2019 WATER JPI EXPERTS WORKSHOP

22–23 October 2019, Dublin, Ireland

Workshop Proceedings

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DISCLAIMER

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EXECUTIVE SUMMARY

Since its inception in December 2011, the European Water Joint Programming Initiative (JPI), "Water Challenges for a Changing World", has achieved, among other accomplishments, the alignment of national water research and innovation agendas and creation of a common vision and a robust Strategic Research and Innovation Agenda (SRIA). The fostering of better coordination and cross-border collaboration is at the very core of the Water JPI, which aims to tackle common societal challenges that cannot be addressed by individual European, and now international, countries alone, and in turn contribute to the European research area and the grand challenge of "achieving sustainable water systems for a sustainable economy in Europe and abroad". To date, the Water JPI has 23 partner countries and three observer countries, plus the European Commission. This accounts for over 88% of annual European public expenditure in the area of water across research, development and innovation.

The SRIA 2.0 set out specific research priorities and actions and identified knowledge needs/gaps in specific and defined research areas. The SRIA is a "living" document that will be kept updated. To this end, the Water JPI is currently updating its Vision and SRIA.

The Water JPI Experts Workshop was held in Dublin, Ireland, on 22–23 October 2019. The purpose of the workshop was to discuss and identify the best instruments to be included under SRIA 2025 to achieve the Water JPI objectives and targets moving forward. The workshop gathered 88 participants in total and included members of the Water JPI Governing and Advisory Boards, ministry/policymaking departments, other European Union initiatives, the research community and enterprises. The main aim of the workshop was to inform the drafting of the SRIA 2025 by:

- identifying what may still be valid from the current SRIA (version 2.0, 2016);
- collating information and feedback on the proposed research, development and innovation priorities (high level) under each of the new proposed themes;
- reviewing research infrastructure needs/gaps;
- identifying what may be missing; and
- discussing expected impacts and Vision 2030 key performance indicators and proposed implementation models.

This document provides the proceedings of the expert consultation workshop. The next steps will include the consolidation and analysis of all of the consultation processes (six stages) and drafting of the SRIA 2025 and Vision 2030. Recommendations will also be addressed to the Governing and Advisory Boards on the remaining challenges.

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LIST OF ABBREVIATIONS

Term	Meaning
AB	Advisory Board
AMR	Antimicrobial resistance
ANR	Agence Nationale de la Recherche
ARC	Aqua Research Collaboration
CEC	Contaminants of Emerging Concern
CSA	Coordination and Support Action
DCU	Dublin City University
DG	Directorate-General (of the European Commission)
EC	European Commission
EPA	Environmental Protection Agency
ERA-NET	European Research Area Network
EU	European Union
EurAqua	European Network of Freshwater Research Organisations
EWA	European Water Association
FACCE-JPI	Joint Programming Initiative on Agriculture, Food Security and Climate Change
GB	Governing Board
GDPR	General Data Protection Regulation
JPI	Joint Programming Initiative
MAR	Managed aquifer recharge
MS	Member State
NBS	Nature-based solution
NWRM	Natural water retention measure
PRIMA	Partnership on Research and Innovation in the Mediterranean Area
RDI	Research, development and innovation
RIS3	Research and Innovation Strategies for Smart Specialisation
SDG	Sustainable Development Goal
SEA	Strategic Environmental Assessment
SRIA	Strategic Research and Innovation Agenda
UN	United Nations
UNEP	United Nations Environment Programme
Water Europe	The new name of the Water Supply and Sanitation Technology Platform
WEFE	Water–Energy–Food–Ecosystems (Nexus)
WFD	Water Framework Directive
WssTP	Water Supply and Sanitation Technology Platform

1 INTRODUCTION

As the global climate crisis is inextricably linked to the water cycle and "water stress", it is expected invariably to increase the occurrence of extreme weather events, which will in turn reduce water availability and quality. We live in precarious times: as the global temperature rises, the predictability of water quality and quantity diminishes. Water stress is multi-factorial. Population expansion, socio-economic development, urbanisation and industrial development are examples of how pressure can be put on energy-intensive water, as more water needs to be pumped, treated and transported. The demand becomes greater than the available amount. In fact, annual economic water usage in Europe accounts for 243,000 hm^3. Over 140,000 hm^3 is returned to the environment; however, it often contains impurities and hazardous chemicals.[1] Not only has the water stress affected society, but also biodiversity and the environment have shown decline. Water stress can contribute to global biodiversity loss as up to 1 million species depend on freshwater habitats.[2]

Several significant policy developments within the Water Framework Directive (WFD) (2000/60/EC), namely the "Fitness Check" [to future-proof European Union (EU) water legislation by evaluating the performance of key water sector directives in all Member States, i.e. the WFD, including its "daughter directives", the Groundwater Directive (2006/118/EC) and the Environmental Quality Standards Directive (2008/105/EC), as well as the Floods Directive (2007/60/EC)][3] and "Reality Check" [implementation of the Bathing Water Directive (2006/7/EC), with a focus on the "practical challenges linked to monitoring and assessing of bathing waters"], will direct and identify areas that need improvement or modification of the legislation, which in turn will inform priority areas of research and innovation.

The Water Joint Programming Initiative (JPI), "Water Challenges for a Changing World", was launched in 2010 with the aim of tackling the ambitious challenge of achieving sustainable water systems for a sustainable economy in Europe and beyond. With a view to strengthening Europe's leadership and competitiveness on water research and innovation, the European Council formally endorsed the initiative in 2011. The main aim of the Water JPI is to tackle societal challenges that cannot be addressed by single countries alone, and in turn contribute to the European research area. Europe invests over 500 million euros per year in public research and innovation in water. The Water JPI ensures that there is a maximum return on this investment by implementation of strategic activities such as thematic themes (Knowledge Hubs and networking workshops), joints calls, exploratory workshops and the monitoring of Water JPI-funded projects. To date, the Water JPI has 23 partner countries and three observer countries, plus the European Commission (EC). This accounts for over 88% of annual European public expenditure in the area of water across research, development and innovation (RDI) (JPI Mapping exercise in 2014).

This report contains the proceedings of the Experts Workshop held in Dublin, Ireland, on 22–23 October 2019. The aims of the workshop were to collect information and priorities regarding research and innovation needs under the new structure of Vision 2030 and the Strategic Research and Innovation Agenda (SRIA) 2025, discuss and identify best instruments to be included under the SRIA 2025 to achieve the Water JPI objectives and targets moving forward, and agree on the contents of the SRIA 2025. The workshop is just one of the steps in a sequence of six consultative processes, with each step helping to inform and shape the direction of the SRIA 2025 and Vision 2030.

1 EEA (European Environment Agency), 2018. *Water Use in Europe – Quantity and Quality Face Big Challenges*. Available online: https://www.eea.europa.eu/signals/signals-2018-content-list/articles/water-use-in-europe-2014

2 IUCN (International Union for Conservation of Nature), 2013. *Biodiversity and Water: Two of a Kind*. Available online: https://www.iucn.org/content/biodriversity-and-water-two-kind

3 EC (European Commission), 2017. Fitness Check of the Water Framework Directive and the Floods Directive. Available online: https://ec.europa.eu/info/law/better-regulation/initiatives/ares-2017-5128184_en

2 METHODOLOGY

The 2-day workshop was organised by the Irish Environmental Protection Agency (EPA), with the support of the WaterWorks2014 Secretariat (Agencia Estatal de Investigación, AEI), the Water JPI Secretariat and Coordinator (Agence Nationale de la Recherche, ANR), and RPS Group Ltd consultants. The workshop represents stage 6 of a six-stage consultation process and was held in the Radisson Blu Hotel in Dublin, Ireland, on 22–23 October 2019.

The online communication tool Slido was used to allow attendees to provide feedback during the event. The Slido tool was left open for a further week post event as time was limited to provide the 30-minute open discussion wrap-up at the end of day 1 and day 2 for the breakout sessions. This allowed attendees to provide further reflective comments, which are included in these proceedings.

2.1 Workshop Aims and Objective

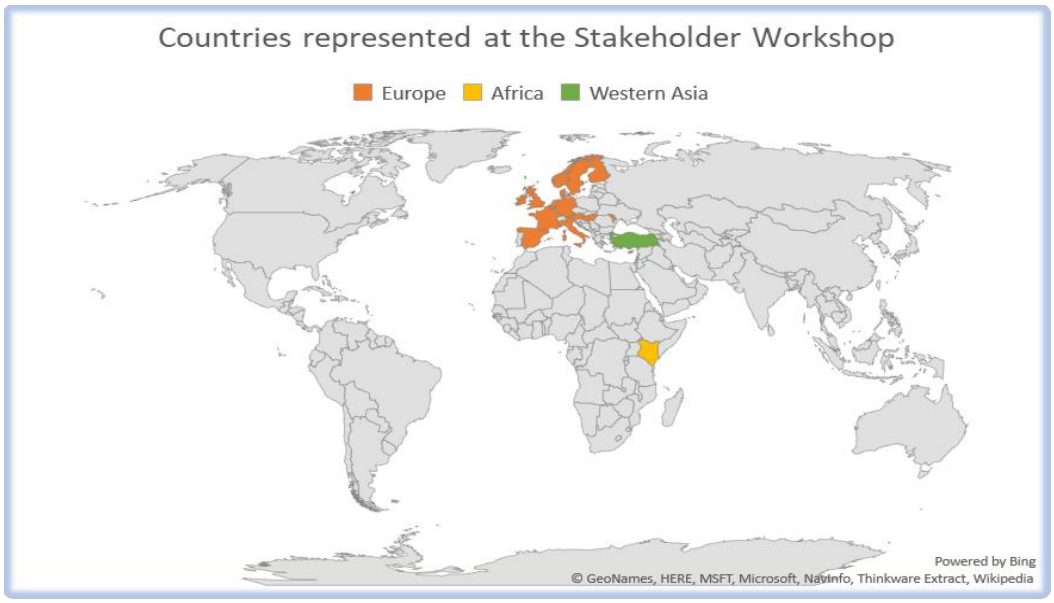
The aims of the workshop were to:

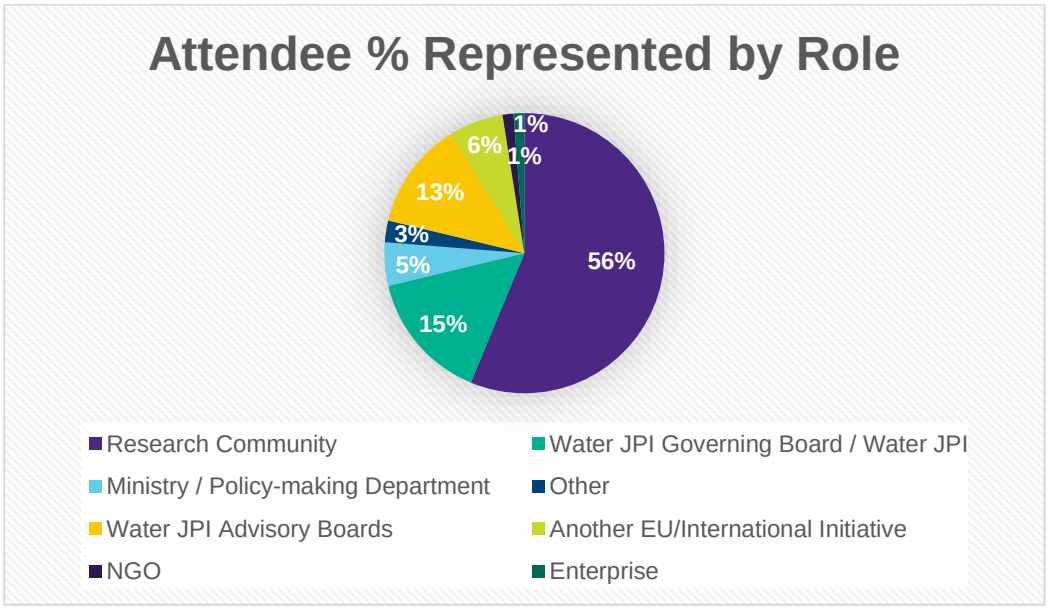
- inform the drafting of the SRIA 2025;
- collate information and feedback on the proposed RDI priorities (high level) under each of the new proposed themes;
- identify what may be missing;
- identify what may still be valid from the current SRIA;
- discuss expected impacts and Vision 2030 indicators; and
- review research infrastructure needs/gaps.

This workshop was targeted at experts from the research community, funders and key stakeholders in the water sector (e.g. policy, river basin managers, enterprises). The main objective of the workshop was to agree on the content of the SRIA 2025.

2.2 Attendance

In total, 88 out of the 110 people who registered attended the workshop over the course of the 2 days. Attendees included members of the Water JPI Advisory Boards (ABs) and Governing Board (GB), researchers, members of water utility and river basin management bodies and members of other EU/international initiatives. Twenty countries out of the 23 JPI member countries were represented. The list of attendees is provided in Appendix A.





2.3 Workshop Programme

The full workshop programme is available in Appendix B. The 2-day workshop included four plenary sessions and two sets of four parallel breakout discussion group sessions. During the breakout group discussions, the participants were split into four different groups according to their chosen theme and their area of expertise. The Workshop Documentation Package was circulated to all attendees in advance of the workshop and included:

- a discussion document on the proposed Water JPI Vision 2030;
- a discussion document on the proposed Water JPI SRIA 2025; and
- a template to be completed during the breakout sessions.

The workshop was opened by Alice Wemaere (EPA Ireland) and the first plenary session was chaired by David Schwesig (Aqua Research Collaboration, ARC, France).

Plenary Session 1, "Setting the Scene", provided an introduction to the expected outcomes of the workshop, the Water JPI initiative and its key achievements, the consultative process in developing and writing the Vision 2030 and SRIA 2025 and the common vision between the Water JPI and the Joint Programming Initiative on Agriculture, Food Security and Climate Change (FACCE-JPI). A question and answer session followed.

Plenary Session 2, "The Wider Context", was chaired by Fiona Regan [Dublin City University (DCU) and Water JPI AB member]. Presentations were given by keynote speakers (see Appendix C) on key water research priorities, water policy developments and water research, and Horizon Europe. A question and answer session followed.

For the two breakout sessions, the workshop participants were split into four groups according to their preferred topic and expertise. Each attendee had selected one of the four breakout sessions when registering. The four breakout sessions were:

1. Theme A: Ecosystems;
2. Theme B: Health and Wellbeing;
3. Theme C: Water Value and Usage; and
4. Theme D: Sustainable Water Management.

Each theme was assigned a chairperson to outline the purpose of the meeting and regulate the meeting in terms of pace, time and facilitating constructive discussion. A rapporteur was assigned to ensure that the proceedings and outcomes of the meeting were clearly recorded. The moderators were assigned to organise the set -up of the sessions.

The aims of Breakout Session Part 1 were to examine, identify and discuss key RDI priorities for each of the Water JPI-proposed new research themes 2020–2025.

For Breakout Session Part 1, each group was asked to discuss the following questions:

- Question 1: Which priorities of the SRIA 2.0 are still relevant?
- Question 2: Do you agree with the new suggested priorities (based on the consultation process)?
- Question 3: Are there any other priorities? Provide the rationale.
- Question 4: Grouping into subthemes.

The aims of Breakout Session Part 2 were to examine, identify and discuss:

- feedback received during the 30-minute exchange between groups;
- the expected impacts of research priorities (positive and negative);
- cross-cutting issues;
- research infrastructure barriers/gaps and identify additional needs.

For Breakout Session Part 2, each group was asked to discuss the following questions:

- Question 1: Define the expected impacts (positive and negative) in respect of:
  - policy level [European Directives, implementation of United Nations (UN) Sustainable Development Goals (SDGs) (all indicators)];
  - the environment;
  - the economy;
  - technology; and
  - society.
- Question 2: Identify any other cross-cutting issues and provide the rationale.
- Question 3: Identify any other drivers/enablers and provide the rationale.
- Question 4: What are the barriers that limit access to European/national research infrastructure?
- Question 5: What additional research infrastructure is needed to support European water-related research up to 2030 and beyond?

Plenary Session 3 was chaired by Antonio Lo Porto (Water JPI AB member) and provided an opportunity for each rapporteur to present a summary of the group consensus outcomes of breakout sessions 1 and 2 and for attendees to provide comments/feedback.

Plenary Session 4 was split into two parts:

1. Part 1, "General Discussion", included discussion around the cross-cutting issues, overlaps and synergies, the proposed structure of the SRIA, and targets for the Vision 2030.
2. Part 2, "Shaping the Horizon Europe Water4All Partnership", included a presentation from Panagiotis Balabanis [Directorate-General (DG) for Research and Innovation, EC] and Dominique Darmendrail (Water JPI Coordinator, France) on the content and development of the Horizon Europe Water4All Partnership.

The biographies of all of the chairpersons and speakers are provided in Appendix C, and presentations are available at the following link.

3 PROCEEDINGS

3.1 Plenary Session 1: Setting the Scene

The aims of the first plenary session were to outline the Water JPI's role and key achievements, the proposed directions for the new Vision 2030, and the commonalities between the Water JPI and the FACCE-JPI. The first plenary session was led by **Alice Wemaere** (EPA Ireland) and chaired by **David Schwesig** (ARC, France). The full biography of the chairperson and the speakers' biographies and presentations are provided in **Appendix C** and are available at the following link.

Dominique Darmendrail (Water JPI Coordinator, ANR, France) presented on the "Water JPI and its Key Achievements". The presentation highlighted the Water JPI key achievements, such as the various joint transnational calls resulting in 70 research and innovation projects, the production of a policy brief, the Water Thematic Annual Programming (TAP) Action on Ecosystem Services initiative and the first Knowledge Hub on Contaminants of Emerging Concern (CECs).

Olivier Gaillot (Director of Environment, Energy and Resources, RPS Group Ireland) presented on the "Water JPI Vision 2030, Proposed Directions". The consultative process is composed of six stages, with each stage feeding into the next. The final stage, the Experts Workshop, will consolidate and provide direction for the overall objective, which is to draft the Vision 2030 and SRIA 3.0.

Heather McKhann (FACCE-JPI Coordinator) presented on the "Common Vision between Water JPI and the Agriculture, Food Security and Climate Change (FACCE) JPI". Established in 2010, with a membership of 23 European countries and New Zealand, the FACCE-JPI has a research agenda that focuses on the intersection between agriculture, food security and climate change. The common vision between the two JPIs is the connection between water resources and food production. Both JPIs also have similar structures, with a focus on European collaborations and working with third parties. The key objective of the Paris Workshop in September 2019 was to strengthen the bond between the FACCE-JPI and the Water JPI.

3.1.1 General Discussion

The question and answer session was led by **David Schwesig** (ARC, France), supported by **Alice Wemaere** (EPA Ireland), **Dominique Darmendrail** (Water JPI Coordinator, ANR, France) and **Heather McKhann** (FACCE-JPI Coordinator). Key points discussed during this session are summarised below.

One point raised was that there was a need to clearly outline and define the Vision 2030. The response was that it has been defined "together for a water-secure world", with the four research themes for the SRIA coming out of the Water JPI AB and GB workshop held in May 2019 in Berlin. Another point was that water quality was not mentioned at a previous FACCE-JPI–Water JPI workshop for preparing the common vision document to be submitted to the GBs of both initiatives. It was noted in response that water quality is included under the pollutants section and that this aspect was a key topic in the 2016 Joint Call.

In relation to knowledge gaps, a general comment was made in relation to the FACCE-JPI presentation and the current water nexus, noting how science and scientific concepts can and should be communicated to the public, as this is a leading concern for addressing the knowledge gaps of policymakers and scientists, and the

general public. Linked to this question was how the UN SDGs could be met and the time that could/should be invested into areas of public research.

There was a discussion around the role of scientists as communicators of knowledge and if it is the job of the scientist to communicate to the public. Some scientists claimed that it is not their job to communicate to the public but rather that it is a responsibility of disciplines such as the humanities, and that investing in new knowledge and using knowledge transfer are key resources to fill these gaps. It was mentioned that scientists should have the skills to engage and be capable of adequately communicating. It was also mentioned that the WFD Fitness Check does not address how new knowledge is being used and consideration should be given to how best to address public needs and cross-cutting issues. Other discussion points highlighted the issues in relation to water/wastewater infrastructure and the public perception with regard to the cost support for such infrastructure and also the maintenance required needs to be made clearer.

The interactive question and answer and polling platform Slido was used to encourage further participation and the exchange of ideas. The results from the Slido platform feedback, including the post-event feedback, can be found in **Error! Reference source not found.**.

The following key discussion points were raised:

- Will digitisation become more of a trend for the water sector? In response, it was noted that this is cropping up more and more but that information technologies will not solve all problems and that social innovation is also needed.

- Are transdisciplinary approaches/methods being used as part of the SRIA drafting/revision process? In response, it was noted that this is being catered for. This was also highlighted in the call announcements developed from the research priorities set in the SRIA.

A comprehensive list of questions raised in session 1 is available in **Error! Reference source not found.**.

There was discussion around the science–policy interface, with questioning of the Water JPI consultation in terms of how international organisations, among others, have been brought into the SRIA revision process. It was noted in response that one of the consultation stages involves shortlisting stakeholders, as suggested by the Stakeholders Advisory Group (SAG) and Scientific and Technological Board (STB), which are the ABs of the Water JPI. The response highlighted that other organisations outside Europe, e.g. the Food and Agriculture Organization of the United Nations (FAO) and stakeholders from other countries, such as Turkey and South Africa, were invited to provide comments/input. This allowed for international balance. It was also noted that the JPI ABs hold UN and international institutions as members.

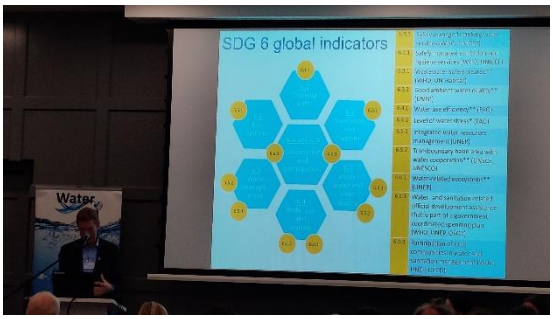
Groundwater was also raised as an important topic that may require greater attention with regard to research efforts and JPI consultation. There was an also additional call for engagement with other JPIs and SDG indicators. Cooperation between the various JPIs is also required when relevant.

3.2 Plenary Session 2: The Wider Context

The aims of the second plenary session were to set out the key water research priorities in the context of the UN SDGs, outline the key developments in water policy and outline the place of water research in the upcoming Horizon Europe EU Framework Programme. The second plenary session was chaired by **Fiona Regan** (DCU and Water JPI AB member) and included three keynote presentations. The speakers' biographies are provided in **Appendix C** and the presentations are available at the following link.

'Score card' for discussion	Adequate / Improve / Critical	Tracking	Understand	Solutions	Implement
6.1 Drinking water supply					
6.2 Sanitation					
6.3 Water quality					
6.4 Productive uses					
6.5 Water management					
6.6 Ecosystems					

Missing: 6.a (cooperation) and 6.b (participation) – both linked to target 6.5 IWRM Interlinkages and Nexes: Food, Energy, Health, Climate, Source-to-Sea, ...



Peter Koefoed Bjørnsen [United Nations Environment Programme (UNEP)–DHI Centre for Water and Environment, Denmark] presented on the "Key Water Research Priorities in the context of the UN SDGs". The presentation highlighted the water and sanitation linkages across the 2030 Agenda for Sustainable Development. The interlinkages include social, economic and environmental dimensions. An overview of SDG 6 and its targets was also provided, which included a "score card" for discussion that ranked all of the targets according to their status of priority. Research priorities in water were categorised according to tracking status progress, understanding cause and effect, providing solutions and accelerating implementation. Each category is aligned to SDG target areas in terms of the level of urgency (adequate, improve and critical). Critical areas of priority identified include research in sanitation and implementation, water quality and tracking, productive uses and implementation, and ecosystem tracking and understanding.

Hans Stielstra (Water Unit, DG Environment, EC) presented (via video link) on "Key Water Policy Developments" in the EU. Highlights of the presentation included the Commission Report on the second River Basement Management Plans and the status of Europe's surface and groundwater and the main environmental pressures. The proposed water reuse regulation was also discussed. By 2025, it is envisaged that potentially circa 6 billion m^3 per year of water will be reused. Minimum requirements will be set for agricultural use. A strategic approach to pharmaceuticals in the environment was discussed. The main objectives are to identify actions to be taken or further investigated to address potential risks from pharmaceutical residues in the environment, encourage innovation and promote the circular economy, identify remaining knowledge gaps and ensure that actions to address the risk do not jeopardise access for humans and animals to safe and effective pharmaceutical treatments. The presentation also discussed the Fitness Check exercise of the WFD, as well as the Drinking Water Directive and Urban Waste Water Treatment Directive. The research needs identified relate to chemical pollution [pharmaceuticals, antimicrobial resistance (AMR), nanomaterials and microplastics] in water (better understand, monitor and evaluate risk). Other areas identified for research were water reuse, sludge reuse, groundwater and drinking water.

"Water Research and Horizon Europe" was presented by Panos Balabanis (DG Research and Innovation, EC) (via video link). The EC's proposal for Horizon Europe is an ambitious €100 billion research and innovation programme to succeed Horizon 2020. The Commission has started preparations for the implementation of Horizon Europe. The new European Innovation Council will support innovations that are considered to being breakthrough and having a disruptive nature and scale-up potential that are too risky for private investors. The framework is built around three pillars: (1) the Open Science Pillar, (2) the Global Challenges Pillar and (3) the Open Innovation Pillar. The Open Science Pillar will continue to reinforce research and innovation through the Marie Skłodowska-Curie Actions, European Research Council (ERC) and various research infrastructures. Pillar 2, Global Challenges and European Industrial Competitiveness, will focus on "societal challenges" and "enabling industrial technologies", in line with EU and global policy priorities, while "accelerating industrial transformations". Pillar 3, Innovative Europe, aims to promote and deploy "disruptive and market-creating innovations".

As part of pillar 2, six clusters with a link to water research will be implemented through usual calls, partnerships and missions. These are:

- Health;
- Culture, Creativity and Inclusive Society;
- Civil Security for Society;
- Digital, Industry and Space;
- Climate, Energy and Mobility; and
- Food, Bio-economy, Natural Resources, Agriculture and Environment.

The Horizon missions were discussed in length. There are five proposed missions:

1. Adaptation to climate change, including societal transformation;
2. Cancer;
3. Healthy oceans, seas, coastal and inland waters;
4. Climate-neutral and smart cities; and
5. Soil health and food.

There is also a new approach to European partnerships, with one partnership dedicated to water (Water4All), which will be discussed during Plenary Session 4. The aim is to deliver on global challenges and industrial modernisation through concerted research and innovation efforts.

3.2.1 General Discussion

The question and answer session was led by Fiona Regan (Professor of Chemical Science at DCU and Director of the DCU Water Institute), Peter Koefoed (Director of the UNEP–DHI Centre for Water and Environment), Hans Stielstra (Water Unit, DG Environment, EC), Dominique Darmendrail (Water JPI Coordinator) and Alice Wemaere (EPA Ireland). The key points discussed during this session are summarised below.

Discussion included using more nature-based solutions, such as ecosystems and their functions, to deal with nutrient levels. The importance of reaching WFD targets and UN Sustainable Development Goals was also highlighted, as well as the fact there are still open issues related to integration of water resource management. Another point raised was that phosphorus is no longer on the agenda for the DG Environment.

Regarding the proposed missions for Horizon Europe, it was asked how the missions will connect to European partnerships. In response it was summarised that, in order to do so, its work packages and calls would have to be implemented and cross-cutting calls and missions incorporated. A second response stated that it was fair to say that things have yet to be determined.

A final point raised was that ecosystems are being lost but that there is a loss of human resources and a lack of investment regarding this issue. In response it was stated that there has been a loss of biodiversity and also major economic losses, which is largely a result of the inefficient agricultural practices. It was emphasised that billions of euros of resources are needed and that this is mainly a result of the costs associated with monitoring.

The detailed questions and answers and points discussed during this session are included in Error! Reference s ource not found. (Plenary Session 2: The Wider Context – Q&A).

3.3 Breakout Sessions

This section provides a summary of outcomes/feedback following the breakout group sessions. Biographies of the chairpersons are provided in Appendix C. Each theme subsection is structured as follows:

- Research theme:
  - Theme A: Ecosystems;
  - Theme B: Health and Wellbeing;
  - Theme C: Water Value and Usage;
  - Theme D: Sustainable Water Management.
- Attendees
- Overview of the table discussions.
- Overall outcomes and consensus reached by all attendees.

3.3.1 Theme A: Ecosystems

3.3.1.1 Attendees

In total, 16 attendees participated at the breakout group session for Theme A: Ecosystems. They represented the research community, the Water JPI ABs, other EU/international initiatives and water utility/river basin management authorities. Six countries were represented: Cyprus, Denmark, France, Finland, Ireland and Spain.

The session was chaired by Xavier La Roux (chairperson of BiodivERsA, France). Niamh O'Neill (RPS Group Ireland), Aimie Cranch (EPA Ireland) and Nathalie Dörfliger [BRGM/AllEnvi (L'alliance nationale de recherche pour l'environnement), France] acted as moderators. Niamh O'Neill also acted as the room rapporteur.

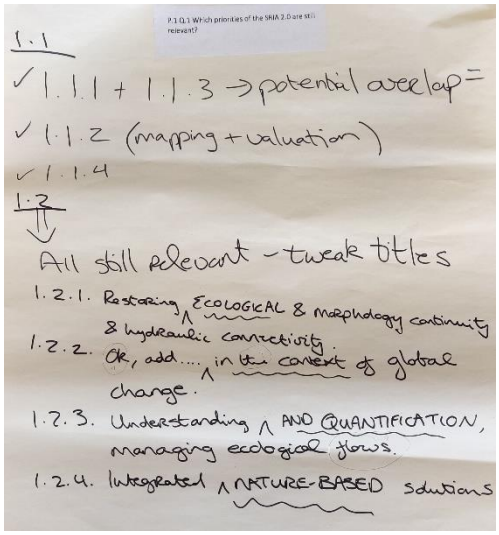
3.3.1.2 Overview of the Table Discussions

As part of breakout group session 1, the participants were divided into three groups and asked to consider the key RDI priorities for each of the Water JPI-proposed new research themes to 2025 (focusing on the research priority level rather than the topic level) and agree on/group them into subthemes and key performance indicators/impacts (expected trade-offs). A moderator was assigned to each table and the discussion feedback was relayed to the rapporteur. The majority of participants agreed that the current priorities of the SRIA 2.0 are still relevant but that a number of modifications would better reflect the scope and focus of the priorities.

Question 1. Which priorities of the SRIA are still relevant?

The research priorities listed in the SRIA 2.0 that were found to be still relevant were as follows:

Table 1



- 1.1.1 (SRIA 2.0 – Developing approaches for assessing the ecological functioning of ecosystems). Should be reworded as "Developing approaches for assessing the structure and function and optimise ecosystem services".

- 1.2 (SRIA 2.0 subtheme – Integrated approaches: developing and applying ecological engineering and ecohydrology). Should be reworded as "Developing and applying ecological engineering and ecohydrology".

- 1.2.1 (SRIA 2.0 – Restoring morphology continuity and hydraulic connectivity). Need to understand, manage and restore ecological morphological continuity and hydraulic connectivity.

