Water4All
Water security for the planet

European Partnership

Water R&I: which achievements, gaps and ways forward

Water4All SRIA update process

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List of acronyms

ACRONYM	FULL TITLE
AI	Artificial Intelligence
CECs	Contaminants of Emerging Concern
EU	European Union
EWRS	European Water Resilience Strategy
FP	Framework Programme
IWRM	Integrated Water Resource Management
JPI	Joint Programming Initiative
PMT	Persistent Mobile and Toxic substances
PRIMA	Partnership for Research and Innovation in the Mediterranean Area
R&I	Research and Innovation
SRIA	Strategic Research and Innovation Agenda
SDGs	Sustainable Development Goals
WFD	Water Framework Directive
WEFE	Water-Energy-Food-Ecosystems nexus

Executive summary

This report provides a strategic overview of how past and ongoing European research and innovation (R&I) investments align with the Water4All Strategic Research and Innovation Agenda (SRIA). By mapping projects funded under the EU Framework Programmes (FP), Water Joint Programming Initiative (JPI) and PRIMA against SRIA topics, the analysis identifies key achievements, structural gaps, and priority areas for future action. The results should be interpreted as indicative rather than exhaustive, offering a high-level perspective on funding patterns rather than a detailed assessment of individual projects.

Overall, the analysis reveals a **strong concentration of funding in a limited number of SRIA topics**, primarily within **Theme I** and selected topics under **Theme IV**. This concentration reflects a long-standing emphasis on technological development, solution-oriented research, and implementation-ready innovations.

The most funded topic across all programmes is **mitigating the impacts of energy and raw material use in water systems**, driven almost exclusively by FP investments. This highlights the EU's sustained focus on energy efficiency, process optimisation, decarbonisation and resource recovery in the water sector. Other well-supported areas include **advanced wastewater treatment and reuse**, **smart and efficient water use technologies**, **adaptation and improvement of existing technologies**, and **management of environmental pressures**, often benefiting from combined contributions from FP, Water JPI and PRIMA. Under **Theme IV**, water treatment, remediation and disinfection stand out as one of the few non-Theme I topics with strong and balanced support from all funding sources, underlining its relevance for public health and risk prevention. In parallel, several **Theme VII topics related to impact, policy alignment and market uptake** receive substantial FP funding, reflecting the increasing importance of deployment and policy relevance in EU R&I strategies.

At the same time, the analysis identifies a **systemic underfunding of a large share of SRIA topics across all themes**. Many topics record zero or near-zero funded projects, indicating that significant parts of the Water4All agenda have not yet been translated into R&I investments. While Theme I is overall well-funded, governance, economic and society-oriented topics within this theme remain largely neglected, despite their essential role in enabling uptake, acceptance and long-term effectiveness of technical solutions. Themes II and III show particularly high concentrations of unfunded topics. These include **ecosystem tipping points, cumulative pressures, carbon sequestration, ecosystem service valuation, land–sea interactions, water scarcity drivers, drought prediction, data-scarce regions, and governance effectiveness**. The lack of investment in these areas suggests a structural bias towards short- to medium-term, operational research, while long-term, system-level ecological and socio-hydrological dynamics remain insufficiently explored. Similar gaps are observed in Themes IV, V, VI and VII, notably for **chronic health impacts, One Health approaches, infrastructure resilience, cybersecurity, water diplomacy, conflict prevention, gender and power dynamics, citizen science, social risk perception, and socio-technical adoption pathways**.

Across themes, underfunded topics share common characteristics: **high interdisciplinarity**, strong **social, behavioural, governance and economic components**, a focus on **long-term or systemic change**, and **limited immediate technological or marketable outputs**. These features appear structurally less compatible with prevailing R&I funding logics, despite being critical for achieving resilient, inclusive and sustainable water management.

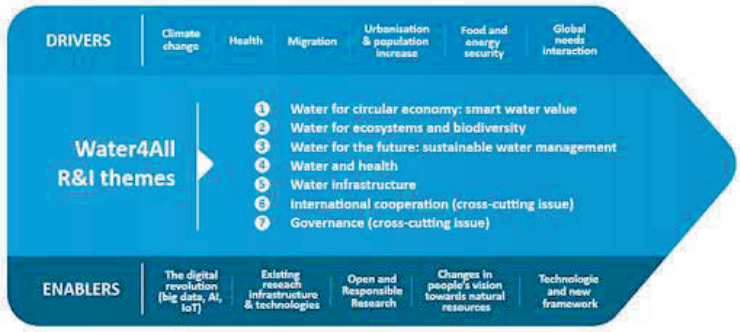
Taken together, the findings highlight a clear need to **rebalance future R&I investments**. Addressing the identified gaps will be essential to fully realise the ambitions of the Water4All SRIA.

