Water Sharing Across Cultures: Gifts, Exchanges, and other Transfers between Households

Introduction

The human right to water has been widely embraced, including by the United Nations General Assembly, civil society and development organizations, and world religious leaders. While access to water is still not a reality for many impoverished, rural and marginalized people around the world (WHO/UNICEF, 2012), most calls for the right to water are predicated upon the notion of formal access that is organized and guaranteed by the state (Bustamante et al., 2012). However, centering the state in discourses around the human right to water potentially ignores the role of household water sharing in ensuring people's survival and dignity in the face of water crises. Water sharing, as a culturally-embedded practice that girds households against water shortages and suffering, arguably recognizes and enacts a human right to water.

Our focus in this paper is on inter-household water sharing—that is, gifts, exchanges and other transfers (Hunt, 2002) of water that occur between households. To date, relatively few studies have examined such water sharing practices. Yet recent quantitative reports indicate that inter-household water sharing occurs at high monthly rates for sites in Uganda (36%, Pearson et al., 2015), Ethiopia (49%, Maes et al., 2018), Malawi (60%, Velzeboer et al., 2017), and Bolivia (66%,Wutich, 2011). These reports suggest that water sharing practices may vary widely, though no systematic work has been undertaken to characterize or compare water sharing practices cross-culturally. Water sharing can likely take many forms, ranging from the so-called "pure gift" with no expectation of—and possibly a strong prohibition on—immediate and direct reciprocation (Malinowski, 1922, p. 99), to balanced exchanges such as even trades and swaps (Sahlins, 1972), to "negative reciprocity" including fraud and theft (Gouldner, 1960, p. 172; Sahlins, 1972, p. 195). Attention to reciprocal obligations enables us to examine, as Mauss (1954[1924], p. 13) encouraged, "the spirit of the thing given," in this case, water. Following Sahlins (1972, p. 191), our interest here is in understanding the full range of forms that water sharing can take.

In understanding sharing practices, it is often valuable to examine both instrumental, self-interested motivations and symbolic, culturally-embedded meanings and practices (Hann, 2006, p. 209). First, water sharing may be characterized as a coping or survival strategy for dealing with water insecurity. For example, ethnographic research conducted with Rwala Bedouin herders in the early 1900s found that, "as a rule, the travelers say they have no water at all" to beggars requesting water. But, "pity is shown by the mounted traveler to one on foot. To such he always gives a drink if the next watering place or camp is more than half a day distant" (Musil, 1978, p. 167). Elsewhere, women in informal settlements in Mumbai, India reportedly beg for water when their households run out (Bapat & Agarwal, 2003); refugees in Lebanese camps report sharing of water for cooking and bathing (Zeina Jamaluddine, personal communication, 2018); and prisoners in the United States collect and share clean bottled water in prisons where piped supplies are contaminated (Abel, 2018; Mobrice, 2017). Each of these examples may be understood as water sharing that is driven, at least in part, by instrumental, need-based motivations.

As a symbolic practice, sharing of waters recognized as sacred, holy, or otherwise imbued with special meaning (Oestigaard, 2017; Orlove & Caton, 2010), can be fundamental for cultural rituals designed to transform or purify. For example, Dogon women were said to announce a first pregnancy by fetching water "drawn for the first time from the pond of their husband's lineage" and silently "hand[ing] the full pot over to the wife" of the oldest male of that lineage (Dieterlen & Granka, 1942). In this example, the familial relationships are transformed and solemnized by the ritual announcement of the pregnancy through water sharing. Ceremonial water sharing can also be conducted to welcome, honor, or recognize a person. For example, a description of Alutiiq hospitality in the 1700s notes that the "first hospitable mark of honour is the giving of cold water all round" (Shelikhov, 1795, p. 38). Taken together, historical accounts of water sharing as need-based and culturally-embedded suggest that, in many contexts, water sharing may be an enduring cultural practice that can hold important instrumental purposes and symbolic values.

In this review, we integrate diverse literatures to explore water sharing as a household practice. We define households as fundamental domestic groups that pool and internally allocate food and water for common consumption (following Netting et al., 1984). We also recognize that households are nested units that contain individuals, are organized in communities, and operate in contexts of broader socio-

economic processes and cultural norms. In the first section, we describe how inter-household water sharing can vary in different livelihood contexts. In the second section, we review the material conditions, socio-economic processes, and cultural norms that shape water sharing across contexts. Finally, in the third section, we highlight key gaps and identify new directions for research on inter-household water sharing. Our goal is to provide an overview and state of knowledge on water sharing, and explore the proposition that water sharing, while often instrumental and need-based, may also symbolically mark the performance of social relations and cultural identities.

Section 1: Water Sharing in Four Livelihood Contexts

To start, we present an overview of water sharing among households in different livelihood contexts—hunter-gatherer, pastoral, agricultural, and urban—with some attention to their historical trajectories. This section gives concrete examples to illustrate the rich range of water sharing practices that exist globally. Further, these snapshots illustrate how cross-cutting factors (addressed in Section 2) shape water sharing practices in each context.

Water sharing in hunter-gatherer livelihood contexts

Human ancestors lived by hunting and gathering until the Holocene 10,000 years ago (Cummings et al., 2014); today, livelihoods based on hunting and gathering are increasingly integrated into mixed economies (e.g., BurnSilver et al., 2016). Hunter-gatherers have inhabited mostly seasonal niches from the Arctic to the southern-most points of the continents of South America, Africa, and Australasia. Historically, availability of water has been important for structuring the seasonal rounds of migration. Water may be fetched from wells, springs, rock pools, tree hollows, streams, lakes, or melted from ice or snow. Fetching may be done by women, men, or children, depending on the distance of the water distance from the settlement.

