

**“Educating for Water Resilience in the Context of Climate Crisis” —  
*Journal of Sustainability Education* Special Issue Released for United Nations  
World Water Day 2020**

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2020 Water and climate change

**Abstract:** This editorial overview provides an introduction to this special *Journal of Sustainability (JSE)* issue devoted to water and climate change, which is being released during United Nations World Water Day 2020. The article contextualizes some of the water security risks that are exacerbated by climate change, such as increasing floods and droughts. This piece further provides a brief overview of the articles in the special water and climate issue of the *JSE*.

**Keywords:** Water; World Water Day (WWD); UN-Water; climate change; climate crisis; human right to water; water resilience

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“The global climate crisis is inextricably linked to water. . . .  
If we are to create a sustainable future, business as usual is no longer an option  
and water management needs to be scrutinized  
through a climate resilience lens.”  
(UN-Water, 2019, p. 1)

Humanity’s relationship with water at all scales—from local to global—directly impacts its ability to build a sustainable future, one that includes food security, human health, peace between water-sharing regions, sustainable economies, healthy ecosystems, sustained biodiversity, and social justice. Water security has never before been so threatened by anthropogenic actions, including climate change. On March 22, 2020, United Nations (UN) World Water Day focuses specifically on the water-climate connection. Concurrently, this special issue of the *Journal of Sustainability Education (JSE)* concentrates on the pivotal role the field of sustainability education plays in educating for a water resilient future in the context of climate crisis.



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Figure 1. From: UN-Water.

This issue contemplates both urban and rural, as well as local and global water concerns; specifically addresses the Flint, Michigan, water crisis; explores Indigenous and Traditional Ecological Knowledge (ITEK) related to water; gives voice to youth perspectives on water-climate action from the Stockholm Junior Water Prize; addresses the corporate sector’s role in water action; presents a variety of water-climate curricular resources; and explores a variety of other water-climate topics. The issue’s specific pieces, including scholarly features, case studies, a series of Q&A interviews, a photo essay, and a book review, are introduced in greater detail below. [See the full Table of Contents here.](#)

We invite you to read—and share—content from this issue, which marks the 10th anniversary of the *JSE*, to inform your and your colleagues’ sustainability education practices. First, though, we contextualize the urgency of addressing the issue of water in the midst of climate crisis.

### **Contextualizing the Urgency of Water Insecurity**

Today, water insecurity is often framed as a “wicked problem.” Driven by a burgeoning global population, global water demand is anticipated to increase by 55% by 2050 (United Nations World Water Assessment Programme [UN WWAP], 2015), and the global water deficit is projected to reach 40% by as soon as 2030 (UN WWAP, 2016). Water-based ecosystems—on which we rely for source water protection, safeguarding from extreme weather events, and the

preservation of biodiversity—are suffering. Today, an estimated two-thirds of water-cycle-regulating forests worldwide are degraded, approximately 70% of natural wetlands have been lost since 1900, and water pollution has increased in most African, Asian, and Latin American rivers since the 1990s (UN WWAP, 2018).

Water insecurity presents significant human rights and social justice concerns. While the human right to water was adopted by the United Nations as binding international law nearly a decade ago, today more than 2 billion people—about 30% of the global population—still do not have their right to water fully realized (World Health Organization, 2017). This water injustice reality disproportionately impacts marginalized individuals and communities, including the world's 370-500 million Indigenous Peoples (United Nations Educational, Scientific, and Cultural Organization, 2019).

