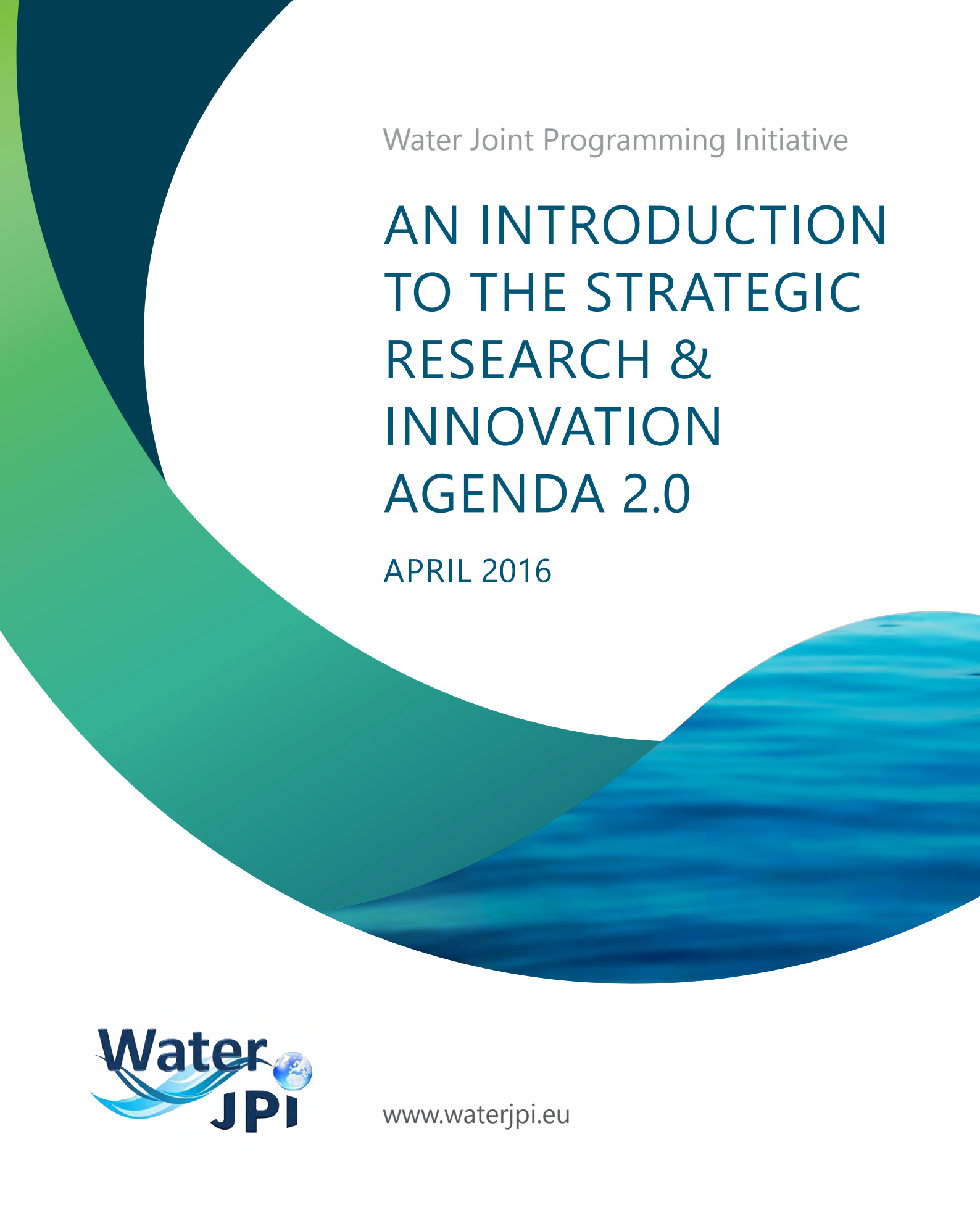




Water Joint Programming Initiative

AN INTRODUCTION TO THE STRATEGIC RESEARCH & INNOVATION AGENDA 2.0

APRIL 2016



www.waterjpi.eu

Foreword



Water is vital for life, for drinking, cleaning, flushing, food production and manufacture of many industrial products. Water challenges are huge, e.g. fast growing world population, pollution from multiple sources and global climate changes. Providing every citizen with access to an adequate supply of safe water, meeting every economic sector's water needs, and delivering water quality with a reduction of energy needs and without conflict of uses, requires increased research and innovation efforts.

This also requires contributions from a new type of science that links disciplines, knowledge systems and societal partners to support more sustainable water resource management and the implementation of water-related policies in a changing world.

The vision of the **Water JPI** is to tackle this ambitious challenge of "achieving sustainable water systems for a sustainable economy in Europe and Abroad" with the most efficient cooperation.

The **Water JPI Strategic Research and Innovation Agenda** is a major contribution confirming the common, collective, Research Development and Innovation vision and needs of the Member States to all stakeholder groups.

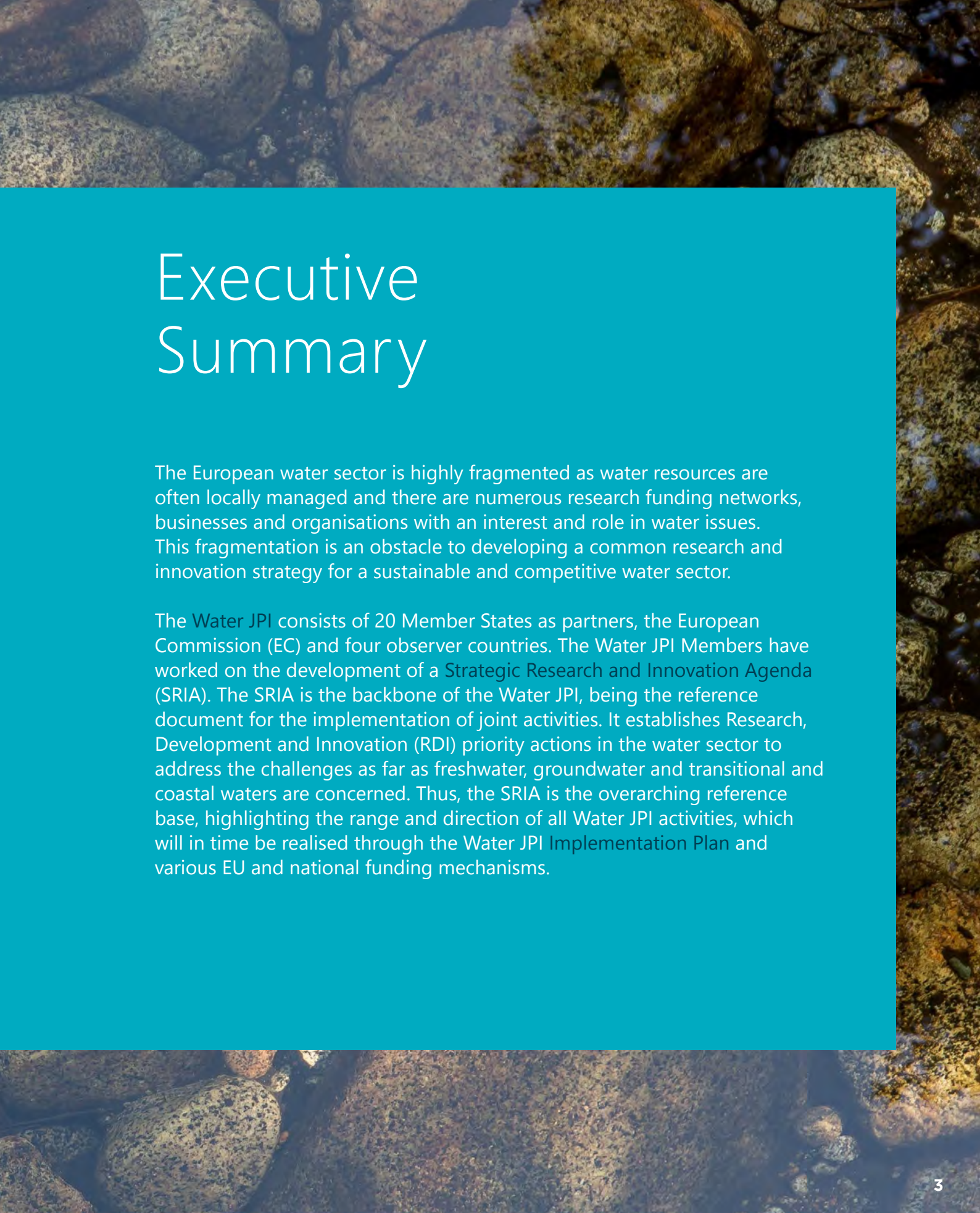
Maurice Héral

Agence Nationale de la Recherche, France
Water Joint Programming Initiative Chair



Contents

Foreword	
Executive Summary	3
Water JPI Partner Countries	4
A Vision for Water in Europe	7
The Function of JPIs	8
The Water JPI	9
The Purpose of the SRIA	9
How was the SRIA developed?	10
SRIA Preparation & Update	
Timeline	12
Structure of the SRIA	14
Theme 1	
Improving Ecosystem Sustainability	
and Human Well-being	16
Theme 2	
Developing Safe Water Systems for Citizens	20
Theme 3	
Promoting Competitiveness in	
the Water Industry	24
Theme 4	
Implementing a Water-Wise	
Bio-Based Economy	28
Theme 5	
Closing the Water Cycle Gap - Improving	
Sustainable Water Resource Management	32
How can the SRIA be used by:	
Researchers	37
RDI Funding Bodies and Programmes	38
Policy Makers	39
Water Utilities & River Basin	
Management Bodies	40
Enterprises	41
General Public	42
European Commission	43
Added Value of the SRIA	44
Our Mission	45