Background information on the programme and the SRIA

The Water4All Partnership — Water Security for the Planet has been established under the European Union's *Horizon Europe* programme as a major research and innovation partnership dedicated to water challenges. Launched in June 2022, the partnership spans **seven years of collaborative action**, bringing together a diverse consortium of research organisations, funding bodies, policy actors, technology developers and water authorities from **over 30 countries in Europe and beyond**. The overarching vision of Water4All is to **enable long-term water security for all**, by fostering *systemic transformations* across the entire research and innovation chain and *matching problem owners with solution providers*. Scientific research, innovation, stakeholder engagement, and cross-sector coordination are all central to this mission.

At the core of Water4All's strategy is its **Strategic Research and Innovation Agenda (SRIA)**, published in 2022. This agenda identifies key research topics that address critical water challenges and sets strategic orientations to guide future research calls and investments. The agenda was developed through extensive consultations with stakeholders, advisory boards, and international partners. The SRIA organises research priorities into thematic areas including:

- Water for circular economy
- Water for ecosystems and biodiversity
- Sustainable water management
- Water and health
- Water infrastructure
- International cooperation
- Water governance



These themes reflect the interconnected nature of water issues — from ecological protection and infrastructure resilience to socio-economic innovation and governance frameworks.

Water4All operates by launching **Joint Transnational Calls (JTCs)** that pool funding from participating national and regional funders to support multinational R&I projects. These calls are directly aligned with themes in the SRIA and aim to: (i) generate new scientific knowledge and tools; (ii) develop innovative technologies and approaches; and, (iii) enhance policy integration and solution uptake. For example, recent calls focus on waterborne contaminants and health risks, advanced monitoring tools, and socio-economic innovations in water and health.

Beyond funding research, Water4All also emphasises:

- **Knowledge production, sharing, and communication**, ensuring that insights and data reach decision-makers, practitioners, and wider society.
- **Support for demonstration and market deployment**, helping innovations move from research to real-world application.
- **Capacity building and training**, developing skills among policy-makers, stakeholders, and R&I professionals.
- **International cooperation.**

Aim of this report

The aim of this report is to **provide a structured and comprehensive overview of water-related research and innovation (R&I) topics that have been funded during the last 5 years (2021-2026)**, with a particular focus on projects supported under Horizon Europe Pillar II, including its thematic clusters, the EU Mission "Restore our Ocean and Waters", and the PRIMA (Partnership for Research and Innovation in the Mediterranean Area) programme. Together, these funding instruments represent the most important European investments in water-related R&I, addressing challenges ranging from water scarcity, pollution and ecosystem degradation to climate adaptation, resilience, biodiversity protection and sustainable resource management.

The report seeks to analyse how public R&I investments have been distributed across different water-related themes and priorities, and to assess the extent to which funded projects contribute to addressing the strategic objectives identified by the Water4All Partnership. By mapping funded projects against the thematic priorities of the Water4All Strategic Research and Innovation Agenda (SRIA), **the report aims to provide an evidence base for future strategic planning and funding decisions.**

More specifically, the report pursues the following objectives:

- Identify which R&I topics have received significant attention through recent European funding programmes;
- Identify research areas that may have reached a level of maturity, and where future efforts could then focus more on demonstration, upscaling or deployment;
- Highlight potential gaps, overlaps, and underrepresented topics that may require additional attention in future funding programmes;
- Support the identification of emerging research needs and opportunities for innovation in response to evolving societal, environmental and policy challenges;
- Provide evidence-based insights to inform the strategic prioritisation of future Water4All and FP calls, activities and investments.
- A more balanced and strategic coverage of the **Water4All thematic priorities**, ensuring alignment with the SRIA.

This report aims to play a critical role in strengthening the strategic coherence of water-related R&I funding in Europe**.** Over the past decades, substantial investments have been made through the EU FPs, and complementary initiatives such as Water JPI and PRIMA have generated a rich portfolio of projects, knowledge, technologies and policy-relevant insights. **However, this growing body of funded activities has also resulted in a** fragmented landscape**, where overlaps, gaps and uneven thematic coverage may remain insufficiently visible.** By systematically analysing past funding patterns across specific R&I topics, this report provides an evidence-based understanding of how public investments have been allocated and how they align with current and emerging water challenges. Such insight is essential to avoid duplication of efforts, ensure better coordination among funding instruments, and maximise the added value of future investments**.**

Beyond supporting programme design, the report also contributes to greater transparency and accountability in public research funding. By providing a shared knowledge base on previous investments and thematic trends, it facilitates dialogue among funding organisations, policymakers, researchers and other stakeholders involved in the water sector. This common understanding can help improve the design of future funding instruments, strengthen collaboration across initiatives and maximise the societal impact of research investments.

Methodology

The first phase of the work consisted of a comprehensive and systematic screening of the Horizon Europe Work Programmes published over a five-year period (2021-2026). This time frame captures the early implementation phase of Horizon Europe and provides a sufficiently broad basis to identify evolving priorities and thematic trends in European R&I funding.

