Draft proposal for a

European Partnership under Horizon Europe

WATER4ALL – Water Security for the Planet

Version 5 June 2020

About this draft

In autumn 2019 the Commission services asked potential partners to further elaborate proposals for the candidate European Partnerships identified during the strategic planning of Horizon Europe. These proposals have been developed by potential partners based on common guidance and template, taking into account the initial concepts developed by the Commission and feedback received from Member States during early consultation[1]. The Commission Services have guided revisions during drafting to facilitate alignment with the overall EU political ambition and compliance with the criteria for Partnerships.

This document is a stable draft of the partnership proposal, released for the purpose of ensuring transparency of information on the current status of preparation (including on the process for developing the Strategic Research and Innovation Agenda). As such, it aims to contribute to further collaboration, synergies and alignment between partnership candidates, as well as more broadly with related R&I stakeholders in the EU, and beyond where relevant.

This informal document does not reflect the final views of the Commission, nor pre-empt the formal decision-making (comitology or legislative procedure) on the establishment of European Partnerships.

In the next steps of preparations, the Commission Services will further assess these proposals against the selection criteria for European Partnerships. The final decision on launching a Partnership will depend on progress in their preparation (incl. compliance with selection criteria) and the formal decisions on European Partnerships (linked with the adoption of Strategic Plan, work programmes, and legislative procedures, depending on the form). Key precondition is the existence of an agreed Strategic Research and Innovation Agenda / Roadmap. The launch of a Partnership is also conditional to partners signing up to final, commonly agreed objectives and committing the resources and investments needed from their side to achieve them.

The remaining issues will be addressed in the context of the development of the Strategic Research and Innovation Agendas/ Roadmaps, and as part of the overall policy (notably in the respective legal frameworks). In particular, it is important that all Partnerships further develop their framework of objectives. All Partnerships need to have a well-developed logical framework with concrete objectives and targets and with a set of Key Performance Indicators to monitor achievement of objectives and the resources that are invested.

Aspects related to implementation, programme design, monitoring and evaluation system will be streamlined and harmonised at a later stage across initiatives to ensure compliance with the implementation criteria, comparability across initiatives and to simplify the overall landscape.

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[1] https://www.era-learn.eu/documents/final_report_ms_partnerships.pdf

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1 Summary

The WATER4All partnership aims at enabling water security for all on the long term. This will be achieved through boosting systemic transformations and changes across the entire research – water innovation pipeline, fostering the matchmaking between problem owners and solution providers. It proposes a portfolio of multi-national, multi-faceted and cross-sectoral approaches, encompassing policy, environmental, economic, technological and societal considerations. Enabling water security for all is a keystone for achieving the Green Deal and a Healthy Europe.

2 Context, objectives, expected impacts

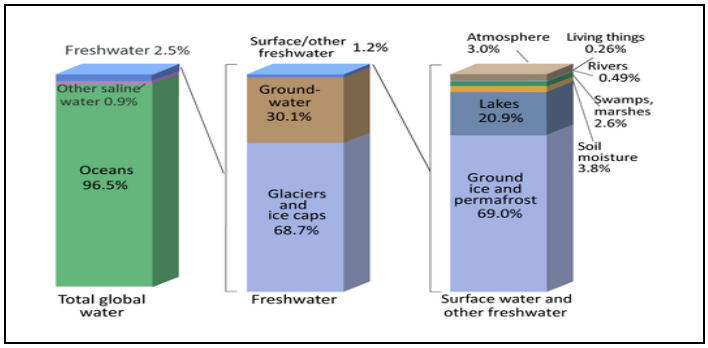
2.1 Context and problem definition

Below we summarise the background context of the Water4All Partnership (water resources and the threats to water security) and the key problem areas that Water4All aims to address: achieving the UN SDGs, the Green Deal[2] and EU Policy Objectives. We also summarise previous R&I activities in this area and priority RDI areas.

2.1.1 Water resources vital for all human activities and the environment

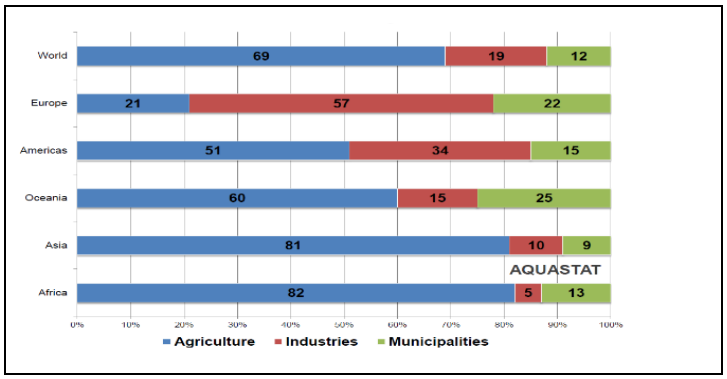
Water is essential for all life on Earth. Up to 60% of the human adult body is water (80% for babies) with vital functions (regulating body temperature, flushing out waste, transporting oxygen and metabolised food, or helping brain function). Each day every person must consume a minimum amount of water to survive (2 – 3 liters for adults).

Only 2.5% of the Earth's water is freshwater, most needed for life to survive (figure 1).



As almost 70% of freshwater is locked up in glaciers and the ice caps, societies get a large proportion of their water from groundwater (30% of total freshwater, and not all of it is readily available) and from surface freshwaters (1.2% only of total freshwater, of which lakes (21%) or rivers (0.49%).

Figure 1 – Distribution of Water resources on Earth (Shiklomanov, 1993[3])



At the global scale, the water withdrawal ratios are 69 percent for agricultural use, 12 percent for domestic use and 19 percent for industrial use, with large variations between world regions (Figure 2).

Figure 2 – Water Withdrawal ratios by world regions (FAO, Aquastat, data 2015)

In terms of water security[4], the most important measure is the volume of renewable freshwater resources, i.e. the volume of precipitation falling on land. As, globally, most rainfall is evapo-transpired by forests and natural landscapes (56%) and rain-fed agriculture (5%), only 39 percent or 43 000 km^3 per year is converted to surface runoff (feeding rivers and lakes) and groundwater (Aquastat, N.A). To maintain sustainable levels of water

[2] EU Green Deal Communication COM/2019/640 final https://ec.europa.eu/info/sites/info/files/european-green-deal-communication_en.pdf

[3] Shiklomanov's Chapter « World Fresh Water Resources », in Peter H. Gleick (Editor), 1993 – Water in crisis: a Guide to the World's Fresh Water Resources ».

[4] UN Water, 2013, *http://www.unwater.org/publications/water-security-global-water-agenda/*

resources, rates of water withdrawals must be kept below rates of freshwater replenishment. Renewable flows (river flows and groundwater from rainfall) are therefore an important indicator of water security or scarcity. If rates of freshwater withdrawal exceed renewable flows, water resources decline.

2.1.2 Achieving UN SDGs targets and managing major risks for all human activities

In 2018, UN SDG 6 on water and sanitation was one of the goals reviewed[5] by the High Level Political Forum, with an alarming conclusion: «Despite progress, billions of people still lack safe water, sanitation and handwashing facilities. More efficient use and management of water are critical to addressing the growing demand for water, threats to water security and the increasing frequency and severity of droughts and floods resulting from climate change. The time to act on SDG6, which is essential for progress on all other SDGs, is now, as the global targets for SDG6 will not be achieved by 2030 at current rates, considering trends in financing, capacity and political commitments». The current **negative trends in water quantity and quality will also undermine progress towards most of the other Sustainable Development Goals** (SDGs), particularly the targets related to Poverty, Hunger, Health, Clean Energy, Cities, Climate, Life below Water or on Land (respectively SDGs 1, 2, 3, 7, 11, 13, 14 and 15), but also Gender Equality and Peace (SDGs 5, 16).

Impacts of the **risks related to water**, **classified among the TOP 3 priorities** by the World Economic Forum[6], are widespread and cross-sectoral (figure 3). Access to water and water–related ecosystem services are also considered as central to several sectors & human activities (safe food production, safe environment, secure energy production (cooling / biofuels)). Safety with respects to floods and dams and other water-related hazards are also crucial for human society and activities.

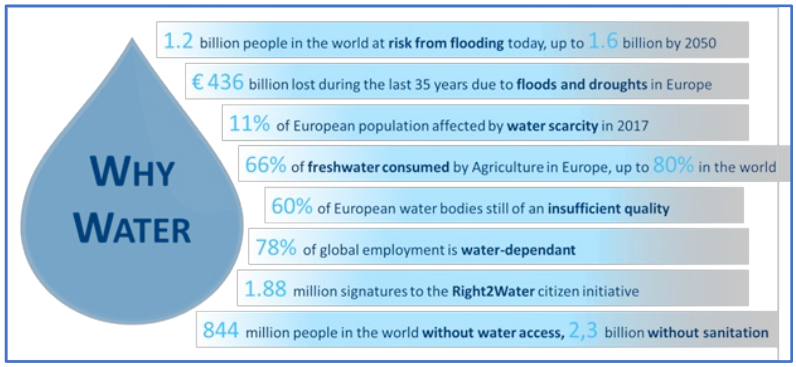


Figure 3: The different Water challenges as identified by different stakeholders (European Environment Agency report – Floods 2018; UN Water Development report 2018; UN Water Development report - Water and Jobs 2016; World Bank and World Economic Forum)

Water stress (the balance between demands and resource availability) is **driven by three important factors**: (1) climate, which controls the availability of renewable water resources, the seasonality in water supply and generates extreme events and related risks, (2) water demand, which is largely driven by population density and related economic activities, and (3) water quality conditions which can prevent or restrict uses of water resources.

Global trends project world-wide growth in water use by 55% by 2050 (figure 4), due to growing demands from manufacturing, thermal electricity generation, agriculture and domestic use, all **increasing the pressure of human activities on our fresh-water sources**.

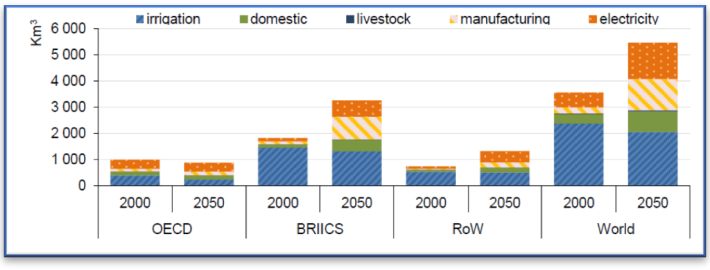


Figure 4: Global water demand: Baseline, 2000 and 2050 (OECD, Environmental outlook to 2050[7])

[5] UN Water, High Level Political Forum, SDG 6 Synthesis Report 2018 on Water and Sanitation - https://www.unwater.org/publication_categories/sdg-6-synthesis-report-2018-on-water-and-sanitation/
[6] World Economic Forum, 2019 Global Risks Report - https://www.weforum.org/reports/the-global-risks-report-2019
[7] OECD, 2012 - Environmental outlook to 2050 - https://www.oecd.org/g20/topics/energy-environment-green-growth/oecdenvironmentaloutlookto2050theconsequencesofinaction.htm

Furthermore, **water quality** is **declining** due to agricultural, industrial, mining and urban pollution, impacting water availability of sufficient quality for users (World Bank, 2019[8]). **Water quality deterioration impacts all countries** (high-income status does not confer immunity from water quality problems) **and is now recognized to have larger impacts on health, agriculture, and the environment than were previously known.** When these sectoral impacts are aggregated, they account for significant slowdowns in economic growth.

Hydrological extreme events, such as floods and droughts, account for more than 60% of natural disasters (CRED, 2019[9]), with the average number of reported flood events increasing from 30 (1971-1980) to 50 (1981-1990) to over 140 (2011- 2015). Considering the **projections of the impacts of Climate Change** by the Intergovernmental Panel on Climate Change (IPPC, 2015[10], 2019[11]), countries will be particularly affected by drier conditions, exacerbating the water crisis and impacts across sectors.

In terms of **freshwater aquatic ecosystems and biodiversity**, the World Wide Fund for Nature's 2018 Living Planet Report[12] shows that population declines in freshwater biodiversity (83% between 1970 and 2014) continue to outpace contemporaneous declines in marine or terrestrial systems (figure 5).

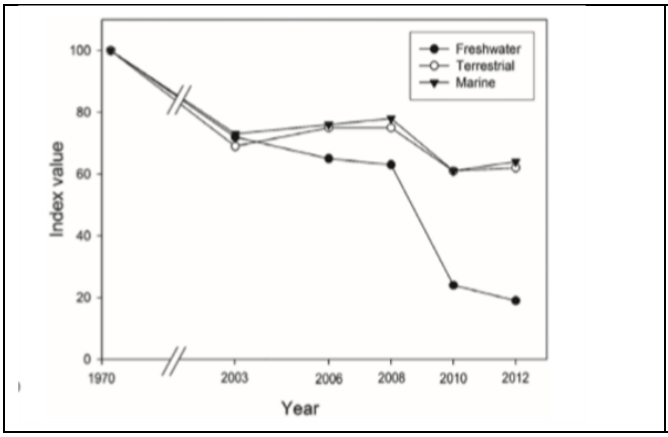


Figure 5: Trends in freshwater biodiversity decline (WWF, 2018**)**

While lakes, reservoirs and rivers cover only 2.3% of the Earth's surface, these ecosystems host at least 9.5% of the Earth's described animal species.

This is confirmed by the Global Assessment recently released by the Intergovernmental Platform for Biodiversity and Ecosystem Services (IPBES[13], 2019): i) **Inland waters and freshwater ecosystems show among the highest rates of habitat decline;** ii) **Only 13 per cent of the wetland present in 1,700 remained by 2000;** iii) **recent losses have been even more rapid** (0.8 per cent per year from 1970 to 2008). The IPBES proposed approaches for sustainability and possible actions and pathways for achieving them, such as integrating water resource management; supporting co-management regimes for collaborative water management and to foster equity between water users reducing the fragmentation of freshwater policies by coordinating international, national and local regulatory frameworks; or promoting investment in water projects.

[8] World Bank, 2019 – Quality unknown – the invisible water crisis - http://documents.worldbank.org/curated/en/537481566459193718/pdf/Quality-Unknown-The-Invisible-Water-Crisis.pdf

[9] Centre for Research on the Epidemiology of Disasters, 2019 – Emergency Events Database - https://www.emdat.be/

[10] Intergovernmental Panel on Climate Change, 2015 – 2014 Synthesis report - https://www.ipcc.ch/site/assets/uploads/2018/05/SYR_AR5_FINAL_full_wcover.pdf

[11] Intergovernmental Panel on Climate Change – 2019, Climate Change and Land - https://www.ipcc.ch/report/SRCCL/

[12] WWF 2018 Living Planet Report https://wwf.panda.org/knowledge_hub/all_publications/living_planet_report_2018/

[13] IPBES, 2019 - https://ipbes.net/sites/default/files/ipbes_7_10_add.1_en_0.docx

Finally, there has been a long history of **conflicts over water resources**, but now, disputes over access to water, the use of water as a weapon, and the targeting of water systems during conflicts are increasing (Figure 6).

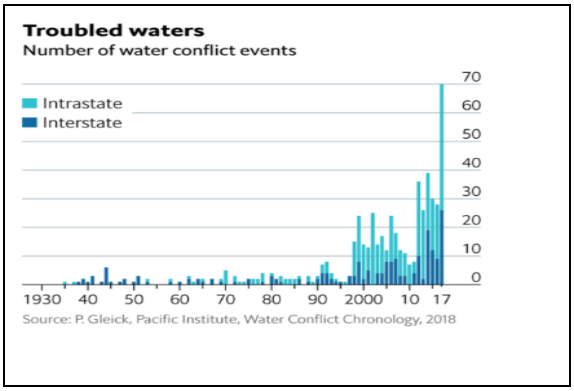


Figure 6: Water conflict types and chronology (Pacific Institute, online list and map)

2.1.3 Achieving EU policy Objectives

Clean water is an essential resource for human health, agriculture, industry, energy production, transport, recreation and nature (Figure Annex 2.12). Ensuring that enough water of high quality is available for all purposes, including for water and wetland ecosystems, remains a key challenge globally and within Europe.

Currently, water stress affects 1/3 of the EU territory all year round (EC, 2019[14] - figure 7). Even if the deterioration of water quality halted across Europe's 130,000 freshwater bodies, the quality is only slowly improving, with **60% of surface water and 30% of groundwater not yet achieving good status under the EU Water Framework Directive (WFD)** (figure 8). Achieving good status of Europe's surface waters not only serves the objective of providing clean water but also supports the objective of providing better conditions for some of Europe's most endangered ecosystems, habitats and species, as listed under the Habitats and Birds Directives. European Water Bodies are under high pressure and the number of bodies not in good status is of concern.

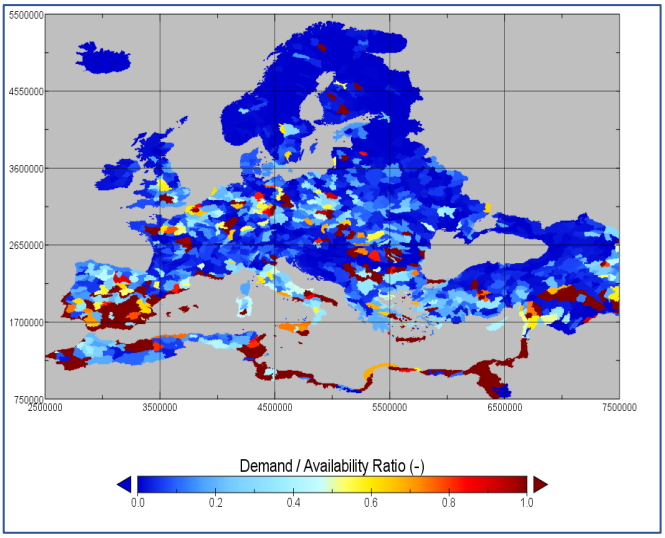


Figure 7: Current water stress in Europe (EC, 2019)

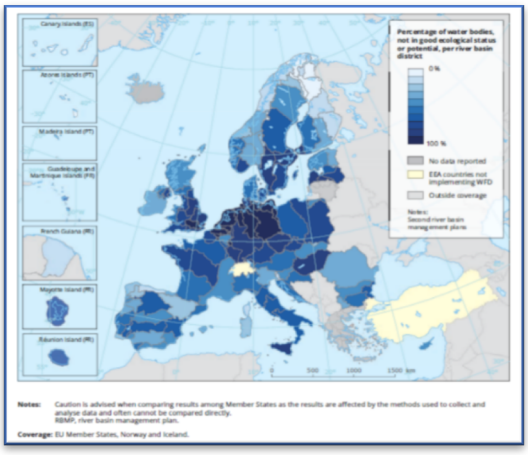


Figure 8: Country comparison – Percentage of European Water bodies not in good ecological status (EEA, 2019)

The main challenges for freshwater resources and ecosystems are: floods (27 out of the 28 MS included floods as a main risk in their National Risk Plans), droughts, hydro-morphological alterations, diffuse and point source pollution, and over-abstraction. **Hydrological extreme events such as floods and droughts,** account for the majority of natural disasters recorded in 2018 (43%) and the majority of the total population affected in the same year (66%) (Centre for Research on the Epidemiology of Disasters[15], 2019).

The **costs** of water shortages were estimated for 1976-2006 to be up to €100 billion (EC, 2019). OECD's partial estimate of the scale of global economic losses related to water insecurity is USD 260 billion per year from

[14] EC, 2019 - Report on the 2nd River Basement Management Plans and first flood risk management plans - https://eur-lex.europa.eu/resource.html?uri=cellar:bee2c9d9-39d2-11e9-8d04-01aa75ed71a1.0005.02/DOC_1&format=PDF

[15] CERD, N.A., International Disaster database - https://www.emdat.be/

inadequate water supply and sanitation, USD 120 billion per year from **urban property flood damages**, and USD 94 billion per year of **water insecurity to existing irrigators** (OECD[16], 2018). More than 3 out of 4 jobs depend on water.

One of the identified solutions for solving some of these challenges is more efficient wastewater treatment and enhancement of water reuse across all user sectors. Nevertheless, several major shortcomings have been identified (EC, 2019[17]):

- Some **EU countries are lagging behind with implementing** the Urban Wastewater Treatment Directive and need to step up their efforts. **Implementation is supported through substantial EU funding** and compliance promotion activities.
- **Storm water overflows place significant pressures on surface water bodies**. With more heavy rainfall events predicted in the future, they will be an increasingly important source of pollution.
- **Small agglomerations or non-connected dwelling**s (not covered by the Directive) place significant pressures on 11% of the EU's surface water bodies.
- **New concerns**, such as the pollution of water bodies by pharmaceutical residues and micro & macro-plastics are being identified and need to be better considered.

What we are learning from the COVID19 crisis is that the resilience capacity of the Water Systems (from distribution to treatment) should be enhanced during the crisis or any emergency potentially threatening supply security and then reduce impacts on society by i.e. avoiding further spread of disease and mitigating secondary effects.

As water is so essential for life and underpins human activities, it should be placed higher in the priorities addressed by other sector policies. Too many pressures come from a lack of integration of the WFD objectives in other policies regulating other sectors (cf. Annex 2). All these remaining challenges call for better prevention of pollution at source and the acceleration of implementation of innovative solutions for water management and water reuse. Innovation should also be stimulated in other sectors, in order to help achieve all policy objectives in a more integrative and synergistic way, to increase joint benefits and to reduce trade-offs.

2.1.4 Relevance to the European Green Deal

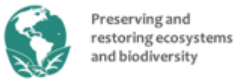
"Water is central to all EU Green Deal components"[18]

Water4All strives to produce science-based knowledge to support the Green Deal by monitoring problems and developing feasible technical and managerial solutions and in support of EU policies. With the SRIA and its targeted activities, Water4All aims to give directionality to the Research needed for eight work streams of the Green Deal, including the Digital Agenda, empowering citizens and strengthening International cooperation, while securing water for all.

Table 1 – Water relevant RDI areas for Green Deal (from COM text) and other EU policies

Work streams	Water RDI areas
	Climate change is associated to water crises. RDI is needed for innovative solutions for adaptation to hydro-climatic extreme events, especially flood and drought risks
	Water security and energy security are strongly interlinked. RDI is needed to improve the understanding of the water–energy Nexus, particularly developing better awareness of the role of water in energy production

[16] OECD, 2018 - https://www.oecd.org/water/Policy-Paper-Financing-Water-Investing-in-Sustainable-Growth.pdf
[17] EC, 2019 - Evaluation report on the implementation of the Urban Wastewater Treatment Directive - https://ec.europa.eu/environment/water/water-urbanwaste/pdf/UWWTD%20Evaluation%20SWD%20448-701%20web.pdf
[18] Daniel Calleja Crespo, Director General Environment, EU Water Innovation 2019 Conference, Zaragoza, December 2019

	RDI is required to identify conditions under which reuse of water does not generate new environmental and health risks; Essential to cope with water scarcity while maximising resources recovery
	RDI on efficiency of water use, supply and access, water quality and sanitation in buildings; RDI on energy generation from water resources in urban or industrial systems
	RDI on effects of climate change in major rivers to allow inland shipping during drought
	RDI on water management in agricultural areas for healthy river basins and ecosystems; RDI on water pollution & risk mitigation and water reuse potential in agriculture
	RDI on Inland waters and wetland ecosystems, and the role of freshwater in nature-based solutions for healthy and resilient seas and oceans
	RDI on better measures to address pollution and risks from several sources, including micro plastics, pharmaceuticals and chemicals.
Additional Policy areas	
Digital agenda	RDI to develop and/or implement sensors & digital solutions that will enable integrated water management in an optimal & transparent manner
Empowering citizens for the transition	RDI on methods for citizen engagement (co-development, improved communication, public perception and responsibility and awareness) for sustainable management of water resources
International cooperation	Align water-related RDI in participating countries and provide a powerful tool for international cooperation to join efforts to solve the global challenges on water

Therefore, **we need to have a specific partnership that does not only examine the specific aspects of water in each of the eight work streams separately, but considers to the interactions between all uses,** with a special attention to the NEXUS approach between Water, Energy, Food and Ecosystems. This will contribute to the alignment and directionality of EU research in each Horizon Europe cluster and between several clusters.

2.1.5 Previous Research and Innovation interventions

Water R&I has been at the heart of **EU Research and Innovation Framework Programmes**, with the production of important knowledge and solutions to address several of the above-mentioned challenges. In FP7, EU funded Research and Technological Development (RTD) projects focused on knowledge and solutions to assess, protect and restore rivers, lakes and wetland ecosystems and develop integrated water resources management options. Horizon2020 expanded the scope of previous water research activities by addressing the whole chain of RDI with the aim of unlocking the innovation potential in the field of water management.

Figure 9 shows the number of projects and scientific issues addressed in recent EU funded RTD projects. In addition to technologies, guidance materials and software have been also promoted to policy makers, managers and water professionals in the transition to sustainable water management. **EU funding achieved several of its objectives**, notably strengthening the scientific impact by generating scientific breakthroughs, reinforcing R&I capacities and integrating R&I efforts. By supporting closer-to-market applications and innovation, Horizon 2020 generated several innovative water technologies and products, thus helping to promote innovation in the EU water sector. However, it has not yet played a strong role in overcoming potential barriers and bottlenecks impeding full effectiveness in terms of market uptake, probably due to the **lack of a systemic approach for addressing the whole water innovation ecosystem**. Results from **EU funded projects have also contributed to EU policy making,** by supporting for example the recent EU guidelines on water reuse, but, **there is still a lot of potential for having a wider influence on EU policy.**

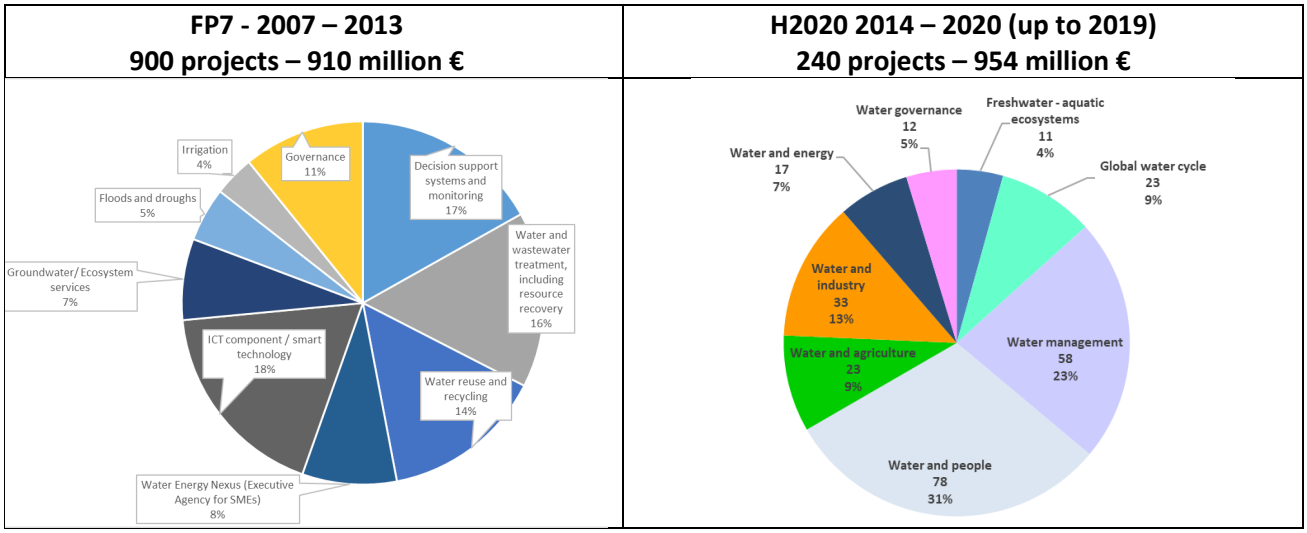


Figure 9: Water challenges projects funded under EC FP7 (left) and Horizon 2020 programmes (right)

In addition, in the context of the implementation of the European Research Area (ERA), the Joint Programming approach was introduced, enabling European Member States (representing 85% of R&I public investments in Europe), and associated and third countries, to participate in joint research programming activities that are strategically important and offer synergies. The **Water Joint Programming Initiative** was approved at the European Council of Competitiveness in December 2011. Since its creation, the Water JPI has worked on different challenges and had several key achievements:

- **Agreements on a common Vision Document (10 years forward looking) and JPI Strategic Research and Innovation Agenda (SRIA)**, which lays out specific RDI needs to tackle the Water JPI grand challenge (the third SRIA 2025 was approved by JPI the 31 March 2020);
- The **extension of the Water JPI membership (from 14 in 2011 to 23 full members** and 3 observers in 2019 corresponding to 88% of the funding capacity of freshwater R&I in Europe) to build a greater critical mass. This is required to provide an effective response to major societal challenges;
- Progress towards **alignment of national research agendas**, which is a crucial priority enabling the optimal use of national research funds;
- The **launch of six Joint Calls for Proposals** in 2013, 2015, 2016, 2017, 2018 and 2020 (two without EC co-funding contributions) addressing different SRIA themes. So far, 70 projects have been funded under the first five calls, **with a total budget of approx. €83.1 million for only €14.3 million of EC contribution**);
- The **development of new cooperation tools**, such as the Thematic Annual Programming Actions (clusters of nationally funded projects), the Knowledge hubs (clusters of experts on specific topics – one on contaminants of emerging concern, one on the Water – Energy – Food – Ecosystems Nexus) and the upcoming information platforms on water related research infrastructures and mobility schemes;
- A comprehensive **EU water RDI mapping report**, including the creation of a Projects Database (Open Access) to better understand European water-related RDI activities and take stock of national and regional research strategies, policies and programmes in the EU;
- **dissemination of research results to support policy** (policy briefs, position papers), **private actors and end-users** (stakeholder briefs, JPI Conference, connections to Water Europe and European Innovation Partnership on Water actions);
- The development and consolidation of **international cooperation**, starting with European countries and then widening. Six additional international countries are now joining Water JPI activities (Brazil, Canada, Egypt, South Africa, Taiwan and Tunisia); and
- The establishment of the **Water JPI Advisory Boards, a Scientific and Technological Board (STB) and a Stakeholder Advisory Group** (SAG), to extend its partnership and involve many stakeholders.