Water sharing between households in many hunter-gatherer societies follows a norm that, like food, resources that are widely available and can be collected by any non-disabled person will be shared within the household and with guests (Gould, 1969). Close kin provide food and water for those who are old, sick, or suffering from sorrow, while all visitors to a household have access to water as basic hospitality (Wiessner, 1996). When water is readily available, it may be the case that no particular significance is placed on water sharing—in this way water is equated with life and shared like the air.

By contrast, in desert environments such as the Kalahari of southern Africa, for example, when surface water or wells have run dry, households are expected only to provide for immediate kin in need (Silberbauer, 1981). The need for access to water sources in others' territories during times of scarcity has led to the development of some very complex social institutions in the Kalahari (Heinz & Keuthmann, 1994). For example, some Ju/'hoansi Bushman groups formed gift-giving partnerships called *xaro* that were passed down over generations so that *xaro* partners could visit one another and stay in each other's territories utilizing water and food resources until conditions improved at home (Wiessner, 1986). Water sharing relationships, then, may be formed within households, across households within a community or settlement, and across broader territories.

Population growth, reduced mobility, environmental change (e.g., climate change, water diversions), and political change (e.g., fortification of international boundaries, land and water grabbing) may alter the abundance or quality of historic water sources such that many hunter-gatherers no longer have consistent access to clean water sources today. Yet, there is insufficient research to determine how such changes might affect water sharing in hunter-gatherer communities. Understanding the complex institutional arrangements and norms in these contexts presents a fruitful opportunity for future study.

Water sharing in pastoral and agro-pastoral livelihood contexts

For millennia, pastoralists have migrated with their livestock in search of pasture and water (Smith, 2013). Migration has long served as a coping strategy to deal with inherent intermittent resource scarcities common in rangeland ecosystems. But over the last few decades, pastoral livelihoods have transformed for a number of reasons, including increasing pressure to sedentarize, land enclosure, and

privatization. Today, pastoralists and agro-pastoralists typically occupy rural areas, with a high reliance on seasonal or intermittent surface water sources, many of which are privately owned and provide water to both humans and livestock (Pearson et al., 2008).

Pastoral households currently employ a variety of strategies to meet human and livestock water needs. In addition to migration, these strategies include buying and sharing water, and switching water sources (Pearson et al., 2015; Pearson at al., 2016). In southwestern Uganda, for example, pastoralists and their agricultural neighbors share water in reciprocal relationships, using these exchanges as wealth stores for the uncertain future (Pearson et al., 2015). Water sharing is common between pastoralist and agricultural households, and between wealthy and poor households, although members of outside ethnic groups may be partially excluded (Pearson & Muchunguzi, 2001). These findings underscore how access to water resources, particularly in times of insecurity, involves socially-differentiated networks that minimize (and at times intensify) risk across households with diverse assets and livelihoods.

Transformations from pastoral to agro-pastoral livelihoods continue to affect water needs, with implications for water sharing practices (Pearson et al., 2017). Larger proportions of communities are becoming sedentary and consequently more reliant on fixed water sources (e.g., with shifts from herding livestock to farming). As a result, water availability in agro-pastoralist communities in arid and semi-arid landscapes may become increasingly insecure, particularly during annual dry seasons. Such trends may increase households' needs for water sharing, while at the same time limiting their ability to form and maintain reciprocal relationships. Alternatively, establishment of a fixed-space community may lead to increased demands by pastoralists for state-provided water infrastructure.

Water sharing in agricultural livelihood contexts

Agricultural communities have long devised communal solutions to manage scarce water needed for household consumption, as well as irrigation and livestock (Ostrom, 1990; Belay & Bewket, 2013; Pearson et al., 2008). For example, Trawick (2001) documents a contemporary Quechua system of water management in Huaynacotas, Peru, and uses ethnohistoric documents to infer that a similar system likely operated among the Inkas prior to Spanish conquest. Huaynacotas households engage in shortage sharing, such that all households equally take cuts to their water allotments during times of scarcity. As Trawick explains (2001, p. 362), "equity in water sharing" is "the moral foundation of village life" today, and likely in the deep past as well. Such institutions attest to the likely historical importance of water sharing in peasant communities.

In contemporary agricultural communities, household water sharing[1] has been predominantly understood as a coping mechanism for water shortage, particularly with respect to water deemed clean, uncontaminated, and drinkable (Stevenson et al., 2012). In rural Vietnam, for example, water sharing is common among households, especially the poorest households. The percentage of households using shared water for domestic purposes is high, accounting for 40-50% of non-poor households, 70-75% of less-poor households, and 72-80% of poorest households (Pham et al., 2011).

Studies of household water sharing in agricultural communities often emphasize particular social dynamics, such as gender or class, as they relate to reciprocal relationships among kin, neighbors, and friends. For instance, in rural Bangladesh where arsenic contamination poses a considerable health risk, women's relationships to neighbors and kin shape water sharing practices in important ways (Sultana, 2011). In this example, community members pointed to cultural, religious, and moral obligations to share safe water, including the idea that denying water for children is particularly immoral. Sultana (2011, p. 167) finds that water sharing is common—so long as it does not compromise intra-household well-being—and that refusals to share water can create social tensions and conflict.

Ongoing efforts to improve water infrastructure in agricultural communities may also affect water sharing practices. In Ethiopia, for example, Stevenson and colleagues (2016) found that water access interventions led by state-NGO partnerships resulted in significant reductions in the likelihood of taking or borrowing water from a neighbor. Such findings indicate the need for further research examining the extent to which water provision interventions might (temporarily) disrupt water sharing practices and,

consequently, associated cultural norms and social networks, or what the longer term consequences of this might be for water security, or other socio-economic dynamics (whether positive or negative).

