Strategic Research and Innovation Agenda

Adopted on 30 May 2013

Disclaimer

This publication reflects the consensus the Water JPI Governing Board members reached in May 2013 and represents the Strategic Research and Innovation Agenda v.0.5. Its drafting and publication was made possible under the framework of Tackling European Water Challenges (WatEUr) Coordination and Support Action from January to May 2013.

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List of Abbreviations

Acqueau	Eureka cluster for Water
CIP	Competitiveness and Innovation Framework Programme of the European Commission
COST	European Cooperation in Science and Technology
EWS	Early Warning Systems
EB	Executive Board of the Water JPI
EIP on Water	European Innovation Partnership on Water
EIT	European Institute of Technology
ERA	European Research Area
ERA-NET	Framework Programme instrument to step up the cooperation and coordination of research activities carried out at national or regional level in the Member States and Associated States
ERA-NET plus	ERA-NET action providing additional Community financial incentive to those national research programmes that pool financial resources to organise a joint call for proposals.
ESS	Ecosystem Services
Eureka	Inter-governmental initiative supporting cooperative RDI to impulse the competitiveness of European companies.
FACCE	Food Agriculture and Climate Change Joint Programming Initiative
FET	Future and Emerging Technologies
FP6, FP7	Sixth, Seventh Framework Programme for Research and Technological Development of the European Commission.
GB	Governing Board of the Water JPI
Horizon 2020	The European Union Framework Programme for Research and Innovation (2014-2020)
JPI	Joint Programming Initiative
JPND	Joint Programming Initiative on Neurodegenerative Disease Research
KIC	Knowledge Innovation Communities
MoU	Memorandum of Understanding
P2P	Public-Public Partnership
PPP	Public-Private Partnership
RDI	Research, Development and Innovation
SAG	Stakeholders Advisory Group of the Water JPI

SFIC	Strategic Forum for International S&T Cooperation, advisory body to the European Council and Commission
SRIA	Strategic Research and Innovation Agenda
STB	Scientific and Technological Board of the Water JPI
WFD	Water Framework Directive
WatEUr	Tackling European Water Challenges, an FP7 Coordination and Support Action energizing the Water JPI
WssTP	Water Supply and Sanitation Technology Platform

Executive Summary

This document is the first Strategic Research and Innovation Agenda (SRIA) of the Joint Programming Initiative "Water Challenges for a Changing World" (the Water JPI). This is a Public-Public Partnership (P2P) initiative responding to the grand challenge of "Achieving Sustainable Water Systems for a Sustainable Economy in Europe and Abroad". This SRIA version 0.5 has been obtained through discussions dating back to the onset of the Initiative. Efforts intensified in 2011, with the first consultation of the Water JPI Advisory Boards. In the period of 2012 and 2013, the SRIAs of some JPIs were released, and relevant developments were made in Horizon 2020 and in other new neighbouring initiatives, such as the European Innovation Partnership on Water (EIP on Water). The second consultation of the Advisory boards, early in 2013, marked the beginning of the drafting of this document.

SRIA 0.5 is intended to guide the development of Water JPI activities in 2013 and 2014, to inform stakeholders of the status of agenda developments and to contribute to sustaining an effective, mutually beneficial dialogue with Horizon 2020.

The release of SRIA 1.0, scheduled for June 2014, will require additional context analysis, information processing, critical review, wide consultation and redrafting.

The priority themes identified in this document include:

i) Maintaining Ecosystem Sustainability;
ii) Developing safe water systems for the citizens;
iii) Promoting competitiveness in the water industry;
iv) Implementing a water-wise bio-based economy; and
v) Closing the water cycle gap.

Research, development and innovation needs have been developed for each theme. Envisaged interactions have been described, paying particular attention to areas of overlap with Horizon 2020 where efforts can be pooled, and to interactions with other JPIs and neighbouring initiatives, where joint activities could be planned. The document is completed with discussions on SRIA evaluation and monitoring, and on instruments and plans for agenda implementation.

1. Aim and Objectives of this Document

This document contains a preliminary Strategic Research and Innovation Agenda (SRIA) for the Joint Programming Initiative "Water Challenges for a Changing World" (from now on, the Water JPI). The grand vision of the Water JPI is "Achieving Sustainable Water Systems for a Sustainable Economy in Europe and Abroad". In order to tackle this ambitious challenge, the Water JPI is strengthening European leadership and competitiveness on water research and Innovation whilst safeguarding water resources. With this overall aim in mind, the main remit of this document is to outline the thematic research, development and innovation priorities of the JPI water.

According to the formal Water JPI strategic planning, the first milestone is version 1.0 of the Strategic Research and Innovation Agenda (SRIA 1.0). This document will be published in June 2014 (18 months after the kick-off of the WatEUr[1] project). However, the partners of the Water JPI have decided to release the present progress document (SRIA 0.5) as a way to:

- Guide the thematic development of Water JPI activities in 2013 and 2014. A Pilot call will be published in September 2013, and an additional set of Joint Activities are planned for publication in 2014;
- Inform relevant stakeholders of the progress made in the preparation of SRIA 1.0, releasing a structure based on themes and subthemes and supported by a number of consultations; and
- Progress in the partnership with Horizon 2020. SRIA 0.5 lays out the interests of the Water JPI, and details research and innovation themes targeting the Water Challenges expressed in the Water JPI vision document. Intense cooperation and coevolution are expected between the Water JPI and Horizon 2020.

The Water JPI has planned its SRIA to be neither the intersection of national (and regional where relevant) SRIAs, nor a brand new document resulting from a bottom-up approach. In fact, the Water JPI SRIA goes beyond these points: it is a collective, shared and forward-looking exercise identifying and prioritising directions for Research, Development and Innovation (RDI). As such, the Water JPI SRIA is being built upon the intersection of national strategies, collective discussions held within the Water JPI and outside, and feedback from internal and external consultations. SRIA 0.5 shows a relevant first step towards this ambitious design.

The emergence of JPIs responds to the need of tackling societal challenges and reducing the level of fragmentation that has traditionally characterised European research and innovation. The release of this document proves the capacity of Water JPI partners to reach consensus, prioritise and progress to fulfil their aims.

[1] WatEUr is an FP7 Coordination and Support action dedicated to energizing implementation of the Water JPI. It covers natural years 2013-2015.

1.1. Progress towards SRIA 0.5

The Vision Document

The development of a Strategic Research and Innovation Agenda for the Water JPI has already been a long process, and plans for future activities in this area have been laid out till the end of 2015. Agenda development started with the preparation of the Vision Document. The current version of this Vision Document, dated April 20 2011, was endorsed by the first meeting of the Governing Board (April 14, 2011). The vision is expressed in terms of Objectives and Research Questions. Objectives concern management activities, setting up aims for the status of the Initiative in 2020. Five research questions were formulated, addressing ecosystems, citizens, industry, the bio-economy and the water cycle gap, respectively. These questions derive from partners' contributions and from the analysis of National Agendas, and constitute the basis of SRIA 0.5.

Consultation with the Water JPI Advisory Boards

The establishment of the Water JPI Advisory Boards in October 2011 led to a first structured consultation with the Scientific and Technological Board (STB) and the Stakeholders Advisory Group (SAG). Fiches were used to express desiderata for research, development and innovation topics and for the instruments more adequate for their eventual implementation. More than fifty fiches were produced. The presidents of both Boards took the duty of summarizing the received input. The content of the fiches was discussed at the third meeting of the Water JPI Executive Board (March 2012). The second meeting of the Advisory Boards took place in February 2013. In them, the Boards were asked to analyse the niche of the Water JPI in the map of European research and innovation funding institutions. Additionally, input was received from the STB on thematic proposals regarding the Water JPI Pilot Call.

Pilot Call Questionnaire

In preparation of the Water JPI Pilot Call, two questionnaires have been distributed to JPI partners. The first questionnaire has allowed JPI partners to express their wish to participate in a pilot call covering the RDI themes identified in the vision document and to propose specific additional topics. The questionnaire also helped to progress in the definition of the five themes of the vision document of the Water JPI. The second questionnaire on pilot call modalities has allowed JPI partners to express their preferences for the technical implementation of the pilot call, including e.g. call text, funding commitments, evaluation and timetable.

The SRIAs of Other JPIs

In 2012 other JPIs started publishing their research and innovation agendas. At this time, four of them are available (JPND[2], FACCE[3], JPI Climate and JPI HDHL[4]). The specific nature of Joint Programming Initiatives within the arena of multinational research coordination efforts makes these four Agendas a major reference for the Water JPI SRIA.

[2] JPND: Joint Programme on Neurodegenerative Disease Research

[3] JPI FACCE: Joint Programming Initiative on Agriculture, Food Security and Climate Change

[4] JPI HDHL: Joint Programming Initiative on Healthy Diet for a Healthy Life

The methodology, prioritization and document structure of this document partly emerge from a critical review of the existing JPI agendas.

The Water JPI SRIA 0.5 implements all the input above to present a comprehensive collection of research, development and innovation lines structured along five thematic areas. The strategic aspect of this progress document has been strengthened through consultation with the Water JPI advisory boards. These boards have a wide representativeness of research, innovation, policy, managerial, institutional and societal water aspects in Europe. Further versions of this document (notably version 1.0) will benefit from a wider stakeholder basis.

The objectives of the Water JPI have been set for 2020, in coincidence with the planning term used by the European Commission and therefore by Horizon 2020. The thematic priorities described in this document are not timed for execution; they have been found adequate for this seven and a half year period, and their time prioritization will be decided in further SRIA versions.

