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PERSPECTIVE

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Water-IQ matters as water conflicts mount

Kevin Bishop[1] | **Irena F. Creed**[2] | **Kathryn Bryk Friedman**[3]

[1]Department of Aquatic Sciences and Assessment, Swedish University of Agricultural Sciences, Uppsala, Sweden

[2]Department of Physical and Environmental Sciences, University of Toronto, Toronto, Ontario, Canada

[3]Global Fellow, Woodrow Wilson International Center for Scholars, Washington, DC, USA

Correspondence
Kevin Bishop, Department of Aquatic Sciences and Assessment, Swedish University of Agricultural Sciences, Uppsala, SE-75007, Sweden.
Email: kevin.bishop@slu.se

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Abstract

Water crises fuel conflicts that confound efforts to solve the underlying water crises. Water diplomacy is more effective at defusing such conflicts when the parties involved share at least a common understanding of the water involved. We argue that basic, but still up to date knowledge of where water is and how it moves is so important for finding common ground in water conflicts that this knowledge deserves a name of its own—the Water Intelligence Quotient or Water-IQ. Science has advanced, and what people learn about the water cycle needs to reflect that. Two keystones of Water-IQ are awareness of how profoundly people have influenced the water cycle and the atmospheric teleconnections that move water between geographic regions. Given the importance of evidence-based knowledge of the water cycle when trying to overcome water conflicts and seek a basis for water cooperation, Water-IQ knowledge needs to be spread widely.

This article is categorized under:

Human Water > Water Governance

Water and Life > Conservation, Management, and Awareness

Human Water > Water as Imagined and Represented

KEYWORDS

climate change, teleconnections, water conflict, water diplomacy

1 | INTRODUCTION

On 22–24 March 2023, governments, non-governmental organizations, civil society organizations, philanthropic organizations, financial institutions, industries, academic institutions, and the scientific community from around the world gathered for the first United Nations Water Conference in a generation. The conference was framed by a bold directive—to achieve water security within the limits defined by the water cycle (Guterres, 2023). The rapidly mounting number of water conflicts across the world (Figure 1) lends urgency to this goal.

Water diplomacy has emerged as a diplomatic specialization to defuse water conflicts (Klimes et al., 2019). Incomplete or inaccurate knowledge of the water cycle, however, makes diplomatic progress harder and water conflicts more volatile (Institute for Economics & Peace, 2020). Examples of these knowledge gaps are the amount of water in question, or how management actions will change who gets access to that water. A key element for success in reducing such conflicts and opening the way to cooperative water action that improves water security is easily overlooked—evidence-based knowledge of the water cycle that is shared by the parties to a conflict. Achieving the goal of increased