Nevertheless, despite this tremendous effort, several challenges **still need to be tackled**, in order to increase the long term impacts of these activities.

2.1.6 RDI Challenges Drivers

Considering the Water security challenges, Water4All will operate on what is performing less well, bottlenecks, and drawbacks in two main areas: Water security and Programme Implementation.

2.1.6.1 At the Water Security Challenge level

Prioritising Water - Water is central to sustaining life and all sectors of activities in Europe and beyond. But it is not recognised as a priority in itself in public policy agendas: water challenges are at present primarily dealt with by Environmental policy-makers and often treated as an extension of other policies by policy makers, (agriculture, energy, etc.). This leads to conflicts and difficult decisions, often to the detriment of water resources, when facing crisis situations.

Time for a systemic approach for transformation - Small changes will continuously improve activities but not necessarily reach an overall objective, while drastic step changes, more demanding at first sight, may be needed to finally reach the objective of sustainable water use. Facing the tremendous challenges outlined in chapter 2.1.1-3, innovation will have to address priority steps-changes, whilst meeting the needs of a range of policy areas and actors.

Working on the interconnections - As highlighted by the Green Deal Communication, conventional approaches will not be sufficient. Emphasising experimentation, and working across sectors and disciplines, the EU's research and innovation agenda will take the systemic approach needed to achieve the aims of the Green Deal. The true transformative potential of the 2030 Agenda can only be realised through a systemic approach that helps identify and manage trade-offs, while maximising co-benefits. This offers the most promise for achieving the desired transformations at the necessary scale and speed.

Synergistic solutions between sectors and actors - The different dimensions of the water crisis (both in quantity and quality) have to be considered for all users who should also be aware of the global needs. The trade-offs between the solutions proposed for each sector have to be properly assessed for informing decision-makers. Synergistic solutions addressing different sectors (e.g. the NEXUS approach) should be prioritized to address several policy objectives at the same time. Reconciling water industry sector with the water consumer sectors is also crucial for avoiding duplication of technology development and implementation, while looking for synergies.

2.1.6.2 At the implementation challenge level

Aligning funding programmes and timelines - Efforts to align programmes and timelines for creating the critical mass required started with the launch of the Water JPI. This includes its proposal of actions with the economic sectors in cooperation with Water Europe. It is a long-term process requiring increased efforts and a willingness to address the inherent barriers. Currently, the different "phases" of the R&I programming chain are operated in silos by different funding actors. More should be done for reconnecting all steps and allocating roles of key actors and therefore to maximise the impacts of the allocated resources.

Funding from research to implementation - As shown in the implementation review of the European Innovation Partnership (EIP) on Water (March 2018) and the review of the Urban Wastewater Treatment Directive review, water projects are often unable to attract the level of finance they require, in order to become a reality. The transition to a circular economy requires several elements of the system to change simultaneously. There is a clear need to act at all levels of the research-innovation pipeline and to connect "downstream" funding programmes (equipment investments, demonstration at policy scales) to demonstrate the efficiency and fairness of new innovations at the field scale, and transform pilots into operations.

Facilitating investments in innovative approaches and solutions - Securing investment is crucial for the market, especially for water infrastructures[19], which are built to last 50 years or more. Investing in innovative solutions is then not always the most secure way of managing available and limited resources. However, it is crucial for operators to adapt to new challenges along the life cycle of their infrastructure. It is also important to develop a legislative framework that stimulates and enables innovation, and provides flexible policy and financing instruments to cover all stages of the innovation cycle.

[19] pumping stations, treatment plants, pipeline networks, buffer storages, etc.

2.2 Common vision, objectives and expected impacts

The WATER4All partnership vision: *Boosting the systemic transformations and changes across the entire research – water innovation pipeline, fostering the matchmaking between problem owners and solution providers for ensuring water security for all in the long term*.

A holistic innovation approach (cf. figure 10) will be able to develop, test and scale up integrated and symbiotic solutions for cities and rural areas, as well as the economic sectors or the nature, thus contributing to the achievement of the EU and International water-related legislation and the UN Sustainable Development Goals.

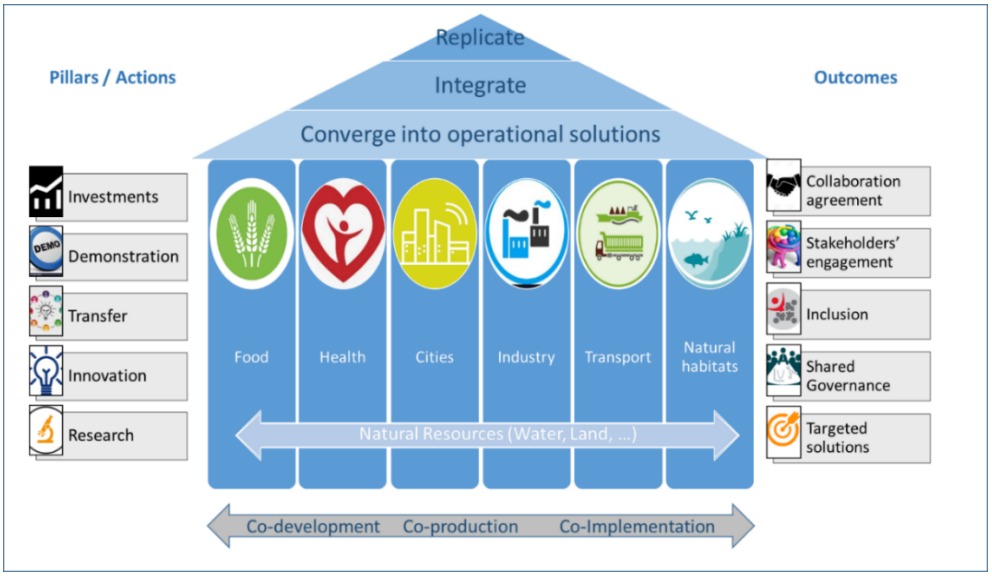


Figure 10: Cross – sectoral approach proposed in Water4All

It will need to address pressing urgent water needs from companies, government and society, while incorporating new insights and legislative needs, guaranteeing a balance in the distribution of resources between drinking water and others uses (agriculture, industry, and tourism). It will also address a safe social and fair use of water, minimizing the impacts on health, nature and habitats in accordance with relevant legislation and directives. Solutions will need to include the right trade-off in terms of energy and resource and generated pollution. They need to move towards a circular economy and moves away from chemical pollution and over exploitation of precious (water) resources, taking climate adaptation into account and preparing mitigation measures. Providing such solutions will require assessment of interconnections and interdependencies between sectors and scales, while considering key trade-offs in a holistic way (e.g. soil sealing for new infrastructures limits groundwater recharge and increases runoff; economic sectors demands vs. minimum ecological flow for maintaining biodiversity services).

Local solutions for storing / keeping water in areas / cities, recharging groundwater resources and reusing water several times will have to be developed in close cooperation between the local actors. This is currently being experimentally tried in some areas (e.g. Tarragona, Spain – Annex 5 – where cities – wastewater treatment operators and industry), but should be duplicated in a safe way in many regions/areas in order to have sufficient impact on the problem of water scarcity.

Therefore, the **general objectives** are:

i. Provide solutions to the current and increasing water crisis in the context of global changes;
ii. Strengthen scientific evidence for new policies or update existing ones;
iii. Supporting efficient collaboration and integration of EU, MS and international R&I activities in a multi-actors innovative approach; and
iv. Increase implementation of solutions and therefore global impacts.

This will create a continuum from the identification of the challenges to the demonstration of proposed solutions, ensuring a more rapid translation of research and innovation into concrete applications and uptake by relevant managers and citizens.

The Specific Objectives for Water4All will be:

- Ensure coordination and alignment of EU/National /regional programmes and a continuum in actions from Research & Innovation to implementation
- Provide new knowledge and innovative solutions at the relevant scales of implementation from local to regional and global scale
- Foster the uptake of R&I results by engaging industries, users and policy makers while developing skills and capacity building at the EU and international scale
- Demonstrate the efficiency of innovation solutions and leverage with "downstream" funding programmes (equipment investments, demonstration) by replication
- Attracting new partners for creating the necessary critical mass required to tackle global water security challenges and for developing innovation cooperation tools.

Figure 11 illustrates the intervention logic adopted for the development of the Water4All partnership.

The major expected impacts are:

- Increased protection of water resources and ecosystems and strengthening of biodiversity
- Enhancing resilience, mitigation and adaptation of water systems to climate change.
- Pooling resources (EU, Member States, European platforms and economic sectors) and aligning a shared and co-developed SRIA and related implementation plans.
- Develop new instruments for cooperation, across stakeholders, sectors and scales for developing future actions.
- Greater cooperation across sectors, with multi-stakeholder engagement and empowerment.
- Reinforcing the EU's role in the international water agenda.

More specific impacts are also foreseen:

- Scaling-up projects (from research to demonstration) and policy implementation, and therefore leveraging impacts of policies on the water security crisis.
- Developing capacity and community building to drive necessary societal transformations required for securing water for all.
- Developing a more systemic and integrative policy which considers cross-sectoral interconnections (Water, Biodiversity, Agriculture, Fisheries and Aquaculture, Energy, Health …).
- Connecting global ambitions with local actions (and vice-versa) and facilitating engagement and empowerment to co-develop and co-implement solutions.
- Embedding the national and regional knowledge and innovation ecosystems better with the EU one.

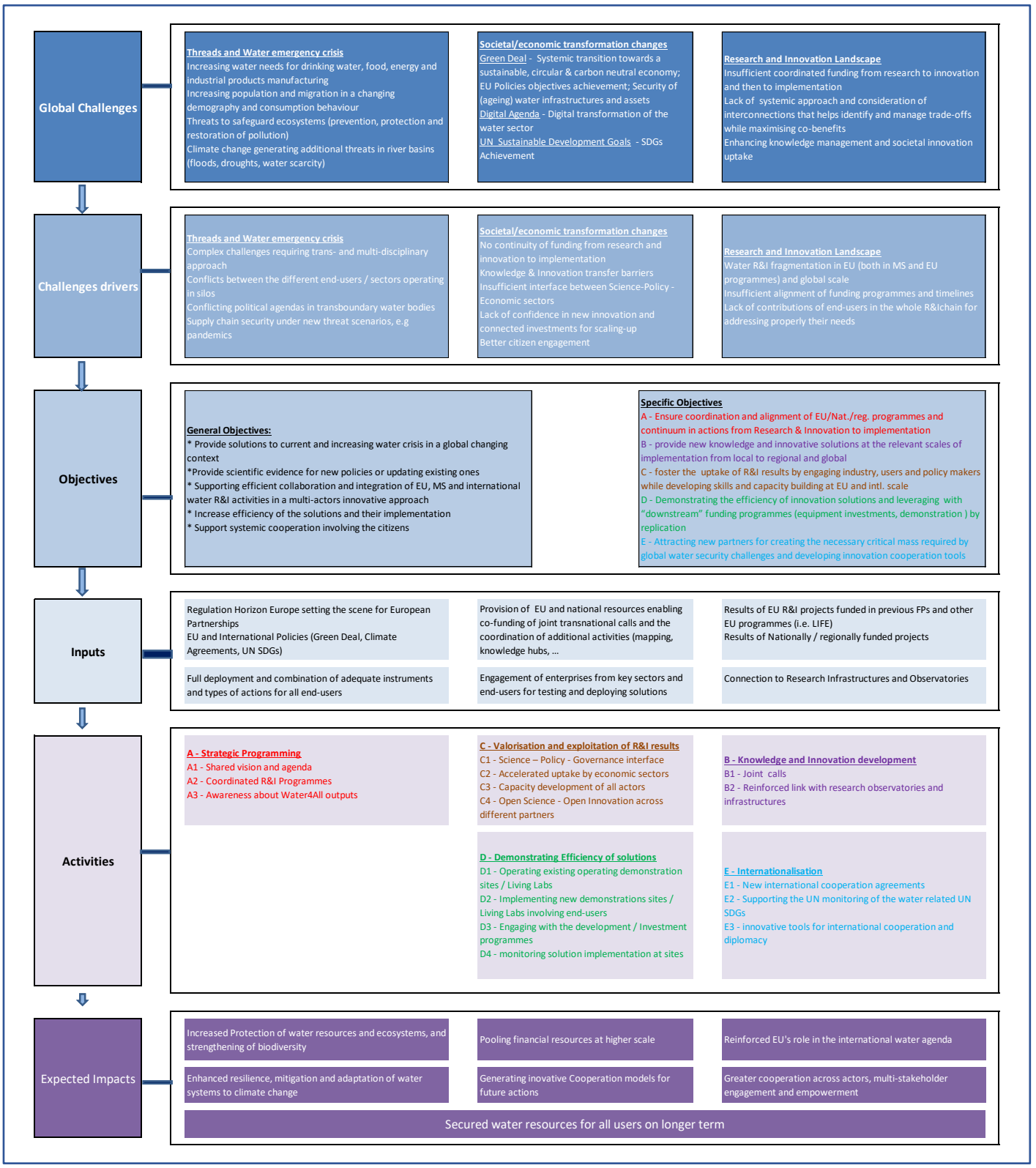


Figure 11: The intervention logic adopted for Water4All

2.2.1 Water4All pillars and SRIA

Water4All will be implemented through a transverse approach (i.e. across silos) and non-exclusive operational pillars (figure 12).

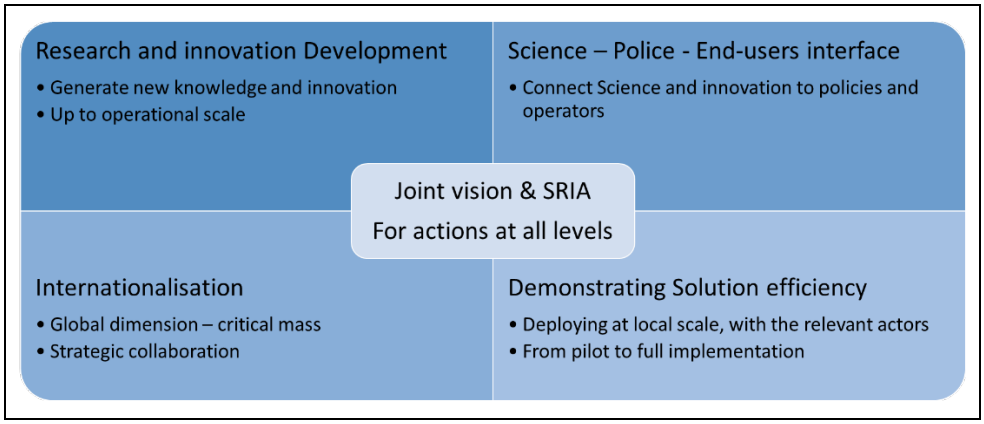
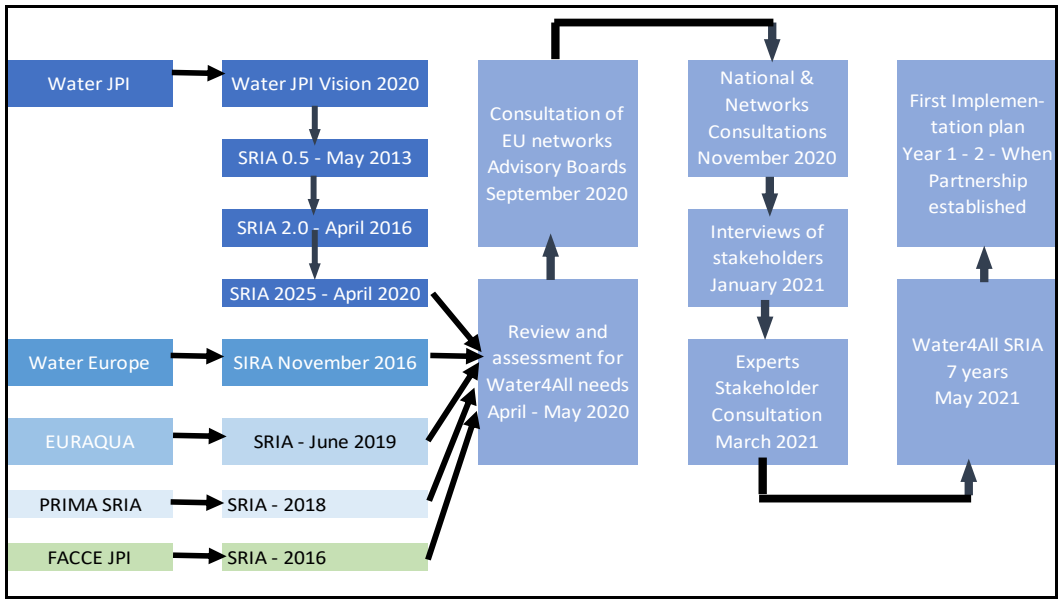


Figure 12: Water4All pillars

The Partnership will be based on a **Strategic Research and Innovation Agenda (SRIA)**, shared between the partners involved in Water4All and the relevant stakeholders. This SRIA will consider the existing SRIAs elaborated recently by some of the stakeholders (Water JPI SRIA – April 2020, Water Europe SIRA – June 2018 and EURAQUA SRIA – June 2019) which have been developed with large stakeholder consultations. The EU and National thematic policy needs were assessed during the preliminary preparation phase for Water4All (e.g. Identified research and innovation gaps for EU Water related policies in Annex 4).



The following process was approved for developing the Water4All SRIA.

Figure 13: Water4All SRIA development process

The SRIA will be updated during the implementation of the Partnership, based on the results of the R&I programmes / actions developed, and on potential additional needs identified during dialogue with relevant actors, end-users and other partnerships.

2.2.2 Links and/or collaboration opportunities identified at this stage with other Partnership candidates and European Union programmes

Water4All would build on the efficient structuring of the European Research Area produced by established networks, with joint actions between some of these initiatives (e.g. Research targeting a key water consumer sector – Agriculture - between Water and FACCE JPIs; an Action Plan for involving economic sectors produced by the Water JPI and Water Europe; a Common vision on risks in relation to pollutants and pathogens between three JPIs: Water, Oceans and Anti-Microbial Resistance; Aquatic Biodiversity and Ecosystems actions between Water JPI and BiodivERsA).

At this stage of the development of Horizon Europe, collaboration with the following European Partnerships proposed under Cluster 6, as well as other Horizon Europe clusters, is foreseen (table 2). In addition, the connection with at least three of the missions would also be investigated when their proposals of actions are

made publicly available. As Horizon Europe Missions are not "about research, but concrete delivery in Society, demonstration to achieve policy goals and have a broader policy tool box" (R&I Days September 2019), the R&I programme tools, such as the Partnerships and the regular work programme calls, should complement the Missions, by providing the new knowledge and innovative solutions required for such concrete delivery..

Table 2 – Relevant New Horizon Europe "instruments" with whom Water4All should interact

Other initiative of relevance	Areas for possible synergies – from publicly available documents (e.g. call for mission strategic planning, etc.)	Envisaged types of actions
Mission "Adaptation to Climate Change including Societal Transformation","	Climate change adaptation and mitigation; climate services; systemic and nature-based solutions; disaster risk reduction and management including public health and critical infrastructures; water management	To be completed when more details become available
Mission "Healthy Oceans, Seas, Coastal and Inland Waters	Systemic solutions for the prevention, reduction, mitigation and removal of marine pollution; Transition to a circular and blue economy; Urban, coastal and maritime spatial planning	To be completed when more details become available
Mission "Climate Neutral and Smart cities" In connection with the partnership on Sustainable, Smart and Inclusive Cities and Communities	Climate change mitigation and adaptation; urban infrastructures and networks, including … water; urban circularity and regeneration; ecosystem services and nature-based solutions; public health & well-being in cities; urban resilience	To be completed when more details become available
Mission "Health Soils and Food"	Food production strongly dependent on and affecting quality & availability of land and water; wastewater as a resource (sludge reuse and its effects, nutrient circulation, water management in industrial processes including mining)	To be completed when more details become available
Cluster 1 - Chemical Risks Assessment	Chemical regulatory processes for persistent or emerging challenges: environmental monitoring; toxicology & hazard assessments; exposure assessment; emerging chemicals; chemical mixtures; risk assessment methodologies; data management & analysis	Inform; Consult; Involve?
Cluster 3 - European Metrology	A cross-cutting partnership that can be linked to almost any other partnership ((Eralearn Workshop, March 2020). Create specialised metrology networks across Europe to respond to new global challenges.	Inform; Consult
Cluster 4 – European Geological Service	4D subsurface management & related geo-scientific data (including groundwater resources): Modelling subsurface environment; European Geological Data Infrastructure; Groundwater / biosphere /ecosystem services	Inform; Consult
Cluster 5 – Smart and Inclusive Cities and Communities	Urban circular economies and resilience to urban robustness, sustainable land use and urban infrastructures: new water technologies, circular processes and services in cities for more efficient use of water resources, blue infrastructure, resilience of city infrastructures etc.	Consult; Involve; Collaborate
Cluster 5 – Water Borne transport	Acting on "Source": Zero-emission shipping for all ship types and services; Increase the environmental performance of inland and marine shipping	Inform
Cluster 6 – Rescuing Biodiversity Vs. existing cooperation between BiodivERsA and Water JPI	Stop net biodiversity loss and guide actions to protect, restore and sustainably manage ecosystems and our natural capital; Conservation, sustainable management and use of biodiversity; Development and deployment of Nature-based Solutions	Consult; Collaborate
Cluster 6 – Blue Economy	Good Environmental Status of European seas, oceans & inland waters; Resilience of marine & freshwater ecosystems; Interlinked connections between land and water resources; fully integrated oceans - inland waters	Inform; Consult; Involve?

	monitoring system; early warning systems related to pollutants, ecosystem conditions, etc.	
Cluster 6 - Safe and Sustainable Food System	Role of water in food safety system, food safety and food quality; Shift to more sustainable and healthy diets	To be completed when available
Cluster 6 - Agro-ecology living labs and research infrastructures	Adverse impact on natural resources (soil, water and air), fragmentation of habitats and loss of wildlife	To be completed when available
Article 185 PRIMA Vs. existing cooperation between PRIMA and Water JPI (cf. SRIAs)	Theme 1 : « Integrated and Sustainable management of water for arid and semi-arid Mediterranean areas" Cross-cutting theme: Nexus with the farming systems and the agro-food value chain	Inform, Consult, involve wherever possible
Pillar III - European Open Science Cloud	Implement & realise the EOSC share and process publicly funded research data across borders and scientific domains.	Consult, collaborate
Pillar III - KIC Climate	Reference to water services in particular in relation with making agriculture climate-smart and transform food systems.	Inform; Consult
ESA - Copernicus	Proposal of additional priority action on freshwater availability under global change - observing capacity, basic scientific knowledge and predicting capabilities of the water cycle at global, regional and basin scales and its impacts on; Alternative management tools for a sustainable use of freshwater resources	

Water4All will also connect with other European Union programmes, in particular Regional Structural funds (and their different components), SMEs, LIFE, Development and Cooperation, as well as some discussion within the European Parliament.

The areas of possible synergies with these initiatives will be identified in the upcoming months when information becomes publicly available. **In addition, a review of the proposals of the other initiatives will be conducted when documents are made publicly available, to ensure all important water-related issues have not been missed. Any gaps will be considered for integration in Water4All activities.**

At this stage of the consultation in the Water4All proposal development, the key topics to be further assessed in terms of sufficient coverage are:

- Addressing the continuum between freshwater and marine environments (e.g. , measures to reduce pressures, such as nutrient and chemical pollution of freshwater systems, will equally benefit seas and oceans)
- Ecological restoration
- Urban water management with the involvement of city authorities
- The impacts of Land use changes (e.g. forestry, energy production…)

2.2.3 Necessary investments

Water4All aims for investments along a continuum: from the identification of the challenges to the demonstration of the proposed solutions to ensure a more rapid translation of research and innovation programme results into concrete applications and their uptake by relevant managers and citizens. It will align nationally and regionally funded R&I programmes, projects and activities across Europe.

Considering the importance of water security in the Green Deal, the role of water for the Digital Agenda and pending decisions on the final focus on some water-related missions, the total investment of the Partnership is currently estimated to €400 - 450 Mio depending of the number of demonstration sites / Living Labs willing to join Water4All activities.

- Overall estimate of required resources for partnership: EUR 55-65 million per year (for a duration of 7 years)
- National investments (based on total costs, current investments as done in the Water JPI – Table Annex 5.1) estimated at EUR 20–30 million per year (cf. chapter 3.2 – Resources)
- Regional / local investments estimated at EUR 7 - 10 million per year (combination of all regional demonstration sites / Living labs, including regional EDRF funding, to cover key situations and therefore future replication if additional investment funds are provided by other operators).

The Partnership proposes an ambitious range of activities, greater than usually developed in previous joint programming approaches (cf. chapter 3.1). This portfolio of activities will be implemented over a period of seven years, considering prioritization in terms of timing and investments for all funders and partners involved in these different actions.

2.2.4 Monitoring scheme

Success will be measured by:

Scientific and innovation gaps:

- The number of funded consortia which include end-users (companies, river basin managers or policy makers) for developing affordable, sustainable, and just solutions for managing water-related risks.
- The number of river basins management plans (RBMP) and resilient cities adopting a Nexus approach, supported by an increase of water and recovery products reuse ratios.
- The number of demonstration sites / living labs, connected to scientific centres of excellence, involved in the partnership actions.

Programming and allocated financial resources

- Number of RDI programmes coordinated at EU/National/Regional levels, and where possible, other funding streams (e.g. Interreg, LIFE, etc.), and beyond Europe for ensuring leveraging.
- The connection to research infrastructures and observatories for a greater integration of the resources allocated and of the data/results gathered.
- Number of projects integrating different financial resources.

Thematic Policies

- Number of policies using research and innovation results (cf. annex 4).
- Number of policy briefs and presentations for policy makers, including briefings for WFD Common Implementation Strategy (CIS) groups and Green Deal policies
- Increasing connections between MS water policy implementation and EU/MS research prioritisation and results uptake.

The way the intervention logic is implemented and how intervention success will be evaluated is detailed for each Action Pillar in section 3. In particular, outputs and results are detailed, with S.M.A.R.T. Key Performance Indicators to monitor achievement.

A Monitoring and Evaluation framework and related tools will be developed from the beginning of the implementation of Water4All, to support reporting to the different funders. At this stage, and in the absence of guidelines on Horizon Europe Partnership monitoring, it is proposed to use the Water JPI monitoring framework (used under Horizon 2020 for reporting to EC and ERALEARN, or GPC) as a basis for Water4All. The Water JPI monitoring framework monitors:

- All types of actions (beyond calls),
- From programme (level of general engagement and commitments) to funded projects levels (from proposal applications to outputs of funded projects, via a JPI Open Access / Open Data interface),
- The involvement of all end-users, including international and economic sector contributions.

The tools used or developed within the Water JPI conform with the General Data Protection Regulation (GDPR) (e.g. Privacy Policy, Submission Platform, Projects Databases …), Open Data / Open Access / Open innovation rules and Intellectual Property Rights (for the funded projects and the JPI activities).

