

# Legislation for Modern Water Data Infrastructure

Enabling Informed Decision-Making for Better Water Management Outcomes

## Policy Recommendations

States who wish to develop water data legislation can look to successful examples in California and New Mexico.

In each case, components of the legislation that ensured success included:

- 1) inclusion of all major water-related agencies,**
- 2) the required release of appropriate data from these agencies,**
- 3) requirements for data and metadata standards,**
- 4) and a public-facing portal built upon concepts of user functionality and usability.**

## WHAT IS MODERN WATER DATA INFRASTRUCTURE?

An integrated system of 21st century information technologies, which includes common standards, formats, and tools designed to make water data easy to find, access, and share online. This system is connected by an organizational network of water data producers, users, and hubs, in which hubs provide structured sources of standardized water data aggregated by theme or geography.

## EXECUTIVE SUMMARY

To date there are very few legislative efforts that address water data infrastructure. Only two states, California and New Mexico, have passed legislation specifically directed at water data that maps out the activities and requirements for a modern water data infrastructure. Most current water data systems in the United States are antiquated and increasingly inadequate for addressing growing water management challenges. Unable to answer basic questions about our water systems, water resource managers are left to rely upon disparate and fragmented data infrastructure. This fragmentation often leads to high transaction costs as the time invested to find, clean and standardize the data leaves little time to put the data to work to gain new insights. Many organizations, private or public, have to make real-time decisions with the data on-hand, which may not provide all of the information needed to make critical decisions about water management.

The potential of previous efforts to open data, such as the Government in the Sunshine Act and the subsequent Executive Orders on open data, have largely been unrealized. Many states lack the capacity to fully convert their existing data systems to modern data infrastructure. While good leadership at the agency and departmental level can overcome the absence of policy or legislation, good leadership is transitory and lacks the direct allocation of resources that legislation provides. In other words, policy is a necessary step.

## SCOPE OF THE PROBLEM

Decision-makers at all levels of government require modern, integrated water data and information as they work to carry out a wide range of water-related missions. In addition to technical tools, effective policy can be a powerful instrument

to improve an agency’s capacity to share and integrate data. This will increase transparency and technical integration, improving agency and public decision-making about water resources.

Governments seeking to strengthen water data policy to advance and support modern water data infrastructure may choose to develop policies at three levels: legislative, executive, and departmental. Legislative mandates and executive actions can be strong starting points, because they compel departments and agencies to respond. These legislative and executive mandates are most effective when they are accompanied by human and financial resources for implementation; both are critical for the

successful implementation of a modernized water data infrastructure.

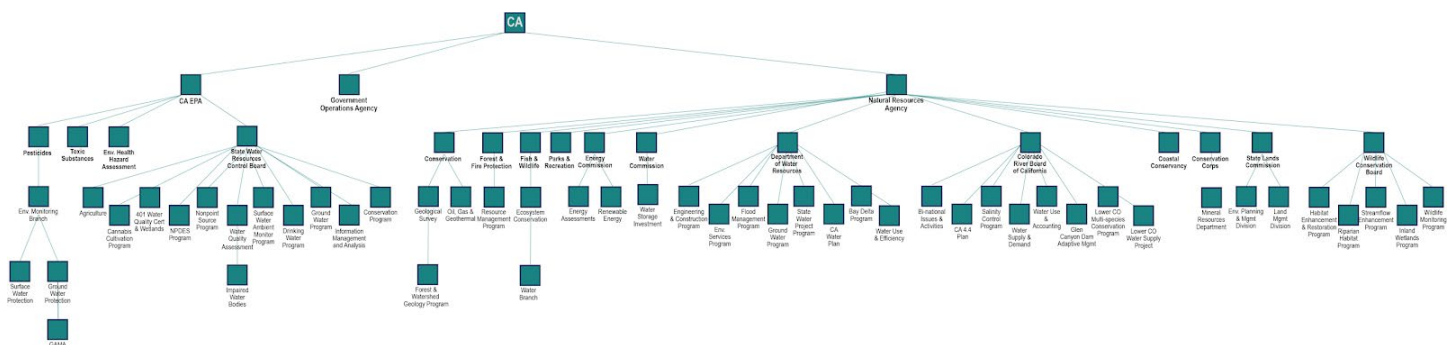
To date, there are very few legislative efforts that address water data infrastructure specifically. Only two states, New Mexico and California, have existing legislation, the [2019 Water Data Act](#) and the [2016 Open and Transparent Water Data Act](#), respectively. The incentives for water data legislation, however, are growing. In many cases water data legislation can help states better position themselves to deal with growing water-related challenges, such as climate change, population growth, the depletion of aquifers, and harmful algal blooms. These factors create a motivation to address the challenges associated

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Table 1: Data Fragmentation (Number of Entities Collecting Water and Number of Water Data Platforms across a sample of states inventoried by IoW).

Government	Overseeing Entity Collecting Water Data	Sub-Entities Collecting Data	Total Number of Entities	Data Platforms
Federal	13	29	42	56
California	2	59	61	34
New Mexico	9	49	58	47
North Carolina	6	36	42	45
Texas	27	96	123	97
<b>Total</b>	<b>57</b>	<b>269</b>	<b>326</b>	<b>279</b>

Figure 1: Data Fragmentation in California (California Water Data Sources)



with modernizing their aging water data infrastructure.

Support for water data legislation is rooted in the open data movement, and furthers many of the same goals. Developing sound policy that supports modern water data infrastructure creates various benefits, including cost-efficiency, improved water resources management, the promotion of water as a public trust, and the extension of other programs supporting transparency in government activities.