1.2. From SRIA 0.5 to SRIA 1.0 and Beyond

In order to elaborate SRIA 1.0, the present SRIA 0.5 will undergo a severe review in the months to come. The following tasks have been planned:

- Framework and context analysis. This task requires critical review of RDI needs; exploratory foresight on trends and drivers; a critical review of available scientific/technological output in different thematic fields; a critical analysis of the boundaries with other JPIs sharing thematic interests; a critical review of existing capacities and current activities; and a critical review of agenda items derived from possibilities or needs for cooperation outside Europe. Cooperation with other JPIs will be sought if appropriate.
- Collection and processing of information about Water RDI context and trends. This task will undertake the collection of new, thematically relevant: Research and Innovation needs expressed in the Agendas of national programmes; foresight exercises; vision documents and SRIAs from RDI Institutions in Europe and beyond; and Water and RDI policy evolution in Europe and beyond.
- SRIA Consultation. The procedure will include yearly consultations with the Water JPI Advisory Boards (STB and SAG) gathering relevant agenda driving forces, information about relevant scientific/technological output, trends, ruptures, gaps, and priorities. External consultations (experts, stakeholders and society at large) will be performed through dedicated workshops (2014 and 2015) and the Water JPI website for both SRIA versions 1.0 and 2.0. During these workshops, analysis on the context and trends will be presented along with the SRIA document. Consultations will allow sharpening and focusing the research needs identified during the "framework and context analysis" activity.
- SRIA elaboration and drafting. This task comprises the writing and updating of the SRIA document, the timing of priorities (urgent, medium and long term) and the allocation of implementation instruments to the different priorities.

As previously discussed, SRIA 1.0 will be released by mid-2014. SRIA 2.0 will result from a second iteration of the steps above, and will be released by the end of 2015.

2. Water Challenges and Water JPI Commitments

The Water JPI Vision Document contains a detailed description of the economic, ecological, technological and societal challenges affecting the European water sector. Progress in the coordination of European Research and Innovation is required to tackle these challenges. The following statements summarize the challenges from a Research and Innovation perspective:

- More effort is required to accomplish the objectives of the Water Framework Directive by 2015. According to the Blueprint's preparatory report, almost half of Europe's freshwaters are at risk of not achieving good ecological status. Consequently, the provision of ecosystem services, the good ecological status of biodiversity and public health are in jeopardy.
- Europe needs to foster innovation in order to remain competitive. The 2012 European Innovation Scoreboard shows that almost all EU countries are improving their capacities. Nevertheless, in general, Europe still lags behinds the USA, Japan and South Korea, and Europe's innovation rate is similar to that of China, Brazil and India. Water competitiveness is higher than average in many criteria.
- Fragmentation of the research and innovation system impedes Europe from reaching its full RDI potential. "National and regional research funding has traditionally remained largely uncoordinated, leading to a dispersion of resources, excessive duplications, and more generally a poor use of the resources that we collectively devote to RDI in Europe" (ERA, 2007[5]). In the same vein, there is no full access to all the available research infrastructures, and researchers' mobility is still limited by legal and practical barriers.
- Member states cannot tackle certain societal challenges in isolation. These challenges are of a transnational nature and they can only be addressed through co-operative programmes.

The Water JPI emerges from the cooperation of the RDI programmes of 18 partner countries. According to the mapping concluded in April 2011, the European Member States and the Associated Countries run Water RDI programmes adding up to an annual investment of about 370 M€. Current Water JPI partners represent 88% of this funding (328 M€). One of the objectives of the Water JPI is to perform joint activities amounting to 20% of the annual investment by 2020. According to the mapping, this implies an annual budget of 74 M€, a relevant funding commitment. In addition to funding RDI activities, the Water JPI will contribute to the coordination of National and Regional RDI programmes. This task will further contribute to optimizing European resources, avoiding duplications and filling in knowledge gaps.

The European Commission performed its own Mapping in 2011, to find out that annual investments in all Framework Programme areas added up to 130 M€. This amount represents the average of FP6 and FP7 to that date. According to both mappings, the RDI investment of Regional, National and European Union administrations adds up to

[5] The European Research Area: New perspectives (Green Paper of the European Commission, 2007). Available at: http://eur-lex.europa.eu

500 M€/yr. The Water JPI is committed to maximizing the societal return of this sizable investment.

2.1. The Water JPI and Other Neighbouring European Initiatives

The Water JPI SRIA emerges in a quite dense landscape of European Research and Innovation funding initiatives in the field of Water.

The purpose of this section is twofold: 1) It looks at the role of the Water JPI within the current Research and Innovation context in Europe by taking into account the objectives of existing initiatives as well as their focus, their funding source and the use of their outputs; and, 2) it examines to what extent the Water JPI can co-operate with neighbouring initiatives. **Table 1** summarizes the purpose of neighbouring initiatives, along with their differences and complementarities with the Water JPI. This Table contributes to identifying a niche of opportunity for the Water JPI. The niche is characterized by the space where the Water JPI will best develop its activities and by the functional relations with the neighbouring initiatives.

Figure 1 presents some of the initiatives listed in Table 1, focusing on those directly related to RDI funding or stimulating innovation funding (this is the case of the EIP on Water). Initiatives are presented along the axes of research focus (research to Innovation) *vs.* the origin on funds (public to private).

The Water JPI covers the full range of Research, Development and Innovation, because the National Programmes composing it go from blue-sky research to industrial innovation support. The mapping analysis of these research programmes permitted to estimate a centre of gravity of the Water JPI, which could have about 75% research and 25% innovation. The full coverage of the Research – Innovation axis makes the Water JPI adaptive to changing societal needs and policy environments. In addition to being an RDI funder, the Water JPI is committed to coordinating European RDI programmes and to elaborating common agendas.

Horizon 2020 stands in a similar case as the Water JPI due to its proximity in focus. Both are interested in projects, mobility, infrastructure, sharing results (networking) and coordinating Research and Innovation activities in Europe. However, the current push towards innovation locates the centre of gravity of Horizon 2020 closer to the innovation pole. Horizon 2020 is a policy instrument for European growth, in which knowledge generation will concentrate at the curiosity-driven European Research Council (ERC). The Societal Challenges area of Horizon 2020 will emphasize the funding of innovation and policy support activities. Both the Water JPI and Horizon 2020 use public funds to perform their activities, and enjoy a significant area of thematic overlap. The Water JPI is a Public-Public Partnership (P2P), fostering cooperation between public ministries and agencies owning and managing RDI programmes.

The EIP on Water, the Climate-KIC and Acqueau map on the same coordinates, since these initiatives target innovation using a Private-Public Partnership (PPP) approach. The expected output of Acqueau and the Climate-KIC is to set up innovation projects whereas the EIP on Water aims to speed up water innovation in Europe by removing existing barriers. COST is located at the centre of coordinates: focus on research networking using public funding.

Table 1. *Main traits of the neighbouring initiatives of the Water JPI*

Initiative	What is it? What are its Aims?	Addressed Needs	Complementarity with the Water JPI	Differences with the Water JPI
Horizon 2020	Horizon 2020 is the main RDI funding programme in Europe, using a seven year programming period (2014-2020). It aims to build a European economy based on knowledge and innovation whilst contributing to sustainable development. It combines previous efforts: the Framework Programme + CIP + EIT.	To build a knowledge-based economy. To foster innovation. To tackle European societal challenges (both environmental and socioeconomic).	The Water JPI fits Horizon 2020 priorities. Horizon 2020 instruments may support the activities of the Water JPI. This SRIA may be a programming tool in the preparation of Horizon 2020's work programmes.	Horizon 2020 is a European programme, whilst the Water JPI is an intergovernmental initiative. Horizon 2020 has a closed budget, while the Water JPI creates budget for its activities using variable geometry.
Structural Funds	European policy for improving the economic well-being of regions. These funds aim at removing economic, social and territorial disparities across the EU whilst making the EU more competitive (great support to RDI activities).	To achieve a balanced economic development in the EU.	Structural Funds represent one of the funding instruments available for the partners of the Water JPI to support their activities.	In the same vein as with Horizon 2020, Structural Funds have their own budget for the full programming period.
COST	Intergovernmental organization supporting networking and mobility actions.	To unleash Europe's full research potential.	COST can support the kick-off of research activities.	Water JPI uses many instruments and coordinates Programmes.
ERA-NET	Instrument of FP6, FP7 and Horizon 2020 aimed at fostering the cooperation and coordination of research activities within a specific research domain. Network activities are carried out at the national (and, if applicable, regional) level (ERA-NET) or through the mutual opening of national and regional research programmes (ERA-NET+).	To effectively address fragmentation of the European RDI system.	Several ERA-NETs have been put in place within the water domain (e.g. IWRM-Net, CRUE or CIRCLE/ CIRCLE-2). A number of other ERA-NETs, only partially related to water, have launched water projects (e.g. BIODIVERSA). The experience and the output of these ERA-NETs are being used to produce the Water JPI SRIA.	The European Commission partially funds ERA-NET activities (top-up funding); JPIs are intergovernmental initiatives and as such, they fall under the full financial responsibility of partner countries.

Table 1 (continued). *Main traits of the neighbouring initiatives of the Water JPI*

Initiative	What is it? What are its Aims?	Addressed Needs	Complementarity with the Water JPI	Differences with the Water JPI
Article 185	European initiatives aimed at fostering cooperation and coordination within a specific domain, based on co-decision and on the existence of a previous formal funding commitment by partner countries. The "BONUS Baltic Sea research and development programme 2010-2016" is related to some of the areas of interest of the Water JPI, in particular those on catchment effects. An Article 185 for the Mediterranean is under preparation.	To effectively address fragmentation of the European RDI system.	This SRIA should be considered by Water JPI Partners and the Commission in preparation of future Article 185 initiatives (i.e. on the Mediterranean basin).	An Article 185 has its own funds to develop activities, obtained from partner countries and the European Commission.
EIP on Water	The EIP is based on private-public participation. It aims at stimulating creative and innovative solutions to tackle water challenges. It is based on bringing together actors from RDI, water users and water utilities. These actors are then invited to propose innovative projects, to coordinate existing funding instruments, and to facilitate the access of innovative products to the market.	To boost innovation in Europe.	The Water JPI can contribute to enriching discussions on the on-going activities of other initiatives (e.g. preparation of strategic agendas, project labelling) by providing scientific expertise from the Advisory Groups.	The Water JPI covers the whole RDI span, and devotes efforts to programme coordination.
Acqueau	Acqueau is the Eureka Cluster for Water. It labels innovation projects in Public-Private Partnership (PPP).	To boost innovation in Europe.	Acqueau acts as a facilitator to obtain national funds attributed under the EUREKA programme.	The Water JPI covers the whole RDI span, and devotes efforts to programme coordination.
European Institute of Technology	Established by the European Commission in 2008 to boost innovation. It implements of KICs (knowledge innovation communities), bringing together research, industry and education. There is no specific KIC on Water, though the Climate-KIC shows relevant interests on Water, namely with the land and water management and engineering for adaptation platform (LWEA).	To boost innovation in Europe.	KICs may involve RDI funding programmes.	The Water JPI covers the whole RDI span, and devotes efforts to programme coordination.