All Pillar II clusters were examined in detail to identify water-related calls and topics, irrespective of their primary sectoral or policy domain, as water challenges are often addressed across sectors such as climate, biodiversity, food systems, circular economy, security, digitalisation, and disaster resilience. As a result, the screening extended beyond explicitly water-focused calls to include all relevant interventions where water appears as a direct or indirect component of the R&I agenda. In parallel, all calls published under the Horizon Europe **Mission "Restore our Ocean and Waters" and the PRIMA** programme were reviewed. These programmes were included due to their strong and explicit focus on water systems and freshwater ecosystems, and regional water resilience challenges, particularly in the Mediterranean context in the case of PRIMA.

For each identified relevant topic, a structured extraction of keywords was performed. This information was then analysed to assess its alignment with the thematic structure of Water4All's SRIA. The objective of this step was to establish a consistent mapping between funded R&I topics and Water4All priority areas, enabling comparability across programmes and funding instruments.

To ensure completeness and minimise the risk of overlooking relevant funding opportunities, the initial review was subsequently verified and complemented through the use of Artificial Intelligence (AI)-based tools. AI-assisted searches were employed to systematically scan the same programming period (2021-2026), identify additional calls, themes, and keywords associated with water resilience, water management, biodiversity, climate adaptation, and related areas. This second layer of analysis served as a validation and enhancement step, confirming the majority of the manually identified topics while also revealing a limited number of additional relevant calls that had not been captured during the initial screening phase. In this sense, AI tools acted as a complementary quality-control mechanism, improving both the coverage and robustness of the dataset.

Methodological considerations and interpretation of results

The results presented in this report should be interpreted with an understanding of the inherent characteristics of Horizon Europe, Mission Ocean & Waters, and PRIMA call texts. These programmes increasingly promote integrated and systemic approaches to addressing societal challenges, meaning that **individual call topics often simultaneously address multiple policy objectives and research domains.** As a consequence, many Water4All-related concepts are present across a large proportion of call descriptions, either explicitly or implicitly.

This creates an important methodological challenge. The presence of a keyword in a call topic description does not necessarily indicate that the corresponding research area represents the primary focus of the call. In many cases, keywords appear as supporting elements within broader narratives addressing climate resilience, biodiversity protection, circular economy, digitalisation, governance, or sustainable development. Conversely, some strategic priorities may be insufficiently captured through keyword matching because they are described using alternative terminology or embedded within wider concepts.

The use of AI-assisted semantic analysis helped address some of these limitations by identifying conceptual relationships beyond exact keyword matches. Nevertheless, neither keyword-based approaches nor AI-

assisted text analysis can fully distinguish between topics that are central objectives of a call and those that are only indirectly referenced. **Expert judgement therefore remains essential throughout the analysis to validate the interpretation of results.**

For this reason, the figures presented in this report should not be interpreted as precise measures of funding intensity or policy importance. Rather, they provide an indicative picture of thematic visibility and alignment between European funding programmes and Water4All priorities. Their main value lies in identifying broad patterns, emerging trends, and potential gaps across the European water R&I landscape.

Despite these limitations, the methodology offers a robust, transparent and reproducible framework for strategic analysis. By combining systematic screening of work programmes, expert review, and AI-assisted validation, it provides a sufficiently reliable basis for understanding how current funding portfolios align with Water4All priorities and where future investments could be directed.

Results and discussion

This section presents the extraction table for all mapped call topics, organised by programme. In total, **64 call topics** have been mapped out.

Table I. Water-related call topics reviewed along with their keywords.

Call code	Topic title	Call keywords
MISS-2025-OCEAN-02	Toolbox for authorities: marine plastics river-to-ocean	Source-to-sea; river basin management; micropollutants; surface water;
MISS-2025-COAST	Supporting regional authorities in coastal and riparian restoration	Restoration; ecosystem conservation; surface water; river basin; partnerships; participation
MISS-2025-PORT	Supporting waterfront cities and ports	Partnerships; participation; ecosystem quality; resilience
MISS-2025-CLIMA-03	Solutions for coastal hotspots to adapt to climate change	Resilience; hydroclimatic extreme events; NbS; ecosystem quality; surface water; multiple stressors
MISS-2025-SOIL-WATER	Soil-water interactions and extreme events	Hydroclimatic extreme events; resilience; ecosystem services; biodiversity; NbS
MISS-2026-POLL	Addressing aquatic pollution and biodiversity loss	Nutrient loadings; biodiversity; wastewater; CECs; IWRM; resilience; partnerships; participation
MISS-2026-WETLANDS	Restoration of freshwater and wetland ecosystems	Restoration; ecosystem quality; NbS; ecosystem services; biodiversity; resilience
MISS-2026-WFD	Supporting WFD implementation and river basin management	Policy; river basin; IWRM; surface water; data monitoring; partnerships
MISS-2026-CITY	Urban water management and resilience	Surface water; resilience; circular economy; wastewater; participation; partnerships
MISS-2026-TOUR	Community-driven sustainable marine and coastal tourism	Participation; partnerships; ecosystem quality; water value; resilience
MISS-2026-VEGE	Conservation of marine and coastal vegetated habitats	Ecosystem conservation; biodiversity; restoration; ecosystem services; NbS
MISS-2026-DISAS	Climate adaptation and disaster risk management	Resilience; hydroclimatic extreme events; risk assessment; policy; participation
MISS-2026-WRES	Water resilience and adaptation strategies	Resilience; hydroclimatic extreme events; IWRM; policy; partnerships
MISS-2026-IWT	Climate resilience of inland waterways	Resilience; hydroclimatic extreme events; surface water; ecosytem quality; data monitoring
MISS-2026-CIRC	Climate-neutral, resilient and circular wtaer sector in cities	Circular economy; wastewater; treatment technologies; resilience; policy; resource recovery
PRIMA-S1-WM-2023	PRIMA section 1: water management 2023	IWRM; groundwater; surface water; hydroclimatic extreme events; resilience; treatment technologies
PRIMA-S1-NEX-2023	PRIMA section 1: nexus theme 2023	WFE nexus; irrigation; resource recovery; circular economy; partnerships