- 1.2.2 (was 1.2.4) (SRIA 2.0 – Managing the risks caused by invasive species and options for remediation). Reword to "Managing the risks used by invasive species and options for remediation".

- 1.2.3 (SRIA 2.0 – Understanding and managing ecological flows). Reword to "Nature-based solutions for the remediation and mitigation of degraded water bodies and aquatic ecosystems".

- 1.3 (SRIA 2.0 subtheme – Managing the effects of hydro-climatic extreme events). Should be reworded to "Managing and adapting to the effects of hydro-climatic extreme events".

Table 2

Subtheme 1.1. Developing approaches for assessing and optimising the value of ecosystem services

- 1.1.1 (SRIA 2.0 – Developing approaches for assessing the ecological functioning of ecosystems) and 1.1.3 (SRIA 2.0 – Establishing multiple pressure–impact–response relationships in aquatic, riparian and groundwater-dependent ecosystems). It was noted that there was potential overlap between these two priorities. This priority should include reference to long-term assessment of the ecological functioning of ecosystems.

- 1.1.2 [SRIA 2.0 – Developing and testing methodologies for the valuation of ecosystems services (link with 5.2.2)]. This is still relevant and there are links with subtheme 1.2 and ecohydrology/ecological engineering.

- 1.1.4 (SRIA 2.0 – Integrating ecosystem services into management of water resources) and 1.1.5 (SRIA 2.0 – Adapting and integrating our water/ecosystem management, planning and governance systems with better environmental data and information – link with 5.2.3). These are still relevant with respect to integrating ecosystem services. Links could be made between ecosystem management and water resource management, as well as reference being made to governance systems. In terms of land use planning, there is a need to turn into actions what will be achieved.

Subtheme 1.2. Integrated approaches: developing and applying ecological engineering and ecohydrology

- 1.2.1 (SRIA 2.0 – Restoring morphology continuity and hydraulic connectivity) and 1.2.3 (SRIA 2.0 – Understanding and managing ecological flows). It was suggested that these priorities be combined. For 1.2.3, it was suggested adding "and quantification of ecological flows".

- 1.2.2 (SRIA 2.0 – Managing the risks caused by invasive species and options for remediation) and 1.2.4 (SRIA 2.0 – Integrated eco-technological solutions for the remediation and mitigation of degraded water bodies and aquatic ecosystems). It was felt that these priorities could be combined. For 1.2.2, it was also suggested adding "in the context of global change". For 1.2.4, it was suggested tweaking the wording to "nature-based solutions" instead of "eco-technological solutions".

- 1.2.3 (SRIA 2.0 – Understanding and managing ecological flows). Need to understand and quantify managing ecological flows.

- 1.2.4 (SRIA 2.0 – Integrated eco-technological solutions for the remediation and mitigation of degraded water bodies and aquatic ecosystems). More integrated and nature-based solutions.

- 1.3.1 (SRIA 2.0 – Understanding the causes of drought/scarcity, predicting drought events and water scarcity and developing adaptation measures) and 1.3.3 [SRIA 2.0 – Improving water management to mitigate the harmful impacts of extreme events (extreme weather events, impaired water quality) (link with 2.2.1)] were broadly agreed to still be relevant as written.

Table 3

Subtheme 1.1. Developing approaches for assessing and optimising the value of ecosystem services

- 1.1.1 (SRIA 2.0 – Developing approaches for assessing the ecological functioning of ecosystems). Ecosystem evaluation still needs work and needs to be put into context:
  - There needs to be a link to policy and demonstrating the monetary value of services and protection.
  - There is a need to improve knowledge of ecosystem functioning.
  - There needs to be a link between biodiversity and human health issues, including less obvious issues such as microbial issues.
  - There should be an interlink of biodiversity with multi-stressors, such as climate change.

Subtheme 1.3 (SRIA 2.0 – Managing the effects of hydro-climatic extreme events). Should be reworded to "Managing and adapting to the effects of hydro-climatic extreme events"

- Subtheme-level – hydroclimatic extreme events and the gradual change that comes with them should be considered.

- There is also a need for cost evaluations of the effectiveness of measures – tools are needed to achieve this.

- 1.1.1 (SRIA 2.0 – Developing approaches for assessing the ecological functioning of ecosystems) and 1.1.3 (SRIA 2.0 - Establishing multiple pressure–impact–response relationships in aquatic, riparian and groundwater-dependent ecosystems). It was noted that there was potential overlap between these

two priorities. It was noted that this priority should include reference to long-term assessment of the ecological functioning of ecosystems.

- 1.1.2 [SRIA 2.0 – Developing and testing methodologies for the valuation of ecosystems services (link with 5.2.2)]. This priority was noted to be still relevant; there are links with subtheme 1.2 and ecohydrology/ecological engineering.

- 1.1.4 (SRIA 2.0 – Integrating ecosystem services into management of water resources) and 1.1.5 [SRIA 2.0 – Adapting and integrating our water/ecosystem management, planning and governance systems with better environmental data and information (link with 5.2.3)] are still relevant with respect to integrating ecosystem services. There could be links made between ecosystem management and water resource management, as well as reference to governance systems. In terms of land use planning, there is a need to turn into actions what will be achieved.

- 1.2.1 (SRIA 2.0 – Restoring morphology continuity and hydraulic connectivity) and 1.2.3 (SRIA 2.0 – Understanding and managing ecological flows) were suggested to be combined. For 1.2.3, it was suggested adding "and quantification of ecological flows".

- 1.2.2 (SRIA 20 – Managing the risks caused by invasive species and options for remediation) and 1.2.4 (SRIA 2.0 – Integrated eco-technological solutions for the remediation and mitigation of degraded water bodies and aquatic ecosystems). It was felt that these priorities could be combined. For 1.2.2, it was also suggested adding "in the context of global change". For 1.2.4, it was suggested tweaking the wording to "nature-based solutions" instead of "eco-technological".

- 1.3.1–1.3.3 [SRIA 2.0 – Understanding the causes of drought/scarcity, predicting drought events and water scarcity and developing adaptation measures; Developing innovative (or improved) tools for adaptation to hydro-climatic extreme events, especially floods – link with 2.2.1; and Improving water management to mitigate the harmful impacts of extreme events (extreme weather events, impaired water quality) – link with 2.2.1] were broadly agreed to still be relevant as written.

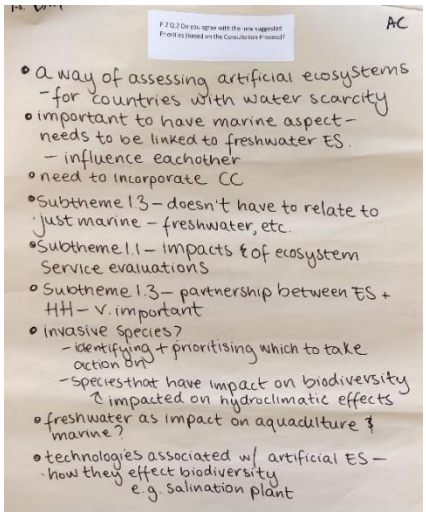
Question 2. Do you agree with the new suggested priorities (based on the consultation process)?

In some cases, yes, the new identified priorities are relevant, but many were too detailed and some were pitched at the research call level. For artificial aquatic ecosystems, they were not considered a relevant priority (artificial systems are lower in priority); another suggestion was the need to assess artificial ecosystems in countries with water scarcity, as well as technologies associated with artificial ecosystems and how they affect biodiversity (e.g. salination plants).

The proposed new research priorities included in the Discussion Note were discussed and the following were found either not to be a research priority as such or to require rewording:

Table 1

- Subtheme 1.1 (SRIA 2.0 – Developing approaches for assessing and optimising the value of ecosystem services). The importance of ecosystem services in land use decisions, of the benefits/value, and of robust indicators was noted. The need for forecasting was flagged as important (on remediation, mitigation and governance).



- 1.1.1 (SRIA 2.0 – Developing approaches for assessing the ecological functioning of ecosystems) should be reworded to "Assessing the functioning of ecosystems".

- 1.1.2 (was 1.1.3) (SRIA 2.0 – Establishing multiple pressure–impact–response relationships in aquatic, riparian and groundwater-dependent ecosystems). Should be reworded to "Understanding and predicting multiple pressure–impact–response relationships in aquatic ecosystems".

- 1.1.3 (was 1.1.2) [SRIA 2.0 – Developing and testing methodologies for the valuation of ecosystems services (link with 5.2.2)]. should be reworded to "Methodologies for the valuation of ecosystem services".

- 1.1.4 and 1.1.5. Maintain as written in current SRIA.

- Subtheme 1.2 (SRIA 2.0 – Integrated approaches: developing and applying ecological engineering and ecohydrology). Decision support systems for adaptive governance were also flagged, as well as the need for suitable assessment measures and indicators. The priorities could better reflect conservation/enhancement of biodiversity, as well as ecosystem functioning.

Table 2

- Subtheme 1.1 (SRIA 2.0 – Developing approaches for assessing and optimising the value of ecosystem services).

- Subtheme 1.2 (SRIA 2.0 – Integrated approaches: developing and applying ecological engineering and ecohydrology).

- Subtheme 1.3 (SRIA 2.0 – Managing the effects of hydro-climatic extreme events). To understand the impacts of climate change from ocean circulation and biogeochemical fluxes to ecosystem dynamics. It was noted that subtheme 1.3 does not have to relate to just marine/coastal but should include freshwater. It was suggested considering invasive species, species that have an impact on biodiversity and species tied to impacts from hydroclimatic effects.

Table 3

1.2.1 (SRIA 2.0 – Restoring morphology continuity and hydraulic connectivity)

- Ecosystem services – the consensus from the table was that they agreed with this priority.

- Artificial aquatic – the consensus from the table was that they did not agree with this priority.

- Rephrase "nature based solutions" and "artificial" (lower priority).

- Wellbeing (human) not relevant for this theme. The same can be said for recreation and the maritime reference should be removed.

- Micro- and macroalgal blooms and their links to climate change were suggested as missing priorities.

- Climate change needs to be incorporated.

- The assessment of multiple risks for ecosystems specifically under climate change was raised.

- Comment that the identified research priorities are very/too detailed.

Subtheme 1.2 (SRIA 2.0 – Integrated approaches: developing and applying ecological engineering and ecohydrology)

- Too much focus on the physical/chemical and missing biological/ecological aspects (1.2.1). It was suggested that wellbeing (human) health was not fully relevant for this theme and the same applied for recreation; others suggestions were, for subtheme 1.3, the partnership between ecosystems and human health was considered to be very important.

Question 3. : Are there any other priorities? Provide the rationale.

The following priorities were discussed as needing to be included in this theme:

Table 1

- CECs, including platinum group metals, microplastic, pesticides, herbicides, metals that are not routinely tested, and nanomaterials
- Effect of chemical mixtures on functioning of aquatic ecosystems
- Restoration and maintaining genetic and biological diversity of aquatic populations
- Restoring ecological connectivity – also lateral connectivity to catchment
- Fragmentation/corridors, impacts on biodiversity (and biodiversity loss)
- Catchment-scale (or ecosystem-scale) management and restoration land and water
- Land use changes – impacts on aquatic ecosystems

Table 2

- Monitoring mitigation measures for ecosystems
- Long-term observations: defining trajectories/scenarios for ecosystems based on knowledge, observatories and modelling, considering time scale/spatial scale – without taking away complexity of ecosystems. To be included as RDI level
- Evaluation of cost-effective measures for restoring ecosystem structure and functioning and water use
- Developing a 'pipeline' for monitoring data to governance, conservatorium and legislation – also stakeholders and knowledge transfer environmental stewardship
- Linked to point above – efficiency, impact assessment of nature-based solutions for ecosystems (surface, groundwater, etc.) and the observations, modelling, time scales, etc., related to nature-based solutions for ecosystems
- Valorisation of biodiversity

Table 3

- Proof of concepts for new technical solutions and measures
- Cost-efficient tools to assess biodiversity/tools for cost-effective measures/develop a European-wide toolbox of measures
- Focus on climate change and scenarios at a relevant downscaled resolution for assessing impacts on water resource use and ecosystem functioning and water use
- Interactions/influences between ocean (coastal/estuarine) and freshwater ecosystems
- Tools to assess the structure and functions of ecosystems – overcome "missing" organisms
- Use of microbial communities as significant players in biodiversity and functions/interlinkages between structure and functions
- Interaction between coastal zones and freshwater

- Human health and biodiversity
- The source and transport pathways of microbial contaminants to surface/groundwater supplies
- Tracing methods for contaminants in groundwater supplies (focusing on microbial)
- Develop tools to better communicate biodiversity significance
- Impact of particle-associated contaminants on groundwater supplies and resources
- New training methods in identifying and working with existing and emerging contaminations to rural groundwater supplies
- Put monetary value on ecosystems
- Agro-hydro systems – role in contaminant transport and impact on biodiversity
- Biodiversity for bio-economy "reservoir"
- Identifying Contaminants/affecting stressors to biodiversity
- Technical processes/mitigation measures affecting biodiversity and how to evaluate these measures
- Rural groundwater resources and effect of energy contamination of water quality/safety/security
- Tools to disentangle stressors driving/affecting biodiversity
- Use microbial communities as significant players in biodiversity

Question 4. Grouping into subthemes

Table 1

The following priorities were discussed as needing to be included in this theme:

- A 1.1 – "Developing approaches for assessing and optimising the value of ecosystem services" reworded slightly to "Developing approaches for assessing the structure and function of ecosystems and optimising ecosystem services".

- A 1.2 – "Integrated approaches: developing and applying ecological engineering and ecohydrology" reworded slightly to "Developing and applying ecological engineering and ecohydrology" by dropping the reference to "integrated approaches".

- New Subtheme A 1.4 to cover ecosystem pressures/impacts.

Table 2

- A 1.3 – "Managing the effects of hydro-climatic extreme events" reworded slightly by adding a reference to "adaptation": "Managing and adapting to the effects of hydro-climatic extreme events".

- A 1.1 – "assessing" needs to be explained.

- A 1.2 – need to add "nature-based technology and materials".

- A 1.1/1.3 – partnership between ecosystem services and health and wellbeing.

Table 3

- A 1.1.1 – assessing ecological functioning of ecosystems at time scales (multi-scales).

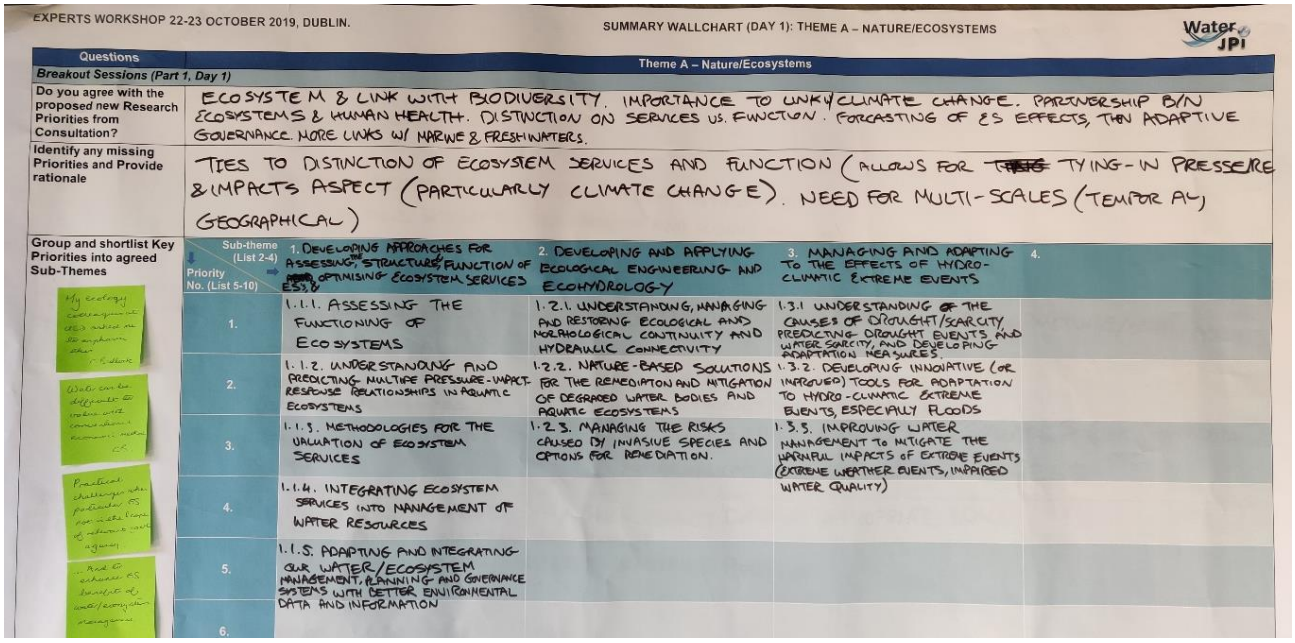
- A 1.1.2 – methodologies for the valuation of ecosystem services.

Room consensus day 1

The following consensus was reached at room level on the inputs for the SRIA 2025 (Table 3-1).

Table 3-1. Room consensus for Theme A: Ecosystems – subthemes and research priorities

A.1. Developing approaches for assessing the structure and function of ecosystems and optimising ecosystem services	A.2. Developing and applying ecological engineering and ecohydrology	A.3. Managing and adapting to the effects of hydro-climatic extreme events
Assessing the functioning of ecosystems	Understanding, managing and restoring ecological and morphological continuity and hydraulic connectivity	Understanding the causes of drought/scarcity, predicting drought events and water scarcity and developing adaptation measures
Understanding and predicting multiple pressure–impact–response relationships in aquatic ecosystems	Nature-based solutions for the remediation and mitigation of degraded water bodies and aquatic ecosystems	Developing innovative (or improved) tools for adaptation to hydro-climatic extreme events, especially floods
Methodologies for the valuation of ecosystems services	Managing the risks caused by invasive species and options for remediation	Improving water management to mitigate the harmful impacts of extreme events (extreme weather events, impaired water quality)
Integrating ecosystem services into the management of water resources		
Adapting and integrating our water/ecosystem management, planning and governance systems with better environmental data and information		


EXPERTS WORKSHOP 22-23 OCTOBER 2019, DUBLIN.

SUMMARY WALLCHART (DAY 1): THEME A – NATURE/ECOSYSTEMS

Water JPI

Questions	Theme A – Nature/Ecosystems			
Breakout Sessions (Part 1, Day 1)				
Do you agree with the proposed new Research Priorities from Consultation?	ECOSYSTEM & LINK WITH BIODIVERSITY. IMPORTANCE TO LINK W/ CLIMATE CHANGE. PARTNERSHIP B/N ECOSYSTEMS & HUMAN HEALTH. DISTINCTION ON SERVICES VS. FUNCTION. FORCASTING OF ES EFFECTS, THN ADAPTIVE GOVERNANCE. MORE LINKS W/ MARINE & FRESHWATERS.			
Identify any missing Priorities and Provide rationale	TIES TO DISTINCTION OF ECOSYSTEM SERVICES AND FUNCTION (ALLOWS FOR ~~THIS~~ TYING-IN PRESSURE & IMPACTS ASPECT (PARTICULARLY CLIMATE CHANGE). NEED FOR MULTI-SCALES (TEMPORAL, GEOGRAPHICAL)			
Group and shortlist Key Priorities into agreed Sub-Themes	Sub-theme (List 2-4) →	1. DEVELOPING APPROACHES FOR ASSESSING STRUCTURE/FUNCTION OF ESS, & OPTIMISING ECOSYSTEM SERVICES	2. DEVELOPING AND APPLYING ECOLOGICAL ENGINEERING AND ECOHYDROLOGY	3. MANAGING AND ADAPTING TO THE EFFECTS OF HYDRO-CLIMATIC EXTREME EVENTS
	Priority No. (List 5-10) ↓			
	1.	1.1.1. ASSESSING THE FUNCTIONING OF ECOSYSTEMS	1.2.1. UNDERSTANDING, MANAGING AND RESTORING ECOLOGICAL AND MORPHOLOGICAL CONTINUITY AND HYDRAULIC CONNECTIVITY	1.3.1 UNDERSTANDING OF THE CAUSES OF DROUGHT/SCARCITY, PREDICTING DROUGHT EVENTS AND WATER SCARCITY, AND DEVELOPING ADAPTATION MEASURES
	2.	1.1.2. UNDERSTANDING AND PREDICTING MULTIPLE PRESSURE-IMPACT-RESPONSE RELATIONSHIPS IN AQUATIC ECOSYSTEMS	1.2.2. NATURE-BASED SOLUTIONS FOR THE REMEDIATION AND MITIGATION OF DEGRADED WATER BODIES AND AQUATIC ECOSYSTEMS	1.3.2 DEVELOPING INNOVATIVE (OR IMPROVED) TOOLS FOR ADAPTATION TO HYDRO-CLIMATIC EXTREME EVENTS, ESPECIALLY FLOODS
	3.	1.1.3. METHODOLOGIES FOR THE VALUATION OF ECOSYSTEM SERVICES	1.2.3. MANAGING THE RISKS CAUSED BY INVASIVE SPECIES AND OPTIONS FOR REMEDIATION.	1.3.3. IMPROVING WATER MANAGEMENT TO MITIGATE THE HARMFUL IMPACTS OF EXTREME EVENTS (EXTREME WEATHER EVENTS, IMPAIRED WATER QUALITY)
	4.	1.1.4. INTEGRATING ECOSYSTEM SERVICES INTO MANAGEMENT OF WATER RESOURCES		
	5.	1.1.5. ADAPTING AND INTEGRATING OUR WATER/ECOSYSTEM MANAGEMENT, PLANNING AND GOVERNANCE SYSTEMS WITH BETTER ENVIRONMENTAL DATA AND INFORMATION		
	6.			

Plenary feedback from day 1

A summary of the discussion from day 1 was provided by the chairperson and rapporteur. During this session, the overlap between health and wellbeing and ecosystems was discussed. The concept of "One Health" was proposed. This ties into the table-level discussions on the need to demonstrate better integration of biodiversity with human health.

Question 1. Define the expected impacts (positive and negative)

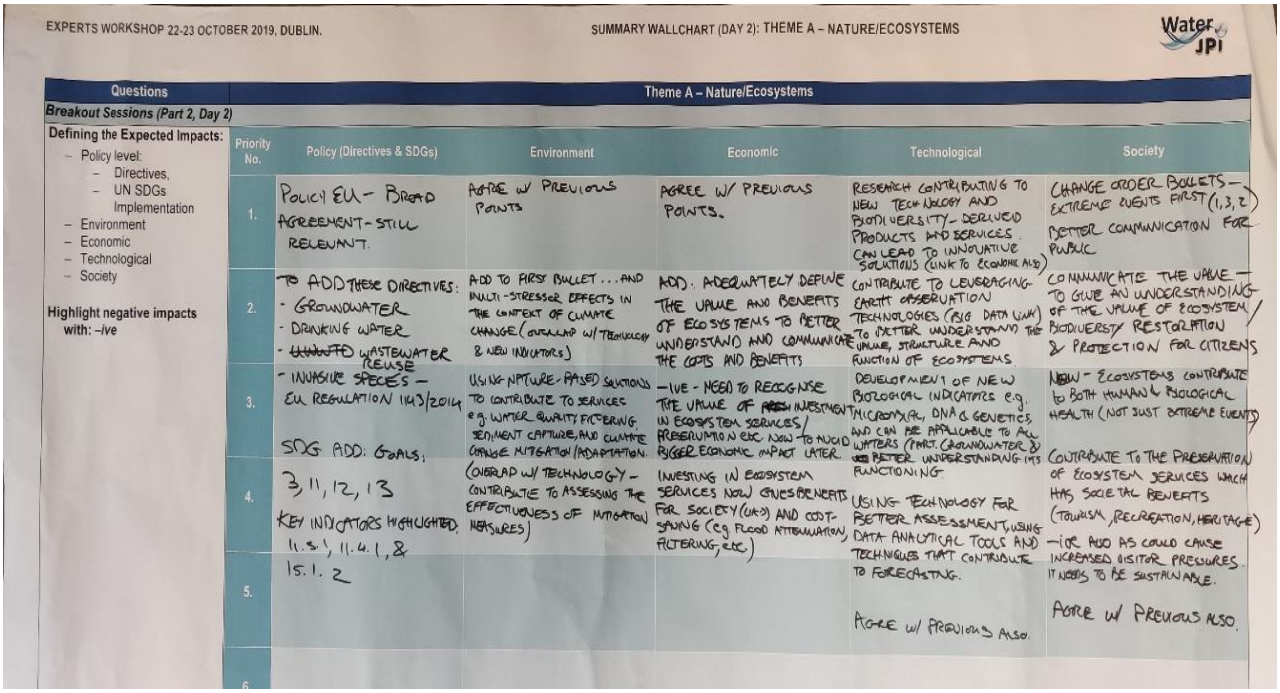
The expected impacts were discussed at each table. At room level, the key expected impacts were agreed and compiled, as detailed in the A0 summary wallchart (see

Table 3-2).

Table 3-2. Theme A: Ecosystems – expected impacts

Area	Expected impacts
Policy	From the policy perspective, it is proposed to add a number of other directives, which are valid across all research priorities, including adding reference to the Groundwater and Drinking Water Directives (particularly relevant to priorities 1.1.2, 1.1.4 and 1.3.1), as well as the "proposal for a regulation on minimum requirements for water reuse" (May 2018) and EU Regulation 143/2014 on invasive species; the latter is particularly relevant to priority 1.2.3 ("managing the risks caused by invasive species . . ."). As the SDGs are cross-cutting issues, they apply across all research priorities. As such, it was recommended to add reference to SDGs 3, 11, 12 and 13 as being relevant to ecosystems, in addition to those currently referenced in the SRIA 2.0 (i.e. SDGs 2, 6, 14 and 15). SDGs at indicator level were discussed briefly but, as there is a large amount of detail in these, only a few key indicators were highlighted in the discussion – 11.3.1, 11.4.1 and 15.2.1 – noting that this level is quite detailed at the strategic scope of the SRIA
Environmental	Under the environment heading, all previous impacts were felt to remain relevant. It was proposed to add the following to the first bullet point, which references assessment and evaluation approaches: " . . . and multi-stressor effects in the context of climate change". This also overlaps with the technology heading, which will reference the development of new indicators. Based on previous discussions on the research priorities, another positive impact to add will be the use of nature-based solutions to contribute to ecosystem services (e.g. water quality, filtering, sediment capture and climate change mitigation/adaptation). Here, there is also an overlap with the technology heading as this links to the expected impact of contributing to assessing the effectiveness of mitigation measures
Economic	Under the economic heading, additional expected impacts include adequately defining the value and benefits of ecosystems to better understand and communicate their costs and benefits
Technological	For the technological heading, specifically, all research priorities can lead to contributions to new technology and biodiversity-derived products and services; this can lead to innovative solutions (which also links positively to the economic aspect). Research can contribute to leveraging earth observation technologies (linking to the big data driver/enabler) to better understand the value, structure and function of ecosystems. Development of new biological indicators (e.g. microbial, DNA and genetics) can be applicable to all waters (particularly groundwater) and contribute to better understanding of its functioning. Technology can contribute to better assessment using data analytical tools and techniques that contribute to forecasting
Society	In consideration of society, it is proposed to change the order of the current SRIA 2.0 bullet points so that extreme events are listed first (1, 3, 2). All of the ecosystem research priorities should contribute to better communication, particularly to the public. Research should also communicate the value aspect to citizens to give an understanding of the value of ecosystems, biodiversity, restoration and protection. Ecosystems research should contribute to both human and biological health (not just relevant to extreme events) and the preservation of ecosystem services that have societal benefits (tourism, recreation, heritage, etc.). However, this needs to be sustainable (as it could also lead to increased visitor pressures)
Negative impacts	The potential negative aspect, tied to the economic impact, is the need to recognise the value of investment in ecosystem services/preservation, etc., now in order to avoid bigger

Area	Expected impacts
	economic impacts later. Investing in ecosystem services now gives benefits for society and is cost-saving (e.g. flood attenuation, filtering), but this needs to be defined, articulated and appropriately communicated



EXPERTS WORKSHOP 22-23 OCTOBER 2019, DUBLIN. SUMMARY WALLCHART (DAY 2): THEME A – NATURE/ECOSYSTEMS

Water JPI

Questions | **Theme A – Nature/Ecosystems**

Breakout Sessions (Part 2, Day 2)

Defining the Expected Impacts:
- Policy level:
  - Directives,
  - UN SDGs Implementation
- Environment
- Economic
- Technological
- Society

Highlight negative impacts with: -ive

Priority No.	Policy (Directives & SDGs)	Environment	Economic	Technological	Society
1.	POLICY EU – BROAD AGREEMENT – STILL RELEVANT.	AGREE W/ PREVIOUS POINTS	AGREE W/ PREVIOUS POINTS.	RESEARCH CONTRIBUTING TO NEW TECHNOLOGY AND BIODIVERSITY – DERIVED PRODUCTS AND SERVICES CAN LEAD TO INNOVATIVE SOLUTIONS (LINK TO ECONOMIC ALSO)	CHANGE ORDER BULLETS – EXTREME EVENTS FIRST (1, 3, 2) BETTER COMMUNICATION FOR PUBLIC
2.	TO ADD THESE DIRECTIVES: - GROUNDWATER - DRINKING WATER - ~~UWWTD~~ WASTEWATER REUSE	ADD TO FIRST BULLET ... AND MULTI-STRESSER EFFECTS IN THE CONTEXT OF CLIMATE CHANGE (OVERLAP W/ TECHNOLOGY & NEW INDICATORS)	ADD: ADEQUATELY DEFINE THE VALUE AND BENEFITS OF ECOSYSTEMS TO BETTER UNDERSTAND AND COMMUNICATE THE COSTS AND BENEFITS	CONTRIBUTE TO LEVERAGING EARTH OBSERVATION TECHNOLOGIES (BIG DATA LINK) TO BETTER UNDERSTAND THE VOLUME, STRUCTURE AND FUNCTION OF ECOSYSTEMS	COMMUNICATE THE VALUE – TO GIVE AN UNDERSTANDING OF THE VALUE OF ECOSYSTEM / BIODIVERSITY RESTORATION & PROTECTION FOR CITIZENS
3.	- INVASIVE SPECIES – EU REGULATION 1143/2014 SDG ADD: GOALS;	USING NATURE-BASED SOLUTIONS TO CONTRIBUTE TO SERVICES e.g. WATER QUALITY FILTERING, SEDIMENT CAPTURE, AND CLIMATE CHANGE MITIGATION/ADAPTATION.	-IVE - NEED TO RECOGNISE THE VALUE OF ~~AREA~~ INVESTMENT IN ECOSYSTEM SERVICES/ PRESERVATION ETC NOW - TO AVOID BIGGER ECONOMIC IMPACT LATER.	DEVELOPMENT OF NEW BIOLOGICAL INDICATORS e.g. MICROBIAL, DNA & GENETICS AND CAN BE APPLICABLE TO ALL WATERS (INCL. GROUNDWATER) & BETTER UNDERSTANDING ITS FUNCTIONING	NEW - ECOSYSTEMS CONTRIBUTE TO BOTH HUMAN & BIOLOGICAL HEALTH (NOT JUST EXTREME EVENTS)
4.	3, 11, 12, 13 KEY INDICATORS HIGHLIGHTED: 11.3.1, 11.4.1, &	(OVERLAP W/ TECHNOLOGY – CONTRIBUTE TO ASSESSING THE EFFECTIVENESS OF MITIGATION MEASURES)	INVESTING IN ECOSYSTEM SERVICES NOW GIVES BENEFITS FOR SOCIETY (UK?) AND COST-SAVING (eg FLOOD ATTENUATION, FILTERING, etc.)	USING TECHNOLOGY FOR BETTER ASSESSMENT, USING DATA ANALYTICAL TOOLS AND TECHNIQUES THAT CONTRIBUTE TO FORECASTING.	CONTRIBUTE TO THE PRESERVATION OF ECOSYSTEM SERVICES WHICH HAS SOCIETAL BENEFITS (TOURISM, RECREATION, HERITAGE) – IOR ALSO AS COULD CAUSE INCREASED VISITOR PRESSURES. IT NEEDS TO BE SUSTAINABLE.
5.	15.1.2			AGREE W/ PREVIOUS ALSO.	AGREE W/ PREVIOUS ALSO.
6.					