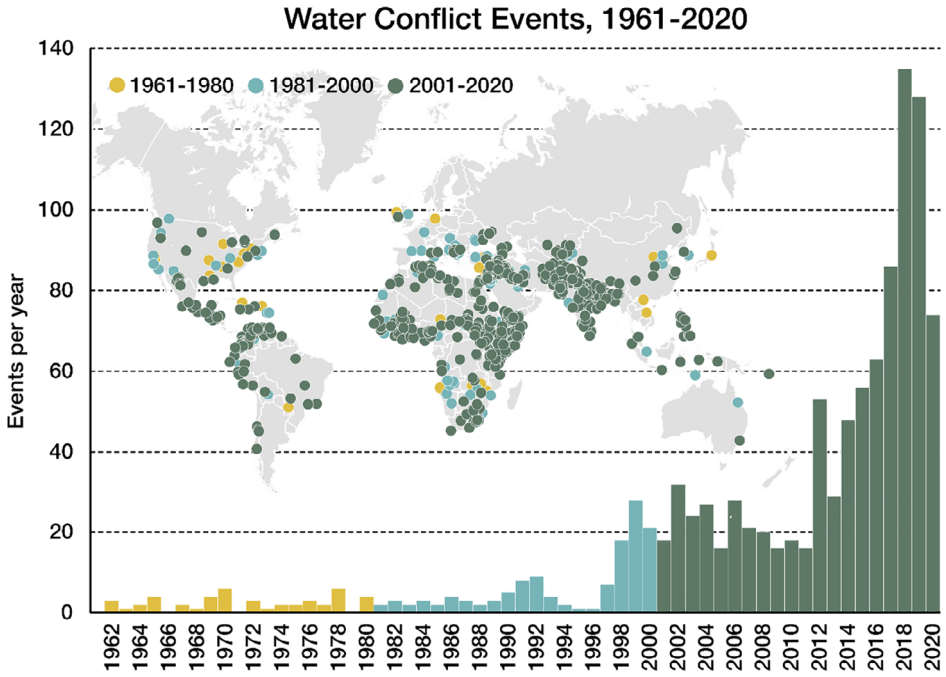

FIGURE 1 Water conflict events by year, 1960–2020. The number of reported water conflicts around the world increased dramatically at the end of the 20th century and has risen again since around 2015. Reported water conflicts have occurred in both developed and developing countries. *Source*: The Water Conflict Chronology of the Pacific Institute, 2023.

water security will be more feasible if action is based on a broadly shared knowledge of the water cycle. We argue that this knowledge is so foundational that it deserves a name of its own—the *Water Intelligence Quotient* or *Water-IQ*.

2 | GLOBAL CHANGES ARE "REPLUMBING" THE PLANET

Successful societies are built on predictable water supplies. Yet climate change and human engineering such as interbasin transfers are "replumbing" the planet, altering the regional water supplies upon which human life and livelihoods depend (National Research Council, 2012). An increase in the frequency and intensity of droughts and floods are affecting the predictability of water supplies around the globe (IPCC, 2022). Foreseeing how regional water supplies will develop is also becoming more difficult due to the homogenization of natural landscapes as they are converted into forest plantations and crops, reducing the variability in water processes and thus the buffering of hydrological extremes (Levia et al., 2020). At the same time, forestry, irrigated agriculture, and other needs of a growing global population are increasing the demands on already stressed water supplies. These rising demands (and some of the solutions to satisfy these demands, like massive new dams) contribute to tensions over freshwater supplies in transboundary water systems of water-scarce regions such as the Middle East, southern Africa and parts of the Americas. At risk is a further increase in water conflicts and water migrants; for example, by 2050, an estimated 1.2 billion people (12% of the projected global population) will be displaced due to climate change and its influence on the global water cycle (Institute for Economics & Peace, 2020).

Science is rising to the challenge of identifying water actions to improve water security in the face of greater complexity and uncertainty (IPCC, 2022). In all too many cases though, water conflicts block the path to innovative solutions for complex problems, and these barriers push communities further towards tipping points, beyond which water secure nations become water insecure and solutions even more difficult.

3 | COMMON GROUND NEEDED IN A "NEW PLAYBOOK" FOR WATER DIPLOMACY

The "old playbook" for water diplomacy, where experts are expected to do most of the "understanding" about water issues, is not working as mounting water demand stresses the societal and physical resources for satisfying those

demands. The amount of water on the Earth and in its atmosphere remains constant as it goes through the water cycle. But where water moves, when it moves, how it moves, and why it moves is changing. The water cycle has never been more complicated. Water diplomacy actions based on outdated knowledge of the water cycle (e.g., not recognizing how profoundly human activity has already changed the water cycle) may be ineffective at resolving conflict, or, even worse, may amplify conflict. There is an urgent need to build practical knowledge of the water stocks and water fluxes that integrate recognition of the myriad factors influencing the water cycle. This knowledge will help diplomatic actions to deal with water crises, from improvements in subsistence agriculture to massive engineering projects.

Since it is the same water that both sides in a conflict disagree about, there are facts concerning the water in question that should be possible to agree upon, such as the rate of recharge in relation to extractions from a transboundary aquifer. Such agreed facts could be a common ground for diplomacy to build on, especially if available data are shared between adversaries in a controversy. A Water-IQ that reflects scientific advances in our understanding of the water cycle and shared data on local situations opens the path to finding that common ground in water conflicts.

