

## Water governance: addressing research and innovation gaps in the future. The Water JPI perspective.

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**Abstract:** *Water governance has been the object of numerous projects and international initiatives. From the perspective of Water JPI, this paper lays out knowledge gaps on water governance that should be addressed in the future through research and innovation (R&I). These knowledge gaps are grouped into different categories, including strategic policy and management, capacity development, communication and awareness, stakeholder participation, and the monitoring and evaluation (M&E) of implemented actions. The contents of this paper are key for national research funding agencies, which are usually challenged with the identification of topics to support within the frame of national research programmes. It is also relevant to the scientific community, which can get a better understanding of water governance topics with high support from research funding operators.*

*Scientific breakthroughs play an important role in improving water governance through the production of tools and methods for the acquisition of data, the delivery of decision-support tools, and the development of M&E frameworks. Progress is still needed in the co-design of solutions with stakeholders; the full roll-out of opportunities provided by citizen science, stakeholder engagement, and the better understanding of concepts related to water allocation vs water demand, social innovation, water trade-offs, virtual water use, water accounting and stakeholders' water value.*

*Amongst other recommendations, the Water JPI pleads for a better valorisation of R&I project results through the launch of a collaborative platform with other initiatives. It invites representatives of all these initiatives to reflect on funding opportunities and the possible structure of such a communication platform.*

*Theme 3. Water and Society / Sub-Theme 3.1. Water security indicators as a tool to improve water management.*

**Keywords:** *co-design, governance, inclusiveness, knowledge gaps, joint activities.*

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### 1. INTRODUCTION

Water governance refers to political, social, economic and administrative systems to develop and manage water resources as well as the delivery of water services at different levels of society and for different uses<sup>6</sup>. It embraces policies, strategies, plans, finances and incentive structures that concern or influence water resources; the relevant legal and regulatory frameworks and institutions; and planning, decision-making and monitoring processes<sup>2</sup>. It is through water governance that water authorities and involved stakeholders more generally define their roles and responsibilities, negotiate their relationship to water

resources, articulate their interests and have their concerns considered, set up priorities and actions in a transparent, equal, fair and accountable manner, and amend their differences<sup>4,5</sup>.

Good governance is crucial in ensuring access to water and sanitation services. Research and innovation play a key role in the provision of knowledge and solutions to tackle current and emerging water challenges, but no real progress can be made if appropriate water governance is not in place. Good water governance can be attained if the following conditions are met: 1) stakeholders are properly engaged in the policy formulation process; 2) institutional and regulatory frameworks are established; and, 3) there is adequate, transparent and accessible information<sup>4</sup>.

Thus, improving water governance is a strategic action pillar for numerous international organisations, multilateral initiatives and expert groups (OECD, UN-Water, FAO, or the International Water Association, to cite just a few examples). Amongst other activities, all these international frameworks advise and inform water authorities at all levels, stakeholders and civil society on the formulation, implementation and evaluation of water policies whilst recognising the socioeconomic, political and environmental specificities of each context. From a research and innovation perspective, water governance is the object of European and international programmes including, amongst others, the European Commission's Framework Programme, the Partnership for Research and Innovation in the Mediterranean Area (PRIMA, [www.prima-med.org](http://www.prima-med.org)), the Baltic and North Sea programme (BANOS, [www.banoscsa.org](http://www.banoscsa.org)) or the Belmont Forum.