## POLICY RECOMMENDATIONS

While most state agencies responsible for monitoring or testing water supplies do have data available for public consumption, the data are often not interoperable. To give a sense of the scale of the problem, the number of agencies in each state that have at least some water data can range up to 40 agencies, each with their own way of recording, reporting, and storing their data.

In most states, there is currently no system to integrate data from multiple agencies for the purpose of region-wide decision-making. This lack of integration limits the potential of the data to support critical decision-making about the current state of water resources. **Inclusion of all major water-related agencies in any policy is necessary to capture and standardize all relevant data, and to ensure interoperability of data across agencies.**

Ideally, past efforts at the federal level to promote open data practices would have resulted in increased efforts at the state level to do the same, and a **requirement to release appropriate data from state agencies.** However, the effects of the 2013 Executive Order and the 2016 Federal Open Data Act on state open data policy has been minimal.

Despite federal agencies being required to make their data available and machine-readable, these requirements to open data and follow data standards have not transferred to the states, even in cases in which an open data portal exists. This lack of action is due, in part, to the fact that state capacity to build such portals is limited, and the Federal Open Data Act does not improve the state's ability to create a portal, either through funding or other resources.

While there are only two states that have water data legislation, there are many that have an open data portal where information from state agencies is shared in some form. However, many existing portals have failed to improve access and interoperability of water data. This is largely due to three factors: a) the portals can be difficult to use, which discourages users from interacting with and using the data as intended; b) portals are incomplete, failing to include all relevant data; and c) the data tends to be unstandardized, lacking interoperability with the other data in the portal.

**To be effective and ensure long-term sustainable use, public-facing portals should be functional (they do what they are intended to do), usable (a user can reasonably achieve their intended goals), and conform to data and metadata standards.** Without required standards, the time spent cleaning and integrating data for each use, in each agency, for each user, becomes cost and time prohibitive. Any movement towards open data portals for states will be driven by state-level efforts and will likely not have the benefit of federal support.

# PROCESS RECOMMENDATIONS

## TO ENSURE THE SUSTAINABILITY OF WATER DATA LEGISLATION

### 1) Public engagement is critical

In both circumstances, engagement with the public served as the vital starting point to successful legislation and its outcomes. An engagement and education campaign greatly increases the chances that the legislation will be successful, and that the participating agencies will be active partners in the process. In California, a series of conferences and listening sessions helped the agencies better understand what members of the public wanted in an open water data portal, and the agencies were then able to respond appropriately. This process also helped uncover several unexpected challenges to the existing data, which are now able to be addressed. Engagement with the public also helped agencies determine which datasets should be prioritized and released first onto the portal. In New Mexico, education and engagement sessions helped agency leadership as well as agency personnel understand the importance of data integration and the challenges in accessing data from agencies outside their own.

### 2) Establishing a lead agency and identifying participating agencies reduces inter-agency conflict and bureaucratic inefficiencies

Establishing a hierarchy of involved agencies and the leading agency within the legislation is critical to sustained progress. While the decision regarding the lead agency will vary state to state, it is recommended that this decision favor an agency with a history of collaboration and public outreach.

### 3) User engagement should guide the development of public-facing portals

The public-facing portal is an important outcome of water data initiatives. The usability of the portal must be part of the initial design to ensure the general public or other identified audiences can use the portal for its intended purpose. Portals with difficult user interfaces result in frustration and dissatisfaction, reducing engagement with the portal. Ensuring the public can access the information in meaningful ways is a critical metric for success.

### 4) Data inventories are a key starting point

An inventory of the existing data that agencies control is the starting point for a successful water data initiative and should be required in any legislation. The process of a data inventory can be illuminating to agencies, revealing difficulties in discoverability, accessibility, and usability of their datasets. A data inventory is also an important step in educating agency leadership and personnel on the challenges and inefficiencies of data fragmentation, and the need to invest in modernized data infrastructure. [View example data inventories created by the Internet of Water.](#)

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# APPENDIX

## SAMPLE LEGISLATIVE LANGUAGE FROM CALIFORNIA AND NEW MEXICO

### CALIFORNIA

The department, the state board, and the Department of Fish and Wildlife shall coordinate and integrate existing water and ecological data from local, state, and federal agencies.

Recipients of state funds through grants or contracts for research or projects relating to the improvement of water or ecological data shall, as a condition of the receipt of a grant or contract, adhere to the protocols developed pursuant to subdivision (a) for data sharing, transparency, documentation, and quality control.

The statewide integrated water data platform created pursuant to Section 12410 shall, at a minimum, do all of the following: (a) Integrate existing water and ecological data information from multiple autonomous databases managed by federal, state, and local agencies and academia using consistent and standardized formats, (b) Integrate the following datasets, as available: (1) The department's information on State Water Project reservoir operations, groundwater use, groundwater levels, urban water use, and land use, (2) The state board's data on water rights, water diversions, and water quality through California Environmental Data Exchange Network (CEDEN), (3) The Department of Fish and Wildlife's information on fish abundance and distribution, etc.

### NEW MEXICO

(The listed agencies shall) integrate: (a) state and local government data on streamflow, precipitation, reservoir and irrigation system operations, groundwater use and levels, municipal and industrial water use and land uses, but not including data from residential wells; (b) data on water rights, water diversions and water quality; and (c) data on fish, aquatic and riparian systems and ecological data; and C. "water data" means measurements of basic properties relating to the planning and management of water resources, including streamflow, precipitation, ground water, water quality and water use in agriculture, industry and municipal uses and natural systems.

The New Mexico institute of mining and technology shall establish a "water data account" to receive appropriations from the legislature and gifts, grants or donations for the Bureau of Geology and Mineral Resources to carry out the purposes of the Water Data Act