Question 2. Identify any other cross-cutting issues and provide rationale

Overall, the following cross-cutting issues were discussed:

- Population growth and migration – in this case, the consideration of migration of both humans and resources was proposed, as population growth is putting pressure on resources (including freshwater resources).

- Urbanisation and land use change (which is also proposed to include food production and agricultural practices) – land use change and ecosystem degradation are some of the key drivers of biodiversity loss globally.

- It was proposed to amend "digitisation" to include infrastructure and open access – this reflects the need for both platforms to access and store data and the data itself, as being key aspects of this enabler.

- Communication and public awareness at all levels of society were also proposed, as information sharing and awareness are key for understanding and tackling global water challenges.

Question 3. Identify any other enablers/drivers and provide rationale

The enablers/drivers were discussed at each table. Overall, the following drivers and enablers were identified:

Drivers

- Ecosystem degradation (loss of biodiversity, fragmentation, etc.).
- Pressures on freshwater resources.
- Big data.
- Climate change adaptation.
- Land use (food production and practices).

The need to recognise ecosystem services and value was also discussed in terms of soil quantity/protection, current agricultural practices for food production and climate change adaptation.

Enablers

- Directives.
- Sustainable resource use.
- Public awareness.
- Interdisciplinary and sectoral collaboration.
- Open data and access.
- Technological development.
- Economy development.

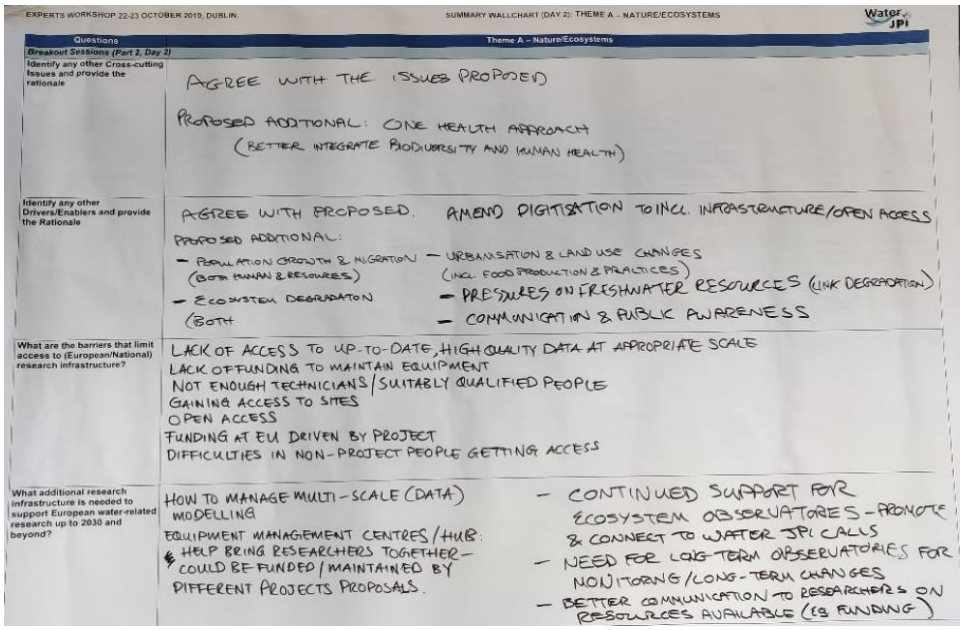
Question 4. What are the barriers that limit access to (European/national) research infrastructure?

The barriers that limit access to European/national research infrastructure were discussed at each table. A number of barriers were discussed, such as the lack of access to up-to-date and high-quality data (especially at the appropriate scale). The lack of funding to maintain equipment, as well as the lack of enough technicians/suitability qualified people to maintain equipment, were also noted. Gaining physical access to demonstration project sites was also raised, which ties in with open access to data (and sites). Related to this are the difficulties sometimes for non-project people (or those not directly involved in projects) to gain access to sites and equipment. It was noted that funding at EU level is often driven from the ground up (i.e. by projects). Overall, the following were discussed:

- data
  - quality of data – standardisation;
  - data at appropriate scales;
  - access to data – policies;
  - lack of data;
- competence on data analytics;
- access to better resources/equipment centres/hubs/experimental stations/"test beds";
- molecular centres for analysis sequencing;
- analytical centres; and
- commercial sponsorship – as a driver of data quality standards.

Question 5. What additional research infrastructure is needed to support European water-related research up to 2030 and beyond?

- Difficulty of managing multi-scale data modelling (need for continued long-term observatories for monitoring and for looking at long-term changes).
- It was noted that there are many avenues for researchers to access different funding sources, but researchers are not always aware of these. Good communication to researchers on these options is therefore crucial.
- Equipment/management hubs that could bring researchers together (face to face) and that could be funded/maintained by different project proposals.
- Continued support for ecosystem observations is needed.
- Promotion of and connection to Water JPI calls.



EXPERTS WORKSHOP 22-23 OCTOBER 2019, DUBLIN. SUMMARY WALLCHART (DAY 2): THEME A – NATURE/ECOSYSTEMS

Questions	Theme A – Nature/Ecosystems
Breakout Sessions (Part 2, Day 2)	
Identify any other Cross-cutting Issues and provide the rationale	AGREE WITH THE ISSUES PROPOSED PROPOSED ADDITIONAL: ONE HEALTH APPROACH (BETTER INTEGRATE BIODIVERSITY AND HUMAN HEALTH)
Identify any other Drivers/Enablers and provide the Rationale	AGREE WITH PROPOSED. AMEND DIGITISATION TO INCL. INFRASTRUCTURE/OPEN ACCESS PROPOSED ADDITIONAL: – POPULATION GROWTH & MIGRATION (BOTH HUMAN & RESOURCES) – ECOSYSTEM DEGRADATION (BOTH – URBANISATION & LAND USE CHANGES (INCL. FOOD PRODUCTION & PRACTICES) – PRESSURES ON FRESHWATER RESOURCES (LINK DEGRADATION) – COMMUNICATION & PUBLIC AWARENESS
What are the barriers that limit access to (European/National) research infrastructure?	LACK OF ACCESS TO UP-TO-DATE, HIGH QUALITY DATA AT APPROPRIATE SCALE LACK OF FUNDING TO MAINTAIN EQUIPMENT NOT ENOUGH TECHNICIANS / SUITABLY QUALIFIED PEOPLE GAINING ACCESS TO SITES OPEN ACCESS FUNDING AT EU DRIVEN BY PROJECT DIFFICULTIES IN NON-PROJECT PEOPLE GETTING ACCESS
What additional research infrastructure is needed to support European water-related research up to 2030 and beyond?	HOW TO MANAGE MULTI-SCALE (DATA) MODELLING EQUIPMENT MANAGEMENT CENTRES / HUB: HELP BRING RESEARCHERS TOGETHER – COULD BE FUNDED / MAINTAINED BY DIFFERENT PROJECTS PROPOSALS. – CONTINUED SUPPORT FOR ECOSYSTEM OBSERVATORIES – PROMOTE & CONNECT TO WATER JPI CALLS – NEED FOR LONG-TERM OBSERVATORIES FOR MONITORING / LONG-TERM CHANGES – BETTER COMMUNICATION TO RESEARCHERS ON RESOURCES AVAILABLE (EG FUNDING)

3.3.1.3 Room Consensus (Summary Wall Charts)

Following the breakout group discussions, the outcomes were relayed to the participants and a consensus was reached regarding the inputs for SRIA 2025 on the expected impacts (Table 3-3) and the cross-cutting issues, drivers/enablers and research infrastructure (

Table 3-4).

Table 3-3. Room consensus for Theme A: Ecosystems – expected impacts

Theme A: Ecosystems (day 2) – expected impacts				
Policy	**Environment**	**Economic**	**Technological**	**Society**
To add these directives: Groundwater Directive, Drinking Water Directive	Add to first bullet ". . . and multi-stressor effects in the context of climate change" (overlap with technology and new indicators)	Add: adequately define the value and benefits of ecosystems to better understand and communicate the costs and benefits	Research contributing to new technology and biodiversity – derived products and services can lead to innovative solutions (link to economic also)	Change order of bullet points – extreme events first (i.e. 1, 3, 2)
EU Regulation 143/2014 on invasive species Proposal for water reuse regulation	Using nature-based solutions to contribute to services, e.g. water quality, filtering, sediment capture and climate change mitigation/adaptation	Negative – need to recognise the value of investment in ecosystem services/preservation, etc., now to avoid a bigger economic impact later	Contribute to leveraging earth observation technologies (big data link) to better understand the value, structure and function of ecosystems	'Better communication for the public –to give an understanding of the value of ecosystems/biodiversity/restoration and protection for citizens
SDG – add goals 3, 11, 12 and 13 Key indicators highlighted (not exhaustive): 11.3.1, 11.4.1 and 15.2.1	Overlap with technology – contribute to assessing the effectiveness of mitigation measures	Investing in ecosystem services now gives benefits for society and is cost-saving (e.g. flood attenuation)	Development of new biological indicators, e.g. microbial, DNA and genetics, which can be applicable to all waters (particularly groundwater) and contribute to better understanding of its functioning	Ecosystems contribute to both human and biological health (not just to extreme events)
			Using technology for better assessment using data analytical tools and techniques that contribute to forecasting	Contribute to the preservation of ecosystem services, which has societal benefits (tourism, recreation, heritage). Needs to be sustainable (as could also cause increased visitor pressures)

Table 3-4. Room consensus for Theme A: Ecosystems – cross-cutting issues, drivers/enablers and research infrastructure

Theme A: Ecosystems (day 2) – cross-cutting issues, drivers/enablers and research infrastructure	
Questions	**Summary of discussion**
Identify any other **cross-cutting issues** and provide rationale	• "One Health" concept was proposed (need to demonstrate better integration of biodiversity with human health)
Identify any other **drivers/enablers** and provide rationale	• Migration (human and resources) • Ecosystem degradation • Urbanisation and changes in land use (food production and practices) • Link to need to recognise ecosystem services and value (soil quality/protection, current agricultural practices for food production, climate change adaptation)
What are the **barriers** that limit access to (European/national) **research infrastructure**	• Lack of access to up-to-date high-quality data at the appropriate scale • Lack of funding to maintain equipment • Not enough technicians/suitability qualified people • Gaining access to sites • Open access • Funding at EU level driven by project • Difficulties in non-project people getting access
What **additional research infrastructure** is needed to support European water-related research up to 2030 and beyond?	• How to manage multi-scale (data) modelling • Equipment management centres/hubs: help bring researchers together – could be funded/maintained by different project proposals • Continued support for ecosystem observations – promote and connect to water JPI calls • Need for long-term observatories for monitoring long-term changes • Better communication to researchers on the resources available (e.g. funding)

3.3.2 Theme B: Health and Wellbeing

3.3.2.1 Attendees

In total, 15 attendees participated at the breakout group session for Theme B: Health and Wellbeing. They represented the research community, the Water JPI GB, ministries and policymaking departments including the health service. Four countries were represented: Italy, France, Finland and Ireland.

The session was chaired by Robert Barouki (University of Paris Descartes School of Medicine, France) (full biography provided in **Appendix C**). Rachel Clarke (RPS Group Ireland), Aisling O'Connor (EPA Ireland), John McEntagart (EPA Ireland) and Dorothy Stewart (EPA Ireland) acted as moderators. Rachel Clarke was also the rapporteur.

3.3.2.2 Overview of the table discussions

As part of the breakout group sessions, the participants were divided into three groups and asked to consider the key RDI priorities for each of the Water JPI-proposed new research themes to 2025 (focusing on the research priority level rather than the topic level) and agree on/group them into subthemes and key performance indicators/impacts (expected trade-offs). A moderator was assigned to each table and the discussion feedback was relayed to the rapporteur.

Before beginning the session, the chairperson proposed that the participants agree on the "One Health for all" concept (human, animal and environment) as it would help to inform their decisions in the discussions. It

was consensually agreed to proceed with the breakout session and inform all decisions incorporating the "One Health for all" concept.

Question 1. Which priorities of the SRIA are still relevant?

The majority of participants agreed that most of the current priorities of the SRIA were relevant but that they required some modification, a re-focus and a re-prioritisation.

The research priorities listed in the SRIA 2.0 that were found to be still relevant were as follows:

Table 1

- 2.1.1 (SRIA 2.0 – Developing analytical techniques for groups of substances). Participants agreed that the priority was still relevant; however, there were concerns over the word "groups" as it was felt that the meaning was too vast – "mixtures of substances" was suggested as an alternative. It was also suggested adding the "combined effects" of substances to the priority. The "risk" aspect was missing and should be included. The term "new tools" was also mentioned as an alternative or to be combined with analytical techniques.

- 2.2.1 [SRIA 2.0 – Progressing towards flood-proof cities (from small settlements to large suburban areas) (link with 1.3.2, 1.3.3, 3.1.1 and 5.2.1)]. Still relevant but should reword as "Progressing towards flood-proof cities and sustainable urban drainage in relation to flood-risk cities".

- 2.1.2 (SRIA 2.0 – Understanding and predicting the environmental behaviour and effects of by-products, pollutants and pathogens, including their environmental effects). This is an important priority and still relevant. It was suggested adding the word "occurrence" as this was an element that was missing and the addition of green chemistry approaches to prevent input.

- 2.1.3 [SRIA 2.0 – Remediation of pollutants: developing strategies to reduce pollutants (DPBs, emerging pollutants, pathogens, including their environmental effect)]. Should be rephrased to include in water, soil, sediment and sludge.

- 2.2.2 (SRIA 2.0 – Improving the performance of water systems). It was suggested adding the words "resilience", "security", "assets" and "infrastructure" to the priority as it lacked structure and was too vague. It should be reworded to include "improving the resilience, security and performance of water assets and infrastructure".

- 2.2.3 (SRIA 2.0 – Assessing the impact of water scarcity on safe drinking water (link with 5.2.1)]. It was suggested adding "safe water" and risks in relation to water reuse.

- 2.2.4 New suggested priority. "Assessing the potential and risks in relation to water reuse strategies and remediation of sludge and observing waste as a resource (e.g. circular economy and bio-economy)".

Table 2

- 2.1.1 (SRIA 2.0 – Developing analytical techniques for groups of substances). The term "group of substances" is too vague and too big.

- 2.1.2 (SRIA 2.0 – Understanding and predicting the environmental behaviour and effects of by-products, pollutants and pathogens, including their environmental effects). Important to keep this priority. The word "health" needs to be included.

- 2.1.3 [SRIA 2.0 – Remediation of pollutants: developing strategies to reduce pollutants (DPBs, emerging pollutants, pathogens, including their environmental effect)]. The question was asked, "what is the relevance to human health?". The remedial part of the priority is important and should be kept.

- 2.2.1 [SRIA 2.0 – Progressing towards flood-proof cities (from small settlements to large suburban areas) (link with 1.3.2, 1.3.3, 3.1.1 and 5.2.1)]. It was suggested dividing the priority in two as there are two dimensions to the priority, an infrastructure part and a wellbeing element. It was also suggested that the priority wording be changed to include climate change.

- 2.2.2 (SRIA 2.0 – Improving the performance of water systems). It was mentioned that the priority needs to add a health element to make it more relevant to the theme.

- 2.2.3 [SRIA 2.0 – Assessing the impact of water scarcity on safe drinking water (link with 5.2.1)]. This priority needs to incorporate the "One Health" concept more. It was also mentioned that it was very engineer based and there were questions over whether or not it fitted in with the health and wellbeing theme. There needs to be a reference to human health to incorporate the "One Health for all" concept. It was suggested looking to other strategies, such as the circular economy, and incorporating these.

Table 3

- 2.1.1 (SRIA 2.0 – Developing analytical techniques for groups of substances). Need to add combined effects and emerging contaminants. The REACH (Registration, Evaluation, Authorisation and Restriction of Chemicals) Directive should be considered.

- 2.1.2 (SRIA 2.0 – Understanding and predicting the environmental behaviour and effects of by-products, pollutants and pathogens, including their environmental effects). Integrated risk assessment needs to be included. Emerging pollutants and metalloids to be included/considered. Integrating and validating datasets is important. Priority should not just be on AMR but also on other chemicals that can trigger resistance.

- 2.1.3 [SRIA 2.0 – Remediation of pollutants: developing strategies to reduce pollutants (DPBs, emerging pollutants, pathogens, including their environmental effect]. Strategies should be introduced on how to reduce emerging pollutants at source. Link to other strategies, for example the circular economy.

- 2.2.1 [SRIA 2.0 – Progressing towards flood-proof cities (from small settlements to large suburban areas) (link with 1.3.2, 1.3.3, 3.1.1 and 5.2.1)]. Design of new green infrastructures, with a link to strategies to reduce emerging pollutants at source.

- 2.2.3 [SRIA 2.0 –Assessing the impact of water scarcity on safe drinking water (link with 5.2.1)]. Socioeconomic, science and humanities components missing – need to be considered (urbanisation, migration, population, etc.).

Question 2. Do you agree with the new suggested priorities (based on the consultation process)?

The proposed new research priorities included in the Discussion Note were discussed and the following were found either not to be a research priority as such or to require rewording:

Table 1

2.1 (SRIA 2.0 – Emerging pollutants and emerging risks of established pollutants: assessing their effects on nature and humans and their behaviour and opportunities for their treatment)

- The AMR topic was not given precedence and it was felt that it was too important not to be put at the forefront and should be considered as a stand-alone topic. Risk was not mentioned in the priority.

- Regarding the circular economy, there is a trade-off with recovery and environmental consequences. It was suggested strengthening the use of surveillance data and that wellbeing needs to be defined (use the World Health Organization's definition).

- Value of water was proposed as a new subtheme; this would encompass the water footprint and human interactions.

Table 2

2.1 (SRIA 2.0 – Emerging pollutants and emerging risks of established pollutants: assessing their effects on nature and humans and their behaviour and opportunities for their treatment)

- AMR needs more precedence.

- Tools-based risk not mentioned.

- Circular economy and trade-offs need to be considered, e.g. metals introduced through animal waste.

2.2 (SRIA 2.0 – Minimising risks associated with water infrastructures and natural hazards)

- Need to define freshwater. It was noted that "ocean" was mentioned – can be confusing.

- Need to include the "One Health" concept. Reword "public health" to "One Health".

- Physical infrastructure and management mentioned; no reference to human behaviour.

Table 3

2.1 (SRIA 2.0 – Emerging pollutants and emerging risks of established pollutants: assessing their effects on nature and humans and their behaviour and opportunities for their treatment)

- There is a need to strengthen the use of surveillance data (often no data are available or "patchy data" are available).

- Need to define wellbeing (use the World Health Organization's definition).

- Too much focus on AMR – need to look at other chemicals – cocktail effect also important to consider.

Question 3. : Are there any other priorities? Provide the rationale.

All participants placed their suggestions and comments on sticky notes:

Table 1

- Environmental health – education and behaviour
- Evaluation of combined effects of chemical mixtures
- How to use "big data"? Data exist, but is it necessary to integrate those already available
- Integrated water issues with other components of the exposome: air, food and social and psychological effects
- Integrated risk assessment
- Unregulated exposomes
- Assessment of mental health impacts

Table 2

- Stormwater treatment
- Environmental justice – right to water
- Effect-based monitoring – tools to evaluate risks of groups of chemicals
- Green chemistry / circular economy / bio-economy
- Value of water–human interactions, industry sources of chemicals, utility responsibility
- Value of water – citizen science can play a role
- Safe materials in contact with water, e.g. lining of tubing, food/drink containers

Table 3

- Transmission of AMR across "One Health"
- Emerging water pathogens as a result of climate change
- Effect-based monitoring tools to evaluate risks of groups of chemicals
- Microbiome changes as a result of pollution
- Basic research into the biology of mobile AMR genes in bacteria
- Safe materials in contact with water
- Establishing surveillance of AMR in water across the environment globally
- Impacts of human actions on "One Health"
- Animal farming and water use
- Value of water–human interaction, industry sources of chemicals and utility responsibility

Question 4. Grouping into subthemes

Table 1

- B 2.1 (SRIA 2.0 – Emerging pollutants and emerging risks of established pollutants: assessing their effects on nature and humans and their behaviour and opportunities for their treatment). Need to prioritise AMR as a "One Health" risk. There is also overlap with the circular economy/bio-economy.

- B 2.2 (SRIA 2.0 – Minimising risks associated with water infrastructures and natural hazards). Emerging pollutants and emerging risks, e.g. migration of plastic into water bottles.

- B 2.3 New Opportunistic pathogens due to climate change and favourable conditions.

- B 2.4 New "One Health" burden of human interactions with the water environment.

Table 2

- B 2.2 (SRIA 2.0 – Minimising risks associated with water infrastructures and natural hazards). Understanding risks (e.g. physical and mental health risks), including behaviour with respect to risks. Separate water infrastructures from natural hazards.

Table 3

- B subtheme 2.1 (SRIA 2.0 – Emerging pollutants and emerging risks of established pollutants: assessing their effects on nature and humans and their behaviour and opportunities for their treatment). Needs to capture monitoring and remediation. There is a need to define "pollutant" in the SRIA and for the definition to encompass by-products, transformation products, mixtures, etc.

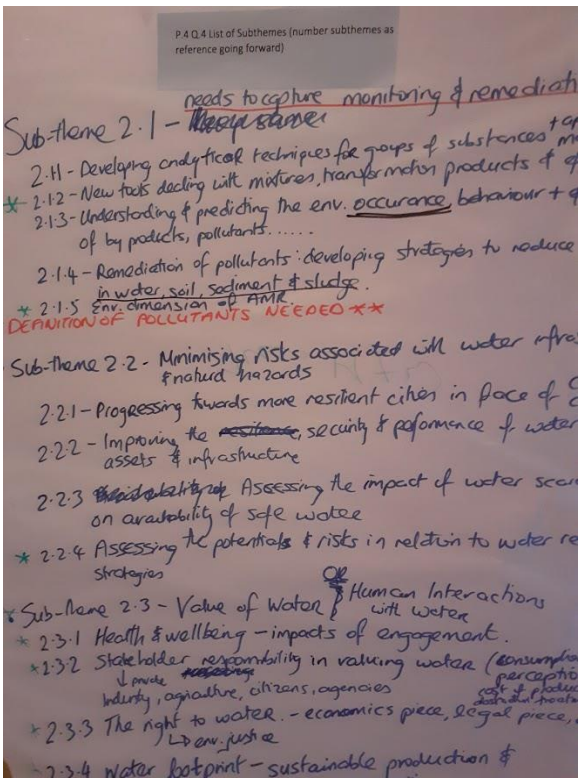
- B 2.1.1 Developing analytical techniques for groups of substances and appropriate matrices.

- B 2.1.2 New tools dealing with mixtures, transformation products and effects.
- B 2.1.3 Understanding and predicting the environmental occurrence, behaviour and effects of by-products and pollutants.
- B 2.1.4 Remediation of pollutants: developing strategies to reduce pollutants in water, soil, sediment and sludge.
- B 2.1.5 The water dimension of AMR, as the broader "environment dimension of AMR" would already be covered under the JPI on AMR.

It was also suggested adding a definition of the pollutants.

Subtheme 2.2 (SRIA 2.0 – Minimising risks associated with water infrastructures and natural hazards)

- B 2.2.1 Progressing towards more resilient cities in the face of climate change.
- B 2.2.2 Improving the security and performance of water assets and infrastructures to encompass all public and private (e.g. private wells) infrastructures.
- B 2.2.3 Assessing the impact of water scarcity on the availability of safe water.
- B 2.2.4 Assessing the potential and risks in relation to water reuse strategies.
- New Subtheme 2.3 (SRIA 2.0 – suggested subtheme "Value of water and interactions with water").
- New B 2.3.1 Health and wellbeing impacts of engagement.
- New B 2.3.2 Stakeholder responsibility in valuing water (consumption, perception, cost of production– extraction and treatment).
- New B 2.3.3 The right (environmental justice) to water – economics piece, legal piece, etc.
- New B 2.3.4 Water footprint – sustainable production and consumption.
- New B2.2 It was also suggested adding "Water dimension of AMR" as a new subtheme on its own.

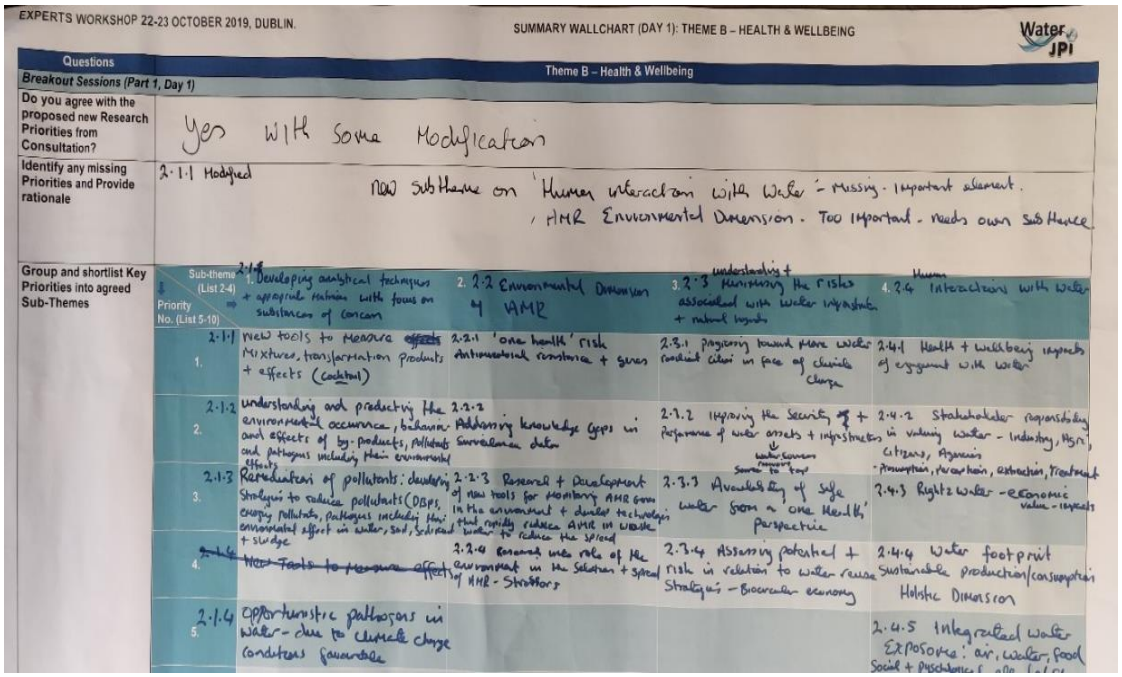


Room consensus day 1

The following consensus was reached at room level on the inputs for the SRIA 2025 (Table 3-5).

Table 3-5. Room consensus for Theme B: Health and Wellbeing – subthemes and research priorities

B.1. Emerging pollutants and emerging risks of established pollutants: monitoring, remediation and assessing their effects on nature and humans and their behaviour and opportunities for their treatment	B2.2. Water dimension of AMR	B2.3. Understanding and minimising the risks associated with water infrastructures and natural hazards	B2.4. Human interaction with water
Developing analytical techniques and appropriate matrices, with a focus on substances of concern	"One Health" risk – AMR and genes	Progressing toward more water-resilient cities in the face of climate change	Health and wellbeing impacts of engagement with water
New tools to measure mixtures, transformation products and effects (cocktail)	Addressing knowledge gaps in surveillance data	Improving the security and performance of water assets and infrastructures – water sources reservoir, source to tap	Stakeholder responsibility in valuing the water industry, agriculture, citizens, agencies – presumption, perception, extraction, treatment
Understanding and predicting the environmental occurrence, behaviour and effects of by-products, pollutants and pathogens, including their environmental effects	Research and development of new tools for monitoring AMR genes in the environment and development of technologies that rapidly reduce AMR in wastewater to reduce the spread	Availability of safe water from a "One Health" perspective	Right to water – economic value and impacts
Remediation of pollutants: developing strategies to reduce pollutants (disinfection by-products, emerging pollutants and pathogens, including their environmental effect in water, soil, sediment and sludge)	Research into role of the environment in the selection and spread of AMR – stressors	Assessing potential and risk in relation to water reuse strategies – bio-economy/circular economy	Water footprint, sustainable production. Consumption: holistic dimension
Opportunistic pathogens in water due to more favourable climate change conditions			Integrated water exposure: air, water, food, social and psychological effects/stressors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SUMMARY WALLCHART (DAY 1): THEME B – HEALTH & WELLBEING

Water JPI

Questions	Theme B – Health & Wellbeing
Breakout Sessions (Part 1, Day 1)	
Do you agree with the proposed new Research Priorities from Consultation?	Yes With Some Modification
Identify any missing Priorities and Provide rationale	2.1.1 Modified New Sub Theme on 'Human interaction with Water' – missing. Important element. , AMR Environmental Dimension. Too important – needs own Sub Theme
Group and shortlist Key Priorities into agreed Sub-Themes	Sub-theme (List 2-4) ⇒ 1. Developing analytical techniques + appropriate rationale with focus on substances of concern; 2. 2.2 Environmental Dimension of AMR; 3. 2.3.3 understanding + minimising the risks associated with water infrastructure + natural hazards; 4. 2.4.4 Human interactions with water Priority No. (List 5-10) ⇒ 1. 2.1.1 new tools to measure effects Mixtures, transformation products + effects (cocktail); 2.2.1 'one health' risk Antimicrobial resistance + genes; 2.3.1 planning around more water resilient cities in face of climate change; 2.4.1 Health + wellbeing impacts of engagement with water 2. 2.1.2 understanding and predicting the environmental occurrence, behaviour and effects of by-products, pollutants and pathogens including their environmental effects; 2.2.2 Addressing knowledge Gaps in Surveillance data; 2.3.2 Improving the security of + performance of water assets + infrastructure in water sources to tap; 2.4.2 Stakeholder responsibility in valuing water – Industry, HSE, Citizens, Agencies – consumption, recreation, extraction, treatment 3. 2.1.3 Remediation of pollutants: developing Strategies to reduce pollutants (DBPs, emerging pollutants, pathogens including their environmental effect in water, soil, sediment + sludge; 2.2.3 Research + development of new tools for monitoring AMR genes in the environment + develop technologies that rapidly reduce AMR in waste water to reduce the spread; 2.3.3 Availability of Safe water from a 'one Health' Perspective; 2.4.3 Right 2 water – economic value – impacts 4. ~~2.1.5 New Tools to measure effects~~ of sludge; 2.2.4 Assessing the role of the environment in the Selection + Spread of AMR – Strategies; 2.3.4 Assessing potential + risk in relation to water reuse Strategies – Biocircular economy; 2.4.4 Water footprint Sustainable production/consumption Holistic Dimension 5. 2.1.4 Opportunistic pathogens in Water – due to climate change conditions favourable; 2.4.5 Integrated water Exposure: air, water, food Social + Psychological

Plenary feedback from day 1

A summary of the discussion from day 1 was provided by the chairperson and rapporteur, with the main emphasis being the importance of safe water for all citizens. A number of new recommendations were made by this group, particularly in regard to new subthemes for the new SRIA.