Executive Summary

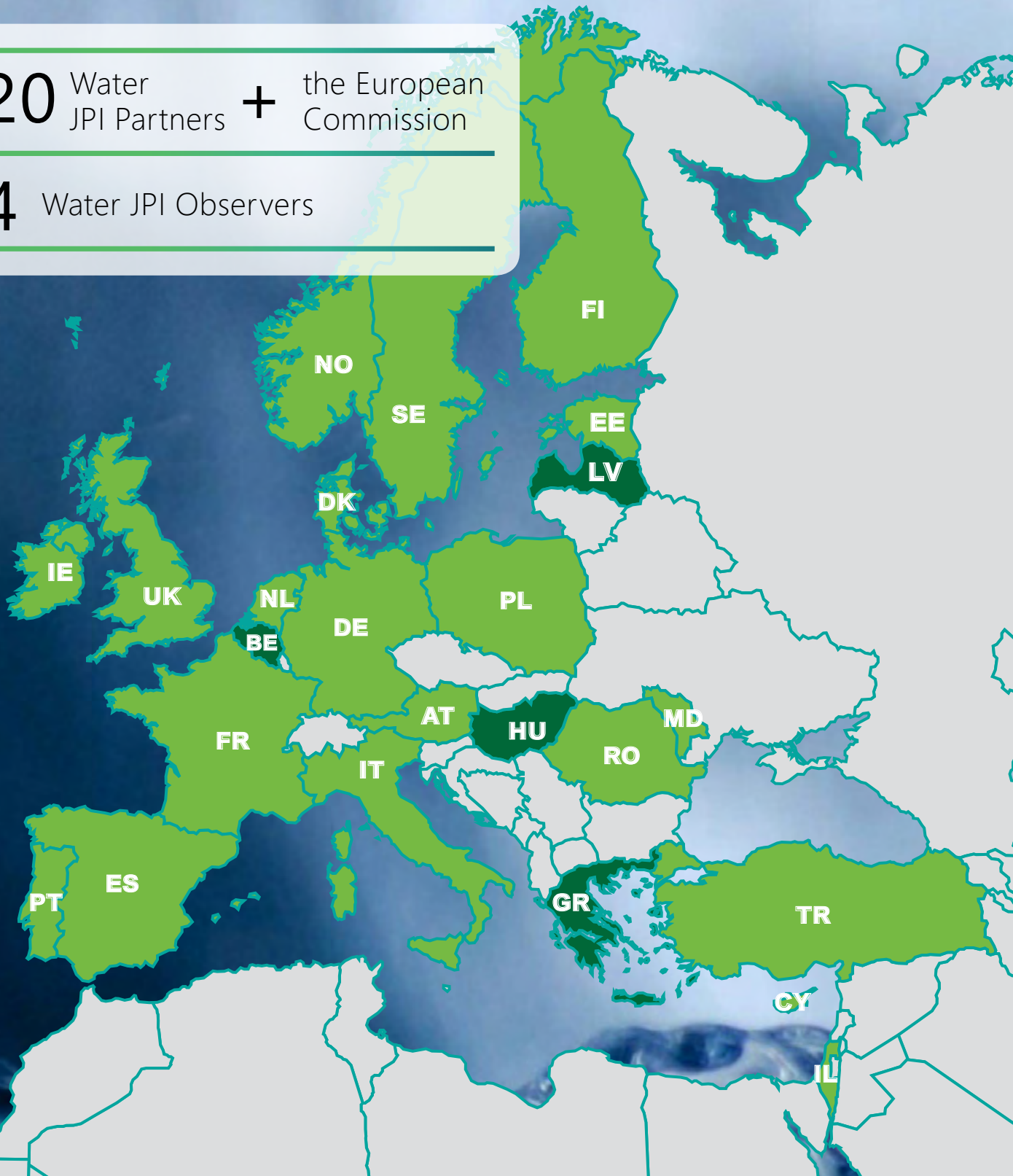
The European water sector is highly fragmented as water resources are often locally managed and there are numerous research funding networks, businesses and organisations with an interest and role in water issues. This fragmentation is an obstacle to developing a common research and innovation strategy for a sustainable and competitive water sector.

The Water JPI consists of 20 Member States as partners, the European Commission (EC) and four observer countries. The Water JPI Members have worked on the development of a Strategic Research and Innovation Agenda (SRIA). The SRIA is the backbone of the Water JPI, being the reference document for the implementation of joint activities. It establishes Research, Development and Innovation (RDI) priority actions in the water sector to address the challenges as far as freshwater, groundwater and transitional and coastal waters are concerned. Thus, the SRIA is the overarching reference base, highlighting the range and direction of all Water JPI activities, which will in time be realised through the Water JPI Implementation Plan and various EU and national funding mechanisms.

Water JPI Partner Countries

20 Water JPI Partners + the European Commission

4 Water JPI Observers



Water JPI Governance - Partners			
AT	Austria	Environment Agency Austria (EAA)	
CY	Cyprus	Research Promotion Foundation (RPF)	
DE	Germany	Federal Ministry of Education and Research (BMBF)	
		Jülich Forschungszentrum (Jülich)	
DK	Denmark	Innovation Fund Denmark (IFD)	
		Danish Hydraulic Institute (DHI)	
EE	Estonia	Ministry of Environment, Water Department (MoE-EE)	
		Tallinn University, Institute of Ecology (TLU)	
ES	Spain (<i>co-chair</i>)	Ministry of Economy and Competitiveness (MINECO)	
FI	Finland	Academy of Finland (AKA)	
FR	France (<i>coordinating country</i>)	French National Research Agency (ANR)	
		AllEnvi / French Geological Survey (BRGM)	
		AllEnvi / Institut national de recherche en sciences et technologies pour l'environnement et l'agriculture (Irstea)	
IE	Ireland (<i>co-chair</i>)	Environmental Protection Agency (EPA)	
IL	Israel	Ministry of Energy and Water (MoE-IL)	
IT	Italy (<i>co-chair</i>)	Ministry of Education, Universities and Research (MIUR)	
		Institute for Environmental Protection and Research (ISPRA)	
MD	Moldova	Academy of Sciences of Moldova (ASM)	
NL	The Netherlands	Ministry of Infrastructure and Environment (I&M)	
NO	Norway	Norwegian Environment Agency (DN)	
		Research Council of Norway (RCN)	
PL	Poland	European Regional Centre for Ecohydrology (ERCE)	
PT	Portugal	Fundação para a Ciência e a Tecnologia (FCT)	
RO	Romania	National Authority for Scientific Research (ANC SI)	
SE	Sweden	Swedish Agency for Marine and Water Management (SWAM)	
		Swedish Research Council Formas (FORMAS)	
TR	Turkey	Scientific and Technological Research Council (TUBITAK)	
		Turkish Water Institute (SUEN)	
UK	United Kingdom	Natural Environment Research Council (NERC)	
Partner in bold = voting partner			
Water JPI Governance - Observers			
BE	Belgium	Flemish Environment Agency, The Belgian Federal Science Policy	
GR	Greece	National Technical University of Athens	
HU	Hungary	Science Counsellor Representation of Hungary to the EU	
LV	Latvia	University of Latvia	
Water JPI Governance - Non-voting member			
EC	European Commission	Directorate-General Research and Innovation	

Water JPI Advisory Boards

Members of the Scientific and Technological Board (STB)	
Member	Institution
Dermot Diamond	Dublin City University, Ireland
Agathe Euzen	Centre national de la recherche scientifique (CNRS) – Laboratoire Techniques Territoires et Sociétés (LATS), France
Despo Fatta-Kassinou, Chair	Nireas-International Water Research Center, University of Cyprus, Cyprus
Ing-Marie Gren	Swedish University of Agricultural Sciences, Sweden
Jaap Kwadijk	Deltares/University of Twente, The Netherlands
Inmaculada Ortiz	University of Cantabria, Spain
Jens Christian Refsgaard	Geological Survey of Denmark and Greenland, Denmark
Seppo Rekolainen, Co-Chair	Finnish Environmental Institute, Finland
Karl-Ulrich Rudolph	Institute of Environmental Engineering and Management, University of Witten, Germany
Adrian Stanica	National Institute of Marine Geology and Geoecology – GeoEcoMar, Romania
Members of the Stakeholders Advisory Group (SAG)	
Acronym	Institution
ACQUEAU	The EUREKA Cluster for Water
ARC	Aqua Research Collaboration
CIS	Common Implementation Strategy
EIFAAC-FAO	European Inland Fisheries and Aquaculture Advisory Commission
EIP Water	European Innovation Partnership on Water
EU-INBO	International Network of Basin Organisations
Euraqua (Chair)	European Network of Freshwater Research Organisations
EurEau	European Federation of National Associations of Water and Wastewater Services
EWA	European Water Association
WssTP (Co-chair)	Water Supply and Sanitation Technology Platform

A Vision for Water in Europe

Water is vital for life and constitutes a precious natural resource. It is essential to most life processes and living organisms, to societal advancement and, equally, it is fundamental to innumerable economic, cultural, commercial and productive activities. Thus, there are ongoing and changing demands from citizens, society, industry and agriculture for this basic resource.

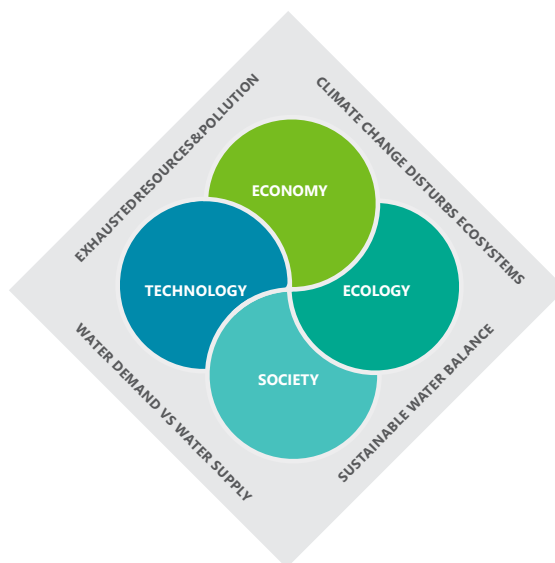
With continued economic and population growth, there will be increased demands and further pressures on our aquatic resources and how they are managed in the coming decades. Furthermore, it is evident that many factors will influence the water sector in the future, e.g. climate change, modifications to land use and industrial & agricultural developments.

In order to meet the needs of a more resource-efficient future, an integrated, dynamic and responsive approach to water resource management is needed at a pan-European level. This approach will develop a sustained and enhanced European society and economy. It will also contribute to maintaining the essential functions of our water ecosystems.

The 2020 vision for the [European Research Area](#) (ERA) supports the free circulation of researchers, knowledge and technology within the ERA. It also calls for attractive conditions and effective and efficient governance for carrying out research and investing in RDI intensive sectors in Europe.

