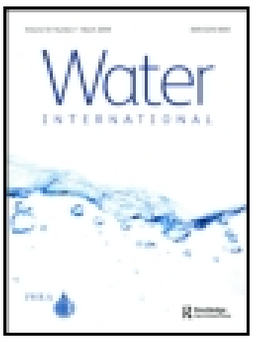

Water International

ISSN: 0250-8060 (Print) 1941-1707 (Online) Journal homepage: http://www.tandfonline.com/loi/rwin20

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To cite this article: Jacob D. Petersen-Perlman, Jennifer C. Veilleux & Aaron T. Wolf (2017): International water conflict and cooperation: challenges and opportunities, Water International, DOI: 10.1080/02508060.2017.1276041

To link to this article: http://dx.doi.org/10.1080/02508060.2017.1276041

Published online: 19 Jan 2017.

WATER INTERNATIONAL, 2017
http://dx.doi.org/10.1080/02508060.2017.1276041

Routledge
Taylor & Francis Group

RESEARCH ARTICLE

International water conflict and cooperation: challenges and opportunities

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ABSTRACT

Though awareness of the nature of water conflict and cooperation has improved over time, the likelihood of water conflicts could increase as populations continue to grow and climate change continues to manifest. This article details the nature of water conflict and water cooperation. We discuss how water conflicts can be resolved, how water can be seen as a vehicle for change between states, and future directions that can be taken in transboundary water conflict research.

ARTICLE HISTORY
Received 19 October 2015
Accepted 21 December 2016

KEYWORDS
Water conflict; water cooperation; transboundary waters; water security

Introduction

All societies are dependent upon readily available freshwater for domestic needs, cultural practices, food production, livelihoods, power generation, industry and/or navigation. However, water resources are subject to change over space and time due to precipitation and temperature cycles, which are becoming increasingly unpredictable due to the effects of climate change. Responding to this variability, users have altered water resources through various engineering efforts, changing the availability, quantity, or quality of water resources for other users. Such alterations can potentially create conflict. Therefore, the management of shared water resources requires innovative and flexible approaches to ensure cooperation between various communities of users.

The complex challenges brought forth by transboundary waters are prevalent across the world. Since first assessing transboundary basins for the International Water Resources Association's Committee for International Collaboration in 1999 (Wolf, Natharius, Danielson, Ward, & Pender, 1999), Oregon State University's Transboundary Freshwater Dispute Database (TFDD) has most recently identified 286 surface water basins that cross international boundaries. In addition, the International Groundwater Resources Assessment Centre (2015) has identified 592 transboundary aquifers. The surface water basins alone cover nearly half of the earth's land area and are also home to 40% of the world's population (TFDD, 2016). Countless more watersheds cross subnational jurisdictions. Rising water demand in these basins, coupled with increasing variability, leads to higher potential for transboundary conflict. Whether conflict increases or decreases, however, depends on several factors that will be discussed in this article.

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As transboundary river basins are experiencing rapid changes through both physical and economic pathways around the world, the field of water conflict and cooperation deserves a re-examination based on these new realities. This article begins with an overview of how water conflicts manifest, including which factors may lead to water conflicts and why water conflicts happen (and do not happen) in certain locations. Following this, it discusses how human and water security may be impacted by global change and how threats to human and water security may lead to water conflict. We next discuss how water conflicts may be resolved, first by arguing that parties must overcome the potential risks of cooperation before cooperation may occur. We also argue that power dynamics in transboundary basins need to be reconsidered regarding water cooperation and conflict. We stress that building institutional capacity is the strongest method to prevent and resolve water conflicts, despite its imperfections. After, we discuss the evolution of attempts to install water principles and build institutional capacity in the international arena. We then elaborate on the role of third parties in resolving, managing, and exacerbating water conflicts. The article concludes with suggestions on how new challenges for practitioners managing transboundary waters can be met.