Call code	Topic title	Call keywords
PRIMA-S1-WN-2024	PRIMA section 1: water management in the nexus 2024	WEFE nexus; IWRM; wastewater; circular economy; fit for use; micropollutants
PRIMA-S1-WN-2025	PRIMA section 1: water management in the nexus 2025	WEFE nexus; irrigation; groundwater management; hydroclimatic extreme events; real-scale validation
HORIZON-CL6-2021-BIODIV-01-03	Understanding and valuing coastal and marine biodiversity and ecosystems services	Coastal ecosystems; biodiversity; estuaries; citizen science
HORIZON-CL6-2021-BIODIV-01-04	Assess and predict integrated impacts of cumulative direct and indirect stressors on coastal and marine biodiversity, ecosystems and their services	Coastal ecosystems; biodiversity; multiple stressors; monitoring
HORIZON-CL6-2021-BIODIV-01-10	Demonstration of measures and management for coastal and marine ecosystems restoration and resilience in simplified socio-ecological systems.	Ecosystem-based management; Climate change resilience; Socio-ecological systems; Multi-actor governance; NbS; Coastal ecosystem restoration; Land-sea interactions; Social innovation
HORIZON-CL6-2021-BIODIV-01-16	Biodiversity, water, food, energy, transport, climate and health nexus in the context of transformative change	Transformative change for biodiversity; biodiversity governance and policy; drivers of biodiversity loss; social innovation and behavioural change; Sustainable Development Goals (SDGs)
HORIZON-CL6-2022-BIODIV-01-01	Observing and mapping biodiversity and ecosystems, with particular focus on coastal and marine ecosystems	Earth observation and remote sensing; environmental DNA (eDNA); biodiversity data integration; autonomous monitoring systems
HORIZON-CL6-2022-FARM2FORK-01-05	Integrated and sustainable freshwater bioeconomy: Combining aquaculture, biodiversity preservation, biotechnology and other uses	Freshwater bioeconomy; sustainable aquaculture; freshwater biodiversity; climate resilience; ecosystem services; water resource management
HORIZON-CL6-2021-ZEROPOLLUTION-01-03	Preventing and managing diffuse pollution in urban water runoff	Urban runoff, stormwater pollution, diffuse pollution, freshwater quality, climate change
HORIZON-CL6-2021-ZEROPOLLUTION-01-10	Environmental services: improved bioremediation and revitalization strategies for soil, sediments and water	Bioremediation, environmental pollution, toxic substances, soil contamination, microbial remediation
HORIZON-CL6-2023-BIODIV-01-3:	Interdisciplinary assessment of changes affecting terrestrial and freshwater ecosystems, building on observation programmes	Ecosystem monitoring, Earth observation, biodiversity restoration, climate change, remote sensing
HORIZON-CL6-2023-BIODIV-01-7:	Demonstration of marine and coastal infrastructures as hybrid blue-grey Nature-based Solutions	NbS solutions, coastal infrastructure, marine ecosystems, climate adaptation, biodiversity impacts
HORIZON-CL6-2024-BIODIV-02-1-two-stage:	Demonstrating Nature-based Solutions for the sustainable management of water resources in a changing climate, with special attention to reducing the impacts of extreme droughts	NbS, drought resilience, water management, ecosystem restoration, climate adaptation
HORIZON-CL6-2024-FARM2FORK-02-7-two-stage:	Minimising climate impact on aquaculture : mitigation and adaptation solutions for future climate regimes	Sustainable aquaculture, climate-resilient food systems, circular economy, aquaculture innovation, environmental footprint reduction
HORIZON-CL6-2023-ZEROPOLLUTION-01-1:	Knowledge and innovative solutions in agriculture for water availability and quality	Water quality; irrigation; groundwater; surface water; ecosystem quality; resilience
HORIZON-CL6-2024-ZEROPOLLUTION-02-1-two-stage:	Holistic approaches for effective monitoring of water quality in urban areas	data monitoring; surface water; groundwater; ecosystem quality; treatment technologies
HORIZON-CL6-2023-CLIMATE-01-2:	Improve the reliability and effectiveness of alternative water resources supply systems and technologies	Alternative water resources, water scarcity adaptation, water reuse, water management, climate change
HORIZON-CL6-2023-CLIMATE-01-3:	Ocean and coastal waters carbon and biodiversity-rich ecosystems and habitats in Europe and the Polar Regions	Blue carbon ecosystems, ocean carbon sinks, climate mitigation, marine biodiversity, ecosystem restoration
HORIZON-CL6-2024-CLIMATE-01-1:	Improving irrigation practices and technologies in agriculture	Irrigation technologies; hydroclimatic extreme events; resilience; water value; IWRM