Water experts can provide diplomats with scientific and technical information, but it is not clear how well tables, charts, reports, and briefings are understood by the diplomatic teams. What a person grasps from an expert briefing is shaped by their pre-existing understanding of the water cycle. It is even less clear that the different parties to a water conflict, from politicians to the broader public, have a shared understanding of the contested waters. We see the absence of Water-IQ, an evidence-based understanding of the water cycle, as a significant obstacle for water diplomacy when trying to reduce tensions in water conflicts and promote cooperation on water actions to resolve water crises.

4 | WATER IQ FUNDAMENTALS

The lack of shared knowledge about water is easy to underestimate. After all, schoolchildren worldwide are often introduced to an iconic water cycle image that depicts rain falling to the land, running to the sea, and then returning to the atmosphere to fall as rain again. However, that oversimplified image does not reflect the more complex picture of the water cycle that has emerged from decades of scientific investigation.

While one can wonder how many of these new scientific findings are relevant for a minimum Water-IQ, (e.g., regional changes in aquifer water storages revealed by gravity anomalies), the iconic water cycle images often miss key features of the water cycle (Abbott et al., 2019). We see at least two common shortcomings as dangerously misleading when it comes to providing a shared knowledge of the water cycle that can help in resolving contemporary water crises.

The first shortcoming is that humans are missing from most images of the water cycle. The interplay between people and the water cycle—sociohydrology—is a rapidly growing field of hydrological science (Di Baldassarre et al., 2019). When people are absent from the image, society's role in creating water crises is overlooked, along with possibilities for alleviating these water crises. Those overlooked human influences can include factors such as colonial history. Some of those past imbalances may have been rectified, but water agreements may date back to such times.

The second shortcoming is that the water inter-connections (between adjacent geographic regions) and teleconnections (between non-adjacent geographic regions) that propagate human influences on the water cycle are missing. We now know that wet areas are becoming wetter and dry areas drier (Madakumbura et al., 2019). We are learning that human actions to mitigate climate change that overlook these water connections may easily lead to unintended consequences. For example, planting trees has been a focus of policies worldwide to increase the land's ability to sequester carbon as nature-based climate solutions. If we achieve the tree restoration potential, new trees could pull 206 gigatonnes of carbon out of the atmosphere in the form of carbon dioxide (Bastin et al., 2019; Veldman et al., 2019). Already though, large-scale reforestation and afforestation efforts focused on nature-based climate solutions for storing carbon are altering how forests transmit water both downstream and downwind. These changes may be pushing conflict areas to (or beyond) critical tipping points (Creed et al., 2019).

These omissions are areas where water science has advanced considerably since images of the water cycle started circulating widely over half a century ago. The United States Geological Survey (USGS), which curates the most widespread images of the water cycle, has recognized the need for taking on board scientific advances and launched a "new" water cycle diagram (Duncombe, 2022). Other teams are also creating visualizations of the water cycle that reflect more of what is now known (Figure 2). Visualizations like the USGS's "new" water cycle and related educational initiatives must gain traction quickly.

FIGURE 2 New visualizations of the water cycle address shortcomings found in many of the images currently in circulation. This image produced by the Brigham Young University Water Cycle Project depicts both human influence on the water cycle and global teleconnections. ("Green Water Use," Brigham Young University Website, accessed 11 May 2024, watercycle.byu.edu).

Given the importance of evidence-based knowledge of the water cycle when trying to overcome water conflicts and seek a basis for water cooperation, we need to spread this knowledge about where the water is, how it moves and how people have shaped these water patterns in ways that range from engineered structures, to land-use patterns and legal agreements. To help do that, facts emerging from scientific advances should be included in an ever-evolving minimum Water-IQ. One example is space based observation that identifies where societal actions are depleting groundwater supplies, such as irrigation with "relic" groundwater in the Midwestern US (Döll et al., 2014). This shared Water-IQ should then form the basis for building support for actions to resolve water-related conflicts.

This water-IQ should also be supported by locally relevant information. It is essential that all available water data be shared by parties in a water conflict to improve the possibilities for shared understanding. That shared understanding needs to recognize the historical context too. Existing water treaties can date to a colonial period, shaped by power relations that were scrapped long-ago.