Water conflict

Given the complexity created by different economies, ecosystems, climates, politics and cultures within watersheds, transboundary water management can be considered a type of conflict management and/or conflict prevention. Therefore, successful transboundary water resources management must consider the dimensions of potential conflict. For the context of this article, 'transboundary water conflict' is defined as verbal, economic, or militarily hostile actions between stakeholders over internationally shared water resources. Within this group of actions, 'violent transboundary water conflict' is reserved to describe militarily hostile actions.

Research has shown that a precedent of coordination between stakeholders, through the establishment of institutional capacity in the form of agreements, treaties or informal working relationships, can help reduce the likelihood of conflict (Wolf, Stahl, & Macomber, 2003; Yoffe, Wolf, & Giordano, 2003; Yoffe et al., 2004). Once institutional capacity is established between parties it has been proven to be resilient over time, even as conflict was being waged over other issues (Wolf, 1999).

The complexities within watersheds make managing water a complicated task, but there are opportunities for both conflict and cooperation within these complexities. Competing demands within any given jurisdiction increase the difficulty of finding consensus among a river basin's users, unless there are diplomatic, economic or other institutional precedents. And the chances of mismanagement due to misunderstanding, mistrust or lack of information increase as a watershed crosses more administrative and conceptual boundaries. The boundaries in question can be actual or conceptual spaces, economic sectors, sovereign nation-states, contested areas, ethnic or language regions, other legal jurisdictions, climate zones, mountain ranges, infrastructure, or socially constructed concepts of the environment, space or history.

When competing interests clash and one stakeholder perceives wrongdoing by another stakeholder in a shared basin, transboundary water conflicts are likely to

occur through economically and verbally hostile actions. Verbal actions can raise tensions when, for example, upstream and downstream interests clash. One instance of verbal hostilities occurred in the La Plata basin in 1993, when Argentina's foreign minister stated that Argentina would not close a canal that diverted flows from the Pilcomayo River (shared between Argentina and Paraguay) towards its territory, which could impact irrigation within Paraguay (TFDD, 2016).

Economically hostile actions that can lead to transboundary water conflicts include upstream actions that are perceived as creating negative impacts downstream. An example of this is when upstream Namibia proposed building a pipe that would pass through the Caprivi Strip to supply drinking water to its capital city, which caused a dispute with downstream Botswana due to its concerns about protecting the Okavango Delta and its ecotourism industry (Wolf, Kramer, Carius, & Dabelko, 2005). Economically hostile actions regarding transboundary water management have also manifested in tensions in the Amu Darya basin between Uzbekistan and Tajikistan due to downstream concerns over how upstream development would affect summer irrigation and winter hydropower production needs (Wegerich, 2008). Reports in Tajikistan suggested that the destruction of a rail bridge near the Uzbekistan–Afghanistan border, crippling shipments of goods, was due to Uzbekistan's opposition to the Tajikistani Rogun Dam project (Kucera, 2011). As of 2015, the countries are still at odds over Tajikistan's proposed Rogun Dam and how it would impact the state-run production of cotton in Uzbekistan, the third-largest exporter of the resource in the world (Putz, 2015).

Though there are several examples of verbally and/or economically hostile actions regarding shared waters, the risk of conflict over water resources, particularly violent conflict, has been debated throughout the years (e.g. Gleditsch, Furlong, Hegre, Lacina, & Owen, 2006; Gleick, 1993; Homer-Dixon, 1994; Lowi, 1995; Toset, Gleditsch, & Hegre, 2000; Wolf, 2000, 2007). Wolf (2000) addressed this argument, stating that while many scholars have identified water as a historical cause and by extrapolation a future cause of warfare, the term 'water war' has been inconsistently defined. Using a definition of 'water dispute' where water was identified as the explicit cause of military action, De Stefano, Edwards, De Silva, and Wolf (2010) found 38 'acute' disputes (those involving water-related violence) between 1948 and 2008; of those, 31 were between Israel and one or more of its neighbours, with none of the violent events occurring after 1970. Yet most of the cases identified by De Stefano et al. were either (1) political tensions or instability rather than true acts of war, or (2) involved using water as a tool, target, or victim of armed conflict. It is important to note that even though water-related violence still exists (Cooley & Gleick, 2011), and the perceived and actual risk of future conflict over water exists, interactions over water resources to date are largely cooperative. Wolf, Yoffe, and Giordano (2003)'s 'Basins at Risk' study, which catalogued over 1800 events involving water conflict and cooperation between nations from 1948 to 2000, found that cooperative events outnumbered conflictive events by over two to one. There is also an extensive history of formalized water cooperation; over 650 treaties related to water have been signed since 1820 (TFDD, 2016). War is usually not a realistic 'best alternative to a negotiated agreement'; this is increasingly accepted as true in international settings. Violent conflict, in the form of shots fired or troops mobilized, has been present in the international setting, but water resources have never been the sole cause of an all-out war. One analyst familiar with both strategic