Water sharing in urban livelihood contexts

Water sharing in urban contexts is also in evidence, both historically and at present. While the archaeological record contains little evidence about water sharing in urban settlements, the historical record indicates that water sharing may have been common. Accounts of early urban settlements are rife with examples of inadequate and unsanitary water supplies (e.g., Engels, 1845). For example, in colonial Gibraltar in the 1800s, where water scarcity was common in rain-dependent urban patio housing, women's social ties were crucial to pooling water and managing shortages (Sawchuk et al., 2002). While we can only infer anecdotally the extent of water sharing practices, such work suggests that they may have been extensive. These water sharing arrangements may have been eventually over-ridden—if not extinguished entirely—in urban contexts with well-functioning, centrally-controlled water systems (Staddon, 2010).

Today, a significant proportion of the global urban population concentrated in Africa, Asia and Latin America live in (often informal) settlements that are underserved or not served by municipal water services. In such settings, formal water provision may be poor, intermittent, unreliable, costly, or non-functional, leading to water access and quality that is often inadequate (cf. Smiley, 2016). These systems are often characterized by persistent inconvenience and distrust of water providers (Birkenholtz, 2010; Burt & Ray, 2014; Jepson & Brown, 2014; Peloso & Morinville, 2014, Rosinger et al., 2018). Households rely on a wide array of informal and/or provisional sources, including pushcart water vendors, private water resale by neighbors, communal stand pipes, community informal networks, sachet and bottled water, as well as unimproved sources such as shallow wells and runoff channels. Moreover, various actors, utilities, state agencies, and users in the water sector *actively produce* these hybrid water provisioning systems, challenging the notion that unregulated water service is a mere absence of development or will be subsumed into formal systems (Cheng, 2014; Hardy & Poupeau, 2014; Kooy, 2014).

What little evidence we have indicates that water sharing is likely widespread in contemporary urban settlements with inadequate water services. In a 2001 study of urban India, 54 per cent of the 33.4 million households who had access to tap water (about 18 million households) engaged in some sharing (Bajpai & Bhandari, 2001). Similarly, in Manila, an econometric study estimated that 25% of urban water access was attributable to water sharing (Violette, 2017). Water sharing was similarly widespread in studies of Khartoum, Sudan (Zug & Graefe, 2014; Zug, 2014), Dar es Salaam, Tanzania (Nganyanyuka et al., 2014), Cochabamba, Bolivia (Wutich, 2011), and Tijuana, Mexico (Meehan, 2010).

Social relations, in turn, underpin how water is gifted, exchanged, or otherwise transferred in urban settings (Meehan, 2010; Zug & Graefe, 2014). These relations may be based on religious, family, business or even professional ties (Schwartz et al., 2015). For example, in Phoenix, US, workers for two religious NGOs distribute free water bottles to persons experiencing homelessness during the Arizona desert's hot summer months (DeMyers, Warpinski, & Wutich, 2017). Water kiosk attendants in informal settlements of Lilongwe, Malawi routinely offer free water (even if illegally) to their family members or people with whom they share close ties. Chiefs and other traditional leaders at times use their elite status to negotiate free water for their families as a condition for donating land for communal water kiosk installation (Adams, Juran & Ajibade 2018).

In sum, the scant literature indicates that people may share water in urban informal settlements to cope with deficient and/or intermittent supply, to navigate the high cost of water, to satisfy religious principles, and to maximize personal and political benefits. The growing pressure on water access in informal settlements and *persistence* of hybrid water provisioning systems suggests that people's reliance on water sharing may increase in the future.

Section 2: Cross-cutting factors that shape water sharing

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Following our brief descriptions of water sharing in different livelihood contexts, we now turn to examine the material conditions, socio-economic processes, and cultural norms that may shape water sharing practices. We emphasize the cross-cutting nature of these factors, as they are often inter-related and interdependent. That said, we explore how each factor drives the emergence of water sharing; whether sharing is considered a gift, exchange, or other transfer; and household motivations for sharing water, or not.

A. Material, need-based, and self-interested motivations

Costs and benefits of sharing

To determine why someone would share water (or any other good), evolutionary scholars, economists, and other social scientists have offered a variety of theories (Cronk & Leech, 2012; Olson, 1965). In many cases, the well-being of people providing the resource is presumed to be dependent in one way or another on the well-being of the people who need the resource (i.e., "fitness interdependence models," (Roberts, 2005)). Among these theories, some have emphasized reproductive fitness for kin networks given shared genes (Hamilton, 1964), or a sense of reciprocity whereby givers would benefit should they be the ones in need in the future (Axelrod, 2006; Trivers, 1971).

Another possibility is that the givers and recipients have a risk-pooling relationship. Here, those who have abundant resources share with those in need because the future of one's own resource acquisitions and holdings is unpredictable (Sahlins, 1972; Cronk et al., in press). For water sharing, such an arrangement would make sense if there were unpredictability as to which party would be successful in obtaining water (or have the resources to buy water) and which would not. This would be the case, for example, in the *xaro* exchange relationships that facilitated water sharing among Ju/'hoansi groups (Wiessner, 2002).

Beyond theories of interdependence, theories of reputation building (e.g., indirect reciprocity (Alexander, 1987) and costly signaling theory (Bliege Bird & Smith, 2005) may help explain individual decisions to engage in water sharing. For example, sharing water may serve as a sign of both people's ability to acquire resources and their generosity. If so, this may help explain why demonstrations of generosity and charity linked to religion seem to be common among reasons and justifications for engaging in water sharing (Adams, 2017; Jewell & Wutich, 2011; Smiley, 2016; Sultana, 2011).

