

Advisory Board Meeting

July 17, 2019 Conference Call

Board Members Present (7 of 9)

Kelly Bennett, Martin Doyle, Greg Gearheart, Sam Hermitte, Sara Larsen, Emily Read, Dwane Young

Welcome and Agenda

Sara Larsen began her new position as the Deputy Director position with the Upper Colorado River Commission starting in the beginning of July. For the meantime, she will continue to serve on the Advisory Board in her new role.

Future advisory board meetings will be shortened to one hour to better accommodate schedules. The IoW team will remain available for the following hour for continued discussions with those advisory board members that can remain online.

There will be no advisory board meeting in August due to the IoW team retreat and summer schedules.

Around the Board

The IoW is gaining traction at the federal government and the message is resonating with some state agencies. EPA is allowing Dwane Young to spend more effort working on IoW related activities. Texas has moved forward in developing three data use cases: flood, drought, and groundwater-surface water interactions and are in the process of developing sub-committees and hiring personnel to support these tasks.

There is general excitement in the private sector for companies to blend private and public water data. B3 is currently scoping pilots to create better frameworks for information sharing platforms that allow companies to better augment proprietary data with public data, such as characterizing aquifer structures, real-time pressure pumping data, etc.

Updates from Chair and ED

Organizational Update

The Chair of the Advisory Board is pursuing new board members. [Jeanne M. VanBriesen](#) is a systems engineer at Carnegie Mellon University who has agreed to serve on the advisory board. She provides insight in academic administration and can help with navigating the transition of the IoW to a new governance structure in 2021. The Chair is soliciting interest from a member of the Amazon Sustainability Initiative to gain expertise from the private data service industry. The chair is also soliciting interest from a foundation that is not supporting the IoW to gain perspective on thinking strategically

about foundation relationships. The Chair welcomes other suggestions from the current Advisory Board, particularly for someone with a deeper understanding of local municipal governments.

The IoW team is currently in the process of hiring a policy associate.

The Water Funders Initiative has launched a campaign to raise money for non-profit organizations in the water space. Data is a focus area and they are featuring the IoW.

Pilot Update

The concept notes and conversations are continuing to progress with New Mexico and California pilots. We will touch back on pilots more during another board meeting.

Technical Update

The focus of this meeting is the technical approach for the IoW (see discussion below).

Deeper Dive into Technical Approach

The Internet of Water will develop a set of common tools to advance the IoW strategic goals. These tools will include: (1) a common water data catalog or 'library'; (2) a water glossary; (3) a water data hub inventory; (4) a water budgeting framework; and (5) a water quality data integration framework. The IoW team provided the advisory board with a draft on this common tools framework. The IoW team invites the advisory board to provide additional feedback on the document over the next two weeks.

Is there a missing piece to the proposed IoW framework?

There is a need for the IoW to develop not just data catalogs, but also catalogs of data standards, metadata standards, api standards, and so on. Such a catalog or inventory would help inform people about available standards and could help them decide which standards to use for their data. This could be part of a general catalog framework or a sixth type of common tool.

Initial reactions to the Common Water Data Catalog

The IoW is considering proposing that data producers and hubs construct water data catalogs and the IoW will create a master catalog at Duke and/or CUAHSI. The IoW would provide to states and hubs a list of vendors and technologies that currently exist, such as Kisters, 52 North, Aquatic Informatics, CKAN, DKAN, and Socrata that are SOS (Sensor Operating Standards) compliant. The theory of change is that if hubs and producers being adopting catalogs using the same set of standards, the data would become interoperable.

The Advisory Board was not sure some of these technologies were appropriate for the IoW cataloging effort. There would need to be a detailed scoping process to ensure these technologies can play the role envisioned for the IoW. There are significant differences between Kisters, 52 North and Aquatic Informatics when compared with CKAN, DKAN, and Socrata. The Advisory Board also noted that many state and local governments use Esri products and it will be important to consider the role for Esri to provide geospatial cataloging. There were also questions around whether the IoW will include hydrography as a means for locating data by tracing and finding all relevant data upstream or downstream a location. The USGS has been working on such an approach but it remains unclear how the IoW could incorporate that technology.

The idea for the approach presented by the IoW team arose for the New Mexico pilot, which is built around legislation that required the state to develop a working platform by the end of this year. As such, they required a full featured software with cataloging capabilities to create such a platform. Additionally, the IoW had cost-shared a software engineer with CUAHSI who was exploring the design and the evolution of the CUAHSI cataloging system. Those conversations sparked the idea of developing a series of federated catalogs that a master IoW catalog could then point to and/or retrieve data.