The [Water JPI](#) has ambitious goals and will deal with these complex and systematic issues. It is driven by emerging RDI, guided by evolving regional, national and EU policies and modulated by the relevant stakeholder interests.

In addition, this JPI aims at contributing to the 2020 vision for the [ERA](#).



Drivers and multidisciplinary challenges to be addressed

The Function of JPIs

Joint Programming was developed by the EC in 2008 as a means to advance the formation and realisation of the ERA. In this context, specific JPIs were established to deal with what were perceived as being 'Grand Challenges'.

It was recognised that, at a European level, to underpin and support the development of societal change and facilitate future economic growth, it would be necessary to have a much broader joint focus on selected, priority themes that posed significant challenges but also offered real opportunities.

There are currently 10 JPIs:

- Alzheimer and other Neurodegenerative Diseases (JPND)
- Agriculture, Food Security and Climate Change (FACCE)
- A Healthy Diet for a Healthy Life (JPI HDHL)
- Cultural Heritage and Global Change: A New Challenge for Europe (JPI CH)
- Urban Europe - Global Urban Challenges, Joint European Solutions (JPI Urban Europe)

- Connecting Climate Knowledge for Europe (CliK'EU)
- More Years, Better Lives - The Potential and Challenges of Demographic Change (JPI MYBL)
- Antimicrobial Resistance - The Microbial Challenge - An Emerging Threat to Human Health (JPIAMR)
- Water Challenges for a Changing World (Water JPI)
- Healthy and Productive Seas and Oceans (JPI Oceans)

JPIs are about tackling these major, common, European societal challenges in a coordinated way, through aligning national research programmes in an effective manner, making better use of Europe's limited public RDI funding and extending links to various international initiatives.

In this way, there will be coordination of effort in the wider common interest and outcomes will be mutually beneficial for all participating parties, regions and states. JPIs provide a combined forum which allows research knowledge and innovation to be collected, evaluated and assessed. They can also advise on and reflect the emerging and changing needs of new policies and stakeholder interests in a dynamic and responsive way.

The Water JPI

The Water JPI, entitled “Water Challenges for a Changing World”, was launched and later formally approved by the European Council in December 2011.

The Water JPI membership consists of 20 Member States (and the EC as a non-voting member) with four observing countries, which collectively represent 88% of European RDI investment in water resources.¹

The Water JPI is dedicated to tackling the ambitious challenge of achieving sustainable water systems for a sustainable economy in Europe and abroad. This will be realised through a multi-disciplinary approach, which includes economic, ecological, societal and technological considerations.

This JPI will mobilise existing national and regional RDI programmes and aims to harmonise their research agendas and infrastructures. It will define common research needs and develop joint activities in the

ERA context, that will increase efficiency by avoiding duplications across Europe.

The Water JPI will provide an opportunity for broader cross-border cooperation, greater collaboration and a more unified focus on water RDI across Europe. It must be remembered that the European water sector has a wide diversity of stakeholders and is highly fragmented: water resources, water supply and wastewater have often been locally managed.

The Water JPI will produce science-based knowledge leading to the support of [European policies](#), comprising the identification of problems, their quantification, and the development of feasible technical and managerial solutions. It will coordinate water RDI in the participating countries, contribute to the Smart Specialisation Agenda, and provide a powerful tool for international cooperation in the water area.

The Purpose of the SRIA

The purpose of the [SRIA](#) is to lay down guiding principles and identify research priorities for the future, while making them openly accessible to the various stakeholder groups including policy makers, regulatory agencies, researchers, end users (such as water enterprises and water utilities & river basin management bodies) and the public.

This booklet is an introduction for the various stakeholders of the Water JPI providing an overview of “What is the SRIA?”, “How to use the SRIA” and “Why is the SRIA needed?” (full text available from www.waterjpi.eu). The completion of the [SRIA 2.0](#), is considered a major achievement and milestone in the timeline of the Water JPI.

The SRIA 2.0 has been conceived and generated to guide future water-related RDI actions in Europe, including, but not only limited to, the Water JPI actions. To this end,

it sets out specific RDI priorities and actions and identifies areas where RDI actions are required (needs/gaps). The Water JPI covers the full range of RDI including the broad range of activities from academic research to innovation, contributing to the 2020 vision for the [ERA](#).

An Implementation Plan specifies which of the needs, identified in the SRIA, will be instigated via the Water JPI activities (e.g. calls, strategic and exploratory workshops, knowledge hubs, and alignment of national programmes).

Addressing the grand challenge to “achieve sustainable water systems for a sustainable economy in Europe and abroad” requires strong levels of communication and coordination amongst the many competent decision-making authorities, end users and experts in the field.

1. 2014 Water JPI Mapping Report.

How was the SRIA developed?

The development and formulation of the SRIA 2.0 has resulted from a comprehensive, consultative, iterative process that started with the publication of the Water JPI Vision Document in 2011, following consultations with the Water JPI Advisory Boards and partner Member States.

The preliminary version of the [Water JPI SRIA \(SRIA 0.5\)](#) was adopted in May 2013. This version teased out a number of relevant RDI needs and objectives for water but no prioritisation was attempted.

Following a public consultation and experts stakeholder workshop, the Water JPI [SRIA 1.0](#) was formally launched in October 2014. The analysis of a number of information sources (including national RDI agendas, the strategic agendas of the [Water European Innovation Partnership \(EIP\)](#), [Water supply & sanitation Technology Platform \(WssTP\)](#), the research agendas of other relevant JPIs, foresight studies, and the [European Water Blueprint](#)) allowed the identification of new water RDI needs.

In the past two years, the Water JPI [Advisory Boards](#) and the general public have been invited to provide their input on the contents of the agenda and to support the

prioritisation of Water RDI needs with a second stakeholder workshop and online public consultation. The [SRIA 2.0](#) was officially adopted by the Water JPI [Governing Board](#) in April 2016.

The Water JPI SRIA 2.0 is neither the intersection of national (and regional) SRIAs, nor a brand new document resulting from a bottom-up approach. It has been conceived as a participatory, inclusive, shared and forward-looking document that sets out RDI directions.

The SRIA should be regarded as a 'live' document that will be reviewed and revisited regularly. Hence, this collaborative exercise will be extended and undertaken again, in coming years, as a further update of the SRIA will probably be required in order to realign water RDI activities with future emerging challenges.

The Water JPI SRIA 2.0 was adopted in April 2016. The next full update of the SRIA (version 3.0) is currently scheduled for 2019.



SRIA Preparation & Update Timeline



LEGEND



Key documents



Consultation

First Stakeholder Consultation Workshop

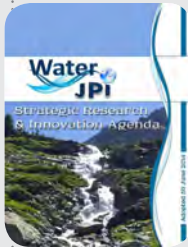
Lyon, France,
4 April 2014

More than 50 participants including members of the Water JPI Advisory Boards, national experts and members of the WatEUr project.



SRIA 1.0

May 2014



Sixth meeting of the Governing Board

Brussels, Belgium,
12 March 2015

Second online public consultation

May 2015

390 public responses received regarding the most important SRIA subthemes and RDI needs.

First Meeting of the renewed Advisory Boards

3 June 2015



SRIA 2.0 officially adopted at the eighth meeting of Water JPI Governing Board

Málaga, Spain, 15 April 2016



2014

2015

2016

Fourth Meeting of the Governing Board

Cyprus,
28 May 2014



Official launch of the Strategic Research and Innovation Agenda and Implementation Plan

Brussels, Belgium,
21 October 2014



Fifth meeting of the Governing Board

Oslo, Norway,
11-12 November 2014



Second stakeholder consultation workshop

Orléans, France,
9 October 2015

40 participants including members of the Advisory Boards, the Water JPI and national experts.



SRIA 2.0

November 2015

Seventh meeting of the Governing Board

Paris, France,
19-20 November 2015

Structure of the SRIA

Reflecting back to the early days of the [Water JPI](#), the [Vision Document](#) of 2011 identified five main themes which still constitute the core of the SRIA:

- 1. Maintaining Ecosystem Sustainability**
- 2. Developing Safe Water Systems for Citizens**
- 3. Promoting Competitiveness in the Water Industry**
- 4. Implementing a Water-wise Bio-based Economy**
- 5. Closing the Water Cycle Gap**

Each theme represents a specific aspect of the Water JPI grand challenge for which multi- and interdisciplinary research and innovation actions are required. Themes are therefore challenge driven. Some of the expected social, economic, technological, environmental and policy impacts of these recommended RDI actions are listed under each Theme.

In this latest version of the SRIA (version 2.0, 2016), the five themes have been further developed and are divided into 11 RDI subthemes. For each of these subthemes, specific RDI needs and related objectives have been identified. Due to their cross-cutting nature, some of the RDI needs and objectives are obviously linked to others within the SRIA listings.

The Water JPI [SRIA 2.0](#) is structured as follows:

RDI Theme A

Short rationale introducing the theme

Table listing the expected research impacts under the theme

- Subtheme A.1
 - Short rationale introducing the subtheme
 - Research Needs A1.1
 - List of RDI Objectives identified for the Research Needs A1.1
- Research Needs A1.x
 - List of RDI Objectives identified for the Research Needs A1.x

RDI Theme B

The SRIA 2.0 has been structured based on the five themes and cross-cutting issues. This “two-dimensional” structure helps the reader to follow the identified knowledge gaps within each theme without ignoring cross-cutting issues.

The ‘Horizontal Water RDI Needs’ table shows how a number of key water-related issues are addressed in each of the five themes of the SRIA. A number of these issues (e.g. energy, climate and global change) are relevant to all five themes of the Water JPI SRIA and even other JPIs.

The relevance of the horizontal needs is based on the results of the various consultation exercises.

