

Policy Brief

Leveraging data-driven decision-making to improve water resilience

CURRENT STATUS

Europe is confronted by increasing challenges from climate change, pollution, floods, droughts, and a growing demand for water services. Data-driven digitalisation is recognised as a critical enabler to address these challenges. However, its impact depends on the availability and accessibility to high-quality, interoperable data.

As a central component of the EU Water Resilience Strategy, the Commission has introduced a Digital Action Plan, aimed in part at facilitating data sharing. The core issue is not a shortage of water data, but rather that such data remains fragmented and isolated. Across Europe, data on groundwater, rivers, wastewater, pollutants, coastal waters, infrastructure, and ecosystems are collected daily by authorities, utilities, laboratories, researchers, and private companies. Yet much of this data remains confined within local systems, sector-specific formats, and institutional silos.

This fragmentation now constitutes a strategic risk. Disconnected water data reduces Europe's ability to act effectively. It hampers the development of a digital water economy and slows, complicates holistic decision-makings on water management plans, water extraction, waste-water treatment, permitting, environmental assessments.

DESIRED FUTURE SITUATION

- Public authorities, universities, the private sector and citizens cooperate to share interoperable data, which are then used to inform future decision-making by the same stakeholders.
- Raw data is made interoperable across multiple environmental sub-domains and is made accessible to all immediately upon registration.
- Knowledge products or refined datasets are derived from the raw data with transparent data lineage and are shared among the stakeholders.
- Overall IT development and operational costs are reduced through joint development and operation of standard components.
- The needs of water-data users are continuously monitored to ensure that investment in data delivers maximum value to society.

THE DIGITAL ACTION PLAN

The EU Digital Action Plan has the two themes:

- Deployment of digital solutions through funding and knowledge-sharing to build up digital skills and encourage technology transfer in the water sector; and
- Support to water data sharing by fostering the development of national data portals to overcome fragmentation and make data easily findable, accessible free of charge, interoperable, and reusable, in line with the requirements of the Open Data Directive.

Water4All contributes to this agenda by proposing a European Water Data Ecosystem enabling data sharing as a foundational pillar for digital transformation by leveraging key learnings from the Danish Environmental Portal.

OUR RECOMMENDED ACTIONS

Below please find five recommendations:

1. Treat water data as strategic infrastructure
2. Enable better decisions with data
3. Promote interoperability at source and use FAIR principles
4. Establish National Water Data Portals as trusted intermediaries
5. Develop shared components as open-source software

Each of these recommendations are described in more detail on the following pages.

RECOMMENDATION 1: TREAT WATER DATA AS STRATEGIC INFRASTRUCTURE

Water data should be recognised as strategic digital infrastructure for Europe's water resilience, climate adaptation, environmental protection, and competitiveness.

This requires a change in the attention to leadership.

Data management can no longer be treated as a back-office technical function. It must be governed with the same level of rigour applied to finance, physical infrastructure, cybersecurity, and regulatory compliance.

Water data infrastructure requires:

- Long-term operational funding
- Clear ownership
- Governance across institutions
- Defined responsibilities for data producers and data users
- Investment in shared components
- Leadership-level accountability.

Project funding alone will not build infrastructure. Pilots alone will not create trust. Strategies alone will not move data.

Actions

- EU institutions and Member States should explicitly recognise water data infrastructure as a core pillar of water resilience and digital transformation.
- Funding programmes should prioritise long-term data infrastructure, not solely short-term innovation projects.
- Public authorities should assign clear leadership-level responsibility for water data governance.

RECOMMENDATION 2: ENABLE BETTER DECISIONS WITH DATA

Europe faces substantial investments to achieve water resilience. This involves improving the environmental quality of the water bodies in Europe; mitigating climate change risks, including flooding and drought; securing access to safe drinking water, ensuring sufficient water for agricultural and industrial use and providing appropriate mitigation of human impacts, including wastewater treatment

These investments must be based on the highest-quality data available. A sector-by-sector approach is no longer adequate; data must be integrated across:

- Groundwater, surface water, wastewater, coastal waters, and marine systems
- Public authorities, utilities, laboratories, researchers, and private companies
- Local, regional, national, and European levels
- Environmental data and technical infrastructure data
- Open public data and governed access to sensitive data
- Data accessibility immediately after creation.

This requires more than digital tools alone. It demands a shared data infrastructure. Without such an infrastructure, Europe risks developing various local digital solutions on fragmented foundations. This may create short-term innovation, but it will not deliver systemic transformation.

Building a shared data infrastructure requires a clear focus on user needs. Not all data have equal value.

Actions

- Conduct studies to quantify the value of water data for different users and needs.
- Conduct assessments to identify the changes required to the existing systems to meet these needs.
- Analyse current and future political priorities to demonstrate the value of water data in the investment decisions by public authorities, water utilities, the private sector, and other stakeholders.

RECOMMENDATION 3: PROMOTE INTEROPERABILITY AT SOURCE AND USE FAIR PRINCIPLES

The water data landscape in Europe must be transformed so that public authorities, universities, the private sector, and citizens collaborate to share interoperable data, which can then inform future decision-making by all stakeholders involved.