issues and water resources wrote, "Why go to war over water? For the price of 1 week's fighting, you could build five desalination plants. No loss of life, no international pressure, and a reliable supply you don't have to defend in hostile territory" (Wolf, 1995).

We should note that work by the London Water Research Group, based largely on Zeitoun and Mirumachi (2008) and Zeitoun and Warner (2006), makes the important contribution that transboundary water relations are more complex than individual interactions, and are often both conflictive and cooperative at the same time. Moreover, they point out that not all conflict is bad, as conflict is often the method for disputes to be addressed, and not all cooperation is good, as power imbalances are often solidified in agreements.

Water security and human security

Water conflicts could become more likely between users as their water security becomes threatened. 'Water security' is a concept that captures the threats to sustainable and safe water uses from natural and manmade pressures on water resources, through either water's presence, as in floods or inundation, or its absence, as in drought or contamination (Grey & Sadoff, 2007). The concept has been defined as a population's capacity to ensure sustainable access to sufficient quantities of water at an acceptable quality for human, economic and environmental well-being (United Nations-Water, 2013). Water security assessments of transboundary waters are rare, but given the various potential threats to sustainable water, they will become more common. Water security focuses on concerns regarding changes due to climate change, water development and armed conflict.

'Human security' is loosely defined as freedom from fear and freedom from want (Eldering, 2010). However, the accepted concept of human security can have different applications, depending on the discipline, and as such has been used interchangeably with water security – as water is the basis for human civilization in a broad sense, and human life in a specific sense. The relationships of an individual or community to a water resource as pertains to livelihoods, health, identity, culture or transportation can all have direct relationships with that individual or community's vulnerability, risk or stability. Assessing human security as it relates to water is especially important in situations of water scarcity, active conflict and natural disasters, including effects of climate change or economic development.

In situations involving water resources development that either modifies or eliminates water use by other basin stakeholders, the human security question becomes quite important. Dam development is one example of this sort of change. When a nation or a private corporation receives permission from a nation to develop a shared water resource, the quality, quantity and access to that resource may change for existing users. Even in cases of relocation, success rates for the river community's security are called into question. Occasionally, people with deep roots near a river are asked to become farmers or city-dwellers, or compensation packages may not be sustainable. Measuring human security calls for both quantitative information, such as economics and mortality, and qualitative information, such as identity and culture. Changes to shared water resources on multiple scales can threaten the stability of human security and result in reverberating problems throughout a region (Veilleux, 2014).

Resolving water conflicts

It is not shortage or lack of water that leads to conflict (Yoffe et al., 2003) but how water is governed and managed. To regulate water use and enable sustainable and equitable management in areas stricken with water shortages, stronger policies need to be put in place. Yet water management institutions, especially in developing countries, often lack the human, technical and financial resources to develop and implement comprehensive management plans that can properly accomplish the installation of sufficient governing mechanisms.

Parties have to weigh whether the opportunities that may come from entering into a cooperative agreement will outweigh the risk of not cooperating. Some of the categories of risk perceived by decision makers include the following, identified by Subramanian, Brown, and Wolf (2012):

Capacity and knowledge. This is when parties fear that they will be at a disadvantage at the negotiating table. The risk manifests in two major ways: (1) parties have a perception of less negotiating capacity than others; or (2) parties have a perception that they do not have accurate information about the shared watercourse.