Call code	Topic title	Call keywords
HORIZON-CL6-2025-01-BIODIV-05:	Assessing and modelling ecosystems' dynamic processes to guide restoration activities and to improve models used for climate	EU Nature Restoration Regulation, habitat restoration, biodiversity targets, ecosystem modelling, ecological connectivity
HORIZON-CL6-2025-01-ZEROPOLLUTION-03:	Environmental biotechnology applications in service of remediation of polluted ecosystems	Treatment technologies; ecosystem quality; restoration; CECs
HORIZON-CL6-2025-01-ZEROPOLLUTION-04:	Towards a comprehensive European strategy to assess and monitor aquatic litter including plastic and microplastic pollution	Data monitoring; micropollutants; surface water; ecosystem quality
HORIZON-CL6-2025-02-CLIMATE-01-two-stage:	Strengthening the resilience of water systems and water sector to climate and global socio-economic change impacts	Water resilience, water cycle, ecosystem restoration, climate adaptation, water-energy-food nexus
HORIZON-CL6-2026-01-BIODIV-02:	Developing methods to assess the presence, functions and sensitivity of groundwater ecosystems	Groundwater ecosystems, water quality, emerging contaminants, ecotoxicology, biodiversity monitoring
HORIZON-CL6-2026-01-BIODIV-01-two-stage:	Living labs for co-creating solutions for the restoration of ecosystems	Nature restoration, living labs, ecosystem co-creation, biodiversity corridors, ecosystem monitoring
HORIZON-CL6-2027-01-BIODIV-03:	Technical innovation to protect ecosystems and to scale up their restoration	Ecosystem restoration, restoration technology, NbS, invasive species control, biodiversity management
HORIZON-CL6-2027-01-BIODIV-04:	Living Labs for the eradication and/or management of invasive alien species	Invasive alien species, biodiversity loss, ecosystem management, living labs, species monitoring
HORIZON-CL6-2026-01-ZEROPOLLUTION-03:	Developing managed aquifer recharge techniques (MAR) in a rural context	Groundwater; groundwater management; hydroclimatic extreme events; ecosystem services; NbS
HORIZON-CL6-2026-01-ZEROPOLLUTION-01-two-stage:	Decontaminate and bioremediate aquatic pollution	Treatment technologies; surface water; groundwater; ecosystem quality; restoration
HORIZON-CL6-2026-02-CLIMATE-02	Towards the water infrastructures of the future	Water infrastructure resilience, digital twins, climate adaptation, wastewater treatment, NbS
HORIZON-CL6-2027-02-CLIMATE-01-two-stage	Open topic: Innovative solutions for the European Water Resilience Strategy	Water resilience strategy, water cycle restoration, water efficiency, circular water use, climate adaptation
HORIZON-CL3-2021-DRS-01-03	Enhanced assessment of disaster risks, adaptive capabilities and scenario building based on available historical data and projections	Disaster risk assessment, resilience planning, simulation models, climate extremes, decision support systems
HORIZON-CL3-2022-DRS-01-01	Enhanced citizen preparedness in the event of a disaster or crisis-related emergency	Risk communication, public preparedness, disaster resilience, citizen engagement, emergency response
HORIZON-CL3-2023-INFRA-01-02	Supporting operators against cyber and non-cyber threats to reinforce the resilience of critical infrastructures	Critical infrastructure resilience, cyber-physical security, supply chain interdependencies, risk management, business continuity
HORIZON-CL5-2021-D1-01-05	Better understanding of the interactions between climate change impacts and risks, mitigation and adaptation options	Integrated assessment models, climate mitigation pathways, adaptation strategies, climate risks, Earth system modelling
HORIZON-CL6-2023-ZEROPOLLUTION-01-3	Tackling pollution in the Arctic	Ecosystem quality; multiple stressors; resilience; CECs; one-health
HORIZON-CL6-2023-ZEROPOLLUTION-01-7	Strategies to prevent plastic packaging pollution from food systems	Surface water; ecosystem quality; micropollutants; pollution loadings
HORIZON-CL6-2023-GOV-01-11	Reducing observation gaps in land-sea interface	Data monitoring; source-to-sea; surface water; decision support
HORIZON-CL6-2024-ZEROPOLLUTION-01-1	Operating within safe N/P ecological boundaries	Nutrient loadings; ecosystem quality; restoration; surface water; groundwater
HORIZON-CL6-2024-CLIM-01-2	Socio-economic aspects of paludiculture	Ecosystem quality; restoration; NbS; ecosystem services; resilience
HORIZON-CL6-2024-CLIM-01-3	Paludiculture: large-scale demonstrations	Restoration; NbS; real-scale validation; ecosystem services

