded on security, as is seen in the Nile, Indus, Tigris—Euphrates, and Lake Chad basins. In all such cases, the hydro-politics context substantiates that water is a potential source of conflict as well as a reason for cooperation, depending on the manner in which states deal with competing interests and pressure on resources. The research clarifies that unilateral measures, institutional shortcoming, and climatically driven shortage will increase insecurity while inclusive accord, cooperative growth schemes, and confidence-building practices tend to reduce tension and increase stability. The entire research affirms that water security is a strategic necessity with the severe regional peace, development, and resilience implications rather than an environmental issue in itself.

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