Figure 1. *Selected agents in European Water RDI funding by focus and origin of the funds. (box size represents the centre of gravity of the initiative, not its funding volume).*

Figure 2 separates the initiatives in the mapping space by introducing the funding target (public *vs.* private performers) in the ordinate axis. Horizon 2020 will increase funding to private performers as compared to FP7. The Water JPI will fund private performers, but in a lower fraction than Horizon 2020 is deemed to do. COST, largely targeting public performers, and the EIP on water, with a very strong interest towards private performers, are located on the extremes of the diagonal arrangement.

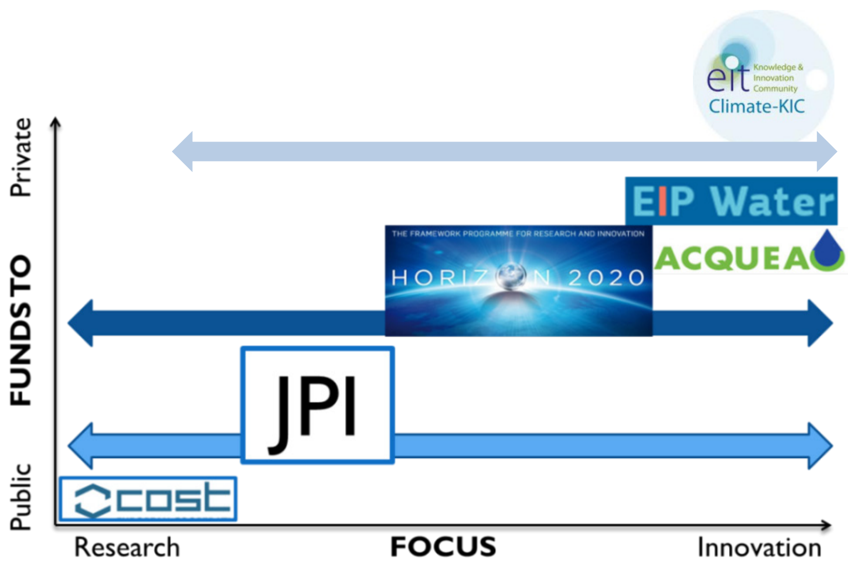

Figure 2. *Selected agents in European Water RDI by focus and destination of the funds. (box size represents the centre of gravity of the initiative, not its funding volume).*

The EIP on Water and Acqueau are not funding initiatives. The EIP on Water will mobilize public EC, National and Regional funds together with private funds. Acqueau labels projects for subsequent National funding. However, these initiatives are integrated in this figure for clarity.

The EIT Climate-KIC has created a "Land and Water management and Engineering for Adaptation platform" (LWEA). This European network of innovators is addressing the challenge of global climate change. The network is composed of companies, academic institutions and the public sector, with funding from the private and academic sector as well as from an EC grant through the EIT.

The European RDI landscape is completed by a number of other initiatives that have not been thoroughly described in this document as they do not directly fund or streamline RDI activities. Examples of these initiatives include:

- European Technology Platforms, whose primary objective is to ensure the growth and competitiveness of the European water sector by fostering collaboration between the industry, research and higher education centres, and water users.
    - The Water Supply and Sanitation Technology Platform (WssTP), whose thematic interests are in strong coincidence with those of the Water JPI.
    - The Platform for Sustainable Chemistry (SusChem).
- Networks of research organisations, contributing to the development of European science and technology (e.g. Euraqua).
- Associations of water professionals (e.g. Eureau, EWA).
- Policy-driven initiatives (e.g. CIS-SPI), aimed at supporting the implementation of European policies.

The Water JPI will build on the work carried out by these initiatives.

2.2. The Niche of the Water JPI

The previous discussion has permitted to identify the following niche for the Water JPI in the RDI funding arena:

- The transnational funding of Research-oriented activities, in cooperation with Horizon 2020 is an area of clear opportunity. The Water JPI will intensify challenge-driven research activities, whereas Horizon 2020 will respond to the need to address societal challenges focusing on innovation and policy support and to support frontier research through the European Research Council and the Future and Emerging Technologies (FET) instrument.
- Addressing water challenges of sub European dimension. Based on the principle of variable geometry, specific challenges concerning a limited number of Countries can be tackled through the JPI in a simple, effective way, as compared to Horizon 2020.
- The valorisation of research and development findings obtained at the Water JPI of at National Programme projects. Valorisation will happen through targeted, market-oriented innovation activities.
- The cooperation with instrument-oriented programmes and initiatives, such as COST or Acqueau, and the continuation of efforts in the cooperation with the EIP on Water.
- The continuous upgrade of the Water JPI SRIA, which is offered to stakeholders as a programming tool at the trans-national and European level.

- Cooperation outside Europe with a light management approach and making effective use of the variable geometry principle. Previous experiences with ERA-NETs have shown that National Programmes can use minimum administrative effort to involve Third Countries in Memoranda of Understanding related to Joint Calls. Coordination with the Strategic Forum for International S&T Cooperation (SFIC) will always be sought.

The Water JPI is expected to attain a relevant funding size in the coming years, boosted by cost effectiveness to partner countries and by the support from Horizon 2020 in areas of thematic overlap. In addition to RDI funding, the Water JPI has a specific area of activity: the coordination of national/regional agendas. This is a major challenge which should not be overshadowed by RDI funding activities.

2.3. Thematic Interaction: Horizon 2020 and the Other JPIs

As previously discussed, Horizon 2020 and the different JPIs have relevant areas of overlap. Cooperation between Horizon 2020 and the different JPIs requires overlap in order to pool resources in areas of common interests. On the other hand, the bottom-up approach used to generate the ten on-going JPIs has produced significant areas of thematic interaction between them. This section explores overlaps and areas of interaction, focusing on the expected cooperation activities.

The three pillars of Horizon 2020 show areas of overlap with the Water JPI. The first pillar, Excellent Science, includes the European Research Council, the Marie Skłodowska-Curie mobility programme and support to research Infrastructures. The mapping performed by the European Commission (partially covering FP6 and FP7) revealed that these three programmes represented 5,8 and 5% of the EC investments on Water RDI, respectively. The second pillar, Industrial Leadership includes programmes such as Information and Communication Technologies, Space and support to Small and Medium Enterprises. These programmes represented 7, 9 and 9% of the EC investments on Water RDI, respectively. The relevance of investments in these two pillars anticipates relevant interaction with the Water JPI. However, the third pillar of Horizon 2020, Societal Challenges, is where the strongest interactions are expected. In fact, in the mapping performed by the EC, challenges 2 (dealing with the bio-economy), 3 (dealing with energy) and 5 (dealing with climate, resource efficiency and raw materials) represented 4, 6 and 39% of the investments on Water RDI, respectively. Challenge 5 is therefore the natural Horizon 2020 hub for the Water JPI. However, interaction is also expected with additional challenges.

Table 2 presents the envisaged interaction between Water JPI themes and the different areas of Horizon 2020. This Table concerns the societal challenges of Horizon 2020, since interaction with the other Horizon 2020 pillars is expected in all Water JPI themes. Interaction with Challenge 5 has been detailed according to its six broad activity lines:

- Fighting and adapting to climate change;
- Sustainably managing natural resources and ecosystems;
- Enabling the transition towards a green economy through eco-innovation;

- Developing comprehensive and sustained global environmental observation and information systems;
- Sustainable supply and use of Raw materials; and
- Cultural Heritage.

Table 2. *Research themes of the Water JPI and their main relations to Horizon 2020 societal challenges.*

Water JPI Theme	Horizon 2020 Challenge: Climate Change, resource efficiency and raw materials						Additional Challenges
	Climate Change	Resources Ecosystems	Eco-Innovation	Observ. & Info.	Raw materials	Cultural heritage	
Ecosystem Sustain.	X	X	X	X	X	X	
Safe for Citizens	X		X				3, Energy
Competit. Industry	X		X		X		3, Energy
Bio-based Economy	X	X	X		X		2, Bio-Economy
Closing Water Gap	X	X	X	X			

With a view to effectively tackling societal challenges and better pooling national RDI resources, the Water JPI will seek cooperation with additional JPIs where thematic overlaps may exist or for which the output of Water JPI activities may relevant. **Table 3** shows the relation between the Water JPI and six other such initiatives (FACCE, Cultural Heritage, Urban Europe, Climate Change, Microbial Challenge, Oceans).

Table 3. *Research themes of the Water JPI and their relation to other JPIs.*

Water JPI Theme	FACCE JPI	Cultural Heritage	Urban Europe	Climate Change	Microbial Challenge	Oceans JPI
Ecosystem Sustain.	X	X		X		X
Safe for Citizens			X	X	X	
Competit. Industry				X		
Bio-based Economy	X			X		
Closing Water Gap				X		X

Cooperation with other JPIs can be cross-cutting, such as with Climate Change, or punctual, such as in the rest of the JPIs. The coordination of activities with these JPIs may take the form of joint calls. Conversations are on-going to progress towards effective coordination.

3. Research and Innovation Challenges

The physical domain of the Water JPI is coincident with that of the Water Framework Directive[6]: "inland surface waters, transitional waters, coastal waters and groundwater".

Five RDI themes are described below, following the definition presented in the vision document of the Water JPI:

i) Maintaining Ecosystem Sustainability;
ii) Developing safe water systems for the citizens;
iii) Promoting competitiveness in the water industry;
iv) Implementing a water-wise bio-based economy; and
v) Closing the water cycle gap.

Each theme represents a specific aspect of the grand challenge for which multi and interdisciplinary research is required. Themes are therefore challenge-driven. Descriptions present the transition from a challenge-driven theme to specific RDI disciplines, methodologies and tools. Themes are divided into sub-themes. For each of them, specific, non-prioritized RDI needs have been identified, and are presented in a Table format. Finally, for each theme, the expected social, economic, technology, environment and policy impacts are presented.