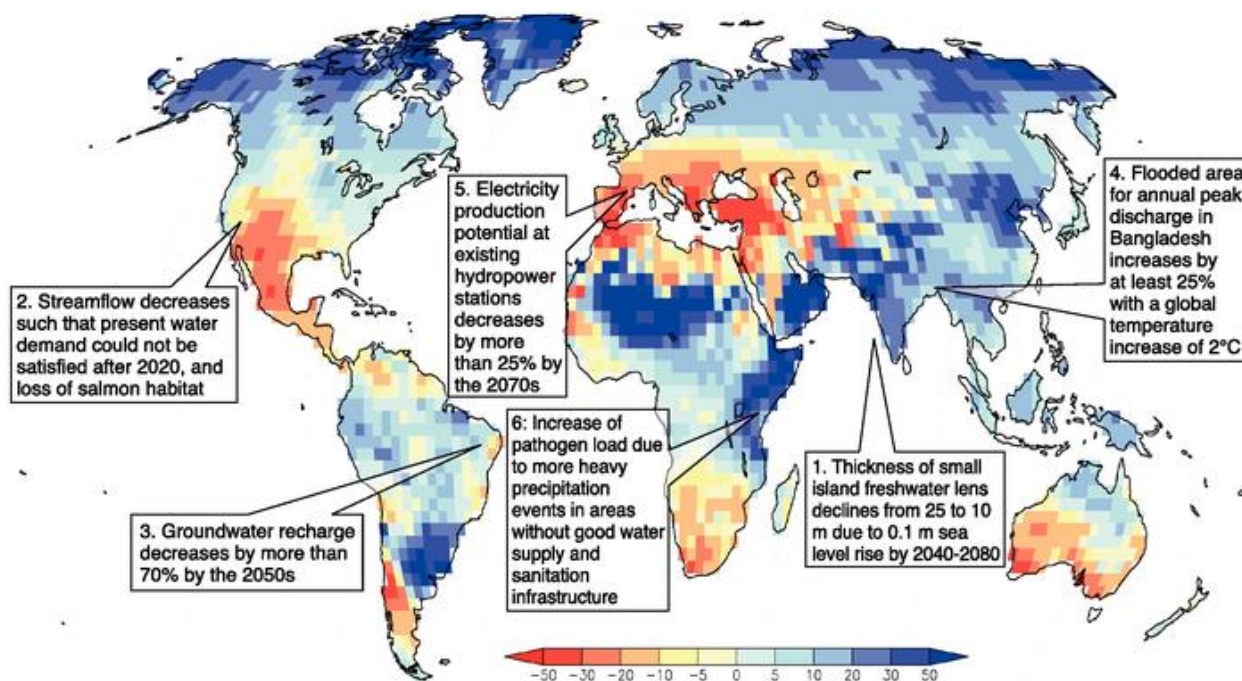


*Figure 2.* After walking long distances, Maasai Indigenous women fetch water from a Kenyan river contaminated from upstream agricultural runoff. From: author.

This lack of access to clean water is felt near and far, in both urban and rural settings, and in both developing and developed nations. It is estimated, for instance, that approximately 2.5 million people in the United States still lack access to safe drinking water (as cited by Venkataraman, 2017, p. 14), a reality jarringly thrust into the spotlight during the 2015 Flint, Michigan, water crisis when lead-contaminated drinking water distributed by the city caused urgent health problems (City of Flint, 2016).

### **Linkages Between Water and Climate Change**

Threats to water security are further—and *severely* in many local contexts—exacerbated by the impacts of the unfolding anthropogenic climate crisis. Notably, the [consequences of climate change are experienced by humans predominantly through their interactions with the water cycle](#) (UN-Water, 2013)



*Figure 3.* This map illustrates projected changes in global freshwater distribution. The background map shows "mean change of annual runoff, in percent, between present (1981 to 2000) and 2081 to 2100 for the SRES A1B emissions scenario (after Nohara et al., 2006)." From: Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report: Climate Change 2007. Retrieved from: [https://archive.ipcc.ch/publications\\_and\\_data/ar4/wg2/en/figure-3-2.html](https://archive.ipcc.ch/publications_and_data/ar4/wg2/en/figure-3-2.html).

Climate intensification is projected to bring increasing volatility and variability to the water cycle in a highly regionalized context, leading to concerns for food security, climate refugee migration, transboundary conflict, and myriad other societal realities. Climate change-related impacts to the hydrologic cycle, including fluctuations to rainfall patterns, river flow, and groundwater recharge rates, are impacting the availability of freshwater for communities around the globe (Cooley, 2012). And, as underscored by the [Intergovernmental Panel on Climate Change \(IPCC\) Climate Change and Water Technical Report](#), climate change feedbacks at the global scale are experienced in highly regionalized contexts, leading to more severe flooding in some regions and more severe droughts in others (IPCC, 2008).

