

IoW Reflections

Lauren Patterson • February 2021



Joshua Earle, Unsplash

The transition from one year to the next is often a time of reflection. How much more so when the past year, the start of a new decade, has brought such radical disruption and change to our society. In 2020, the world entered into a global pandemic, our country immersed itself in deep conversations around race and equity, rampant fires and repeated tropical storms pummeled regions of the U.S., and a presidential election revealed that the nation remains deeply divided. We find ourselves – at a personal, organizational, and cultural level – asking how did we get here? And, where are we going? These are important, shaping questions that I hope we can all pause and ponder for ourselves. The stories we tell ourselves set our trajectories. My task in a few hundred words is to reflect on those questions for the Internet of Water.

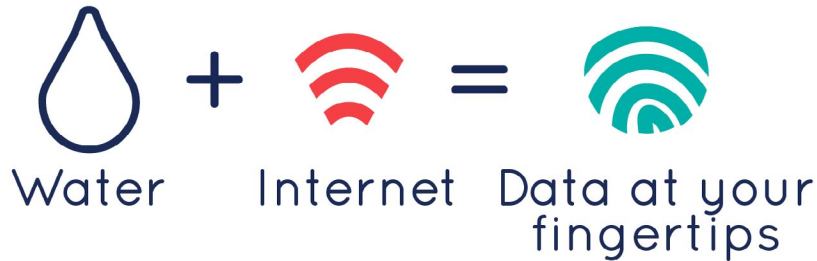
WHAT IS THE INTERNET OF WATER?

For those new to the Internet of Water, I imagine your first question might be “what is it?” That is a great question.

The Internet of Water began as a vision in 2017 to create networks (both social and digital) that allow water data to be (1) found, (2) shared, and (3) standardized so the data can be used to inform decision-making in a timely manner and with greater confidence. In short, we want to use modern digital technology to make water data available at the fingertips of decision-makers to transform how we

manage water resources.

In 2018, that vision evolved into a project at Duke University that is supported by a small team working with partners across the U.S. to create this vision. In the future, the Internet of Water will become an internet of water, much like the internet today, a network sharing digital water data.

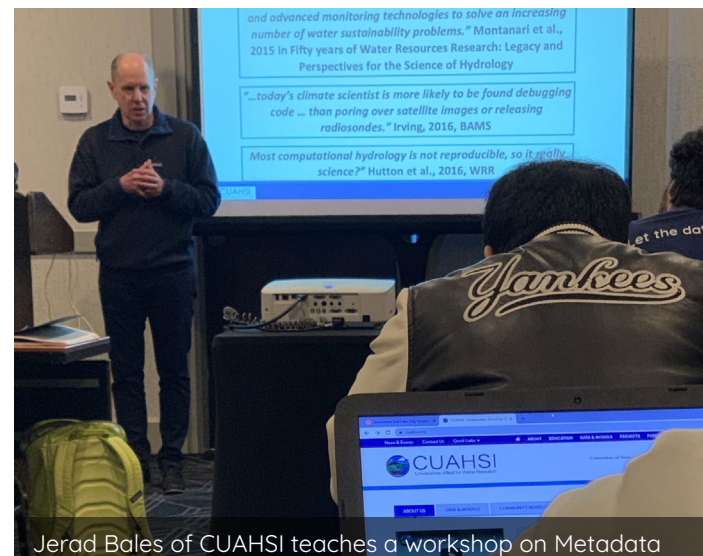


HOW DID WE GET TO WHERE WE ARE TODAY?

The Internet of Water project is within an academic institution and we academics love to ponder out loud with others. Each year, the Nicholas Institute at Duke University partners with the Aspen Institute to host the [Aspen-Nicholas Water Forum](#) where we convene a group of diverse stakeholders to explore what constitutes good governance around different aspects of water management. In 2015, we talked about the potential for the digital revolution to transform how we manage water resources and why that digital revolution is slow to take hold in the water sector. As many practitioners noted, they have to make decisions without data right now, even though those data might exist. The conversation focused on the potential for water data to enable real-time decision-making and transform how we manage our water resources.