While these literatures provide some strong predictions about how motivations might shape water sharing behaviors, there is ultimately little research that specifically theorizes how and why individuals engage in inter-household water sharing. However, there is research that provides some insight into the broader cultural and community beliefs and norms that shape water sharing behaviors.

Water availability, storage, infrastructure and technologies

Water infrastructure and technologies likely shape water sharing in varied but poorly documented ways. Water sharing is often portrayed as a coping strategy for dealing with water insecurity due to seasonal scarcity or infrastructure failures (e.g., Bapat & Agarwal, 2003; Pearson et al., 2016; Wutich, 2011). Beyond infrastructure failures, other water technologies may play an important role in water sharing. In informal settlements of Lilongwe, Malawi, when communal taps stop, poor households pick up their empty buckets, go to more affluent communities with piped water, knock on doors, and ask for free water (Adams, 2017). In this case, the availability of buckets—and the weight of water to be carried—plays an important role in determining the feasibility of water sharing.

Water storage may be another key determinant of community-wide water sharing patterns (Huong et al., 2011). Water can be collected or purchased, and stored in bottles, barrels, or concrete basins. On the Samoan island of Savai'i, large water tanks (>1000 liters) built in a community setting fostered water sharing practices among kin and neighbors. This this case, those without tanks borrowed from those with tanks (Vickers, 2015). In Cochabamba, Bolivia, households with large storage tanks were frequently called upon to share water with neighbors who had only 200 liter storage barrels and frequently ran out of water (Wutich, 2011). Presumably, water sharing is facilitated in these contexts by water storage

infrastructure making some households' water endowment visible – and thus potentially available – to others. Yet, it remains to be seen if similar patterns exist in communities where water storage technologies correspond differently to wealth and socio-economic status.

Beyond water containers and transport, new individualizing water quality and delivery technologies, such as point-of-use water filtration systems, water kiosks, bottled water, and sachet water may reshape or influence such patterns of water sharing, either by encouraging or stymieing it (Vandewalle & Jepson 2015; Stoler, 2017). We do not yet know at what point these technologies and sharing practices stop "merely" addressing acute shortages and become normalized as part of a larger water provisioning system. For example, there are reports of bottled water sharing in the wake of disasters, as in the aftermath of Hurricane Maria in Puerto Rico (Carlos Garcia-Quijano, personal communication, 2018) or the Flint water crisis (e.g., McCarthy, 2018). As yet, few empirical studies exist to assess the scope of how these socio-technologies remain as emergency fixes or become part of lasting socio-hydrological systems. Nor do we know to what degree they impact water sharing in the long term, particularly if they are part of a trend away from municipal services and toward dependence on bottled water.

Beyond this, socio-technological transformations of water, which assign different meanings and values to different waters, might shape water sharing. For example, future work could examine how water assigned higher social and economic values (e.g., bottled, desalinated, sacred) are shared differently than waters assigned lower social and economic values (e.g., contaminated, potable reuse, greywater) in specific contexts. Such research could add important new dimensions to our understanding of water sharing as embedded in complex hydro-social processes.

B. Socio-economic processes

Social and political power

Power in social and political relations determines access to and control over water, especially for economically, socially, and/or politically marginalized groups such as racial/ethnic minorities, informal settlers, itinerant populations, and indigenous peoples (e.g. Swyngedouw, 2013). Research focusing on the power relations that shape control over and access to water (e.g. Swyngedouw, 2004) has reframed deficient access among marginalized groups as unequal access between privileged and underprivileged social groups (Watkins et al., 2006). This work emphasizes the origins of water deficiencies as often being political (e.g., low political priority, illegal land tenure), rather than predominantly tied to physical water scarcity, budgetary constraints, or population pressure.

Research examining power and marginalization can help us understand water sharing in several ways. Firstly, inter-household water sharing can be—and often is—approached as a coping strategy in the face of exclusion, but without losing sight of inequality as the underlying driver. Secondly, water sharing can be conceptualized as a hydro-social relation that determines how water is accessed by different people, and how that affects people's lives, relations with each other, and identities. As such, sharing is necessarily related to who decides to share, how, and under what conditions. These decisions could, in turn, be influenced by factors including social status, class/caste, or ethnicity, and could also be motivated by political and economic interests (Linton & Budds, 2014; Sultana, 2011). Thirdly, beyond the sharing of water itself, there are many instances of shared practices through which water is secured: the work, organization, and burden of water provision may also be differentiated according to social and political power and inequity (e.g. Allen, Dávila, & Hofmann, 2006).

A final consideration is that although "sharing" is commonly taken to be benevolent and helpful for households experiencing water shortages, water sharing can constitute—and thus (re)produce—unequal power relationships. While social exclusion may motivate households to share water in some contexts, it is also clear that certain social groups may also be excluded from water sharing (e.g., Pearson et al., 2015). It is thus important to examine when, why, and with whom water is *not* shared, as water sharing may not necessarily promote household water security or alleviate the specific water-related precarities certain populations face. It is also important to note that water sharing practices may not be

altruistic, as often inferred, but rather envisage future return favors, such as prestige, paybacks, or privilege (e.g., ambition to be a community leader). This point relates to a wider insight into the relationship between water and power, which is that power relations do not simply exist around water, but can also be pursued through water (Linton & Budds, 2014).

Water entitlements

Entitlement theory can be especially useful for unraveling the legal and economic processes through which power and inequality affects water sharing practices. Entitlements describe the bundle of formal and informal rights and capacities that allows people to access a resource (Sen, 1981). Water entitlements can be understood as use or access rights conferred to individuals, households, and/or collectivities, and may or may not be enforced by the state or formal governance mechanisms (Anand, 2010; Dapaah & Harris, 2017; Gimelli at al., 2018; Mehta, 2014; Orlove, Roncoli, & Dowd-Uribe, 2015; Wutich & Brewis, 2014). Formal sets of rules or laws complement informal rules of use determined by social networks, kinship, and local leadership systems or organizations to access and distribute water (e.g., Chalaune, 2010).