Accountability and voice. Decision makers fear that other basin countries, third parties, or the regional institution may not deliver benefits. Parties perceive that it is highly probable that the proposed institutional arrangement would not result in the flow of benefits, and are concerned that their party's interests would not be adequately considered in joint decision-making processes.

Sovereignty and autonomy. This risk involves sensing the danger that a sovereign's authority may be intruded upon in decision-making processes. It addresses both the desire to have control of its development goals, resources and infrastructure, and the right to make independent decisions.

Equity and access. Parties are acutely aware of ensuring fairness in any agreement, whether it involves specified water quantities and/or qualities, benefit flows, or project costs. Parties also want to ensure their entitlement to use the watercourse, which could mean the right to continue with historic uses, gaining access to a river that runs through (or originates in) its territory, and/or attaining benefits in proportion to its relative size in (or contribution to) the basin.

Stability and support. The final risk is an important one for all parties, but particularly for those that have diversified and powerful stakeholders. Parties consider the implementability of an agreement based on whether key stakeholders support or oppose the agreement and the positive or negative public image of the decision maker.

In the process of overcoming these risks, parties can start working together towards resolving present conflicts and preventing future ones. To create successful transboundary water management, Blomquist and Ingram (2003) suggested building institutional capital, achieving equity and fairness, and meeting needs that are harmonious with both parties' cultural values.

An example of building institutional capacity from a recent water dispute is the Nile River negotiations between Egypt, Ethiopia and Sudan over the Grand Ethiopian

Renaissance Dam. To date, the Nile River basin countries have respected the 1959 Nile Waters Treaty, a document formed and amended before many of the Nile Basin countries were independent from colonial rule. The treaty allots 100% of Nile water resources to Egypt and Sudan.

Egypt, Ethiopia and Sudan have engaged in a series of negotiations starting in 2013 that most recently resulted in a Declaration of Principles in March 2015. New negotiations can be representative of political changes in Egypt and their relationship with upstream, more economically and politically stable countries, such as Ethiopia, as well as economic improvements that the upstream Nile basin countries are experiencing (Veilleux, 2015). The very act of the ongoing negotiations demonstrates a willingness of historically rival countries to come to the table over shared Nile River water resources. The alternative, conflict, was contained in rhetoric, particularly by the press and politicians, but the choice, cooperation, was demonstrated in action (Veilleux, 2015).

The importance of institutional capacity

Throughout, this article has referenced how building institutional capacity has been observed to be a successful strategy in resolving and preventing water conflicts. Building institutional capacity, through signing agreements (treaties) and creating river basin organizations, is described as a tool which can reduce the likelihood of water conflict (Wolf, Stahl, & Macomber, 2003; Yoffe et al., 2004, 2003). McCaffrey (2003, p. 157) wrote, "Treaties stabilize [the relations of states sharing a river] giving them a certain level of certainty and predictability that is often not present otherwise." To overcome the risks of cooperation mentioned in the previous section, institutions responsible for managing a watercourse's resources must be strong enough to balance competing interests of allocation and use.

Countries are more likely to sign treaties when they are in conflict with others over management, are dependent on the water resource, and/or have less control over the resource (Espey & Towfique, 2004). Riparians who have countervailing economic and political power and share 'Western civilization' characteristics are also much more likely to sign treaties (Song & Whittington, 2004).

Institutions may also need to manage human-induced water scarcity. Because of the possible contentiousness surrounding these decisions related to managing water scarcity, institutions (and their structural makeup) can themselves become central settings for disputes. International water conflicts may happen when there is no institution that delineates each nation's rights and responsibilities with regard to the shared body of water, nor any agreements or implicit cooperative arrangements.

The mere presence of institutional capacity does not imply its effectiveness; in an analysis of 153 water-related agreements in Africa identified by Lautze and Giordano (2005), only 108 were considered substantive, and many of these either were never implemented in practice or are no longer enforced. For these agreements to be considered substantive, they need to have characteristics that are operative in preventing conflicts. Ambiguity (intentional or not) in agreements may prove to increase the agreement's resilience towards conflict by allowing each side to present the treaty differently at home to defuse domestic opposition and/or providing leeway to adjust

allocations during crises (Fischhendler, 2008). Other characteristics that make institutional capacity effective for preventing water conflict include:

- an adaptable management structure (including flexibility, allowing for public input, changing basin priorities, and new information and monitoring technologies)
- clear and flexible allocating criteria among riparians
- equitable distribution of benefits
- detailed conflict-resolution mechanisms (Giordano & Wolf, 2003).