1. THE TIMING WAS RIGHT

The idea of sharing water data across the nation took off because the timing was right. A similar idea has been proposed and attempted more than a decade earlier, but there was not enough demand, not enough need, not enough insecurity around our water resources to warrant any expenditures. First, in several region-wide disasters have brought into question our ability to ensure safe, reliable water supplies in the last decade. Multi-year droughts in California, Texas, and the Colorado River basin have heightened the need for water data and led to



some state's creating open water data policies. The proliferation of harmful algal blooms, dead zones in our estuaries, and repeated flooding in the Mississippi River have highlighted the need for coordinated responses across a watershed. The connection between groundwater and surface water have become more evident as population and industries concentrate in certain areas and place growing stress on available water resources. We are repeatedly discovering how little we know about water outside our local jurisdictions and how difficult it is to manage regional water resources without information. Without data. We have the need.

Second, the digital revolution has made it possible to share data across platforms and consumers are more technologically savvy and interested in seeing higher resolution data. This is particularly true for water utilities. Marketing has done a fantastic job convincing consumers that they should buy bottled water. Utilities need to show customers that their water is safe to drink, and that is going to require providing data and with greater transparency. There is simply greater public and private demand for water data to inform decision-making. Even Zillow is interested in offering information on their platform to inform buyers about the flood risk and a water quality appraisal for potential homes. There is a movement towards data democratization to fill the void created by the lack of data available from public agencies.

Third, there is heightened awareness and impact of environmental issues on consumers. The costs to treat contaminated water are growing and increasingly being passed onto individual customers as utility bills rise. The rising costs of water treatment is making water unaffordable for more households. There is demand for water management to be different and data are a low-hanging fruit and are necessary to know how to manage water differently. Local and state budgets were tight before the COVID-19 pandemic and they need to know how to spend those limited dollars to make cost-effective investments with high probabilities of success. The pandemic has also reinforced the public health necessity of access to water, as well as the potential for wastewater data to inform COVID-19 prevalence within a community.

2. WE LISTENED TO NUMEROUS SECTORS TO DEVELOP SOME BASIC PRINCIPLES FOR A NATIONAL APPROACH TO SHARE WATER DATA

The idea for sharing water data across the nation could have stopped with the conclusion of the forum, but for a few philanthropic organizations that wanted to invest in the idea. They believed data is the most cost-effective way to improve water management today. They asked us to continue these conversations to build

a strategy that would allow water data to be easier to find, share, and use. From 2016 to 2017, we gathered with 20 or 30 individuals to develop a series of principles that could enable sharing different types of water data across geographies and sectors. The group developed principles and recommendations on how to build an [Internet of Water](#).

3. PHILANTHROPY INVESTED IN CREATING AN INTERNET OF WATER

Next, we tested the waters so to speak. We took the Internet of Water report to several regions and sectors across the U.S. to have conversations around their aspirations and concerns about sharing water data ([see findings here](#)). What would an Internet of Water look like for them? What changes would need to take place for their organization to share data? These conversations informed the initial activities we began in earnest after hiring a small team in 2019.



Peter Colohan speaking to New Mexico state agencies about water data modernization.

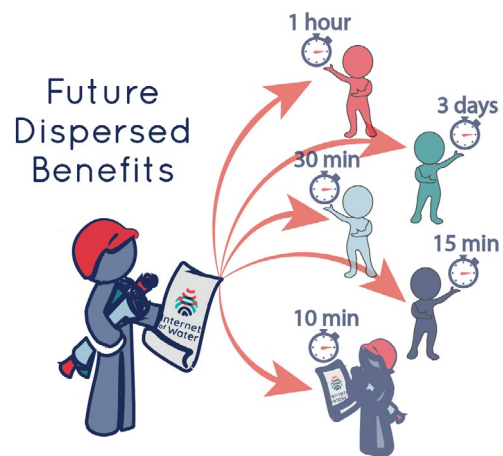
4. WE DOVE IN HEAD FIRST WITH MANY OF YOU