Question 1. Define the expected impacts (positive and negative)

The expected impacts were discussed at each table. At room level, the key expected impacts were agreed and compiled, as detailed in the A0 summary wallchart (see Table 3-6).

Table 3-6. Theme B: Health and Wellbeing – expected impacts

Area	Expected impacts
Policy	• Priorities 2.1.1 and 2.1.2. The discussion around policy and expected impacts related to the fact that regulation would need to change in line with the categories of pollutants that are not regulated for • The SDGs of importance were 2, 3, 5, 8, 9 and 11–15. SDG 2, zero hunger, was added as pollutants may also enter the food chain and, therefore, it needs to be considered • Drivers are needed to drive economic impact – supply and demand • Regarding the policy impacts, the WFD, Waste Framework Directive and the Common Agricultural Policy need to implement stricter controls on the use of antibiotics • Policy impacts around the need for the top level to lead by example. There was also discussion regarding water and water value/pricing • The SDGs considered relevant are 3, 12, 13, 16 and 17. SDG 17 was considered very important/relevant as it includes partnership for all
Environmental	• More research is needed to understand the risks of antibiotics in aquaculture. Increase in maintaining biodiversity resistance. Reducing AMR would reduce the costs of treatment and ultimately loss of humans and animals
Economic	• Create new tourism opportunities • Reduce AMR – reduce cost of animal/human life

Area	Expected impacts
	• "O'Neill report" • Negative impact on farming • Wider viability of water and land for remediation • Leak reduction, less usage • Decrease economic cost of health (human and animal)
Technological	• Identify new technologies and be technologically ready • Better health for society • Novel tools for surveillance and new materials or uses of materials
Society	• Understanding the health risk of sludge and manure will allow evidence-based decisions to be made around nutrient cycling • Society would benefit as there would be improved options for treatment of disease
Negative impacts	• The negative is that more knowledge requires action and there is a potential impact on farming economics • Negative value of water – price • Negative price increase

Question 2. Identify any other cross-cutting issues and provide rationale

The cross-cutting issues were discussed at each table. Overall, the following cross-cutting issues were discussed:

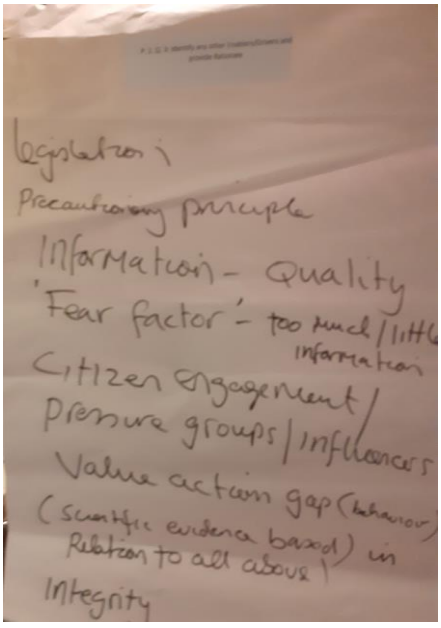
- Communication between researchers and stakeholders (industry, policymakers and public). It was stressed that it is always expected that researchers should be more communicative regarding research needs, findings and recommendations. Some researchers questioned why not the other way around?

- Exclusion was also discussed as a cross-cutting issue. Some researchers felt that they were not included in initiatives or should be better informed of initiatives.

- Integration of nature into urban.

Question 3. Identify any other enablers/drivers and provide rationale

The enablers/drivers were discussed at each table. Overall, the following drivers and enablers were discussed:



Drivers

- Legislation is a relevant enabler/driver as there are laws in place to protect water courses and to ensure quality/quantity.

- The "precautionary principle" in the EU is a fundamental principle that governs policy related to health, the environment and food safety.

- Quality of information received. The wrong information could incite fear and drive the wrong response, especially in relation to water quality, etc.

Enablers

- Citizen engagement.
- Pressure groups and influencers.
- "Value–action gap" in relation to human behaviour – the attitudes of individuals may not correlate with their actions.

It was also noted that there was too much information in real time, yet it may not be understood or be accurate. If information is to be circulated in real time and at the rate that it is, the information needs to be scientifically evidence based and fully validated.

Question 4. What are the barriers that limit access to European/national research infrastructure?

- General Data Protection Regulation (GDPR).
- Lack of openness and transparency from various EU agencies. A country may not divulge information or be involved in initiatives as it may not have national importance, politically or economically. This creates a barrier to other EU members engaging.
- Lack of capacity to be involved in initiatives for researchers.
- Lack of research infrastructure in place initially.

Question 5. What additional research infrastructure is needed to support European water-related research up to 2030 and beyond?

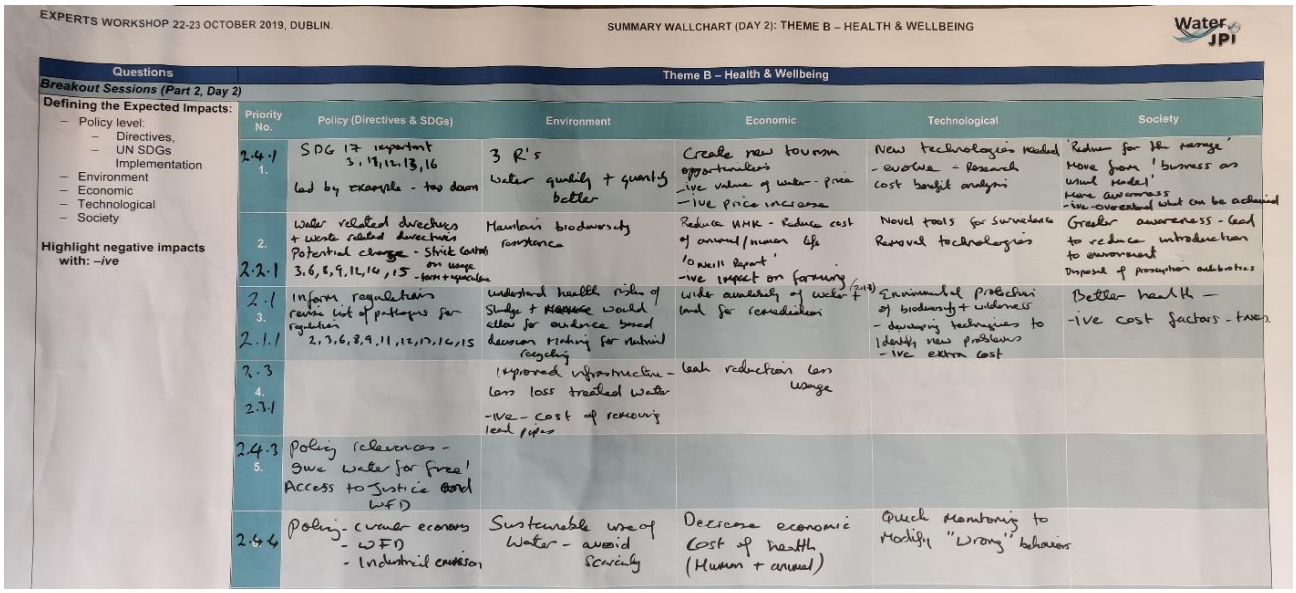
- Data infrastructure (health) and the lack of it for the environment.
- Surveillance infrastructure (opportunistic pathogens, pathogens, AMR, etc.).
- More survey model systems need to be developed to define what is available in terms of parameters/variables.

3.3.2.3 Room Consensus (Summary Wall Charts)

Following the breakout group discussions, the outcomes were relayed to the participants and a consensus was reached regarding the inputs for SRIA 2025 on the expected impacts (Table 3-7) and the cross-cutting issues, drivers/enablers and research infrastructure (Table 3-8).

Table 3-7. Room consensus for Theme B: Health and Wellbeing – expected impacts

Theme B: Health and Wellbeing (day 2) - expected impacts				
Policy	**Environment**	**Economic**	**Technological**	**Society**
Inform regulations regarding the list of pathogens for regulation SDGs 2, 3, 5, 8, 9 and 11–15	Understand health risks of sludge to allow for evidence-based decision-making regarding national recycling	Wider viability of water and land for remediation	Environmental protection of biodiversity and wilderness Developing technologies to identify new problems Negative – extra cost	Better health Negative – cost factors – taxes
Water-related directives and waste-related directives Farm and aquaculture Strict controls on usage Potential change to SDGs 3, 6, 8, 9, 12, 14 and 15	Maintain biodiversity resistance	Reduce AMR – reduce cost of animal/human life "O'Neill report" Negative impact on farming	Novel tools for surveillance Removal technologies	Greater awareness – lead to reduce introduction to environment Disposal of prescription antibiotics
	Improved information – less loss of treated water Negative – cost of removing lead pipes	Leak reduction, less usage		
Policy references Give water for free! Access to justice and WFD SDG 17 important; also SDGs 3, 17, 12, 13 and 16 Lead by example – top down Policy – circular economy, WFD, industrial emissions	3 R's (reduce, reuse and recycle) Improve water quality and quantity Sustainable use of water – avoid scarcity	Create new tourism opportunities Negative – value of water – price Decrease economic cost of health (human and animal) Negative – price increase	New technologies needed – evolve – research cost–benefit analysis Quick monitoring to modify "wrong" behaviour	Ready for the message Move from "business as usual mode" More awareness Negative – overextend what can be achieved Better communication for public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SUMMARY WALLCHART (DAY 2): THEME B – HEALTH & WELLBEING

Water JPI

Questions

Breakout Sessions (Part 2, Day 2)

Defining the Expected Impacts:
- Policy level:
  - Directives,
  - UN SDGs
  - Implementation
- Environment
- Economic
- Technological
- Society

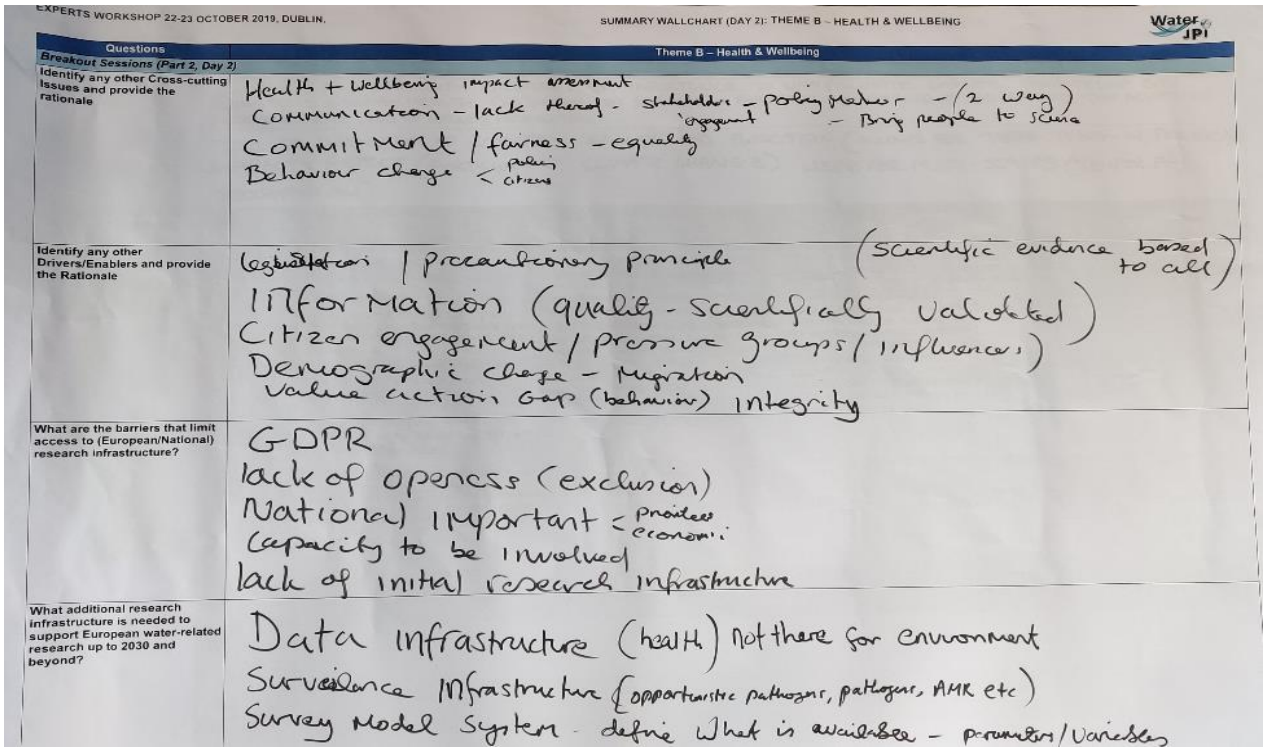
Highlight negative impacts with: –ive

Theme B – Health & Wellbeing

Priority No.	Policy (Directives & SDGs)	Environment	Economic	Technological	Society
2.4.1 1.	SDG 17 important 3, 11, 12, 13, 16 Led by example - top down	3 R's Water quality + quantity better	Create new tourism opportunities -ive value of water - price -ive price increase	New technologies needed - evolve - Research cost benefit analysis	'Reduce for the average' Move from 'business as usual model' More awareness -ive-overstand what can be achieved
2. 2.2.1	Water related directives + waste related directives Potential change - Strict control on usage 3, 6, 8, 9, 11, 14, 15 - farm + agriculture	Maintain biodiversity resilience	Reduce HMK - Reduce cost of animal/human life 'Dasgupta Report' -ive impact on farming (2018)	Novel tools for surveillance Removal technologies	Greater awareness - lead to reduce introduction to environment Disposal of prescription antibiotics
2.1 3. 2.1.1	Inform regulations revise list of pathogens for regulation 2, 3, 6, 8, 9, 11, 12, 13, 14, 15	Understand health risks of Sludge + Manure would allow for evidence based decision making for natural recycling	Wide availability of water + land for remediation	Environmental protection of biodiversity + wilderness - developing technologies to identify new problems -ive extra cost	Better health — -ive cost factors - taxes
2.3 4. 2.3.1		Improved infrastructure - Less loss treated water -ive - cost of renewing lead pipes	Less reduction less usage		
2.4.3 5.	Policy relevance - Give water for free! Access to Justice Good WFD				
2.4.4	Policy - circular economy - WFD - Industrial emissions	Sustainable use of Water - avoid scarcity	Decrease economic cost of health (Human + animal)	Quick monitoring to identify "Wrong" behaviour	

Table 3-8. Room consensus for Theme B: Health and Wellbeing – cross-cutting issues, drivers/enablers and research infrastructure

Theme B: Health and Wellbeing (day 2) – cross-cutting issues, drivers/enablers and research infrastructure	
Questions	**Summary of discussion**
Identify any other **cross-cutting issues** and provide rationale	• Health and wellbeing impact assessment • Communication – lack thereof – stakeholders – policymakers (two-way) • Commitment and fairness – equality • Behaviour change – policy/citizen
Identify any other **drivers/enablers** and provide rationale	• Legislation/precautionary principle (scientific evidence based) • Information (quality – scientifically validated) • Citizen engagement/pressure groups/influencers) • Demographic change – migration • Value–action gap (behaviour) integrity
What are the **barriers** that limit access to (European/national) **research infrastructure**	• GDPR • Lack of openness (exclusion) • Nationally important: priorities, economic • Capacity to be involved • Lack of initial research infrastructure
What **additional research infrastructure** is needed to support European water-related research up to 2030 and beyond?	• Data infrastructure (health) not there for environment • Surveillance infrastructure (opportunistic pathogens, pathogens, AMR, etc.) • Survey model system – define what is available – parameters/variables)



EXPERTS WORKSHOP 22-23 OCTOBER 2019, DUBLIN. SUMMARY WALLCHART (DAY 2): THEME B – HEALTH & WELLBEING

Questions	Theme B – Health & Wellbeing
Breakout Sessions (Part 2, Day 2)	
Identify any other Cross-cutting Issues and provide the rationale	Health + Wellbeing impact assessment Communication – lack thereof - stakeholders – policy makers – (2 way) engagement – Bring people to scene Commitment / fairness – equality Behaviour change < policy citizens
Identify any other Drivers/Enablers and provide the Rationale	legislation / precautionary principle (scientific evidence based to all) Information (quality - scientifically validated) Citizen engagement / Pressure groups / influencers) Demographic change – Migration Value action Gap (behaviour) Integrity
What are the barriers that limit access to (European/National) research infrastructure?	GDPR lack of openess (exclusion) National important < Priorities economic Capacity to be involved lack of initial research infrastructure
What additional research infrastructure is needed to support European water-related research up to 2030 and beyond?	Data infrastructure (health) not there for environment Surveillance Infrastructure (opportunistic pathogens, pathogens, AMR etc) Survey Model System - define what is available – parameters / variables

3.3.3 Theme C: Water Value and Usage

3.3.3.1 Attendees

In total, 15 attendees participated at the breakout group session for Theme C: Water Value and Usage. They represented the research community, the Water JPI GB and ministry and policymaking departments. Seven countries were represented: Denmark, Finland, France, Italy, Ireland, Norway and Austria.

The session was chaired by Jean-Daniel Rinaudo from the French Geological Survey (BRGM), who is a Water JPI AB member (full biography provided in Appendix C). Alice Wemaere (EPA Ireland), Dominique Darmendrail (Water JPI Coordinator, ANR, France) and Laura Forsström (Academy of Finland, Finland) acted as moderators. Alice Wemaere was also the rapporteur.

3.3.3.2 Overview of the Table Discussions

As part of the breakout group sessions, the participants were divided into three groups and asked to consider the key RDI priorities for each of the Water JPI-proposed new research themes to 2025 (focusing on the research priority level rather than the topic level) and agree on/group them into subthemes and defining the expected impacts (positive and negative). A moderator was assigned to each table and the discussion feedback was relayed to the rapporteur.

Question 1. Which priorities of the SRIA are still relevant?

The research priorities listed in the SRIA 2.0 that were found to be still relevant were as follows:

Table 1

- 3.1.1 (SRIA 2.0 – Developing smart water technologies (sensor networks and real-time in- formation systems in water distribution and wastewater networks) and 3.1.3 (SRIA 2.0 – Promoting innovative approaches to asset management). Should including renewal/replacement of ageing infrastructure, water losses. It was discussed that these could be merged.

- **3.1.2** (SRIA 2.0 – Delivering technological solutions for water and wastewater treatment). Split drinking water and wastewater treatment.

- **3.2** (SRIA 2.0 – Enhancing the regulatory framework). This would include, for example, licence abstractions.

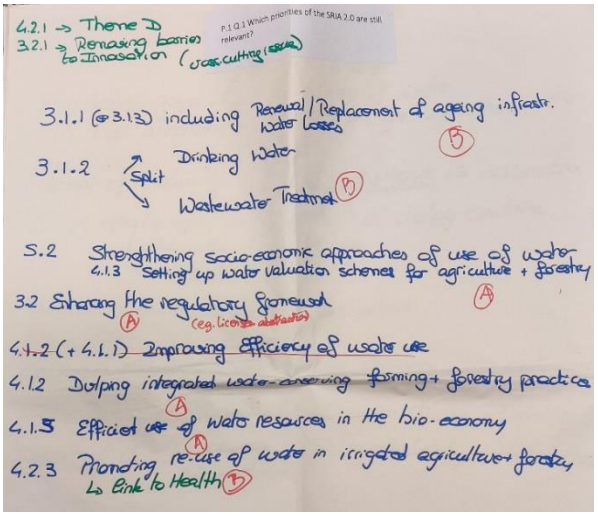
- **4.1.1** (SRIA 2.0 – Implementing efficient water use systems and practices for the European and overseas market) and **4.1.2** (SRIA 2.0 – Developing integrated water-conserving farming and forestry practices and varieties). Improving efficiency of water use. It was discussed that these could be merged.

- **4.1.3** [SRIA 2.0 – Setting up water valuation schemes for agriculture and forestry (link with 5.2.2 and 1.1.2)].

- **4.1.5** (SRIA 2.0 – Ensuring the efficient use of water resources in the bio-economy sector).

- **5.2** (SRIA 2.0 – Strengthening socio-economic approaches to water management).

- **4.2.3** (SRIA 2.0 – Promoting reuse of water in irrigated agriculture and forestry). It was outlined that this priority also links to health.



The following research priorities listed in the SRIA 2.0 were discussed and it was suggested that:

- **4.2.1** (SRIA 2.0 – Developing sustainable production systems) should be considered under Theme D.

- **3.2.1** (SRIA 2.0 – Removing barriers to innovation) should be considered as a cross-cutting issue in the new SRIA.

Table 2

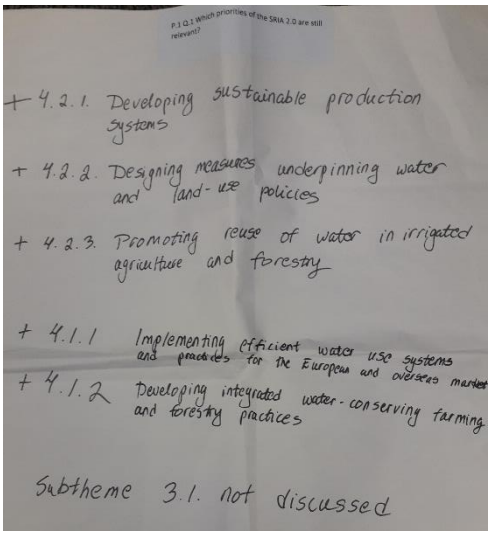
- **4.2.1** (SRIA 2.0 – Developing sustainable production systems).

- **4.2.2** [SRIA 2.0 – Designing measures underpinning water and land-use policies (link with 4.1.3 and 4.1.4)].

- **4.2.3** (SRIA 2.0 – Promoting reuse of water in irrigated agriculture and forestry).

- **4.1.1** (SRIA 2.0 – Implementing efficient water use systems and practices for the European and overseas market).

- **4.1.2** (SRIA 2.0 – Developing integrated water-conserving farming and forestry practices and varieties).



Subtheme 3.1 was not discussed.

Table 3

- 3.1.1 [SRIA 2.0 – Developing smart water technologies (sensor networks and real-time information systems in water distribution and wastewater networks) (link with 2.2.1, 2.2.2)].

- 3.1.2 (SRIA 2.0 – Delivering technological solutions for water and wastewater treatment) – in the context of being more efficient, more off-grid, more cost-effective, easier to implement. Social acceptance and connecting "hard" wastewater technologies with nature-based solutions were also discussed. It was also noted that water reuse should be cross-sectoral.

- 4.1.1 (SRIA 2.0 – Implementing efficient water use systems and practices for the European and overseas markets).

- 4.1.2 (SRIA 2.0 – Developing integrated water-conserving farming and forestry practices and varieties). It was highlighted that both priority 4.1.1 and priority 4.1.2 should be considered in the context of climate change.

- 4.1.3 [SRIA 2.0 – Setting up water valuation schemes for agriculture and forestry (link with 5.2.2 and 1.1.2)]. It was noted that addressing this priority will be challenging.

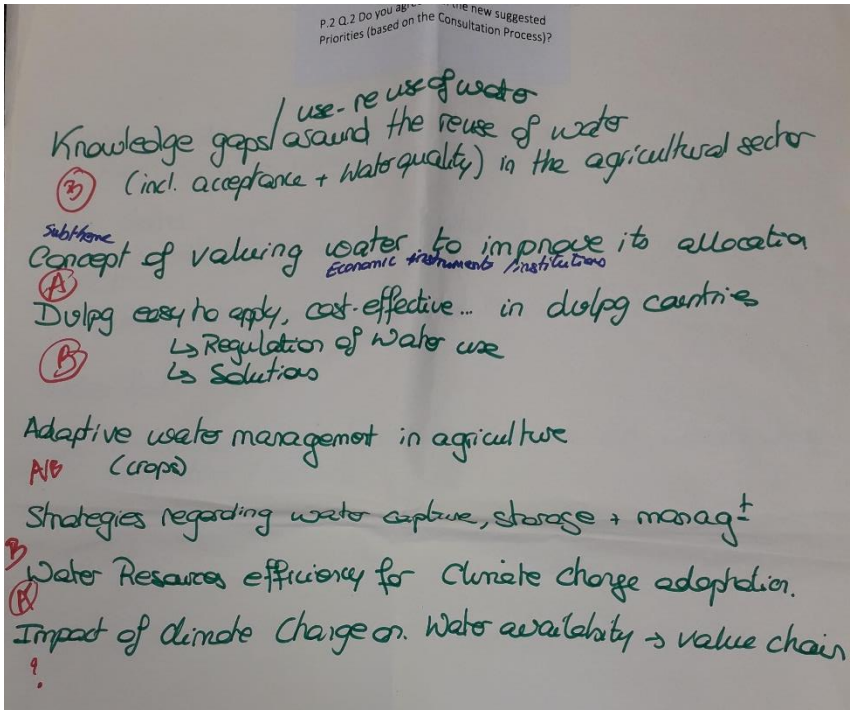
- 4.1.5 (SRIA 2.0 – Ensuring the efficient use of water resources in the bio-economy sector).

- 4.2.1 (SRIA 2.0 – Developing sustainable production systems). The following were also discussed as relevant for this priority: agriculture, forestry, freshwater aquaculture and trade-offs with environmental issues, as well as other economic activity impacts. Aeroponics and hydroponic aquaculture were discussed and it was noted that microbiological pollution should be considered. This should be linked to Theme D.

- 4.2.3 [SRIA 2.0 – Promoting reuse of water in irrigated agriculture and forestry (link with subtheme 5.2)]. It was noted that this priority should be further developed and considered with 4.1.5 (SRIA 2.0 – Ensuring the efficient use of water resources in the bio-economy sector).

Question 2. Do you agree with the new suggested priorities (based on the consultation process)? Table 1

The following were outlined as relevant:



- Knowledge gaps around the use and reuse of water (including acceptance and water quality) in the agricultural sector.
- Concept of valuing water to improve its allocation (economic instruments/institutions).
- Developing easy-to-apply, cost-effective (particularly in in developing countries) solutions.
- Adaptive water management in agriculture (crops).
- Strategies regarding water capture, storage and management (this is related to nature-based solutions).
- Water resource efficiency for climate change adaptation.
- Impact of climate change on water availability along the value chain (i.e. climate change risk assessment for value chains).
- Climate change risk assessment for value chains, prices, international trade and food security, including changes in consumer behaviours and wastes – impact of climate change on water availability versus value chain agriculture – producers and consumers.
- Water management for agriculture, including water stress, dryness (desertification), precision use, prevention, flooding, quantity and quality of water management.

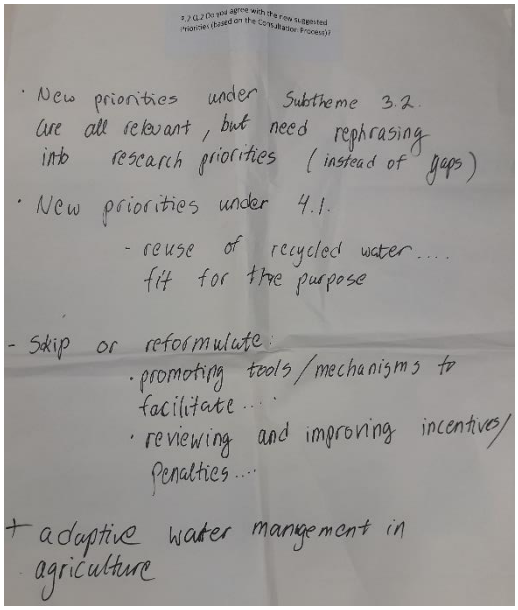
The proposed new research priorities included in the Discussion Note were discussed and the following were found either not to be a research priority as such or to require rewording:

- Explore inputs/approach to cumulative effects, thresholds, acceptance and monitoring costs.
- Developing easy-to-apply, cost-effective solutions (with minimum operation and maintenance requirements) for developing regions/countries (intersecting with subtheme 5.1) was highlighted as a need.
- Research requirement for a broader scope and more water management solutions than the current focus on the water industry.
- Research on the use/reuse of alternative or recycled water (rainwater, reclaimed domestic wastewater, stormwater, desalinated sea water) and/or more diverse (groundwater) water sources for water fit for purpose to mitigate water stress and water scarcity and the implications thereof in terms of water quality and new infrastructure. This was discussed as being more in scope for the FACCE-JPI.

- Promoting tools/mechanisms to facilitate and enhance innovation.
- Reviewing and improving incentives/penalties to assist RDI functions.
- Water should be fit for use for all economic sectors (beverages, food, leisure), have links/synergies between sectors and link with pathogens (consider reuse and the energy–agriculture nexus.
- Research in watershed management, flooding, irrigation technologies and water reuse.
- Further investments in research and data collection are needed to better understand the current and potential contribution of urban agriculture to venture capital and to break current constraints to urban /agriculture development, including insecure land tenure, polluted land and water, limited access to resources and support services and lack of recognition by city authorities.

Table 2

The following was discussed:



- New priorities listed in the Discussion Note under subtheme 3.2 were found to all be relevant, but in need of rephrasing into research priorities (instead of knowledge gaps).
- New priorities listed in the Discussion Note under subtheme 4.1:
  - Reuse of recycled water – fit for purpose is relevant.
  - There is a need to reformulate: promoting tools/mechanisms to facilitate, and reviewing and improving incentives/penalties.
  - Adaptive water management in agriculture is relevant.

Table 3

The following were outlined as relevant:

- Knowledge gaps identified around the agriculture sphere, particularly crop research knowledge gaps around the reuse of water and water quality (no EU legislation to specify the conditions for water reuse). It was noted that this linked to 4.2.3 [SRIA 2.0 – Promoting reuse of water in irrigated agriculture and forestry (link with subtheme 5.2)].
- Knowledge gap around the concept of valuing water. It was noted that this could be considered under Theme A.
- Explore inputs/approach to cumulative effects, thresholds, acceptance and monitoring costs.
- Research into developing easy-to-apply, cost-effective solutions (with minimum operation and maintenance requirements) for developing regions/countries (intersecting with subtheme 5.1). It was noted that this linked to 3.1.2 (SRIA 2.0 – Delivering technological solutions for water and wastewater treatment).

- Research requirement for a broader scope and more water management solutions than the current focus on the water industry. This should be considered/reworded in the context of conflict of usages, quantity and quality for economic factors and "water smart economy and society" and could also be of relevance to Theme D.

- Research into crops, in terms of adapting to water shortages. It was noted that this linked to 4.1.1 (SRIA 2.0 – Implementing efficient water use systems and practices for the European and overseas markets).