Water sharing can be part of entitlement systems, particularly when a moral economy of water underpins a common sense of individual and community obligation to provide water to the needy—and frames sanctions against those who do not (Wutich, 2011; Zug, 2014). Research has examined complex, integrated entitlement systems of which water sharing forms one part. In Namibia, for example, collective water management is governed by multiplex relationships that facilitate water sharing as well as sharing of food, work, and ancestries (Schnegg & Linke, 2015). In Darjeeling, India, households work in social collectives called *samaj*, which include people of various religious, caste, and ethnic backgrounds, to obtain, allocate, and share water collaboratively (Drew & Rai, 2018; Drew & Rai, 2016). Such work has great value in exploring how collective water institutions underlie and interlock with water sharing.

Water sharing can also be understood as a coping mechanism for "entitlement failure," or the inability to acquire water through other entitlements (Dapaah & Harris, 2017). Since water entitlements are often tied to land ownership, they are usually limited for the poor or marginalized, dispossessed, or landless households (Sangameswaran, 2009). In Jakarta, Indonesia, for example, those without a piped water connection buy bulk water from neighbors, an informal practice called *nyelang* (Kooy, Walter, & Prabaharyaka, 2016). This example of water sharing, which involves some expectation of payback, demonstrates the potentially complex role of exchange relations in water entitlement regimes.

As this example suggests, theories that explain the expectations of reciprocation in water sharing across cultures are poorly developed. We do not know the extent to which water sharing carries systematic expectations of token or symbolic cash payments. Situations in which water is regularly exchanged for labor (e.g., in the context of familial caregiving relationships) have been documented ethnographically, but it is unknown how extensive they may be. An important question for future work, therefore, is how water commodification alters specific entitlements, practices, and social relations of water sharing.

Ethnicity & Gender

Ethnicity and other markers of social difference and location are likely related to water sharing practices and associated networks. For instance, work by Dapaah and Harris (2017) based in two communities of Accra, Ghana has shown that kinship and ethnicity shaped inter-household water sharing during times of shortage. As expected, water sharing was more common in Ga Mashie, a relatively homogenous indigenous community: 54% of respondents reported that households shared water in the compound, 42% reported that one can borrow water from neighbors, and 46% reported that they can rely on other households. However, in Madina, a diverse peri-urban community comprised of new migrants to the city, reported water sharing was less common , ranging from 28% to 43% of households. The fact that water sharing occurred among such a large proportion of households—and in a context characterized by significant linguistic, ethnic, and religious diversity, and where extended kin networks are rare—is

especially significant. Given the complexity of ethnicity, ethno-linguistic identity, race, caste, class, and social status, there is an enormous need for research examining how these factors shape water sharing.

Like ethnicity, gender is crucial to water use, access, and management. Women and men often have different knowledges or uses of water, and play different roles in procuring water or with respect to formal and informal water governance institutions (Harris et al., 2017). Although it varies by context, women often play an important role in accessing water for domestic uses, and may travel long distances to fetch water and queue for long periods to procure water (Singh et al., 2006; Sorenson et al., 2011; Krumdieck et al., 2016). In different cultural contexts, women are sometimes seen as 'water keepers' who have specific roles and responsibilities to provide water, to maintain quality, or to engage in spiritual practices involving water (Anderson et al., 2013, for example of Indigenous communities in Canada).

Sultana's work in Bangladesh (2011) and Wutich's in Bolivia (2009) have shown that women often are involved in navigating relationships with neighbors in hopes of borrowing water. This leads to considerable stress and complex emotional and power entanglements. The broader literature also indicates that women play a key role in maintaining community networks and social capital—often investing in children and community, building trust, and investing in relationships to improve familial and community well-being (Agarwal, 2000; Molyneux, 2002). In this sense, it is possible that women or other community members, in particular, may be the ones to engage in sharing practices as part of social cohesion and networking (or as part of gender-specific water fetching or water-keeping practices). That said, care must also be taken not to romanticize or normalize such gender-specific roles, as these practices are often direct results of exclusions from formal networks or linked to other gendered labor expectations, rather than senses of altruism or women's essential attributes (Molyneux, 2002). Furthermore, there is some evidence that even long-standing gender roles around water procurement may be in considerable flux, with men taking on more of the tasks commonly characterized as women's work in some contexts (Geere & Cortobius, 2017).

When considering gender and ethnicity as factors that shape water sharing, it is critical to maintain focus on a range of linked intersectional inequalities and statuses that may also be important. Future research should aim to disaggregate data on water sharing by gender and ethnicity in order to substantiate and parameterize these types of insights.

Sovereignty: territories, reserves, and reservations

Territorial sovereignty—especially among colonial/settler and Indigenous peoples—is another understudied factor that has a likely impact on water sharing practices. Globally, Indigenous peoples have faced exclusion and dispossession of traditional territories, and other limitations on their cultural practices. Land and water in delimited territories designated as areas under Indigenous governance (e.g. the reserve system in the U.S. and Canada) might be under the control of Indigenous peoples, but fragmentation of these spaces has also often separated communities from their livelihoods, or larger territories (including hunting and fishing grounds) (Wilkins & Stark, 2017).