Call code	Topic title	Call keywords
HORIZON-CL6-2025-FARM2FORK-03	Scaling up circular water management in agriculture	Circular economy; fit for use; resource recovery; real-scale validation
HORIZON-CL6-2025-ZEROPOLLUTION-07	Reducing pollution from food and drink industries	Wastewater; treatment technologies; circular economy; resource recovery
HORIZON-CL6-2025-COMMUNITIES-03	Resilient coastal communities in the Atlantic	Resilience; hydro-climatic extreme events; NbS; participation; ecosystem services
HORIZON-CL6-2026-BIODIV-04	Mainstreaming and scaling-up nature-based solutions	NbS; restoration; ecosystem services; real-scale validation; resilience
HORIZON-CL6-2027-FARM2FORK-01	Resilience of agriculture in water and nutrient-scarce environments (digital)	Hydroclimatic extreme events; resilience; irrigation technologies; decision support
HORIZON-CL6-2027-FARM2FORK-02	Water-nutrient-energy nexus for sustainable agriculture in Africa (FNSSA)	WEFE nexus; hydroclimatic extreme events; resilience; irrigation; partnerships

In the next step of the analysis, the keywords extracted from each Horizon Europe, Mission Ocean & Waters, and PRIMA call topics were systematically compared with the reference set of Water4All keywords derived from the SRIA. This cross-matching exercise enabled a structured assessment of thematic alignment between past EU-funded research and the strategic priorities of Water4All. By identifying where call topic descriptions contain one or more Water4All-related keywords, it becomes possible to quantify and visualise the degree of overlap across programmes and thematic areas.

The table presented below summarises this comparison by reporting the number of call topic descriptions that include Water4All keywords. **This provides an indicative measure of thematic convergence, highlighting areas of strong alignment as well as topics where Water4All priorities appear less frequently represented.** Rather than offering a project-level evaluation, the table supports a portfolio-level understanding of how closely past funding programmes reflect the Water4All strategic agenda, thereby informing future programming choices and priority setting.

Table II. Number of call topic descriptions containing each one of Water4All's keywords, as listed in the updated SRIA.

Keyword	N	Keyword	N	Keyword	N
Circular economy	7	**Biodiversity**	17	**Sewage sludge**	0
Fit for use	2	**Policy**	5	**Water infrastructure safety and security**	3
WEFE nexus	5	**IWRM**	6	**Asset management**	0
Water value	2	**River basin management**	3	**Lifecycle and capital maintenance**	0
Partnerships and business models	10	**Groundwater management**	1	**Adaptive and safe-to-fail design**	0
Water pricing	0	**Conjunctive use**	1	**Digitalisation and digital twins**	1
Bio-based feedstocks	0	**Data and monitoring**	5	**Machine learning**	0
Value chain	0	**Source-to-sea approach**	2	**Internet of things**	0
Resource recovery	4	**Participation**	7	**Smart sensors**	0
WoLL	0	**Inclusiveness**	0	**Cybersecurity**	1
Real-scale validation environments	4	**Hydroclimatic extreme events**	10	**Hybrid grey-green infrastructdures**	0
Ecosystem quality	12	**Decision support**	3	**Centralised and distributed systems**	0
Multiple stressors	3	**Drinking water and sanitation (WASH)**	0	**Groundwater–surface water interactions**	0

Resilience	29	**Contaminants of emerging concern**	4	**Integrated spatial planning**	1
Ecosystem conservation	2	**PMT substances**	0	**Transitional water**	0
Restoration	18	**AMR**	0	**Inland navigation infrastructures**	1
Ecosystem services	9	**Risk assessment and communication**	2	**Cost-recovery principle**	0
Nature-based solutions	6	**Treatment technologies**	7	**Affordability and equity principles**	0
Nutrient and pollution loadings	2	**Micropolluants**	0	**Financing and investment mechanisms.**	0
Groundwater	8	**One-health**	1		
Surface water	12	**Wastewater**	6		

The results presented in **Table II** show that the distribution of keyword occurrences is not uniform in water-related EU R&I calls. Certain thematic areas appear significantly more frequently than others, indicating a differentiated level of maturity and policy attention across topics. **Keywords linked to climate change adaptation, hydroclimatic extreme events, biodiversity, restoration, or integrated water resources management tend to be more recurrent**, reflecting their strong anchoring in EU policy frameworks such as the EU Adaptation Strategy, the Water Framework Directive, the EU Floods Directive, or the Nature Restoration Law. By contrast, other Water4All priorities appear less frequently in call topic descriptions, which may suggest that they are either emerging fields, embedded within broader thematic categories, or less explicitly articulated in call texts.