- Water management for agriculture, including water stress, dryness (desertification), precision use, prevention, flooding, quantity and quality of water management. It was noted that this linked to 4.1.2 (SRIA 2.0 – Developing integrated water-conserving farming and forestry practices and varieties).

- There is a need to strengthen strategies regarding water capture, storage and management. This could also be of relevance to Theme D.

- Water resource efficiency for climate change adaptation. Design and test methods. It was noted that this linked to 4.1.1 (SRIA 2.0 – Implementing efficient water use systems and practices for the European and overseas markets).

- Research on the use/reuse of alternative or recycled water (rainwater, reclaimed domestic wastewater, stormwater, desalinated sea water) and/or more diverse (groundwater) water sources for water fit for purpose to mitigate water stress and water scarcity and the implications thereof in terms of water quality and new infrastructure. It was noted that this linked to 4.2.3 [SRIA 2.0 – Promoting reuse of water in irrigated agriculture and forestry (link with subtheme 5.2)].

- Promoting tools/mechanisms to facilitate and enhance innovation. This is not a research priority as such but rather a cross-cutting issue.

- Reviewing and improving incentives/penalties to assist RDI functions (in the context of testing uncertainties for more efficient solution implementation).

- Water should be fit for use for all economic sectors (beverages, food, leisure), have links/synergies between sectors and link with pathogens, consider reuse and the energy–agriculture nexus.)

- Research in adaptive water management in agriculture. It was noted that this linked to 4.1.2 (SRIA 2.0 – Developing integrated water-conserving farming and forestry practices and varieties).

- Research in watershed management, flooding, irrigation technologies and water reuse. This should be considered under Theme D.

- Climate change risk assessment for (along the value chains) value chains, prices, international trade and food security, including changes in consumer behaviours and wastes.

Further investments in research and data collection are needed to better understand the current and potential contribution of urban agriculture to FSN and to break current constraints to urban agriculture development, including insecure land tenure, polluted land and water, limited access to resources and support services and lack of recognition by city authorities.

Question 3. Are there any other priorities? Provide the rationale.

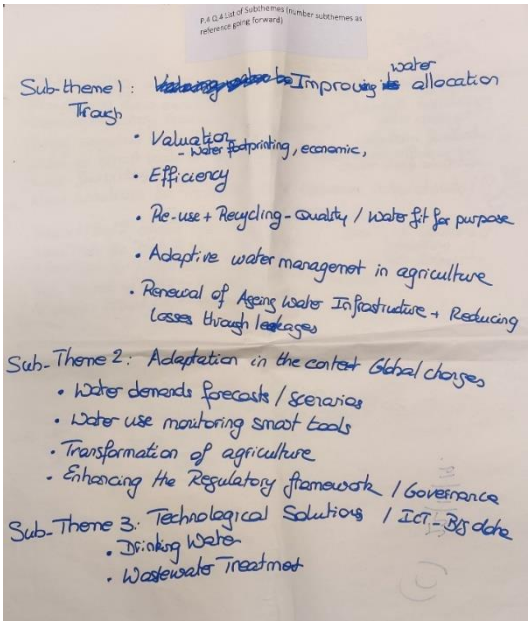
The following priorities were discussed as needing to be included in this theme:

• Water quality (fit for purpose). New tools for biological quality	• Water "smart" – circular economy across economic sectors – efficiency	• Decentralised areas/rural
• Water use monitoring with smart tools: big data; citizen science; information and communications technology – the technology is available but the challenge remains on how to use it	• Energy production from wastewater treatment plants	• 'Fit-for-purpose' water for all sectors using water (level of security/ sanitation). Key water users were outlined as agriculture, energy, textiles, etc.; cities
• Water footprinting	• Hybrid technologies	• Scalable affordable solutions
• Long-term water demand forecasts/scenarios including climate change adaptation/resilience	• Smart cities; prioritising investments	• 3.1.2 (SRIA 2.0 – Delivering technological solutions for water and wastewater treatment) including social acceptance
• Empowering public to value water	• Communicating water value	• Side note outlining key water users

Question 4. Grouping into subthemes

Table 1

Two options were discussed at the first table as detailed below. The second option was the one used to provide the table summary.



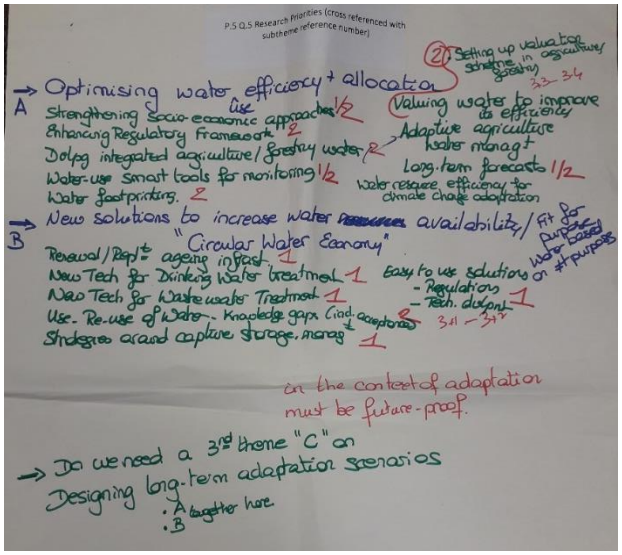
Option 1:

- New Subtheme C.1: Improving water allocation:
  - valuation – water footprinting;
  - efficiency;
  - reuse and recycling – quality/water fit for purpose;
  - adaptive water management in agriculture;
  - renewal of ageing water infrastructure and reducing losses through leakages.
- New Subtheme C.2: Adaptation in the context of global changes:
  - water demands forecasts/scenarios;
  - water use monitoring using smart tools;
  - transformation of agriculture;
  - enhancing the regulatory framework/governance.
- New Subtheme C.3: technological solutions/information and communications technology – big data:

- drinking water;
- wastewater treatment.

Option 2:

- New Subtheme C.1: Optimising water use efficiency and allocation:
  - strengthening socio-economic approaches;
  - enhancing the regulatory framework;
  - developing integrated agriculture/forestry water;
  - water use – smart tools for monitoring;
  - water footprinting;
  - setting up valuator scheme in agriculture/forestry;
  - valuing water to improve its efficiency;
  - adaptive agriculture water management;
  - long-term forecasts;
  - water resource efficiency for climate change adaptation.



- New Subtheme C.2: New solutions to increase water availability/fit for purpose – "circular water economy":
  - renewal/replacement of ageing infrastructure;
  - new technologies for drinking water treatment;
  - new technologies for wastewater treatment;
  - reuse of water (including acceptance);
  - strategies around capture storage, management;
  - easy-to-use solutions, including regulations and technological development.

All research priorities outlined above must be considered in the context of adaptation to climate change (i.e. must be future-proofed).

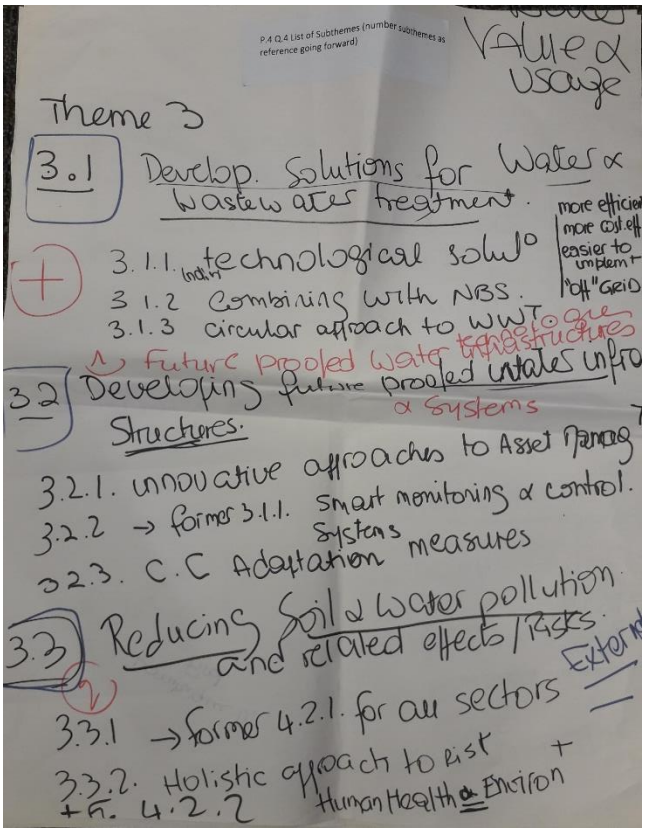
Potential new! A question was raised on whether or not a third subtheme was needed on designing long-term adaptation scenarios.

Table 2

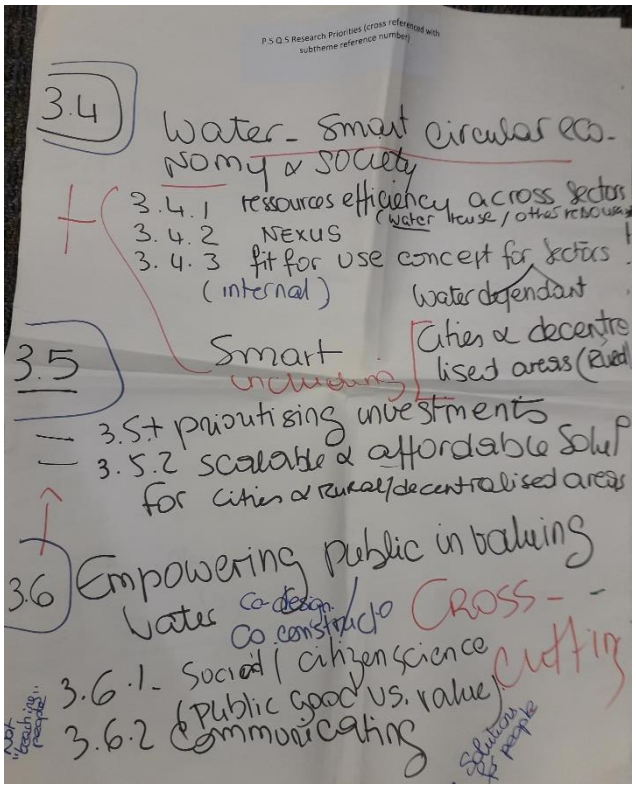
The following option was discussed at the second table:

- New Subtheme C.1: Develop solutions for water/wastewater treatment:

  - C.1.1 Technological solution.
  - C.1.2 Combining with nature-based solutions.
  - C.1.3 Circular approach to wastewater treatment.
  - C.1.4 Future-proofed water technologies infrastructure systems.



- New Subtheme C.2: Developing future-proofed water infrastructures:
  - C.2.1 Innovative approaches to asset naming.
  - C.2.2 [including previous 3.1.1 from SRIA 2.0 – Developing smart water technologies (sensor networks and real-time information systems in water distribution and wastewater networks) (link with 2.2.1, 2.2.2)] Smart monitoring and control systems.
  - C.2.3 Climate change adaptation measures.
- New Subtheme C.3: Reducing soil and water pollution and related effects/risks:
  - C.3.1 (including previous 4.2.1 from SRIA 2.0 – Developing sustainable production systems) for all sectors ("external perspective").
  - C.3.2 Holistic approach to risk and human health and environment [encompassing previous 4.2.2 from SRIA 2.0 – Designing measures underpinning water and land-use policies (link with 4.1.3 and 4.1.4)].



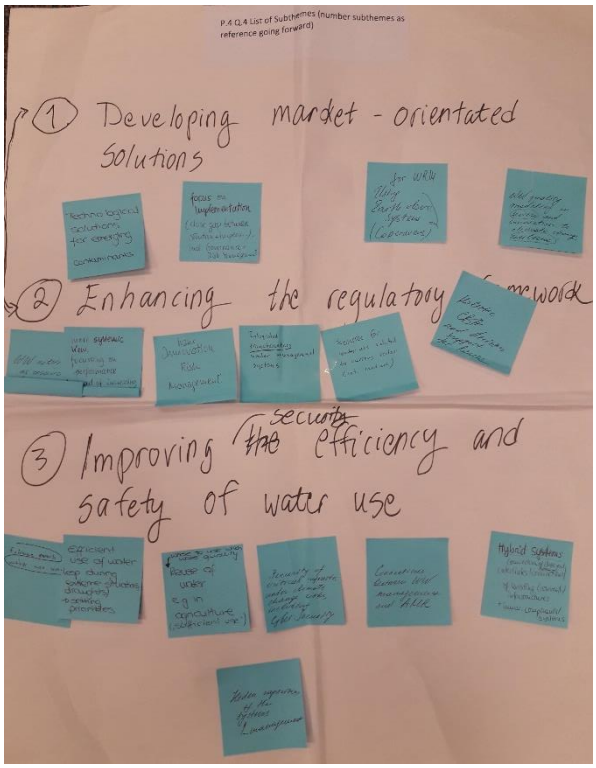
- New Subtheme C.4: Water-smart circular economy and society, including:
  - C.4.1 Technological solution.
  - C.4.2 Resource efficiency across sectors (water reuse/other resources).
  - C.4.3 Nexus.
  - C.4.4 Fit-for-use concept for water-dependent sectors (“internal perspective”).
- New Subtheme C.5: Smart cities and decentralised areas (rural):
  - C.5.1 Prioritising investments.
  - C.5.2 Scalable and affordable solutions for cities and rural/decentralised areas.
- New Subtheme C.6: Empowering public in valuing water (co-design/co-construction):
  - C.6.1 Social citizen science.
  - C.6.2 Communication (public goods vs value).

Table 3

The following option was discussed at the third table:

- New Subtheme C.1: Enhancing the regulatory framework:
  - Water networks, disruptive technologies, systemic change’– new ways of thinking;

  - water innovation risk management (implementation of new solutions – impact (risk about implementing new solutions);
  - integrated transboundary under management systems;
  - scenarios for water reuse related to all sectors, including land use.



- New Subtheme C.2: Developing market-oriented solutions:
  - technological solutions for emerging contaminants;
  - governance and risk management included in implementation, close gap between solutions and implement;
  - wastewater;
  - using Earth observation for water management, such as Copernicus.
- New Subtheme C.3: Improving security, efficiency and safety of water use:
  - efficient use of water – where/from where;
  - reuse of water;
  - security of critical infrastructure (climate change/cybersecurity);
  - connections between wastewater management and AMR (conventional/innovative systems);
  - climate change resilience through management, hidden capacity.

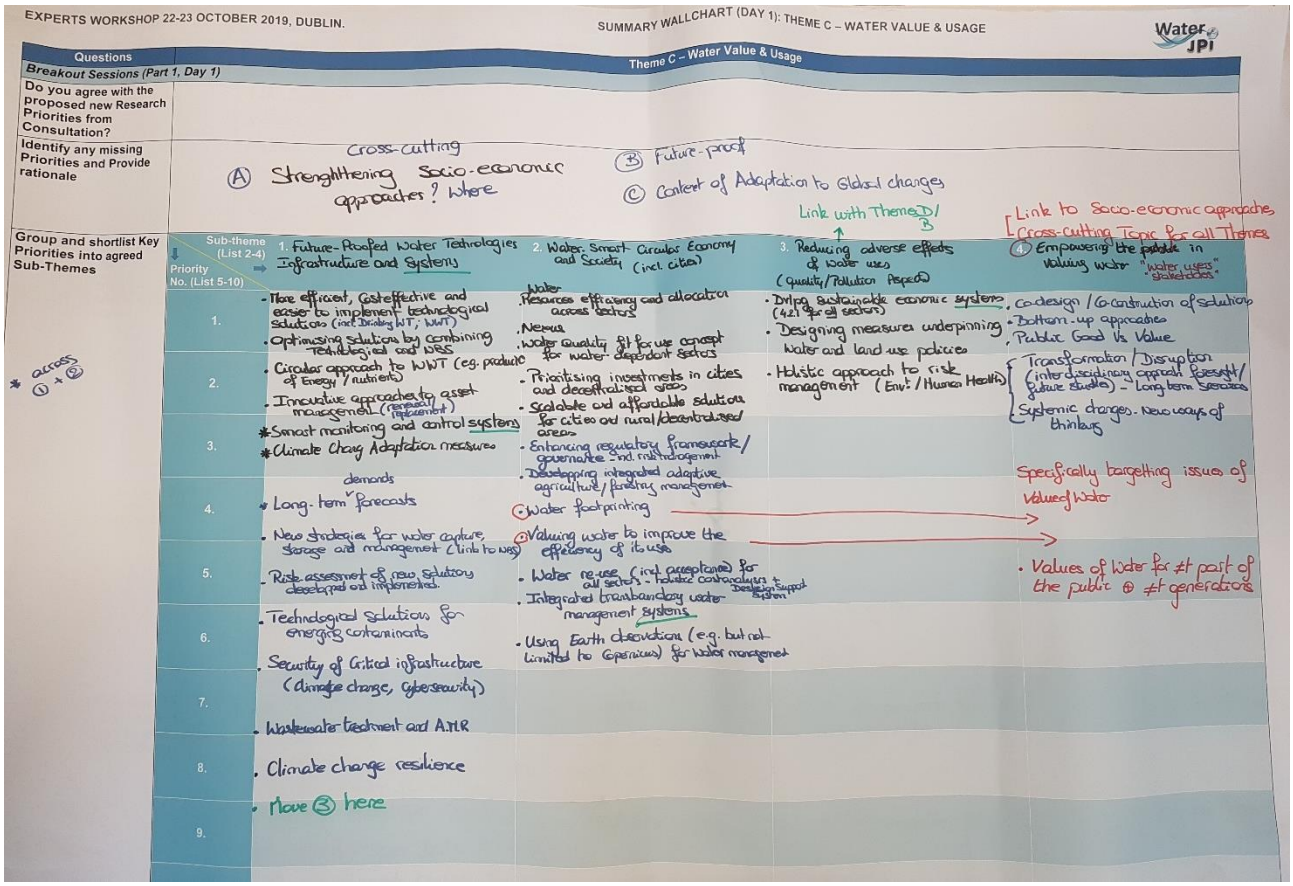
Room Consensus day 1

Following the breakout group discussions, the outcomes were relayed to the participants and a consensus was reached regarding the inputs for SRIA 2025 (Table 3-9).

Table 3-9. Room consensus for Theme C: Water Value and Usage – subthemes and research priorities

C.1 Future-proofed water technologies, infrastructures and systems	C.2 Water-smart-circular economy and societies	C.3 Empowering the public/water users/stakeholders in valuing water
More efficient, cost-effective and easier-to-implement technological solutions, including drinking water treatment and wastewater treatment	Water resource efficiency and allocation across sectors	Co-design – co-construction of solutions for the public
Optimising solutions by combining technological and nature-based solutions	Nexus	Bottom-up approach

C.1 Future-proofed water technologies, infrastructures and systems	C.2 Water-smart-circular economy and societies	C.3 Empowering the public/water users/stakeholders in valuing water
Circular approach to wastewater treatment (e.g. production of energy and nutrients)	Water quality fit for use concept for water-dependent sector	Public good vs value of water
Innovative approaches to assets management (including replacement/renewal of ageing infrastructure, dealing with leakages, etc.)	Prioritising investments in cities and rural/decentralised areas	Systemic changes and new ways of thinking (including transformation, disruption, foresight studies and long-term scenarios)
Smart monitoring and control systems		Water footprinting
Long-term water demand forecasts and scenarios		Valuing water to improve the efficiency of its uses
New strategies for water capture, storage and management (link to nature-based solutions)	Scalable and affordable solutions for cities and rural/decentralised areas	Value of water for different stakeholders and different generations
Risk-based assessment of the implementation of new solutions	Long-term water demand forecasts and scenarios	
Technological solutions for emerging contaminants	Enhancing the regulatory framework/governance, including risk management	
Security of critical infrastructure (in the context of climate change and cybersecurity)	Developing integrated adaptive agriculture/forestry management	
Wastewater treatment and AMR (connection between conventional and innovative solutions)	Water reuse for all sectors, including acceptance, holistic costs analysis and decision support systems	
Climate change resilience		
	Integrated transboundary water management systems	
	Using Earth observations (e.g., but not limited to, Copernicus) for water management	
	Developing sustainable economic systems (see 4.2.1 – Developing sustainable production systems in SRIA 2.0) for all sectors	
	Designing measures underpinning water and land use policies	
	Holistic approaches to risk management (environment/health)	
	Reducing adverse effects of water uses (quality and pollution aspects)	



Plenary feedback from day 1

A summary of the discussion from day 1 was provided by the chairperson and rapporteur. The summary wallcharts from both days are provided below in. Following the breakout group discussions, the outcomes were relayed to the participants and a consensus was reached regarding the inputs for SRIA 2025 on the expected impacts (Table 3-11) and the cross-cutting issues, drivers/enablers and research infrastructure (

Table 3-12).

Table 3-11.

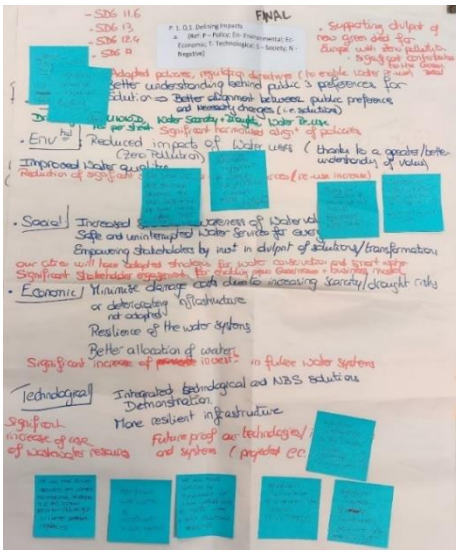
During this session, the definition of a "water system" was discussed:

> Water system is taken to mean rivers and their tributaries ("natural systems"), everything that brings water from sources to its users and is used to deliver water services. It can mean technical systems, which are used to deliver a service, and can refer to organisational systems and operational systems (resources/demands/uses/technologies/infrastructure/operational organisation).

Question 1. Define the expected impacts (positive and negative)

The expected impacts were discussed at each table, as detailed in Table 3-10.

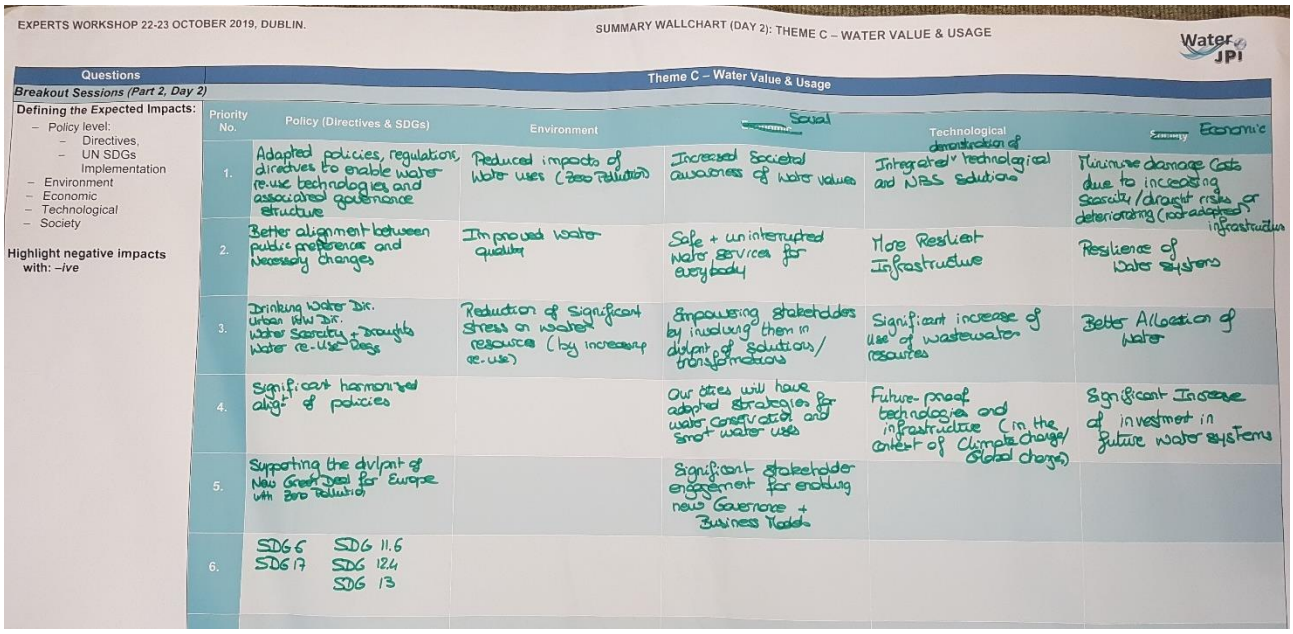
Table 3-10. Theme C: Water Value and Usage – expected impacts



Area	Expected impacts
Policy	Design of better programme of measures (POMs) (WFD) Science based, efficient, cost/effect Better integration between agricultural and environmental policies (Common Agricultural Policy, WFD, Nitrates Directive, Floods Directive) Urban water management Provide new tools to better fulfil the WFD Knowledge for adaptive policies Policy – have a common regulation for sustainable water management implementation at local scale Better-informed policymaking Contribution to reaching the WFD Sustainable water management; improved implementation of UN SDG 6 Decrease the rise of water issues in policies Sustainable water management – water – UN SDG 6 Sustainable water management – reduction in pollution leading to improved state of water bodies in WFD Provide an evidence base for implementing the UN SDGs and ensuring that EU directives are feasible and in line with the UN SDGs Fulfilment of the Urban Waste Water Treatment Directive Link assessment of proposed impacts to the UN SDG targets and indicators Fulfilment of the Floods Directive Amendments to the water policy framework in line with urgent needs of society Degree of integrated water resource management – UN SDG target 6.5.1 UN SDG 1, society and policy – equal rights to water UN SDGs 2 and 9 (economics link)
Environmental	Reduce, reuse, recycle – zero impact on environment Push EU research on environmental expertise gathering Functional in terms of ecosystem services, aquatic ecosystems Improve the stability of ecosystems Sustainable water management – no over-abstraction – reduce loss of aquatic biodiversity Work in a systems approach to minimise contamination of water services and ensure safe water Reducing anthropogenic load on water through closed water cycle Cleaner receiving waters as a result of treatment of heavily polluted wastewater and storm water – closing the water cycle Cleaner water environment capable of supporting the life of hydrobionts and safe for people Maintaining natural equilibrium of processes in water bodies, promoting self-purification of water UN SDG 6, water – target 6.3, reducing pollution, etc.
Economic	Social innovations - participation in different practices – sustainable water management Determine the boundary limits of water resources and availability Sustainable water management of urban areas decreases the costs for tax payers Fair and just water pricing to allow access but also support research/water treatment Promoting water – saving and resource-saving economic development Increasing attractiveness of locations for investment Optimisation of ecosystem services decreases costs

Area	Expected impacts
	Developing productive capacity from water use UN SDG 9, sustainable industrialisation – target 9.4, upgrade infrastructure Increased wellbeing in society when using attractive nature-based solutions, which links to biodiversity and ecosystem services UN SDG 2, economic food production – need to secure water resources in order to double the agricultural productivity UN SDG 6, water – target 6.4.1, water use efficiency over time
Technological	Preserve/improve groundwater quantity and quality by controlling over-extraction and agricultural activities Water and resources reuse Promoting more efficient technologies in water treatment, conditioning, preventing pollutant discharges Nature-based solutions Optimise water treatment with state-of-the-art technologies Impact – change in water use efficiency over time – UN SDG 6, target 6.4.1 UN SDG 6, water – target 6.4, water use efficiency across all sectors UN SDG 7, affordable and clean energy – target 7.1, affordable, reliable and modern energy services
Society	Inclusiveness via citizen science Transfer of knowledge by stakeholders' involvement in JPI projects Enough safe and healthy water for all Costs of overconsumption or pollution will decrease Provide more reliable living conditions for humans Stewardship development Citizen involvement Improve the public sense of responsibility More resilient society/cities in terms of climate change effects Ensure same safe water for drinking, bathing, food production (human and animal use) Cleaner and more safe water for the general population UN SDG 6, water – target 6.2.1, safely managed sanitation services UN SDG 8, decent work and economic growth – target 8.2 UN SDG 11, sustainable cities and communities – targets 11.2, 11.3, 11.5
Negative impacts	• Incentives/income gaps – increase the problem • If goal is too broad there is a risk of not achieving impact • Cost for water consumption may increase • Farmers may be unhappy to be expected to take the initiative in terms of economic support

At room level, the key expected impacts were agreed and compiled, as detailed in the A0 summary wallchart (see Table 3-110).



EXPERTS WORKSHOP 22-23 OCTOBER 2019, DUBLIN.

SUMMARY WALLCHART (DAY 2): THEME C – WATER VALUE & USAGE

Water JPI

Questions

Breakout Sessions (Part 2, Day 2)

Defining the Expected Impacts:

- Policy level:
  - Directives,
  - UN SDGs
  - Implementation
- Environment
- Economic
- Technological
- Society

Highlight negative impacts with: –ive

Theme C – Water Value & Usage

Priority No.	Policy (Directives & SDGs)	Environment	Social	Technological deployment of	Economic
1.	Adapted policies, regulation, directives to enable water re-use technologies and associated governance structure	Reduced impacts of Water uses (Zero Pollution	Increased Societal awareness of water values	Integrated technological and NBS Solutions	Minimise damage Costs due to increasing Scarcity/drought risks or deteriorating (not adapted infrastructure
2.	Better alignment between public preferences and Necessary changes	Improved water quality	Safe + uninterrupted Water services for everybody	More Resilient Infrastructure	Resilience of Water systems
3.	Drinking Water Dir. Urban WW Dir. Water Scarcity + Droughts Water re-use Regs	Reduction of Significant Stress on water resources (by increasing re-use)	Empowering stakeholders by involving them in dvlpmt of solutions/ transformations	Significant increase of use of wastewater resources	Better Allocation of water
4.	Significant harmonised align of policies		Our cities will have adopted strategies for water conservation and Smart water uses	Future-proof technologies and infrastructure (in the context of Climate change/ Global change)	Significant Increase of investment in future water systems
5.	Supporting the dvlpmt of New Green Deal for Europe with Zero Pollution		Significant stakeholder engagement for enabling new Governance + Business Models		
6.	SDG 6 SDG 11.6 SDG 17 SDG 12.4 SDG 13				

Question 2. Identify any other cross-cutting issues and provide rationale

The cross-cutting issues were discussed at each table. Overall, the following cross-cutting issues were identified, based on the three table discussions:

- The UN SDGs and the need for resilience to climate change impacts.
- The need for robustness of solutions (in all scenarios).
- Empowering stakeholders in the design/implementation of new solutions is a related issue.
- The concept of “just transition”, i.e. taking everybody on board and promoting inclusivity. This will then lead to social innovation.
- Open knowledge and innovation.

Future-proofing was discussed and found not to be a cross-cutting issue as such, but it is part of adaptation to global changes. Additionally, “strengthening socio-economic approaches” was discussed and was found to be a priority/subtheme of its own, rather than a cross-cutting issue.