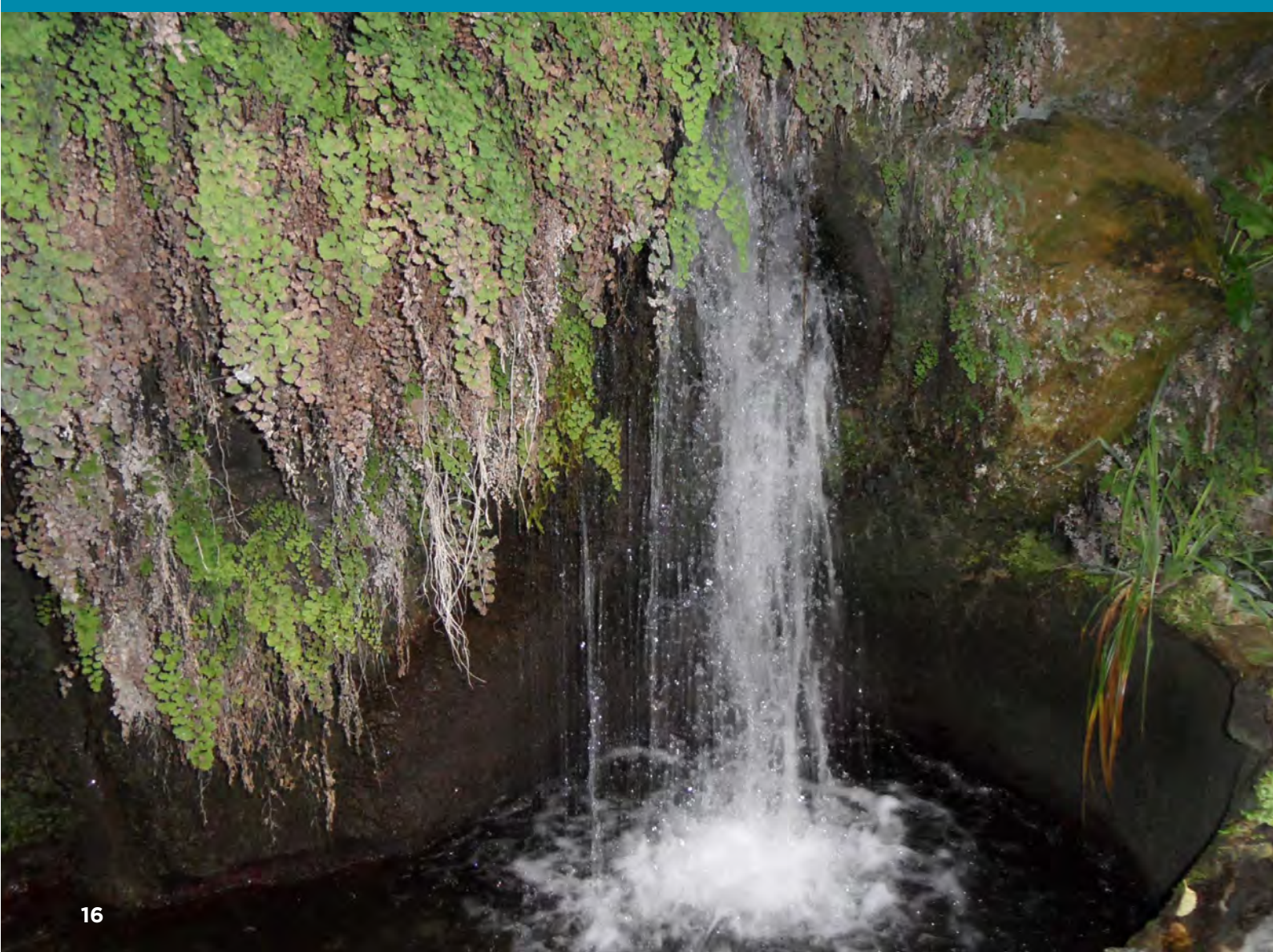
Horizontal Water RDI Needs and their relevance

(based on the results of the various consultation exercises)

THEMES 1-5						
	Theme 1: Improving Ecosystem Sustainability and Human Well-being	Theme 2: Developing Safe Water Systems for Citizens	Theme 3: Promoting Competitiveness in the Water Industry	Theme 4: Implementing a Water-wise- Bio-based Economy	Theme 5: Closing the Water Cycle Gap - Improving sustainable water resource management	
HORIZONTAL RDI NEEDS	Ecosystems' ecological status, resilience, services & restoration	Very relevant	Somewhat relevant	Somewhat relevant	Somewhat relevant	Relevant
	Pollutants: risks and remediation	Somewhat relevant	Very relevant	Relevant	Relevant	Somewhat relevant
	Water and energy	Somewhat relevant	Somewhat relevant	Very relevant	Somewhat relevant	Relevant
	Water and agriculture	Somewhat relevant	Somewhat relevant	Somewhat relevant	Very relevant	Relevant
	Water and citizens	Somewhat relevant	Relevant	Somewhat relevant	Somewhat relevant	Very relevant
	Water and climate	Relevant	Relevant	Somewhat relevant	Somewhat relevant	Relevant
	Water data (monitoring, citizen participative sciences)	Relevant	Relevant	Relevant	Relevant	Very relevant
	Sensors, technologies and smart systems	Relevant	Relevant	Very relevant	Relevant	Relevant
	Governance and acceptance, removing barriers (legislation, funding schemes, governance, acceptance)	Somewhat relevant	Somewhat relevant	Very relevant	Relevant	Very relevant
	Developing new tools combining in situ and remote sensing data: models	Somewhat relevant	Somewhat relevant	Somewhat relevant	Very relevant	Very relevant
	Integration of water policies in the EU	Relevant	Relevant	Relevant	Relevant	Relevant

Theme 1

Improving Ecosystem Sustainability and Human Well-being



Theme 1: Improving Ecosystem Sustainability and Human Well-being

The overall goal is to maintain the essential functions, processes and services of water bodies and associated ecosystems over the long-term through integrated and interdisciplinary RDI actions.

Rationale

The key to sustainable development is to achieve a balance between the exploitation of natural resources for socio-economic development and conserving ecosystem services (benefits people obtain from ecosystems). Further water management efforts and RDI actions are currently needed to ensure the protection and/or restoration of water bodies and ecosystems whilst meeting the socio-economic, political and cultural needs of current and future generations. Research on ecosystem sustainability will also support a relatively wide range of national, European and international policy initiatives including: the [7th Environment Action Programme](#) (EAP); [EU Biodiversity Strategy](#); the [Water Framework](#); [Habitats](#) and [Flood Directives](#); and the [UN Sustainable Development Goals](#) (SDGs).

It is expected that a better understanding of the role of biodiversity in the strength and sustainability of aquatic ecosystems will be realised. From an operational point of view, functional indicators are to be developed to better understand the condition and ecological dynamics, and to act in terms of conservation and rehabilitation. As such, innovative applications of ecological engineering (design of ecosystems for the mutual benefit of humans and nature) can help restore water resources, biodiversity and aquatic environments (wetland restoration or hydromorphological [physical characteristics

of the shape, boundaries and content of a water body] sediment management, restoration of ecological continuity, reintroducing key species).

Subtheme 1.1. Developing Approaches for Assessing and Optimising the Value of Ecosystem Services

To provide a better understanding and assessment of ecosystem services relies on research on the ecological functioning of aquatic (surface, transitional and coastal water), riparian (located along the banks of rivers, streams, or any other water bodies) and groundwater ecosystems.

CURRENTLY IDENTIFIED NEEDS

- 1.1.1. Developing approaches for assessing the ecological functioning of ecosystems
- 1.1.2. Developing and testing methodologies for the valuation of ecosystem services
- 1.1.3. Establishing multiple pressure-impact-response relationships in aquatic, riparian and groundwater-dependent ecosystems
- 1.1.4. Integrating ecosystem services into management of water resources
- 1.1.5. Adapting and integrating our water/ecosystem management, planning and governance systems with better environmental data and information



Subtheme 1.2. Developing and Applying Ecological Engineering and Ecohydrology

Other than ecosystem services, several new approaches have emerged with the objective of safeguarding and restoring degraded water bodies and associated ecosystems. The following topics are particularly relevant for the [Water JPI](#): restoration of morphology continuity and hydraulic connectivity; risk management for biological invasive species; understanding ecological flows; and innovative nature-based solutions and green infrastructure.

CURRENTLY IDENTIFIED NEEDS

- 1.2.1. Restoring morphology continuity and hydraulic connectivity
- 1.2.2. Managing the risks caused by invasive species and options for remediation
- 1.2.3. Understanding and managing ecological flows
- 1.2.4. Integrated eco-technological solutions for the remediation and mitigation of degraded water bodies and aquatic ecosystems

Subtheme 1.3. Managing the Effects of Hydro-climatic Extreme Events

To better convey information on the interaction between hydro-climatic events and multiple pressures on ecosystems to stakeholders and policy makers, the further development and use of integrated systems and forecasting tools must be encouraged. 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 extreme weather events and minimise the impacts on human lives, natural ecosystems, cultural heritage and food cycles.

CURRENTLY IDENTIFIED NEEDS

- 1.3.1. Understanding the causes of drought/scarcity; predicting drought events and water scarcity and developing adaptation measures
- 1.3.2. Developing innovative (or improved) tools for adaptation to hydro-climatic extreme events, especially floods
- 1.3.3. Improving water management to mitigate the harmful impacts of extreme events (extreme weather events, impaired water quality)

To view the full description of Theme 1, please consult the [Water JPI SRIA 2.0](#) available at www.waterjpi.eu

Theme 1 - Expected Impacts

Impact Level	Description
 Social	Contribute to: • Safeguarding natural resources for future generations; • Better protection of public health and the environment from effects of extreme weather events; • Identifying, proposing and prioritising measures to help societies adapt and react to current and future pressures.
 Economic	Contribute to: • Addressing market failures (integration of externalities in policy-making), by assessing & comparing the preservation, adaptation and restoration costs; • Better decision and policy making processes, as well as economic impacts, by developing monetary and non-monetary (e.g. managerial) methods of valuation.
 Technological	Contribute to: • Development of new tools in ecological engineering and Early Warning Systems, including sensors, web services, numerical codes and ecological restoration technology; • Increased availability and relevance of data and decision making products, in particular for extreme weather events.
 Environmental	Contribute to: • Better assessment and evaluation approaches of ecosystem services concept; • Better understanding of aquatic ecosystems; • Achieving sustainable resource uses; • Improved water management and availability of good water quality, in particular in the case of extreme weather events.
 Policy	Relevant to: • EU Regulations & Policies, in particular: 7th Environment Action Programme; EU Water Blueprint; Water Framework Directive; Marine Strategy Framework Directive; Floods Directive; Water Scarcity & Drought Strategy; EC Guidance on Ecological Flows (Eflow); EU Climate Change Adaptation Strategy; Habitats & Birds Directive; EU Biodiversity Strategy; International Convention on Biodiversity, Natura2000; • UN Sustainable Development Goals (SDGs), especially: SDG 6 "Ensure availability and sustainable management of water and sanitation for all"; SDG 2 "End hunger, achieve food security and improved nutrition and promote sustainable agriculture"; SDG 14 "Conserve and sustainably use the oceans, seas and marine resources for sustainable development"; and SDG 15 "Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss".