2.2.5 Exit Strategy and measures for phasing out

The partnership is built on existing initiatives developed for several years, which have already developed some more sustainable systems for operating on a longer term. As an example, the Water JPI has started to assess a more sustainable financial model for running the coordination and the core actions of the JPI, whilst considering not endangering the membership and its inclusiveness approach (i.e. a mixed model considering EC contributions via projects, in-kind national contributions from national institutions and membership fees (a basic fee plus an additional differentiated fee if needed). Nevertheless, it is also noticed that the EC contribution

is used for proposing a variety of activities to be implemented, for allowing high involvement of some countries and for reducing the gap in success ratio between EU13 countries (13.5%) and all partners (16%).

During the duration proposed for the Partnership, long-term sustainability will be developed, by taking advantage of policy developments which are creating opportunities for more implementation of more innovative solutions. The Water4All Governing Board, its decision making body, will have to discuss, and agree on, the corresponding appropriate model for long – term sustainability.

The current political context, with the new Green Deal, should also reinforce the need for innovative approaches and solutions with increased social expectations for zero pollution and safer environments and, there is therefore, increased interest in pursuing cooperation on a longer term. As the slow implementation of actions has been highlighted as one of the causes of the failure of achieving some EU policy targets (e.g. Urban Waste Water Treatment directive and its consequences), it will be critical to reinforce the connection between the implementation level (local, regional and national) and investors. These actors will be key to discussing the long-term sustainability of the Partnership. That's why, during the implementation phase, the Governing Board (GB) members will have to play a major role in discussing funding and actions with relevant actors in each country and considering any additional necessary actions required for long-term sustainability.

At this stage of the development, considering the numerous uncertainties on financing instruments, it will be proposed to the Water JPI Governing Board (decision to be taken at the upcoming meeting) to: i) keep the JPI running for operating and monitoring the ongoing activities (e.g. running CSA and Cofund Actions until the end of 2025, stand-alone JPI activities on International Cooperation or Alignment); ii) invest in Water4All for all new activity funding to avoid competition in funding parallel actions; iii) creating synergies when possible (e.g. same Advisory Boards); and iv) give a higher ambition on this partnership on the basis of the new policy directions in the forthcoming ERA communications, when Water4All will end.

2.3 The Need for a European Partnership

2.3.1 Directionality

The diversity of challenges we are now facing to secure water for all, requires a new partnership that brings together all public and private research funders and supports a more efficient collaboration and integration of EU and MS water RDI activities. This will ensure a transition to a healthy planet, respectful of planetary boundaries, a resilient Energy Union, and implementation of an EU climate neutral policy, in line with Horizon Europe priorities.

Based on a **shared and co-constructed SRIA**, such partnership combines bottom-up and top-down approaches and can, therefore, reconcile needs whilst pooling resources from different sources. It should foster consortium building and help leverage between existing partnerinitiatives of partners under common broader or specific objectives. This will give direction and shape a common water implementation strategy.

A European Partnership would be more efficient than Horizon Europe calls because it commits the various relevant actors to address the whole chain of research and innovation in a coordinated way and in close cooperation with all relevant actors (**from the elaboration of a shared SRIA, the generation of new knowledge to its transfer to end-users for a rapid and concrete implementation at local scales**). With a systematic approach to the exploitation of partnership outputs, it will support the linkage of science and policy.

It also requires the **alignment and/or integration of different research and innovation agendas and** of EU and national programmes, coordination of funding agencies and commitments to implement a long-term strategy that would deliver major changes and impacts.

2.3.2 Additionality

No single State or stakeholder can fix global challenges alone, in terms of the R&I resources and capacities needed to address challenges such as the ones considered by Water4All. Currently the landscape of actors is summarised in Figure 14.

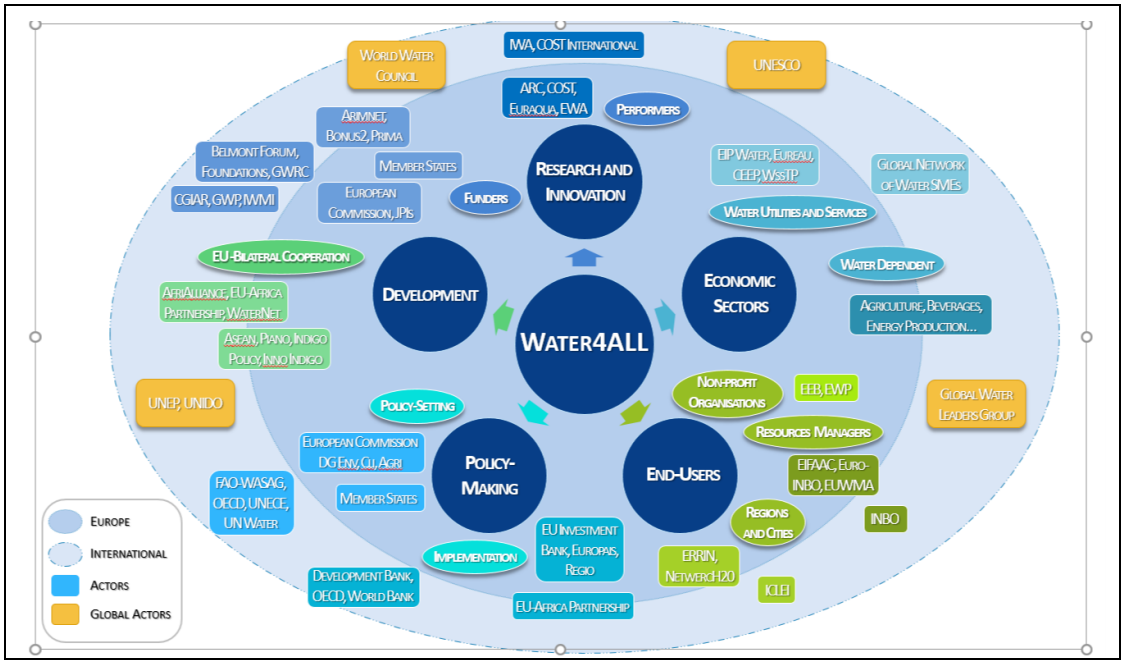


Figure 14: Current R&I landscape of actors at the scales of action of Water4All

In terms of research and innovation funding, this can be illustrated by the relative importance of EC and national funding allocated to Research and Innovation in relation to water challenges: the EC contribution in this domain in 2016 represented 12% of the total public R&I expenditure (Water JPI[20], 2014).

Therefore, multi-stakeholder partnerships (research, policy-making, financing, implementing, monitoring, etc.) are needed to be efficient and impactful.

The relevance of water to several intervention areas of Cluster 6 and other clusters of Horizon Europe (Clusters 1, 3, 4 and 5), requires a European and global partnership bringing together a broad spectrum of public and private stakeholders in the different activities proposed in the five pillars: this is not possible through regular individual calls for proposals and traditional collaborative projects.

A Co-funded European Partnership would deliver an objective and impact-driven approach and build **critical mass in resources (human and financial), expertise and capacities in the longer-term,** in line with the challenge faced (we are currently off track for achieving water-related EU policies or UN SDGs targets in due time).

Water4All allows **orienting and mobilising additional national resources with access to other instruments** / financing / investments along the same strategic research agenda (e.g. real life testing sites, research infrastructures, and innovation hubs or competitiveness clusters), contributing from collaboration that benefits existing European, national and local ecosystems.

As more synergies will be developed between various EU funding mechanisms and investment funds, this partnership scheme is **more appropriate for launching activities aimed at impacting policy development and implementation** (7th Environment Action Plan, Water Framework Directive and its daughter directives, Circular Economy Strategy, CAP and Food 2030, REACH, COP21 – Paris Agreement, UN SDGs, etc.).

2.3.3 Engaging with relevant stakeholders and citizens

Tackling the global challenges also requires **different forms of cooperation** (for maximising the types and number of partners involved). It will also allow implementation of a larger range of types of actions from development of academic and applied research, innovative solutions, including collaboration with enterprises in projects, transfer of innovation to enterprises, addressing the science – policy interface, while having better access to research infrastructures and connections to implementation tools (financial, regulatory), demonstration and training. It will provide the coverage of actions needed, the **necessary long-term flexibility and the possibility for rapidly integrating rapidly a larger range of activities** devoted to the achievement of proposed targets, in close cooperation with ad-hoc stakeholders, who would be associated as partners for

[20] Water JPI, Mapping Exercise, 2014 - http://www.waterjpi.eu/images/WatEUr%20Mapping%20Report/Mapping%20Report.pdf

achieving specific proposed objectives and targets. If **sufficiently flexible, it could allow a broader stakeholder engagement**, by the use of different financial programmes (e.g. structural funds, regional specialization) and different collaboration agreement models designed explicitly for the different communities.

Through Water4All, the needs to flow from local to EU to global and back, as solutions are typically local (in mother tongue). The Partnership should develop flows over scales.

2.3.4 International cooperation and water diplomacy

Water4All also allows development of strong and efficient international cooperation required to address complex water challenges and also supports achieving inclusiveness within European MS (EC contribution facilitating the participation of EU13 by reducing the transaction costs for all actions, allowing differentiated distributions of top-up, or supporting participation costs, to key events and meetings).

At the same time, more than any other region in the World, Europe boasts a wealth of experience in collaboration, innovation and the creation of proven solutions in addressing past and current water challenges. Therefore, this new partnership will be important to strengthen water diplomacy and maintain the EU's leading role as a global actor by supporting regional and international cooperation, to address water as a path to achieving the UN SDGs. By placing the engagement of civil society at the centre of its action, the partnership expects to deliver true progress and leverage research and innovation to generate green growth. Water4All will deliver sustainable financing opportunities and create more impacts by accelerating the application of research results for policy implementation.

In essence, **international cooperation** in RDI programming is complex and requires a monitoring, evaluation and learning process and related adaptation, flexibility and variable geometry interventions. Moreover, a European Partnership could help leverage cooperation at the global scale, helping to find solutions to many of the global water issues that lie outside of Europe. This will strengthen the EU's global role, develop science diplomacy and strengthen linkages to national programmes on international cooperation.

2.4 Partner composition and target group

2.4.1 Building upon, strengthening and/or expanding collaborations with existing networks and initiatives

As research and innovation policy is a shared competence between the European Union and Member States, Horizon 2020 helped strengthen complementarity and synergies with the European Framework Programmes and among EU MS activities in this area. This was achieved by supporting the implementation of various partnership initiatives, in particular the Water Joint Programming Initiative (JPI), and adopting related Art.185 initiatives with regional targets, such as PRIMA (Partnership on Research and Innovation in the Mediterranean Area) and BONUS (Science for a Better Future of the Baltic Sea Region).

Table 3 –Current EU partnership landscape following Horizon 2020 (EC, 2019)

	Public – Public Partnerships	Public – Private Partnerships	EIT instruments	Other Instruments
Currently active partnerships	Water JPI & its Eranet Cofunds (WaterWorks2014, 2015, 2017, AquaticPollutants) Articles 185 - PRIMA, BONUS	CPPP SPIRE (via Water Europe)	KIC Climate (water services component	EUREKA, COST Association

The current landscape of water R&I funding is even more complex and fragmented, within the EU and national programmes and more globally, if the EU MS bilateral international cooperation, EIB and private companies are also considered. It is also reflected in the EU setting and implementation of water policy (DG ENV, AGRI, GROW, CLIMA, REGIO, MSFD), with their equivalents at the national and regional levels in each MS.

During the last 6 years, actions were undertaken for rationalising this landscape:

- A shared strategic research and innovation agenda was developed with other stakeholders (including international institutions and partners), complementarity between the Horizon2020 framework programme and the Water JPI programme,
- four ERA-NET cofunds were implemented (WaterWorks2014, WaterWorks2015, WaterWorks2017, AquaticPollutants) and another one is upcoming (one planned in H2020 Work Programme 2020 in cooperation with BiodivERsA) under the umbrella of the Water JPI, based on the shared Water JPI SRIA. This wasdefined in cooperation with other stakeholders, and when relevant, other networks joined forces (e.g. WaterWorks2015 with FACCE JPI, AquaticPollutants with JPI Oceans and JPI AMR, last one with BiodivERsA).
- Continuous exchanges with other regional or international initiatives funded partly by EU and its MS (e.g. PRIMA, BONUS, CEWP – PIANO …).
- launching of science – policy interface structures for delivering specific documents that support the implementation of European and International policies in cooperation with key stakeholders (e.g. Water JPI – Water Europe – EurAqua):
    - in particular the European Water Framework Directive & associated daughter directives (drinking water, urban waste water treatment, upcoming water reuse), or other EU policies (7th Environment Action Plan, REACH, Industrial Emissions Directive, Common Agriculture Policy and Food 2030, SET Plan (alternatives to fossil fuels – water dependent) and of the international conventions (UN SDGs, COP21 – Paris Agreement).

The Partnership also requires strengthening cooperation with public and private research organisations, public authorities, research infrastructures and innovation transfer agencies. Cooperation with investors and the wider financial sectors will be essential as well as the involvement of end-users, especially citizens. That's why this proposal has been developed in an open and transparent way launched by the EC (cf. chapter 3.4) and developed by a group of networks and their members (see Annex 1).

2.4.2 Type and composition of the partners considered necessary (considering current information on eligibility conditions)

Considering current information on eligibility conditions, to achieve the proposed objectives, Water4All will rely on a core group composed of R&I programme funders and close cooperation with associated partners on some specific activities.

- Core members of the Partnerships (committed to all activities of the Water4All partnership):
    - R&I programme owners and funders from
        - Ministries in charge of R&I policy and agencies (cf. Water JPI membership)
        - Ministries in charge of Environmental policy and Environmental / Water Protection agencies (cf. Water JPI membership)
        - Public authorities funding thematic research and innovation in relevant thematic areas for Water4All area.
    - From EU, neighbouring countries and beyond EU, as is the case in the Water JPI (cf. MS consultation – June 2019 and Water JPI Governing Board resolutions)
- Associated partners for specific actions (through collaboration agreements with the partnership):

The following networks and institutions are considered important to ensure that the R&I priorities of Water4All meet the end-users' needs, assess efficiency of developed solutions on real situations and create greater impact. Their mobilisation is fundamental to ensure the achievement of all the proposed objectives and disseminating and exploiting the results to the various target groups as well as offering evidence for the stakeholder networks' own policies and activities.

- Research Infrastructures and observatories: ESA, COPERNICUS and ESFRI Infrastructures (e.g. DANUBIUS-RI, eLTER, ANAEE, …)
- The research alliances relevant to the Water security challenges (e.g. EURAQUA, EWA, …)
- The Technology Platforms: the European Innovation Partnership on Water and Water Europe
- River Basin managers and regional water agencies
- Water utilities and their demonstrators, members of the European associations (EUREAU, Aqua Publica Europea)

- The NORMAN reference laboratories network

Two other groups will also be associated at different stages of the implementation:

- **Observers (pending decision on EC role in partnerships):**
  - The European Commission / thematic directorates (e.g. DG ENV, DG CLIMA, DG AGRI, DG REGIO, …), including some specific programme representatives (e.g. LIFE)
  - The Joint Research Centre of the European Commission, units dealing with the challenges addressed by the Water4All partnership
  - The Common Implementation Strategy (CIS) Group and associated Working Groups, led by DG ENV, which are instrumental to the Water4All partnership aims
  - COST Association (with 15 running COST actions in the area)
  - UN institutions with the same challenges who have signed cooperation agreements / MoU with the EC and/or partners (e.g. UN Water and its World Water Quality Alliance)
- **Other partnerships** (existing or under development – Table 2), with whom discussions and coordination of activities should be organised.

2.4.3 Envisaged target groups and stakeholder communities

The Water4All considers a quintuple helix approach for ensuring long-term impact and legitimacy. Target groups are from: i) Research and Education System, ii) Economic System, iii) Political System and related public authorities, iv) the civil society and v) the natural environment, as each of them has an asset at its disposal with a societal and scientific relevance (i.e., human capital, economic capital, natural capital, social capital …).

Table 4 – Target groups and level of engagement with Water4All

	Collaborate	Involve	Consult	Inform
Research and Education Systems • **Funders** **Sustainable agriculture and food**, in relation to water reuse: FACCE JPI & EIP Agri, JPI Oceans (aquaculture) **Health challenges related to aquatic environments & sources**: JPI AMR, H2020 HERA project **Sustainable and resilient cities**: JPI Urban Europe, NetwercH20, EIP Smart cities, **Biodiversity conservation and restauration**: BiodivERsA, Biodiversity Partnership, IPBES • **Performers** Universities, public and private research organisations, Infrastructures and Observatories across disciplines	X	X X	X X	
Economic Systems • **Water sector** (water utilities, wastewater treatment services, water services producers, water related technologies providers, waterworks), EIP on Water • **For water consuming economic sectors** (energy production, inland water transport, manufacturing, tourism, …) • **Service and Technologies providers** • **Innovators and entrepreneurs, competitiveness clusters**	X	X X	X X	X
Political Systems and Regulatory authorities • Policy-makers (EU, National, regional), including WFD CIS WGs • LIFE programme (more than 200 implementation projects since the last 10 years) • ERDF programme * • Municipalities	X	X	X	X
Civil Society Regional and local initiatives, NGOs, Citizens involved in Living Labs				
Natural Environment • **River Basin Managers** (e.g. River Basin Commissions – Danube, Rhine, …) • **Water agencies**		X	X	X

*EU fund transfers to MS constitute 70% of money spent for flood protection in EU 13 (15% in EU15), 200 years will be needed for a complete renewal of sanitation infrastructures to current standards – OECD[21],2018)

- **International dimension and its added-value:**

Creating relevant critical mass in cooperation and developing networks with international or geographical initiatives for creating the relevant critical mass:

- Research side: directly with national funding organisations or through existing networks such as Belmont Forum, GWP, GWRC, international foundations (e.g. Bill and Melinda Gates foundation) and at regional scale, PRIMA, BONUS/BANOS (with EU and non EU-members)
- Policy side: UN Water, OECD, FAO
- Implementation side: i) river basin scale through relevant river basin managers (INBO, River Basin Commissions…); ii) science – innovation - market interface through existing networks (Global Water Technology Hub Alliance) or networks under development (Accelerators).

3 Planned Implementation

3.1 Activities

In order to reach the objectives presented in chapter 2, the Water4All partnership will deploy a broad range of activities along the whole R&I chain of values (cf. Figure 15), which are developed below, including Joint calls, as well as joint activities beyond calls designed to achieve the proposed objectives. Particular attention will be given to outreach, dissemination, knowledge transfer and uptake of new technologies and solutions to national / regional and local stakeholders, which are the final end-users.

The proposed structure of activities is designed using the most important information on the eligibility of actors relevant for a successful Partnership and can subsequently be adjusted to target key commitments. The Partnership as designed can also start around a core set of partners and enlarge later on with new partners and/or activities as planned in the five pillars.

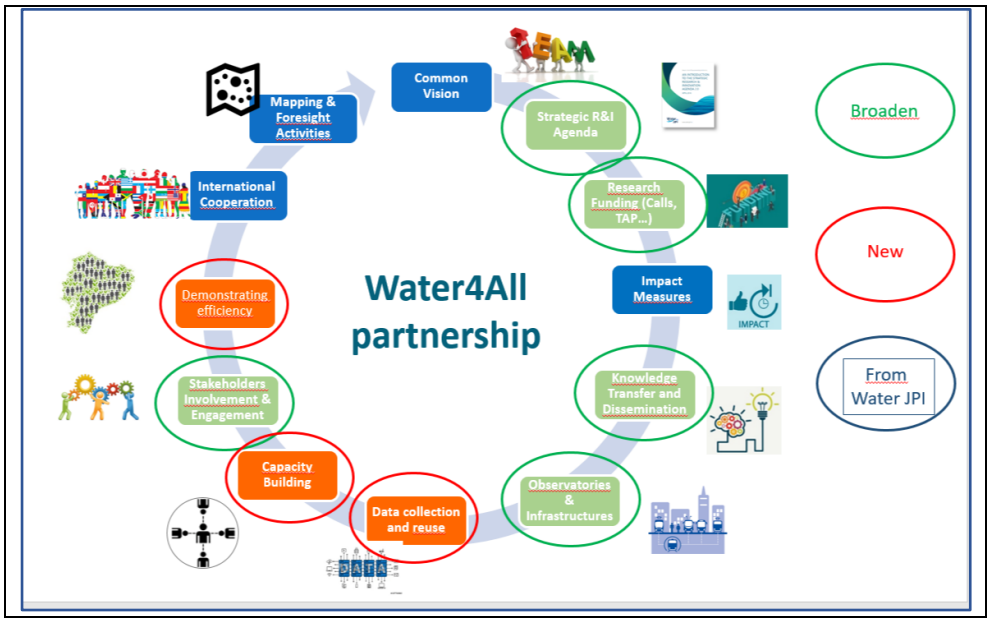
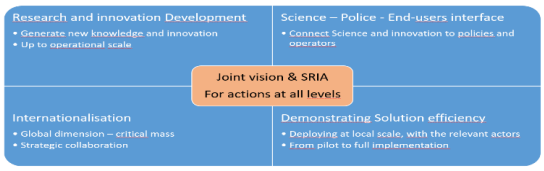


Figure 15: range of activities planned within the Water4All partnership

The Partnership will be organised around the following five pillars and activities.

[21] OECD, 2018, Study for DG Environment on financing capacities for water-related investments - https://www.oecd.org/water/Session%202.%20Mapping%20investment%20needs%20and%20financing%20capacities%20for%20water-related%20investments.pdf

	**Pillar A – Identifying research and innovation priorities to strengthen alignment of EU and National RDI programmes and increase the impact and policy relevance**

Objectives: The establishment of shared and agreed visions on research and innovation gaps will ensure: i) the appropriateness and efficiency of the joint actions to be designed and implemented for addressing the identified challenges; and ii) the policy relevance and timeliness of the proposed joint actions being designed. It will also address and reduce the fragmentation of the R&I landscape by aligning SRIAs, while anticipating and avoiding overlaps. Articulating & completing actions and identifying areas of synergy with the other programmes will create the critical mass required to address the challenges, maximise efforts and limit or overcome existing barriers. Finally, this approach will make water challenges and innovative solutions more visible to the general public, increase recognition of the role of water in the upcoming challenges (e.g. Brave Blue World) and provide a showcasing platform and the portal for access to water security solutions.

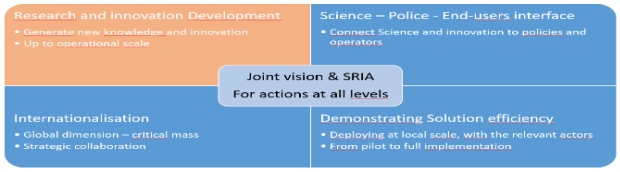
Main **activities** are:

- Developing and updating the shared vision and SRIA of the Partnership
- Coordinating the R&I programmes and actions across the European Research Area, and possibly beyond
- Raising awareness about Partnership outputs.

This pillar will rely on the following detailed intervention logic (Figure Annex 6.1) with the following **outputs**:

- Shared and coordinated methodology for updating the SRIA
- Shared vision and SRIA for Water security challenges to be implemented in the coming years
- Identification of possible synergies (& Joint Actions) with other Partnerships and relevant initiatives
- Buy-in from stakeholders (i.e. by involving them in the co-design process)
- The development of foresight studies
- Scientific contribution on key questions raised, via the organisation of specific AB Working Groups
- Mapping of the projects already funded by the different programmes involved (EU, national, regional) and of the outputs to identify gaps to be prioritized in the Partnership work programmes
- Providing pertinent and timely data during the duration of the Partnership for temporal and geographical mapping of RDI funding
- Provide a platform presenting the existing research infrastructures, observatories and living labs of relevance for Water4All. This could be built on the existing tools developed by some of the proposed partners (e.g. MERIL Platform project, Water JPI information platform on water related research infrastructures and observatories – to be operational by the end of 2020 with proposed services, Water Europe Living Labs mapping)
- Facilitate meetings for co-designing annual complementing programmes with the relevant initiatives to reinforce synergies and co-design activity programmes which are as much as possible synergistic and complementary in addressing all the needs identified in SRIAs
- Contributing to EC consultations (HE strategic planning, WP position papers…)
- Promote dissemination products based on the research and innovation activities performed within Water4All
- Produce case / Success studies for presenting solutions tested in demonstration sites / living labs
- Generate a global central portal for informing in water security solutions.

This will include the implementation of an Advisory Board (AB) in support of the Partnership, comprising scientists and Stakeholders to ensure a close connection to the core needs, coupled with the co-design and a co-development of the actions which should support wider acceptance and the final up-take of results. An AB with high level experts would be able to work on a more regular and organised basis.

	**Pillar B – Developing new knowledge and innovative solutions for a systemic and inclusive approach of water challenges at operational scale (e.g. river basin, water catchment)**

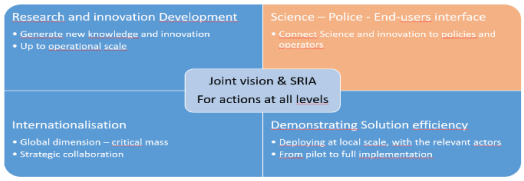
Objectives: Based on the SRIA, Pillar B will develop knowledge and innovation capacity to address the Water security challenges identified, by aligning and leveraging national programmes to overcome the current fragmentation. The Partnership actions will be prioritized to deliver innovative approaches and solutions to achieve the Water4All objectives. More efficient use of the information collected across disparate centres and programmes covering all scientific areas will be achieved by engaging with existing Research Infrastructures (RIs) and connecting information and data from local to Global observation and vice-versa. The participation of research observatories and infrastructures within innovative projects will be encouraged and promoted in order to maximise the return and add value to existing investments.

Main **activities** are:

- Implementing work programmes for developing new knowledge and innovative solutions through Joint Multilateral calls for proposals
- Reinforcing links with research observatories and infrastructures

This pillar will rely on the following detailed intervention logic (figure Annex 6.2) with the following **outputs**:

- Transnational Research and innovation projects
- Clusters of projects on the same topics for increasing delivery
- Increased participation of stakeholders in projects in order to accelerate uptake of results / products
- Connected information and data from local to Global observation and vice-versa
- More reliable and standardised information, building on the FAIR (findability, accessibility, interoperability, and reuse) principle
- Better and fully consistent representation of the groundwater-surface-atmosphere interaction to address the impact of water and the land use changes, Predictability of global/continental environmental change models
- New climate adaptation measurements for alternative management tools for the sustainable use of freshwater resources.

	**Pillar C – transferring knowledge and innovation to i) policy-makers and ii) operators / managers to be able to implement the proposed solutions**

Objectives: This pillar aims at increasing science and innovation support by a systemic knowledge and innovation transfer to:

- Policy-makers for relevant policies need to take into account the different levels of policies implementation / enforcement, and
- Local operators by developing new services and products (source of job creation and growth) and accelerating the uptake of project outputs by the economic sectors and hence provide more effective implementation at local scales.

How to implement EU principles such that they are "as open as possible, as closed as necessary" will also be considered by reviewing SMART principles and ensuring interoperability between existing OA/OD portals (see A2) in the Water challenges for sharing outputs and progressing the State of the Art. Scaling-up of the identified innovations and implementing the new approaches and innovative solutions developed within Water4All with

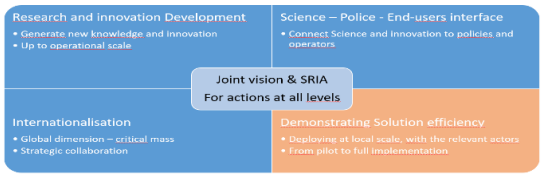
all relevant actors will drive the transformation at the action levels. This will also support UN SDG achievement by intervening in an international context.

Main **activities** are:

- Strengthening the Science – Policy – Governance interface
- Accelerating the uptake of R&I results by the economic sectors
- Fostering capacity development for all actors
- Developing Open Science and Open Innovation across the different partners of Water4All.

This pillar will rely on the following detailed intervention logic (figure Annex 6.3) with the following **outputs:**

- Integration of "existing treasure" (former projects outputs) with newly developed knowledge and innovation that benefit of all RDI investments
- Policy-briefs, policy recommendations, factsheets, based on the knowledge and innovation derived from Water4All activities
- Synthetic documents targeted to policy-makers and actors facing policy implementation.
- Develop a systemic approach to the identification of innovative approaches and programmes that need to be scaled-up
- Contribution to the development of a European Innovation Accelerator (with an international outreach) to support market uptake and implementation
- Develop learning materials for different actors of relevance that will increase / maximise the use of Water4All outputs and eliminate the duplication of effort in developing solutions
- Provide support to Capacity building programmes for different communities with Water4All outputs.
- Provide capacity building for entrepreneurs and start-ups within the Water economic sector (e.g. Training and coaching to create a spin off, develop a proposal or project writing skills, present to investors, enhance human resources management, managerial leadership…).
- Expand capacity and skills building programmes to support solution acceptability and uptake adapted to the local level and stakeholder landscape.
- Create Open Access / Open Data / Open innovation policy for the Water4All outputs
- Develop an OA/OD/OI interface to support access to products connected to the Water4All information platform (see A3).
- OA/OD/OI interface for support access to products connected to the Water4All information platform (see A3).