Cooperative water management institutions that have these characteristics are much better at anticipating conflict and solving long-simmering disputes, especially when the adaptable management structure allows stakeholders to be included in decision-making processes and given the necessary data, trained staff, and financing for the parties to work together as equals. These institutions may reduce the potential for conflict in a number of ways. First, these institutions may act to provide a forum where joint negotiations may take place, allowing each party's interests to be considered during decision-making processes. This forum can allow multiple perspectives and interests to be heard, in turn revealing new management options and creating win-win solutions. Institutions may also provide opportunities for parties to collaborate and engage in joint fact-finding, hopefully leading to decisions that are much more likely to be accepted by stakeholders and stakeholder groups in both parties, even if total consensus may not be reached. Once in place, effective institutions are tremendously resilient over time, particularly if they incorporate characteristics such as effective monitoring, a clear allocation framework, and adequate enforcement. An often-cited example is the Indus Waters Treaty, which is still in place after over 60 years despite two wars between India and Pakistan. While the treaty does have flexible allocating criteria, the allocating criteria are clear, third-party referrals for resolution allow some management flexibility, and the treaty contains conflict-resolution mechanisms that have been deemed effective, including the Permanent Indus Commission, which must meet at least once every year (Sarfraz, 2013). Institutions without these characteristics can lead to future conflict, as when Iran and Iraq confronted a militarized water dispute in 1981 due to the lack of enforcement mechanisms in their 1975 treaty over joint control of the Shatt al-Arab waterway (Mitchell & Zawahri, 2015; TFDD, 2016).

Political power dynamics in transboundary basins

Though installing institutions in the form of treaties and river basin organizations has the potential to create a more equitable power dynamic between riparians, sometimes these institutions can reinforce or even strengthen disparities. Power inequities are defined by relationships between basin riparian countries and, often, important actors outside the region. It has been argued that unequal resources, usually of a financial or political nature, result in real-world inequities. These inequities can be present within institutions, weakening their effectiveness (Conca, Wu, & Mei, 2006).

Riparian parties can exploit institutions in numerous ways. For example, treaties are not easily enforceable and can be structured in a manner that reflects (or worsens) existing inequities between parties, and can lead to a lack of participation by other

riparians. This exploitation by more powerful riparian parties forms the basis of the theory of hydro-hegemony, which postulates that the most powerful country in the basin, the hydro-hegemon, can create its preferred mechanisms of transboundary water management due to its relative power within the watershed (Zeitoun & Warner, 2006). In some situations, hegemons have sufficient structural power to coerce asymmetric cooperation (Weinthal, 2002).

Hydro-hegemons have been identified by the presence of advantages that these riparians may have over others, including their relative power, riparian position, and technological potential to exploit the resource (Zeitoun & Warner, 2006). However, it can be argued that the presence of these advantages for riparians has led to assumptions that the so-called non-hegemons are unable to achieve their own positive outcomes. Countries may use interlinkages between water and non-water issues, internal and external expectations of riparian behaviour, and consideration of whether the water-related issue at hand is crucial to each party's survival or whether the party has the luxury to survive the outcome of the resolution (Petersen-Perlman & Fischhendler, forthcoming). Certain dynamics where the non-hegemons have been able to achieve positive outcomes have been prevalent in such transboundary basins as the Mekong, La Plata and Nile. Take for instance Paraguay's refusal to change the frequency of electricity produced by its generators at the Brazilian-Paraguayan Itaipu Dam, despite the hegemon, Brazil, intensively pressuring Paraguay to do so and offering to pay for the conversion (Nickson, 1982). Other examples include: Syria (the non-hegemon) securing water from Turkey (the hegemon) by allowing the Kurdistan Workers' Party (PKK) to base themselves within Syria's borders (MacQuarrie, 2004); Afghanistan (the non-hegemon) unilaterally capturing water resources in the Harirud basin shared with Iran, the hegemon (Thomas & Warner, 2015); Ethiopia (the non-hegemon) building the Grand Ethiopian Renaissance Dam over the downstream objections of Egypt (Oestigaard, 2012); and upstream riparian countries in the Nile pursuing ratification of a Cooperative Framework Agreement, again over the downstream objections of Egypt, the hegemon, and Sudan (Heuler, 2013).