Theme 2

Developing Safe Water Systems for Citizens



Theme 2: Developing Safe Water Systems for Citizens

The main goal of RDI actions under this theme is to protect the health of European citizens through the provision of safe water. Attention is particularly paid to the impacts of i) emerging pollutants; and ii) natural hazards and water infrastructures on water and human health.

Rationale

Millions of Europeans receive high quality drinking water every day. However, the provision of safe water for drinking purposes is threatened by, amongst other factors, the improper disposal of chemicals, animal and human wastes, pesticides, emerging pollutants, and emerging risks from “established” pollutants, aged water supply infrastructures, sub-optimal water management, and natural hazards.

To achieve the appropriate implementation of all relevant policies and protect the health of Europeans, the [Water JPI](#) proposes that further RDI actions should be undertaken in the areas of emerging pollutants, water infrastructure and natural hazards.

Key knowledge gaps remain around the environmental behaviour of emerging and “established” pollutants and their impacts on human health. Likewise, water distribution and storage facilities may be old and their performance far from optimum.

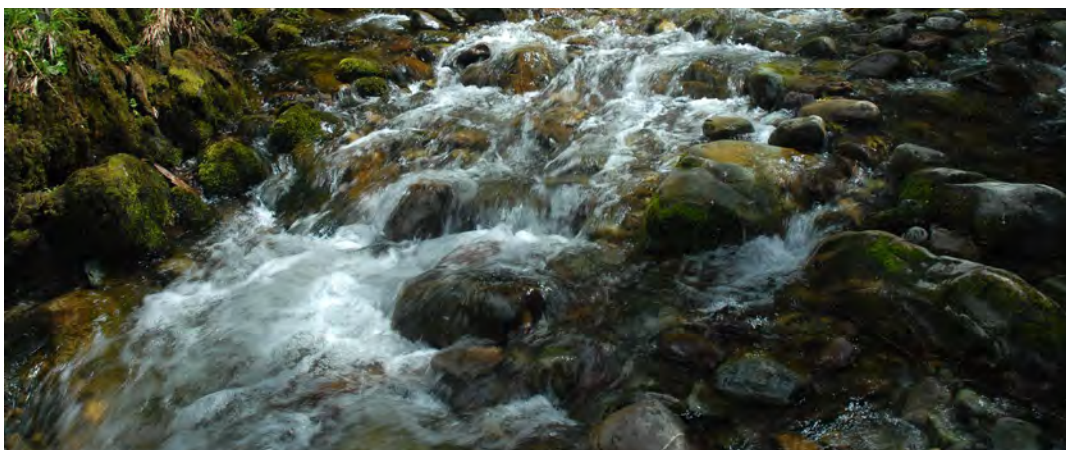
Scientific and technological attention needs to be paid to innovative practices for minimising risks associated with water distribution and storage facilities.

Subtheme 2.1. Emerging Pollutants and Emerging Risks of Established Pollutants: Assessing their Effects on Nature and Humans and their Behaviour and Opportunities for their Treatment

Future RDI should contribute to filling current knowledge gaps regarding the environmental behaviour of pollutants (emerging pollutants, and emerging risks from “established” pollutants) and their effects on human health; the development of innovative rapid analysis and detection systems; water treatment opportunities; impacts of wastewater reuse on human health; and social behaviour towards emerging pollutants and new water management practices.

CURRENTLY IDENTIFIED NEEDS

- 2.1.1. Developing analytical techniques for groups of substances
- 2.1.2. Understanding and predicting the environmental behaviour of by-products, pollutants and pathogens, including their environmental effects
- 2.1.3. Remediation of pollutants: Developing strategies to reduce pollutants (Disinfection by-products [DBPs], emerging pollutants, pathogens) including their environmental effects



Subtheme 2.2. Minimising Risks Associated with Water Infrastructures and Natural Hazards

Improving the performance, resilience and capacity of water networks to deliver quality water to citizens is a major goal for both European and non-European countries. In this context, the water sector needs to respond to extreme weather events, sea level rise, temperature changes, and changes in the patterns of precipitation through the development and implementation of innovative practices.

🔍 CURRENTLY IDENTIFIED NEEDS

- 2.2.1. Progressing towards flood-proof cities (from small settlements to large suburban areas)
- 2.2.2. Improving the performance of water systems
- 2.2.3. Assessing the impact of water scarcity on safe drinking water

To view the full description of Theme 2, please consult the Water JPI [SRIA 2.0](#) available at www.waterjpi.eu

Theme 2 - Expected Impacts

Impact Level	Description
 Social	Contribute to: • The protection of human health through the provision of safe water; • The protection of water utilities assets; • Alleviating the water challenges inside and outside Europe, where most of the global population increasingly lives in urban areas.
 Economic	Contribute to: • Improved management of urban water systems; • Improved water supply and sanitation, including the replacement of ageing infrastructures to guarantee supply, reduce leakage rates and protect water quality.
 Technological	Contribute to: • Technological innovation in terms of chemical/physical and biological tools (e.g. detection & analyses of pollutants and decision-support systems) to detect and prevent chemical & biological risks and extreme events; • Technological and methodological innovations to improve the performance and resilience to floods and extreme events of urban water systems.
 Environmental	Contribute to: • Reducing the risks associated with emerging pollutants and accidents related to water infrastructure status or management; • Reducing the impacts of floods and extreme events (e.g. storm water retention ponds or water treatment plants); • Reducing the impacts of pollutants on water bodies, ecosystems and food chain.
 Policy	Relevant to: • EU Regulations & Policies, in particular: 7th Environment Action Programme; Water Blueprints; Water Framework Directive; Drinking Water Directive; Floods Directive; Water Scarcity & Drought Strategy; Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) Regulation; Environmental Quality Standards Directive; Priority Substances Directive; Urban Wastewater Treatment Directive; EU Climate Change Adaptation Strategy; Common Agricultural Policy (CAP); • UN Sustainable Development Goals (SDGs), especially: SDG 6 "Ensure availability and sustainable management of water and sanitation for all".

Theme 3

Promoting Competitiveness in the Water Industry



Theme 3: Promoting Competitiveness in the Water Industry

RDI actions under this theme will aim at developing products, processes and services that promote the competitiveness of the European water industry, thereby contributing to fuelling the European economy.

Rationale

The water industry sector is an important contributor to economic growth and job creation. Investments to reach full compliance with EU legislation have significant potential to create new jobs and growth. The waste water management in the goods and services sector represents more than 600,000 jobs, an annual production value of more than €100 billion and an annual added value of about €42 billion (investments, maintenance, operation, export of technology and knowledge)².

Investments in innovative technologies are essential to make the water industry more resource efficient and also contribute to job creation and economic growth. The [Water JPI](#) is committed to prioritising and funding problem-solving RDI supporting the development of market-oriented solutions in Europe and beyond. The Water JPI will seek cooperation with stakeholders at all levels to ensure that research results are swiftly transformed into business opportunities. Activities will focus on aspects, such as new materials and processes, management tools, Information and Communication Technologies (ICT), energy efficiency and supporting key enabling technologies (e.g. in the provision of clean water, wastewater treatment, etc.).

Equally, the Water JPI is fully engaged in the identification and implementation of innovative governance solutions, as well as in removing existing barriers to the marketing of innovative products and services. RDI actions will also focus on social aspects, individual and collective perceptions, public acceptance and resource usage. The Water JPI will favour the transfer of solutions identified in case studies to other sectors and areas of Europe and the world.

Subtheme 3.1. Developing Market-Oriented Solutions for the Water Industry

The Water JPI is committed to developing solutions aimed at ensuring water provision in situations of shortage and achieving the sustainable use of water whilst contributing to enhancing the competitiveness of the European water sector. With this purpose, the Water JPI will support the development of innovative and cost-effective technologies, processes and services with a potential application in Europe and beyond, in the areas of: water distribution and measurement; overall solutions for water treatment and reuse; water desalination; and valorisation of wastewater sewage/sludge and desalination brine.

2. 2016, EC 8th Report on the Implementation status of the Urban Wastewater Treatment Directive

CURRENTLY IDENTIFIED NEEDS

- 3.1.1. Developing smart water technologies (sensor networks and real-time information systems in water distribution and wastewater networks)
- 3.1.2. Delivering technological solutions for water and wastewater treatment
- 3.1.3. Promoting innovative approaches to assets management
- 3.1.4. Supporting the water-energy nexus (namely on efficiency and sustainability)
- 3.1.5. Mitigation of the impact of obtaining energy from the ground and the sea
- 3.1.6. Mitigation of the impact of obtaining water from the ground and the sea
- 3.1.7. Developing and demonstrating water reuse and recycling concepts; recovering products and energy from treatment plants

Subtheme 3.2. Enhancing the Regulatory Framework

New regulatory frameworks aimed at protecting the economic value of European innovations, as well as being able to better anticipate regulation and adaptation needs, are required in order to minimise existing risks when developing or adapting new technologies in the water sector. There is also a need to explore new systems in the fields of education and governance regarding innovations (risk versus reward) in order to remove existing limiting factors.

CURRENTLY IDENTIFIED NEEDS

- 3.2.1. Removing barriers to innovation

To view the full description of Theme 3, please consult the [Water JPI SRIA 2.0](#) available at www.waterjpi.eu

Theme 3 - Expected Impacts

Impact Level	Description
 Social	Contribute to: • Better human health as a result of access to better water quality; • More water resources available for societal uses, particularly in areas of low-quality water, water scarcity and drought vulnerability; • Increased societal acceptance of reused wastewater.
 Economic	Contribute to: • Better understanding of the water–energy nexus and savings made in energy costs; • Supporting the development of major business opportunities inside and outside Europe, laying the foundations for sustained economic growth and industrial leadership; • Sustaining the competitive advantage of Europe; • Supporting the reduction of innovation time to market.
 Technological	Contribute to: • Increased availability of reused wastewater for agricultural and industrial uses; • Increased groundwater storage; • Sustaining the current European leadership in water treatment for urban and industrial purposes.
 Environmental	Contribute to: • Improving the status of water bodies in quantitative and qualitative terms; • More efficient use of our natural resources.
 Policy	Relevant to: • EU Regulations & Policies, in particular: 7th Environment Action Programme; Water Blueprint; Water Framework Directive; Drinking Water Directive; Floods Directive; Water Scarcity & Drought Strategy; “Towards a Circular Economy” Communication; Roadmap to a Resource Efficient Europe; Thematic Strategy on the Urban Environment; Green Infrastructure Strategy; “For a European Industrial Renaissance” Communication, Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) Regulation; Environmental Quality Standards Directive; Priority Substances Directive; Urban Wastewater Treatment Directive; Water Reuse Roadmap, EU Climate Change Adaptation Strategy; Common Agricultural Policy (CAP); • UN Sustainable Development Goals (SDGs), especially: SDG 6 “Ensure availability and sustainable management of water and sanitation for all”, and SDG 9: “Build resilient infrastructure, promote sustainable industrialisation and foster innovation”.