Colonial/settler governance practices and the reservation/reserve system led to drastic changes in lifeways, governance, familial relationships, housing organization, subsistence systems, and customary laws (e.g., Navajo Nation Department of Water Resources, 2011). For example, in North America, 566 American Indian nations and Alaska Native villages (AIAN) have had to fight for their legal rights to water and access to safe drinking water, and continue to do so today. Indeed, a much larger proportion of AIAN homes lack adequate sanitation and water delivery compared to the general population (Eichelberger, 2014; Indian Health Service, 2016; Teodoro, Haider, & Switzer, 2018). A similar situation exists for First Nations, Inuit and Metis populations in Canada, leading many to refer to a 'two tiered' water governance system that features disproportionately high numbers of water boiling advisories among First Nation communities. For many AIAN nations, water is sacred and part of the symbiotic relationship between land and people (Norman, 2017), and the dispossession and exclusion from traditional waters has been devastating.

This situation also has had considerable impacts for reciprocity and ceremonial practices that affect water use and governance, including water sharing. For example, the White Mountain Apache

historically lived a nomadic lifestyle made up of extended family groups who worked cooperatively to hunt and gather food, haul water, and build residences. After the reservation system was introduced, extended families were dispersed and communities were largely comprised of strangers, dismantling the formally built-in cooperative living system and related water sharing arrangements (Goodwin, 1969). In New Zealand, Māori have successfully built new and legal institutions, engaged with local and central government, to manage and protect natural resources (Waa, Pearson, & Ryks, 2017; Kooyela, 2007). Such developments align with a Māori worldview that "water should be shared amongst all life forms and…through that sharing, all life is interconnected" (Jackson, 2018, p. 121).

Relations among colonial/settler and Indigenous people vary widely across and within countries. Nevertheless, the general pattern of disruption of long-held water sharing practices linked to colonial/settler governance and losses of land and water rights is a reality that is broadly shared globally. More research is needed to understand water sharing norms and practices in the many contexts of Indigenous communities.

C. Cultural norms, beliefs, and knowledges

Moral economies of water

Culturally-shared understandings of morality underpin some justifications for altruistic, generous, or pro-social behaviors such as water sharing. The idea that "water is life" is a basic ethical commitment articulated in a variety of cultures, including Quechua and Aymara peoples in Bolivia (Perreault, 2006), Shona people in Zimbabwe (Chemhuru & Masaka, 2009), and Anishnaabe people in Canada (McGregor, 2009). Moral commitments to the principle that "water is life" might produce a moral economy, or shared moral views about the just allocation of resources (Scott, 2000, p. 167; Trawick, 2001). Moral economies produce norms that govern how resources should be exchanged and may be understood to uphold a human right to water. Recent studies have explored how the moral economy concept animates water-related altruism and exchanges in Egypt (ElDidi & Corbera, 2017), Italy (Fantini, 2014), and the United States (Arnold, 2017). Research on inter-household water sharing in Bolivia has also indicated that a moral economy of water underlies reciprocal obligations to share water and moral commitments to survival and subsistence (Wutich, 2011, p. 20). Yet, research on moral economies of water is still quite nascent (cf. Arnold, 2008; Tilt, 2014), and there is a need for much more inquiry into their origins, meanings, norms, functions, evolution, and persistence in diverse contexts.

Water ontologies

Recent work suggests the importance of political ontologies—or ways of understanding, narrating, and being—for research on contested environmental resources (Blaser, 2013a; Blaser, 2013b). In the case of water, Yates, Harris, and Wilson (2017) have enjoined us to consider the implications of multiple ontologies of water, a set of engagements that could also have implications for water sharing. Water as "lifeblood" is a worldview that might link with spiritual or moral understandings, particularly among Indigenous populations. Some communities view water itself as a relation to which humans have mutual and reciprocal responsibilities as with other relatives, human and non-human (Wilson, 2018). This is a significant extension on the very idea of "water sharing" as we have defined it to this point, suggesting the potential for very important contributions from the ontologies and epistemologies of Indigenous communities, as well as the broader set of questions informed by work on these concerns. In Māori conceptualizations of well-being, for example, a fundamental domain is *whanaungatanga*, which highlights the importance of social support where shared experiences of community members develop a sense of collective belonging, obligations, and reciprocal caring (Waa, Pearson, & Ryks, 2017). This domain intersects *kaitiakitanga*, which acknowledges responsibility as guardians of natural resources. Such ontologies might offer radically different types of insight in terms of 'water sharing' to include 'sharing with water' and other living beings (including trees or animals) that might also depend on the same water sources (ibid, see also Yates, Harris, & Wilson, 2017). Explorations of spiritual worldviews

of water (e.g., Shaw & Francis, 2008) and moral dimensions of water sharing will likely be fruitful opportunities for future research.

Religion and religious beliefs

In many religions, water is important for purification, prayer, and other rituals (Oestigaard, 2017). Some religious texts and practices also emphasize an ethic of care that underlies practices of water sharing (Staddon, 2010). For instance, rituals around baptism and holy water in Christianity or ritual bathing for Islam and Judaism might involve water sharing. Across Orthodox Christianity, Islam, and many other religions, water is also viewed as an essential element of healing (Doumato, 2000; Porterfield, 2005; Ross, 2007). Some religious perspectives, such as Islam, view all aspects of nature as created or even owned by God, and that humans are only stewards of what belongs to Him (Abdul-Matin, 2010; Abedi-Sarvestani & Shahvali, 2008). These religious perspectives enjoin humans to be good stewards of the water that God, the true owner, has gifted and demands its sharing as a moral principle.

The Qur'an is quite strict not just about the proper keeping of wells, but also about the obligation of well-owners to provide any surplus water to those less well off. In a well-known *hadith* (referring to the ways that Mohammed himself lived), Mohammed is said to have warned of the consequences of withholding water from those who need it, as access to water for everyone (including for prayer) is seen as essential: "there are three persons whom Allah will not look at on the Day or Resurrection, nor will he purify them and theirs shall be a severe punishment. One of them is a man who possessed superfluous water on a way and he withheld it from travelers." (Abdul-Matin, 2010, p. 120). In Dar es Salaam, Smiley (2013) documents that residents occasionally receive free water from mosques, which they may drink or use to meet religious obligations. Similarly, in Accra, Ghana, some households leave buckets of water in front of their houses to offer water at no cost for Muslim strangers who might need water for ablution before prayers (Adams, 2018).