Given these realities, the need for water action has emerged as a leading priority on the global water and sustainable development policy stage, as signified by the 2015 inclusion of a stand-alone United Nations Sustainable Development Goal—[SDG 6](#)—specifically related to water. It is recognized that water security sits at the nexus of many different societal needs and will require interdisciplinary approaches to address, particularly in the context of climate change.

### **Invitation to Explore Sustainability Education’s Role Moving Forward**

We explore—in this special issue—the pivotal role sustainability educators might play moving forward in driving both understanding and action related to the climate-water nexus. In recognition of UN World Water Day 2020, we invite you to read and share the pieces outlined below.



### **Issue Feature: Water Justice from the Flint Water Crisis to the Dakota Access Pipeline**

In this piece, [Vaughan-Lee and Dorman \(2020\)](#) of the Global Oneness Project, an initiative that focuses on the power of storytelling as a pedagogical tool to engage students in learning about social and environmental justice, explore how educators can use photography “as an immersive storytelling medium to humanize the issue” of the human right to water in marginalized communities.



*Figure 4.* USA. Flint, Michigan. 2016. The Flint River, downtown. © Matt Black/Magnum Photos.

The article explores water justice through the lens of the Flint, Michigan, water crisis, “considered one of the worst public health crisis of our time” (Vaughan-Lee and Dorman, 2020) and events associated with the Dakota Access Pipeline. In this piece, the authors ask:

At this crucial junction in our history, during severe climate and ecological breakdown, what are the ways we can challenge students to learn and be aware of the environmental injustices impacting marginalized communities? Do we have a human right to clean water? (Vaughan-Lee & Dorman, 2020)

### **Q&A Interviews with Voices from Global Water Institutes and Beyond**

In a series of three Q&A interviews, this special issue connects readers with notable voices associated with the [Stockholm International Water Institute](#) (SIWI), the Pacific Institute, and the California Academy of Sciences.

In the first Q&A, [the \*JSE\* interviews 18-year-old Diana Virgovicova](#), UK-based youth water scholar and a recipient of the prestigious 2019 [Stockholm Junior Water Prize](#) (SJWP). In this piece, Virgovicova discusses how—and why—she and other SJWP recipients collaborated to issue a [joint statement to the United Nations General Assembly calling for urgent water-climate action](#). Specifically, Virgovicova explains why the statement, which read “we want to see theory being put into practice,” focused on the need for more sustainability education—both in the classroom and in the community—to drive water-climate praxis (Bielawski & Virgovicova, 2020).



Figure 5. Stockholm Junior Water Prize Winners, representing 35 countries, pictured during World Water Week in Stockholm, Sweden, in August 2019. From: Jonas Borg, Stockholm International Water Institute.

Next, [the \*JSE\* hosts a discussion about the role of the corporate sector in water resilience efforts](#) with Cora Kammeyer, a researcher at the [Pacific Institute](#), a California-based research center focused on water challenges in California, the United States, and globally (Bielawski & Kammeyer, 2020). In this piece, Kammeyer points out that businesses make 90% of water withdrawals, making the corporate sector, in Kammeyer’s words, “one of the biggest and most important levers for achieving global water security.” Kammeyer specifically discusses the work of the [California Water Action Collaborative](#), which brings together what she calls “unlikely bedfellows”—corporations such as Google, Proctor & Gamble, and Coca-Cola, and NGOs such as The Nature Conservancy, WWF, and the Environmental Defense Fund, to “enable unprecedented collaboration” on water literacy and collective action.



Figure 6. Members of the California Water Action Collaborative (CWAC), which unites the corporate sector with leading water-focused NGOs, learn about stream restoration in the Tahoe National Forest. From: Pacific Institute.

In the final Q&A interview piece, [the \*JSE\* sits down with Megan Schufreider](#), director of education at the [California Academy of Sciences](#) to discuss how climate change’s impacts on the water cycle are driving increasing demand for water-related curricular resources, as well as the importance of directly addressing *virtual* water issues in water curricula (Bielawski & Schufreider, 2020).

