Technology Adoption at Public Agencies

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In the US, water data are collected by a variety of public agencies each with its own data standards, formats, platforms, and sharing protocols. There is variability not only between different states, but also between public agencies within the same state, and even between departments within the same public agency. This data fragmentation makes it difficult for potential data users to find the data they need, and once they've found it, to standardize the data so that they can integrate it with other datasets. As a result, decision-makers are often forced to make judgments without the benefit of a complete picture of their water resources.

To build an accurate water picture, public agencies must modernize their water data infrastructure. Modern water data infrastructure is an integrated system of information technologies, which includes common standards, formats, and tools designed to make water data easy to find, access, and use. Modern water data infrastructure does not necessarily have to be "new." Rather modern data infrastructure is optimized to meet the needs of all users. In some cases, the newest technology may not be the most accessible. The rapid pace of digital innovation and environmental change cause user needs to change rapidly as well. Modern water data infrastructure is designed to adapt to users' evolving needs.

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THE TECHNOLOGY ADOPTION RESEARCH PROJECT

If there is a clear need for modern water data infrastructure, why is the pace of technology adoption at public agencies lagging so far behind user needs? In the

spring of 2021, the the Nicholas Institute for Environmental Policy Solution's Water Policy Program launched the Technology Adoption Research Project to assess the current state of water data infrastructure at public agencies, learn more about the process of technology adoption within those agencies, document their successes, and identify the barriers they face when attempting to adopt new technology or technological processes.

READ THE FULL REPORT

In collaboration with the Water Data Exchange of the Western States Water Council, the American Water Resources Association, the American Water Works Association, the Association of Clean Water Administrators, the Association of State Drinking Water Administrators, and the Environmental Council of States, the Water Policy Program team administered a twenty-three-question survey via listservs and social media outlets, followed by in-person interviews of participants. The results revealed technology adoption challenges unique to public agencies. Generally, these challenges were rooted in four causes: lack of demand, necessary transparency, competing priorities, and generational conflict.

LACK OF DEMAND

In the private sector technology adoption happens at a faster pace because market demand incentivizes companies to modernize. In the public sector, there is no demand signal. Instead, public agencies are driven by the need to reliably deliver public services within their budget and in accordance with their mission.

NECESSARY TRANSPARENCY

When the private sector fails or makes a mistake in technology development, they don't have to share that information with the public. But when a public agency fails, transparency requirements often make that failure public knowledge. This can lead to public outrage around the misuse of tax dollars, and as a result, public agencies tend to be risk-averse.

COMPETING PRIORITIES

Private organizations can change their priorities based on a dynamic market-driven mission and can quickly implement unilateral decisions across divisions to support these priorities. Public agencies' missions are often established in law and are not as flexible as those of private organizations. Each agency has a unique mission that it must fulfill. Competing priorities at different public agencies can make cross-agency coordination and centralized data management difficult.

GENERATIONAL CONFLICT

Public agencies often have multiple "generations of technology" under one roof. This causes technical and cultural conflicts and often results in resistance to technology adoption within and between agencies. Today's systems are not only built upon legacy technologies, but also the thinking that created them.

TECHNOLOGY ADOPTION RECOMMENDATIONS

While these challenges are significant, they are not insurmountable. This assessment does not mean public agencies need to be more like private organizations. Instead, public agencies need to approach technology adoption with a greater level of intentionality than private sector organizations so that they can surpass the barriers they face and develop data infrastructure systems that are sustainable over time.

The Water Policy Program team developed the following recommendations for technology adoption at public agencies based on the survey and interviews conducted during the Technology Adoption Research Project, as well as best practices in the field of digital transformation, and lessons learned from community and public agency engagement during the 18-month pilot period of the Internet of Water project.


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IDENTIFY AND PROVIDE INCENTIVES FOR DATA MODERNIZATION

One of the main barriers to technology adoption identified by the survey was a lack of funding. Currently, there is no incentive for public agencies to carve out portions of their limited budgets for data infrastructure modernization. Even though data infrastructure modernization provides cost savings in the long term, the benefits are not immediately apparent and, like any significant organizational change, there is always a risk of failure.