In Christianity, the significance of water is also widely documented in religious texts. Several passages in both the Old and New Testaments allude to the use of water for purification and depict water as a spiritual material and a symbol of God's nature. The ethics of water sharing among Christians are thus motivated by the many scriptures that admonish charitable sharing of water, such as Matthew 25: 35: "For I was hungry and you gave me meat: I was thirsty, and you gave me drink: I was a stranger, and you took me in." As evangelical Christians in Bolivia explained, regarding water sharing as a religious practice, "We always give to our Christian brothers…our neighbors come asking for water and we always try to help them" (Jewell & Wutich, 2011, p. 318). As this quote implies, water sharing was preferentially conducted with co-religionists (as well as kin), though many acknowledged a general moral obligation to help the needy.

As these findings show, research on religious beliefs around water and charity suggests the need for much more inquiry into the relationship between religion and water sharing. While our review here focused largely on Islam and Christianity, large and important literatures also address water in the context of Hinduism, Buddhism, and many other religious belief systems (e.g., Lansing, 2009; Alley, 2002; Alley, 2011; Shaw & Francis, 2008), all of which would be productive for further examination of water sharing practices.

Section 3: New Directions and Opportunities in Water Sharing Research

In this final section, we identify key gaps and discuss new directions that we believe have particular potential to advance research on water sharing. Arising from our review, we propose five domains that may serve as a starting point for defining a new research agenda for water sharing: (1) the conceptualization of "water sharing," (2) water sharing as a form of exploitation, (3) biocultural dimensions of water sharing, (4) values and meanings of water shared, and (5) water sharing as a way to build alternative economies, or as a form of resistance.

Conceptualization

Given the dearth of economic studies of water sharing, our discussion has largely treated "sharing" as a monolithic socio-economic practice. However, literature suggests that there are many ways to share water, including gifts, exchanges, and other transfers. For example, a study of Bolivian water sharing documented ten different Spanish terms used to describe need-based water sharing alone—ranging from *regalar* (to gift) to *compartir* (to share) to *intercambiar* (to swap) (Wutich, 2011, p. 10). For each term, the social and emotional contexts, and the expectations of reciprocation of shared water, varied in potentially significant ways. Similar linguistic and conceptual complexity likely exists in many cultural settings where water sharing is common.

More theoretical work with reciprocity concepts could help us enrich our understanding of the myriad forms and practices of water sharing (Schnegg, 2015), including how social networks and multiplex relationships contribute to water sharing institutions (Schnegg & Bollig, 2016; Schnegg, 2016). For example, the literature on food sharing has developed concepts—such as "tolerated theft" (Blurton Jones, 1987) and "demand sharing" (Peterson, 1993)—that may be useful for advancing the conceptualization of water sharing; albeit with attention needed to the material and cultural differences between different resources that may shape particular social relations.

Exploitation and status accumulation

Although "sharing" commonly invokes notions of generosity and benignity, it is important to bear in mind that, by definition, sharing constitutes a relation—often unequal—between givers and receivers. Mauss (1954[1924]), in some of the earliest scholarship on reciprocity, was at pains to demonstrate the ways in which gift-giving can be used to accumulate honor and prestige (e.g., in the potlatch). Being attentive to the social power relations embedded in water sharing implies that water giving may not necessarily be altruistic, but rather envisages opportunities for personal benefit or exploitation of others. In most classic examples of gift economies, these opportunities are based on access to status and/or positions of leadership within social groups or communities. They also may include future return favors, such as payment in cash or in kind (e.g. Sultana, 2011), future water paybacks, or other privileges. As noted earlier, a focus on the relationship between water and power requires that we remain vigilant to the ways that water sharing can potentially (re)produce unequal power relationships (Linton & Budds, 2014). Future research on water sharing should consider the eventuality that water sharing is not just a practical intervention to give or receive access to water, but potentially also a means through which to enact subjugation or to gain privilege.

Biocultural approaches

Research on biocultural and psychosocial pathways could illuminate ways in which water sharing can produce health disparities. Exploitative or stigmatizing water sharing experiences may produce negative mental and emotional health. For example, people who engaged in water sharing in Bolivia were far more likely to experience emotional distress than those who did not (Wutich & Ragsdale, 2008). Similarly, Sultana (2011) found that water sharing in the context of arsenic contamination of groundwater in Bangladesh can be difficult and emotionally-fraught due to the intersection of political, resource, and gender constructions. Research on the stressful, shameful, and stigmatized dimensions of water sharing could add significantly to our understanding of embodied harms and mental health disparities.

A biocultural lens can draw our attention to ways that water sharing might alleviate water-related illnesses, including dehydration and water-borne diseases. In addition, a biocultural approach also invites inquiry into forms of "virtual water sharing," such as sharing of water-rich foods used for hydration [e.g., giving coconuts in Micronesian societies in Spiro (1949); melons among the !Kung in Silberbauer (1981); chicha among the Tsimane' in Zycherman (2015)]. It is also possible that, in contexts where water scarcity negatively impacts hygiene and health, sharing of clean cooking utensils, clothes, or other goods that require water to clean might be considered another health-giving form of virtual water sharing.