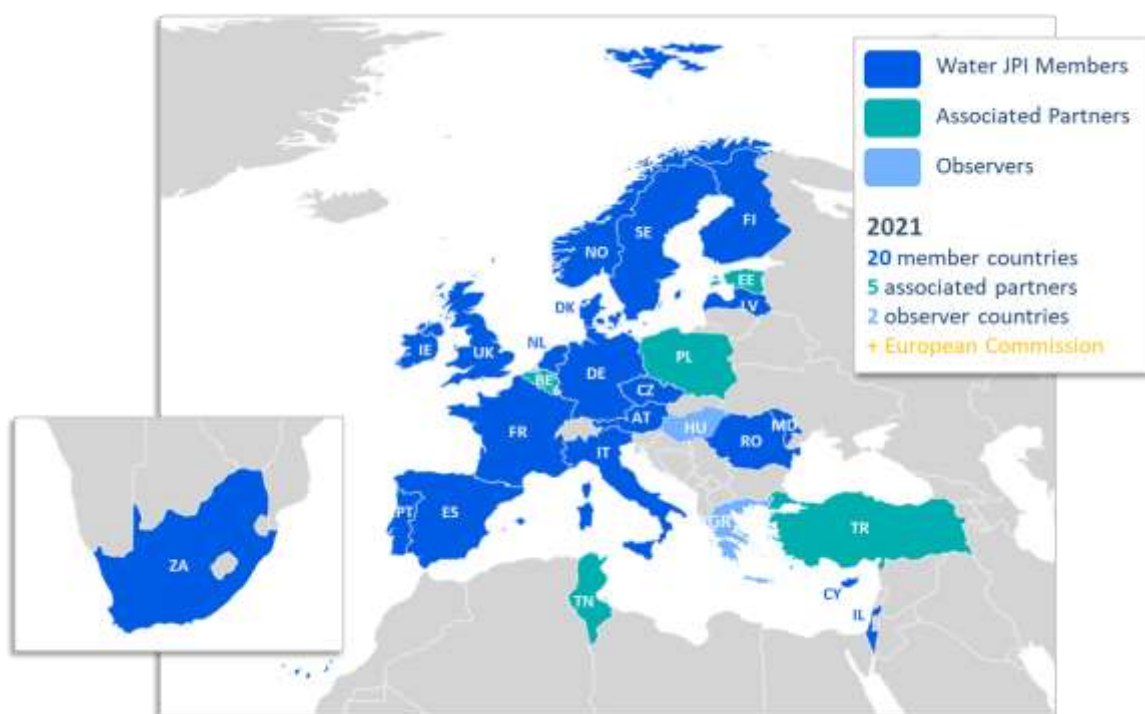
Improving water governance is also one of the strategic orientations of the Water Joint Programming Initiative (Water JPI), an intergovernmental research and innovation programme launched in 2011. Building upon the experience and the knowledge accumulated by the Water JPI and its groups of experts, the purpose of this paper is to **provide an insight into water governance issues for which research and innovation activities are recommended in order to enhance water governance in integrated water management in the future**. With this purpose, this paper takes into consideration the contents of the strategic agenda of the Water JPI as well as proposals made by an internal and informal working group.

This paper is particularly useful to **research and innovation funding operators**, which are usually challenged with the identification of priority areas to support within the frame of national or multilateral research programmes, or, for the same reason, to **water policy makers or stakeholders involved in the design of research and innovation programmes**. Contents are also relevant to the **scientific community**, which will develop a better understanding of water governance topics having received high political support from Water JPI members (i.e. national research funding agencies/ ministries).

The paper is structured as follows. The **following chapter** presents the Water JPI and spells out Water JPI's activities conducted in the field of water governance. **Chapter 3** presents main water governance topics for which research and innovation should be ensured. **Chapter 4** describes the aims and activities of an informal Working Group on water governance recently launched by the Water JPI. Conclusions and recommendations are given in **Chapter 5**.

## **2. RESEARCH AND INNOVATION ON WATER GOVERNANCE; THE CASE OF THE WATER JPI**

The Water JPI “Water challenges for a changing world” is an intergovernmental research and innovation programme that brings together partners from 27 countries (**Figure 1**). As an intergovernmental initiative, all its partners stem from research agencies/ ministries in charge of their national research programmes (i.e. research funding operators).



**Figure (1).** Water JPI Consortium.

The Water JPI encourages the participation of non-member countries as a way to strengthen international cooperation and enhance research and innovation capabilities. Countries like Brazil, Canada, Egypt, Morocco and Taiwan have joined specific Water JPI activities.