Cross-programme patterns and thematic convergence

A cross-programme comparison reveals that Horizon Europe Pillar II clusters demonstrate the highest overall density of Water4All-related keywords. In particular, clusters related to climate, environment, food systems, and digital transformation show strong overlaps with water-related terminology. This reflects the integrated nature of Horizon Europe, where water is not treated as a standalone sector but rather as a cross-cutting enabler of multiple policy objectives.

The Mission “Restore our Ocean and Waters” also shows a high concentration of Water4All keywords, particularly those related to aquatic ecosystem restoration, water quality improvement, pollution reduction, and nature-based solutions. This confirms a strong conceptual alignment between Water4All priorities and Mission objectives, especially in relation to ecosystem-based management and restoration approaches.

The PRIMA programme, while more regionally focused on the Mediterranean area, shows a distinct but complementary pattern. Keywords related to water scarcity, irrigation efficiency, drought resilience, and agricultural water management are particularly prominent. This reflects PRIMA’s strong orientation towards water-food-energy nexus challenges in semi-arid and water-stressed regions. However, compared to Horizon Europe and the Mission, PRIMA shows relatively lower representation of keywords related to biodiversity.

Identification of dominant themes

The most frequently occurring keyword is **“Resilience” (N = 29)**, which stands out as the dominant cross-cutting concept across all programmes. This reflects the increasing centrality of resilience thinking in EU policy frameworks, particularly in relation to climate change adaptation, disaster risk reduction, and water system robustness. Closely related to this are **“Ecosystem conservation” (N = 18)** and **“Biodiversity” (N = 17)**, confirming that ecosystem-based approaches are strongly integrated into water-related research agendas.

Similarly, **"Ecosystem quality" (N = 12)** and **"Surface water" (N = 12)** indicate a sustained focus on freshwater systems and ecological status, consistent with the implementation of the Water Framework Directive. The relatively high occurrence of **"Groundwater" (N = 8)** also highlights the continued relevance of subsurface water resources, although this remains less prominent than surface water-related themes.

Another major cluster of well-represented keywords includes **"Hydroclimatic extreme events" (N = 10)** and **"Ecosystem services" (N = 9)**, reflecting the growing importance of climate extremes (droughts, floods, heatwaves) and the increasing adoption of ecosystem service-based valuation frameworks.

From a governance and system transformation perspective, **"Partnerships and business models" (N = 10)** and **"Participation" (N = 7)** indicate a strong emphasis on multi-actor approaches and stakeholder engagement. Likewise, the emerging importance of the **"WEFE nexus" (N = 5)** shows that integrated and cross-sectoral approaches are becoming increasingly embedded in EU-funded research.

Finally, keywords such as **"Circular economy" (N = 7)**, **"Data and monitoring" (N = 5)**, **"Wastewater" (N = 6)**, and **"Treatment technologies" (N = 7)** further demonstrate the consolidation of water-related innovation across resource efficiency, digital monitoring, and pollution control domains.

Moderately represented themes

A second group of keywords appears with moderate frequency, suggesting either emerging relevance or more fragmented integration across programmes. These include **"Water infrastructure safety and security" (N = 3)**, **"River basin management" (N = 3)**, **"Multiple stressors" (N = 3)**, and **"Decision support" (N = 3)**. These results indicate that while integrated water governance and risk-based approaches are present in EU funding, they are not yet dominant thematic pillars. Similarly, keywords such as **"Resource recovery" (N = 4)**, and **"Real-scale validation environments" (N = 4)** show that innovation-oriented and experimental approaches are present but not yet mainstreamed across all calls. On the other hand, **"Contaminants of emerging concern" (N=4)** —despite their growing policy relevance—remain relatively underrepresented compared to more established pollution-related topics. Other moderately represented areas include **"Policy" (N = 5)** and **"Source-to-sea approach" (N = 2)**, which suggests that while governance and systemic thinking are acknowledged, they are not consistently or explicitly articulated across call topics.

Underrepresented and missing thematic areas

A significant outcome of the analysis is the identification of several Water4All keywords that are either weakly represented or entirely absent from the analysed call topics. These gaps are particularly important from a strategic perspective, as they highlight potential areas for future development within EU research programming. Underrepresented and missing thematic areas include **"water pricing", "affordability and equity principles", or "water infrastructure lifecycle and capital maintenance"**. The absence of these keywords suggests that socio-economic dimensions of water governance are not explicitly foregrounded in current call formulations, despite their importance for policy implementation and public acceptance.

Groundwater-related system interactions, particularly **groundwater–surface water dynamics**, also appear absent, indicating a potential disconnect between hydrological complexity and its representation in programme-level priorities.

Recommendations for upcoming Water4All calls

The analysis of funded projects across Water4All SRIA topics highlights a clear imbalance between technological and implementation-ready research and topics addressing governance, ecosystems, social dynamics and long-term systemic change. To better align future R&I investments with the strategic ambitions of Water4All and EU water-related policies, the following recommendations are proposed.