Cultural meanings and socio-economic values

Our review has focused primarily on water sharing, and, in most cases, the literature we reviewed paid little attention to the *kinds* of water that are shared, aside from the general notion that it entails water that is safe for drinking (e.g., Sultana, 2011). However, the literature indicates that the cultural *meanings* and socio-economic *values* assigned to different forms of water should be important for understanding water sharing, as well as other forms of water sharing. For example, some forms of water sharing may require sacred or holy waters, or water imbued with other spiritual or ceremonial meanings (e.g., Alley, 2002). Other uses—particularly those intended for human consumption—may require water that is considered to be pure or safe, or from a particular source, and in many contexts this perception would exclude municipal piped water (regardless of its real quality, particularly biological quality). There is substantial literature documenting how perceptions of purity and value have become aligned with imported and packaged water (e.g., Wilk, 2006; Hawkins, Potter, & Race, 2015; Stoler, 2017), and we would expect that such notions shape water sharing in important ways. That said, we did not identify any specific accounts of households sharing water that may be considered to be of inferior quality, such as desalinated water or reused wastewater, but such water is probably already shared, whether known or unbeknown to givers and receivers (Rice, Wutich, & Westerhoff, 2013; Fragkou & McEvoy, 2016) and is likely to be shared even more in the future. These topics offer interesting avenues for future research into hydro-social relations, particularly as they relate to power and identity.

Alternative economies & resistance

Alternative economies, in which people intentionally initiate, construct, or revive sharing economies, provide a final, intriguing context for understanding water sharing. In England, for example, activists have mobilized to support the creation of public water fountains as part of a movement to claim a "right to the city" (e.g., Bond, 2012). In another example, Kankanaey people in the Philippines reportedly repurposed a long-standing water sharing ritual to promote need-based water sharing (Lutz, 2005). In these examples, water sharing is prompted as an alternative pathway to ensuring a human right to water.

Water sharing may also be embraced with the goal of contesting and/or confronting the perceived drawbacks of specific water governance interventions, in particular water privatization or dispossession. Water sharing may also be seen as a way to move toward more diverse economies and resource systems (following Roelvink and Gibson-Graham, 2009). For instance, in Detroit, US, community activists engaged in a campaign of illegally reopening water valves that had been disconnected through non-payment (Salina and Starr, 2008), while a similar campaign advocated the breakage of water meters in South Africa (Budds and Loftus, 2014). While these examples are more oriented towards reinstating individual access, rather than promoting water sharing *per se*, they do point to contestation of the social relations of control over water to promote its public good nature, which may include, and/or foster, water sharing.

Some examples suggest that purposeful acts of water sharing also constitute acts of resistance against prevailing social relations of exclusion. For instance, in the Arizona desert along the Mexican border, activists have set up humanitarian drinking water points for incoming undocumented migrants; some reports also suggest that such points are deliberately destroyed by counter-activists or governmental authorities patrolling these areas in order to deter such migrants (La Coalición de Derechos Humanos & No More Deaths, 2018). Such processes of water sharing as a means to democratization or resistance warrant further research.

In sum, our review has brought together diverse literatures to explore water sharing. Much of this research is fragmented and would benefit from broader interdisciplinary inquiry. Scholars in geography, environmental studies, sustainability, and resilience might examine water sharing as an adaptive response to climate change, droughts and other natural hazards. Historians, institutional economists, and governance scholars may explore the evolution of water sharing rules and norms. Water sharing may help maintain culturally-valued (or historically-exploitative) customs; gender, ethnic, and area studies scholars have much to contribute to such research. Water sharing may also pose significant and poorly-understood risks, such as ingesting contaminated water, injuries from carrying water, or psychosocial impacts of

stigmatization. These could be promising avenues of research for a range of health scholars in fields such as medicine, physiotherapy, biology, cross-cultural psychiatry, social psychology, and global health. Future research should be attendant to the complex harms and benefits potentially involved in water sharing.

Conclusion

Water sharing offers insight into the everyday and, at times, invisible ties that bind people and households with water and to one another. Rather than simply a fleeting charitable impulse, we have described how water sharing emerges from certain livelihood contexts, cost/benefit calculations, and water insecurities. Moreover, we have illustrated that the act of giving water traverses complex social and political relations that can be understood in terms of gender and ethnicity, and examined in terms of social and political power. Water sharing emerges from multiple ontologies of water, social and cultural obligations, and complex moral economies. Religiosity, too, can shape water sharing practices that have evolved and endure temporally and geographically. The sharing of water, whilst often instrumental, also marks the performance of social relations and cultural identities. In these ways, focused inquiry into water sharing can enrich our understanding of how household and community water management is shaped by—and act in response to and against—broader political ecologies of water.

Footnotes

1. Water sharing for the purposes of irrigation and livestock use is beyond the scope of this paper; our focus is solely on household water sharing.

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Water sharing offers insight into the everyday and, at times, invisible ties that bind people and households with water and to one another. Water sharing can take many forms, including so-called "pure gifts," balanced exchanges, and negative reciprocity. In this paper, we examine water sharing between households as a culturally-embedded practice that may be both need-based *and* symbolically meaningful. Drawing on a wide-ranging review of diverse literatures, we describe how households practice water sharing cross-culturally in the context of four livelihood strategies (hunter-gatherer, pastoralist, agricultural, and urban). We then explore how cross-cutting material conditions (risks and costs/benefits, infrastructure and technologies), socio-economic processes (social and political power, water entitlements, ethnicity and gender, territorial sovereignty), and cultural norms (moral economies of water, water ontologies, and religious beliefs) shape water sharing practices. Finally, we identify five new directions for future research on water sharing: conceptualization of water sharing; exploitation and status accumulation through water sharing, biocultural approaches to the health risks and benefits of water sharing, cultural meanings and socio-economic values of waters shared; and water sharing as a way to enact resistance and build alternative economies.