When launched in 2011, the Water JPI’s primary goal was to **align the national agendas of its members** through the identification of commonly agreed water research and innovation priorities. Such priorities are laid out in the Water JPI’s Strategic Research and Innovation Agenda (SRIA), for which different versions have been delivered in order to integrate emerging challenges in water as well as new strategic priorities arising from latest scientific and political developments. Thus, a first SRIA was adopted in 2013. A second version followed in 2016 a third one in 2020 (all these versions are available on the Water JPI’s website: [www.waterjpi.eu](http://www.waterjpi.eu)). All these versions have been elaborated on the basis of a co-design process so that water stakeholders and civil society in general were invited to participate in the identification and prioritisation of relevant water research and innovation topics. The launch of public consultations and the organization of consultative workshops allowed integrating in the SRIA writing process the views of research

operators, academia, water associations (agriculture, water utilities, energy, etc.), private companies, and institutions dealing with water policy and water management from the local up to the international level. The participation of all these actors also ensured the **political, social and scientific relevance** of the SRIA.

The SRIA is the “backbone” document for the Water JPI as it provides a comprehensive catalogue of water research and innovation areas to which Water JPI members are invited to contribute, through specific activities and/or cash support to R&I projects. These activities can take different shapes e.g. the opening of joints calls for projects, the launch of expert groups, the organization of thematic workshops, etc. **The experience accumulated by the Water JPI throughout these activities shows that tackling water challenges is not only a matter of technological developments; it is mainly a governance issue that calls for innovative approaches and urgent actions at all levels. Water governance is thus one of the thematic priorities listed in all the different SRIAs and all Water JPI joint calls for proposals. It is also a short-term strategic topic for the initiative,** which recently decided upon the set-up of a working group on water governance. This group gathers today representatives from research centres, academia, the private sector and international organisations.

Since the Water JPI came into existence, seven joint transnational calls for proposals have been launched in the fields of aquatic pollutants, water use efficiency in agricultural areas, water technologies, sustainable water management, international cooperation, and ecosystems protection and restoration. Other than the identification of specific solutions to improve water and ecosystems quality and ensure the access to water in sufficient quantity for different uses, supported projects are meant to contribute to better water governance in all its dimensions including, among others:

- identification of best practices, strategies and plans for sustainable water management through participatory approaches, as well as their communication and dissemination to concerned stakeholders;
- integration of the social and economic context into water governance;
- assessment of the trade-offs and synergies between targets, benefits and policies for water access, and aquatic ecosystems conservation and restoration;
- contribution to water quality standards and norms;
- social awareness of water challenges;
- development or upscale of tools and approaches for decision making;
- development or upscale of innovative technologies with a high market potential.

### **3. RESEARCH AND INNOVATION NEEDS ON WATER GOVERNANCE**

As shown in the **Figure 2**, the Water JPI has established a framework for structuring research and innovation needs on water governance. This framework is built upon a number of components for which actions are required in order to improve water governance both in Europe and abroad. Although depicted separately, all these components are interlinked and interdependent.



**Figure (2).** Water JPI's water governance framework.

Building upon this framework, this chapter presents the **main research and innovation needs on water governance** identified by Water JPI members, as described in the SRIA of the initiative, and for which urgent actions are recommended.

- Research and innovation needs related to “**Policy and strategy**”. More informed decisions on water management lie, amongst other factors, on the acquisition and integration of relevant data as well as the use of decision support tools. Numerous tools have been developed in the past, but they are not sufficiently used for decision making. Future actions should then promote the development and upgrade of tools co-designed with interested users e.g. regional water management authorities, agricultural associations, water utilities.