The Advisory Board also noted that the approach outlined by the IoW team might work for SOS compliant technologies, which is a great standard for real-time sensor data, but would not work for other types of data. For instance, impaired water data with a linear representation will not work with an SOS standards. Members of the board suggested a better standard for a catalog would be to use a project level ISO standard that is already broadly used to capture high-level metadata about a project. In that way, the data within the dataset can have whichever standards are best suited to a particular data type.

The IoW team has noticed this weakness in past cataloging efforts where only a general ISO metadata standard is used and the catalog points to data that are in wildly different formats and standards. Conversations with catalog vendors are aware of this weakness and are in the process of developing a workflow to require better standardization of data and the inclusion of metadata around the data, rather than just the project. The opportunity is for the IoW team to use ISO standards for cataloging, then match different water data types with the ideal data standard. The next step is to work with data producers and/or hubs to adopt standards and open APIs. Advisory board members recommended taking DKAN off the list of recommended software because it does not do well with APIs.

California has been attempting to federate datasets into a common platform to meet AB-1755 and are currently testing the CKAN/DKAN catalogs. California has found that the catalog technology is adequate; however, the true challenge is building the pipes from the data to the catalog. For the technology to work well, the data must have a common vocabulary, be machine readable, use standard formats, and have standardized metadata. Advisory board members offered that while creating catalogs has value, the catalogue itself won't solve the fundamental problems that the IoW is well-suited to address. There is a need for the IoW to create common tools and frameworks to help organizations improve their data so they can move seamlessly into a catalog. The IoW can create an inventory and catalog of common ontologies: data standards, metadata standards, vocabularies, API's, and so on. This requires the data producer to change their data collection or the data hub to do the crosswalks to get raw data into an

interoperable format. If the data flow easily then they can flow into any platform and may not require a proprietary solution. Without addressing the underlying data challenges, the IoW could create a non-functional data library. It may be helpful to explore interoperability efforts in the energy and health sector.

The Advisory Board repeated concerns identified in the initial IoW report that the approach the IoW establish an approach that ensures the data opening and cataloging architecture will not limit participation by requiring a rigid set of standards for participation. The long-term goal is to move towards standardization through a collaborative approach with participants. There was also a discussion about whether the IoW should simply create a catalog or go an extra step by providing data delivery. The general consensus seemed to be that an IoW central catalog should not go as far as data delivery.

Initial reactions to the Water Budget Framework

The water budget framework will document the frameworks currently used to create water budgets by the federal government, California, and other Colorado River Basin states. The specific components of this framework are the:

- (1) water budget components are currently part of methods (surface water, groundwater, evapotranspiration, etc.),
- (2) estimation methods for each water budget components
- (3) parameters and data input requirements for each estimation method
- (4) available data sources for each parameter and data input
- (5) the spatial and temporal coverage of the water budgets

The IoW will build an ontology of water budgets that will show similarities and differences between federal and state methods. As recommended by the Advisory Board, this process will be purely descriptive and not go the additional step of providing recommended approaches. The Advisory Board was pleased with this approach and the value it can provide in further discussions and methods around water budgeting. This approach can catalyze conversations and discussions around the pros and cons of different data, estimation methods, and approaches.

Water savvy individuals will recognize the value of the IoW engaging in a water budget exercise; however, a challenge will be communicating the value proposition to non-water experts. A value proposition for the private sector, particularly oil and gas, might be to help industries understand their role and contributions to a water budget from a policy standpoint. Does produced water count as a discharge, etc.? The concept of a water budget is politically charged and the IoW may provide a pragmatic construct for large private industries to understand and find their role.

Initial reactions to the Water Quality Framework

Water quality is a component of the water budget, however water quality is also incredibly complicated and in need of it's own framework. The water quality framework can then feed into a water budget. The Advisory Board recommended a two-step approach. First, inventory and understand the diversity of

water quality components to ensure the framework can encompass all types of water data. There may be value in also considering future types of water quality data, such as environmental DNA and citizen science data. Second, take a similar approach to the water budget, but instead of starting at a specific location (water quality challenges are ubiquitous across the nation), start with a specific water quality challenge. Specific water quality challenges could be trash, PFOS/PFAS, chemistry-based, nutrients, harmful algal blooms, emerging contaminants, etc. The water quality framework could also build on existing water quality platforms such as the Water Quality Portal.

Next Steps

The IoW team will revise the technical approach regarding cataloging based on the suggestions of the Advisory Board. The IoW should also continue its focus on common tools and pathways for data producers and hubs to improve data structures and flows prior to being ingested in a catalog. The IoW could provide roadmaps for different types of water data and a menu of resources for how to get from point A to point B, with the pros and cons for each method. This would allow producers and hubs to make their own informed decisions and come to solutions that work best for their needs while getting the data into common standards (data, metadata, and APIs).