International water law

It is still arguably more difficult for non-hegemons to achieve all desired outcomes. Resolving international disputes through legal means can prove difficult in certain cases due to some jurisdictions having to rely upon poorly defined water law or customary water law, few enforcement mechanisms, and a dispute settlement system (the International Court of Justice) where the disputing parties themselves have to decide on jurisdiction and frames of reference before a case can be heard. This results in very few international water conflicts being decided in the International Court of Justice.

An alternative to resolving international disputes through the courts is to create effective institutional capacity that can adapt to change in order to prevent conflict. Schmeier (2012) documented over 120 river basin organizations worldwide that often are effective in managing for changes in the system and in helping resolve disputes or, better, prevent them from arising. State practice too has evolved over time, with over 500 treaties being negotiated over water resources since World War II (TFDD, 2016)

There has been slow progress on codifying principles on non-navigational watercourses in international law. Opinions have varied regarding how to treat international water. At one end of the spectrum is the 1895 Harmon Doctrine, which has been cited as supporting the unqualified right of the upstream state to utilize and dispose of the waters of an international river flowing through its territory. Other approaches have included the 1966 Helsinki Rules, which established the rule of 'equitable and reasonable utilization' as a customary international river law. Building on the establishment of the Helsinki Rules, the United Nations adopted the Convention on International Watercourses in 1997 (Salman, 2007), which entered into force in 2014. The convention includes a definition of the term 'international watercourse' which is significant for including groundwater connected to surface water systems in addition to surface water, a framework in which international water agreements can be interpreted, and the obligation of not causing significant harm to other states in a party's water use (McCaffrey, 1998).

In addition to the UN convention, nations have engaged in regional-level cooperation over water, the most prominent effort being through the United Nations Economic Commission for Europe (UNECE). Through efforts to develop legal and international frameworks to promote transboundary environmental cooperation, UNECE developed the Convention on the Protection and Use of Transboundary Watercourses and International Lakes, signed in 1992 and entering into force in 1996. The convention included provisions meant to protect transboundary surface water and groundwater by reasonable and equitable use of transboundary waters, ecosystem conservation/restoration, and controlling and reducing pollution (Bosnjakovic, 1998). While the UNECE convention has already influenced transboundary water management in Europe in a number of ways (Wouters & Vinogradov, 2003), its effectiveness has yet to be determined, though the increasing number of nations that have acceded to this convention suggests that the principles espoused in each convention are being adopted in more countries.

Other informal agreements also hold significance in international watercourses, including the Johnston negotiations in the Jordan River basin (Wolf & Newton, 2008) and an unofficial memorandum of understanding (MoU) between subnational entities for the Hueco Bolson aquifer underlying Juárez and El Paso on the Mexico–United States border (Eckstein & Sindico, 2014). The UN convention is also influencing the still-developing Law of Transboundary Aquifers, which is becoming customary law even while being drafted (Eckstein & Sindico, 2014).

Third-party involvement

Treaties and other efforts towards transboundary cooperation can be more resilient to conflicts through the involvement of third parties. Third-party involvement is a concept that can describe diplomatic, economic or virtual engagement on a shared water resource. Third-party involvement indicates a level of influence from an outside party on the decisions and agreements made between riparian countries on shared waters.

Diplomatic third-party involvement

Diplomatic third-party involvement has had different iterations throughout recent history. Historical third-party involvement often came in the guise of colonialism. More recently, third-party involvement has often come in the guise of a neighbouring country's assistance, a Western country's consultation, or an international organization's mediation.