- “**Participation**”. The full involvement of end-users, and stakeholders more generally, is not only vital in the design of decision support tools in water management<sup>1</sup>. It is also crucial in the acceptability of policy options and the adoption of innovations. In this context, the Water JPI advocates innovative approaches for stakeholder participation in water policy and management. To support this, the “water value” concept has taken a prominent role in the last few years as it helps to understand water use options for different users in a similar context, to push forward technological and policy innovations for more efficient water use and reuse (circular economy), and to arrange possible conflicts around the resource. “Water value” is one of the four main themes of the Water JPI SRIA 2025, adopted in 2020.

- “**Awareness**”. There is a general societal lack of awareness of the water cycle, water infrastructure, and even more of the severity and irreversibility of degrading natural

resources. These issues are often difficult to communicate or are “invisible”, for example groundwater resources and underground infrastructure<sup>8</sup>. The Water JPI advocates education and communication initiatives to raise social awareness concerning consumption habits, water scarcity, best practices in water efficiency in both agricultural and industrial areas, and circular economy e.g. social acceptance of grey water reuse.

Raising awareness is not only an issue for communication experts. It is a multidisciplinary domain that requires the involvement of experts in social sciences, data collection, data analysis and modelling. Enhanced awareness of water challenges could be attained through the development of participatory foresight approaches, as well as through the development of ICT tools (sensors, smart meters, smart phone applications) combined with citizen science to increase information and transparency over water use.

- “**Regulatory frameworks**”. The Water JPI highlights the need for new frameworks to protect the economic value of European innovations and to remove existing bottlenecks in the adoption of research and innovation products. Specific topics within this area include:

- exploring conditions that contribute to removing barriers to innovation, considering i.e. the impact of water pricing in innovative water reuse technologies.
- developing and implementing effective policy and management frameworks making possible the market uptake of innovations;
- understanding the requirements driving the social adoption of innovations by integrating technical and social sciences and humanities research, by involving stakeholders at the adequate phases, levels and scales of participation and by enabling large-scale socio-technical experimentations;
- identifying approaches for knowledge transfer from other scientific fields to enable the commercialisation of research products.

- “**Financing of water policy and management activities**”. Economic instruments play an important role in assessing the economic value of water resources, in evaluating the efficiency of current economic instruments in promoting sustainable water management (such as pricing policies or subsidies), in quantifying their impact on users, in developing new concepts on water policy and management (cap and trade, quotas), and in enhancing the use of new technological solutions. However, limited access to appropriate forms of finance can be a restraint to water related innovations. New frameworks aimed at protecting the economic value of industries as well as to better anticipate regulation and adaptation needs are requested in order to minimize existing risks when developing or adapting new technologies in the water sector<sup>7</sup>.

In the European Union, the Water Framework Directive (WFD) is the main piece of legislation on water. Water JPI’s activities strive to support the implementation of the WFD through, amongst other activities, providing an insight into the transaction costs resulting from the implementation of measures (cost-effectiveness analysis of measures, disproportionality of costs, water pricing, and cost recovery of water services).

- “**Coordination**”. No real improvements in water governance can be made if existing political and research foci are not fully aligned and share a common vision. The Water JPI urges multilevel, multisectoral and multi-stakeholder cooperation and coordination through policy coherence, information sharing, dialogue and collaborative decision-making. Policy

coordination is particularly challenging since water is a cross-cutting issue for various sectoral policies and their respective legislation, as for instance in Europe the Circular Economy Strategy Package, and the Common Agricultural Policy (CAP).

- “**Monitoring, evaluation of activities and learning**”. The systematic analysis and evaluation of planning and decision-making activities aim at systematically and objectively tracking performance of water management plans and policies in the short, medium and long term. Evaluation helps in determining the relevance, impact, effectiveness, efficiency and sustainability of different interventions<sup>1,3</sup>, and adjusting them when necessary. Evaluation is underpinned by monitoring techniques. It is through learning that the exchange of information and best practices for policy making takes place. Monitoring and evaluation are topics of particular interest for the Water JPI and, as such, the SRIA strongly encourages research and innovation in this field. Amongst others, the following actions are proposed in the SRIA:

- adapting and integrating water management, planning and governance systems with better environmental data and information, including the alignment of monitoring and reporting frameworks.
- development of monitoring schemes (e.g. biosensors, monitoring networks) and data processing technologies, such as leveraging big data and machine learning.
- development of new water management approaches empowering stakeholders and citizens in general to carry out their own supplementary monitoring of water resources. Such approaches should allow stakeholders to assess how the information they provide is integrated by local authorities.