### **Sustainability Journey: Chronicling an Historic Indigenous Salmon Re-Joining Ceremony**

In “[The Body that is a River](#),” Eileen Delehanty Pearkes (2020), noted author of the book *A River Captured: The Columbia River Treaty and Catastrophic Change*, chronicles an Indigenous salmon-rejoining ceremony that returned salmon to their native waters upstream of a mega-dam for the first in nearly 80 years. In this piece, Delehanty Pearkes (2020) notes, “In the coming era of climatic uncertainty, we each and all have the opportunity . . . to restore something that has been nearly lost.”



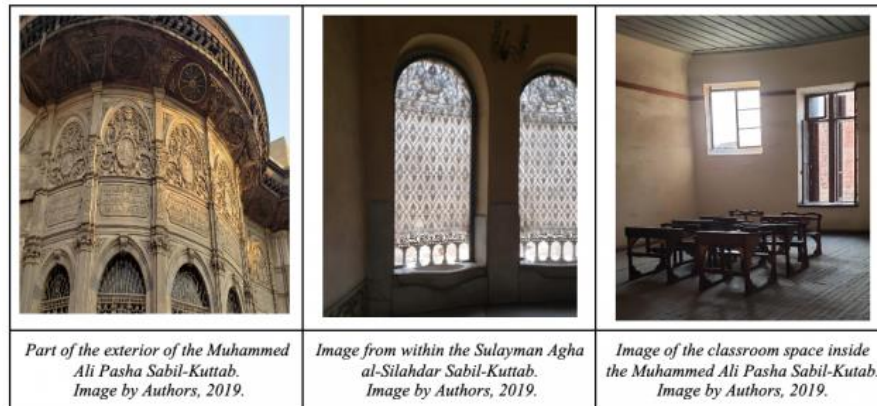
*Figure 7.* A woman from the Wenatchee tribe listens to leaders before the Salmon Rejoining Ceremony begins. From: Delehanty Pearkes (2020).

Delehanty Pearkes further explains:

For nearly a century, Columbia River Indigenous tribes have watched ever-dwindling stocks of Chinook travel upstream through many fish ladders on the lower and mid-river, only to be stopped by Chief Joseph Dam (236 feet high) and Grand Coulee Dam (550 feet high), behemoths that provide no passage. Columbia River salmon survive in the thousands instead of millions. With climatic changes further constraining water supply, the coming era seemed an unlikely one to invest much hope in the salmon. And yet, the tribes do. It is, they say, their responsibility to do so. (Delehanty Pearkes, 2020)

### **International-Focused Scholarly Features Report from Cairo, Egypt; Maasailand, Kenya; and Islamabad, Pakistan**

Three articles address issues of water insecurity from an international context. In “[The Sabils of Cairo: Small Scale Urban Adaptations to Water Stress](#),” Farmer et al. (2020) explore the climate-era role of sabils, which are “charitably endowed water fountains” in Cairo, Egypt. The authors note that “as global climate change has manifested in cities in the Middle East, urban dwellers, particularly those with the fewest resources, face mounting problems with water insecurity” (Farmer et al., 2020).



*Figure 8.* Charitable water fountains called sabilis are part of the urban landscape in Cairo, Egypt. From: Farmer et al. (2020).

In “[Seeing Water Through the Trees](#),” (Bielawski, 2020), I examine how Maasai Indigenous activists are calling for the long-term conservation of the Mau Forest Water Tower in Kenya as a Nature-Based Solution (NBS) for downstream water security.



*Figure 9.* Maasai environmental and land-rights activist George Risa Kosen leads a protest in Narok, Kenya, calling on the county and national governments to stop deforestation in the Mau Forest Water Tower. From: Kosen; in Bielawski (2020).

Further, I explore how the global water policy stage, while traditionally focused on western-emanating Scientific Ecological Knowledge (SEK) that predominantly fuels investments in grey built infrastructure such as dams and water treatment plants, is showing signs of increasing its inclusion of NBS, such as forest-based water protection, that is often based upon Indigenous and Traditional Ecological Knowledge (ITEK). This includes discussion about surging visibility of NBS at key venues, including a video endorsement by Swedish climate activist Greta Thunberg and increasing inclusion at global sustainable development policy events such as the UN General Assembly, UN Climate Change Conference (COP 25), and the World Economic Forum.

In “[Water Scarcity and Social Vulnerabilities](#),” Durrani (2020), addresses the potential of water scarcity to become the source of world conflict, with a specific focus on water security in Pakistan.