Theme 4

Implementing a Water-Wise Bio-Based Economy



Theme 4: Implementing a Water-Wise Bio-Based Economy

The growth of the bio-economy in Europe is expected to increase pressure on natural resources. The overall goals of the RDI actions under this theme are i) to encourage the sustainable use of water resources; and ii) to safeguard water resources by reducing and limiting pollution.

Rationale

Agriculture is an important source of environmental pressures. In Europe, agriculture accounts for around 33% of total water use and is the main source of nutrient pollution in water.³ Bio-economy refers to an economy based on the use of renewable resources from land and sea, and the conversion of these resources and waste streams into added-value products such as food, feed, bio-based products and bioenergy.

One of the most likely effects of the bio-economy is the intensification of agriculture, forestry and aquaculture with consequent pressure on natural and artificial resources (water, land and various chemicals used in agriculture). The total European bio-economy amounts to €2.1 trillion turnover, and includes the food, feed and beverages sectors which are responsible for roughly half of the turnover. The total employment in the European bio-economy is 18.3 million employees with primary biomass production (agriculture, forestry & fishery) as the biggest contributor (58%).⁴

In the [Water JPI SRIA](#), agricultural water use is considered from the point of view of natural resources, not as a production factor, covering for example, the concepts of sustainable agriculture, good agricultural practices and safe food production.

Subtheme 4.1. Improving Water Use Efficiency for a Sustainable Bio-economy Sector

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 and issues of food security and climate change. These sectors account for the majority of global freshwater usage and, in Europe, are responsible for the vast majority of water use with resource efficiency being required in both rain-fed and irrigated systems. Research is needed in a variety of disciplines, including crop agronomy, forestry, plant breeding and irrigation science.

CURRENTLY IDENTIFIED NEEDS

- 4.1.1. Implementing efficient water use systems and practices for the European and overseas markets
- 4.1.2. Developing integrated water-conserving farming and forestry practices and varieties
- 4.1.3. Setting up water valuing schemes for agriculture and forestry
- 4.1.4. Progressing towards future-proof agricultural water use
- 4.1.5. Ensuring the efficient use of water resources in the bioeconomy sector

3. 2014 European Court Auditors Special Report: Integration of EU water policy objectives with the CAP: a partial success.

4. 2016, Nova-institute: European Bioeconomy in Figures.



Subtheme 4.2. Reducing Soil and Water Pollution

Arising from agricultural, forestry and aquacultural activities, numerous substances are regularly detected in water bodies at levels sufficiently high to affect aquatic (surface, transitional & coastal) and riparian ecosystems. This listing includes nutrients from fertilisers (mainly nitrogen and phosphorus), pesticides and their transformation products, emerging pollutants, microorganisms excreted by livestock and organic pollution from manure. This subtheme will provide site-specific research oriented towards the sustainable intensification of farming and land-use activities.

CURRENTLY IDENTIFIED NEEDS

- 4.2.1. Developing sustainable production systems
- 4.2.2. Designing measures underpinning water and land-use policies
- 4.2.3. Promoting reuse of water in irrigated agriculture and forestry
- 4.2.4. Provision of good quality water resources in support of European bio-economy

To view the full description of Theme 4, please consult the Water JPI **SRIA 2.0** available at www.waterjpi.eu

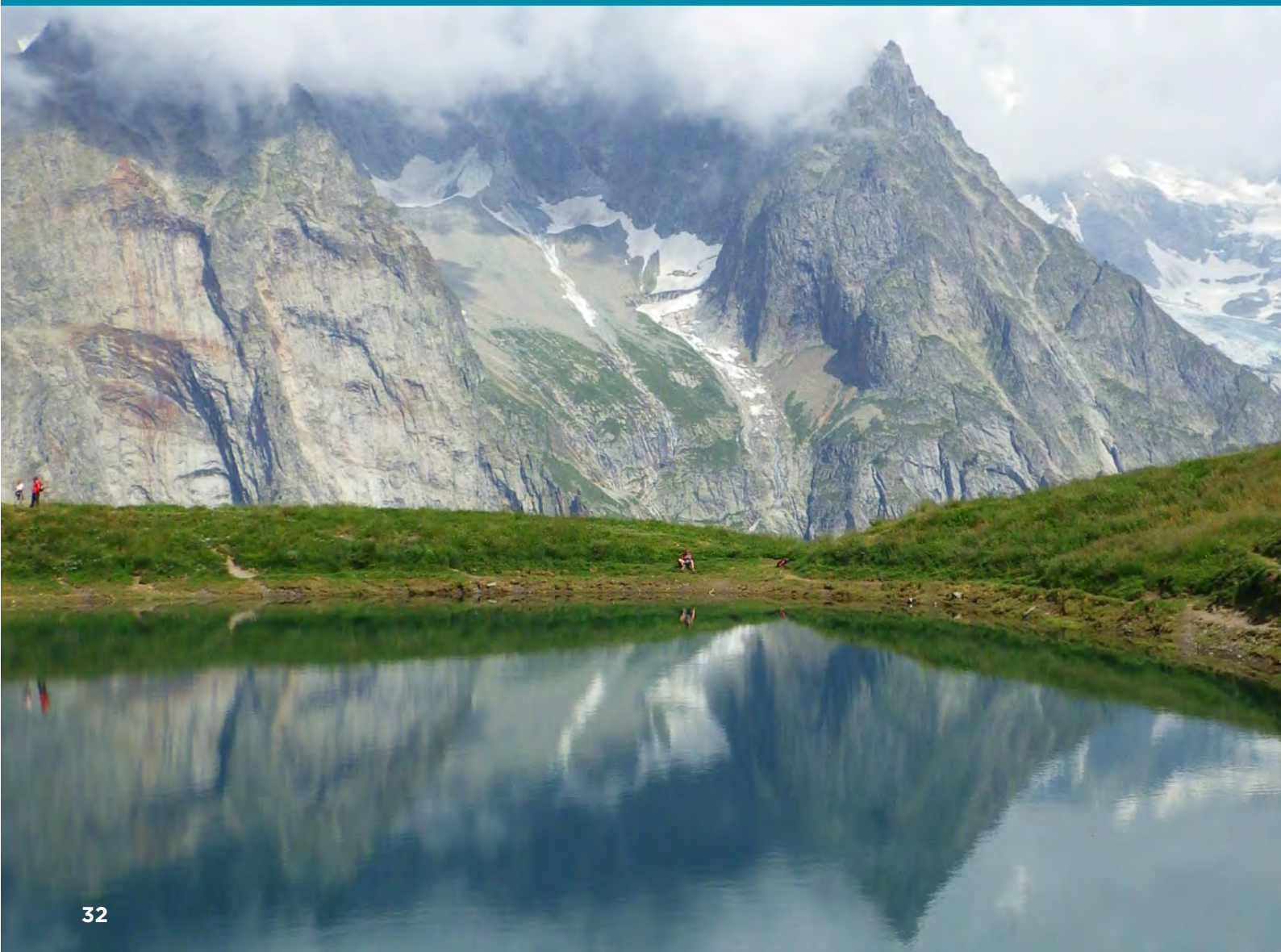
Theme 4 - Expected Impacts

Impact Level	Description
 Social	Contribute to: • More environmentally-friendly sustainable farming operations, which will ensure compatibility between current land use activities and the envisaged deployment of the bio-based economy; • Increased access to water resource with water abstraction and consumption not limiting other societal uses of water; • Understanding and decreasing the combined environmental risks from agriculture, forestry and freshwater aquaculture to human health (environmental exposure from water uses and food); • Protecting humans against health risks if additional water sources, such as reuse, are made available; • Greater awareness of water-reuse opportunities, and of the cost (including energy) of treatment and supply.

Impact Level	Description
 Economic	Contribute to: - Increased productivity of agriculture, forestry and aquaculture sectors if appropriate measures (aimed at reducing soil and water pollution and at enhancing resource efficiency) are taken; - Increased resilience of agriculture and forestry systems and landscape management in a context of highly variable water availability due to climate trends, climate variability and extreme events (floods and droughts); - Creation of more employment opportunities and wealth by the implementation of a water-wise bio-based economy.
 Technological	Contribute to: - Innovative technologies for more sustainable agricultural and forestry practices; - Development of blue biotechnology in freshwater aquaculture; - Innovative water use systems and practices, including precision irrigation technologies (e.g. models, sensors and ICT); - Innovative technologies for the treatment, testing and reuse of wastewater in the agriculture, forestry and freshwater aquaculture sectors; - Innovative technologies for the monitoring of surface and groundwater bodies for effective integrated water management (including water abstraction) in agriculture, forestry and freshwater aquaculture sectors.
 Environmental	Contribute to: - Better use and protection of European natural resources; - Improved environmental water quality of the receiving waters as a result of actions targeting pollution from agriculture, forestry and aquaculture sectors; - Improving soil quality while reducing pollution; - Optimisation of the water-energy nexus (e.g. improving energy efficiency) in the agriculture, forestry and aquaculture sectors.
 Policy	Relevant to: EU Regulations & Policies, in particular: 7th Environment Action Programme; Water Blueprints; Water Framework Directive; Nitrates Directive; "Towards a Circular Economy" Communication; Roadmap to a Resource Efficient Europe; Bio-economy Strategy; Priority Recommendations from the EC Lead Market Initiative for Bio-based Products; "Maximisation of water reuse in the EU (a new EU instrument)" Roadmap; Common Agricultural Policy (CAP); EU Climate Change Adaptation Strategy; Soil Thematic Strategy; UN Sustainable Development Goals (SDGs), especially: SDG 2: "End hunger, achieve food security and improved nutrition and promote sustainable agriculture"; SDG 6 "Ensure availability and sustainable management of water and sanitation for all"; SDG 9 "Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation"; and SDG 12 "Ensure sustainable consumption and production patterns".