Pillar D – Demonstrating the efficiency and the sustainability of the proposed solutions at the local levels, in close cooperation with the relevant actors (including policy-makers and decision-makers)

Objectives: Engagement with operators of Demonstration sites / Living Labs funded by different programmes will support the deployment of co-developed practical concepts that benefit from local know-how and drive towards practical, cost-efficient and affordable solutions, which could be replicated in different contexts in Europe and beyond Europe. Accelerating implementation / operationalization of innovative solutions at large scales and affordable costs for the interested countries / regions / Cities requires enabling an environment that facilitates duplicating / replicating in other geographical areas. Realising the water-smart society mission as a reality will require support and funding from a combination of research and innovation programmes and the connection of research infrastructures / observatories data and policy monitoring data.

Main **activities** are:

- Engaging with existing operating demonstration sites / living labs or programmes
- Implementing new demonstration sites / living labs in different geographical / climate contexts
- Engaging with development and investment programmes

- Developing methodologies for monitoring the implementation of the solutions at sites

This pillar will rely on the following detailed intervention logic (figure Annex 6.4) with the following **outputs:**

- Produce lists of sites / labs / programmes (e.g. H2020, LIFE, INTERREG, national funding including research infrastructures – cf. Table 5) connected to Water4All, with possible contributions
- Generate logical framework conditions from R&I outputs for testing solutions
- Produce case studies presentation that support a replication approach
- Develop a set of dedicated Demonstration sites / Living Labs which will implement innovative solutions and move to operational sites
- Developing Demonstration Sites Package for further replication
- Facilitate connection to international partners, with sites / labs in transboundary conditions or in partnering countries, which will contribute to water diplomacy in critical areas where implementable within Water4All (cf. eligibility conditions of international partners).
- Enhane access to innovative approaches for development and investments programmes.
- Develop amended Guidance for selecting innovations (cf. EC recommendations for "Accelerating the transition to the circular economy – Improving access to finance for circular economy projects, March 2019) that could be used in those programmes (e.g. in the InvestEU Fund).
- Develop harmonised monitoring systems for such demonstration sites / Living Labs
- Provide guidance for these monitoring systems for implementation by the relevant actors.
- Provide integration of outputs of demonstration / living labs in a trusted innovation loop (cf. figure 16).

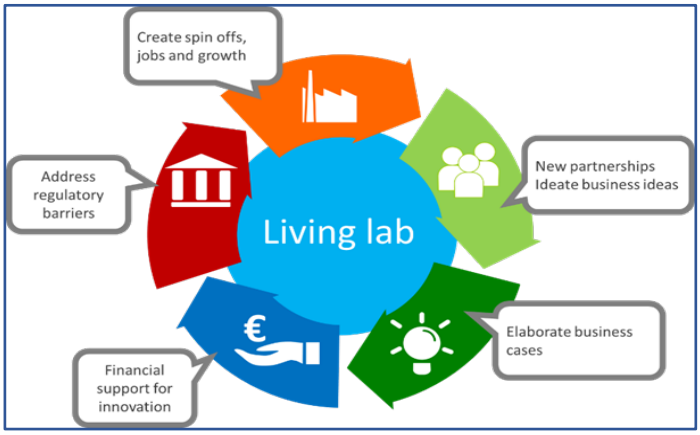
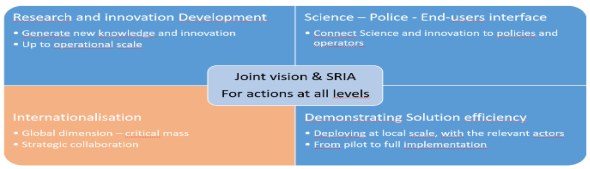


Figure 16: Connecting a living lab approach with an innovation accelerator

Table 5 – Types of actions proposed by these projects

Projects	Objectives and Types of actions
LIFE project – ARTISAN (2019 – 2026)	Create conditions for a generalization of Nature-based adaptation solutions (NBAS) Actions: Demonstration programme (10 sites in France); Dissemination, training and capacity building; Helping implementation of new NBAS (supporting economic stakeholders for implementing, local planning and strategy, mobilizing funding, improving regulations)
INTERREG NWE – Water Test Network	Transnational network of testing facilities which can be used by SMEs in North-West Europe (NWE) to develop, test and verify new products for the water sector. In this way, new innovations will be developed and it will accelerate the time to market.
Structural funds – Water Smart Territories	Support of cross-sectoral collaboration between regional authorities, clusters, industries and research organisations in

	water and ICT sectors, to be able to highlight the most promising innovations: exchange of experiences in interregional value chains, investment pipelines and investment platform, enhanced industrial dialogue for the development of innovative technologies and services.
EASME ICT Action Plan – Digital Innovation hubs (2019 – 2023)	Integration and standardization of the Water ICT technologies. Development of system standards and the interoperability of solutions. Actions: Promote data-intensive and cost-efficient water business models, products and services using digital technologies; Develop and deploy one-stop-shops for digital water services; Deploy technology infrastructure (competence center) to provide access to the latest knowledge, expertise and technology with piloting, testing and experimenting with digital water innovations.

	**Pillar E – Increasing and strengthening the international cooperation for developing a critical mass in relation with the global challenges faced (cf. UN SDGs section).** CROSS-CUTTING Pillar

Objectives: Water security is a global challenge faced by all countries. Therefore strengthening collaboration which goes beyond Europe is considered as a cross-cutting pillar (involving possible contributions of international partners to all activities) with some additional and mutual benefits: i) supporting the participation of countries beyond Europe in an equal footing basis; ii) reducing existing barriers for engaging with RDI programmes; iii) enlarging the role of co-design and the cooperation; and iv) attracting new partners in order to create the necessary critical mass for developing innovative solutions and increasing their implementation. By connecting R&I activities to UN Monitoring of UN SDGs and related targets and Raising the level of engagement of countries by providing solutions from Water4All, the Partnership will concretely contribute to UN SDGs achievements. This approach will ensure that by the end of the implementation plan Water4All should become the coordination / strategic portal for R&I programming in Water challenges.

Main **activities** are:
- Developing international cooperation agreements
- Developing innovative tools for international cooperation
- Links with the UN monitoring of the water – related UN SDGs.

This pillar will rely on the following detailed intervention logic (figure Annex 6.5) with the following **outputs**:

- Generate a list of Memoranda of Understanding or programs of cooperation with third countries, with regards to geographical distribution and types of partners
- Generate a list of activities integrating International partners
- Co-develop framework tools for integrating RDI in UN Monitoring tool.
- Develop a cooperation agreement with UN Water and UNEP on supporting tools.
- Develop promotional materials for the establishment of new cross-thematic international initiatives that will drive change across the SDGs.
- Develop new sets of tools for engaging with international partners such as:
    - Co-designing innovation transfer (e.g. maturation project)
    - WOPs (Water Operator Partnerships) are peer-to-peer, decentralised cooperation projects between utilities based on solidarity focused on capacity building to enhance long-term water management improvements between utilities in European and in developing countries

- Co-creation spaces in the demonstration / Living labs areas for further disseminating experience and benefits from local know-how.

- Develop new types of activities to support openness and inclusiveness in RDI programmes.

3.1.1 Foreseen partners in relation with proposed activities (based on preliminary consultations)

During the **first MS consultation in June 2019**, all countries express interest in having access to results produced in the context of the partnership. At this stage, 11 countries already indicate their interest to join as a partner (BE, CY, CZ, FR, IE, IT, MT, NL, PT, SE, SI). The high interest is notably due to a number of existing strong networks (e.g. Water JPI). 16 countries are at this stage undecided. A number of research programmes (existing national R&I programmes, governmental research organisations, research infrastructures, regional R&I and smart specialisation strategies) have been identified as principle potential partners or contributors (all have interest rates above 70 %).

Table 6 – Probable Water4All partners vs. proposed actions

List of likely activities	Probable MS Partners (cf. MS consultation)	Possible associated partners (preliminary consultation of water related networks by EC and Zaragoza meeting)
Pillar A – Identifying research and innovation priorities to strengthen alignment of EU and National RDI programmes and increase the impact and policy relevance A1 – Developing the shared vision and SRIA of the Partnership A2 – Coordinating the R&I programmes and actions in this field across the European Research Area, and possibly beyond, A3– Raising awareness about Partnership outputs	MS funders / June 2019 Consultation: BE, CY, CZ, FR, IE, IT, MT, NL, PT, SE, SI (+16) February-March 2020: FI, FR	Water Europe, EurAqua, EWA, EUREAU, Aqua Publica Europea Europea, Water Smart Territories Project partners
Pillar B – Developing new knowledge and innovative solutions for a systemic and inclusive approach to water challenges at an operational scale B1 – Implementing the work programme(s) for developing new knowledge and innovative solutions B2 – Reinforcing links with research observatories and infrastructures	MS funders / June 2019 Consultation: BE, CY, CZ, FR, IE, IT, MT, NL, PT, SE, SI (+16) February-March 2020: FI, FR	Pending eligibility conditions of Associated Partners: EUREAU, EurAqua, Water Smart Territories Project partners
Pillar C – transferring knowledge and innovation to i) policy-makers and ii) operators / managers to be able to implement the proposed solutions *C1 – Strengthening the Science – Policy - Governance interface* *C2 – Accelerating the uptake of R&I results by the economic sectors* *C3 – Developing capacity building for all actors* implementing the new approaches and innovative solutions developed within Water4All. *C4 – developing Open Science across the different partners*	MS funders / June 2019 Consultation: BE, CY, CZ, FR, IE, IT, MT, NL, PT, SE, SI (+16) February-March 2020: FI, FR	Water Europe, EurAqua, EWA, EUREAU, Aqua Publica Europea Europea
Pillar D – Demonstrating the efficiency and the sustainability of the proposed solutions *D1 – Implementing at least XX demonstration sites / Living labs* *D2 – Engaging with existing demonstration sites / Living Labs or programmes* (e.g. LIFE, INTERREG, national funding)	MS funders / June 2019 Consultation: BE, CY, CZ, FR, IE, IT, MT, NL, PT, SE, SI (+16) February-March 2020: FR	Water Europe, EurAqua, EWA, EUREAU, Aqua Publica Europea Europea, Water Smart Territories Project partners

D3 – Engaging with the development / Investment programmes for preparing a larger implementation plan *D4 – Developing methodologies for monitoring the implementation of the solutions at the demonstration sites / living labs,*		
Pillar E – Increasing and strengthening the international cooperation for developing a critical mass in relation to the global challenges faced (cf. UN SDGs section). E2 - Link with the UN monitoring of the UN SDG6 E3 – Developing innovative tools for international cooperation (equal footing, co-design)	MS funders / June 2019 Consultation: BE, CY, CZ, FR, IE, IT, MT, NL, PT, SE, SI (+16) February-March 2020: FI, FR	EurAqua, EWA, Aqua Publica Europea Europea

3.1.2 Ensuring coherence and synergies in relation to major national (sectorial) policies, programmes and activities

A- Research Policy

Water4All will contribute to several of the targeted impacts of Horizon Europe as described in the Draft Strategic Plan proposed by the EC (draft for consultation, October 2019), and in particular:

- Improved knowledge and innovations build the foundations for climate neutrality by reducing GHG emission and enhancing the sink and storage functions in production systems and ecosystems, promoting adaptation of ecosystems, and water management and production systems as well as enhancing resilience in rural, coastal and urban areas to climate change
- Better understanding of planetary boundaries facilitates innovative solutions for sustainable and circular management and use of natural resources as well as the prevention and removal of pollution, guaranteeing healthy soils and clean water and air for all thus boosting competitiveness, value creation and attractive jobs
- Environmental observations, a strengthened evidence base and user oriented tools are delivered and used for the establishment and monitoring of governance models that promote sustainability.

It will be of high relevance to severa of the intervention areas of Cluster 6 and other key clusters of Horizon Europe (Clusters 1, 3, 4 and 5).

B- Sectorial Policy

Policy development in water (e.g. in Europe, the Water Framework Directive and River Basin Management Planning, the Floods Directive and Flood Management Planning, Urban Wastewater Treatment Directive and Drinking Water Directive, as well as international policy – Chemicals management, UN SDGs, etc.) has led to reviews and evaluation of policies to adapt to climate change, urbanisation and population expansion/societal change.

Table 7 – Policy Impact areas

Impact Area (Contributions to policies)	Mission Impact on Key Policy fields for Europe
Green Deal and its 8 work streams	e.g. Food and energy security strongly linked to Water security Cf. Table 1 and detailed elements below
Healthy Water related Ecosystems (Water Framework Directive; Groundwater Directive; Biodiversity Directive; Natura 2000 Directive; Drinking Water Directive; Nitrate Directive; Marine Strategy Framework Directive; Common Agricultural Policy; UN-SDGs)	Healthy water ecosystems are going to be provided for meeting required targets for healthy lives and well-being for all population at all ages. Support to European and international policy initiatives – the Water Framework Directive, the Floods Directive and the EU Biodiversity Strategy
Circular Economy Package; UN-SDGs)	Reuse of water, but also nutrients/materials/energy across different sectors will be spread out to maintain circular economies through

	Europe. Circular economies are going to be effectively used to represent new standards for a more grounded approach to sustainable development for industries
Water smart rural areas (Nitrate Directive; Common Agricultural Policy; UN-SDGs)	Ensuring technological development in the agricultural sector, making agricultural practices and water systems sustainable and effectively reducing soil and water pollution. Increased climate change resilience of food and feed production
Water – Food – Energy – Land Nexus (UN-SDG; Common Agricultural Policy; SET Plan, Renewable Energy Directive)	Demonstrating a new approach of integrated management and governance across sectors and scales (from local to regional, national and global). While engaging with multiple sectors requires both time and resources, a multi-sectoral approach offers long-term sustainability and can improve resources efficiencies.
Climate resilient Cities (Urban Waste Water Treatment Directive; UN-Habitat, UN SDGs)	Ensure the transition towards more sustainable, resource efficient, climatic adapted (resilient), worth living/healthy/safe and economically strong cities.
Disaster risk deduction (Floods Directive; UN-Sendai Framework for Disaster Risk Reduction; UN-SDG)_	Ensure the protection of society and in particular the water infrastructure against natural hazards, with emphasis on floods and droughts, but extending to other hazards that affect water infrastructure.

As many of these policies are under revision or evaluation, both at European and International levels, the table will be amended to the timeline in due course (cf. Annex 2).

3.2 Resources

Several kinds of commitments (both financial and in-kind) are required in order realizing the Water4All partnership as described below. They represent the contributions from Core Partners and Associated Partners (cf. Chapter 3.2.4) with consideration of their effective contributions to the implementation plan of the Partnership. For example, Core Partners are expected to provide financial and in-kind resources for running the activities as set out in the chapter 3.1.

Considering the importance of water security in the Green Deal, the role of water for the Digital Agenda and pending decisions on the final focus on some water-related missions, the **total budget of the Partnership** is currently estimated to be approximatively €400 - 450 Mio depending of the number, range and type of demonstration sites / Living Labs willing to join Water4All activities. The following distribution (figure 17) presents the financial contributions required for strategic (Pillar A), transverse (Pillar E) or operational activities (Pillar B, C and D).

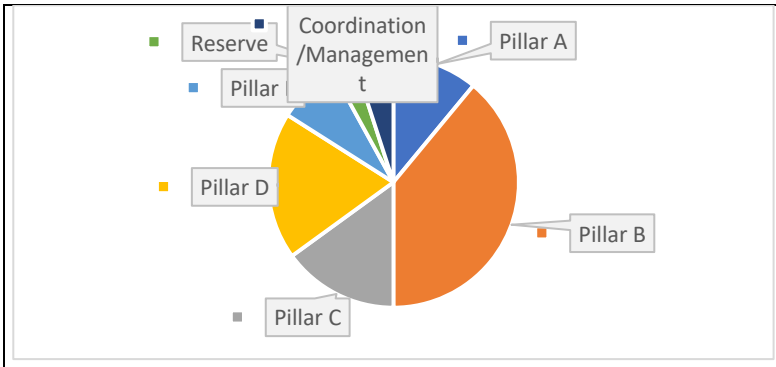


Figure 17– Overview of the global Water4All budget distribution per Action Pillar (estimation as of April 2020)

Nevertheless, it also noted that the final budget will be further discussed with the core partners and associated partners during the final preparations of the partnership.

3.2.1 Financial commitments and in-kind contributions to the different implementation actions

All activities will require partner funding provisions for the support and implementation of the actions and to handle the related "transaction costs" of managing and coordinating these activities.

Some of these activities will require the upgrade of existing tools at national / regional funder level or the development of new tools to fulfil new requirements (e.g. monitoring).

Table 8 – "Individual activities" costs and related commitments for each pillar

Types of actions	Financial commitments for implementing actions*		Transaction costs
	Cash	In-kind	
Pillar A – Vision / SRIA and Coordination	€ 500k per SRIA update (1 development and 1 mid-term review planned)	Personal costs of experts involved in different countries	Advisory Boards meetings (2 per year – €70-90k – 25 members) Stakeholders Engagement events (€80k per event) Communication
Pillar B – Developing Knowledge and innovation	€20 – 30Mio per joint transnational call, global from national / regional funders* (1 per year) Connecting activities for Research Infrastructures and observatories: €100 - 200 k per RI per year Reserve fund for emergency/crisis needs (flash calls): €10-15M	Personal costs for call coordination & management submission platform Monitoring system National budgets on Research infrastructures to connect	500 k€ per call (from call announcement setting, call steering committee meetings, to final term evaluation and reporting)
Pillar C - Transfer	Knowledge Hubs: €300k per hub and per year	Personal costs of experts involved in different countries and coordination team	Knowledge sharing platform (setting, maintenance, updates) - under evaluation
Pillar D	New Demonstration sites / Living Labs : from €200k to € 1M per site and per year depending on size of sites and level of innovations to develop / implement	Existing relevant Demonstrations sites / Living labs (variable depending of innovation to be tested)	Global Coordination Monitoring engagement and progress Innovation implementation tools (Voucher, awards for using demonstration sites, etc.)
Pillar E	Depending on the number of countries involved		Coordination actions, roadshows

* based on total costs (for considering different national regulations and aligning calculations)
** based on previous experiences of Water JPI (cf. Annex 5). National / regional commitments vary per country (budget allocated to research and/or innovation, size of communities, topic relevance for the country / region)

Although it is far too early to attempt to accurately predict the full short and long-term effects of the COVID-19 pandemic on research policy, it is crucial to begin reflecting on what a post-COVID19 world will look like and how the strategic priorities in different domains, beyond the health research sector, will need to shift in response to these unforeseen changes. European Partnerships could play an important role in preparing strategies and actions for rapid responses in future crises (e.g. "flash calls", science-based policy briefs) by aligning EU and national resources. It is therefore proposed to consider some flexibility in the overall budget to respond rapidly to new and emerging challenges and/or unexpected opportunities.

3.2.2 Financial commitments and in-kind contributions to coordinate with existing programmes and actions at European, national and regional level

Some of the planned activities require strengthened coordination with associated partners to ensure the relevant mobilisation of the relevant stakeholders (both in quality and level of mobilisation / engagement), the promotion of joint actions, and the additional activities they will have to perform to integrate Water4All

activities with their in-kind contributions (i.e. access to research infrastructures, access to existing demonstration sites / living labs). Strengthening the demonstration and replication actions at national / local level will require coordination actions, systemic exchanges with the national/regional/local actors (via Mirror Groups, special events), alignment with national / regional / local strategies and priorities.

The required budget for these activities will sum up to about EUR 80,000 to 200,000 per country and year, again depending on the complexity of the national landscape and required efforts to coordinate across sectors and stakeholders (cf. figure 16).

3.2.3 Financial commitments and in-kind contributions to the governance structure

This part of the Water4All budget comprises the daily operation of the partnership coordination & management activities, participation at governance meetings (Partnership Governing Board, Associated Partners Board, Advisory Board – cf. Chapter 3.3), the central costs for basic support (offices, IT, Website, communication materials etc.) and the hosting of central events.

Based on the experiences in JPIs and networks, the estimated costs for the coordination and central management costs is currently estimated to €1.4 M per year.

Table 9 – Central governance and coordination costs (cf. Chapter 3.3)

	Structure / basis of cost calculation	Estimated Costs per year	Funding Model
Governing Board	2 plenary meetings per year, for decision-making and strategic discussions	€100 – 150k (depending of no. of countries / partners involved)	Mixed model with EC funding and in-Kind contributions from Core Partners
Executive Board	4 meetings per year	€150 k (on the basis of a limited number	Mixed model with EC funding and in-Kind contributions from Core Partners
Associated Partners Board	2 meetings per year, back to back with GB meetings	€100 – 150k (depending of no. of associated partners involved)	Mixed model with EC funding and in-Kind contributions from Core Partners
Advisory Board	2 plenary meetings per year, contribution of chair(s) to additional meetings / events	€150k	Mixed model with EC funding and in-kind contributions from AB and Core Partners
Partnership Coordination Team	Daily management, central costs (offices, IT support, experts invitation), central communication and related tools	€800k	Mixed model (EC funding, in-kind national contributions from core partners and, possibly if approved by GB, mem-bership fee)
Total		€1,400k	

3.2.4 Participation opportunities as "Associated Partner »

Participation opportunities as a non-partner were discussed, from the least constructive / binding to the most:

- Informal collaboration and information exchange
- In programming (by replying to consultation activities of the Partnership) and coordinating its own activities in pillar A.
- At project level, by applying to open calls for proposals launched by the Partners in pillar B or by the EC in its normal work programme with additional in-house resources due to national funding rules.
- With ad-hoc collaboration in areas of common interest (pillars C and D) through formal agreements with the Partnership (e.g. via Memorandum of Understanding) to benefit from their own research infrastructure or data collections.

These contributions are considered as win-win situation for Water4All as illustrated by table 10.

Table 10 – Mutual benefits

Benefits for Water4All	Benefits for Associated Partners
• Increased critical mass in: funding, data collection, harmonisation and assessment • Support from existing infrastructures • Inclusiveness of countries / partners with limited resources • Opportunities to connect to other funding programmes (structural funds, LIFE, ESFRI, …)	• Incentives for joining (financial benefits for additional costs due to participation, validation, visibility) • From priority setting to testing and operation • Interfacing with regional/local actors • Benefiting from all non-concurrential results • Contributing to the knowledge hubs for water security

Table 11 summarises who is expecting to contribute and how. This will have to be confirmed after the MS consultation.

Table 11 – Distribution of share of Water4All budget per funding sources

Water4All funding 7 years	Actions to be supported	Foreseen financial commitments	
		In Cash	In-kind / in-house
Ministries / Executives Agencies - Research and Innovation	Pillars A, B, C (partly), D and E	Activities support funding	X (personal staff for Pillar active-ties, submission platform, hosting events…)
Ministries / Executives Agencies - thematic	Pillars A, B, C (partly), D and E	Activities support funding	X (personal staff for Pillar active-ties, submission platform, hosting events…)
Research Performing Organisations			Coverage of non-eligible costs by in-house budget, access to Research infra-structures & Observatories,
Economic Sectors	D (sites possible in different countries)		Coverage of non-eligible costs by in-house budget, access to Research infra-structures & Observatories,
Regional authorities (including Structural Funds)	Pillars B, C and D	Activities support funding	Access to existing Demonstration sites / Living Labs
Development / investments institutions	Via InnovFin?	To be investigated with EIB	
Total combination of funding schemes			
European Commission / Horizon Europe (CO-FUNDING)	Expected 50% considering the variety of the activities developed in Water4All which are coming beyond current ones		
Total Partnership budget			

3.3 Governance

The following draft governance structure (figure 18) should be further developed with the partners to be involved in the Water4All partnership. The role and responsibilities of the different bodies will be set out.

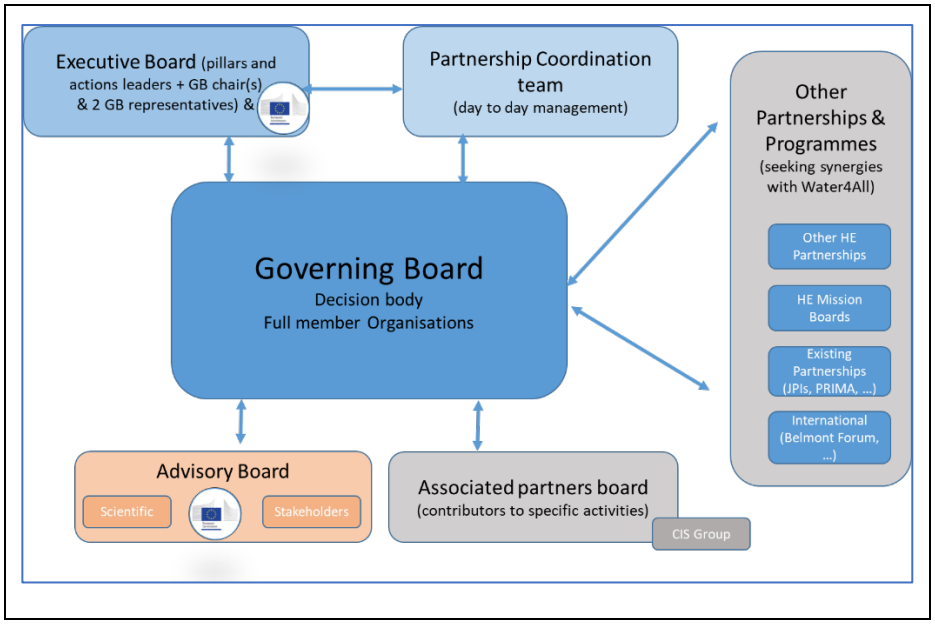


Figure 18– Proposed Governance structure (assuming that EC will be involved in the governance boards of the Partnership)

At this stage, it should be mentioned that:

- The proposed structure will consider the partners' eligibility conditions set by the EC for such an instrument.
- There is a willingness to keep the governance as simple as possible to avoid adding to the complexity of the Partnership and concentrate efforts and resources on developing solutions and maximizing impacts.
- It should directly be connected to the roles and, the level and means of commitments.
- The proposed structure allows the integration of new candidates from different communities, with regards to their effective commitments and the EC financial regulations which will apply to these communities.
- It should be flexible enough for managing the different proposed activities for a better alignment to the strategic objectives and increased efficiency which will optimize the use of the available budget(s).
- Synergies with existing structures (e.g. Water JPI) will be sought. Some proposals in this sense are submitting for approval under the Water JPI Governing Board in May 2020.

This proposal is also pending internal EC discussions which will provide details on the role of the EC in the implementation of the Water4All Partnership.

The Partnership Governance will rely on:

- A decision-making body, the Governing Board (GB), composed of representatives of each Partnership member which are those committing to the partnership vision and SRIA and are financially committing to the partnership actions to be granted within the EC partnership agreement;
    - The GB deals with the global strategy, the related implementation plan and defines the policy rules (e.g. voting rules, integration of new partners, …).
    - They will appoint a chair and vice-chair(s) for chairing the different partnership governance boards and representing the Partnership as necessary.
    - They will also elect two GB members to sit on the Executive Board.
    - They will serve to connect national communities and actors (e.g. via national mirror groups), to enhance closer involvement of the local / regional and national actors (policy-makers, operators, research and innovation communities …) and ensure better match-making to their concrete needs.
- An Executive Board (EB), which implements the strategy defined and issued by the GB and monitors the advancements of the Partnership activities. The EB will be responsible for regularly checking the implementation of the GB decisions and preparing recommendations for GB review and considerations.
    - The EB will be comprised of i) the Chair and the Vice-Chair of the Partnership; ii) the Partnership members coordinating Pillars; iii) additional members based upon expressions of interest and approved by the GB; and iv) if necessary, task leaders or associated partners board members to discuss specific issues.
    - It's proposed to have two additional GB members associated on a volunteer basis in order to enlarge GB involvement, and to have the participation of the Associated Partners board as observers.
    -
- The Partnership Coordination Team (PCT), which will ensure the day to day operational management of the Partnership activities, in particular efficient coordination between the different bodies and supporting the exchanges between them. It will also be in charge of communication and support in assisting the Partnership members with the implementation of Partnership activities.
    - It should comprise experienced staff hired by one or several Partnership members on behalf of the whole consortium.
    - It will also take care of monitoring key issues such as GDPR, Ethics, Gender balance, …
- An Associated Partners Board, for all institutions committing to specific actions and will join via MoU with the Partnership consortium.