The Water JPI has the ambition to act as a research and innovation platform that offers adequate solutions and improved learning, as well as the sharing and pooling of expertise and knowledge. Hence, the Water JPI stimulates the exchange of good practices and information to adapt and improve water policies and management plans.

- “**Capacity development**”. The Water JPI seeks to strengthen capabilities of water management authorities and stakeholders in general. Capacity development can be achieved through training, new or reinforced institutional and legal frameworks, knowledge transfer, and awareness building. Hence, many of the aspects described above contribute to enhancing capacity development.

The increasing role of citizen science in data collection and interpretation calls for the launch of education programmes and the upskilling of citizens in order to raise the quality of the data provided by laypeople.

**Table 1** summarises the key topics that the Water JPI recommends to support in future research and innovation actions. Some of the topics are linked to several components of the water governance framework elaborated by the Water JPI (see **Figure 2**) e.g. citizen science and policy coordination, which highlights the interdependence of all the different aspects that contribute to better water governance.

**Table (1).** Water governance topics for which research and innovation are recommended by the Water JPI.

<b>Water governance components</b>	<b>Keywords</b>
<b>Policy and strategy</b>	Co-designed decision support tools.
<b>Participation</b>	Innovative stakeholder participation approaches that consider stakeholders' water value.
<b>Awareness</b>	Education, communication, decision support tools, citizen science.
<b>Regulatory frameworks</b>	New frameworks to enable to adoption of innovations.
<b>Coordination</b>	Policy coherence, information sharing, dialogue and collaborative decision-making.
<b>Financing</b>	Minimise risks in the adoption of innovations. Development of economic instruments as an evaluation tool of policy decisions.
<b>Monitoring and evaluation</b>	Development of monitoring schemes, information sharing and exchange.
<b>Capacity development</b>	Institutional and policy frameworks, coordination, awareness, knowledge exchange, upskilling, citizen science.

#### **4. INTERNAL WORKING GROUP ON WATER GOVERNANCE**

Adopted in 2020, the Water JPI's SRIA 3.0 lays out the strategic vision of partners until 2025. The Water JPI Coordination team has the mission to identify and inform about emerging water governance issues, as well as to propose joint activities in this domain. In line with this mission, the Coordination team has recently set up an internal Working Group on water governance.

Following an international cooperation workshop on SDGs held by the Water JPI in January 2021, the initiative launched an informal Working Group on Water Governance. The purpose of this Working Group is double fold: 1) to identify emerging knowledge gaps; and, 2) to come up with good practices, tools, methodologies and approaches to improve water governance and hence contribute to SDGs on water. It is through this work that the Water JPI wishes to act as a think-tank and communication platform on water and SDGs.

The Working Group brings together water experts from academia, education, the private sector, and research funding operators. Current members come from Finland, France, Sweden, The Netherlands, the United States, and United Kingdom. Since its inception in February 2021, the Working Group has already produced a concept note that lays out a scientific framework for tackling water governance challenges (Figure 3).





**Figure (3).** Water governance framework conceived by the Water JPI informal Working Group on Water Governance.

This framework establishes four levers of societal transformation towards sustainable development: 1. social capital; 2. economy and finance; 3. science and technology; and, 4. society, behaviour and culture. As depicted in the Figure, improving water governance – and environmental governance, more generally - entails above all:

- The establishment of adequate institutional arrangements and policy frameworks, including a good understanding of **enablers and barriers for good governance** at the institutional level. **Roles and responsibilities** of concerned actors must be clarified and **key lessons** must be shared across river basins.
- Enhanced participation of stakeholders as a means to ensure co-design and co-decisional approaches. The participation of **actors stemming from different sectors and economic interest** must be encouraged (land use, urbanization, industry, tourism, energy production, etc.). Participation must also benefit from the knowledge provided by representatives of the water research and innovation domain, water management, policy regulators, investors and funders, water utilities and civil society.
- **Strong science-policy dialogue** in order to bring the scientific and policy-making communities closer together and encourage mutual understanding, cooperation and collaboration (UNESCO, 2017). Science plays a key role in the provision of relevant data and information for policymaking as well as in the delivery of technological solutions. Progress in **social innovation** to better meet social needs is still needed. Issues of fair **water allocation vs water demand, trade-offs, virtual water use, and water accounting** need to be further explored by the scientific community and discussed with stakeholders.
- **Capacity development** through training, public investments, incentives for experimentation, business innovation ecosystems, etc.
- Integration of stakeholders' **water value** in policy co-design processes.

The initial work carried out by the water governance Working Group has proved useful in the identification of specific areas and concepts to be further explored by the scientific community. Hence, a panel discussion on social innovation for water governance will take place on the occasion of the side event that the Water JPI is organizing during the Cairo Water Week. Future activities of the group should enable a more thorough analysis of joint

activities in specific river basins as well as the integration of additional partners. The Water JPI Coordination team is helping the working group in identifying the most promising funding opportunities to ensure its long-term financial sustainability.

## **5. CONCLUSIONS AND RECOMMENDATIONS**

Good governance is crucial to sustainably manage water. However, it is not easy to set forth commonly agreed principles of good governance as it is a complex concept that encompasses policy and strategic issues, communication aspects, funding, capacity development, and societal values to cite just a few. Taking into consideration the knowledge and experience accumulated since its launch in 2011 through different activities, the Water JPI has proposed in this paper a framework for **structuring good water governance** and it spells out **specific areas for which research and innovation are recommended**.

The contents of this paper are useful to both the policy making (in particular, research funding operators) and the scientific community as it provides an insight into knowledge gaps that should be covered in the future. Results unveil that water governance is not only about putting forward specific action plans or policies. It is also about delivering co-designed decision support tools with potential users, creating a favourable ecosystem for the adoption of innovations, raising public awareness of water challenges, enhancing the capacity development of water management authorities and civil society in general through upskilling and education, monitoring the performance of measures, assuring the coordination of policies and RDI initiatives on water, and enabling the sharing of knowledge and good practices.

Based upon these results and lessons from the past international workshops, **the Water JPI recommends:**

- to further explore issues concerning **citizen science, co-designed decision support tools, social innovation, water allocation vs water demand, water trade-offs for different purposes and economic sectors, virtual water use, water accounting, and water value.**

- to **consider governance in any joint activities** aiming at collaboration and alignment of research and innovation programmes on water at a transnational or international scale. Governance is not a stand-alone domain; on the contrary, it is a multidisciplinary field that determines the actual relevance and usefulness of technological and non-technological solutions as well as the effectiveness of water management plans/ policies.

- to develop new inclusive governance models and **“living laboratory” pilots** as collaborative platforms for the co-design of goals and solutions. Results from these pilots should be shared and serve to influence and adapt policies, enforce regulations, and improve governance structures<sup>8</sup>.

- to set up a communication platform on water governance with other European and international initiatives working on water governance building upon the work carried out by the Water JPI’s informal working group. Such a communication platform could provide information on specific research and innovation projects funded by EU-based initiatives (e.g. Horizon Europe – Water4All Partnership, Water JPI, the European neighbourhood

instrument) or international initiatives (Belmont Forum). This communication platform could play a key role in the valorisation of research and innovation results, the monitoring of projects (including their contribution to the SDGs), the identification of knowledge, the establishment of project clusters, and the raising of public awareness on emerging challenges around water.

**The Water JPI therefore invites representatives of all these initiatives to reflect on the opportunity, feasibility, possible structure and funding opportunities of such a communication platform.**

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