Question 3. Identify any other enablers/drivers and provide rationale

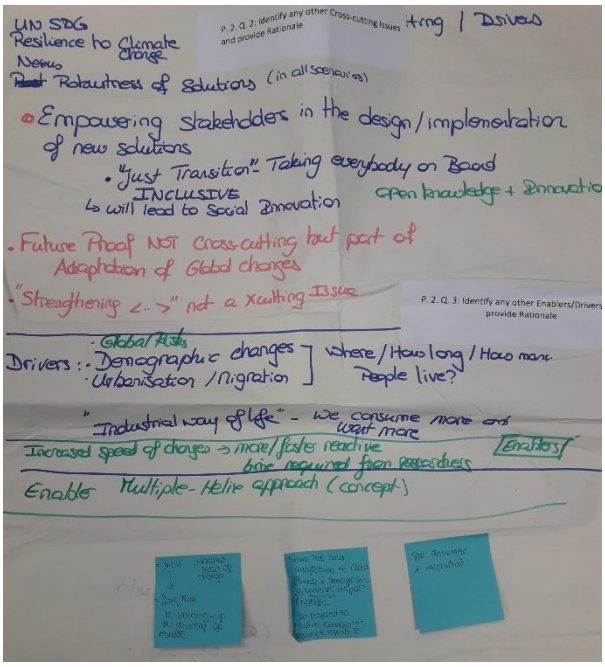
The enablers/drivers were discussed at each table. Overall, the following enablers/drivers were identified:

Drivers

- Global risks.
- Consumerism.
- Demographic changes.
- Urbanisation.
- Migration.

Enablers

- Increased speed of changes leading to faster reactive time required from researchers.
- The multiple (or triple) helix approach/concept (i.e. the relationships and interactions between academia, industry and government).



Questions 4 and 5. What are the barriers that limit access to (European/National) research infrastructure? and What additional research infrastructure is needed to support European water-related research up to 2030 and beyond?

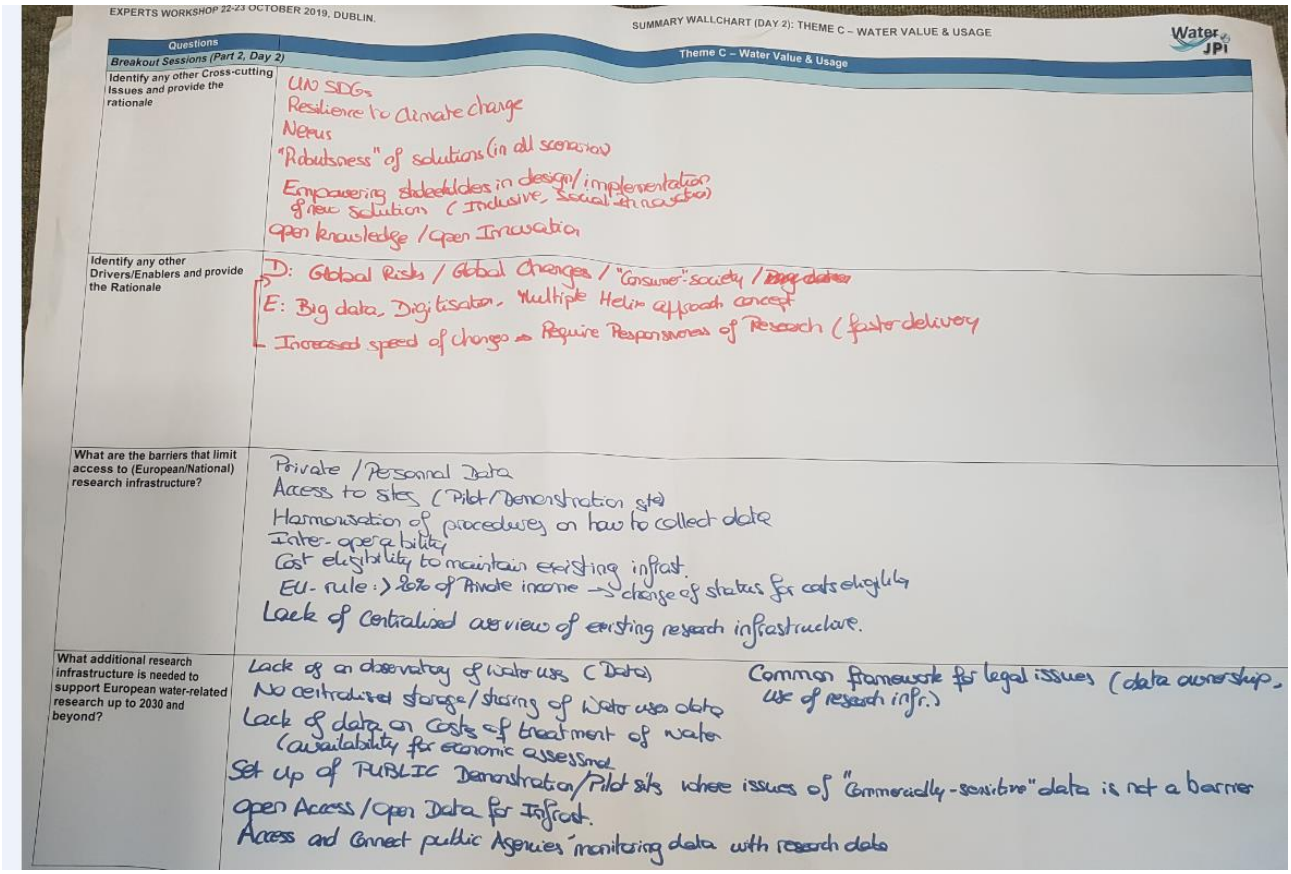
The barriers that limit access to European/national research infrastructure were discussed at each table. Overall, the following barriers were identified:

- private data;
- personal data;
- access to “sites” (pilot – demonstration);
- harmonisation of procedures on how to collect the data “interoperability”;
- lack of centralised overview of existing infrastructures;
- availability/accessibility of “costs data”;
- cost eligibility to maintain existing infrastructure;
- EU rule (20% of private income);

The additional research infrastructure needed to support European water-related research up to 2030 and beyond was discussed at each table. Overall, the following additional research infrastructure was identified:

- access and connect public agency monitoring data with research data;
- common framework for legal issues regarding data ownership and use of research infrastructure;

- harmonisation of procedures on how to collect the data and interoperability;
- set up demonstration sites/pilot sites where the issue of "commercially sensitive data" (private/intellectual property) is not a barrier;
- information on how to get access to infrastructures (how to use);
- harmonisation of procedures for sharing;
- long-term forecasts for modelling (not only environmental data) – uses, prices;
- open access to data from observations;
- access to state agencies' monitoring and connecting to research;
- "common interface";
- living labs and demonstration sites – and the Institutional structure to deliver:
  - "free flowing rivers";
  - national flowing systems;
  - need referencing systems;
  - catchments to test/demo;
  - for ecosystems/not capital;
- legal studies for liabilities;
- joint research coordination – "natural/coordination";
- need to support the various research infrastructure needs;
- gap analysis – need to provide/analyse research infrastructure gaps;
- set up strategic priorities (prioritise the current roadmap) for the need of research infrastructure;
- knowledge hub or research infrastructure for sustainable water management;
- need buy-in from all Member States on equal footing.



EXPERTS WORKSHOP 22-23 OCTOBER 2019, DUBLIN.

SUMMARY WALLCHART (DAY 2): THEME C – WATER VALUE & USAGE

Water JPI

Questions Breakout Sessions (Part 2, Day 2)	Theme C – Water Value & Usage
Identify any other Cross-cutting Issues and provide the rationale	UN SDGs Resilience to climate change Nexus "Robustness" of solutions (in all scenarios) Empowering stakeholders in design/implementation of new solution (Inclusive, Social innovation) Open knowledge / Open Innovation
Identify any other Drivers/Enablers and provide the Rationale	D: Global Risks / Global Changes / "Consumer"-society / Big data E: Big data, Digitisation, Multiple Helix approach concept Increased speed of change → Require Responsiveness of Research (faster delivery
What are the barriers that limit access to (European/National) research infrastructure?	Private / Personal Data Access to Sites (Pilot/Demonstration site) Harmonisation of procedures on how to collect data Inter-operability Cost eligibility to maintain existing infrast. EU-rule: >80% of Private income → change of status for cost eligibility Lack of Centralised overview of existing research infrastructure.
What additional research infrastructure is needed to support European water-related research up to 2030 and beyond?	Lack of an observatory of water use (Data) No centralised storage/sharing of water use data Lack of data on costs of treatment of water (availability for economic assessment) Set up of PUBLIC Demonstration/Pilot sites where issues of "Commercially-sensitive" data is not a barrier Open Access / Open Data for Infrast. Access and Connect public Agencies' monitoring data with research data Common framework for legal issues (data ownership, use of research infr.)

3.3.3.3 Room Consensus (Summary Wall Charts)

Following the breakout group discussions, the outcomes were relayed to the participants and a consensus was reached regarding the inputs for SRIA 2025 on the expected impacts (Table 3-11) and the cross-cutting issues, drivers/enablers and research infrastructure (

Table 3-12).

Table 3-11. Room Consensus for Theme C: Water Value and Usage – expected impacts

Theme C: Water Value and Usage (Day 2) – expected impacts				
Policy	**Environment**	**Economic**	**Technological**	**Society**
Adapted policies, regulations and directives to enable water reuse technologies and associated governance structure	Reduced impacts of water use on the environment (zero pollution)	Minimised damage costs due to increased risks of droughts and scarcity or due to deteriorating or unadapted infrastructures		Increased society awareness of water values
Better alignment between public preferences and necessary changes (note: this does not imply only increased public acceptance)	Improved water quality	Resilience of the water systems (i.e. from sources to users)		Safe and uninterrupted water services for everybody
As listed in the Discussion Note – but mostly relevant to: Drinking Water and Urban Waste Water Treatment Directives, scarcity and droughts strategy and draft regulations on water reuse	Reduction of significant stress on water resources (e.g. by increasing water reuse)	Better allocation of water		Empowering stakeholders by involving them in the development of solutions/transformations
Significant harmonised alignment of policies		Significant increase in investment in future water systems		Our cities will have adopted strategies for water conservation and smart use of water
Supporting the development of the new Green Deal for Europe (towards zero pollution)				Significant stakeholder engagement for enabling new governance and business models

Table 3-12. Room consensus for Theme C: Water Value and Usage – cross-cutting issues, drivers/enablers and research infrastructure

Theme C: Water Value and Usage (day 2) – cross-cutting issues, drivers/enablers and research infrastructure	
Questions	**Summary of discussion**
Identify any other **cross-cutting issues** and provide rationale	• UN SDGs • Resilience to climate change • WEFE (water–energy–food–ecosystems) nexus • Robustness of solutions in all future scenarios • Empowering stakeholders in the design and implementation of new solutions (in an inclusive way, leading to social innovation) • Open knowledge • Open innovation
Identify any other **drivers/enablers** and provide rationale	• Drivers: global changes, global risks, "want more/use more" mentality, increased speed of changes requiring faster delivery of research outputs • Enablers: big data, digitisation, multiple helix approach (i.e. academia, industry, government and society interactions)
What are the **barriers** that limit access to (European/national) **research infrastructure**	• Private/personal data • Access to sites (e.g. demonstration/pilot sites) • Interoperability of the data • Harmonisation of procedures on how to collect the data • Cost eligibility of the current existing research infrastructures • EU rule of change of eligibility status when private income is more than 20% of the costs of the research infrastructures
What **additional research infrastructure** is needed to support European water-related research up to 2030 and beyond?	• Need an observatory of water uses (in terms of data) • Need a centralised storage/sharing facility for water use data • Need to improve the access and availability of data on costs of treatments of water • Set up demonstration/pilot sites replicating the conditions in the water utilities – overcoming the issues related to access of "commercially sensitive" data • Open access and open data for research infrastructures • Access to public agencies' monitoring data and connect with research data • Common framework for legal issues (e.g. data ownership, use of research infrastructure)

3.3.4 Theme D: Sustainable Water Management

3.3.4.1 Attendees

In total, 28 attendees participated at the breakout group session for Theme D: Sustainable Water Management. They represented the research community, the Water JPI GB, ministries and policymaking departments. More than 11 countries were represented, including Denmark, Finland, France, Germany, Hungary, Italy, Ireland, Moldova, Norway, Sweden and Turkey.

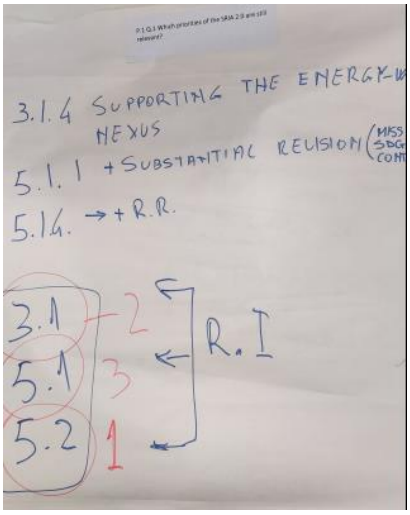
3.3.4.2 Overview of the Table Discussions

As part of the breakout group sessions, the participants were divided into four groups and asked to consider the key RDI priorities for each of the Water JPI-proposed new research themes to 2025 (focusing on the research priority level rather than the topic level) and agree on/group them into subthemes and define the expected impacts (positive and negative). A moderator was assigned to each table and the discussion feedback was relayed to the rapporteur. This session was chaired by Károly Kovács [European Water Association (EWA), Hungary]. Andrea Rubini (Water Europe, Italy), Ivar Berthling (Water JPI GB, Norway) and Bjørn Kaare Jensen (Water JPI GB, Denmark) acted as moderators. Lisa Sheils (EPA Ireland) acted as a moderator and was also the rapporteur.

Question 1. Which priorities of the SRIA are still relevant?

The research priorities listed in the SRIA 2.0 that were found to be still relevant were as follows:

Table 1



- 3.1.4 [SRIA 2.0 – Supporting the energy–water nexus (namely on efficiency and sustainability)]. Relevant.
- 5.1.1 (SRIA 2.0 – Promoting water RDI infrastructures for a better understanding of hydrological processes on different scales). Substantial revisions are needed as this is missing with regard to the SDG context. Need to add new parameters, promoting RDI infrastructure for the water cycle and catchments; although acknowledging that there are many ongoing initiatives in this arena, there are still major needs and gaps that need to be addressed.
- 5.1.4 [SRIA 2.0 – Innovating on practical, low-cost technologies treating wastewater to produce resources that are safe for reuse (link with 3.1.6, 3.1.7 and subtheme 5.2)]. Still considered relevant.
- 3.1 (SRIA 2.0 – Developing market-oriented solutions for the water industry). Considered still be to relevant, but more research infrastructure orientated.
- 5.1 (SRIA 2.0 – Enabling sustainable management of water resources). Still considered relevant.
- 5.2 (SRIA 2.0 – Strengthening socio-economic approaches to water management). Considered to be very relevant and important to link to 5.1.4.

Table 2

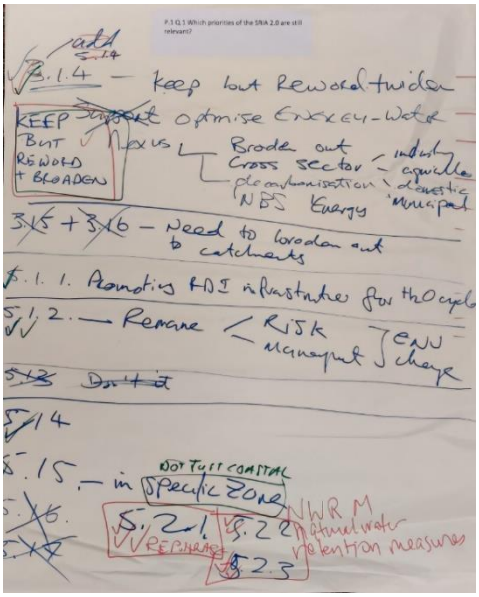
- 3.1.4 [SRIA 2.0 – Supporting the energy–water nexus (namely on efficiency and sustainability)]. Relevant but it was considered that a broader nexus approach is needed, as noted above, i.e. not just including energy but also including health, ecosystem services, food, etc.

- 3.1.6 [SRIA 2.0 – Mitigating the impact of obtaining water from the ground and the sea (link with 4.2.3)]. Still considered somewhat relevant; however, desalination of groundwater is missing.

- 5.1.1 (SRIA 2.0 – Promoting water RDI infrastructures for a better understanding of hydrological processes on different scales). There is a need for the addition of new parameters.

- 5.1.2 (SRIA 2.0 – Promoting adaptive water management for global change). Relevant, but would need to be renamed to encompass risk management and environmental change.

- 5.1.3 [SRIA 2.0 – Implementing MAR (Managed Aquifer Recharge) and other natural water retention measures (NWRMs)]. Much of this is no longer relevant.



- 5.1.5 (SRIA 2.0 – Mitigating water stress in coastal zones). Relevant but suggested to add microplastics, etc., and also aquaculture effects, including NWRMs. In specific zones, not just coastal, but catchment-holistic including (groundwater/freshwater, estuaries, lakes and rivers) approach so needs to be rephrased.

- 5.1.6 [SRIA 2.0 – Securing freshwater in the Mediterranean and Baltic basins (Article 185)]. No longer considered relevant as too region specific.

- 5.1.7 [SRIA 2.0 – Securing freshwater in the Danube (Danube Knowledge Cluster, Article 185)]. No longer considered relevant as too region specific.

- 5.2.1 (SRIA 2.0 – Integrating economic and social analyses into decision-making processes). Still relevant but needs to be rephrased.

- 5.2.2 (SRIA 2.0 – Connecting socio-economic and ecological issues). Still relevant.

- 5.2.3 (SRIA 3.0 – Promoting new governance and knowledge management approaches). Still relevant.

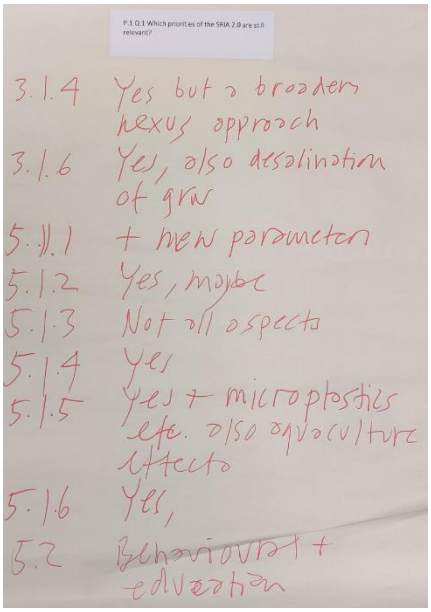
Table 3

- 3.1.4 [SRIA 2.0 – Supporting the energy–water nexus (namely on efficiency and sustainability)]. Relevant but needs rewording and broadening. Optimise energy – this aspect needs to be broadened to include industry and catchments.

- 3.1.5 and 3.1.6 [SRIA 2.0 – Mitigating the impact of obtaining energy from the ground and the sea and Mitigating the impact of obtaining water from the ground and the sea (link with 4.2.3)]. Both relevant; however, they need to be broadened to catchments.

- 5.1.1 (SRIA 2.0 – Promoting water RDI infrastructures for a better understanding of hydrological processes on different scales). Relevant – promoting RDI infrastructure for the water cycle.

- 5.1.2 (SRIA 2.0 – Promoting adaptive water management for global change). Relevant, but suggested it needs modifying to include demands–risk management–environmental change aspect.



- 5.1.3 (SRIA 2.0 – Implementing MAR and other NWRMs). Still relevant to a certain degree but not a priority.

- 5.14 [SRIA 2.0 – Innovating on practical, low-cost technologies treating wastewater to produce resources that are safe for reuse (link with 3.1.6, 3.1.7 and subtheme 5.2)]. Relevant.

- 5.1.5 (SRIA 2.0 – Mitigating water stress in coastal zones) approach needs to be rephrased – not just coast zones but ALL water.

- 5.1.6 [SRIA 2.0 – Securing freshwater in the Mediterranean and Baltic basins (Article 185)]. No longer really considered relevant as too region specific, but should be more catchment based.

- 5.1.7 [SRIA 2.0 – Securing freshwater in the Danube (Danube Knowledge Cluster, Article 185)]. No longer considered relevant as too region specific.

- 5.2.2 (SRIA 2.0 – Connecting socio-economic and ecological issues). Relevant – need to add natural water.

- 5.2.3 (SRIA 2.0 – Promoting new governance and knowledge management approaches). Relevant – need to add retention measures.

Table 4

- The subthemes need to be broadened and rephrased in the next SRAI in order for them to be relevant – inclusion of climate change – or the omission of it – is a major gap.

- 5.1 Subtheme (SRIA 2.0 – Enabling sustainable management of water resources). Still extremely relevant but needs to be broadened to take into account resource efficiency, reuse, health and wellbeing and, at the centre, society.

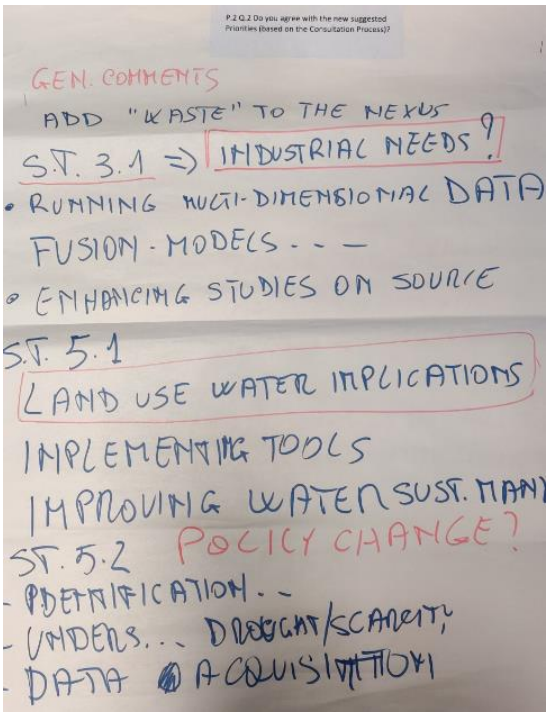
- 5.2 Subtheme (SRIA 2.0 – Strengthening socio-economic approaches to water management). Behaviours and education should be mentioned. NWRMs need to be fully included, and practical applications in both rural and urban settings. Bring the challenges and solutions near to citizens so that they can feel empowered to act positively and make a change.

Question 2. Do you agree with the new suggested priorities (based on the consultation process)?

In general comments regarding question 2, adding "waste/resource recovery/health/ecosystem services" to the nexus paradigm was key. There is a need to strike a balance between monitored research and basic research.

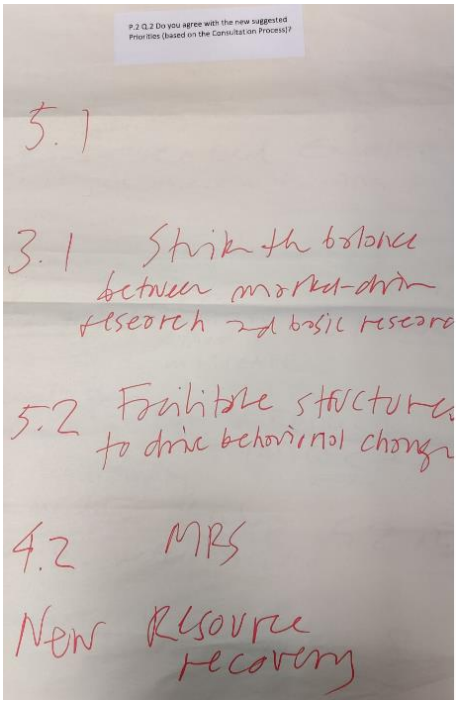
Table 1

General comments to expand/enlarge the water nexus to include waste/resource recovery/health/ecosystem services in the nexus paradigm.



- D Subtheme 3.1 (SRIA 2.0 – Developing market-orientated solutions for the water industry). Does not address industrial needs. Running multi-dimensional data, fusion models and increasing studies with regard sources were also suggested priorities.
- D Subtheme 5.1 (SRIA 2.0 – Enabling sustainable management of water resources). Land use water implications, implementing tools and improving sustainable water management were not considered.
- D Subtheme 5.2 (SRIA 2.0 – Strengthening socio-economic approaches to water management). Needs to incorporate policy change. Other considerations are identification of drought/scarcity and data acquisition.

Table 2



- D Subtheme 3.1(SRIA 2.0 – Developing market-orientated solutions for the water industry). There is a need to strike a balance between monitored research and basic research.
- D Subtheme 5.2 (SRIA 2.0 – Strengthening socio-economic approaches to water management). Need to facilitate structures to drive behavioural change. Studies on "source reduction" (i.e. CECs/AMR in wastewater treatment).
- New D Subtheme – greater emphasis on resource recovery and the circular economy is required.

Table 3

General comments – mismatch with subthemes. There should be a rewording of "sector engagement" to "cross-sectoral engagement" and "waste" should be broadened out.

There is also a greater need for the inclusion of ecosystem services through the new SRIA, as well as studies looking into "source reduction", for example CECs.

- D Subtheme 5.1 (SRIA 2.0 – Enabling sustainable management of water resources). Should include managing the effects/impacts/adaptation and mitigation of climate extremes, as well as gradual and extreme events.

- D Subtheme 5.2 (SRIA 2.0 –Strengthening socio-economic approaches to water management). Monitoring the linkages between data acquisition and the UN SDGs was suggested, as well as research on water resources and biodiversity versus ecosystem services.

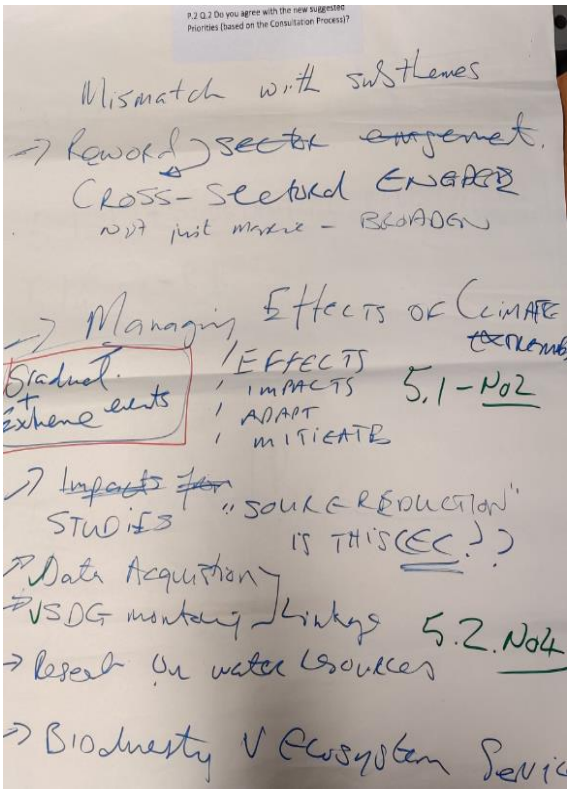


Table 4

- 5.1 (SRIA 2.0 – Enabling sustainable management of water resources). Land use water implications, implementing tools and improving sustainable water management were not considered and should be included. Managing the effects/impacts/adaptation and mitigation of climate elements, as well as gradual and extreme events.

Adaption of more holistic and sustainable ways of managing our waters is needed, for both water quality and quantity, e.g. storm waters.

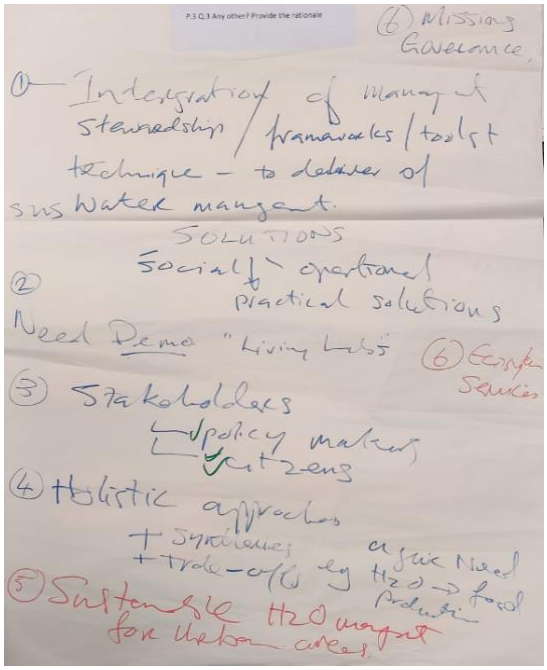
Citizen and wider stakeholder engagement across sectors is paramount for the new SRIA development.

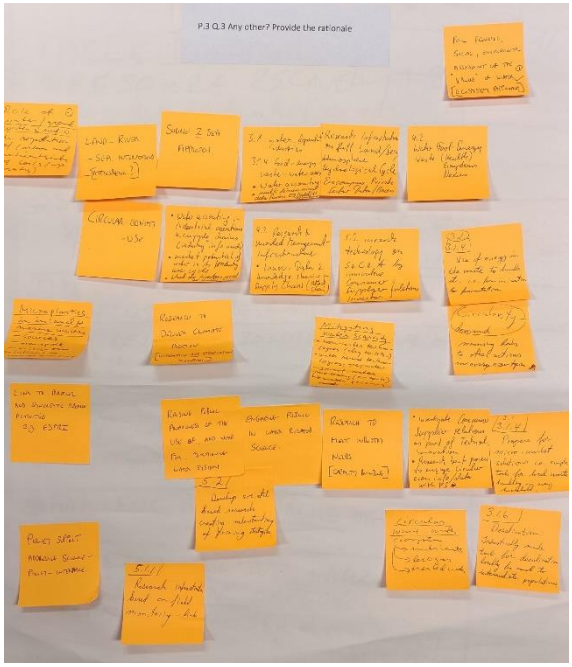
Question 3. Are there any other priorities? Provide the rationale.

The following priorities were discussed as needing to be included in this theme and were considered overarching priorities.