3.1. Maintaining Ecosystem Sustainability

Water demand, mismanagement and climate change inducing short- to long-term variations in water availability (including extreme events) have increased the stress on water bodies and associated ecosystems. Europe faces a water landscape often characterized by water scarcity in certain regions and flooding in others, overexploitation of water for agriculture, forestry or aquaculture, pollution, sea water intrusion, severe hydromorphological changes, and intense structural works on rivers and lakes. In this context, there is a need for integrated and interdisciplinary research and development aimed at understanding and maintaining the essential functions and processes of ecosystems (i.e. "ecosystem sustainability") to enhance their resilience to stress due to human activities.

3.1.1. Integrated Approaches: Developing and Applying Ecological Engineering and Ecohydrology

Ecological Engineering has been defined as the application of engineering and life-science principles to the design of sustainable ecosystems integrating human society with its natural environment for the benefit of both (Mitsch and JØrgensen, 2004[7]). The goals of Ecological Engineering are: to design and create new sustainable ecosystems; to restore

[6] Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy.

[7] William J. Mitsch; Sven E. Jørgensen (2003). Ecological Engineering: A field whose time has come. Ecological Engineering Journal 20, 363–377.

ecosystems that have been substantially disturbed by human activities (e.g. urban development, agriculture, forestry, or aquaculture); and to enhance ecosystem resilience to stress with regards to human pressures. By way of example, Ecological Engineering approaches are used to retain, or even to degrade certain pollutants and to reuse them as raw materials for fertilizers and industrial by-products. Potential applications of Ecological Engineering in rural landscapes may include wetland treatment, as well as hydromorphological restoration or sediment management. At the urban level, potential applications of Ecological Engineering could be found by combining the expertise of landscape architecture, urban planning and urban storm water management. Ecological Engineering deals with both fundamental ecological processes and engineering applications on scales ranging from microscopic to watersheds and beyond.

In turn, Ecohydrology is an application-driven discipline aiming at a better understanding of the relationships between hydrological processes and biotic dynamics (Hannah et al., 2004[8]). Within the field of water resources management, Ecohydrology assesses ecosystem responses to natural and anthropogenic induced water stress.

⇨ ***Currently Identified Needs***

Title of the Needs	Objective	Focus and Instrument
Pressure-impact relationships in aquatic and riparian ecosystems	• Better understanding of the effects of hydromorphological pressures (damming, embankment, channelization, non-natural water level fluctuations) on the structure and functioning of aquatic and riparian ecosystems. • Quantification of the effects of chemical sediment pollution on biological communities. • Identification of cost-effective measures to restore or design sustainable ecosystems.	Focus: Research Instrument: Projects Opportunity: Networking with Danube Knowledge Cluster
Hydromorphology: Restoring continuity, sediment transport and fish migration within river systems	• Thorough understanding of the processes and dynamics of sediment transport, hydraulic connectivity, flow regimes and fish migration within river systems.	Focus: Research, Development Instrument: Projects, Demonstration
Measures to achieve Water Framework Directive (WFD) objectives in Heavily Modified Water Bodies	• Better understanding of the techniques and approaches which can be efficiently used to restore Heavily Modified Water Bodies, defined as water bodies subjected to several concurrent pressure factors.	Focus: Research Instrument: Projects

[8] David M. Hannah, Paul J. Wood and Jonathan P. Sadler (2004). Ecohydrology and hydroecology: A new paradigm? Hydrological Processes 18, 3439–3445.

Terrestrial and aquatic interface and catchment management	• Study the linkage between the terrestrial parts of a catchment and the aquatic ecosystem, including wetlands and peat lands. • Analyse the linkage between upstream and downstream areas, the role and functional importance of floodplain/lateral connectivity and channel dynamics and, the interaction between groundwater and the hyporheic zone.	Focus: Research Instrument: Projects

3.1.2. Managing the Effects of Hydro-climatic Extremes on Ecosystems

Integrated systems for collecting, analysing, interpreting, and communicating data can be used to make decisions early enough to protect public health and the environment from the effects of weather extreme events, and to minimize unnecessary concerns and inconveniences to the population. The primary objectives of forecasting tools (including early-warning systems, EWS) are to improve prediction of catastrophic events (floods, droughts) and to minimize the impacts on human lives, natural ecosystems, cultural heritage and food cycles.

⇨ ***Currently Identified Needs***

Title of the Needs	Objective	Focus and Instrument
Monitoring of drought events and water scarcity	• Diagnosing the causes for water scarcity in Europe and evaluating the incidence of drought events under potential climate change scenarios. • Determining short-term drought predictions and climate change scenarios. • Development of management strategies focusing on cost-benefit analysis of agricultural evapotranspiration *vs.* water conservation for alternative hydrological uses.	Focus: Research, Innovation Instrument: Projects Networking, Infrastructure
Innovation barriers on early warning systems	• Development of innovative tools (such as EWS) for extreme events prevention and protection, including sensor technology and monitoring networks. • Improvement of EWS for the forecasting of flooding and assessment of risks.	Focus: Innovation Instrument: Networking, infrastructure
Improved water management (weather extreme events, impaired water quality)	• Setting a diagnosis of situations of droughts, floods and impaired water quality as a result of climate change. Development of a people-centred monitoring and EWS that includes both expert and local knowledge. Relevant questions include: Is local knowledge concerning hazards and impacts reliable enough? What are the main limitations of local knowledge regarding natural phenomena? How to overcome these limitations? How to better integrate local and scientific knowledge? How to deal with the different time and spatial scales?	Focus: Research Instrument: Projects Mobility, Networking

3.1.3. Developing Ecosystem Services Approaches

Ecosystem Services (ESS) are defined as the benefits people obtain from nature (MEA, 2005[9]). ESS fall into the following categories: i) provisioning services, i.e., material outputs from ecosystems such as food, fresh water, raw materials and medicinal resources; ii) regulating services, i.e. the services that ecosystems provide by acting as regulators of climate, pollution, pollination, soil stability, etc.; iii) cultural services, the non-material benefits obtained from ecosystems such as recreation and mental and physical health, tourism, aesthetic appreciation and inspiration for culture, art and design, spiritual experience and sense of peace; and iv) supporting services, which underpin almost all other services and include habitat for species and maintenance of genetic diversity (CIS SPI report, 2011[10]). At the policy level, ESS are in essence an economic valuation tool to protect biodiversity and on which to base decisions. Thus, for instance, the cutting of a forest for urban sprawling leads to substantial gains for construction companies but the costs of this land conversion are subsequently paid by society at large as a result of biodiversity loss and dwindling levels of carbon storage. Another example is the restoration of floodplains and wetlands. Restoring former floodplains and wetlands may entail considerable costs. However, increasing retention measures help reduce flood risk, reduce pollution, improve the ecological and quantitative status of freshwater, and decrease the risk of water scarcity. Monetary valuation methodologies permit integrating the value of these non-marketable issues into the decision-making process. For a sound water management plan to be set up, this monetary valuation should be completed by a social valuation of ecosystems as some social values are enhanced by perception, history and traditional practice in the use of water and by the environmental, political and institutional context in which water regulation takes place. Research and development are required to refine the methodology through case study analyses, and to establish firm links with general water policies. Overall, a better understanding and assessment of ecosystem services relies on research on the ecological functioning of aquatic and riparian ecosystems.

In the last few years ESS has appeared as a promising concept to support the implementation of the Water Framework Directive (WFD). Thus, and as concluded during the 2nd "Water Science Meets Policy" event organised in Brussels by the initiative CIS-SPI, the ESS approach is expected to provide responses on the economic requirements of the WFD, in particular those concerning derogations based on disproportionate costs, cost recovery and incentive pricing. In the same vein, the ESS approach could support the implementation of the "Water Scarcity and Droughts" Communication of the European Commission based, amongst other principles, upon water pricing and water-efficient technologies and practices.

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[9] The Millennium Ecosystem Assessment Synthesis Report (2005). Available at: http://cce.lternet.edu

[10] Catherine Wallis, Nirmala Séon-Nassin, Frédérique Martini, Michel Schouppe (2011). Implementation of the Water Framework Directive. When ecosystem services come into play. 2nd "Water Science meets Policy" event; Brussels (29-30 September 2011). Available at: http://www.onema.fr

⇨ ***Currently Identified Needs***

Title of the Needs	Objective	Focus and Instrument
Methodologies for valuation of ecosystems services	• Development of new methodologies for assessing the economic value of water ESS	Focus: Research, Development Instrument: Projects
Barriers towards integration of ecosystem services into water resources management	• Overcoming fragmentation of responsibilities and knowledge between disciplines. • Better alignment of monitoring and reporting frameworks with ecosystem approaches. • Assessment of environmental, economic and social values. • Developing innovative management schemes, including green infrastructures, addressing water related ecosystem services. • Adopting an ESS approach to the role of agriculture, forestry and aquaculture to allow for careful planning in the use of water resources whilst addressing the needs of local users. A comprehensive monetary and social evaluation of all secondary services provided by all agents will be required.	Focus: Research Instrument: Projects
Ecosystem services and the ecological functioning of ecosystems	• Obtaining a better understanding and quantification of the ecological functioning of ecosystems as the ESS approach does not directly assess ecosystem integrity. • Development of the next generation of indicators of good functioning of aquatic and riparian ecosystems in the Water Framework Directive. • Development of new bio-assessment tools and validation methodologies. • Evolving toward a more functional and holistic approach of aquatic and riparian ecosystems.	Focus: Research Instrument: Projects

⇨ ***Expected Theme Impacts***

Impact	Description
Social	Contribute to safeguarding natural resources for future generations. Aquatic and riparian ecosystem sustainability research will contribute to identifying, proposing and prioritising measures to help societies adapt and react to current and future pressures. Better protection of public health and the environment from effects of weather extreme events.
Economic	Address market failures (integration of externalities in policy making), considering that preservation costs are lower than restoration costs. Monetary and non-monetary valuation methods will contribute to better decision and policy making process as well as economic impacts.
Technological	Increased availability of data and decision-making products for weather extreme events. Develop new tools in ecological engineering and early warning systems, including sensors, web services, numerical codes, ecological restoration technology.
Environmental	Better assessment and evaluation of ecosystem service approaches; Better understanding of hydromorphological processes; Achieving sustainable resource use; Improved water management and availability of good water quality in case of weather extreme events.