Several treaties and agreements listed in the TFDD include countries that are geographically distant from the shared basin. Many of these treaties are relics of the colonial era, when Europe played a heavy hand in resource engineering decisions in their foreign occupations. The Nile Waters Treaty, drafted before the present-day Nile Basin countries were independent nation-states, is an example of how treaties from the colonial era can be impediments in present-day negotiations due to allocations for Egypt and Sudan.

Third-party involvement comes from entities such as embassies, the United Nations, the US State Department, the North Atlantic Treaty Organization, or a neighbouring neutral country's government. The third party may be publicly recognized or kept secret. The engagement can be invited, offered, or in some cases, forced. In the former two cases, the involvement is appreciated in order to keep the conversation going, to assist with expertise through consultants, or to host talks and meetings or negotiations. Largely, third parties are sought for their ability to witness and bridge dialogue. In the last case, forced involvement may come in the form of sanctions or coercion, but is typically hard to measure directly. Examples of third-party involvement in management of a shared basin are the Lake Ohrid watershed, Indus River basin and Lake Victoria sub-basin. The World Bank served as a bridge between the countries of Albania and Macedonia to develop and sign an MoU in the Lake Ohrid watershed, which had been without any diplomatic contact for decades due to historical political circumstances (Spirkovski, Avramovski, & Kodzoman, 2001). The International Bank for Reconstruction and Development is a co-signatory to the Indus Waters Treaty between India and Pakistan, bringing an element of third-party mediation (Sarfraz, 2013). Similarly, the East African Community, through the Lake Victoria Basin Commission, helped Kenya and Tanzania sign an MoU on water management on the Mara River (Kenya's Ministry of Labour and East African Affairs, 2015). While these MoUs are brief and limited, official dialogue can start from this place in a step-by-step process towards more detailed attention to the complexity of watershed management.

Economic third-party involvement

Third-party involvement in the area of economics is common in developing-country negotiations with interested developed countries or with two countries that share an economic interest. Economic investment or trade agreements allow influence on water management decisions directly, as has been the case in some dam construction, and sometimes indirectly, by negotiations on an unrelated issue, such as compromises on water allocation in exchange for another economic good, such as electricity. This can be controversial or welcomed by basin riparians. A recent example of direct foreign investment in a shared water resource is five Thai banks' investing in Laos's controversial Xayaburi Dam. The availability of investment from the banks is what made this dam project possible, as Laos itself does not have the funds for such projects. The resulting dam, which impacts the entire Lower Mekong basin, will generate electricity, 80% of which will go to Thailand (Veilleux, 2014).

Virtual stakeholders

Virtual stakeholders are those stakeholders who do not live in the shared basin and perhaps do not directly use the shared waters, but nevertheless have great influence on how the shared waters are managed and allocated. The concept of 'virtual water' is one that assigns the embedded water in an economic product to the consumer (Allen, 1998). Similarly, a virtual third party is one that exhibits consumption patterns or high-visibility interests that are linked with the shared water resources.

One type of virtual stakeholder as a third party is that of money lenders and their associated 'experts'. Large international banks, such as the World Bank and other development banks, often weigh in on the feasibility of projects in otherwise underdeveloped areas. The World Bank, in particular, has not provided funding for projects that do not have the full support of all riparian countries in the area, such as Turkey's Ataturk Dam in the Tigris-Euphrates basin (Starr, 1991). When water infrastructure is proposed in high-risk environments to invest, such as developing nations, where most of the world's water infrastructure is currently in development or under construction, typically an associated feasibility study is conducted. Such studies have value for national governments as validation for projects, but include economic projections that are speculative and contain negative social and environmental externalities, and in this way, often do not present the total cost/benefit of given projects. By doing this, money lenders can alter and influence the management of shared water resources, even if they do not offer the loan to do so.

Future directions and techniques for addressing new problems

As demonstrated above, scholars have documented the leading causes of water conflict. The debate over how to mitigate the things which cause and exacerbate water conflict, however, continues. There are still new techniques with which transboundary water resources management can be improved. Below, we offer some suggestions for new directions.