Tying grants or other funds to data

infrastructure modernization would provide an incentive for agencies to bring their data systems into compliance with standards and best practices for improved data discoverability, accessibility, and interoperability. This could include grants offered by federal agencies as well as philanthropic and other non-profit organizations. Grantors should be provided with standards and best practices to include in their grant requirements. In addition to funding discrete data infrastructure modernization initiatives, these grants would also provide in-house demonstrations of the benefits of technology adoption. This could help convince resistant leadership to adopt data infrastructure modernization more broadly and urge policymakers to develop sustainable funding sources to support these initiatives.


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CONNECT INFORMATION DELIVERY WITH POLICY OUTCOMES

While leaders often tout "data-driven decision-making," participants in the study and pilot period engagements struggled to provide evidence of decisions directly informed by data. Decision-makers who have not had access to the information they need in the past often continue to fall back on their traditional methods of decision-making. Agencies must develop clear avenues of information delivery to provide decision-makers with relevant, timely, and easy-to-use data and information. To promote continued support of technology adoption, agencies should compile evidence of how their data infrastructure modernization efforts have directly improved or informed decision-making.

RESOLVE ISSUES WITH PROCUREMENT PROCESSES

Public agencies often hire contractors to build data infrastructure and tools because they do not have this capability in-house. If specific guidance on data standards and best practices are not provided in the contract documents, these systems and tools may not adhere to modern water data principles and may be

difficult to maintain or adapt to meet future needs. Guidelines should be developed for agency procurement contracts to ensure that contractors follow modern data principles, meet agency needs for sharing and interoperability, and build in plans for sustained maintenance.

IDENTIFY A LEADER FOR CROSS-AGENCY COMPLIANCE AND ESTABLISHMENT OF STANDARDS

There must be an owner—a single decision-maker who is responsible for data infrastructure modernization across agencies or divisions. This ensures cross-agency compliance with data standards and best practices and facilitates better coordination and communication between agencies and divisions. A Chief Data Officer or Compliance Officer could fill this role, but it's important that they are not only well versed in modern data management but also have subject matter expertise and an in-depth understanding of agency needs. This ensures that the data infrastructure developed is rooted in the agency context and responsive to changing agency needs. Investing in expertise and management reduces inefficiencies, facilitates resource sharing, and supports a holistic approach to systems management.

INVEST IN MODERNIZATION AND TECHNOLOGY ADOPTION TRAINING FOR WATER LEADERS

On-site technology adoption training would help public agencies overcome the barriers to modernization. On-site training allows for one-on-one meetings with key leaders, as well as collaborative working sessions with agency staff from different divisions and with differing levels of authority. This type of training ensures that agency leaders, IT staff, and staff who use or produce data are working towards shared goals. Completing the training in their own data environment also provides an opportunity to work through potential challenges during the training, preventing projects from being stymied before they get off the ground.