Policy	Research on ecosystem sustainability will support a relatively wide range of National European and International policy initiatives including EU biodiversity strategy particularly target 2: "By 2020, ecosystems and their services are maintained and enhanced by establishing green infrastructure and restoring at least 15% of degraded ecosystems". Set up to monitor and predict adverse effects, EWS gives reasonable time to allow policy makers to take appropriate measures.

3.2. Developing Safe Water Systems for the Citizens

Water quality and societal wellbeing are currently threatened by emerging pollutants and pathogens (including antibiotic resistant bacteria and viruses). Key knowledge gaps remain concerning their environmental behaviour (in surface water, in groundwater). Assessing the impact of emerging pollutants on human health and citizens' quality of life through the reuse of urban effluents in irrigation, water supply and water storage in rural and urban environments needs substantial research efforts. On the other hand, scientific and technological attention needs to be paid to innovative practices for minimizing risks associated with water distribution and storage facilities and with natural hazards. Water distribution and storage facilities are for the most part aged, and their performance is often far from optimum. Associated risks fluctuate between life threatening accidents to low reliability of the conveyance networks. Low conveyance performance is commonly associated to energy inefficiency, an issue which severely affects the sustainability of water services to citizens. In addition to promoting societal health, this JPI aims at protecting citizens from the effects of natural hazards. For instance, urban floods have often shown devastating effects to human life and property in Europe and beyond. Climate change may locally increase the frequency and intensity of floods and droughts. Protecting citizens will require increased RDI efforts in disciplines such as water resources, hydrodynamics, ICT, social sciences and geography. Participatory research approaches will be required to manage these risks.

3.2.1. Emerging Pollutants: Assessing their Effects on Nature and Humans, their Behaviour and Treatment Opportunities

In recent years, concern has been raised with respect to the presence of some emerging pollutants in treated municipal drinking water. Since removal rates with conventional wastewater treatment processes are low for several emerging contaminants, discharge of wastewater effluents into receiving waters is a major environmental and health concern. Even though emerging pollutants have been detected mainly in surface waters and wastewater, concern about their presence in groundwater bodies has also been reported. Future research on emerging pollutants in water for urban or agricultural purposes should deepen our understanding on the following issues: What are the new contaminants, such as polar compounds, pharmaceuticals, personal care products, perfluorinated and organosilicon compounds, endocrine disruptors, or emerging pathogens (including antibiotic resistant bacteria and viruses), cyanotoxins and nanomaterials? How can we predict their environmental behaviour in surface water, sediments, soil and groundwater? Which innovative rapid analysis and detection systems could be developed? What impact do emerging pollutants have on human health (toxicology) and on ecosystems (ecotoxicology)? How can we prevent the emergence of these pollutants and the risks thereof? To what extent are these contaminants removed, or modified, by natural processes in water and soil, or by the techniques used in water treatment or reuse? What types of technologies (including post treatments) should be applied for a more efficient removal of these compounds? Should these compounds be removed in decentralised units before entering in sewers? Which health risks could result from new water management practices, such as water reuse in urban areas? How do we identify and manage the 'next generation' of emerging pollutants?

⇨ ***Currently Identified Needs***

Title of the Needs	Objective	Focus and Instrument
Development of analytical techniques for groups of substances	• Improving methodologies for the detection, quantification and monitoring of emerging substances, their metabolites and degradation products in different compartments of the environment. • Development of new approaches to analyse the combined effects of chemicals (i.e., chemical mixtures), integrative bio-assessment tools and new biomarkers and bioassays.	Focus: Research, Development, Innovation Instrument: Projects
Emerging pollutants and pathogens, including their environmental effects	• Understanding and prediction of environmental behaviour of emerging pollutants in surface water, sediments, soil and groundwater. • Assessing the transfer time of the different pollutants as well as understanding the processes suffered during transfer. • Antibiotic Resistance in aquatic Environments: Develop comparable and validated data sets on the prevalence and spread of major bacteria in the aquatic environment with clinically and epidemiologically relevant antimicrobial resistances in Europe. • Development of an integrated risk assessment for antibiotics and other emerging pollutants acting at sub-lethal levels. • Modelling transport, growth and degradation of emerging pollutants and pathogens. • Evaluation and implementation of management measures and technologies to reduce the impact of emerging pollutants and pathogens on water quality, especially under the aspect of water reuse. • To what extent are emerging pollutants removed, or modified by water treatment plants or by natural processes in water and soil? Technologies are required for more efficient and economic removal, including the concept of decentralised treatment and post treatment.	Focus: Research, Development, Innovation Instrument: Projects

3.2.2. Minimizing Risks Associated with Water Infrastructures and Natural Hazards

Current global changes (such as climate change and urban sprawling) demand innovative practices minimizing risks associated with: i) water distribution and storage facilities in urban areas; and ii) natural hazards (floods and associated risks for citizens' life and assets).

Protecting the capacity of urban water networks to deliver water to citizens with target quality standards is a major goal for both European and non-European countries. Urban water networks concentrate large public investments, guarantee the right to water access and represent a very important niche for multinational European companies of all sizes. Research can protect citizens, investments and businesses by supporting innovative management and decision making. Urban water natural hazards can be exemplified by urban floods. Their devastating power will be limited through multidisciplinary research exploring the areas of risk prevention and management. A variety of scientific and technological areas will be explored to put research results at the service of citizens' life and assets. The two aspects of this subtheme (infrastructure and natural hazards) may be combined in specific topics. For instance, improving the performance of storm water retention ponds, including the management of contaminants, and managing overflows in advanced wastewater treatment facilities when affected by floods.

⇨ *Currently Identified Needs*

Title of the Needs	Objective	Focus and Instrument
Exploiting ageing urban water systems for dependable and cost-effective service	• Development of methodologies and technologies for the effective monitoring and control of urban water networks. • Enhancement of the resilience of urban water systems (i.e. pipeline networks, drinking water reservoirs, pumping stations and large water treatment plants). • Improvement of the efficient use of state-of-the-art monitoring and control systems. • Developing decision support systems for long-term rehabilitation decisions based on the time evolution of system conditions. • Improvement of data management routines.	Focus: Research, Development Instrument: Projects, Infrastructure
Towards urban flood proof cities	• Development and set-up of technological and managerial solutions to urban floods. • Production of integrated systems for the prediction and risk management of urban floods (urban hydrology, hydrodynamics, Internet of things, drainage design, social sciences and climate change analysis). • A smart city approach development to integrate sensors and public information services designed for all event phases.	Focus: Research, Development, Innovation Instrument: Projects, Networking

⇨ *Expected Theme Impacts*

Impact	Description
Social	This theme directly faces the social water challenges, as it addresses the protection of human life, health and assets. The international profile of the topic does contribute to alleviating water challenges inside and outside Europe, when the majority of global population is more and more living in urban areas.

Economic	As an indicator of the relevance of managing urban water systems, the World Business Council for Sustainable Development estimated that OECD nations need to invest at least 200 billion $ per year to replace aging water infrastructure to guarantee supply, reduce leakage rates and protect water quality. Regarding natural hazards, suffice to mention recurrent losses even in developed countries.
Technological	This theme needs technological innovation in terms of chemical/physical and biological tools and early warning systems to detect and prevent natural, chemical and biological risks and to enhance the resilience of urban water systems.
Environmental	Emerging pollutants and accidents related to urban water infrastructure status or management result in relevant environmental concerns. Urban floods have similar effects, as in storm water retention ponds or water treatment plants. Reduce the impact of emerging pollutants on water bodies.
Policy	Understanding the fate and behaviour of emerging pollutants in water bodies, and improving urban network performance and resilience to floods will support the implementation and refinement of specific policies. While a corpus of European policies gravitate around this theme, it is important to recall the numerous national and local policies both in Europe and in other countries targeted for the deployment of these technologies (WFD, Blueprint, Directive 2007/60/EC on the assessment and management of flood risks and national policies).

3.3. Promoting Competitiveness in the Water Industry

Innovative technologies are required by the water industry to develop products and services fuelling the European economy. The world water market has an estimated size of 234.000 M €, and Europe is currently leading it with a combination of large multinational companies and technology-rich SMEs. According to the Strategic Research Agenda of the Water Supply and Sanitation Technology Platform (WssTP), the European water sector has an annual turnover of 72,000 M €, sustains 600,000 jobs, manages a network of 5.7 M km, and operates 70,000 wastewater plants.

The Water JPI is committed to prioritise and fund problem-solving research leading to the development of market-oriented solutions. Cooperation with stakeholders will be sought at all levels to ensure that research results are swiftly transformed into business opportunities. Innovation will be particularly promoted in this theme, taking advantage of the capacities and know-how of the specialized Innovation agencies partnering in the Water JPI. Promoting competitiveness in the water industry will require technologies for water storage, distribution, measurement, purification, treatment, desalination and irrigation. Activities will focus on aspects such as new materials and processes, management tools, ICT and energy efficiency.

3.3.1. Developing Market-Oriented Solutions for the Water Industry

This subtheme focuses on the development of robust, smart and cost-effective technological solutions in each of the areas described below:

- Water distribution and measurement. The analysis of water conveyance networks around the world evidences large differences in leakage rates. As a consequence, there is room for improvement in network performance in Europe and worldwide. Technological solutions include the monitoring of water losses, flow meters adapted to different accuracy requirements and water quality standards, and the promotion of performance quality in water supply networks. Telemetry and remote control are commonly used in this type of applications, but standardization and interoperability remain a pending issue.