- As some partners could not join the Partnership (cf. EC eligibility conditions), they will be associated via this board, allowing participation of a broad range of actors
- The role of the Common Implementation Strategy Group will be key at this level.

- An **Advisory Board** with **Scientific and Stakeholders representatives**, which advices and makes recommendations on the overall strategy, the main activities of the Partnership and possible cooperation with other initiatives of relevance. They also serve as the key means for further communication / dissemination to different stakeholder's communities (researchers, policy-makers, economic sectors …) to interact with the Water4All Partnership.
  - It will also include representatives of the thematic DGs and international experts to ensure a link to international important fora.
  - The role of the Common Implementation Strategy Group will be further detailed with exchanges with DG ENV.

Rules for operating Water4all will be further developed with the Partners and provided in terms of references (different bodies' role, number of meetings per year, voting rules, duration of mandate of chair / vice-chair, etc.).

Involvement of the European Commission Services

During the preparation phase discussion, a formal EC decision at the strategic level on their role in partnerships was announced. When known, the EC role will be integrated in the governance scheme and principles presented above.

- GB and/or Executive Board observer for EC / DG RTD (to ensure up to date information on funding decisions, annual work programmes.
- Advisory Board: EC / thematic directorates (e.g. DG ENV, DG CLIMA, DG AGRI, DG REGIO, …), including some specific programme representatives (e.g. LIFE)
- Specific role for the Common Implementation Strategy (CIS) Group and associated Working Groups, led by DG ENV, which are instrumental for the Water4All partnership
- Specific role for the Joint Research Centre of the European Commission, units dealing with the challenges addressed by the Water4All partnership (Internal JRC discussion ongoing).

3.4 Openness and transparency

Preparation

The proposed Partnership has been established in an open and transparent manner, with several meetings targeting different audiences:

- Preliminary meeting between DG R&I and other thematic DGs (ENV, JRC, DEVCO, MARE):
- Special session at Water JPI SRIA Experts Workshop, 23 October 2019 (with 88 participants out of the 110 who registered **from 20 countries**, including members of the Water JPI Advisory Boards (AB) and Governing Board (GB), researchers, water utility and river basin management bodies and other EU/ international initiatives (cf. table 12);
- Meetings in a smaller configuration with representatives from the key stakeholders networks (by alphabetic order: Aqua Publica Europea Europea, EURAQUA, EUREAU, EWA, WATER Europe, WATER JPI, Water-Smart Territories platform) and EC DGs (Research and Innovation, Environment, JRC);
- A side event at the EU Water Innovation 2019 event (900 attendees), with representatives of MS (Water4All contact points from 10 countries - BE (Wallonia and Flanders), DE, DK, ES, FI, FR, IT, NL, NO & PL) and the key stakeholder networks (see above);
- Participation in workshops organised by other Partnerships under development (Agro-Ecology Living Labs, Blue Economy, Urban transitions towards sustainable future, Rescuing Biodiversity).
- Consultation of Water JPI Advisory Boards (March 2019, September 2019, February 2020) and Governing Board (November 2018, May 2019, November 2019)
- Consultation of Water4All National Contacts Points (Nominated by MS in summer 2019) and Water JPI Members on contents and interests to contribute, February 2020.

- Plenary discussion with Water JPI advisory Boards (Scientific and Stakeholders), 5 March 2020,
- Consultation of Water Smart Territories projects (regions, competitiveness clusters), March 2020.
- Already Planned:
    - Water JPI Governing Board: Preparatory Workshop 29 April 2020 and Governing meeting 14 May 2020.
    - Workshop with Water4All NCP – 19 May 2020 (tbc)
    - Workshop with other Partnerships – 21 May 2020 (tbc)
- To be further completed when new events will have been held.

Table 11 – Water JPI SRIA experts Workshop outputs

attended by 88 participants from 18 countries – special session on Water4All concepts), for discussing topics to be addressed and prioritising the types of activities to be included in Water4All

Types of activities as it was proposed	% of supportive answers
Knowledge Development (Calls)	60%
Knowledge transfer to policy-making	64%
Networking – Capacity Building	52%
Living labs (larger scale interconnections, interdependencies)	40%
Observations (from global to local, and vice-versa)	32%
Innovation demonstration	24%

On-going consultation:
- With the regions, via DG REGIO and the Water Smart Territories platform (22 EU regions)
- With the thematic ministries (in particular Environment, Ecological transition), via DG ENV and the Common Implementation Strategy Working Group
- Within the research funders network via the Water JPI, consultation of the JPI members and connection to the National Contact Points and shadow committee members
- Within the Economic Sectors representatives
- Within the research institutions networks

During Implementation

The Openness principles proposed for Water4All should build on the ones, which have been successful in involving existing partnerships, such as the Water JPI for the public funding institutions.

They can be summarised as acting at different levels:

- Openness to membership / action level:

Any Member State (MS) of the European Union or any Associated Country (AC) to the European Framework Programme can be a Partner of the Water JPI (cf. terms of reference on line). Others countries (neither MS nor AC) can participate in Joint activities and then decide if they want to be integrated. The integration is done on the basis of different status to allow a large range of partners to join: full member, participant, and observer. The status is based on their level of commitments in the activities.

The integration of new partners half way through the implementation of the Partnership will be possible depending on their effective commitments and the eligibility conditions set by the EC instrument.

- How do we approach them proactively?
    - Via different existing Working Groups / committees (e.g. programmes committees, CIS, etc.)
    - Via invitations to Partnership activities which might be of interest for potential new partners
    - With roadshows" in interested countries, e.g. South Africa in 2015 and 2017, Estonia in 2017, Austria, Brazil (back to back with the World Water Forum) and Latvia in 2018, Czech Republic in 2019, giving opportunities to present the activities and the concrete process… to discuss the barriers and challenges on what to do in order to facilitate their accession.

- How to ease the participation of new countries / partners?

- Governance structure:

All countries (full members, participants, observers) can join our meetings or task forces and contribute, including identifying special needs. Nevertheless, it is often a ***question of availability of human resources in candidate countries / institutions*** to participate in the different meetings and take some responsibilities. Organising governance meetings in these countries also encourages local participation. Having representatives from the candidate countries in the Advisory Boards provides an opportunity to leverage cooperation.

- Considering their specific needs in our activities, in particular in the SRIA:

Some comments from new members and interested parties about the identification and highlights of "specific non European" research needs should be integrated in the SRIA.
Some countries have no national RDI strategy and programme on water and asked for some support in elaborating one and therefore in more closely aligning the national strategy with the partnership SRIA.

- Implementing activities, via:
    - Developing systematic proposal to take part as Work Package tasks, both in supporting projects or in the governance structure
    - Organizing of events / workshops / roadshows in the countries in order to promote the Partnership and show case results
    - Inviting participants from these countries as the national funders cannot provide the financial support for attending (e.g. workshop on international cooperation, UN SDGs RDI needs or SRIA update).
    - Developing specific document for them, i.e. factsheets on the countries.
    - Considering specific activities in relation with their needs (i.e. Danube region workshop planned under IC4Water in 2020 – 2021).

- Suitable Alignment tools:

Some alignment tools have been developed to ease integration (Thematic Annual Programming, Knowledge hubs, information platforms on mobility schemes and research infrastructures), as there are less resource demanding, or to facilitate the connection with activities funded under other EU programmes (e.g. Structural funds and national research infrastructures).
Even if not active partners, they are systematically offered to participate in some of our workshops (e.g. exploratory, good practices workshops) or to support national representatives (development / update of the JPI SRIA, International cooperation, research infrastructures).
Hosting member staff at the Water JPI secretariat or in member institutions has also been demonstrated to have positive effects on participation.

- Contributing to Joint Calls, with:
    - Promoting the use of the JPI Partnering tool on the Water JPI Researchers Forum Group.
    - Clear recommendation for integrating new countries in the proposal consortia in the call documents, call webinars or in national events (by national funders, with the document support of the call secretariat).
    - Partnering tool such as the LinkedIn Water JPI researchers' forum group.
    - Participation of experts from new and non-associated countries in the evaluation
    - Participation of end-users in projects at the selection (definition / design for identifying challenges and impacts) and evaluation process.
    - The consideration of special needs and later on in Follow-up groups monitoring the funded projects.
    - Some "call engineering measures" to be discussed at the Call Steering committee level, from the use of structural funds allocated to their countries (not eligible under the Co-fund top-up) to specific inclusiveness measures (e.g. flexible top-up distribution, etc.).

- Impact monitoring and measurement, via specific indicators.

All these principles should be developed in close cooperation with the interested parties and should be properly documented to ensure transparency.

Additional mechanisms for positive discrimination could be transparently developed and implemented in all the main activities to contribute to the Sharing Excellence and the Widening of Participation objectives in relation to the Framework Programme.

The implementation of the Water4All Partnership will also follow Transparency principles:

- Transparent decision-making process and access to decisions by all partners and associated parties
- Regular information:
    - With partners
    - With MS, via GA, CIS, with mirror groups where established
    - With EC
    - With other initiatives
- Validation of key documents in cooperation with relevant stakeholders (via the AB, via Public Consultation on the SRIA if revised)
- Development of a Plan for Communication, Dissemination and Exploitation of the Partnership in cooperation with the different partners and
- Access to all results produced by the Partnerships actions with respect to IPR and GDPR regulations.

Annex 1 – Preamble – Partners involved in the preparation of Water4All

At this stage, the development of this Partnership has been done following European Commission presentation on possible instruments (European Commission; Shadow Committee meeting, 21 November 2019), "programme co-funding action means an action to provide **multi-annual co- funding** to a programme of activities established and/or implemented by **entities managing and/or funding research and innovation programmes**, other than Union funding bodies. Such a programme of activities may support networking and coordination, research, innovation, pilot actions, and innovation and market deployment actions, training and mobility actions, awareness raising and communication, dissemination and exploitation, any relevant financial support, such as grants, prizes, procurement, as well as Horizon Europe blended finance or a combination thereof. **The programme co-fund action may be implemented by those entities directly or by third parties on their behalf**".

Nevertheless, the challenges to be tackled by Water4All requires the contribution of other stakeholders and end-users (e.g. policy-makers, economic sector, regions, cities, river managers, etc.) and therefore asks for connecting / engaging them have to be further developed in the context of the proposed financial instruments of Horizon Europe. **Therefore, upcoming information in relation to the instrument (cf. chapter 3.2) is expected for adjusting / amending the proposal and contribute to the launch of the official commitment phase.**

The proposal has been developed in an open and transparent way launched by EC (cf. chapter 3.4 – meetings, workshops, drafting working group) by a group of networks and their members:

- Water JPI: 23 full members (Ministries and executive agencies of Science / Innovation / Technology and Environment) from EU, neighbouring and Beyond Europe, 3 Observers and 5 associated countries
- Water Europe: 218 individual members distributed in seven different colleges (Multinational corporations, Research & Technology developers, Utilities, Suppliers & SMEs, Large water users, Public Authorities and Civil Society Organisations)
- EUREAU: 32 national associations of drinking and waste water operators (both public and private) from 29 European countries (representing 470,000 direct jobs)
- Aqua Publica Europea : 65 public water operators and their associations distributing more than 70 million citizens every day (for an aggregated turnover of 8 Billion euro)
- EURAQUA: 26 major European Research Performing Organisations
- EWA: 20 European associations distributed in corporate members, Research members and Sponsor members.
- The WaterCampus Leeuwarden with its different types of partners for a co-funding thematic targeted education, research and innovation projects, globally sharing innovation insights (20 Universities in 10 European countries, 200 companies from 19 countries with different status of memberships).

Annex 2 – Detailed assessment of current water security challenges for Europe

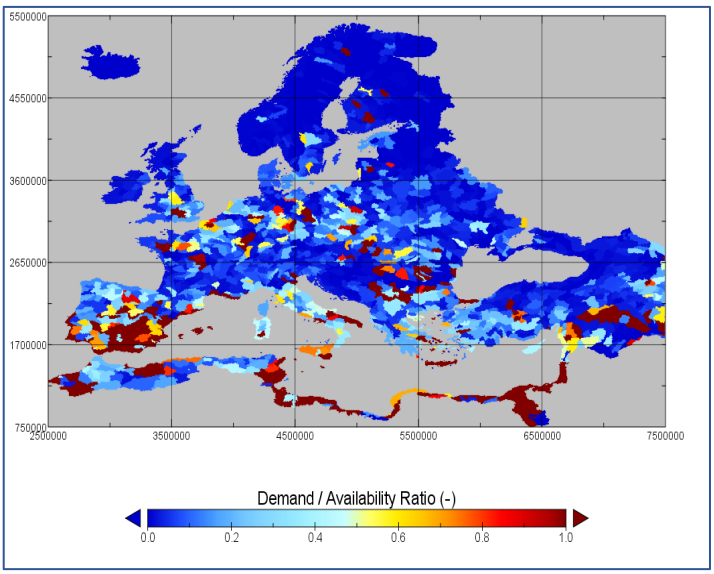
The proposed partnership is relevant to a number of EU policies.

2.1. Water Policies

The EU freshwater situation has been assessed by the European Commission in 2019 (Report on the 2nd River Basement Management Plans and first flood risk management plans[22]), showing that:

- **Surface water: 40% in good ecological status** (Main pressures: hydro-morphological alterations, diffuse and point source pollution, over-abstraction)
- **Surface water: 38% in good chemical status** (Mostly due to mercury and other ubiquitous substances)
- **Groundwater: 74% in good chemical status and 89% in good quantitative status**
- **Flood risk:** 27 out of the 28 MS included floods as a main risk in their National Risk Plans; the 26 flood risk management plans were assessed by the EC and are now under implementation phase.

Water stress affects 1/3 of the EU territory all year round, and as shown below, not just southern Europe. Diffuse pollution significantly affects 90% of river basin districts, 50% of surface water bodies and 33% of groundwater bodies across the EU.



Climate change will also modify i) the frequency and intensity of droughts on the rise, and ii) extreme weather events, to which EU will need to adapt. Cost of water shortages were estimated for 1976-2006 up to **€100 billion** (EC, 2019). Even if the deterioration of water quality halted across Europe's 130,000 freshwater bodies, the quality is slowly improving, with 60% of surface water not yet at overall good status. The main reasons for not achieving good ecological status are linked to hydro-morphological pressures (40 %), diffuse pollution (38 %) and water abstraction.

Figure Annex 2.1: Current water stress in Europe (EC, 2019)

Thematic summary assessment

Theme	Past trends and outlook		Prospects of meeting policy objectives/targets
	Past trends (10-15 years)	Outlook to 2030	2020
Water ecosystems and wetlands	Trends show a mixed picture	Developments show a mixed picture	Not on track
Hydromorphological pressures	Deteriorating trends dominate	Developments show a mixed picture	Not on track
Pollution pressures on water and links to human health	Trends show a mixed picture	Developments show a mixed picture	Not on track
Water abstraction and its pressures on surface and groundwater	Improving trends dominate	Developments show a mixed picture	Not on track

Figure Annex 2.2: Summary of past trends and outlooks from the Environmental Status of Freshwater resources in Europe (EEA, 2019)

[22] https://eur-lex.europa.eu/resource.html?uri=cellar:bee2c9d9-39d2-11e9-8d04-01aa75ed71a1.0005.02/DOC_1&format=PDF

The evaluation report on the implementation of the **Urban Wastewater Treatment** Directive (EC, December 2019) identified several major shortcomings:

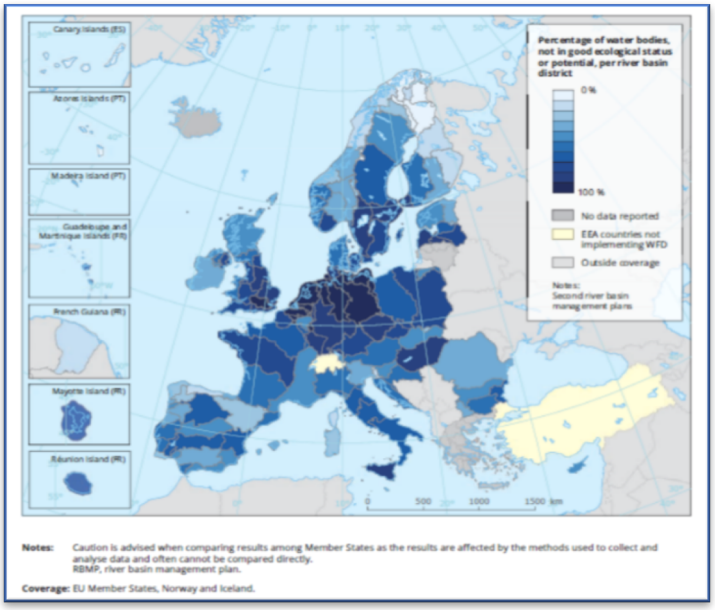
- Some **EU countries are lagging behind with implementing** the Urban Wastewater Treatment Directive and need to step up their efforts. **Implementation is supported through substantial EU funding** and compliance promotion activities.
- **Storm water overflows place significant pressures on surface water bodies**. With more heavy rainfall events predicted in the future, they will be an increasingly important source of pollution.
- **Small agglomerations or non-connected dwellings** (not covered by the Directive) place significant pressures on 11% of the EU's surface water bodies.

New concerns, such as the pollution of water bodies by pharmaceutical residues and micro & macro-plastics are being identified and need to be better considered.

2.2. Biodiversity

In the European Policy, the aquatic ecosystems are defined as rivers, lakes, transitional and coastal waters, but also wetlands and floodplains found in proximity of surface water or depending of groundwater**.** The figure 9 below, resulting from assessment under the Water Framework Directive (WFD) of Ecological Status or Potential shown by river basin district (EEA, 2019), illustrates the percentage of water bodies, not in good ecological status or potential, per river basin district in the European Union. Likewise, Water ecosystems and wetlands are not on track to reach good ecological status by 2030 as the hydro-morphological pressures continue to deteriorate (figures Annex 2.3).

The aquatic ecosystems are providing important regulating ecosystem services (such as water purification, carbon capture and storage, and flood protection, in addition to providing habitats for many protected species. Achieving good status of Europe's surface waters not only serves the objective of providing clean water but also supports the objective of providing better conditions for some of Europe's most endangered ecosystems, habitats and species, as listed under the Habitats and Birds Directives. European Water Bodies are under high pressure and the number of bodies not in good status is of concern. (figure Annex 2.3).

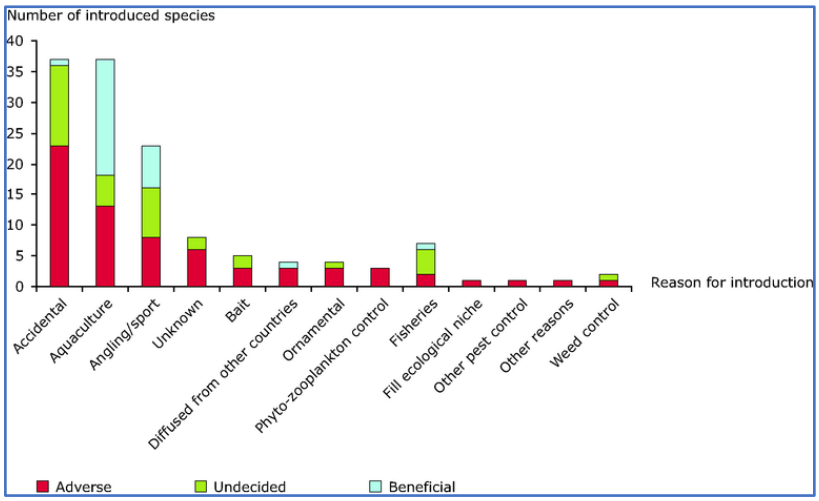


To better emphasize and to provide protection for vital and vulnerable freshwater eco-systems and habitats (also requested by the EU Biodiversity Strategy), proper water accounting and water ecosystems accounting are considered as valuable instruments in valuing the essential assets of freshwater ecosystems (EEA, 2019, World Bank Wealth Accounting and Valuation of Ecosystem Services – WAVES, 2019).

Figure Annex 2.3: Country comparison – Percentage of European Water bodies not in good ecological status (EEA, 2019)

Freshwater habitats are subject to many pressures as surface water bodies, and they are often very sensitive to over-abstraction of water and hydro-morphological alterations. In reporting under the Habitats Directive for freshwater habitats, changes in hydrology, including over-abstraction of freshwater are most frequently reported as being important, although 'loss of habitat features or prey availability' is frequently reported for species, as is 'pollution to surface waters' for habitats.

Currently, the introduction of invasive non-native species (plant and animal) and for example new species escaping from aquaculture installations that have an adverse effect on freshwater ecosystems is a pressure that threatens the biodiversity and healthy ecosystem functioning the EU aquatic ecosystems.



Together with habitat degradation, those pose a major threat to biotic communities which can lead to ecological degradation and lower ecological status. However, currently the freshwater invasive non-native species are not monitored by WFD and thus their impact and potential ecological and economic damages remain largely unattended.

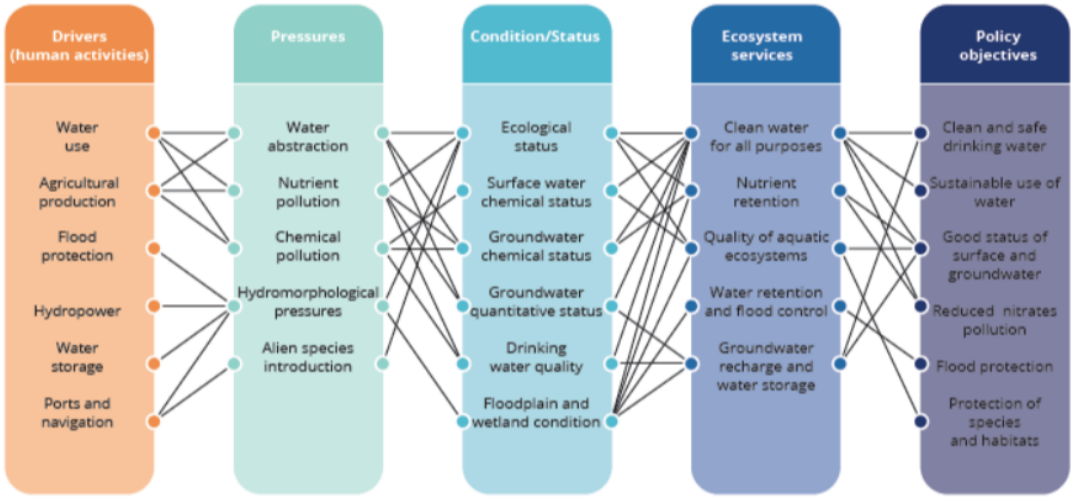
Figure Annex 2.4. Number of introduced non-native freshwater species of various taxa with ecological effects (EEA, 2015)

All these remaining challenges call for better prevention of pollution at source and the acceleration of implementation of innovative solutions (e.g. wastewater treatments, water reuse, innovative management solutions, disartificialisation).

2.3. Other European sectoral policies of relevance

As water is essential for life and human activities, it should be placed higher in the priorities addressed by other sector policies. As reflected by the evaluation of the WFD, too many pressures come from a lack of integration of the WFD objectives in other policies regulating other sectors. Innovation should also be stimulated in other sectors in order to help achieving the objectives of the WFD, integrating solution to better address pollution at source and avoid that the water consumer pay for solving pollution created by others.

Clean water is an essential resource for human health, agriculture, industry, energy production, transport, recreation and nature (figure Annex 2.5). Ensuring that enough water of high quality is available for all purposes, including for water and wetland ecosystems, remains a key challenge globally and within Europe.



Note: BOD, biological oxygen demand.

Source: Modified from Maes et al. (2018).

Figure Annex 2.5: Selection of links between drivers, pressures, conditions, ecosystem services and policies objectives (EEA, 2019)

So, in addition to these EU environmental legislation and policies targeting freshwater and biodiversity, a number of EU policies, some of which now being revised, will benefit from the results of research and innovation developed within Water4All, notably:

- The **Common Agricultural Policy**, both for its efforts to protect water resources quality and for managing the impact of water resources (in quantity and quality) of the food production and its foreseen evolution, supporting in particular three of the nine specific objectives of the CAP (i) contribution to climate change adaptation, ii) fostering sustainable development and efficient management of natural resources, iii) contribution to the protection of biodiversity, enhance ecosystems services and preserve habitats, at least for the aquatic environments).
- Counteracting the existing trade-offs (boosting food production vs. increased water withdrawal and degradation of water quality, achieving connected nutrition targets) will require sustainable agricultural systems and practices, and enhanced water governance to manage growing and competing demands on water resources.

- The **Common Fisheries Policy**, as the production of fish from inland waters is increasing and is now higher than the production of beef since 2010, showing the move in world diet (FAO).

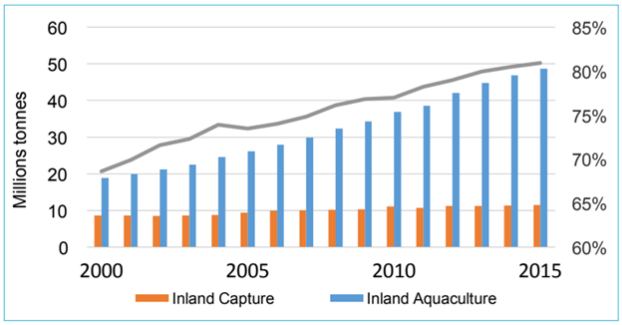


Figure Annex 2.6: Comparison of world capture and aquaculture in the production of aquatic animals from inland water (excluding Algae)

- The **Energy Strategy** which should help to provide secure, affordable and clean energy for EU citizens and businesses. Some of its components in clean energy transition are the hydropower production with reservoirs on rivers (figure Annex 2.7, European Rivers Network - ERN), the developing of biofuels (with consideration of its sustainability vs. land & water consumption, competition with other uses) and alternative energy source like biogas from wastewater treatment plants.

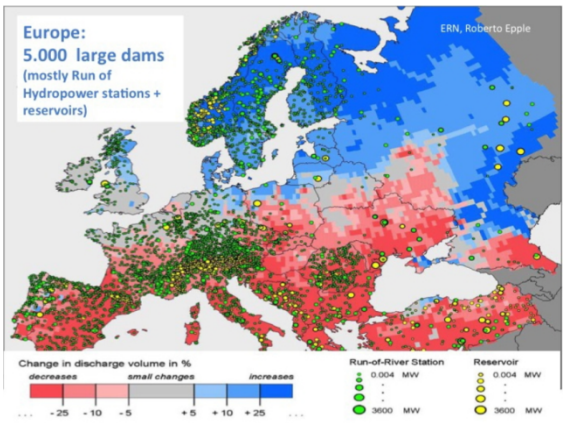


Figure Annex 2.7: Distribution of large dams with reservoirs on rivers in Europe (ERN)

- The **EU Climate Strategy** by helping to take into consideration the water-energy-food nexus in planning the climate adaptation measures and considering potential mitigation co-benefits.
- The **Industrial Strategy**, since a sustainable management of Europe's water resources is one of the foundations for the industrial Renaissance of Europe. In fact, water plays a quintessential part in supporting a large number of industrial activities that are heavily reliant on a constant supply of sufficient water of the right quality. A large manufacturing and water services sector is crucial economic and social driver in Europe with more than 136.000 SME's directly involved in the value-chain of the water related economy.
- The **Marine Strategy Framework Directive**, as the majority of water from freshwater systems will end up in the sea. Hence, measures to reduce pressures such as nutrient and chemical pollution of freshwater systems will equally benefit the sea.