Theme 5

Closing the Water Cycle Gap - Improving sustainable water resource management



Theme 5: Closing the Water Cycle Gap - Improving Sustainable Water Resource Management

In many regions of Europe, it may be difficult to reconcile water supply and demand both in terms of quantity and quality. The aim of the RDI actions under this theme is, therefore, to bridge the gap in “supply–demand” by enabling the sustainable management of water resources. Innovative strategies and approaches will be developed where appropriate.

Rationale

Europe is not an arid continent but water scarcity has become a concern for millions of people. In quantitative terms, the availability of water for different uses is threatened by more frequent droughts. However, leakages in water supply infrastructures, greater demand on freshwater for agriculture and the lack of appropriate water-saving technologies will collectively increase pressure on limited water resources in many regions. At the same time, water consumption for public, industry and agricultural use is expected to increase by 16% by 2030. In qualitative terms, water pollution from nutrients, organic matter, heavy metals and other chemical by-products pose a serious threat to water availability.

Research needs to bring together our knowledge in ecology, social sciences, economics, geography, environmental sciences, geosciences and technology. Research is also required to better integrate water policy with other public policies (agricultural, industrial, domestic, urban, regional planning, transport, energy, biodiversity). In a context of rising tensions on water, tools for monitoring, forecasting, information and decisions are needed to anticipate and manage such tensions

and avoid conflict. Required water RDI infrastructures include, for example: experimental catchments and field labs, test basis for new integrated hydrological models or for new sensors, remote observation systems, and also the related database and big data processing applications, etc.

Subtheme 5.1. Enabling Sustainable Management of Water Resources

Integrated models of the entire water cycle, including all compartments (surface soil and groundwater) and water use, have yet to take into account scenarios of water demand and predict the impact of global change (including climate). This work must be based on observation, experimentation and models, including the development of new measuring instruments (for example, sensors and geo-information systems) that are reliable and cost efficient. The application of innovative concepts – such as Managed Aquifer Recharge (MAR), Soil-Aquifer Treatment (SAT), Natural Water Retention Measures (NWRM) or solutions only developed locally - needs to be further explored.



CURRENTLY IDENTIFIED NEEDS

- 5.1.1. Promoting water RDI infrastructures for a better understanding of the water hydrological processes on different scales
- 5.1.2. Promoting adaptive water management for global change
- 5.1.3. Implementing managed aquifer recharge and other natural water retention measures
- 5.1.4. Innovating on practical, low-cost technologies treating wastewater to produce resources safe for reuse
- 5.1.5. Mitigating water stress in coastal zones
- 5.1.6. Securing freshwater in the Mediterranean and Baltic basins
- 5.1.7. Securing freshwater in the Danube

Subtheme 5.2. Strengthening Socio-economic Approaches to Water Management

In a context of tensions regarding the use of water, it is essential to support and develop an interdisciplinary and integrated research approach to better understand such a complex interacting system. Social, economic and governance systems need to address innovative solutions towards sustainable management and improving the balance between water demand and availability.

CURRENTLY IDENTIFIED NEEDS

- 5.2.1. Integrating economic and social analyses into decision-making processes
- 5.2.2. Connecting socio-economic and ecological issues
- 5.2.3. Promoting new governance and knowledge management approaches

To view the full description of Theme 5, please consult the Water JPI [SRIA 2.0](#) available at www.waterjpi.eu