- Overall solutions for water treatment and reuse. Wastewater treatment and reuse is a key research topic in response to the challenge of an increasing demand resulting from population growth, agricultural and forest production, and climate change. Water scarcity and the need to protect natural resources are the main drivers for the development of innovative water treatment and reuse technologies in water scarce areas. Potential applications of reclaimed water include agricultural and landscape irrigation, groundwater recharge, industry and in specific cases, potable use.
- Technological developments in water reuse face a number of constraints: financial, human health, environmental safety standards and regulations, monitoring and evaluation, energy consumption, and public acceptance and awareness. Case studies from different European areas and involving different types of reuse water producers and receivers are needed to complete the understanding of the involved processes. Solutions identified in these case studies should be tested for transferability to other sectors and areas of Europe and the world.
- Water desalination. In areas with high water demand for residential use, tourism or agriculture, desalination can contribute to the solution of water scarcity. Desalination is challenged by installation and energy costs, and by environmental issues such as brine management. Local water stakeholders often experience both the problem-solving capacity of this technology and the relevance of the related challenges. The thermodynamic energy requirement to separate water and salt implies that – despite technological progress – desalination will always be an energy-intensive technology. The Water JPI will address desalination challenges by combining renewable energies with desalination plants and reducing the environmental impact of brines.
- Valorisation of wastewater sewage/sludge and desalination brine. Shifting from the conventional view of waste to a resource that can be processed for the recovery of energy (converting organic matter into biogas using sludge digestion) and raw materials brings many opportunities to the water sector. A number of technical, economic and management approaches are available for recovering nutrients from wastewater streams. An example of such approaches is the recovery of phosphorus to produce fertilizers. Additionally, the production and recovery of chemicals such as cellulose, phosphate, polyhydroxyalkanoate (bioplastic) and alginates has become technologically and economically feasible. The recovery of all these chemicals permits to substitute mining or industrial products. Exploring these opportunities will increase market opportunities and in the end reduce the citizen's cost of water treatment.

⇨ ***Currently Identified Needs***

Title of the Needs	Objective	Focus and Instrument
Smart water technologies (sensor networks and real-time Information systems in the water cycle)	• Development of innovative, affordable (micro and nano) sensors and detection systems, remote control systems, data networks and decision support systems to monitor and control the water cycle. Standardization and interoperability will support competitiveness and defend consumers' interests.	Focus: Development, Innovation Instrument: Projects
Technological solutions for water and waste water treatment	• Development of innovative membrane systems for water treatment and assessment. • Development of innovative advanced processes for water treatment and assessment. • Assessing the robustness of biological water treatment processes and boosting progress in the conversion from conventional water treatment plants to biological water treatment plants. • Better understanding of how natural organic matter behaves during advanced treatment. • Life cycle analysis of treatment technologies and strategies treatment process intensification (improving water systems efficiency by decreasing the amount of inputs required by water technologies, efficiency of the whole plant with low energy consumption, smaller footprints). • Holistic modelling and simulation approaches for optimising the water and wastewater treatment systems.	Focus: Development, Innovation Instrument: Projects
Exploring the energy-water nexus	• Progress in the understanding of the water-energy nexus. • Assessing energy use in the whole water cycle in different environments. • Joint planning of water and energy. • Reducing energy consumption and recovering energy from water with a watershed perspective. • Maximize renewable energy use and production from wastewater processes.	Focus: Research, Development, Innovation Instrument: Projects
Biological processes for water treatment	• Development of opportunities analysis of hybrid systems (combine redox conditions, attached and suspended biomass…) combining several degradation/removal mechanisms in different compartments. • Conception and validation of new processes resulting in an enhanced efficiency of the whole plant. • Plant-wide modelling, optimisation and control of new water treatment systems.	Focus: Research, Development, Innovation Instrument: Projects

Water reuse and recycling technologies and concepts	• Development of technologies and demonstrators concerning the reuse of wastewater for agricultural purposes and for water management purposes (i.e., artificial aquifer recharge). Separation and extraction technologies in water-using industries. • Resource recovery (phosphate, brine). • Development and assessment of decentralised treatment systems allowing reuse of grey water and energy recovery from black water.	Focus: Research, Development, Instrument: Projects
Water and energy from ground	• Prediction and prevention of environmental impacts from gas shale exploitation. • Development of treatment processes for water used for shale gas extraction.	Focus: Research, Development, Instrument: Projects, Demonstration
Products recovery from treatment plants	• Conception of treatment plants as producers of valuable resources (nutrients, sludge, bioenergy…) through sustainable processes. • Development of holistic control approaches aiming at optimising water quality, energy and resources recovery.	Focus: Research, Development Instrument: Projects

3.3.2. Enhancing the Regulatory Framework

Economic instruments can play an important role in assessing the economic value of water resources, in evaluating the efficiency of protection measures, in quantifying their impact on users, in developing new concepts on water management (cap and trade, quotas), and in enhancing the use of new technological solutions. Innovative governance frameworks aimed at protecting the economic value of European industries as well as to better anticipating regulation adaptation needs are key to removing barriers to innovation.

⇨ ***Currently Identified Needs***

Title of the Needs	Objective	Focus and Instrument
Removing barriers to Innovation	• Exploration of regulatory, governance and management conditions which contribute to removing barriers to innovation. • Removing bottlenecks such as limited institutional capacity to formulate and institutionalize recycling and reuse measures, inadequate policies or lack of financial incentives. • Implementation of effective policy and management frameworks that pave the way to the market uptake of innovative technologies. • Management models for new technological solutions to support sustainable operation, maintenance and market uptake.	Focus: Innovation Instrument: Networking, Projects
Overcoming barriers preventing water reuse in irrigated agriculture and forestry	• Development of harmonised and established standards for water reuse in irrigation throughout Europe. • Research on social perceptions, costs, water quality, technical and safety bottlenecks.	Focus: Research Instrument: Projects

⇨ ***Expected Theme Impact***

Impact	Description
Social	Smart water technologies will contribute to societal wellbeing through better human health as a result of better water quality. More water resources will be available for societal uses, particularly in low water quality, water scarce and drought vulnerable areas. Social acceptance of reused waste will significantly improve.
Economic	Bring major business opportunities inside and outside Europe, setting the ground for sustained economic growth and industrial leadership. RDI activities will contribute to sustaining the competitive advantage of Europe, reducing innovation time to market. Water-energy nexus will be entirely understood and energy costs saved.
Technological	More reused waste water will be applied to agricultural and industrial uses; ground water storage will increase. The current European leadership in water treatment for urban and industrial purposes will be supported.
Environmental	Water technology will contribute to improving the status of water bodies in quantitative and qualitative terms. Natural resources will be used in a more efficient way.
Policy	A number of European and National policies will be streamlined to support market uptake of water Innovations. Water policies (WFD) will be indirectly supported by RDI activities on this theme.

3.4. Implementing a Water-Wise Bio-Based Economy

Máire Geoghegan-Quinn, the European Commissioner for Research, Innovation and Science, defined Bioeconomy as "the use of renewable resources from land and sea, and the use of waste to make value added products, such as food, feed, bio-based products and bioenergy". One of the most likely effects of a bio-based economy is the intensification of agriculture, forestry and aquaculture, resulting from the development of non-food products (biomass, bio fuel, timber…). Further intensification will pose a number of challenges for Europe, such as increased pressure on natural and artificial resources (water, land, and agrochemicals), and the need for more efficient agroforestry systems. On the other hand, non-food activities can play a relevant role in water reuse and recycling. Since the bio-based economy has not yet been fully deployed, joint RDI activities will arrive on time to streamline its water profile in quantitative and qualitative terms. Understanding the effects of the bio-based economy on European ecosystems and on water delivery systems will require intense cooperative research. This theme is characterized by strong interactions between hydrology, agronomy, forestry science and plant breeding. Experimental, modelling and social sciences approaches need to be combined to ensure that the right combination of technologies and policies is deployed in the agricultural sector to reach the target of sustainable intensification. In the Water JPI, agricultural water use is analysed from the point of view of natural resources, not as a production factor.

3.4.1. Improving Water Use Efficiency for a Sustainable Bio-economy Sector

Resource efficiency represents one of the main challenges of our society. A resource efficient economy aims at the sustainable use of natural resources with a view to meeting the needs of a growing population within the ecological limits of a finite planet, whilst minimising impacts on the environment. The purpose of resource efficiency is to create more with less and to deliver greater value with less input. Resource efficiency approaches applied to water are particularly needed within the European agricultural and forestry sectors, currently challenged by the development of the bio-based economy. These sectors account for the majority of global freshwater withdrawals, and are responsible for the vast majority of societal consumptive water use in Europe. This is particularly important since the most relevant competitor in terms of consumptive water use is the environment. Even small improvements in water productivity can result in substantial water savings. Resource efficiency is required in both rainfed and irrigated systems, since evapotranspiration is the largest consumptive water sink throughout Europe. At the policy level, resource efficiency constitutes one of the flagship initiatives of the Europe 2020 Strategy, the EU's growth strategy for a smart, inclusive and sustainable economy. Research is needed in a variety of disciplines. Crop agronomy and forestry science will support the assessment and minimization of water use. Plant breeding will produce varieties more adapted to the local water conditions and resulting in higher water use efficiency. Irrigation science and technology needs to be developed to optimize water application practices with state-of-the art conveyance and on-farm equipment.