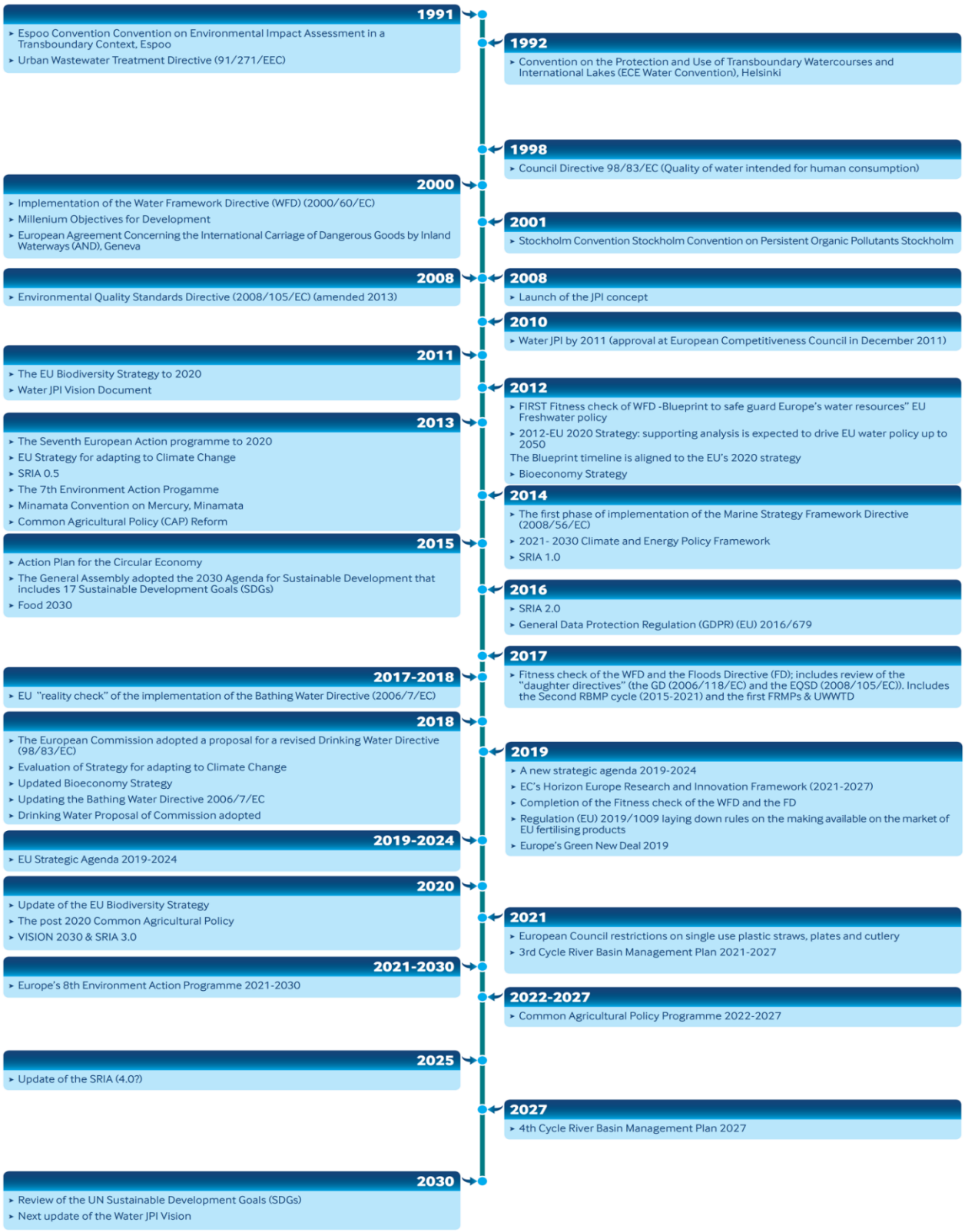


Figure Annex 2.8: European Policy context (Water JPI, SRIA 2025 under publication)

2.4. International policies and conventions

Global trends project world-wide growth in water use by 55% by 2050 (figure Annex 2.9), due to growing demands from manufacturing, thermal electricity generation, agriculture and domestic use, all increasing the pressure of human activities on our fresh-water sources.

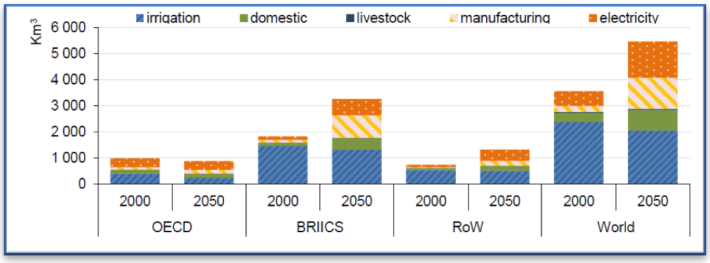


Figure Annex 2.9: Global water demand: Baseline, 2000 and 2050 (OECD, Environmental outlook to 2050)

Furthermore, water quality is declining due to agricultural, industrial, mining and urban pollution, impacting water availability of sufficient quality for users. Diffuse pollution significantly affects 90% of river basin districts, 50% of surface water bodies and 33% of groundwater bodies across the EU.

The **growing needs of population and economies** will make the availability of water in sufficient quantity and quality a challenge in Europe and beyond in the future with significant environmental and economic consequences. The overall global water quality risk estimated using an umbrella proxy indicator composed by World Bank Group for the three major water quality indicators of SDG 6.3.2[23] is illustrated in figure Annex 2.10.

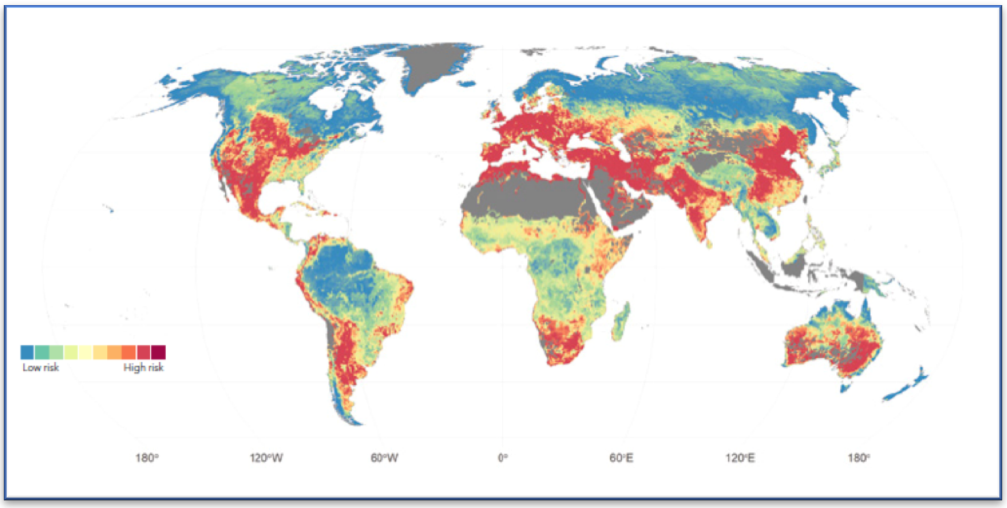


Figure Annex 2.10: Water Quality Risk for 2000 - 2010 (World Bank, 2019– Quality unknown, the invisible water crisis – Grey areas have no data for one or more parameters)

Water quality deterioration impacts all countries (high-income status does not confer immunity from water quality problems) **and** is now recognised to have larger impacts on health, agriculture, and the environment than were previously known. When these sectoral impacts are aggregated, they account for significant slowdowns in economic growth.

Hydro-logical extreme events, such as floods and droughts, account for the majority of natural disasters recorded in 2018 and the majority of the total population affected in the same year (cf. figure Annex 2.11).

[23] i) Nitrogen (nitrate-nitrite), an outlier pollutant in terms of scale, scope, trends, and impacts; **ii)** electrical conductivity, a measure of salinity in water; and **iii**) biological oxygen demand (BOD - a measure of how much organic pollution is in water and a proxy measure of overall water quality), a widely used umbrella proxy for water quality.

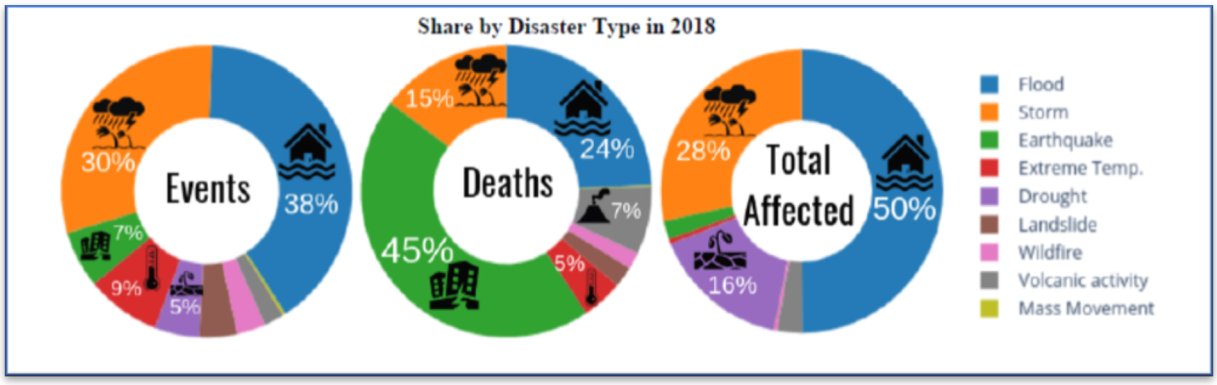


Figure Annex 2.11: Share by disaster type in 2018 (Centre for Research on the Epidemiology of Disasters, 2019)

According to the Centre for Research on the Epidemiology of Disasters (CRED), more than 60% of the 4,250 flood disasters reported in the EM-DAT database since 1970 occurred since the year 2000, with the average number of reported flood events increasing from 30 (1971-1980) to 50 (1981-1990) to over 140 (2011- 2015).

In terms of **freshwater aquatic ecosystems and biodiversity**, the Global Assessment recently released by the Intergovernmental Platform for Biodiversity and Ecosystem Services (IPBES) (IPBES, 2019) shows that Inland waters and freshwater ecosystems show among the highest rates of habitat decline: Only 13 per cent of the wetland present in 1,700 remained by 2000; recent losses have been even more rapid (0.8 per cent per year from 1970 to 2008). The Living Planet Index, which synthesises trends in vertebrate populations, shows that species have declined rapidly since 1970, with reductions of 84 per cent for freshwater species (compared to 40 per cent for terrestrial species, and 35 per cent for marine species). The IPBES proposed approaches for sustainability and possible actions and pathways for achieving them, such as integrating water resource management and landscape planning; supporting inclusive water governance; supporting co-management regimes for collaborative water management and to foster equity between water users (while maintaining a minimum ecological flow for the aquatic ecosystems); mainstreaming practices that reduce soil erosion, sedimentation and pollution run-off; reducing the fragmentation of freshwater policies by coordinating international, national and local regulatory frameworks; increasing water storage; promoting investment in water projects .

There has been a long history of **conflicts over water resources**, extending back thousands of years. But now, disputes over access to water, the use of water as a weapon, and the targeting of water systems during conflicts remain all too common as illustrated in the figure Annex 2.12.

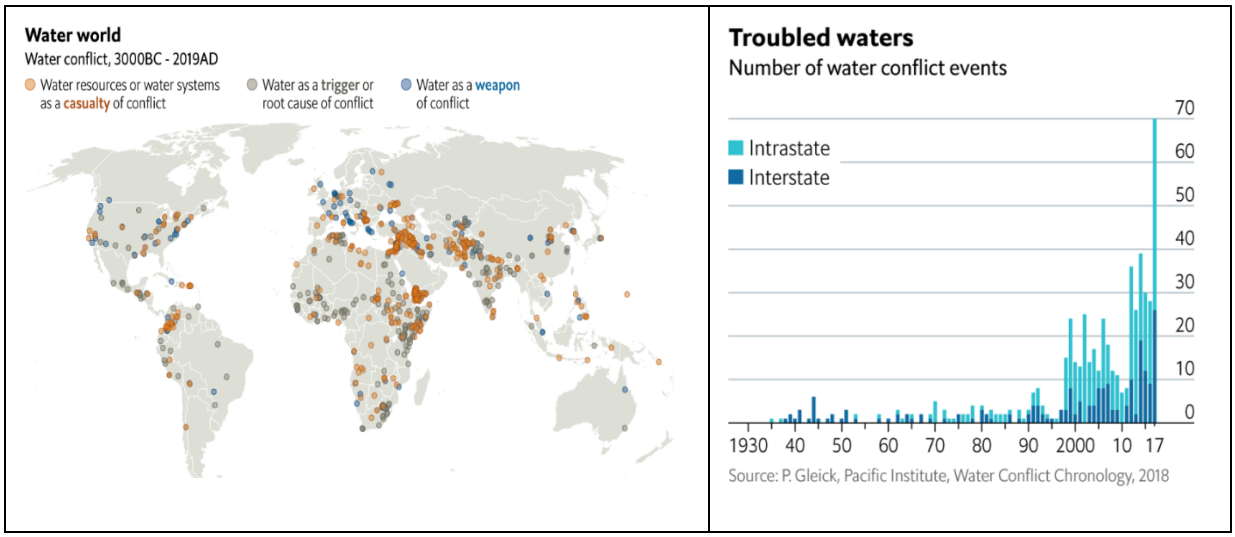
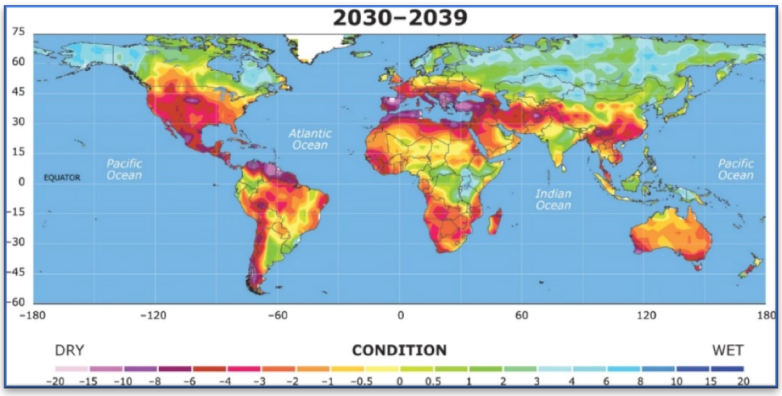


Figure Annex 2.12: Water conflict types and chronology (Pacific Institute, online list and map)



Considering the **projections of the impacts of Climate Change** by the Intergovernmental Panel on Climate Change (IPPC - figure Annex 2.13), countries will be affected, mainly by dryer conditions, exacerbating the water crisis and impacts across sectors.

Figure 2.13: Climate Change Evolution predictions (IPCC, 2015)

Increasing water abstraction for agricultural and industrial activities, escalating global demand for renewable energy (cf. announcement of EU carbon neutral by 2050) which is strongly water dependent, saline intrusions and the pollution of surface water and groundwater mean that water security is the primary challenge in the coming decades. In addition, the loss of livelihood due to increasing water variability can also exacerbate migration phenomena and flows with higher total of people affected and with an impact on social stability.

Annex 3 – Existing SRIAs and Possible Process to develop a Partnership SRIA based on existing ones

The SRIA is a document that presents and prioritises RDI needs. The purpose of the SRIA is to lay down guiding principles and identify the policy-relevant research priorities for the future, while making them openly accessible to the various stakeholder groups, including policymakers, regulatory agencies, researchers, end-users (such as water enterprises, water managers) and the public.

The SRIA should result from a comprehensive, iterative process, including the consultation, collaboration and consensus of a very broad base of stakeholders. The SRIA is:

- A guide to where water-related RDI funding should be focused at EU- and national-level. It is a commonly agreed vision and a reference for all of the Water JPI activities
- A reference document for decision making, which is aligned & responsive to key policy directives and strategies.

At this stage, there are three published SRIAs in relation with Water challenges:

- The Water JPI SRIA v2.0, May 2016 (under revision – SRIA 2025 to be published Spring 2020)
- The Water Europe SIRA, November 2016
- The EURAQUA SRIA, June 2019

In order to support the elaboration of the Water4All SRIA, a comparison of the existing SRIA has been performed (cf. table below).

R&I Typology		EurAqua	Water Europe	Water JPI
1	Freshwater - aquatic ecosystems			
12	functioning	1.1		1.1.1, 1.2.3
13	quality	1.1, 1.2	KC2-S2	1.1.3, 1.2.2
14	services	1.1	KC1-S1	1.1.2, 1.1.4, 5.2.2
2	Global water cycle			
21	earth system	2.2		1.3.1, 5.1.1, 5.1.2, 5.1.5, 5.1.6, 5.1.7
22	hydrology	1.2		1.2.1, 1.2.3, 5.1.1
23	hydro-morphology, restoration	1.2	KC3-S1	1.2.1, 1.2.4, 5.1.3
24	extreme events	2.1, 2.2	KC3-S1	1.3.1, 1.3.2, 1.3.3
25	groundwater	1.1	KC3-S1	3.1.6, 5.1.3, 5.1.5
26	soil, sediments	1.1, 1.2, 2.1	KC3-S1	4.2.1, 5.1.7
3	Water management			
31	demand, allocation scenarios, modelling,	1.3	KC3-S3, KC4-S3	1.1.4, 3.1.4, 4.1.4 2.2.2, 4.2.1, 5.1.2,
32	DSS	1.3	KC2-S1, KC4-S1	5.1.5, 5.1.6, 5.1.7
33	EO, data, IT	1.1, 3.1	KC2-S1	1.1.5, 3.1.1, 4.2.2, 5.1.1
34	sensors, monitoring	1.1	KC2-S1	2.1.1, 3.1.1, 5.1.1

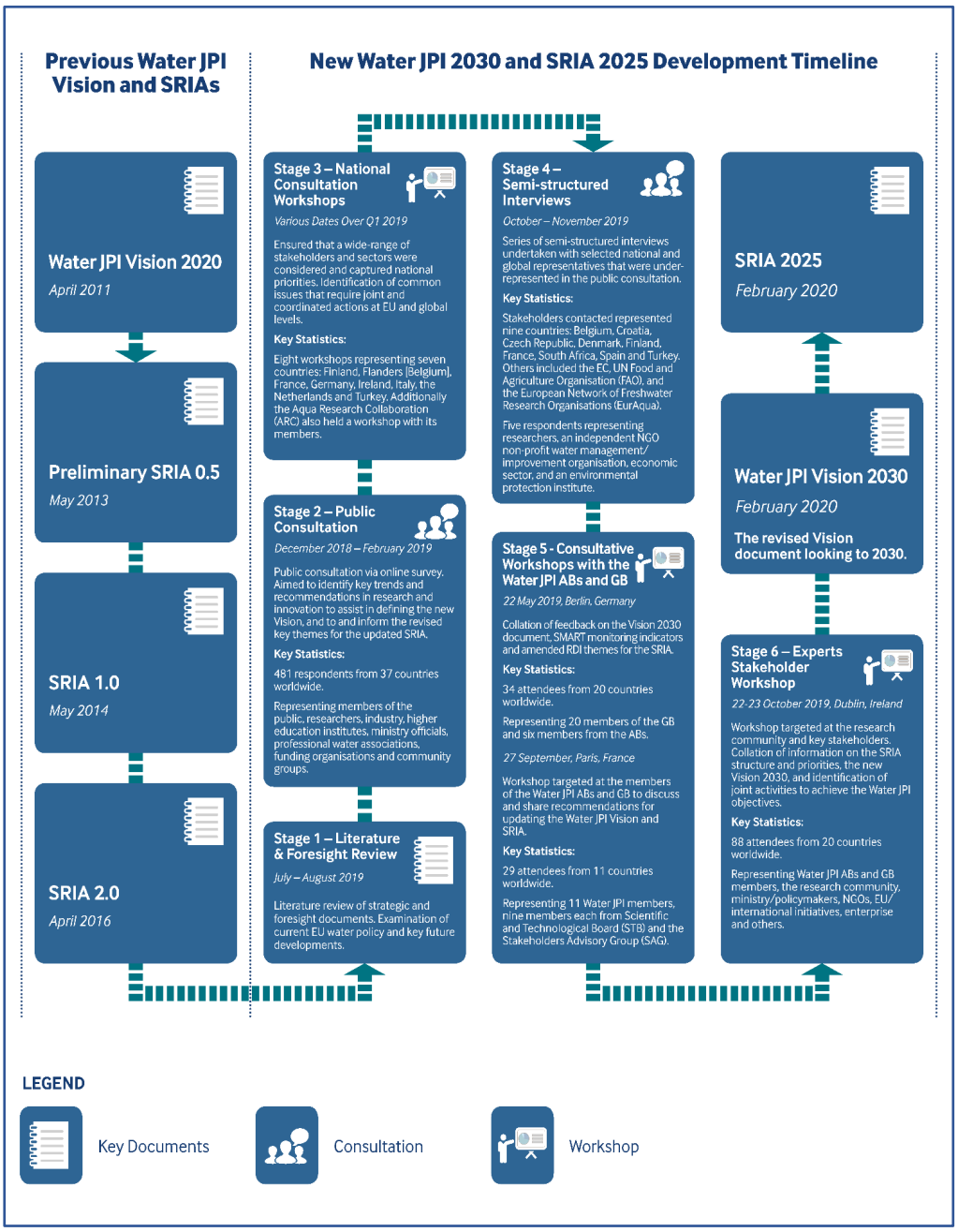
4	Water and people			KC5-LL3	
	41	water treatment		KC1-S4, KC1-S2	2.2.2, 2.2.3, 3.1.2, 3.1.6
	42	waste water treatment		KC2-S3	3.1.2
	43	water reuse, efficiency		KC1-S2, KC1-S3	3.1.7, 4.2.3, 5.1.4
	44	sewage sludge		KC2-S3	3.1.7
	45	resource recovery		KC1-S4	3.1.7
	46	infrastructure, networks		KC3-S2	2.2.1, 2.2.2, 3.1.3
	47	contaminants of concern		KC2-S2	2.1.2, 2.1.3, 5.1.4
5	Water and agriculture, food production			KC5-LL1	
	51	efficient use		KC1-S3	4.1.1, 4.1.3, 4.1.5
	52	irrigation, conservation		KC2-S4	4.1.2, 4.2.3
	53	diffuse pollution		KC2-S4	4.2.1, 4.2.4
6	Water and industry			KC5-LL2	
	61	process water treatment			2.1.3, 3.1.2, 3.1.3
	62	waste water treatment			3.1.2, 3.1.3
	63	water reuse, efficiency		KC1-S2, KC1-S3	3.1.4, 4.2.3
	64	resource recovery		KC1-S4	3.1.7, 5.1.4
7	Water and energy				
	71	hydropower			Only on impacts of hydropower plants - 1.2.1 and 1.2.3 and adaptation to water scarcity - 1.3.3
	72	renewables			3.1.5
	73	efficiency		KC1-S5	3.1.4, 3.1.7
	74	availability		KC1-S5	3.1.4
8	Water governance				
	81	policies	1.3	KC4-S3	5.2.3, 3.2.1
	82	economic, financing		KC1-S1, KC3-S2	5.2.1, 5.2.2
	83	innovation	3.1	KC1-S1, KC6-S1	3.2.1
	84	trade-offs, conflicts			3.1.4, 5.1.5 - 5.1.7, 5.2.1
	85	engagement, stakeholders,	1.3	KC4-S2	5.2.1, 5.2.3

Activities beyond FP	EurAqua	Water Europe	Water JPI
experimental facilities	3.2		5.1.1
living labs		KC5-LL1, LL2 and LL3	
capacity building, D&E		KC6-S2, S3 and S4	
science diplomacy			X
international cooperation		KC6-S5	X
promotion of synergies			X

As an example of process to be conducted for establishing a SRIA, the Water JPI is currently revising its SRIA following the below process. Stage 6 is now completed. The Water JPI should approve its final version by the first Quarter of 2020.

SUEZ Research and Innovation agenda:

- Water reuse: a major expected impact by increasing water reuse is to reduce water abstraction. today's Industries are using 40% of the water abstraction; Reach Zero water discharge; Freshwater substitution; Reduce energy consumption : a water quality for a specific need (avoid overquality); industry – territory symbiosis : create local closed loops
- Secure virus and emerging pollutants removal
- Nutriment valorization : valorization of phosphate and nitrate in agriculture within the territory in closed loop, develop new circular business models and circular value chains
- New technologies to provide a more efficient valorisation of solids from wastewater (new materials, or reuse for energy production), increase level of circularity and carbon neutrality in the use of new materials in sludge or wastewater
- Brine management needs disruption to be competitive
- Natural based solution approach; natural capital preservation


Previous Water JPI Vision and SRIAs
New Water JPI 2030 and SRIA 2025 Development Timeline
Water JPI Vision 2020
April 2011
Preliminary SRIA 0.5
May 2013
SRIA 1.0
May 2014
SRIA 2.0
April 2016
Stage 3 – National Consultation Workshops
Various Dates Over Q1 2019
Ensured that a wide-range of stakeholders and sectors were considered and captured national priorities. Identification of common issues that require joint and coordinated actions at EU and global levels.
Key Statistics:
Eight workshops representing seven countries: Finland, Flanders (Belgium), France, Germany, Ireland, Italy, the Netherlands and Turkey. Additionally the Aqua Research Collaboration (ARC) also held a workshop with its members.
Stage 2 – Public Consultation
December 2018 – February 2019
Public consultation via online survey. Aimed to identify key trends and recommendations in research and innovation to assist in defining the new Vision, and to and inform the revised key themes for the updated SRIA.
Key Statistics:
481 respondents from 37 countries worldwide.
Representing members of the public, researchers, industry, higher education institutes, ministry officials, professional water associations, funding organisations and community groups.
Stage 1 – Literature & Foresight Review
July – August 2019
Literature review of strategic and foresight documents. Examination of current EU water policy and key future developments.
Stage 4 – Semi-structured Interviews
October – November 2019
Series of semi-structured interviews undertaken with selected national and global representatives that were under-represented in the public consultation.
Key Statistics:
Stakeholders contacted represented nine countries: Belgium, Croatia, Czech Republic, Denmark, Finland, France, South Africa, Spain and Turkey. Others included the EC, UN Food and Agriculture Organisation (FAO), and the European Network of Freshwater Research Organisations (EurAqua).
Five respondents representing researchers, an independent NGO non-profit water management/ improvement organisation, economic sector, and an environmental protection institute.
Stage 5 - Consultative Workshops with the Water JPI ABs and GB
22 May 2019, Berlin, Germany
Collation of feedback on the Vision 2030 document, SMART monitoring indicators and amended RDI themes for the SRIA.
Key Statistics:
34 attendees from 20 countries worldwide.
Representing 20 members of the GB and six members from the ABs.
27 September, Paris, France
Workshop targeted at the members of the Water JPI ABs and GB to discuss and share recommendations for updating the Water JPI Vision and SRIA.
Key Statistics:
29 attendees from 11 countries worldwide.
Representing 11 Water JPI members, nine members each from Scientific and Technological Board (STB) and the Stakeholders Advisory Group (SAG).
SRIA 2025
February 2020
Water JPI Vision 2030
February 2020
The revised Vision document looking to 2030.
Stage 6 – Experts Stakeholder Workshop
22-23 October 2019, Dublin, Ireland
Workshop targeted at the research community and key stakeholders. Collation of information on the SRIA structure and priorities, the new Vision 2030, and identification of joint activities to achieve the Water JPI objectives.
Key Statistics:
88 attendees from 20 countries worldwide.
Representing Water JPI ABs and GB members, the research community, ministry/policymakers, NGOs, EU/ international initiatives, enterprise and others.
LEGEND
Key Documents
Consultation
Workshop

Annex 4 – Research and innovation needs identified for achieving EU and international policies

Annex 4.1 - Gaps in Knowledge and innovation transfer for International conventions

Based on the assessment of the current solutions in terms of efficiency for achieving the UN SDGs and projections for reaching the targets by 2030, different research and innovation gaps have been identified by the UN Water programme (as end-user's point of view), presented along a simple typology (modified from P. Koefoed-Bjornsen, 2019, Water JPI SRIA experts workshop) which should be connected to the different UN SDG6 targets (cf. tables 1 and 2). Some of them are also reflected in the existing SRIAs (cf. Annex 3).