Table 1

- Integration of management stewardship/frameworks/tools and techniques – to deliver sustainable water management
- Sustainable water management solutions – social/operational/practical solutions. Need demonstration sites and "living labs''.
- Holistic approaches: add trade-offs, e.g. water and food production
- Sustainable water management for urban areas
- Missing governance
- Stakeholders: policymaking and citizens
- Ecosystem services





Tables 2–4 combined

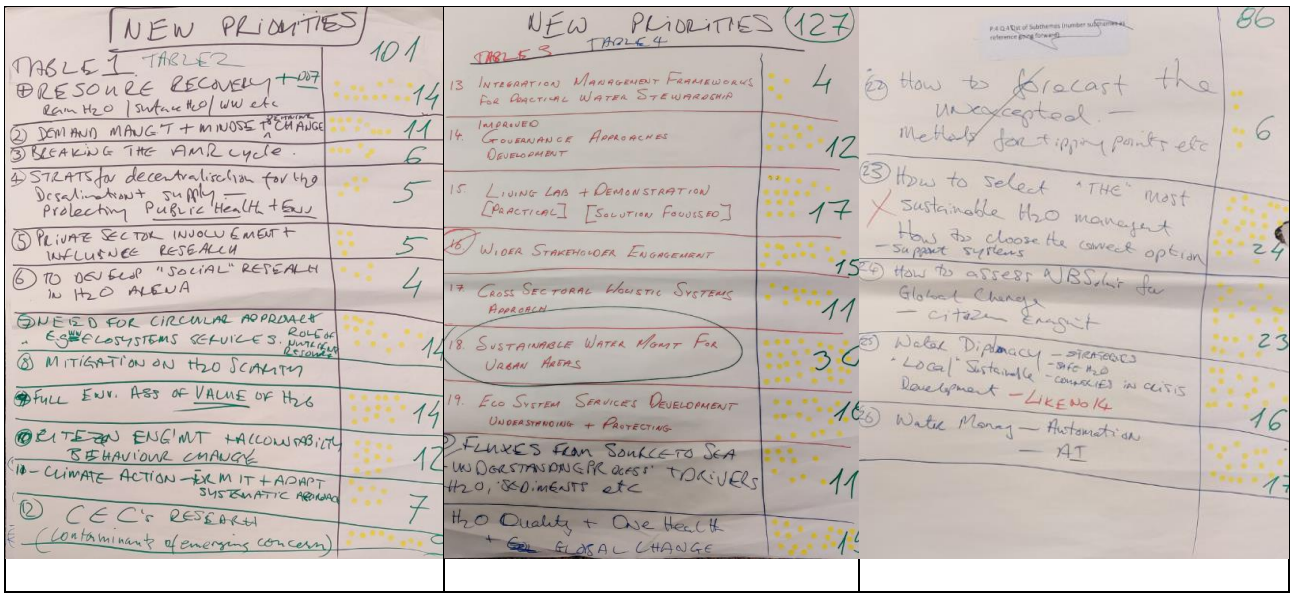
- Full economic, social, environmental assessment of the "value" of water (ecosystem approach)
- Role of water/water and reef in regulation of carbon and nutrients of soils (agriculture, forestry)
- Land–river–sea interactions (consider also atmospheric inputs and climate impact)
- Source-to-sea approach – holistic catchment approach
- 3.1 Water-dependent industries:
  - water accounting and multi-dimensional data
  - research infrastructure on full land/sea/atmosphere
  - encompass private sector data/process
- 3.1.4 Use of energy in the waste resources i.e. from incineration to fermentation:
  - water accounting
  - multi-dimensional data function

  - evolving objects/model
  - citizen science
- Circularity demand/circular waste – water ecosystems/solutions: circular economy
- Nutrients, biogas, treated water
- Microplastics in land and marine waters (sources, transport, mitigation)
- Research to deliver climate action (mitigation and adaption together)
- Mitigating water scarcity:
  - non-water technologies (dry toilets)
  - water reuse technologies, grey waters
  - smart water metering (e-tools)
  - water pricing
- Link to parallel and synergetic research activities, e.g. ESFRI (European Strategy Forum on Research Infrastructures)
- Raising public awareness of the use of, and need for, functioning water systems
- Engaging public in water-related science
- Research to meet industry needs (capacity building)
- Investigate consumer supplier relations as part of technical innovation
- Research best process to engage circular economy data with policy structure
- Prepare for micro-market solutions, i.e. simple tools for local waste handling in every household (policy support/interface; addressing support)
- 3.1.6
  - Desalination: industrially made tools for desalination locally for small to intermediate populations
- 4.2 Water–food–energy–waste–(health) ecosystems nexus
  - Circular economy – use:
    - water accounting in industrial operations and supply chains (industry information needs)
    - market potential of water in its industry use cycle
    - what do investors need to know

4.2 Research and knowledge management infrastructure

  - Circular waste – water ecosystems, innovative data and knowledge sharing in supply chains (block chain)
- 5.1.1
  - Research infrastructure based on field monitoring link:
    - how to forecast the unexpected, methods for tipping points, etc.
    - how to select “the” most sustainable water management system, how to choose the correct option – support systems
    - how to assess nature-based solutions for global change
- 5.2
  - Develop societal-based research, creating understanding of pricing strategies
  - Research technology on innovative consumer, supplier, investor – relationships – what are the dynamics

The research priorities were further organised and given a ranking, based on a power-dotting exercise to rank the degree of priority (the greater the number in square brackets, the higher the research priority):



New research priorities identified:

1. Resource recovery (rainwater/surface water/wastewater, etc.) [14].
2. Demand management and mindset to rethink and change [11].
3. Breaking the AMR cycle [6].
4. Statistics for decentralisation for desalination and supply – protecting public health and the environment [5].
5. Private sector involvement and influence research [5].
6. To develop “social” research in the water arena? [4].
7. Need for a circular approach, e.g. wastewater, ecosystem services. Role of Natural Water Treatment (NWTR) is not resolved [14].
8. How to forecast the unexpected. Methods for tipping points, etc. [6].
9. Water diplomacy, “local sustainable development” (strategies, safe water, countries in crisis) [16] – similar to no. 14.
10. Mitigation on water scarcity [0].
11. Full environmental assessment of the value of water [14].
12. Citizen engagement and accountability for behaviour change [12].
13. Climate action – enterprise risk management IT(ERM) and adapt systematic accordance need to be investigated [7].
14. CECs research [9].

15. Integration management frameworks for practical water stewardship [4].
16. Improved governance approaches development [12].
17. How to select “the” most sustainable water management system. How to choose the correct option and support systems [24].
18. Water management – automation – artificial intelligence [17].
19. Living labs and demonstration sites (practical and solution focused) [17].
20. Wider stakeholder engagement [15].
21. Cross-sectoral holistic systems approach [11].
22. Sustainable water management for urban areas [30].
23. Ecosystem services development – understanding and protecting [18].
24. Fluxes from source to sea – understanding (processes and drivers, sediments, etc.) [11].
25. Water quality and “One Health” and global change [19].
26. How to assess nature-based solutions for global change and ensuring citizen engagement [23].

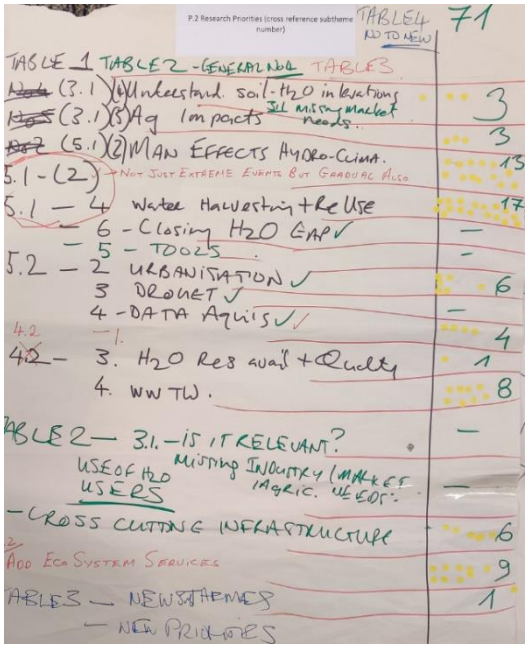
Based on the ranking system applied by the Theme D group, the top five research priorities identified were:

1. Sustainable water management for urban areas [30]/How to select “the” most sustainable water management. How to choose the correct option and support systems [24] – similar in context.
2. How to assess Nature-based solutions for global change and ensuring citizen engagement [23].
3. Water quality and “One Health” and global change [19].
4. Ecosystem services development – understanding and protecting [18].
5. Living labs and demonstration sites (practical and solution focused)/water management – automation – artificial intelligence [17].

Question 4. Grouping into subthemes
Tables 1 (black), 2 (green), 3 (red), 4 (blue)

The following priorities were discussed as needing to be included in this theme:

The proposed new research priorities included in the Discussion Note were discussed and the following were found either not to be a research priority as such or to require rewording:

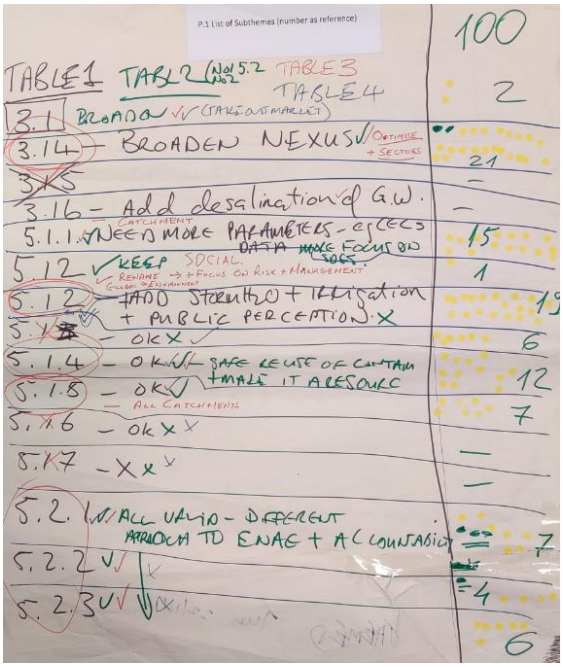


Research priorities (room level):

- D 3.1.1 – Missing market needs.
- D 3.1.4 – Broaden nexus – optimise sectors [21].
- D 3.1.6 – Add desalination of groundwater – again taking the catchment approach [0].
- D 5.1.1 – Need for more parameters, e.g. CECs data – more focus on UN SDGs [15].
- D 5.1.2 – Keep "social" in wording but rename to it to the Global Environment and focus on risk and management, plus add stormwater and irrigation and public perception [19].
- D 5.1.4 – Relevant if include safe reuse of contaminants and makes it a resource [6, 12].
- D 5.1.5 – Relevant if includes catchments [7].
- D 5.1.7 – Propose to drop this – not relevant.
- D 5.2 – All valid – different approach to National Classification of Economic Activities (CNAE) and accountability [7].
- D 5.2.2 – Still slightly relevant [4].
- D 5.2.3 – Still slightly relevant [6].

Subthemes (room level): what needs to be taken into consideration:

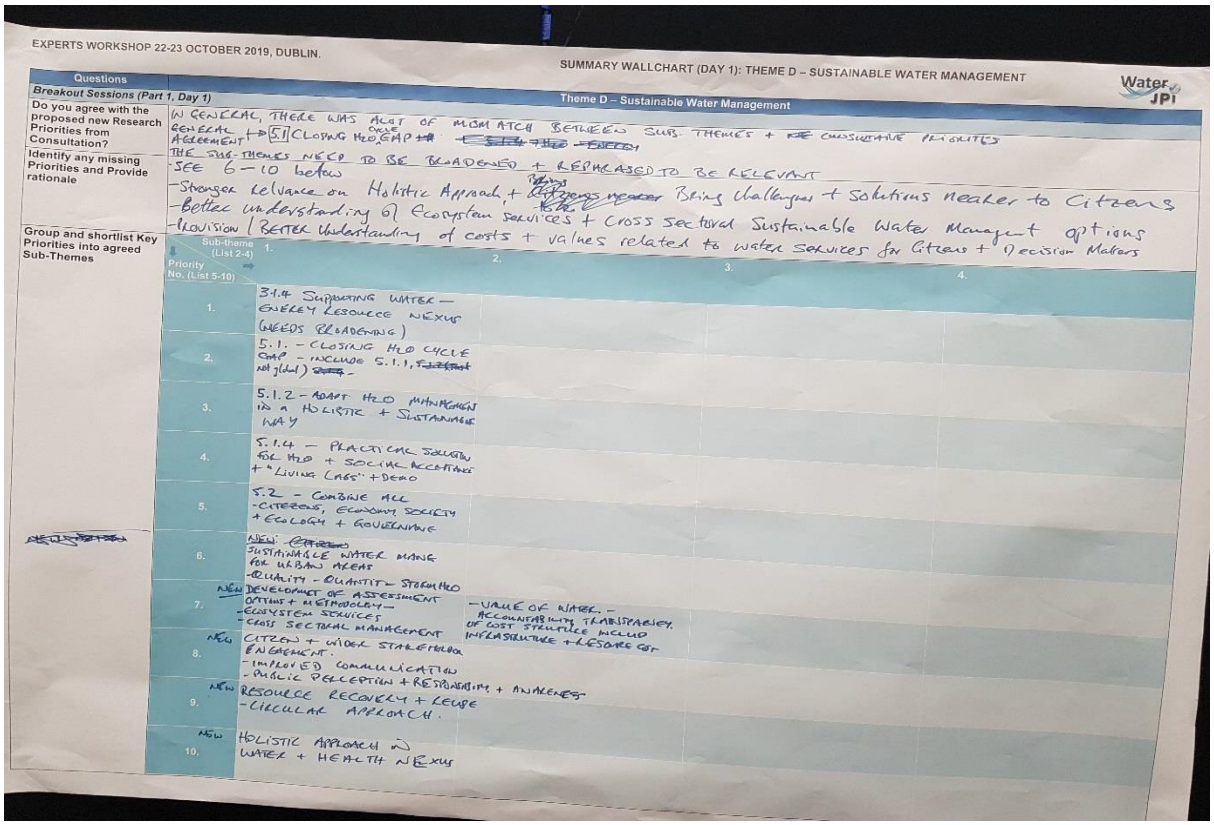
- 3.1 – Broaden (take out market), understand soil–water interactions.
- 3.2 – Agricultural impacts.
- 5.1 – Manage the effects of hydroclimatic events; not just extreme events but gradual also: water harvesting and reuse; closing the water gap; tools.
- 5.2 – Urbanisation, drought, data acquisition.
- 4.2 – Water resource availability and quality, wastewater treatment works (WWTW); add ecosystem services.



Room consensus day 1

The following consensus was reached at room level on the inputs for the SRIA 2025 (Table 3-13**)'?**

D.1 Optimising the water–energy–food–ecosystems (WEFE)	D.2 Closing the water cycle gap	D.3 Enabling sustainable management of water resources	*D.4 new subtheme – Citizens and sustainable water management*
Broaden scope of SRIA 2.0 ref. 3.1.4 – Supporting the energy–water nexus (namely on efficiency and sustainability) to WEFE nexus	Adapt water management in a holistic and sustainable way (SRIA 2.0 ref. 5.1.2 – Promoting adaptive water management for global change)	Integrating economic and social analyses into decision-making processes (SRIA 2.0 ref. 5.2.1)	New Sustainable water management for urban areas – quality, quantity, storm water
New Holistic approach in water and health nexus – resource reuse and recovery	Practical solution for water – social acceptance and "living labs" and demonstration sites (SRIA 2.0 ref. 5.1.4 – Innovating on practical, low-cost technologies treating wastewater to produce resources that are safe for reuse)	Connecting socio-economic and ecological issues (SRIA 2.0 ref. 5.2.2)	New Development of assessment options and methodology – ecosystems services, cross-sectoral management
	Promoting water RDI infrastructures for a better understanding of hydrological processes on different scales (SRIA 2.0 ref. 5.1.1)	Promoting new governance and knowledge management approaches (SRIA 2.0 ref. 5.2.3)	New Citizen and wider stakeholder engagement: improved communication; public perception and responsibility and awareness
		New Resource recovery and reuse – circular economy	
			New Value of water, accountability, transparency of costs structure, including infrastructure and resources costs



Question 1. Define the expected impacts (positive and negative)

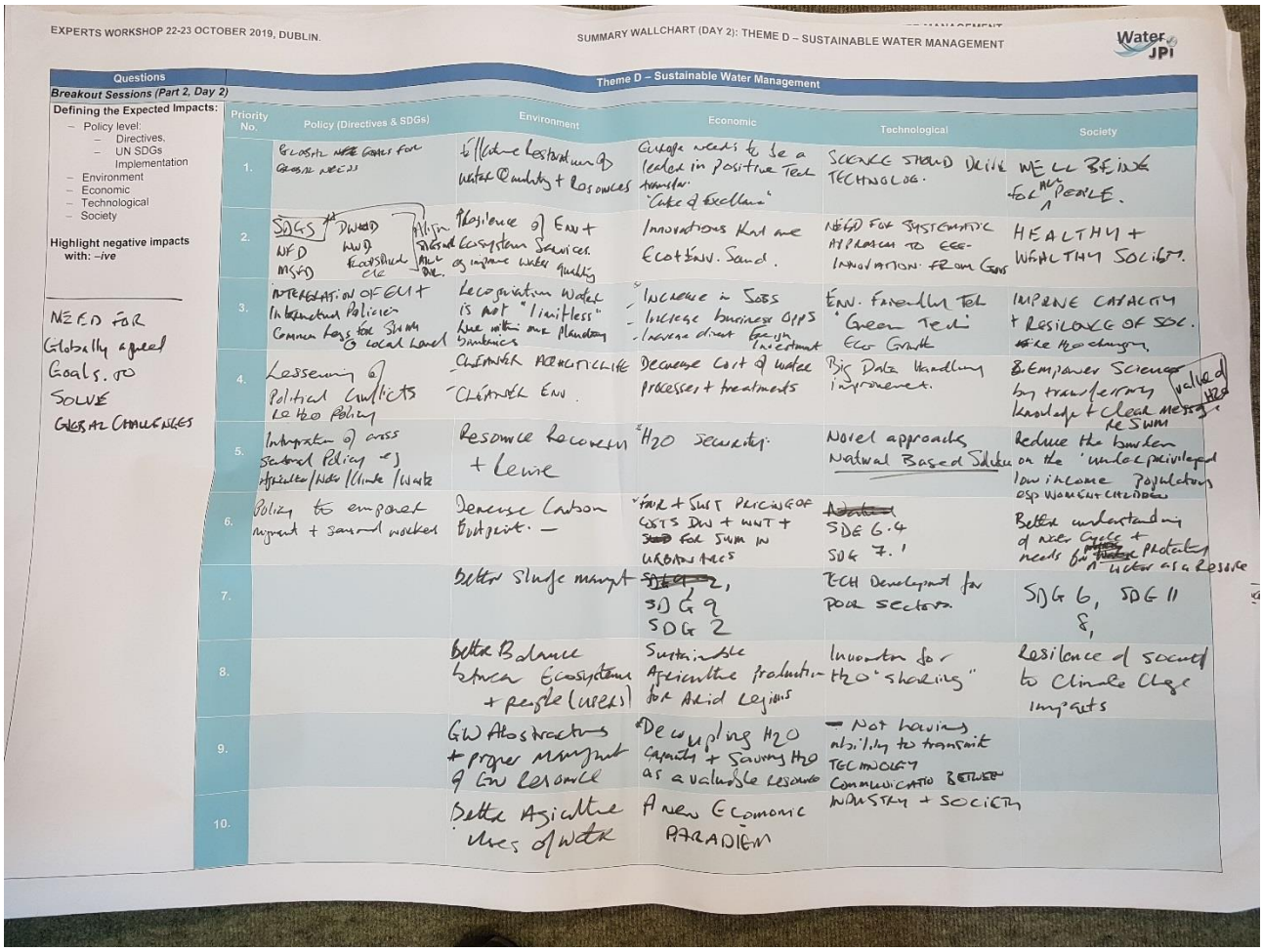
The expected impacts were discussed at each table. At room level, the key expected impacts were agreed and compiled as detailed in the A0 summary wallchart (see

Table 3-13).

Table 3-13. Theme D: Sustainable Water Management – expected impacts

Area	Expected impacts
Policy	• Globally agreed goals – global challenges • Integration of agricultural and environmental policy • Common EU regulations for sustainable water management at local level • Lessening political conflicts • Align the Drinking Water and Floods Directives with SDGs • Policy empowering migrant workers, e.g. seasonal • Equal rights to water SDGs • Evidence-based policy, cross-boundary, transparency, data • Improved infrastructure/monitoring tools
Environmental	• Effective restoration of water • Resilience of ecosystems – improve quality • Recognise that we are in a limited environmental – "planetary boundary" • Reduce loads on water • Cleaner water for aquatic life and people • Maintaining purification of drinking water • Improved water use efficiency system, wastewater sludge management, water and wastewater reuse • Decrease carbon footprint • Balance between user and ecosystem
Economic	• Europe – leader in sustainable water management technology for positive impact – "centre of excellence" • Innovations to be economically sound • Increase jobs

Area	Expected impacts
	• Decrease cost of water progression and wastewater treatment • Increase business and water efficiency • Water security for different stakeholders • Fair and just water pricing and costs of drinking water and wastewater, etc., treatments • Foreign direct investment/tips • SDG 9 – sustainable industry decoupling increases in water use • Security of supply and diverse supply • Sustainable agricultural production in arid regions for EU
Technological	• Science should drive innovation; eco-growth; environmentally friendly technology • Technology, government and innovation systems • Need for big data handling driving technology • Nature-based solutions • SDG 6.4, water; SDG 7.1, water in nexus • Impacts promoting treatment technology • Technology development in poor rural areas • Sustainable grants • Innovation for technology for water sharing • Not having the ability to transmit technical communication between industry and society
Society	• More resilient society/cities in terms of climate change effects • Ensure same safe water for drinking, bathing, food production (human and animal use) • Cleaner and more safe water for general population • SDG 6, society – 6.2.1, Safely managed sanitation services • SDG 8, decent work and economic growth – achieve higher levels of economic productivity, target 8.2 • SDG 11, social – 11.2, 11.3, 11.5 • Shift in water use • Capacity, resilient society re. climate change • Nature-based solutions/sustainable water management in society • Citizen science and empower people • Transfer knowledge with regard to sequence batch reactors • Having clean safe water – live better/drink/food for all



Policy. It was stressed that global goals should be for global needs; in this regard, it was discussed that these should be informed by water governance across policy, markets and civil society, which links into how society can cope with global changes and transitions. Related to this is the aim to contribute to supporting implementation of key water-related policies and directives. There should also be an improved research infrastructure and a consensus reached on monitoring and modelling tools. A cross-boundary basin information database would increase transparency. Research should contribute to measurement data, which would help to develop robust evidence-based policy.

Environment. Research priorities should contribute to effective water restoration, as well as diverse and resilient ecosystems (e.g. ecosystem services and benefits). It was also flagged that humanity needs to stay within the limits of the planetary boundaries. Resource recovery should also contribute to a lower carbon footprint, which should also be an aim of improved wastewater treatment systems. A negative is that incentives to save water will disproportionally reduce the freedom of the less wealthy. A balance needs to be reached between use of resources and ecosystem quality.

Economic. The aims are, through research, to contribute to making Europe a recognised centre of excellence in sustainable water management. It was also proposed that positive economic impacts can be achieved though the enablement of diverse livelihoods and local job creation based on water resource employment and supporting innovation. It was suggested that economic soundness is always important given the nature of certain directives. Research should also contribute to enabling active participation in resource management, supporting democracy and a sense of social belonging (overlaps with "society" impacts).

Technology impacts. Research should drive innovation and underpin/utilise research infrastructure. Technological development should contribute to improving water and wastewater quality through better

data and contribute to mitigating negative impacts. A negative aspect is the lack of know-how/knowledge to transfer to industry and stakeholders, which makes switching to sustainable water systems more difficult.

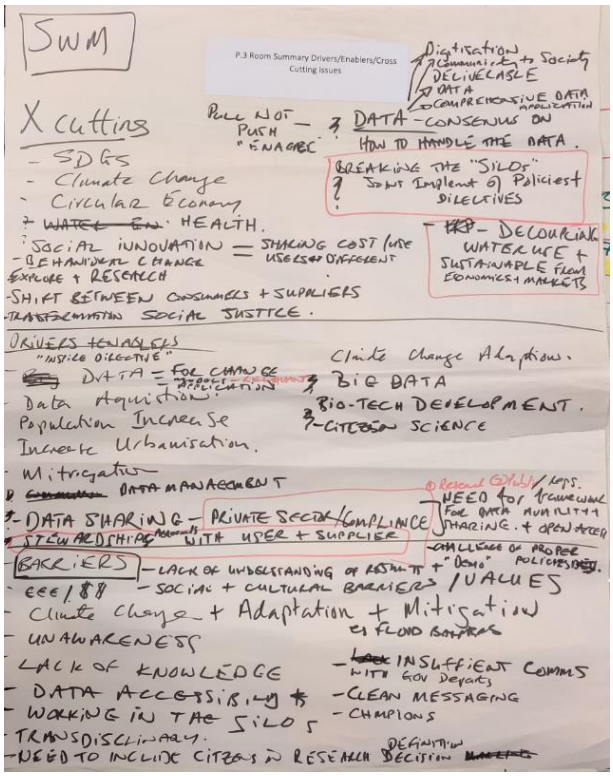
Societal impacts. The interaction between health and wealth and how it affects society was raised. Research should aim to change/shift water uses at society level and contribute to protecting water resources for future generations and population growth, and reduce concerns over water restrictions/shortages. Related to this should be contributing to the just and equal allocation of water and water-based services. Research should also allow societies to become resilient in the face of extremes (e.g. drought, floods) and, overall, contribute to quality of life improvements. Societal impacts from research results also provides a platform for funding and reducing the burden of water collection by women and girls in developing countries.

Negative impacts discussed include undervaluing water and linear approaches to sustainable water management.

Question 2. Identify any other cross-cutting issues and provide rationale

The room was in agreement with the cross-cutting issues, as outlined in the discussion document. A number of issues were proposed in the table discussion, including:

- data (digitisation/community to society/deliverables;
- health;
- social innovation – sharing cost/use;
- behavioural change – different users, different needs;
- explore and research;
- social justice;
- health;
- shift between consumers and suppliers;
- transformation and social justice;
- decoupling water use and sustainability from economics and markets;
- comprehensible data application/consensus on how to handle the data;
- breaking the “silos” – joint implementation of policies of directive;
- “pull” not “push” – engagement.



It was proposed to add the concept and practice of real social innovation – "sharing cost/use". Related to this is the concept of behavioural change – different users have different needs and can contribute differently. Other related issues that were proposed include explore and research; shift between consumers and suppliers; transformation and social justice; and breaking the "silos" – joint implementation of policies of directives. The issue of decoupling water use and sustainability from economics and markets was also proposed as an important issue as it reflects the world's limited resources and how people use them in the context of development demands and growing populations.

Additionally, "healthy environment" was also proposed as an issue for inclusion, as there is less and less distinction between human health and environmental/ecosystem health (such as the "One Health" concept proposed elsewhere).

Although big data is listed as a driver/enabler, "data" was proposed here as a cross-cutting issue and was proposed to encompass digitisation/community to society/deliverables/comprehensible data application/consensus on how to handle the data.

Question 3. Identify any other enablers/drivers and provide rationale

A suite of drivers and enablers was discussed and compiled from across the table discussions:

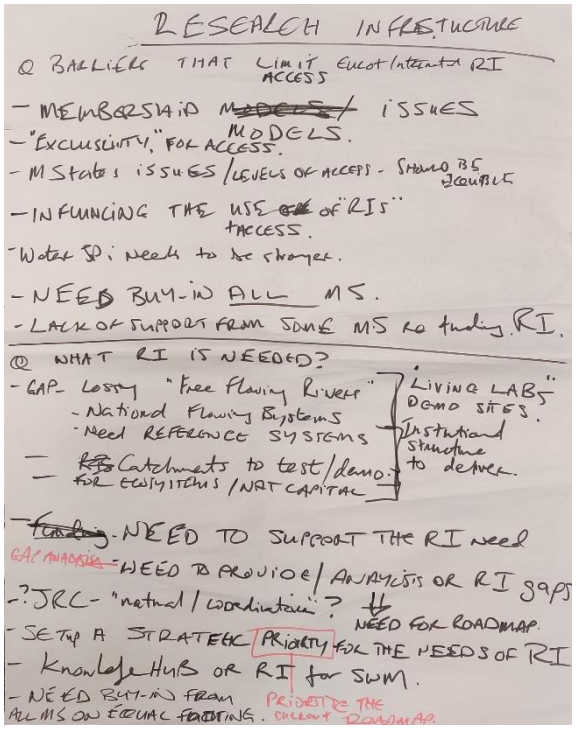
- population increases;
- increase urbanisation;
- migration;
- data:
  - data acquisition;
  - data management;
  - data sharing (private sector/compliance, research community/ general public);
  - data accessibility;
  - need for a framework for data availability;
  - sharing and open access;
  - data for change, models, application;
  - big data;
- stewardships agreements with user and supplier;
- climate change adaptions;
- biotech development;
- citizen science;
- barriers – lack of understanding of results and "demonstration";
- social and cultural barriers/values;
- challenge of proper policies €€€;
- climate change and adaptation and mitigation, especially flood barriers;
- unawareness;
- lack of knowledge;
- working in the silos;

- transdisciplinary cooperation;
- need to include citizens in research decision;
- insufficient communications with government departments;
- clean messaging;
- water "champions"

Question 4. What are the barriers that limit access to (European/national) research infrastructure?

A number of barriers to (research infrastructure) were discussed among the tables, which included:

- money and funding;
- climate change adaptation and mitigation;
- lack of knowledge;
- lack of awareness;
- data accessibility;
- need to include citizens in research definition and priorities;
- social and cultural values and barriers;
- insufficient communication between government departments and Member States;
- need for "water champions" and communicating clear and urgent messages in order to influence.

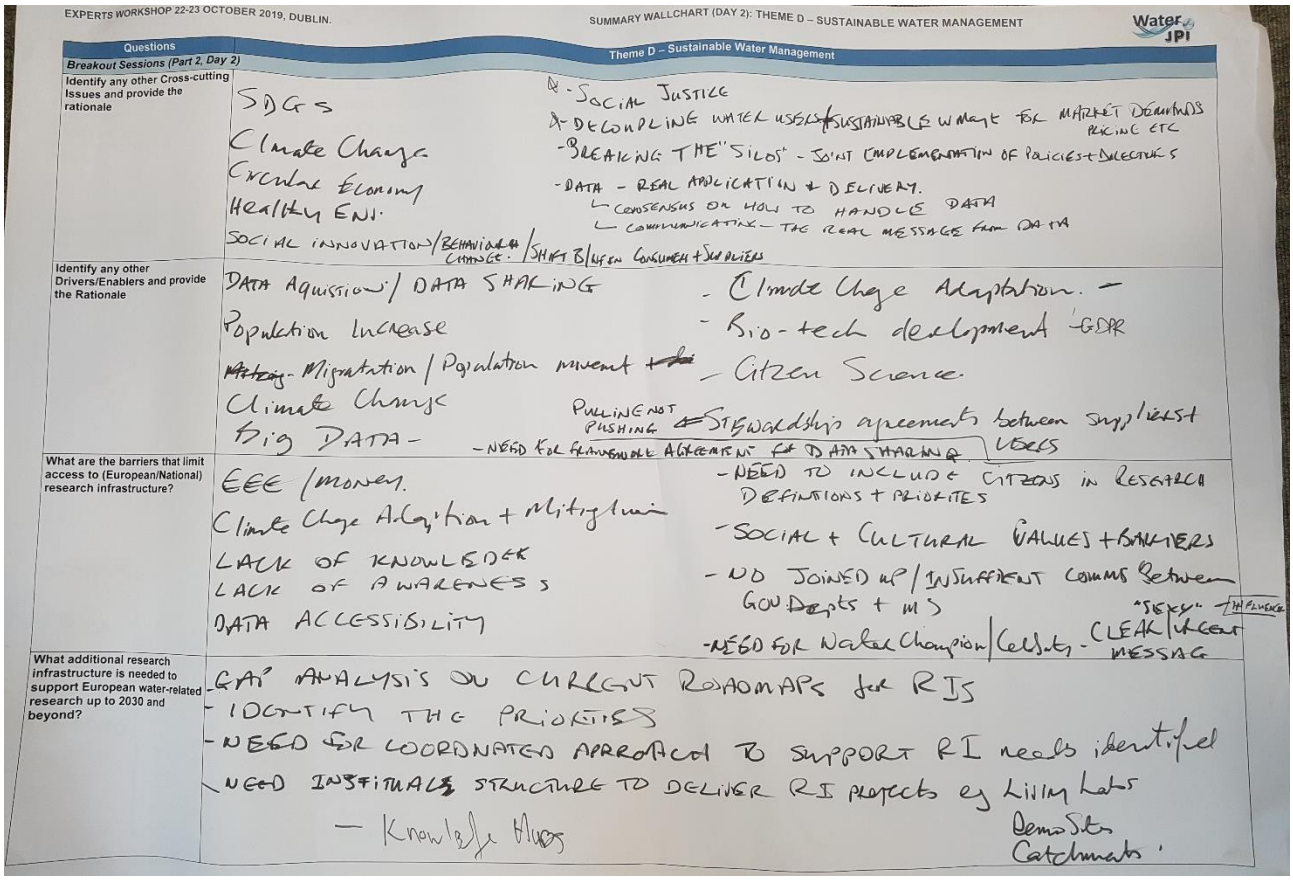


Question 4. What additional research infrastructure is needed to support European water-related research up to 2030 and beyond?