The benefits of this approach is substantial. Some estimates indicate that ensuring data collected for one purpose can be reused for others yields a return on investment of up to twenty-fold. This makes it one of the most compelling investments a society can make.

The more interoperable the data, the greater the value for the society. A Danish study on harmonizing chemical parameters across groundwater, drinking water, surface water, and wastewater demonstrates that the lack of standardisation imposed significant costs. All, from data producers, laboratories to national authorities was required to invest time and resources in translating the data. The introduction of a harmonised chemical standards list was estimated to deliver benefits exceeding €13 million.

To achieve interoperability and promote data sharing the following obstacles must be overcome:

- Data standards across sub-domains must be harmonized
- Data must be shared as soon as possible and not after lengthy quality assurance processes
- Data must be viewed as a key deliverable not as a byproduct
- Data producers must focus on the needs of data users.

The environment is interconnected. Therefore, environmental data must also to be interconnected.

Actions

- Mandate or promote the sharing of water data by public authorities, utilities, universities, and the private sector, with publicly funded data made openly accessible by default.
- Prioritize the availability of raw data immediately after creation, accompanied by a quality label indicating that the data is not yet validated.
- Promote data standardisation, e.g., by developing a conceptual data model for water. Thus, promoting interoperability of water data across sub-sectors
- Adjust EU requirements in directives, standards, and reporting requirements so that they are aligned and promote standardization.

RECOMMENDATION 4: ESTABLISH NATIONAL WATER DATA PORTALS AS TRUSTED INTERMEDIARIES

National Water Data Portals should form the backbone of Europe's water data infrastructure. Their purpose should be to assemble, harmonise, and provide access to water data across the entire water cycle, including groundwater, surface water, wastewater, coastal waters, and marine environments. While publicly funded or mandated data will constitute the core of this backbone, the ambition should be to incorporate data from the private sector and other sources to create the strongest possible data foundation. This will enable better decision-making by ensuring that data collected for one purpose can be reused for many others.

Organizational design is critical. If a National Water Data Portal is housed within a single organizations and optimized around that organization's priorities, it risks becoming yet another silo with a public interface. If, instead, it is established as shared infrastructure, it can focus on the needs of data users. National Water Data Portals should therefore operate as trusted intermediaries. They should:

- Be co-owned across relevant organizations
- Have secure, long-term operational funding
- Support a wide range of users and use cases
- Act as a facilitator between data producers and data users
- Prioritize access to data through API's, with limited user interfaces where appropriate
- Facilitate the gradual harmonization of data production so that data becomes interoperable at the point of creation
- Offer guidance and support to both data producers and data users.

Actions

- Member States should establish or strengthen National Water Data Portals as shared public digital infrastructure.
- Conduct a study on best practices for Water Data Portals, drawing on experience from other data initiatives such as data spaces.
- Based on this study, develop guidance defining principles for governance, openness, interoperability, funding, and mandate.

RECOMMENDATION 5: DEVELOP SHARED COMPONENTS AS OPEN-SOURCE SOFTWARE

If Europe is serious about building a Water Data Ecosystem, the policy framework must incentivise shared infrastructure, data reuse, and interoperability.

The current IT landscape for water data in Europe is highly fragmented. Solutions have been developed by individual organisations, each optimised for narrow institutional needs.

This fragmentation acts as a barrier to data sharing, as each system relies on its own data models and standards. This reduces the value of the data for others.

Experience shows that the ongoing effort to align central IT systems with decentralised ones is expensive. It is more cost-effective to serve all users through centralised system. However, a fully centralised system may fail to accommodate local priorities and may face resistance from vested interests.

Therefore, rather than building a centralised system, the recommended approach is to develop shared software components. These components could, e.g., be:

- Access to a semantic baseline for relevant sub-domains, such as those endorsed by OGC and WMO e.g., WaterML2 Part 3 and 4: Surface Hydro Features, and GroundWaterML2
- Standardised code lists accessible via APIs, such as harmonised chemical parameter lists
- Components for managing data exchange with laboratories, planning processes, and quality assurance
- A standard metadata catalogue and data-distribution components.

This approach preserves local flexibility, reduces overall IT development costs, and improves standardisation.

Action

- Commission a study to identify potential shared components and the barriers to their widespread adoption.
- Ensure EU funding programmes prioritise the development of shared open-source components, and systems across Member States and EU institutions.
- Commission the development of standard code lists by the European Commission, in cooperation with the EEA and selected Member States, and provide funding for their ongoing maintenance.

THE WATER4ALL WHITE PAPER FOR FURTHER READING

<https://www.water4all-partnership.eu/joint-activities/data-sharing>



The Water4All Partnership, co-funded by the European Union within the frame of the [Horizon Europe programme](#), aims at enabling water security for all. It will boost systemic transformations and foster the matchmaking between problem owners and solution providers.

Launched in June 2022, Water4All brings together a wide and cohesive group of 90 partners from 33 countries in the European Union and beyond.

<https://www.water4all-partnership.eu/water-security-planet>