Table Annex 4.1 –Proposed typology for assessing RDI gaps within UN SDG6 context

A) Track status/progress: – Reliable monitoring tools – Filling data gaps (including data quality and reliability) – Scaling global-national-local (considering rivers basins, coastal waters) – Disaggregation of indicators by sectors or by sub-topics for matching small scale relevance	B) Understand causes and effects: – Drivers, barriers – Impacts and risks for ecosystems and human health – Interlinkages
C) Provide solutions: – Technological & methodological innovation – Applicability, simplification, reliability – Mobilize indigenous know-how (citizens, local communities) which are playing a crucial role in managing natural resources	D) Accelerate implementation and upscaling: – Financing, cost recovery, investment planning – Capacity development – Incentives for positive change – Fast-tracking innovative solutions – Streamlining policies, legislation and regulations

Table Annex 4.1b – Level of achievement of the UN SDGs targets related to Water (Global situation)

Objective	Adequate	Improve	Critical	Comments
6.1. By 2030, achieve universal and equitable access to safe and affordable drinking water for all"	6.1.1 Proportion of population using safely managed drinking water services	6.1 Implementation: cost recovery 6.1 Solutions: off-grid water collection, household water purification		Basic coverage decreasing in 20 countries. Progress too slow in 68 countries. Only 15 countries on track for universal access by 2030
6.2 - By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, …."	6.2.1 Proportion of population using safely managed sanitation services, …	Understand interlinkages 6.2 Solutions: dry sanitation, separate feces and urine, use nutrients	6.2 Implementa-tion: behavioural change, overcome taboos	Basic sanitation decreasing in 20 countries. Progress too slow in 89 countries. 14 countries on track for universal basic sanitation

6.3 - By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, …"		Understand new pollutants, impacts, fate. Integrate WQ in hydrological models 6.3.1 Proportion of wastewater safely treated 6.3 Solutions: Nature-based solutions, Product replacement 6.3 Implementation: Incentives, cost recovery, Feedback from down to up-stream	6.3.2 Proportion of bodies of water with good ambient water quality	https://uneplive.unep.org/media/docs/assessments/unep_wwqa_report_web.pdf
6.4 - By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity		6.4.1 Change in water use efficiency over time 6.4.2 Level of water stress: freshwater withdrawal as a proportion of available freshwater resources; Water foot print and virtual water scarcity in relation to the hydrological cycle and climate change /variability 6.2 Solutions: Water-Efficient technologies for irrigation, industry and households	6.2 Implementation: Water pricing / valuation	
6.5 - By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate	6.5.1 Degree of integrated water resources management implementation (0-100) 6.5.2 Proportion of transboundary basin area with an operational arrangement for water cooperation	IWRM: Understand "Integrated" 6.5 Solutions: e-governance, Water Information Systems 6.5 Implementation: Basin vs admin boundaries (WR vs IM)		
6.6 - By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes"		6.6. Implementation: Nature-Based Solutions, Ecosystem restoration, Payment for Ecosystem Services	6.6.1 Change in the extent of water-related ecosystems over time Understand: multiple stresses, tolerance limits, tipping points, fragmentation. Ecosystem services (valuation)	Wetlands Extend Index 1970 – 2008: 40% loss over 40 years, 2,7 trillion $ loss per year

Acting on these targets will also support other UN SDGs implementation as shown by UN Water in its "Water and Sanitation interlinkages across the 2030 Agenda for Sustainable Development" report (2016).

Annex 4.2 - Gaps in Knowledge and innovation transfer for EU Policies

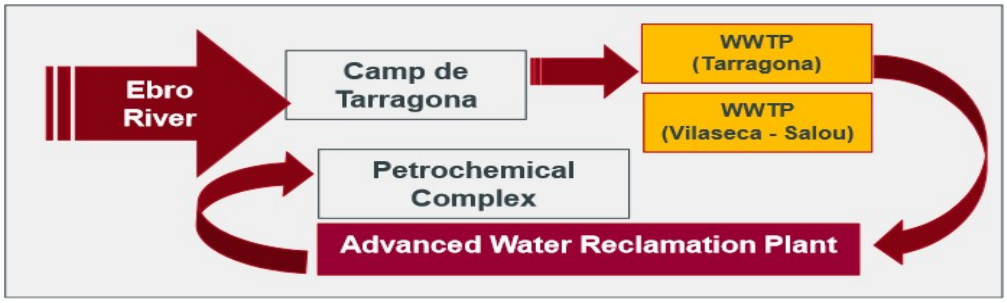
Considering what are the gaps (as identified by DG ENV and existing Strategic Research and Innovation Agendas – Annex 3), for being able to match the targets of the European (and beyond) Water policies, there is a clear need for better information (on what is produced) and better knowledge and innovation transfer, some of these scientific areas.

Table Annex 4.3 – Illustrations of Research and innovation needs identified by DG ENV for being able to fulfil the different EC policies vs. what was already funded by the European Framework Programmes

Theme	Areas identified as Research and innovation gaps by DG ENV (October 2019) and existing SRIA	No. of projects funded since FP7
Chemical pollution in water	➢ better understand, monitor and evaluate risk (to ecosystems and human health) posed by simultaneous **exposure to multiple chemicals** present in the aquatic environment ➢ Fate, transport and impact of **pharmaceuticals and antimicrobial resistance** in the environment ➢ investigation of the risk posed by **nanomaterials** and plastics in the aquatic environment (including risk to the human health & aquatic environment/via the aquatic environment)	
Water reuse	➢ assess the role and **significance of treated waste water in antimicrobial resistance propagation** and develop methodologies to measure the problem ➢ framing and sizing the **micro-plastic dimension in treated wastewater** with the aim to estimate possible release of micro-plastics from reuse ➢ assessment of **other pollutants of emerging concern** including the role and significance of treated waste water in antimicrobial resistances propagation and the spreading of pharmaceuticals in the environment	
Sludge reuse	➢ technologies to ensure that the **sludge** is clean enough to use in agriculture (both from control at source and sludge treatment) ➢ Alternative to recover nutrients from sludge and reducing GHG emission impacts.	
Groundwater and drinking water	➢ **Climate change impacts** on groundwater resources (improving resilience, exploring new technologies for groundwater levels control, groundwater and use of geo-energy) ➢ Natural groundwater **renewal** , managed aquifer recharge and processes in the unsaturated zone ➢ Groundwater and **dependent associated ecosystems** (indicators for protected areas) ➢ Sharing approaches and tools to **protect drinking water sources** ➢ "**Cocktail" effects of substances in low concentrations** in water and drinking water on human health and the aquatic environment (non-single substance effect based assessment, including endocrine disrupting effects) ➢ **"Safe" materials** and surfaces in contact with drinking water and food, including microbiological safety (migration potentials, biofilms …) ➢ Standards and cost-effective treatment methods for **PFAS and other emerging contaminants** in drinking water	

Extreme events	➢ Understanding **environmental, societal and economic risks and impacts of extreme droughts** and developing strategies to ensure food security and energy security while increasing the climate resilience of ecosystems ➢ Improving knowledge and practice in **forecasts of extreme hydrological events** and developing pathways and **improved management strategies** to reduce the vulnerability of ecosystems, society and economic sectors	
Water Resources and River Basin Management	➢ **Adapting water infrastructures** to be Climate Change resilient ➢ Renewing **ageing infrastructures** (from impacts to management) ➢ Designing environmental- and cost-effective Program of Measures in order to achieve water quality and ecological quality targets for EU rivers and to develop CC-aware RBMPs ➢ Deepening knowledge on practices needed to overcome negative impacts from **diffuse pollution and geomorphological changes** (cf. identified challenges) ➢ Defining pathways for the real life implementation of the **Nexus approach** with specific regards to interaction with agriculture	
Water related ecosystems	➢ Understanding the **efficiency of nature based solutions** in low impact development in urban and peri-urban areas ➢ Defining tools to design adaptation pathways to support the management and preservation of climate resilient aquatic ecosystems	

Annex 5 — Example of Water reuse for ensuring water security



Critical issues for reuse of municipal effluent water as cooling water by industry:

- Requirements for water and energy use: Available in sufficient quantity and consistent water quality for reuse at different levels in the process
- Impacts: avoiding corrosion, development of microbes, effectiveness of water treatment process, heat performance and longevity

Figure Annex5.1: Example of the Camp de Tarragona Water Reclamation Plant and examples of critical issues to be solved for implementation (Dow, 2018 – Water Innovation Europe)

Annex 6 — Detailed presentation of Activities planned in Water4All

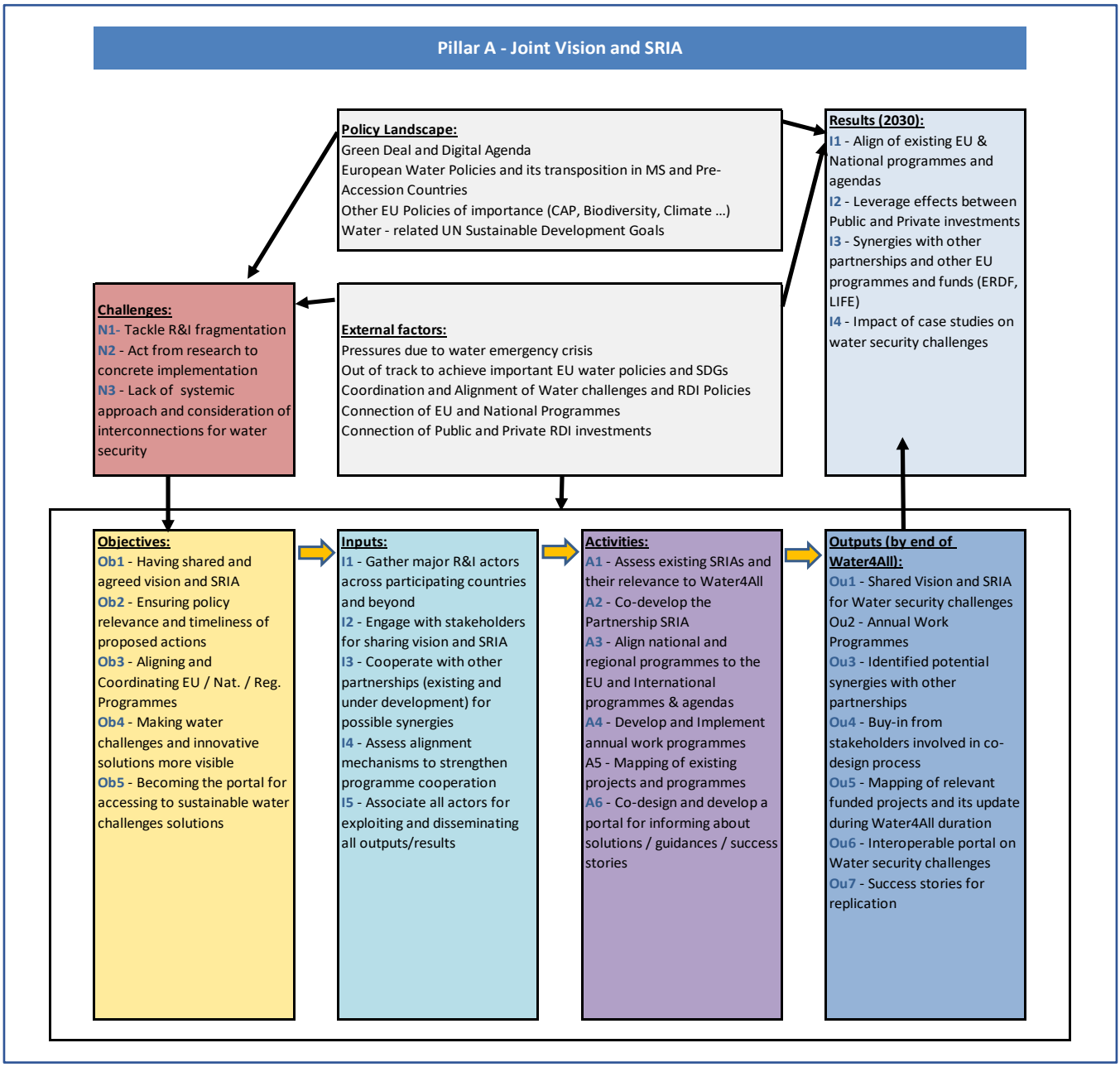


Figure Annex 6.1 – Intervention logic planned for Water4All Pillar A

A1 – Developing the shared vision and SRIA of the Partnership with the involved partners, in close collaboration with the relevant stakeholders:

Objectives:

- Having shared and agreed visions on research and innovation gaps to ensure the appropriateness and efficiency of the joint actions to be designed and implemented for addressing the identified challenges.
- Ensuring the policy relevance and timeliness of the proposed joint actions being designed.
- Addressing and reducing the fragmentation of the R&I landscape by aligning SRIAs.

Inputs:

- Gather major relevant R&I actors across participating countries and beyond.
- Engage with scientists and stakeholders for sharing a vision and a SRIA.
- Cooperate with other Partnerships (existing or under development) for identifying areas of synergies.

Activities:

- Assessment of the existing SRIAs (some recently updated) and their relevance for the Water4All partnership.
- If needed the complete process of the SRIA development and revision could be implemented (cf. Water JPI process as example in Annex 1).
- Organisation of consultation and strategic workshops for finalizing the Water4All partnership SRIA, in cooperation with the European Commission, Water4All partners, and key stakeholders at different levels of decision-making.

This will include the implementation of an Advisory Board (AB) as support of the Partnership, composed by scientists and Stakeholders to ensure the close connection to the effective needs, a co-design and a co-development of the actions which should support larger acceptance and final up-take of results. AB with high level experts could work on a more regular and organised basis way.

Outputs:

- Shared and coordinated methodology for updating the SRIA.
- Shared vision and SRIA for Water security challenges to be implemented in the upcoming years.
- Identification of possible synergies (& Joint Actions) with other Partnerships and relevant initiatives.
- Buy-in from stakeholders (i.e. by involving them in the co-design process).
- Foresight studies.
- Scientific inputs on some questions raised, via the organisation of specific AB Working Groups.

Key Indicators: to be further developed by Water4All partners when work plan set and approved (e.g. Number/Type of ministries/agencies involved in the Partnership, umber of stakeholders involved in the development of the Water4All SRIA, Number and type of joint actions to implement the SRIA, etc).

A2 – Coordinating the R&I programmes and actions in this field across the European Research Area, and possibly Beyond,

Objectives:

- Anticipating and avoid overlapping while creating synergies;
- Articulating / completing actions and identifying synergistic actions with the other programmes to achieve the critical mass required by the challenges faced.
- Coordination with the different initiatives which will maximise efforts and limit existing barriers.

Inputs:

- Identify key partnerships for possible synergies (table 2).
- Engage R&I programme managers of relevance at all levels (local / regional, national, European and if possible, International).
- Assess Alignment mechanisms to strengthen programme cooperation and create higher critical mass.

Activities:

- Alignment of national and regional programmes related to water challenges to the European and International programmes and agendas – Acting at the different scales (regional, national, European and Beyond Europe)
- Developing annual work programme of the Water4All Partnership complementing what will be done by Research and Innovation programmes (e.g. Horizon Europe – Missions, other partnerships, Intervention Areas work programme, KICs, relevant Articles 185/187 (e.g. PRIMA, BONUS)) but also activities developed under programmes (LIFE, Cohesion Funds, Cost Association & Cost Actions, …. – cf. activities planned in D1 – D3).

Outputs:

- Mapping of the projects already funded by the different programmes involved (EU, national, regional) and of the outputs to see what are the effective remaining gaps to be priorities in the Partnership work programmes.
- Mapping update during the Partnership duration for temporal and geographical mapping of RDI funding

- Interoperable portal connecting all information from the different programmes across the European Research Area, and if possible Beyond Europe;
- Platform presenting the existing research infrastructures, observatories and living labs of relevance for Water4All. This could be built on the existing tools developed by some of the proposed partners (e.g. MERIL Platform project, Water JPI information platform on water related research infrastructures and observatories – to be operational end of 2020 with proposed services, Water Europe Living Labs mapping).
- Meetings for co-designing annual complementing programmes with the relevant initiatives to reinforce synergies and co-designing activity programmes which are as much as possible synergistic and complement to address all needs identified in SRIAs.
- Contributing to EC consultations (HE strategic planning, WP position papers…).

Key Indicators: to be further developed by Water4All partners when work plan set and approved (e.g. Temporal and geographical mapping of RDI funding; Number of EC programmes and funding agencies involved in co-designing work programme with regards to geographical distribution; Number of water-related RDI infrastructures in information Platform database; Number of programmes contributing to the project mapping, etc.).

A3– Raising awareness about Partnership outputs (Communication and Dissemination actions)

Objectives:
- Making Water challenges and innovative solutions more visible to the general public (Considering the fragmentation and the increased recognition of the role of water in the upcoming challenges (e.g. Brave Blue World);
- Becoming the showcasing platform and the portal for accessing to solutions.

Inputs:
- Increasing engagement of stakeholders in transdisciplinary approach.
- Coordinate communication actions for raising water role in global challenges.
- Associate actors for disseminating case studies.

Activities:
- Different forms of events for more participative approach and more solutions oriented tackling problem owners needs
- Innovating in communicating to general public (“everyone is a water consumer”) for exchanging on water security challenges, discussing priorities in actions and testing new concepts, solutions or any proposed innovations (Forum Water4All to be further developed if approved by Water4All partners).
- Developing a portal/platform for informing about solutions / guidance / success stories of relevance for all actors facing water security challenges (to be linked to the European Open Science cloud under development).

Outputs:
- Dissemination products based on the research and innovation activities performed within Water4All
- Case / Success studies for presenting solutions tested in demonstration sites / living labs
- Global central portal for informing in solutions

Key Indicators: to be further developed by Water4All partners when work plan set and approved (e.g. Number of events related to funded project, including global attendance of the meetings and Sectors represented; Number of Success case studies made publicly available, etc.).

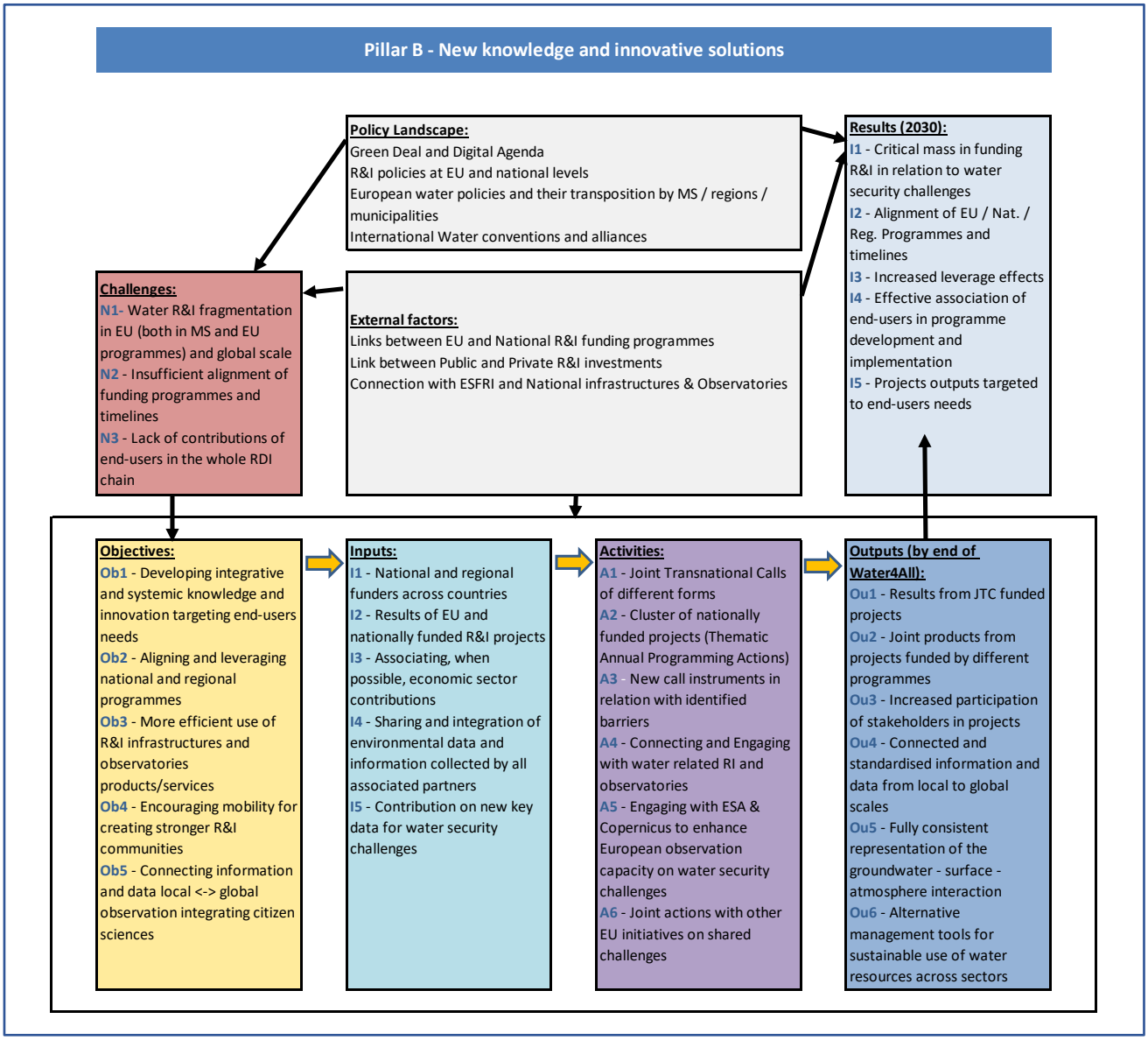


Figure Annex 6.2 – Intervention logic planned for Water4All Pillar B

B1 – Implementing the work programme(s) for developing new knowledge and innovative solutions through Joint multilateral calls for proposals.

Objectives:

- Developing knowledge and innovation for addressing in due time the Water security challenges identified in the SRIA;
- Aligning and leveraging national programmes to avoid fragmentation;
- Prioritising Partnership actions to deliver innovative approaches and solutions to achieve the Water4All objectives.

Inputs:

Pooling together financial resources from:

- Participating national and regional research **and** innovation funding programmes towards the definition and implementation of several co-funded transnational and multi-disciplinary calls (several forms) for research and innovation proposals.
- When possible, economic sector contributions (directly or by in-kind contributions in the selected projects for research and innovation programmes)
- from Governmental Research Performing Organisations, depending financial rules to be clarified for co-funded partnerships
- Encouraging mobility actions.

Activities:

- Joint transnational calls for Research and Innovation, such as Joint Transnational Calls in cash, Transfer project, Young researchers call, Challenges call, Maturation call.)
- Thematic Annual Programming actions – TAP (clusters of projects funded through national calls – cf. concept description on Water JPI example).
- New call instruments (e.g. Knowledge transfer, innovation transfer) as proposed by funders partnering – to be connected to other Pillars needs (in particular C, and potentially D).
- Connect to COST Actions (cf. previous exchanges and proposals of labelling of proposals, maturation of Cost Actions outputs, clusters of Cost Actions with other funded project, etc.)?

Outputs:

- Transnational Research and innovation projects,
- Clusters of projects on the same topics for increasing delivery.
- Increased participation of stakeholders in projects for accelerating uptake of project results / products.

Key Indicators: to be further developed by Water4All partners when work plan set and approved (e.g. Number of SRIA subthemes and UN SDGs targets addressed in the Joint Calls scope and relevance to other policies and conventions (circular economy, COP21 agreement); Budget committed to the Joint Calls by the funding partners; Number of funded projects and their global financial budget; Level of stakeholders' engagement in funded projects, etc.).

B2 – Reinforcing link with research observatories and infrastructures

Objectives:

- More efficient use of the information collected at their level and for covering all scientific areas.
- Engaging with existing RIs.
- Increased participation of research observatories and infrastructures in research projects.
- Connecting information and data from local to Global observation and vice-versa.

Inputs:

- Sharing and integration of environmental data and information collected from the large array of observing systems contributed by countries and organisations.
- Contribution on key data (e.g. large scale and real-time assessments for water storage in the sub-surface: Assess both water availability (Has the Earth become wetter or dryer? look into soil moisture trends) and water quality)

Activities:

- Exchanging with the relevant EU and national actors (from Copernicus programme to ESFRI RI – projects and landmarks such as Danubius-RI, eLTER, …., but also infrastructures funded by EU Structural funds in regions …) for presenting the Water4All needs and cooperate for developing observation data and services for broadening implementation; connecting earth observation and local measurements is crucial for improving understanding functioning of hydro-systems.
- Exchanging with ESA (e.g. possible flagship initiative on Freshwater availability under global change) and similar programmes in order to enhance the European observing capacity and predicting capabilities of the water cycle at global, regional and basin scales and its impacts on ecosystems.
- Continuing the engagement with other partnerships at EU level (JPIs, KICs, EIP) as already started as they have similar demands,
- Enlarging the discussion to the new ones (relevant Horizon Europe partnerships and mission boards).

Outputs:

- Connected information and data from local to Global observation and vice-versa
- More reliable and standardised information, building on the FAIR (findability, accessibility, interoperability, and reuse) principle.

- Better and fully consistent representation of the groundwater-surface-atmosphere interaction to address the impact of water and the land use changes, Predictability of global/continental environmental change models
- New climate adaptation measurements for alternative management tools for a sustainable use of freshwater resources.

Key Indicators:: to be further developed by Water4All partners when work plan set and approved (e.g. Number of observatories / research infrastructures connected to Water4All activities with consideration of partners involved and geographical distribution; Number of data resources made available, etc.).

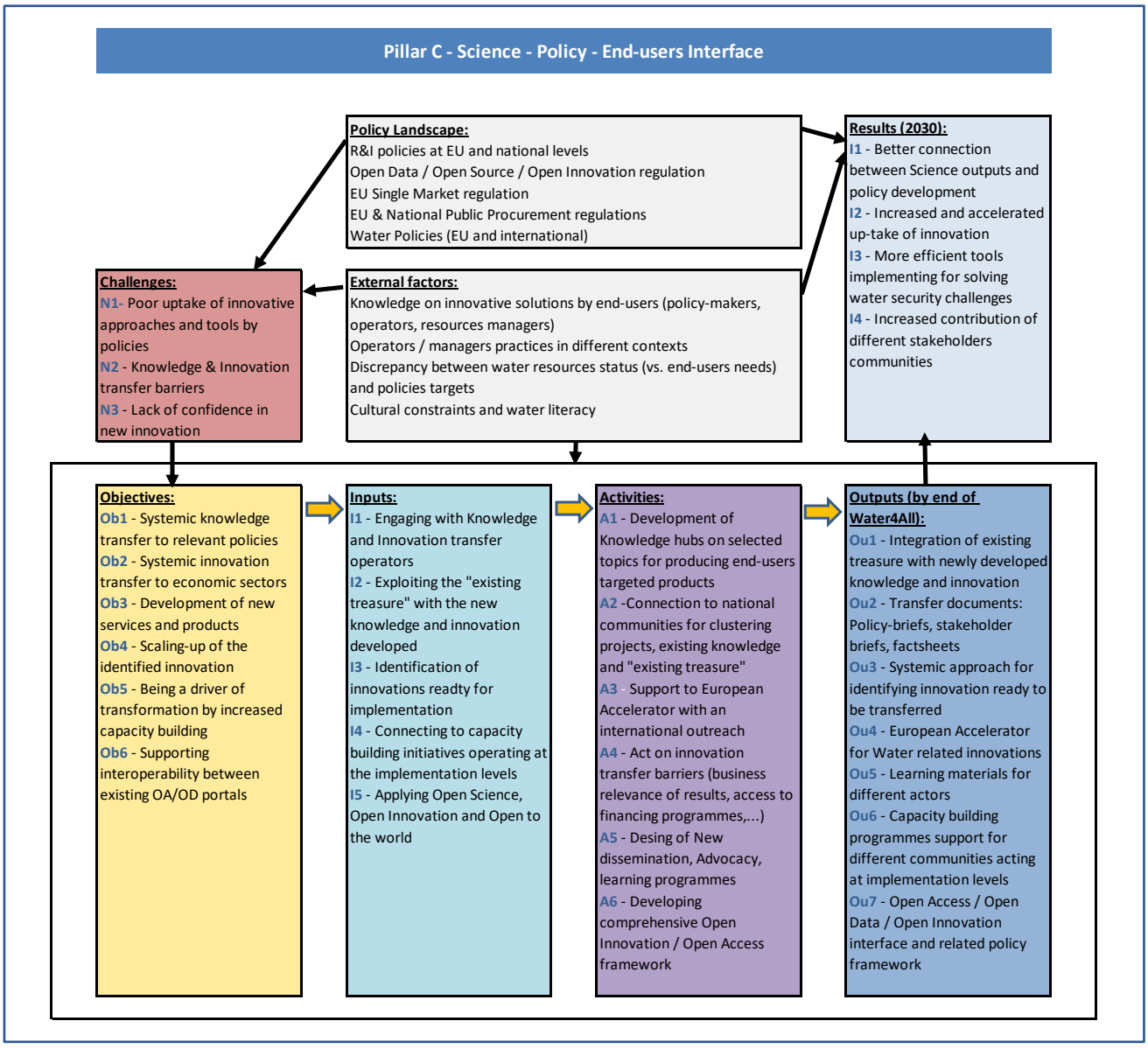


Figure Annex 6.3 – Intervention logic planned for Water4All Pillar C

C1 – Strengthening the Science – Policy - Governance interface

Objectives:

- Systemic knowledge transfer to relevant policies needs considering the different levels of policies implementation / enforcement.

Inputs:

- Engaging with the relevant actors for covering different stages of knowledge transfer (Knowledge management (collecting – sharing); Knowledge usability; Knowledge synthesis; Knowledge sharing to extended domain(s); Knowledge transfer (to end-users); and Knowledge communication & dissemination)
- Developing / fostering initiatives (such as the EC "Projects for Policies" – P4P project or the Water JPI knowledge hubs on Contaminants of Emerging Concern and on water related UN SDGs)
- Exploiting the existing research "treasure" (non-exploited results – to be identified from the project database developed in A2)

Activities:

- Develop knowledge hubs (consisting of selected research groups within a defined area of research targeted at stakeholders) on different specific scientific issues
- Identify, evaluate and produce synthetic information in different forms which will be disseminate to the relevant policy-makers.
- Connecting to the national communities and to the ongoing projects at local / regional / National levels for benefiting from their programmes / expertises / outputs.
- How these knowledge hubs could interact with the existing policy support working groups (e.g. Common Implementation Strategy (CIS) working group of the Water Framework Directive) and the stakeholders involved in the policy implementation (e.g. regions, cities) will be investigated.