An Internet of Water is a network...meaning it requires more than one organization to participate. We began our network with an amazing advisory board that has consistently engaged with us and provided good guidance. They have introduced us to new partners and networks that have helped us design the data infrastructure that would allow water data to be findable, accessible, and usable. Organizations such as [CUAHSI](#) and [WaDE](#) have shared staff, time, and resources to figure out how to share data from their platforms, as well as to make data discoverable between their platforms (meaning I can find WaDE data in CUAHSI). State agencies in New Mexico, California, Texas and North Carolina have been gracious enough to work with us to address some aspects of their water data infrastructure. We cannot thank them enough for letting us participate and learn from their experience. These lessons are shaping our trajectory for the next few years.

WHERE ARE WE GOING?

2020 has been a disruptive year and it has truly highlighted how important water is for public health and how little we know about how our water flows between, and even within, jurisdictions. The shut-off moratorium and the allocation of federal stimulus dollars to utilities based on need has been hampered by lack of data about how many people have (or don't have) access to water. In short, the need for water data has only grown in the past year.

While the need for data has grown, the capacity to invest in data infrastructure has shrunk. Prior to the pandemic we were learning that even those who strongly believe in the mission of sharing water data face significant capacity challenges – human, technical, and financial. Most organizations and their employees are over 100% capacity and they have no extra bandwidth to improve their water data infrastructure now even if it has the potential to save time in the future. This is especially true if many of the beneficiaries are likely to be outside of their organization.



The lack of capacity was true of state and local governments prior to the pandemic. It will be doubly true for the next few years. Given this reality, the Internet of Water will prioritize creating technology to make basic tasks easier and creating hubs that exist outside of state and local government jurisdictions.

First, we will pivot to developing thematic hubs where we have the capacity to go that last mile of getting data into hubs in a standardized format and making those data discoverable. If state and local governments would like for their data to be discovered and available on a hub, then the Internet of Water will provide the human and technical resources to enable that effort.

Second, we have learned that there are some key technologies that need to be developed to make it easier for water data to be found, accessed, and made interoperable. The USGS and the Internet of Water have partnered to develop [Geoconnex](#) for the U.S. Geoconnex creates unique identifiers for water data and holds metadata that improves data discovery. Soon, you will be able to google “water data in my town” and the web browser will return all relevant water data identified by Geoconnex. We will also develop HubKit, which is an end-to-end software that will



Geoconnex

create an automated process to ingest, standardize, and serve data through an API. HubKit will also pull the relevant metadata stored in Geoconnex. This approach will make it easy for mini-hubs to be developed nimbly and discovered easily.

Third, we have learned that many of the state and local governments we are asking to share data often lack the capacity to access their own data, let alone other data, from hubs. That is a huge barrier and incentive problem, particularly if we are moving towards thematic hubs. Some federally designed thematic hubs already exist: USGS's National Water Information System, the Water Quality Portal, and the Groundwater Monitoring Network. Each requires some level of expertise to know how to find and collect the desired data, let alone create some type of visualization or analysis. Our initial task will be to develop user-friendly interfaces that enable this community to find and access data from thematic hubs. We want Internet of Water hubs to be used by as many people as possible, particularly the organizations that are sharing their data with the community. We want to create transparency and we want data to drive future policies.

We are excited to focus on these three areas in the upcoming year.

OUR HOPE FOR YOU

This past year has been full of disruption for many of us. Disruptions are hard. Full stop. They also provide opportunities to learn and change how we do things. Our hope is that we can improve how we share water data so that we can make better informed decisions that improve how we steward our water resources, whether it is the creek in our backyard or an aquifer crossing multiple state boundaries. May 2021 bring more water data to your fingertips.