## U.S.-Based Scholarly Features: Engaging Students in Local Water Issues and the Sustainability of Showers

Two scholarly features focus on education strategies to engage students in local water issues. In “[Embracing Our Place: Sustainability and a Bioregional Watershed Education Approach](#),” Hensley (2020) posits that “recognizing the importance of maintaining the health and integrity of our watersheds is a vital part of a strong sustainability-oriented education program.” And, in “[Improving Water Resilience Through Environmental Education](#),” Nation et al. (2020) explore “lessons [that] increased student understanding of water quality issues and motivated students to take personal action to improve water resiliency within their local communities.”

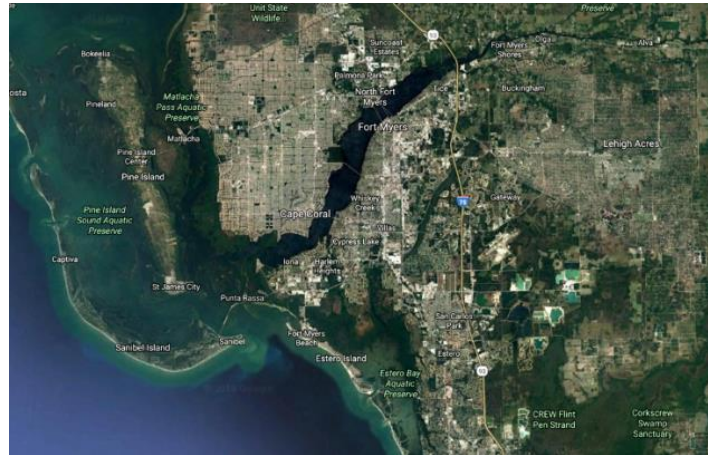


Figure 10. Aerial map of Florida's southwest coast, where Nation et al. (2020) address middle school environmental education focused on water quality, including algal blooms. From: GoogleMaps.

In a two-part series, “Dissecting the Average Shower and Its Impact on the Planet,” Linda Pope (2020), an editorial staff colleague here at the *JSE*, explores various aspects of the sustainability of showers, while inviting “students and instructors to collaborate with the author to construct a prototype of an off-grid recirculating shower.”

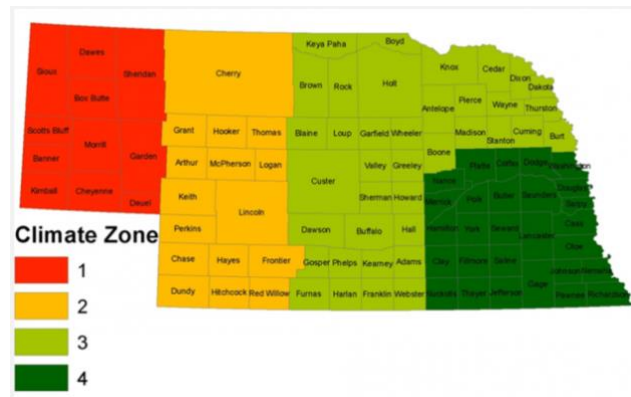
In “[Part One: Human Water Usage and Global Impact](#),” Pope (2020) “outlines a brief history of showering and questions current showering practices.” And, in “[Part Two: The Recirculating-Shower Design Elements](#),” Pope (2020) explores sustainable alternatives for current shower practices, such as rainwater harvesting and recirculating showers.



*Figure 11. Pope (2020) explores sustainable showers, including a prototype for an off-grid recirculating shower. From: Pope (2020).*

### **Case Studies Address Teaching Water in Classroom Settings, Perspectives on Stormwater Management**

Two case studies explore examples of teaching water literacy in classroom settings. In [“Undergraduate Education about Water and Climate Change: Students’ Use of a Water Balance Model,”](#) Lally et al. (2020) discusses the effectiveness of student use of computer-based simulation models, specifically the Water Balance Model (WBM) in “making and testing hypotheses and conveying comprehension” in their understanding of the interconnectedness of water and climate change.