Outputs:

- Integration of "existing treasure" with newly developed knowledge and innovation for benefiting of all RDI investments
- Policy-briefs, policy recommendations, factsheets, based on the knowledge and innovation derived from Water4All activities
- Synthetic documents targeted to policy-makers and actors facing policy implementation.

Key Indicators: to be further developed by Water4All partners when work plan set and approved (e.g. Number of SRIA objectives/RDI needs addressed in the policy briefs arising from the partnership activities; Number of EU policies driven by science results; Common vision developed with relevant EU and International initiatives for addressing all policies and conventions, etc.).

C2 – Accelerating the uptake of R&I results by the economic sectors

Objectives:

- Developing new services and products, source of job creation and growth.
- Accelerating the uptake of projects outputs by the economic sectors for more effective implementation at local scales.
- Scaling-up of the identified innovation

Inputs:

- Identification of the innovations (technological, but also social) which are (almost) ready for being implemented / placed on the market (based on the projects database developed in A2).
- Coordination with existing initiatives at different levels (regional, national – e.g. competitiveness clusters, technological centres, KICs) to reinforce the action in Water4All to reduce fragmentation.
- Simplification of the access to information or programmes for the start-ups and SMEs.

Activities:

- Support to the confirmation of the business relevance with the market and to the evaluation of capacity to place the innovation on the market.
- Support to access to different financial programmes for finalizing the developments.
- Support to the creation of spin-offs or start-ups / building licensing opportunities, seed financing for launching spin-offs and supporting early-stage start-up, de-risking future business (in cooperation with the InnovFin facility and the project of European Accelerator on Water).

- Support to the development of a European Accelerator (with an international outreach): activities will entail e.g. co-developing the business plan and strategy, preparing for raising the required capital, fostering business and industrial partnerships, helping structure the business, facilitating market access) - Focus on spin-off and early stage start-ups (Seed and Series A, and not generating revenues yet).

Outputs:

- Systemic approach to identification of innovation to be scaled-up.
- Contribution to the development of a European Accelerator (with an international outreach) to support market uptake and implementation.

Key Indicators: to be further developed by Water4All partners when work plan set and approved (e.g. Number of innovations identified at the end of the Partnership; Number of patents; Number of spin-offs receiving grants;, etc.).

C3 – Fostering Capacity development of all actors

Objectives:

- Implementing the new approaches and innovative solutions developed within Water4All with all relevant actors.
- Being a driver for transformation.
- Supporting UN SDG achievement dimension in an international context.

Inputs:

- Defining different types of capacity building activities, in close cooperation with the existing actors at the different levels (local, regional, national, different groups involved in implementing solutions connected to Water4All partnership) to maximize the impacts.
- Connecting to existing programmes / initiatives operating at these scales.

Activities:

- Design of dissemination programmes for targeted groups (policy makers, decision-makers, such as cities or regions, services providers)
- Implementation of Advocacy programmes on innovations produced by R&I projects for policy makers in charge of implementing policies
- Design of distance learning programmes for targeted groups (e.g. MOOCs will be developed on how science can interface with policy development, webinars for policy makers and implementers (e.g. regulators and local authorities on how policy can be supported by science)
- Proposing mobility schemes between research institutions, but also between researchers and economic sectors and/or water resources managers
- Connection to education programmes, especially about the innovative solutions.
- Developing, where relevant, Communities of Practices.

Outputs:

- Learning materials for different actors of relevance for increasing / maximizing the use of Water4All outputs and easing duplication of solutions.
- Support to Capacity building programmes for different communities with Water4All outputs.
- Capacity building for entrepreneurs and start-ups of the Water economic sector (e.g. Training and coaching to create a spin off, to write a proposal or project writing, present to investors, human resources management, managerial leadership…).
- Capacity and skills building programmes to support solution acceptability and uptake adapted to the local level and stakeholder landscape.

Key Indicators: to be further developed by Water4All partners when work plan set and approved (e.g. Number of participants in the capacity building programmes developed by the Partnership; % of spin-offs/start-ups still successful beyond the acceleration programme during the Partnership duration; Number of Community of Practices developed, etc.).

C4 – developing Open Science and Open Innovation across the different partners of Water4All

Objectives:

- Supporting interoperability between existing OA/OD portals (see A2) in the Water challenges for sharing outputs and progressing State of the Art;
- Review for SMART principles the EU principles "as open as possible, as closed as necessary"

Inputs:

- Open Access (with its two main routes, **open access** publishing - **gold**' **open access -** or self-archiving - '**green**' **open access**) as default setting for research data generated in the European Framework Programmes
- Follow three O approaches in parallel – open innovation, open science and open to the world
    - Opting-out option should be considering if, in particular, one of the following conditions are fulfilled:
        - Participation is incompatible with the obligation to protect results that can reasonably be expected to be commercially or industrially exploited
        - Participation is incompatible with the need for confidentiality in connection with security issues
        - Participation is incompatible with rules on protecting personal data

Activities:

- Develop the concept of Open Innovation in the context of Water4All, which will combine research and innovation actions, will build on the FAIR (findability, accessibility, interoperability, and reuse) principle, and should have an International Cooperation dimension (European Interest – better protection of EU outputs / products)
- Consultation of Partnership partners in all activities for defining possible status of Water4All outputs.

Outputs:

- Open Access / Open Data / Open innovation policy for the Water4All outputs
- OA/OD/OI interface for support access to products connected to the Water4All information platform (see A3).

Key Indicators: to be further developed by Water4All partners when work plan set and approved (e.g. Number of outputs registered under the three modes (Green, Gold, Opt out); Metrics related to the Water4All Information Platform (Views, users, downloads, etc.), etc.).

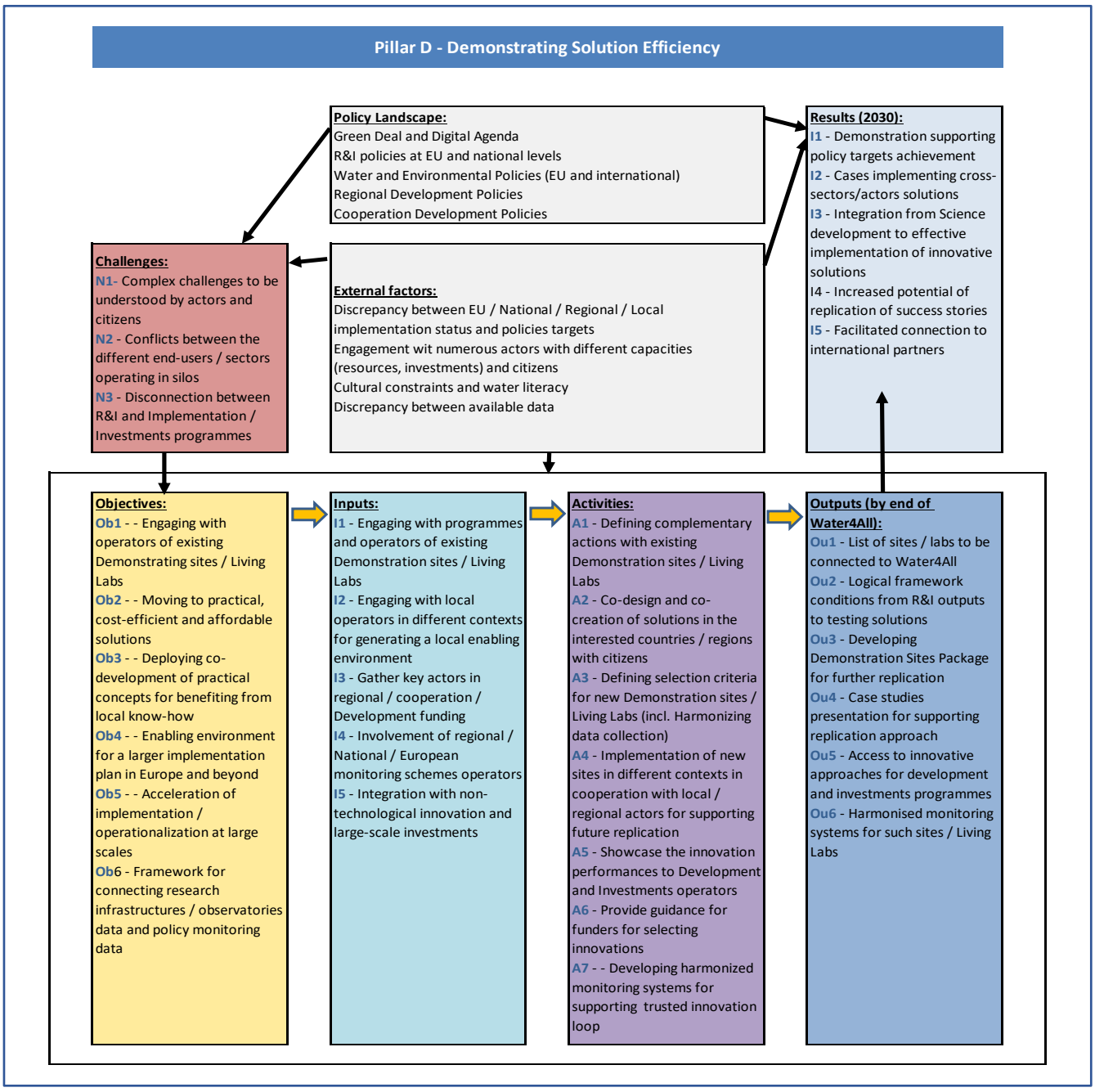


Figure Annex 6.4 – Intervention logic planned for Water4All Pillar D

D1 – Engaging with existing operating demonstration sites / Living Labs or programmes (e.g. H2020, LIFE, INTERREG, national funding including research infrastructures)

Objectives:

- Engaging with operators of Demonstrating sites / Living Labs funded by different programmes, which could be further used for duplicating / replicating in other geographical areas.

Inputs:

- Engaging with the units in charge of the programmes which are more focus on implementation at local and regional scales, for identifying and articulating the activities planned in the different programmes (cf. Water Europe Living Labs report, 2019, Water JPI – Research Infrastructures Platform)
- Connecting with the identified projects / programmes acting at the levels of Water4all actions (e.g. Regions with RI3S related to water), which are relevant for the Water4All partnership (e.g. LIFE projects such as ARTISAN, "Achieving Resilience by Triggering Implementation of Nature-based Solutions for climate

Adaptation at a National scale, INTERREG – NWE – Water test Network, Structural funds - Water Smart Territories platform; EASME ICT4 Action Plan – Digital innovation hubs).

Activities:

- Defining selection criteria for identifying the most important initiatives to engage with (basis: perimeter of actions, level of maturity and activities, sustainability).
- Defining complementary actions with these projects, including discussion about open access to Living Labs (such as what is proposed for Research Infrastructures in Pillar A).
- Testing innovative tools to maximise use of these infrastructures (e.g. possibility of innovation implementation vouchers, awards for using demonstration sites …).
- In the context of International Cooperation as foreseen in Water4All, co-design and co-creation of solutions in the interested countries / regions, for providing more opportunities for replication in different contexts.

Outputs:

- List of sites / labs to be connected to Water4All, with possible contributions.
- Logical framework conditions from R&I outputs to testing solutions.
- Case studies presentation for supporting replication approach.

Table 7 – Types of actions proposed by these projects

Projects	Objectives and Types of actions
LIFE project – ARTISAN (2019 – 2026)	Create within the next ten years the conditions of a generalization of Nature-based adaptation solutions (NBAS) Actions: Demonstration programme: 10 sites in France Dissemination, training and capacity building Helping the implementation of new NBAS (supporting economic stakeholders for implementing, local planning and strategy, mobilizing funding, improving regulations)
INTERREG NWE – Water Test Network	The Water Test Network (WTN) project will establish a transnational network of testing facilities which can be used by SMEs in North-West Europe (NWE) to develop, test and verify new products for the water sector. In this way, new innovations will be developed and it will accelerate the time to market.
Structural funds – Water Smart Territories	The S3 Water Smart Territories Partnership will pay special attention to the support of cross-sectoral collaboration between regional authorities, clusters, industries and research organisations in water and ICT sectors, and be able to highlight the most promising innovations. The exchange of experiences in interregional value chains, investment pipelines and investment platforms will enhance industrial dialogue and will allow the development of innovative technologies and services. Consequently, new projects and joint activities will drive regional cooperation through innovations.
EASME ICT Action Plan – Digital Innovation hubs (2019 – 2023)	Integration and standardization of the Water ICT technologies. Development of system standards and interoperability of solutions, i.e. adaptability of solutions to new user requirements and technological change. Actions: Promote data-intensive and cost-efficient water business models, products and services using digital technologies Contribute in advancing the consolidation of the ICT4Water community.

	Develop and deploy one-stop-shops for digital water services. Deploy technology infrastructure (competence center) to provide access to the latest knowledge, expertise and technology, to support the water community with piloting, testing and experimenting with digital water innovations.

Key Indicators: to be further developed by Water4All partners when work plan set and approved (e.g. Number of countries participating in the demonstration activities; Number of sites / labs to be connected to Water4All; Number of other projects / initiatives included in the demonstration activities, etc.).

D2 – Implementing at least XX demonstration sites / Living labs in different geographical / climate contexts to launch implementation of new approaches and innovative solutions developing in pillar 1, for the cities, for the economic sectors (number depending from S3 mapping)

Objectives:

- Moving to practical, cost-efficient and affordable solutions, which could be replicated in different contexts in Europe and Beyond Europe.
- Deploying co-development of practical concepts for benefiting from local know-how.

Inputs:

- Engaging with local operators in different contexts for generating a local enabling environment that fosters multi-sector and multi-actor cooperation.
- Promote citizen science in the co-design, co-development and co-deployment of the solutions for increasing the impacts.

Activities:

- Defining selection criteria for Demonstration sites / Living Labs to be developed
    - Complementary river basins and water catchments will be selected to reflect the different regions in Europe with respect to water security challenges (e.g. urban areas vs. peri-urban and rural areas) and. The selected river basins and water catchments will represent all relevant types of geographic, functional (e.g. cities – highly centralized or not, food production, tourism, …), hydrological (coastal areas, deltas …), managerial (e.g. water facilities more or less developed, combining technologies and nature-based solutions for considering local nature capacities) and climatic challenges that need to be jointly tackled, from water scarce, polluted, drought and flood prone areas.
- Proposing innovative approaches and solutions to local / regional decision-makers to be implemented in new demonstration sites and living labs
- Roadshows with structured context /design for promoting innovative approaches
- Association of local / regional operators with MoU for developing such sites

Outputs:

- Set of dedicated Demonstration sites / Living Labs which will implement innovative solutions and move to operational sites acting on securing water
- Developing Demonstration Sites Package for further replication
- Facilitated connection to international partners, with sites / labs in transboundary conditions or in partnering countries, which will contribute to water diplomacy in critical areas if really implementable within Water4All (cf. eligibility conditions of international partners).

Key Indicators: to be further developed by Water4All partners when work plan set and approved (e.g. Level of engagement of local authorities / institutions / entreprises in the demonstration sites / living labs, level of engagement of citizens in the local projects, etc.).

D3 – Engaging with the development / Investment programmes

Objectives:

- Enabling environment for a larger implementation plan in Europe and beyond.

- Acceleration of innovative solutions for making implementation / operationalization at large scales affordable for the interested countries / regions / Cities.

Inputs:

- Gather key actors: EIB (Water Programme), Structural funds for EU13 (as Water infrastructures are large part of the structural funds distributed under the previous programmes), and for the International context, development agencies.

Activities:

- Inform development and investment programmes on the innovations developed in the partnership,
- Showcase the innovation performances which could be funded by their programmes (after being validated and accepted in the Water4All demonstration actions D1 – D2)
- Provide guidance for them for selecting innovations (cf. EC recommendations for "Accelerating the transition to the circular economy – Improving access to finance for circular economy projects, March 2019) and see how circular projects and business could be prioritised in their financing schemes (e.g. in the InvestEU Fund).
- Propose innovative tools for supporting the regional / local replication (e.g. innovation implementation vouchers, awards for using demonstration sites, etc.).

Outputs:

- Access to innovative approaches for development and investments programmes.
- Amended Guidance for selecting innovations that could be used in those programmes

Key Indicators: to be further developed by Water4All partners when work plan set and approved (e.g. Number of programmes engaging with the Partnership for developing the implementation of innovative solutions; Number of "success stories" developed from Water4All approach with the support of development and investments programmes, with regards to geographical distribution, etc.).

D4 – Developing methodologies monitoring the implementation of the solutions at the demonstration sites / living labs,

Objectives:

- Proposing a framework for connecting research infrastructures / observatories data and policy monitoring data.
- Realising the water-smart society mission a reality (including replication) to be supported and funded by a combination of research and innovation programmes.

Inputs:

- Involvement of regional / National / European monitoring schemes operators.
- Collaboration with operators for adapting existing schemes to innovative approaches.
- Integration with non-technological innovation and large-scale investments to carry out research and innovation in real-life environments.

Activities:

- Assessment of existing monitoring policy systems for proposing appropriate monitoring methodologies which consider innovation in approaches and implementation.
- Developing harmonized monitoring systems between R&I and policy monitoring systems for benefiting from all data collected and evidence established.
- Integrating new methodologies of innovative monitoring (e.g. connection to citizen data collection programmes, demonstration of the participatory approach, feedbacks from the citizens on the innovations implemented and the concrete implementation), which will integrate end-users and consumers in the overall approach.
- Supporting integration of outputs of demonstration / living labs in a trusted innovation loop (cf. figure 24).

Outputs:

- Harmonised monitoring systems for such sites / Living Labs
- Guidance for these monitoring systems for implementation by the relevant actors.

Key Indicators: to be further developed by Water4All partners when work plan set and approved (e.g. Number of monitoring tools/guidance developed and implemented in Demonstration sites and Living Labs; etc.).

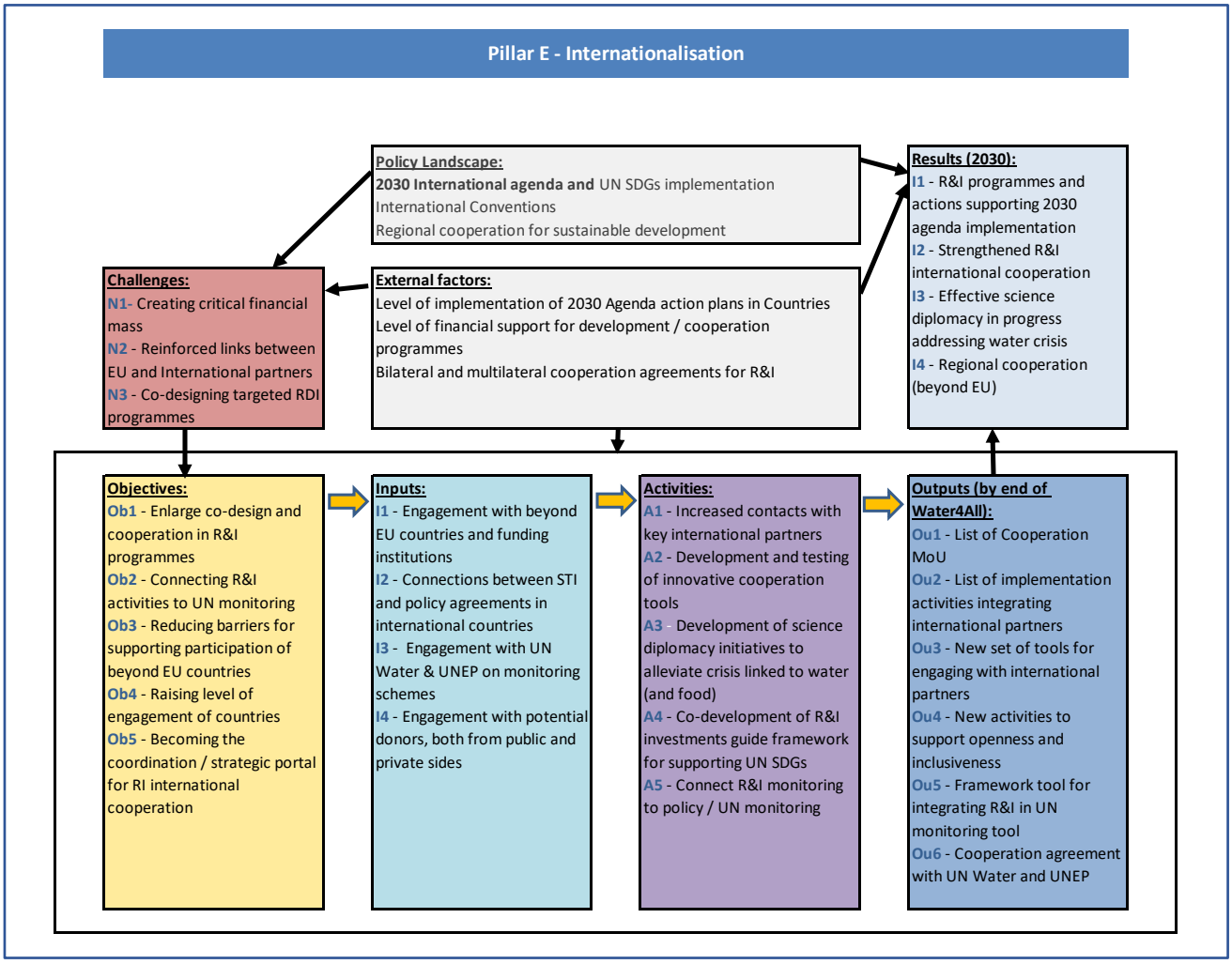


Figure Annex 6.5 – Intervention logic planned for Water4All Pillar E

E1 – Developing international cooperation agreements to:

Objectives: enlarge the co-design and the cooperation, in a flexible way, and attract new partners for creating the necessary critical mass for developing innovative solutions and increasing their implementation; Becoming the Coordination / strategic portal for R&I programming in Water challenges.

Inputs:

- Engage with countries sharing the same Water security challenges
- Connect to the official Science – Technology and Policy agreements with international partners (e.g. Brazil, China, India …).
- Work on incentives for International Cooperation (in R&I programmes (e.g. joining national resources (for creating a critical mass necessary to tackle global challenges, articulating international and national agendas, increased and faster knowledge transfer, widening and enlargement of market opportunities) while barriers constraining it (additional complexity, time for ensuring trust and respect between the partners, absence of alignment of activities and timelines, difficulties to co-construct joint actions in an equal footing basis, etc.).

Activities:

- Pursue the contacts with the key international partners, as those already involved in bilateral agreements with the EC (e.g. Brazil, China, India, South Africa, …) or multilateral programmes (e.g. with the Water JPI – cf. developments in international cooperation and existing related actions, such as policy sectoral dialogue programmes and development policy (e.g. Africa, South East Asia, Central Asia);
- Strengthen the role of the Water4All partners for underpinning knowledge and evidence for supporting the implementation of related international & EU policies, and for fostering the EU's position in global water-related negotiations and fora; and of course for the aquatic ecosystems;
- Identify opportunities for future research and innovation cooperation with international partners, both from the public and economic sector, considering the existing networks;
- Roadshows in interested countries;
- Develop initiatives for fostering scientific diplomacy on water to alleviate crisis linked to food and water crisis.

Outputs:

- List of Memoranda of Understanding or programs of cooperation with third countries, with regards to geographical distribution and types of partners
- List of activities integrating International partners

Key Indicators: to be further developed by Water4All partners when work plan set and approved (e.g. Number of international partners joining the Partnership activities (per type of activities – Joint calls, workshops, demonstrations…); Number of proposals and funded projects with international collaborators, etc.).

E2 - Link with the UN monitoring of the UN SDG6 (and connected UN SDGs) and targets (such as the 2018 HLPF review)

Objectives: Connecting R&I activities to UN Monitoring of UN SDGs and related targets; Raising level of engagement of countries by providing solutions from Water4Alls

Inputs:

- Engage formally with UN Water on monitoring UN SDGS schemes
- Engaging with participating countries for raising their current level of engagement

Activities:

- Co-developing with UN relevant agencies a framework to guide investments in STI at all levels (projects, programmes and involved initiatives for identifying the transformative potentials and institutionalise a "high-impact logic" approach ;
- Support of the effort aimed at the global monitoring process, follow up and review of SDGs by providing data and evidence from R&I programmes ;
- take a leading role in existing international collaboration on water – related UN SDGs to promote the establishment of new cross-thematic international initiatives that will drive change across the SDGs.

Outputs:

- Framework tool for integrating RDI in UN Monitoring tool.
- Cooperation agreement with UN Water on supporting tools.

Key Indicators: to be further developed by Water4All partners when work plan set and approved (e.g. Number of UN agencies involved in some of the Water4All partnership; Number of infrastructures providing data to UN monitoring, etc.).

E3 – Developing innovative tools for international cooperation, in particular for:

Objectives: Supporting the participation of countries beyond Europe for achieving equal footing and co-design; Reducing existing barriers for engaging with RDI programmes

Inputs:

- Engage with interested international networks and organisations,
- Engage with potential donors for supporting new participating countries.

Activities:

- Developing and testing innovative tools such as:
    - Co-designing innovation transfer (e.g. maturation project)
    - WOPs (Water Operator Partnerships) are peer-to-peer, decentralised cooperation projects between utilities based on solidarity focused on capacity building to build long-term water management improvements between utilities in European and in developing countries
    - Co-creation spaces in the demonstration / Living labs areas for further disseminating experience and benefits from local know-how.

Outputs:

- New set of tools for engaging with international partners
- New types of activities to support openness and inclusiveness in RDI programmes

Key Indicators: to be further developed by Water4All partners when work plan set and approved (e.g. Number of innovative tools developed; etc.).

Annex 7 — Water JPI contributions

As a starting point, the table below presents the current commitments from the public funders involved in the Water JPI in knowledge & innovation development since its creation in December 2011 (table Annex 5.1). The Water JPI represents 88% of the water related public research and innovation funders in Europe (WatEUr CSA, D2.2, December 2014).

Table Annex 5.1 – financial commitments in Joint Transnational Calls in the Water JPI

Year	Topics covered	No. of countries involved	No. of beyond EU countries	No. of projects	Total budget of projects	Total Grant Allocated (including EC cont.)	EC contribution
2013	Emerging Water Contaminants	10	None	7	10.1 M€	7.9 M€	None
2015	Technological solutions for water distribution & measurement	15 + EC (cofund)	1 (South Africa - ZA)	16	20.1 M€	14 M€	4.6 M€ (top-up via WaterWorks 2014)
2016 *	Improving water use efficiency and reducing soil and water pollution from Agriculture, Forestry & Fresh water Aquaculture	22 + EC (cofund)	CA, EG, TN, TW, ZA	21	22.3 M€	16.75 M€	4.8 M€ (top-up via WaterWorks 2015)
2017	Water resource management in support of the UN SDGs	12	BR, EG, ZA	8	8.3M€	6.8 M€	None
2018	Closing the water cycle gap, improving sustainable water resources management	21 + EC (cofund)	BR, EG, IL, TN, ZA	18	20.8M€	15.2 M€	4.9M€ (top-up via WaterWorks 2017)
2018	Thematic Annual Programming – TAP - AQUATAP-Ecosystems	4	None	6	1.51 M€	1.4M€	None
2020	Risks posed to human health and the environment by pollutants and pathogens present in water resources	26 +EC	BR, IL, TN, TR, TW, ZA	Call in 2020		>28 M€ max	5.1 M€ max (top-up via AquaticPollutants)
2020	Transfer project for Aquatic Pollutants	2	None	Call 2020		0.85 M€	None
2020	TAP for Aquatic Pollutants	5	None	Call 2020		3.25 M€	None
2021	Conservation and restoration of degraded ecosystems	Under developm	foresee n	Call in 2021		>30 M€	5 M€ max

	and their biodiversity, including a focus on aquatic systems	ent – 30 foreseen					

Up to end of 2019, Countries involved in the JPI activities invested in total budget 83,1M€ including an EC financial support of 14,3 M€ (17,25%).

These Joint Transnational Calls complement other activities such as the two knowledge hubs (one on Contaminants of Emerging Contaminants, in operation since April 2018 with 24 experts, one on water related UN SDGs, in operation since December 2019 with 14 first experts) and the development of the platforms on water related research infrastructures and mobility schemes.

Annex 8 – Letters of Support / commitment of partners

List to be completed later on