Identifying risk

Scholars have identified and analyzed the major causes of transboundary water conflict. More recently, given the history of conflict in shared watersheds, the focus has shifted towards identifying risks for future hydro-political conflict. The shifts in hydrology due to climate change, new development of water resources from population growth, irrigation, dams and diversions, and the lack of effective institutional capacity to manage these shifts could lead to future conflict. These traditional sources of water conflict may lead to new conflicts, and there may be new forms, perhaps in the form of consequences of desalination as the technology becomes more efficient and affordable. Regardless of the source, predicting where water conflict might occur continues to be a challenge.

Scale and basin management

No two river basins, watersheds, aquifers, lakes, or any bodies of water are alike. Each has its own climate, demographic makeup, hydrology, industry, topography and cultural divisions. Despite this, it is natural to wish to find patterns from which universal

patterns can be extracted. While it is true that patterns can be found to a certain extent, each basin/watershed/aquifer is unique, and any attempt towards management should be adapted to these unique dimensions.

Increasingly, with globalization, virtual water will become more important than ever. Dependence on agricultural and economic goods coming from outside a watershed means that the dependent countries or regions will not be immune to ripple effects from times of drought, scarcity or conflict. This implies that water conflicts may become more frequent between entities from both inside and outside basins.

Managing change

Complicating management, every watershed is dynamic – volumes and conditions constantly change. New uses develop; weather patterns alter runoff and discharge regimes; people migrate into and out of watersheds. Effective transboundary water management must be prepared for, and even embrace, this dynamism. This requirement for flexibility challenges current, static policy regimes (perhaps guaranteed water flows in particular).

Improving cooperative frameworks

As discussed earlier, parties are willing to engage in cooperation when opportunities exceed the risks and benefits exceed the costs. To reach this point is difficult. But if one agrees that cooperation, rather than conflict, is more beneficial for all parties, it must be accomplished. Third parties can play a role in mediating negotiations between contesting parties and alleviating the risks of cooperation.

As river basin organizations become more prevalent as a management structure on the international stage, the concept must be re-examined. With many donors requiring the building of institutional capacity (e.g. through the creation of river basin organizations) as a prerequisite for the distribution of funds to developing countries in transboundary basins (Alaerts, 1999; Mukhtarov & Gerlak, 2013), the question is raised of how effective the mere presence of institutional capacity is in rendering effective governance and preventing conflict, particularly when donor-induced projects and initiatives do not align with stakeholders' concerns. For instance, donors encouraged the Red River Basin Organization in Vietnam to identify and focus on integrated water resources management issues, despite stakeholders' voicing different concerns (Molle & Hoanh, 2011), creating confusion within institutional frameworks.

Improving baseline information and data exchange

To a certain extent, institutional capacity may be only as strong as the basic information available about the watershed in question. Lack of data in some basins on, for instance, historical hydrological patterns or water quality can make management decisions much more difficult. There are certain cases where this is due to a lack of monitoring capacity, but it can also be due to a lack of information sharing between countries or even between agencies in one country. Reliable, basic

information about the watershed in question is crucial for parties to buy into cooperative frameworks. What's more, this backbone of basic information about the watershed in question is crucial in making management plans; the foundational aspects of a watershed – the hydrology, the people, the uses, the biology, the topography, etc. – must be accounted for in any effective plan.

Conclusion

Being part of a transboundary basin makes a user interconnected with the rest of its users. Every downstream user has the potential to be affected by events occurring upstream of them. To a lesser extent, upstream users are also interconnected with their downstream counterparts through downstream demands and actions. This interconnectedness strengthens the case for the need for cooperative frameworks to manage transboundary waters. It is important to note that not all cooperative frameworks are ideal or just for all parties involved, but given a list of alternatives that includes violence, cooperation might be a preferred path.

New challenges in managing transboundary water will surely emerge, particularly with the advent of increased variability due to climate change and the growing globalized economy. To be prepared for this, parties should participate in conflict-resolution mechanisms and invest in institutional capacity with their neighbours. Systemic, holistic water management can provide the opportunity for more users to meet their basic needs and become economically resilient with respect to whatever new variables regarding management they face, thereby increasing water security.

Disclosure statement

No potential conflict of interest was reported by the author.

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