1. **Rebalance funding portfolios to address structurally underfunded SRIA topics.** Future calls should explicitly target underfunded topics, particularly those with zero or near-zero funded projects across all funding instruments.

2. **Strengthen support for interdisciplinary and transdisciplinary research.** Underfunded topics consistently require integration across disciplines, notably between technical, environmental, social, economic and governance sciences. Funding schemes should further adapt evaluation criteria, call design and project duration to better accommodate interdisciplinary research that recognises non-technological outputs such as policy frameworks, governance models and behavioural insights.

3. **Increase investment in governance, economic and social enablers of impact**. While technological innovation under Theme I and selected Theme IV topics is well supported, the analysis shows that societal uptake, governance effectiveness and economic instruments remain weakly funded. Future R&I agendas should place greater emphasis on water demand management, pricing and incentive mechanisms, participatory approaches, trust building, gender and equity dimensions, and institutional innovation. These topics are essential to ensure that technical solutions translate into real-world impact and long-term sustainability.

4. **Promote digitalisation while addressing emerging technological gaps**. While digital transformation is increasingly recognised in European policy frameworks, keywords such as digital twins for freshwater, machine learning, internet of things, smart sensors, and cybersecurity appear only rarely in the analysed call topics and funded projects. Future calls could stimulate R&I in artificial intelligence for water systems, predictive analytics, digital twins of river basins and water infrastructures, and cyber-resilience of critical water services. These technologies are likely to become essential components of future water management systems.

5. **Bridge the gap between policy ambitions and R&I investments**. Several underfunded topics directly support the implementation of EU Directives and strategies (e.g. WFD, Biodiversity Strategy, Climate Adaptation Strategy), yet remain weakly represented in funded projects. Greater coherence between policy objectives and R&I funding priorities is needed, including calls explicitly designed to assess policy effectiveness, cumulative impacts of measures, and governance performance across scales.

6. **Expand health- and exposure-oriented water research**. Despite growing societal concern, key health-related topics under Theme IV—such as integrated One Health/EcoHealth approaches, CECs, PMT substances, antimicrobial resistance—remain unfunded. Dedicated funding actions should support research on long-term, low-dose exposure pathways and combined risks**,** complementing existing investments in treatment and remediation technologies. Future calls should also support interdisciplinary research linking water quality, ecosystem health, human health, and climate change. This would contribute to the implementation of recent revisions of EU water legislation and support emerging regulatory needs.

7. **Support socio-technical experimentation and innovation uptake pathways**. Topics related to citizen science, social perception of risks, co-management institutions, financial mechanisms, and market uptake of innovation remain underrepresented despite their role as impact enablers. Future calls should encourage

large-scale socio-technical experimentation, living labs, and real-world testing of governance and adoption models.

8. **Increase attention to groundwater systems and groundwater-dependent ecosystems**. Although groundwater appears in both calls and projects, the analysis highlights significant gaps regarding groundwater management, groundwater-surface water interactions, conjunctive water use, managed aquifer recharge, and groundwater-dependent ecosystems. Given the strategic importance of groundwater for drinking water supply, drought resilience, ecosystem functioning and climate adaptation, Water4All could promote dedicated calls focusing on integrated groundwater management and subsurface ecosystem protection.

9. **Enhance complementarity and coordination across funding instruments**. Differences in topic coverage between the Framework Programme, Water JPI and PRIMA suggest opportunities for improved coordination. Strategic alignment and joint programming could help reduce fragmentation and increase overall system impact.

10. **Support the transition from resilience concepts to implementation pathways**. Resilience is by far the most frequently occurring keyword across programmes, demonstrating its central role in European water policy. However, the analysis suggests that resilience is often addressed as a broad concept rather than through concrete implementation mechanisms. Future Water4All and FP calls could focus on operationalising resilience through adaptive governance frameworks, resilience indicators and monitoring systems, decision-support tools, risk-informed planning approaches, and long-term evaluation of adaptation measures. This would help translate resilience objectives into measurable outcomes.

11. **Improve coverage of infrastructure resilience and long-term asset management**. Keywords related to asset management, lifecycle maintenance, adaptive design, and water infrastructure resilience remain weakly represented. This is notable given the increasing challenges posed by ageing infrastructure, climate change and cybersecurity threats. Water4All could encourage research addressing infrastructure renewal strategies, climate-proof infrastructure design, integrated asset management, resilience planning for critical water infrastructure, and hybrid grey-green infrastructure systems.

12. Establish a systematic monitoring mechanism for thematic coverage. Finally, this exercise demonstrates the value of periodically assessing how funding programmes align with R&I priorities. Water4All could establish a regular monitoring process combining expert review and AI-assisted analysis to track thematic evolution over time, identify emerging priorities, detect funding gaps, and support evidence-based programming decisions. Such a mechanism would strengthen the strategic positioning of Water4All within the broader European R&I landscape.

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