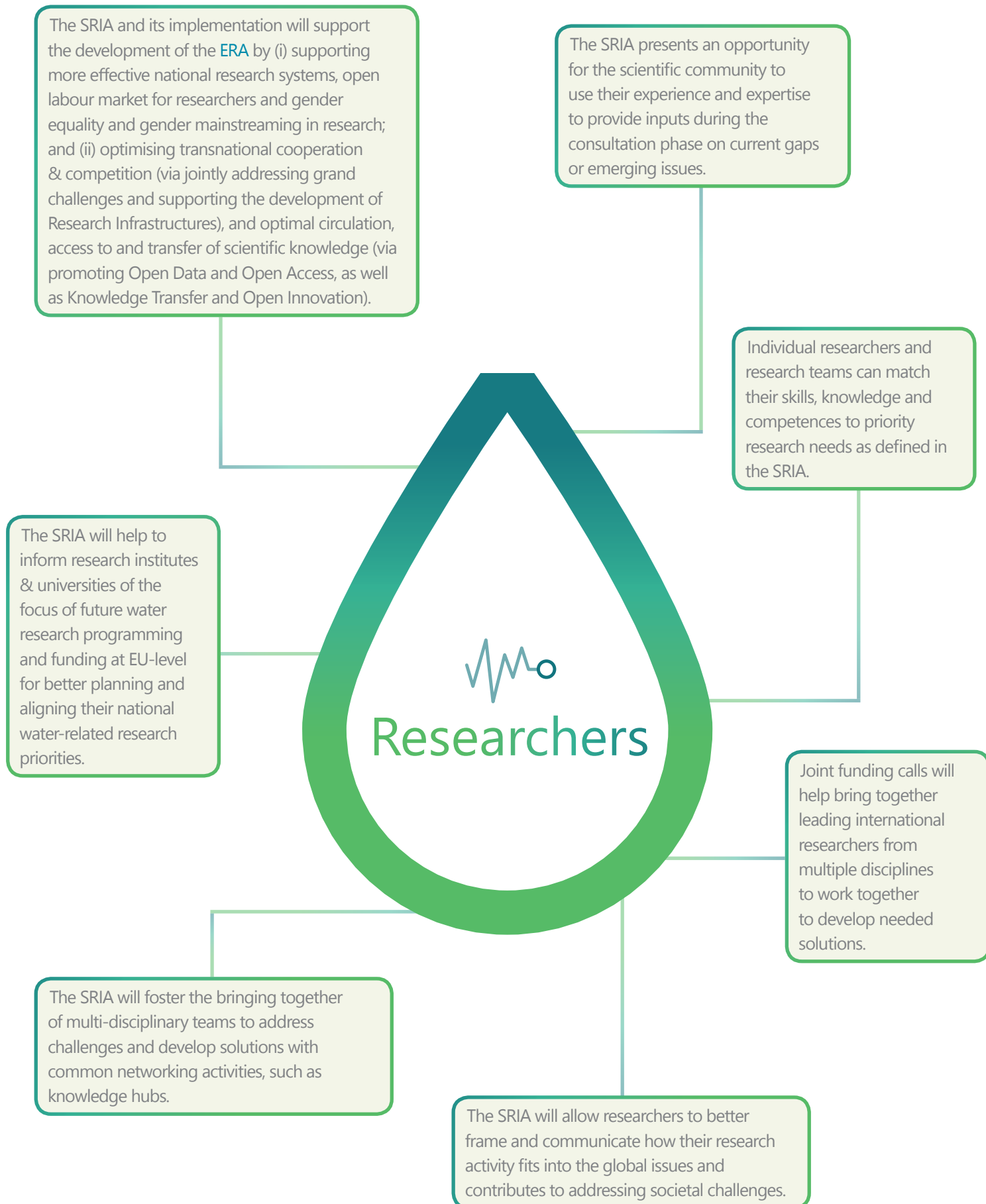
Theme 5 - Expected Impacts

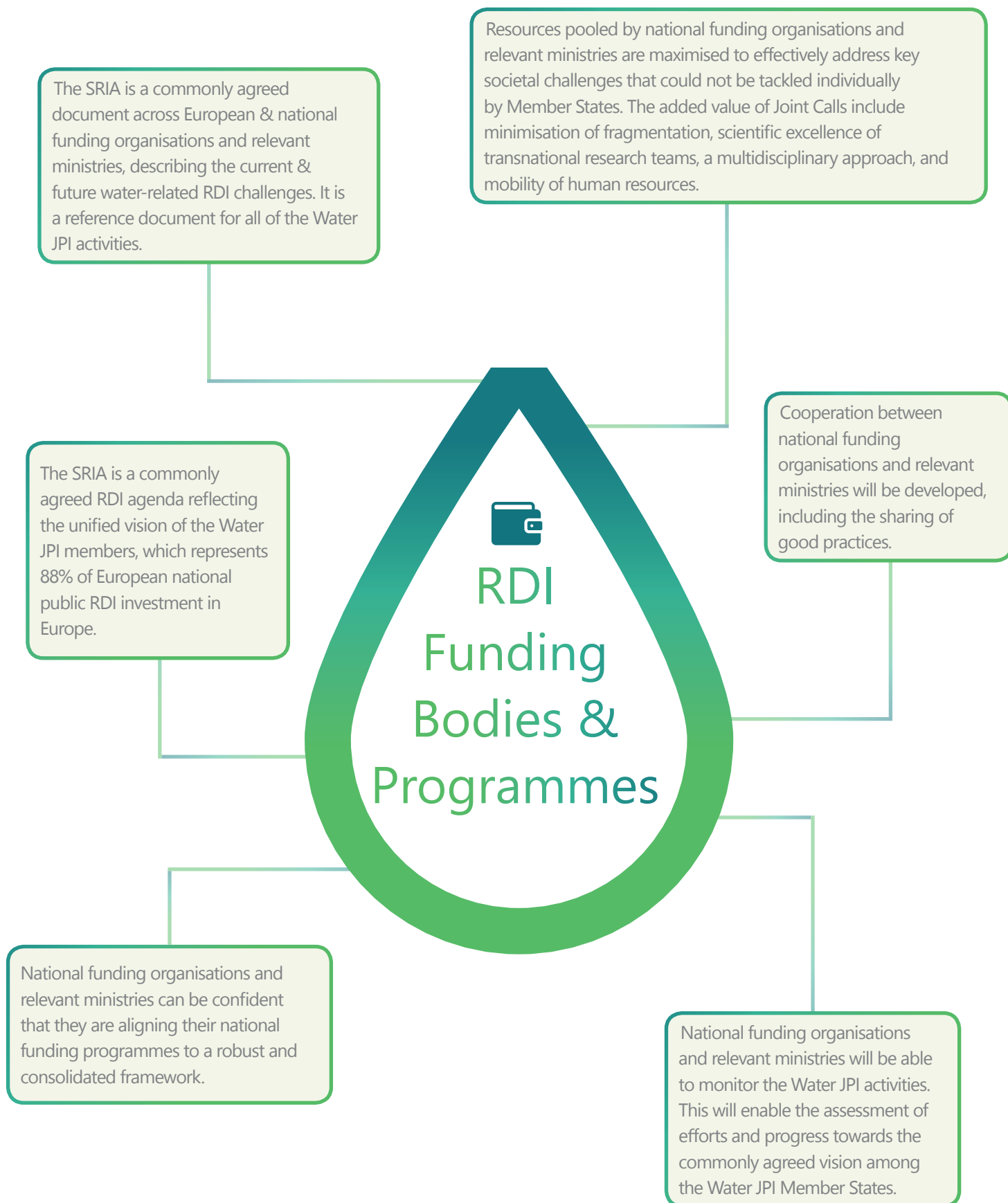
Impact Level	Description
 Social	Contribute to: - Increased public awareness and acceptance of sustainable water resources management; - Protecting humans against health risks if additional water sources, such as reuse, are made available; - Greater awareness of water-reuse opportunities, and of the cost (including energy) of treatment and supply; - New governance in close collaboration with all stakeholders, leading to shared water resources uses and a more effective implementation of water policy; - Improved water management leading to alleviation of societal tensions, as the impacts of water crises are not equally distributed in society, and they can be a source of conflict between different water users.
 Economic	Contribute to: - Supporting the better allocation of water resources between competing user demands, via using economic instruments such as taxes and subsidies can act as incentives for prudent water management; - Mitigation measures and short-term solutions to overcome water scarcity (e.g. water transfers) being included in the assessment of costs related to scarcity or droughts and the assessment of economic vulnerability of users and assets.
 Technological	Contribute to: - Improvement of the techniques for managing of water resources (aquifer recharge, Decision Support Systems [DSS], inter alia) with interoperability of databases, sensors and combined socioeconomic and physical water models; - Development of new instruments, e.g. sensors and geo-information systems; - Development of practical, low-cost technologies treating wastewater to produce resources safe for reuse.
 Environmental	Contribute to: - Maintaining water quantity and quality; - Improving the balance between water availability & demand; - Ensuring a healthy ecosystem by maintaining environmental flows; - Preventing the loss of biodiversity and the degradation of landscape quality.
 Policy	Relevant to: EU Regulations & Policies, in particular: 7th Environment Action Programme; Water Blueprints; Water Framework Directive; Groundwater Directive; Marine Strategy Framework Directive; Floods Directive; Water Scarcity & Drought Strategy; "Towards a Circular Economy" Communication; Roadmap to a Resource Efficient Europe; "Maximisation of water reuse in the EU (a new EU instrument)" Roadmap; Common Agricultural Policy (CAP); UN Sustainable Development Goals (SDGs), especially: SDG 6 "Ensure availability and sustainable management of water and sanitation for all"; SDG 11 "Make cities inclusive, safe, resilient and sustainable"; and SDG 13 "Take urgent action to combat climate change and its impacts".



How can the SRIA be used by:

- **Researchers**
- **RDI Funding Bodies & Programmes**
- **Policy Makers**
- **Water Utilities & River Basin Management Bodies**
- **Enterprises**
- **General Public**
- **European Commission**







The SRIA is developed using an extensive consultation process and, thus, is representative of the views of a multi-stakeholder community who have collectively defined the key water related societal challenges for Europe.

The SRIA is a key milestone in overcoming fragmentation and contributing towards the construction of an ERA in the field of water.

The SRIA is a forward-looking document that sets out the direction needed for future RDI.

Policy makers at all levels (EU, national, regional) should be able to use the SRIA as a reference product for decision making, helping to ensure planned actions are aligned and tackle societal challenges.

The SRIA is aligned and responsive to key policy directives and strategies related to water use and management and the water-related **UN Sustainable Development Goals**. RDI actions listed in the SRIA will promote cross-compliance and a cross-sectoral approach, such as Greening the Common Agricultural Policy and Smart Cities & Communities.

The SRIA and its implementation will help inform appropriate and focused budgetary supports to address the prioritised water related challenges.

The SRIA is a useful tool for communicating to stakeholders and the wider public, the need for investments in water-related RDI.

The SRIA is a living document based on a consultative process. Future development of the SRIA will allow European Water Utilities & River Basin Management Bodies to contribute during the consultation process, ensuring that their interests, operational needs and resource requirements are appropriately represented in future RDI planning.

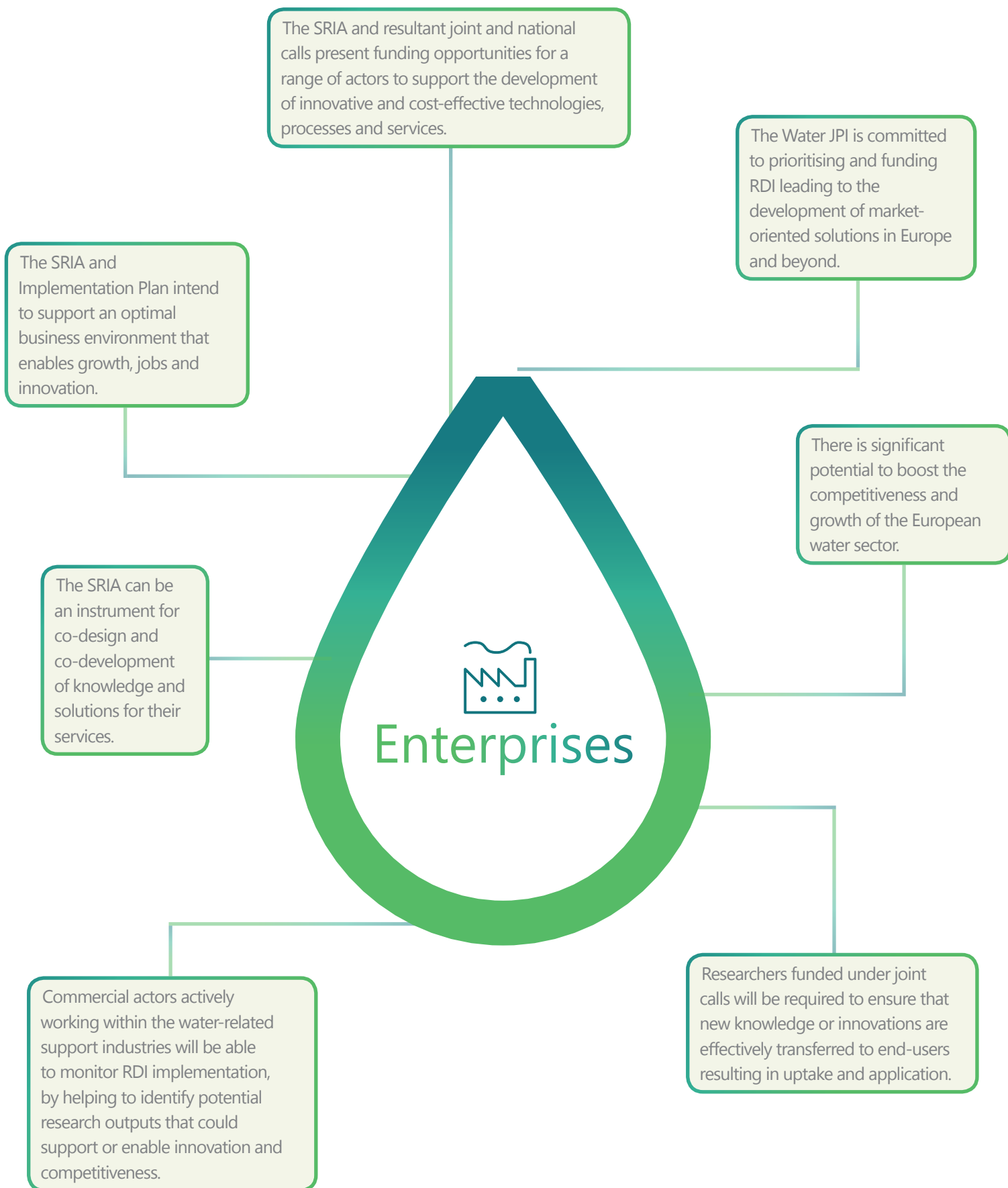
The implementation of the SRIA intends to be enabling by ensuring suitable framework conditions (regulatory, economic, societal) that support the development of market-oriented solutions in Europe and beyond.



Water Utilities & River Basin Management Bodies

The SRIA and resultant joint and national calls present funding opportunities, in which Water Utilities & River Basin Management Bodies can participate. They can test the best suited technologies/approaches generated by the Water JPI funded research.

Stakeholders actively working within water enterprises will be able to monitor RDI implementation helping to identify potential research outputs that could support or enable innovation and competitiveness.







Added Value of the SRIA

The Water JPI SRIA ...



Enterprises

... is an instrument for co-design and co-development of knowledge and solutions, which helps to identify potential research outputs that could support or enable innovation and competitiveness.



RDI Funding Bodies & Programmes

... is a guide to where water-related RDI funding should be focused at EU- and National-level. It is a commonly agreed vision and a reference for all of the Water JPI activities.



Researchers

... provides an insight into the focus of future water research funding at EU level, bringing together researchers from multiple disciplines to work together to develop solutions.



Water Utilities & River Basin Management Bodies

... will ensure suitable framework conditions (regulatory, economic, societal) supporting the development of market-oriented solutions in Europe and beyond.



European Commission

... supports the development of the ERA, reduces fragmentation of water RDI efforts across Europe, and will provide underpinning knowledge and evidence for supporting the implementation of related EU policies.



General Public

... supports the provision & security of safe water; and open access to information.



Policy Makers

... is a reference document for decision making, which is aligned & responsive to key policy directives and strategies related to water use and management.

Our Mission

The Water Joint Programming Initiative aims at tackling the ambitious grand challenge of “Achieving sustainable water systems for a sustainable economy in Europe and abroad”. Water is vital and essential for smart, sustainable and inclusive growth. Better results and optimisation of public funds are obtained through the alignment of water research agendas and programmes at European and international level.



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