5 | BUILDING THE COLLECTIVE WATER-IQ

Who exactly is it though that needs this Water-IQ? Diplomacy has traditionally been the domain of a professional corps. Now, however, a more inclusive view of diplomacy is emerging. For water-related conflicts, diplomacy is no longer the singular domain of formal diplomacy among nation-states, but simultaneously activates informal diplomacy among actors including all levels of government, scientific and technological experts, and the affected local communities, including constituencies that have often been ignored. Together they can help defuse water conflicts with "water-proofed" peace initiatives and build broad support for water action. The work of Great Lakes decision makers to include traditionally disenfranchised groups in the creation of transboundary water policies demonstrates the transformative power of such approaches (Creed & Friedman, 2020; Friedman & Creed, 2021). This shift in power structures—where all relevant experts and actors are given agency with inclusive and equitable voices—makes it imperative for all members of society to have at least a minimum Water-IQ. The same trend towards increased inclusiveness in water diplomacy also applies to the implementation of water cooperation.

Both water diplomacy and water cooperation benefit from engaging more deeply with actors whose professional or lived experiences access information that can help solve complex problems and identify viable solutions to resolve water conflicts (e.g., Wolf, 2017). For water solutions and diplomatic arrangements to be understood and broadly supported though, it is essential to have a good collective Water-IQ, one that grows with the Water IQ added by each new individual participating in collective actions. There is no guarantee that people with good water IQ will interpret shared data

in the same way, but Water IQ will facilitate the recognition of common ground by more of the constituencies on both sides involved in a water conflict.

Water-IQ based on up-to-date scientific understanding creates a solid basis for shared knowledge that can help water diplomacy work more effectively on water conflicts. Recognizing the general need for Water-IQ is a start. But if we are to build a shared knowledge on which to base bold actions to reduce water conflict (Guterres, 2023), then Water- IQ needs to go mainstream—and quickly too. This means that diplomats, decision-makers, experts, as well as civic society, need to get up to speed with the "new" water cycle. Fortunately, in a world filled with water crises (National Academy of Engineering, 2016), there is good reason to think that this is possible.

To begin with, the need to raise our Water-IQ is compelling. It is inspiring to see how visualizations of the "new" water cycle make people realize their need to re-examine what they thought they knew. Moreover, when it comes to communicating the role of humans in changing the water cycle, the magnitude of those changes makes them hard to miss. Nevertheless, global effort to raise Water-IQ cannot be based on outdated curricula or misleading images. Science has advanced, and what people learn about the water cycle needs to reflect that. The fact that the "old" water cycle is so widely recognized provides hope that institutions and organizations are in place to spread knowledge of the "new" water cycle, and with it Water-IQ. As yet, there is no syllabus to establish the Water IQ urgently needed to face contemporary water challenges. It is our hope this perspective article will spur efforts to create one.

6 | CONCLUSION

Climate change and intensification of human activities are replumbing the global water cycle in ways that are increasing the number of water conflicts around the world. Diplomacy to defuse water conflicts works better when parties to the conflict at least agree on the amounts and flows of water in the contested situation. Basic, up-to-date knowledge of the water cycle, a Water-IQ, helps navigate to common ground about the quantities of water involved in a particular conflict. Two fundamental elements of Water-IQ are awareness of both the profound influence people have on the water cycle, and the inter/tele-connections of water between geographic regions.

AUTHOR CONTRIBUTIONS

Kevin Bishop: Conceptualization (equal); writing – original draft (equal); writing – review and editing (equal). **Irena F. Creed:** Conceptualization (equal); visualization (equal); writing – original draft (equal); writing – review and editing (equal). **Kathryn Bryk Friedman:** Investigation (equal); writing – review and editing (equal).

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There is no conflict of interest.

DATA AVAILABILITY STATEMENT

Data sharing is not applicable to this article as no new data were created or analyzed in this study.

ORCID

Kevin Bishop https://orcid.org/0000-0002-8057-1051

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