*Figure 12. The Water Balance Model (WBM) allows the student to simulate realistic future scenarios investigating the tradeoffs between land use (i.e. irrigation intensity) and water table decline across four climate zones within the state of Nebraska. From: Lally et al. (2020).*

And, in [“Strengthening Water Cycle Literacy among Senior High School Students in East Java Province, Indonesia, through the Application of the Conservation-Based Learning Model,”](#) Sukarsono (2020) discusses a study of nearly 400 high school students across six schools that found students exposed to a Conservation-Based Learning (CBL) model benefit from “more

complex water cycle literacy” than students exposed to the common teaching model. Sukarsono (2020) extrapolates that the “CBL model stimulates students to find their own interests and problems . . . [and that] for students to really understand. . . they should work to solve problems, discover something for themselves, and always work on ideas” (as cited in Sukarsono, 2020).



Figure 13. Students directly feel the river flow and measure the depth of the Brantas River in East Java. From: Sukarsono (2020).

An additional case study address stormwater management. In “[Urban Revival and Appropriate Stormwater Management](#),” Korenic (2020) discusses how students in a “real world engineering technology analysis” at Youngstown State University effectively engaged in “find[ing] accurate quantities of runoff . . . and expand[ing] on sustainable storm water management techniques that can be incorporated in urban areas including bioswales and rain gardens.”

### Book Review: *Blue Mind*

In his [review of the book \*Blue Mind: The Surprising Science That Shows How Being Near, In, On, or Under Water Can Make You Happier, Healthier, More Connected, and Better at What You Do\*](#) (Nichols, 2014), Ramsey (2020) contemplates how the text “offers readers important strategies for dealing with the emotional challenges associated with climate change,” while suggesting “important insights into climate advocacy.”

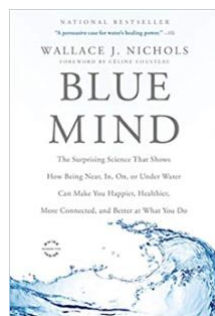
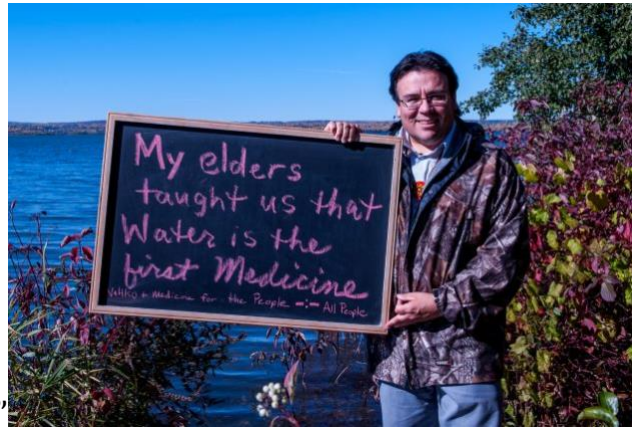


Figure 14. Ramsey (2020) reviews the text *Blue Mind*. From: Nichols (2014).

### **Photo Essay: “Words for Water”**

Finally, in a photo essay entitled “[Words for Water](#),” Dougherty (2020) “asks the question, ‘what are your words for water?’ in order to capture the essence of what we, as a community, value about Lake Superior and the land, streams, rivers and watersheds that feed it.” Dougherty’s (2020) piece includes photographs of hundreds of individuals standing in front of Lake Superior, which is noted for “supplying 10 percent of the globe’s fresh water,” with a chalk board showing each person’s words for water. As noted by Dougherty (2020), “As a community of humans we need to write our shared story. To speak the words that were born in our watershed and flow downstream—an Indigenous narrative that declares this place worth saving.”



*Figure 15. Dougherty's (2020) photo essay explores "Words for Water." From: Dougherty (2020).*

On behalf of the *JSE*, we hope you find new insights to inform your sustainability education practice in this special issue devoted to the connections between water and climate change.

The *Journal of Sustainability Education (JSE)* serves as a forum for academics and practitioners to share, critique, and promote research, practices, and initiatives that foster the integration of economic, ecological, and social-cultural dimensions of sustainability within formal and non-formal educational contexts.



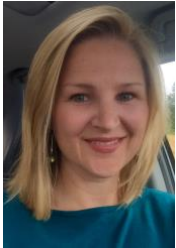
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