⇨ ***Currently Identified Needs***

Title of the Needs	Objective	Focus and Instrument
Efficient irrigation systems and practices for the European and overseas markets	• Development of innovative and efficient irrigation systems and practices combining crop water requirements, crop physiology, irrigation science, sensors, ICT, and expert systems and test and evaluation of them. Resource efficiency will be extended to the use of energy and agrochemicals (i.e., fertigation). Systems will be developed for different development environments to ease access to a variety of markets.	Focus: Research, Development and Innovation Instrument: Projects
Supporting research on water conserving farming and forestry practices and varieties	• Identification of more water efficient and/or salinity tolerant crops and forestry species. Design of water efficient farming/forestry techniques in order to support water conservation and water use efficiency. Ex-ante and ex-post economic assessment methodology of farmers' benefit of water efficient farming techniques.	Focus: Research and Development Instrument: Projects
Developing water pricing schemes for agriculture and forestry	• Investigation of criteria adopted in European states concerning water pricing in agriculture and forestry. • Development of appropriate tools and guidelines for estimating the associated environmental resource costs.	Focus: Research and Development Instrument: Projects
Crop water requirements under climate change	• Simulating the effect of future climatic conditions on agricultural water use through the use of integrated models. This will support the estimation of crop water requirements and agricultural water demands under future climates in Europe.	Focus: Research and Development Instruments: Projects

Designing and demonstrating farmers' incentives to support WFD implementation	• Advance in designing effective incentives for farmers and land owners so that they become more proactive in the implementation of the WFD.	Focus: Research, Development and Innovation Instrument: Projects and pilot-demonstration sites
Overcoming barriers preventing water reuse in irrigated agriculture and forestry	• Progress in harmonised and established standards on water reuse in irrigated agriculture and forestry throughout Europe. • Research on social perceptions, costs, water quality, technical and safety bottlenecks.	Focus: Research Instrument: Projects

3.4.2. Reducing Soil and Water Pollution

Efforts to reduce farming-induced soil and water pollution have not yet removed farming as the major cause for poor soil and water quality in certain parts of Europe. Along with farming activities, sewage treatment plants and industrial discharges represent the most important sources of pollution in Europe (EEA 2008[11]). Regarding agricultural, forestry and aquaculture water pollution, nutrients from fertilizers (mainly nitrogen and phosphorus), pesticides and their metabolites, pathogenic microorganisms excreted by livestock and organic pollution from manure are regularly detected in water bodies at levels sufficiently high to impact aquatic and riparian ecosystems. Research is needed to develop a range of cost-effective in-situ measures to use inorganic and organic fertilizers and pesticides more efficiently. Substantial reductions in pesticide use can be achieved through modifying crop rotations and sowing dates, selecting more pest-resistant crop varieties, and designating buffer strips along water courses. New formulations, advanced application techniques, assessment of environmentally safe crop requirements and leaching prevention constitute additional relevant research lines. Sustainable agrochemical consumption patterns may also be effectively achieved through a mix of policy responses, involving regulation, economic incentives and information-based instruments, including awareness-raising campaigns. This subtheme will feed crop technology, and bio-economy policies with site-specific research oriented towards the sustainable intensification of farming and land use activities.

⇨ *Currently Identified Needs*

Title of the Needs	Objective	Focus and Instrument
Assessing the efficiency of established water quality protection measures in agriculture	• Progress in monitoring, simulation and analysis of site-specific effects of measures aiming at protecting water quality (groundwater, streams and lakes).	Focus: Research Instrument: Projects

[11] Water pollution in Europe: Overview. The European Environment Agency (2008). Available at: http://www.eea.europa.eu

Characterizing and minimizing agricultural and forest pressures on aquatic environments	• Development of assessment methods and management tools to identify, quantify and minimize agricultural and forest pollution sources. • Development of efficient monitoring schemes and indicators. • Development of simulation models for agrochemicals dynamics in soil and water to build effective tools for decision making and policy support.	Focus: Research and Development Instrument: Projects
Evaluating the impact of WFD implementation measures on water quality in agricultural areas and forests	• Develop methodologies to define appropriate monitoring locations. • Improvement of methods to compare different combinations of measures to assess their effectiveness/ efficiency in reducing water pollution from agriculture and forestry in various climatic and pedological conditions. • Delineating specific policy target areas and designing corrective measures, as well as their effectiveness.	Focus: Research and Development Instrument: Projects

⇨ ***Expected Theme Impacts***

Impact	Description
Social	Society will benefit from more environment friendly farming operations, which will ensure compatibility between current land use activities and the envisaged deployment of the bio-based economy. Water abstractions and consumptive use will not limit other societal water uses.
Economic	Agricultural and forest productivity will increase if appropriate measures (aimed at reducing soil and water pollution and at enhancing resource efficiency) are taken. Today, the European Bio-economy (standard and innovative applications) is already worth more than €2 trillion annually and employs over 22 million people. The implementation of a water-wise bio-based economy will create more employment opportunities and wealth.
Technological	Development of new agricultural and forest practices, and blue biotechnology.
Environmental	Better use and protection of European natural resources, substantiated in the protection of water levels in aquifers and lakes, and discharge in streams. Additionally, environmental water quality will improve due to actions targeting farming and forest pollution.
Policy	This theme supports: i) the European Bio-economy Strategy, released by the European Commission in 2012; ii) the priority recommendations from the Lead Market Initiative (LMI) for bio-based products; iii) the Common Agricultural Policy (CAP); iv) a wide variety of national policies targeting water quality, and the agriculture and forestry sectors.

3.5. Closing the Water Cycle Gap

Recurrent water resources crises call for a better understanding of hydrological processes and improved technical and socioeconomic management. In many areas of Europe, growing freshwater scarcity currently emphasizes the need to close the water cycle gap by reconciling water supply and demand in both quantitative and qualitative terms. The demand for closed water systems is obvious in semiarid areas, where research institutes are currently developing new concepts and technologies. Water scarcity requires new integrated concepts related to water re-use, energy, recovery of valuable substances, monitoring, control, decentralized systems, and the interaction with natural resources. Water quality may induce water scarcity in many societal water uses, thus calling for multi-target analyses of water availability. Research needs to be deployed in a number of scientific fields to improve the knowledge base on water resources availability and use. Water resources observation and modelling will be required to better understand hydrological processes and to analyse and forecast the effect of management options. This technological and environmental research must be systematically combined with a socio-economic approach investigating the questions of participation, behaviour and commitment of stakeholders. The costs and benefits of the different management solutions (including environmental costs and benefits) must be systematically assessed. The concept of water foot-printing needs to be deepened, establishing practical methods and certifiable systems. Innovative concepts for water resources management need to be developed, with the aim of providing science-proof solutions to societal water challenges. RDI activities will be required at different hydrological scales.

3.5.1. Enabling Sustainable Management of Water Resources

Improving our understanding of water resources rests upon integrated water and catchment management analyses involving surface water and soil management, erosion and pollution control, as well as environmental management and wastewater. Reuse pressure resulting from increased water demand (quantitative and qualitative), climate change and climate variability add relevance to this sub-theme. Links between pressures and water resources will be established through research activities aiming at elucidating specific connections between water resources, pressures and uses. The combination of observations and hydrological modelling (water bodies, overland flow, vadose zone, groundwater and land cover) will be targeted to ensure proper conceptualization of the involved processes. Effective combinations of water quantity and quality will be sought, in the search for integrated understanding which can lead to operational management tools for complex, changing environments. Innovative concepts such as Managed Aquifer Recharge (MAR) or Soil-Aquifer Treatment (SAT) are increasingly being used to manage and store water in water scarce areas. A number of similar solutions have been locally developed over the centuries depending on the source and availability of water, demand, geology and socio-economic structure. These methods are being widely reapplied and developed using current technologies. However, examples of quantified assessments of their effectiveness are limited. Improved understanding of how recharge structures actually function and the impact they have on water availability, water quality, sustainability as well as on the local and downstream environment, need to be gained and disseminated to promote cost-effective implementation.

⇨ ***Currently Identified Needs***

Title of the Needs	Objective	Focus and Instrument
Water Platform and Observatory	• Establishment of a European research infrastructure supporting research on up-scaling of water flow (runoff and groundwater), reactive transport and floodplain ecosystems up to the catchment scale in order to facilitate policy implementation and assist scientists worldwide. • Advance in the up-scaling theories and tools, insufficiently well founded and underdeveloped at the present time. • The infrastructure will be based on experimental catchments and a comprehensive database.	Focus: Research and Development Instrument: Infrastructure
Adaptive water management for climate change	• Development and test of improved methodologies for adaptive water management in relation to climate change. Methodologies will be tested on relevant cases using scenario development, uncertainty assessments and pilot experiments.	Focus: Research Instrument: Projects
Managed Aquifer Recharge (MAR)	• Development of MAR projects: Planning, operation, risk assessment and management. RDI activities will lead to effective control of groundwater over-abstraction and degradation of freshwater resources by providing guidelines, supporting a harmonized legislation and by providing tools for risk assessment.	Focus: Research, Development and Innovation Instrument: Projects, Networking
Freshwater in the Mediterranean and Baltic basins	• Development of a systemic approach to study, manage and protect Mediterranean and Baltic freshwater. There is a need to improve the knowledge on overland flow, water recharge *vs.* storage and on contaminants transfer namely in karst aquifers. Balance between fresh and brackish water in coastal areas will also be targeted.	Focus: Research Instrument: Projects, Networking
Freshwater in Danube (Danube Knowledge cluster, article 185)	• Development of a systemic approach to protect water resources considering integrated water resources management in order to restore and maintain the quality of waters (surface water and groundwater).	Focus: Research Instrument: Projects, Networking

3.5.2. Strengthening Socio-economic Approaches to Water Management

Social, economic and governance systems need to address innovative solutions to improve the balance between water demand and availability. Participatory approaches bring together different stakeholders, users and water authorities and provide platforms for fruitful discussions. These platforms have been conceived to identify problems, to facilitate dialogue, and to identify alternatives suitable for decision making. This process of horizontal and vertical stakeholders' integration will only be effective if they have access to high quality scientific and technical information on which to base their discussions. Effort should be then made to best inform society at large about state-of-the-art scientific knowledge on water resources, as well as on social processes for information and decision making. Research is required to improve decision support systems (DSS) as critical tools to integrate scientific knowledge on decision-making. Multidisciplinary DSS, covering from social human sciences to physical sciences will be required for this purpose, as well as to effectively guide policy development and water management decisions. The knowledge base on water users' behaviour and water economics needs to be expanded. Practical applications include the will of consumers to use alternative water sources (such as recycled water for agricultural or forest purposes or for artificial recharge), and water governance, particularly regarding frameworks, instruments, pricing policies and integrated models.