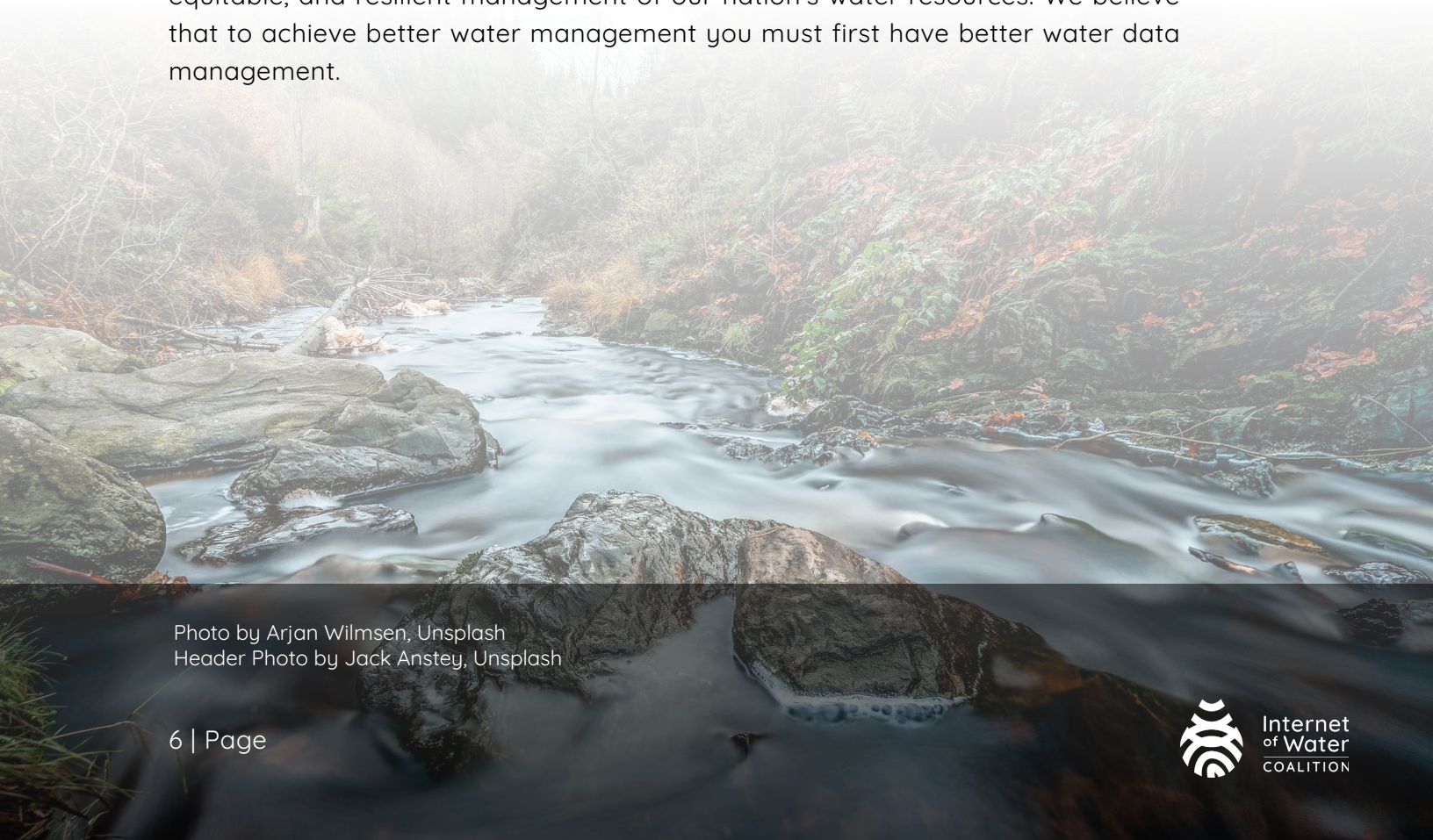
The Nicholas Institute Water Policy Program is currently developing a Technology Adoption Program modeled after the Harvard Evidence for Policy Design program, which would provide on-site technology adoption and data modernization training for public agencies. With this program, we aim to narrow the cultural divide between different generations of technology, equip leaders with the knowledge they need to engage with their staff about modernized data infrastructure, and help assuage the resistance and fear surrounding technology adoption.

MOVING FORWARD

The Technology Adoption Research Project revealed a strong desire for data infrastructure modernization within state agencies that manage water resources across the US. It also illuminated significant barriers that have prevented many of these agencies from implementing large-scale data modernization projects in the past.

The Infrastructure Investment and Jobs Act, signed into law on November 15, 2021, commits $55 billion to modernize America's water infrastructure. As part of that investment, the U.S. Environmental Protection Agency (EPA) will receive $15 million for grants to pilot projects aimed at more easily sharing information on water quality, water infrastructure needs, and water technology between state and local agencies. The law states that the "Internet of Water Principles developed by the Nicholas Institute for Environmental Policy Solutions" should guide these efforts. This funding will help state agencies overcome one of their most substantial barriers to data infrastructure modernization, a lack of funding.

The IoW aims to help state agencies overcome the other barriers revealed by our research through our Technology Adoption Program and by developing other resources and tools to support state agencies as they work towards modernization. Our goal is a future where decision-makers at all levels can access the data and information they need to adapt to water challenges and ensure sustainable, equitable, and resilient management of our nation's water resources. We believe that to achieve better water management you must first have better water data management.



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