⇨ *Currently Identified Needs*

Title of the Needs	Objective	Focus and Instrument
Integration of economic analysis into decision making process	• Improvement of baseline economic information and communication tools and methodologies for local decision-makers. • Providing insight on the transaction costs resulting from the implementation of the WFD measures (cost-effective analysis of measures, assessing disproportionality of costs to justify exemptions, water pricing and assessing cost recovery level of water services).	Focus: Research Instrument: Projects
Alternative financing approach through the use of economic and market-based instruments	• Understanding of the conditions for efficiency of current economy-based instruments such as pricing policies (financial and fiscal instruments) and related policy instruments (e.g. subsidies for agriculture). Progress is required on cost analysis and cost recovery principles, as well as advance in the development of methodologies concerning combination of market economic tools and regulations for achieving WFD objectives and assessment of such tools.	Focus: Research Instrument: Projects
Reconnecting socio-economic and ecological issues	• Advance in reinforcing the knowledge on relationships between good ecological status, biodiversity and ecosystem services. • Progress in methodology to clarify the links between Good Ecological Potential and socio-economic valuation.	Focus: Research Instrument: Projects, Networking

⇨ *Expected Theme Impacts*

Impact	Description
Social	The diversity of pressures and impacts on water bodies suggests that water policy can only be effective if it is implemented in a close 'horizontal' dialogue with the stakeholders interested in clean water and healthy water ecosystems. The impacts of water crises are not equally distributed in society, and can be a source of conflict between different water users. Improved water management will alleviate societal tensions.
Economic	Economic instruments such as taxes and subsidies can act as incentives for prudent water management. They constitute a vital complement to water regulation, and can assist allocating water between competing user demands. Mitigation measures and short-term solutions to overcome water scarcity (e.g. water transfers) will be included in the assessment of costs related to scarcity or drought, and the assessment of economic vulnerability of users and assets.
Technological	Improvement of management techniques of water resources (aquifer recharge, decision support systems, inter alia) with interoperability of databases, sensors on water platform, combined socio economic and physical water models.

Environmental	Both water quantity and water quality are key factors on aquatic and riparian ecosystems. A decrease in available water resources jeopardises environmental flows as a minimum requirement for a healthy ecosystem. Other impacts include the loss of biodiversity and the degradation of landscape quality.
Policy	Regulatory measures are essential tools to ensure compliance with environmental standards of water quality and quantity. Economic policy instruments contribute to supporting these regulations, as expressed in the Blueprint. Understanding the mechanisms leading to improved water management will lead to better policy design and adaptation.

4. Evaluation and Monitoring

A regular process of benchmarking and monitoring is being established in the Water JPI. When the process is fully operational, Water JPI implementation (joint activities and harmonization of agendas) will be assessed against a set of performance indicators. Results will be used to iteratively evaluate and improve performance, as well as for reporting to governance bodies.

The set of indicators currently being designed develops the following concepts:

- The involvement of end-users at the partner Country team level.
- Comparison of RDI budget of the Water JPI Partner Countries to that of Member States and Associated Countries.
- Cooperation between the Water JPI and Horizon 2020, instrumentation via the Horizon 2020 ERA-NET scheme or the Mobility and Infrastructure areas of the Programme. Agenda interaction between the Water JPI and Horizon 2020: cooperation in the establishment and update of the Water JPI SRIA and the Horizon 2020 Work Programmes.
- Effective harmonization of the water RDI agendas of Partner Countries and the Water JPI SRIA. Indicators will be designed to analyse thematic and implementation convergence.
- Success in joint activities: mobilization of funds, implication of Water JPI partner countries, diversity and specialization in the instruments used, coverage of the themes and subthemes of this SRIA, involvement of countries out of Europe in water JPI activities, including calls for proposals.
- Monitoring the European leadership in publications and patents, with specific indicators showing links to the activity of the Water JPI.

Water JPI performance will be periodically compared to that of other JPIs and similar initiatives in Europe and worldwide. Novel approaches and lessons learned will be brought on board and assessed for use in the Water JPI. Furthermore, the effectiveness of Water JPI activities will be refined and improved.

Water JPI evaluation and Monitoring will lead to an analysis of Water JPI sustainability. This assessment will be based on the analysis of indicators and on an iterative scenario analysis.

5. Agenda Implementation

SRIA implementation will be based on a light touch high level management. In order to achieve the Water JPI objectives, three principles will inspire all activities:

- Variable geometry: Partners will join together on their own specific priority issues, using mechanisms and instruments that optimise the effectiveness and efficiency of joint programming. Water JPI partners will: i) Participate only in those topics in which they have a specific interest; and ii) Choose between activities such as, but not limited to:
    - co-funded or aligned Research;
    - researcher mobility;
    - shared and coordinated Research and Innovation infrastructures;
    - demonstration and Innovation actions;
    - knowledge and good practice exchange;
    - interfacing science to policy; and
    - public awareness actions.
- Flexibility: Processes and structures will be established that maximise the flexibility of the JPI. Such flexibility will support the development of diverse activities driven and led by different partners and responding to partner requirements and opportunities.
- Responsiveness: The methods and tools used to implement the JPI will be responsive to the requirements of variable geometry and flexibility. The Water JPI will, therefore, provide an enabling environment, within which the appropriate processes are employed to implement different activities in a timely and effective manner.

The JPI will draw upon the experience and methods of earlier ERA-NETs, COST, other JPIs and similar alignment and coordination initiatives (as deemed appropriate). New approaches to joint activities that best suit specific needs will be designed as required. Attention will be paid to produce and communicate environmental policy-related results. When relevant, policy briefs will be requested to consortia developing JPI Activities at the end of their operation.

5.1. The Water JPI Pilot Call Launched in 2013

As a part of guiding the thematic development of Water JPI activities in 2013 and 2014, the Partners of the Water JPI have decided that a Pilot call will be launched in September 2013. In order to realise activities, a Memorandum of Understanding (MoU) is being prepared to establish the procedures for the Pilot Call for proposals for a trans-national funding programme within the context of the WatEUr project. The MoU needs to be accepted and undersigned by all partners willing to join the call.

The pilot call modalities describing technical details for the pilot call, in the MoU are being developed according to three key aspects of the Water JPI: variable geometry, flexibility and responsiveness. This will permit to attain a *light management level* for the call. Water

JPI partners showing initial interest on the Pilot Call were asked for thematic preferences and call modalities using a questionnaire. Pilot call documents are being developed on the basis of the analysis of the questionnaire results, and reusing best-practice examples from FP7, national procedures, ERA-Nets; other JPIs and ERA-LEARN. The overall structure of call text was kept compact with only necessary annexes. Proposals will be sent to the Academy of Finland (AKA) online services. The call timetable is still to be decided. Funded transnational projects are expected to start their activities after summer 2014. The type of co-funding will be a virtual common pot, i.e., all partner countries willing to join the call will fund their own applicants. The country funding commitment must be signed before the call pre-announcement. Countries will follow their own funding rules. Participation of private companies will depend on national rules.

5.2. Activities Planned to Be Launched in 2014

The WatEUr project describes a set of additional Joint Activities to be published in 2014. This set of activities will be varied in nature. It will contain a Joint Call for proposals.

Annex I: Members of the Water JPI Advisory Boards

Members of the Scientific and Technological Board (STB)

Member	Institution
Dr. Luc Abbadie	Laboratory BIOEMCO (Biogeochemistry and Ecology of Continental Environments), University Pierre & Marie Curie, France
Prof. Eilon Adar	Institute for Water Research, Israel
Dr. Damiá Barceló, *President*	Catalan Institute for Water Research and CSIC Spain
Dr. Marc F.P. Bierkens	University of Utrecht and Deltares, The Netherlands
Dr. Cees Buisman, *Vice President*	Wetsus, The Netherlands
Dr. Despo Fatta-Kassinos	Nireas- International Water Research Centre, Cyprus
Prof. Robert Ferrier	The James Hutton Institute, United Kingdom
Prof. Maria Kennedy	UNESCO-IHE Institute for Water Education, The Netherlands
Prof. Claudia Pahl-Wostl	University of Osnabrück, Germany
Dr. Jens Christian Refsgaard	Geological Survey of Denmark and Greenland, Denmark
Dr. Susan D. Richardson	Athens, Georgia, United States
Prof. Karl-Ulrich Rudolph	University of Witten/ Herdecke, Germany
Dr. Sveinung Saegrov	Norwegian University of Science and Technology, Norway
Prof. João Santos Pereira	Technical University of Lisbon, Portugal
Dr. Eric Servat	IRD, France
Dr. Merete Johannessen	Norwegian Institute for Water Research, Norway
Dr. Michele Vurro	Italian National Research Council, Italy

Members of the Stakeholders Advisory Group (SAG)

Acronym	Institution
Acqueau	The EUREKA Cluster for water
ARC	Aqua Research Collaboration
CIS-SPI	Science-Policy interface
EMWIS	Euro-Mediterranean Information System on know-how in the water sector
Euraqua	European Network of Freshwater Research Organisations
Eureau	European Federation of National Associations of Water and Wastewater Services
EWA	European Water Association
FAO Land and Water	Food and Agriculture Organization of the United Nations, Land and Water Department
SYKE, *Vice President*	Finnish Environmental Institute
CHJ	Júcar River Basin Organization
WssTP, *President*	Water Supply and Sanitation Technology Platform

Annex II: List of Water JPI partners and observers

JPI partners

Country	Leading Representing Institution(s)
AT, Austria	Environment Agency, Vienna University of Technology
CY, Cyprus	Research Promotion Foundation
DE, Germany	Federal Ministry of Education and Research, Jülich Forschungszentrum
DK, Denmark	The Danish Council for Strategic Research, DHI
ES, Spain, *Coordinating Country*	Ministry of Economy and Competitiveness
FI, Finland	Academy of Finland
FR, France	BRGM, ISTEA
IE, Ireland	Environmental Protection Agency
IL, Israel	Ministry of Energy and Water
IT, Italy	Institute for Environmental Protection and Research (ISPRA), Ministry of the Environment
MD, Moldova	Academy of Sciences of Moldova
NL, The Netherlands, *Co-Coordinating Country*	Ministry of Infrastructure and the Environment, NL Innovation
NO, Norway	The Research Council of Norway, Norwegian Directorate for Nature Management
PL, Poland	Ministry of Science and Higher Education, Centre for Ecohydrology under the auspices of UNESCO (ERCE),
PT, Portugal	Science and Technology Foundation
RO, Romania	Romanian Office for Science and Technology, National Authority for Scientific Research
TR, Turkey	The Scientific and Technological Research Council of Turkey (TUBITAK), Turkish Water Institute (SUEN)
UK, United Kingdom	Natural Resources Council (NERC), Department of Environment, Food and Rural Affairs (DEFRA)
EC, European Commission	(Non-voting partner)

JPI observers

Country	Leading Representing Institution(s)
BE, Belgium	Flemish Environment Agency
EL, Greece	National Technical University of Athens
HU, Hungary	Representation of Hungary to the EU
LV, Latvia	University of Latvia
SE, Sweden	Swedish Research Council, Swedish National Network for Drinking Water, Swedish Agency for Marine and Water Management