A number of additional research infrastructures were proposed, as follows:

- gap analysis is required on the current roadmap for research infrastructures;
- identify the priorities;
- need for coordinated approach to support research infrastructure needs identified;
- need institutional structure to deliver research infrastructure projects, e.g. living labs, demonstration sites, catchments, knowledge hubs.

It was also discussed that the SRIA 2.0 subthemes 3.1, 5.1 and 5.2 could also fall under the umbrella of research infrastructures (Developing market-orientated solutions for the water industry; Closing the water cycle gap – enabling sustainable management of water resources; Strengthening the socio-economic approaches to water management, respectively).


EXPERTS WORKSHOP 22-23 OCTOBER 2019, DUBLIN.

SUMMARY WALLCHART (DAY 2): THEME D – SUSTAINABLE WATER MANAGEMENT

Water JPI

Questions	Theme D – Sustainable Water Management
Breakout Sessions (Part 2, Day 2)	
Identify any other Cross-cutting Issues and provide the rationale	SDGs Climate Change Circular Economy Healthy Env. Social innovation/Behavioural change/Shift B/Ween Consumers + Suppliers & - Social Justice A- Decoupling water use/sustainable usage for market demands pricing etc - Breaking the "silos" - Joint implementation of policies + directives - Data - real application + delivery. └ consensus on how to handle data └ communicating – the real message from data
Identify any other Drivers/Enablers and provide the Rationale	Data Aquisition / Data Sharing Population Increase ~~Mining~~ - Migration / Population movement ~~+ the~~ Climate Change Big Data – - Climate Change Adaptation. – - Bio-tech development GDPR - Citizen Science. Pulling not pushing – Stewardship agreements between sup/least users – need for reasonable agreement for data sharing
What are the barriers that limit access to (European/National) research infrastructure?	EEE / money. Climate Change Adaptation + Mitigation Lack of knowledge Lack of awareness Data accessibility - need to include citizens in research definitions + priorities - Social + Cultural values + barriers - no joined up / insufficient comms between Gov Depts + MS -need for Market Champion/Celebrity - CLEAR/URGENT messag "sexy" - the element
What additional research infrastructure is needed to support European water-related research up to 2030 and beyond?	- Gap analysis on current roadmaps for RIs - Identify the priorities - need for coordinated approach to support RI needs identified - need institutional structure to deliver RI projects eg Living Labs – Knowledge Hubs Demo Sites Catchments.

3.3.4.3 Room Consensus (Summary Wall Charts)

Following the breakout group discussions, the outcomes were relayed to the participants and a consensus was reached regarding the inputs for SRIA 2025 on the expected impacts (.

Table 3-14) and the cross-cutting issues, drivers/enablers and research infrastructure (

Table 3-15).

Table 3-14. Room consensus for Theme D: Sustainable Water Management – expected impacts

Theme D: Sustainable Water Management (day 2) – expected impacts				
Policy	**Environment**	**Economic**	**Technological**	**Society**
Global goals for global needs	Effective restoration of water quality and resources	Europe needs to be a leader in positive technology transfer (centre of excellence)	Science should drive technology	Wellbeing for all Healthy and wealthy society
UN SDGs (align SDGs with all directives dealing with water – WFD, Marine Strategy Framework Directive, Drinking Water Directive, Urban Waste Water Treatment Directive, Floods Directive)	Increased resilience of environment and ecosystems services	Innovations that are sound from the environmental and economic points of view	Need systematic approach to innovation	Improved capacity and resilience of society in a context of global changes
Integration of EU and international policies	Recognition that water is not a "limitless" resource and live within our planetary boundaries	Increase in jobs, business opportunities and direct foreign investments	Environmentally friendly green tech	Empower society by transferring knowledge and clear message in relation to sustainable water management and the importance of valuing water
Lessening of political conflicts in relation to water policies	Cleaner environment	Decreased costs of water processes and treatments	Improvement in the handling of big data	Reduce the burden on the underprivileged, low-income population, especially women and children
Cross-sectoral integration of policies (e.g. agriculture, water, waste, climate)	Resource recovery and reuse	Ensure water security	Novel approaches – nature-based solutions	Better understanding of the water cycle and need for protecting water as a resource
Policy to empower migrant and seasonal workers	Decreased carbon footprint	Fair and sustainable pricing for drinking and wastewater treatments, and for sustainable water management in urban areas	SDGs 6.4 and 7.1	SDGs 6, 8 and 11
	Better sludge management	SDGs 9 and 2	Technological development for poor sectors	Resilience of society to climate change impacts
	Better balance between ecosystems and people (users)	Sustainable agriculture production for arid regions	Innovation for water sharing	
	Better management of environmental resources, including	Decoupling water capacity and water	Increased ability to transmit technology (communication	

Theme D: Sustainable Water Management (day 2) – expected impacts			
	groundwater abstraction	savings as a valuable resource	between industry and society)
	Better use of water in agriculture	A new economic paradigm	

Table 3-15. Room consensus for Theme D: Sustainable Water Management – cross-cutting issues, drivers/enablers and research infrastructure

Theme D: Sustainable Water Management (Day 2) - Cross-cutting Issues, Drivers/Enablers, and Research Infrastructure	
Questions	**Summary of discussion**
Identify any other **cross-cutting issues** and provide rationale	• UN SDGs • Climate change • Circular economy • Healthy environment • Social innovation, behavioural change, shift suppliers/consumers • Social justice • Decoupling water users/sustainable water management for market demands pricing, etc. • Breaking the silos – joint implementation of policies and directives • Data – real application and delivery (consensus on how to handle data, communicating the real message from data)
Identify any other **drivers/enablers** and provide Rationale	• Data acquisition and sharing • Population increase • Migration/population movement • Climate change adaptation • Big data • Citizen science • Biotech development • GDPR • Stewardship agreement between suppliers and users (i.e. “pulling” and not “pushing”) • Need for framework agreement for data sharing
What are the **barriers** that limit access to (European/national) **research infrastructure**	• Money • Climate change adaptation and mitigation • Lack of knowledge • Lack of awareness • Data accessibility • Need to include citizens in research definition and priorities • Social and cultural values and barriers • Insufficient communication between government departments and Member States • Need for water champion and clear/urgent message to influence
What **additional research infrastructure** is needed to support European water-related research up to 2030 and beyond?	• Gap analysis is required on current roadmap for research infrastructures • Identify the priorities • Need for coordinated approach to support research infrastructure needs identified • Need institutional structure to deliver research infrastructure projects, e.g. living labs, demonstration sites, catchments, knowledge hubs

3.4 Plenary Session 3: Feedback from the Breakout Sessions

Plenary Session 3 was chaired by Antonio Lo Porto, EurAqua (European Network of Freshwater Research Organisations) and Water JPI AB member. All four rapporteurs presented summaries of the key points from the 2 days of breakout sessions across the four themes. The Slido platform was open for 1 week post event to allow participants to reflect and add comments on the summaries and feedback from all four breakout sessions. The guiding question asked was the following:

Slido question: Any additional suggestions/feedback?

The full Slido responses are provided in Error! Reference source not found. and the key points are s ummarised below:

- Could have a unique topic on the "One Health approach" to address common links between Theme A and Theme B.
- Need to interlink biodiversity with policy development and better integrate it in existing legislation.
- Too much of a focus on urban areas – could alienate rural populations and increase the rural–urban divide.
- Noted overlaps:
  - Need to rationalise overlaps between themes.
  - Pollution is noted across Themes A, B and C but from different angles.
  - Many overlaps between Theme 4 and others. Proposing the "One Water" concept?
  - Significant overlap between some of the priorities in Themes C and D. Some priorities linked to uses and usage could be moved to Theme C.
  - Suggested that there is a need to limit overlaps between assessment of ecosystem services/restoration/remediation, etc., and ecosystems and sustainable water management research priorities.
  - Consider cross-cutting research priorities between all four themes. Research needs in socio-economics for new governance solutions.

3.5 Plenary Session 4: General Discussion

Plenary Session 4 was chaired by Antonio Lo Porto, EurAqua and Water JPI AB member. Alice Wemaere (EPA Ireland), Dominique Darmendrail (Water JPI Coordinator) and Andrea Rubini (Water Europe) participated in the question session.

Questions asked in the session are listed below and are detailed in the following section:

- How did we deal with the cross-cutting issues?
- What were the potential overlaps and synergies?
- Review of the proposed structure.
- Targets for Vision 2030.

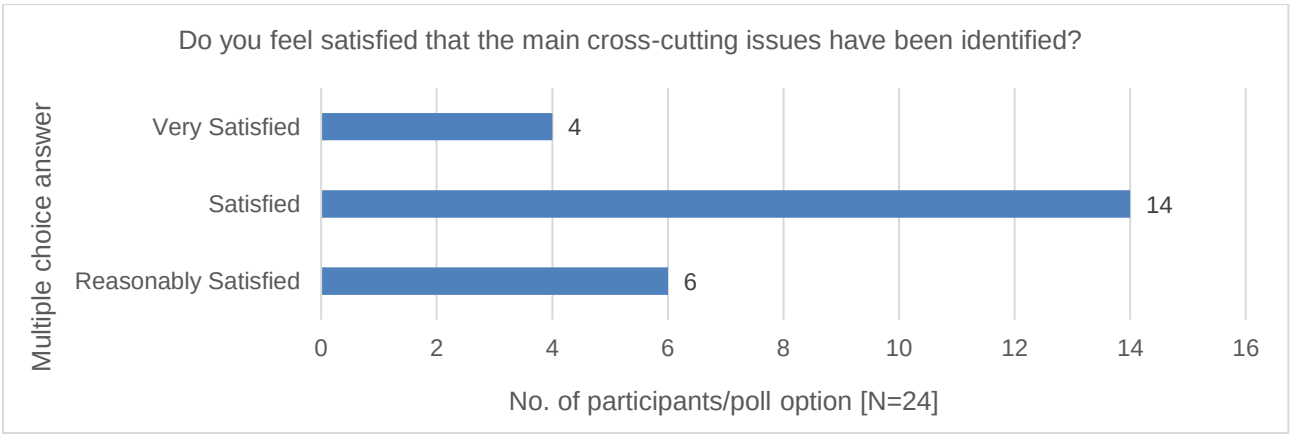
Slido questions are highlighted in green and graphically represented where relevant.

3.5.1 Part 1: Where Are We At?

How did we deal with the cross-cutting issues?

Key points raised regarded the economic aspect and sustainable water management and ecosystems. It was highlighted that there is a need to consider progress in the long term, including the type of environmental data, such as the diversity of the data and big data that can be considered. It was agreed that the WEFE nexus and climate change are key. Synergies can be identified in terms of overlaps with water quantity, water quality and ecosystems. Under the nexus, it was queried whether the different funding aspects of WEFE could be considered to be competing; in response, it was noted that this is just a way to present the ideas. The cross-cutting issues will need to be addressed as a basic action in research calls (see Slido question and Graph 3-1).

Slido question: How did we deal with cross-cutting issues? Do you feel satisfied that the main cross-cutting issues have been identified?



Graph 3-1. Summary of attendees' satisfaction with the cross-cutting issues identified.

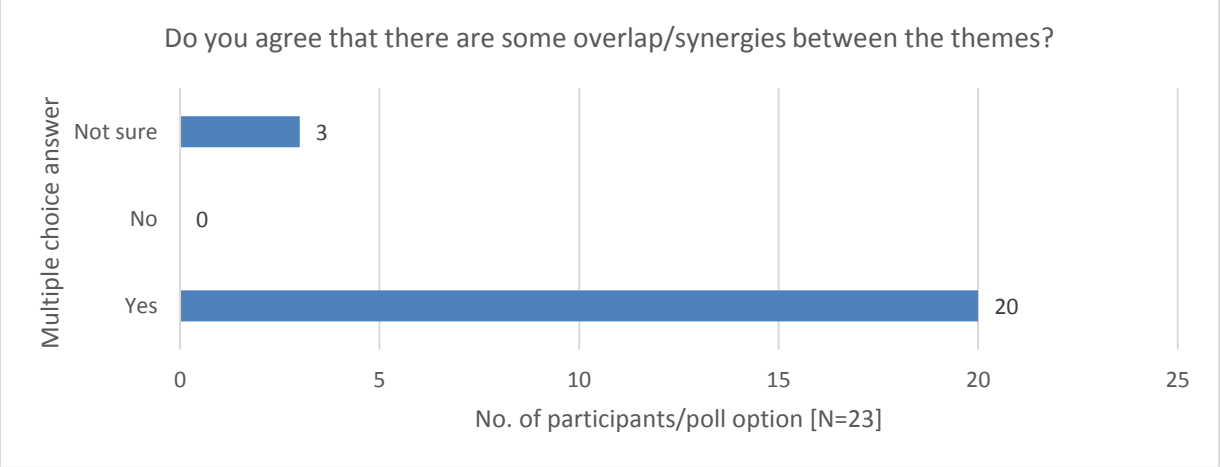
Slido question: If NOT, what is missing?

- "One Health" approach;
- water scarcity and quality;
- citizen participative sciences;
- more on groundwater and pressures;
- transition of water systems and governance structures;
- transformation.

What were the potential overlaps and synergies?

There was agreement that there was indeed overlap but this was not highlighted as an issue as they focus on different aspects, which is why such overlaps are so important (see Slido question and Graph 3-2). The intention now is to present overlaps in a simple way, e.g. the previous SRIA 2.0 theme 5 (Closing the water cycle gap) was considered good for scientists but confusing for policymakers. There should be support for new research topics that are not "business as usual", including at governance level, and involving citizens, leading to participative sciences.

Slido question: Do you agree that there are some overlaps/synergies between the themes?



Graph 3-2. Summary of attendees' responses to synergies/overlaps between themes.

Slido question: If yes, please give an example:

- infrastructure;
- "One Health" approach;
- lot of overlap between Theme D and Themes A, B and C;
- sustainable water management and ecosystems;
- many – interlinkages between, for example, wastewater and energy;
- pollution;
- health, climate;
- digitalisation;
- management theme overlapping with all others;
- pollution, climate change, multi-stressor effects;
- yes, overlaps, but not a problem if the context of each theme is clear, as well as the perspective/angle it is coming from.

Review of the proposed structure

Responses to the requirement for adjustments to the themes were discussed. It was noted that water quality, quantity and ecosystems must be clearly expressed, and the rationale for naming "health and wellbeing". The rationales need to be very clear, as these set the pitch for the target audience and the context for the subthemes and research priorities (see Slido question and Graph 3-3).

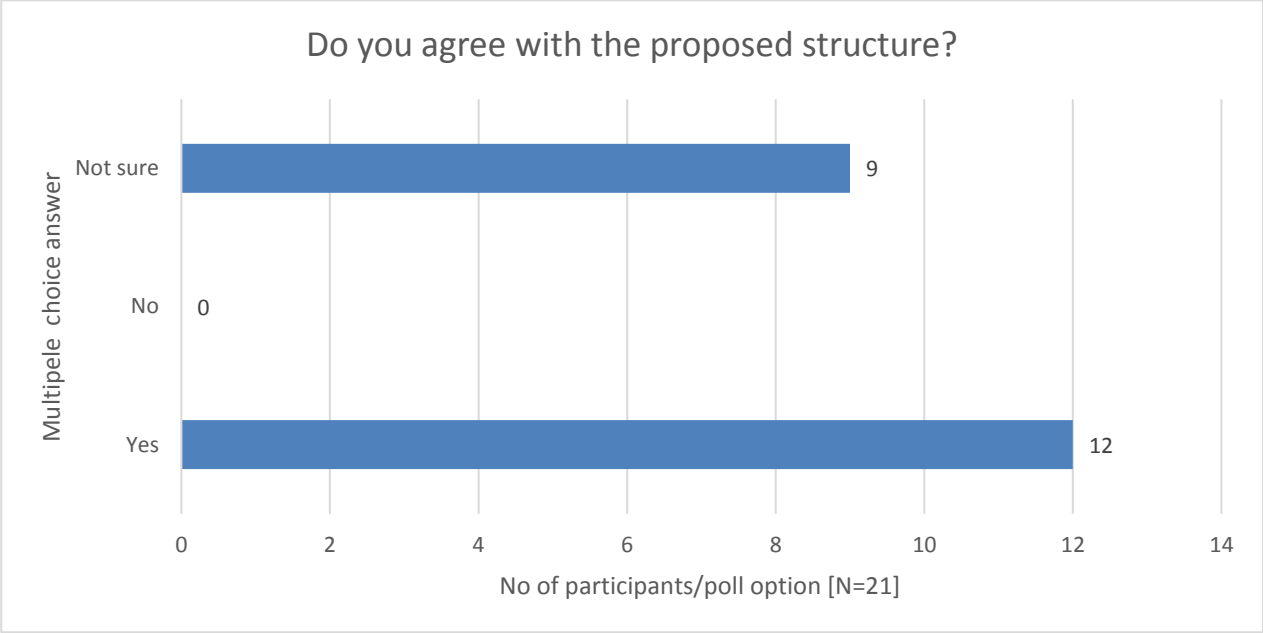
Suggestions and comments from Slido on putting some concepts together:

- Concepts of water quality and water quantity is good to keep.
- WFD will be phased out in 2027 most likely. What then?
- Need to think of challenges in the long term.
- Rural/agriculture under FACCE Strategic Research Agenda (SRA), and not just urban focus.

- Better communication of values of nature/biodiversity to citizens and industries. Need a push from Europe.
- Better communication of values of nature/biodiversity to citizens and industries. Need a push from Europe. But note might conflict with BiodivERsA permit?
- Spread the knowledge and how to better communicate.

Using the online communication tool Slido, the question, "Do you agree with the proposed structure (incl. naming of themes)?" was posed and results show that 52% agree with proposed structure, while 48% are not sure.

Slido question: Do you agree with the proposed structure (incl. naming of themes)?



Graph 3-3. Summary of attendees' responses to the proposed structure.

Slido question: If not, what changes would you suggest?

- Separate water, wastewater and wastewater reuse.
- Emerging contaminants not currently visible.
- Water diplomacy/conflicts.
- Water quality, quantity and urban to be clearly identified in sustainable water management theme.
- Rewording of some themes/make focus more clear.
- Need for overarching picture of how all themes connect/look for overlaps.
- Meaning of health and wellbeing not always unanimously accepted.

Slido question: What is missing? Should we add an additional theme? Subtheme?

- Water users' role in water management sciences.
- Governance stakeholder engagement.
- Living labs.

- Sediment.
- Wastewater.
- Nexus.
- Pool resources and equipment and make facility exchange arrangements easier.
- Water-diplomacy/water and peace.
- Health rights in legislation are not universal and link directly with water.

Targets for Vision 2030

The Vision objectives and indicators were shown. It was noted that indicators are only as good as the targets. This was addressed as a "tricky element" as the question itself had some question marks surrounding it, such as "How do we want to address it?". What is meant by "involve" needs to be clarified, as well as what the stakeholder's investment/metric is. It was also noted that infrastructure (water treatment and production) was missing – what does it mean, how to measure it and no indicator of how it leads to sharing. A number of other suggestions were provided (see

Table 3-16).

Table 3-16. Suggested changes for the Vision 2030 indicators

Vision 2030 objective	Indicator text ***[suggested changes in italic]***
Objective 3 *To influence policy development/implementation in the EU and beyond*	• Indicator 3.2: Number of policy briefs published by Water JPI; *targets should focus not on the supply side but on what is triggered at country level, but this needs a qualitative aspect and to reflect on how briefs are changing. The number and scope need to be added to provide the context for what action is taking place* • *Use of the word "influence" in the objective text could be contentious (as it might imply lobbying); suggest using a different word?* • *Number of "understanding to act" documents point towards methodologies to address issues and how they can be used by various stakeholders*
Objective 4 *To support and enhance the research and innovation community with developing research capacity, mobility actions and sharing research infrastructures*	• Indicator 4.4: Numbers of PhDs financed; *funding mechanisms vary between 3- and 4-year PhDs – change indicator to postgraduate instead to capture those as well* • *Consider research infrastructure such as eLTER H2020 project, which is used through Water JPI projects*
Objective 6 *To contribute to achieving the UN SDGs*	• Indicator 6.1: Number of projects funded addressing especially UN SDG 6; *consider also other SDGs as the focus is too narrow* • *Regarding the SDGs: verified contributions to SDG achievement; stakeholder engagement metrics* • *It is not necessarily about the number of projects under SDGs, but of how many intersectoral dialogues that lead to, for example, cross-pollination of SDGs as a measurement of JPI effectiveness*
Other suggestions	• *Good to have indication of how well accepted the Water JPI is over time at funding agency/country level.* • *Quantified water efficiency impact; number of demonstration projects completed; number of sectors engaged* • *Reaching a consensus on a tiered approach to monitoring and modelling tools* • *Suggestion of more emphasis on surface and groundwater supplies and effects of emerging contaminants and climate change impacts* • *Transition needs as a focus on its own; health rights as a lever of change; define "smart" website statistics: number of clicks/comments as a metric* • *Synergies between the SRIA and other initiatives could be another metric*

3.5.2 Part 2: Shaping the Horizon Europe Water4All Partnership

Part 2 of Plenary Session 4 was introduced by Panos Balabanis (DG Research and Innovation, EC, via video link). The discussions were led by Andrea Rubini (Water Europe) and Dominique Darmendrail (Water JPI Coordinator).

A question was posed regarding opportunities to fund WaterWorks, which currently occurs through partnerships, and whether or not they can be funded by new initiatives. The noted response was "not yet" as it is necessary, first, to look at the action and see how this aligns and can be implemented. Funding is still up for discussion and there is a need to look at synergies and complementarities. Another query was why a partnership would be more effective than the normal work programme. In response it was noted that

international cooperation can be difficult and challenging. Graph 3-4 outlines the portfolio of activities (beyond joint calls) that attendees voted on through Slido during the discussion.

A question was raised about how to create a link from Water Europe [previously known as the Water Supply and Sanitation Technology Platform (WssTP)] and for funding, including private funding. In response it was noted that Water Europe represents a different side and that it is necessary to put together the needs of research, good governance, strong policy and the needs of sustainable development in Europe.

Leveraging ideas to bring in existing ports/states, e.g. non-state actions (such as the Covenant of Mayors), can be more efficient and ambitious than government actions.

All organisations must come together for common goals. It could be easier to derive water-related challenges, rather than trying to get consensus across many organisations. It is important to try to have all sectors at the relevant scale on the same page. Integrate at region/research/infrastructure/consortia level and define what needs to be done.

There is a land–sea connection and a point was raised regarding regional seas – it was pointed out that interaction is noted in the sustainable water management theme and connecting source to sea.

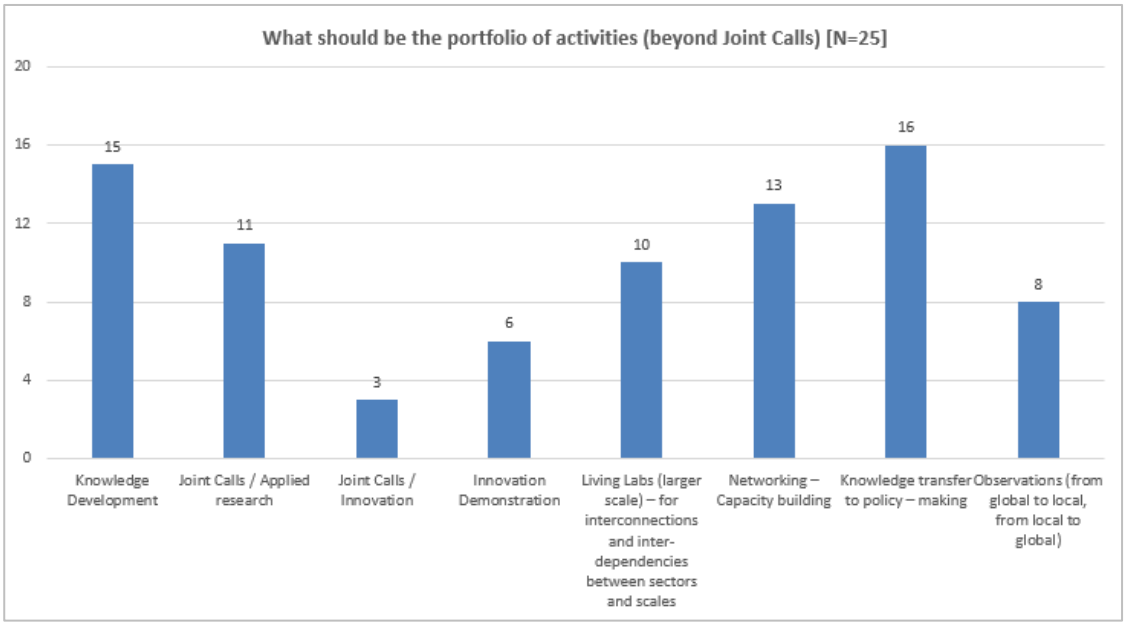
It was stated that the Water4All partnership will need its own SRIA and the question was then asked how this will be completed. In response, it was stated that other existing agendas will be looked at: EU agendas; JPIs; EIP (European Innovation Partnership), which has an implementation plan (covers barriers to uptake). Further work and analysis are needed to see where the gaps lie, in addition to mapping the information and reflecting on similar gaps.

The Partnership on Research and Innovation in the Mediterranean Area (PRIMA) will focus on general aspects, in order and carry out a pre-assessment of synergies with other SRIAs. The Water4All SRIA will look to be activated in 2022, with an expected duration of 5–7 years.

Slido question: Why would the partnership be more effective than implementing a research topic via the normal work programme?

- Broader stakeholder/community engagement/social values and behavioural change.
- Create more impact.
- Bottom-up approach.
- Already a strong network of different actors and has spent years building trust and a modus operandi.
- More impact through living labs – this approach can support the scalability of solutions and market outreach.
- More ambitious and challenging projects.
- Broader involvement of various stakeholders and link with regional specialisations – but complex.
- Easier connection between partners.
- Continuity.
- An existing well-renowned network, good connections at different levels in the EU and wide expertise and a variety of stakeholders.
- Less fragmentation.
- Faster consortia building.

Slido question: What should be the portfolio of activities (beyond joint calls?)



Graph 3-4. Summary of voting responses from attendees on the portfolio of JPI activities.

Slido: other suggestions (free text) (n = 2)

- Knowledge transfer to local or regional actors/users/stakeholders.
- Leverage existing initiatives of partners under a common broader or specific objective.

Slido question: How to build the research agenda for the Water4All partnership? Linkages with other existing research agendas

- Involve other EU-level subjects that develop SRIAs.
- Based on Water JPI SRIA and Water Europe mainly.
- All regional Strategic Environmental Assessments (SEAs) and JPIs currently updating or creating SRIAs.
- Series of sandpit workshops with wide geographic coverage facilitated by existing partnership secretariats and national agencies.
- Include findings from COST[4] actions finished or ongoing in an area.
- Establish common platforms and frameworks and engage stakeholders in
- consultation groups/workshops to build synergies.
- Explore possible integration at EU regional level through the Research and Innovation Strategies for Smart Specialisation (RIS3).

[4] COST Action is a network dedicated to scientific collaboration, complementing national research funds

3.6 Concluding Remarks and Next Steps

Specific research priorities and actions and knowledge needs/gaps in specific and defined research areas are outlined in the SRIA 2.0. The ambition of the Water JPI programme is to "steer research and innovation in the water sector" towards a more "effective" and robust "response" globally to "societal challenges". To this end, the Water JPI is currently updating its Vision 2030 and SRIA 2025.

The Water JPI Experts Workshop was held in Dublin, Ireland, on 22–23 October 2019. The main purpose of the workshop was to discuss and identify the best instruments to be included under SRIA 2025 to achieve the Water JPI objectives and targets moving forward. In total, 88 people attended, including members of the Water JPI GB and ABs, ministry/policymaking departments, other EU initiatives, the research community and enterprises. The main aims of the workshop were to inform the drafting of the SRIA 2025 by Identifying what may still be valid from the current SRIA (version 2.0, 2016), collate proposed information and feedback, review research infrastructure knowledge gaps/needs and discuss expected impacts and Vision 2030 key performance indicators and proposed implementation models. Preparations are currently under way to draft the Vision 2030 and SRIA 2025 as high-level strategic documents. Both documents are due to be completed by February 2020.

Summary of breakout session on Theme A: Ecosystems

- The SRIA 2.0 subthemes are all considered still relevant.
- Some minor word adjustments make the subthemes more inclusive and better reflects the scope.
- One key wording change in a research priority was from "eco-technological solutions" to "nature-based solutions", as the more widely accepted phrase, which is echoed in other themes.
- A clear distinction was made between "ecosystem services", which are those services that benefit people, e.g. flood attenuation, filtering, and ecosystem services from the perspective of the structure and functioning of those ecosystems, which is more about understanding nature for its own sake and biodiversity in general.

Summary of breakout session on Theme B: Health and Wellbeing

- It was agreed to implement the "One Health" approach at the beginning of the breakout session to help inform and focus discussion.
- The majority of participants agreed that most of the current priorities of the SRIA were relevant; however, they required some modification, a re-focus and a re-prioritisation.
- The AMR topic was too important not to be considered as a stand-alone topic.
- The main outcome of breakout session 1 was the development of two new subthemes: subtheme 2.2, "Environmental dimension of AMR", and subtheme 2.4, "Human interaction with water".

Summary of breakout session on Theme C: Water Value and Water Usage

- Most participants agreed that most of the priorities under SRIA 2.0 were still relevant but that a restructure of the theme is required.
- New priorities were proposed under 4.1 (SRIA 2.0 – Improving the efficiency of water use for a sustainable bio-economy sector): "Reuse of recycled water, promoting tools/mechanisms to facilitate; and reviewing and improving incentives/penalties" and "Adaptive water management in agriculture".
- It was proposed to include additional UN SDGs in addition to those mentioned in SRIA 2.0, to which research priorities should be aligned: UN SDGs 11 (target 11.6), 12 (target 12.4), 13 and 17.
- The main enablers discussed included the increased speed of changes – more/faster reactive time required from researchers.

Summary of breakout session on Theme D: Sustainable Water Management:

- Overall, the SRIA 2.0 priorities are mainly still relevant; however, they need to be broadened out to encompass other relevant considerations, such as alignment with the UN SDGs and the definition of nexus (cross-sector, decarbonisation, nature-based solutions, industry, domestic, ecosystem services, resource recovery and municipal aspects).
- Regarding new priorities, "waste/resource recovery/reuse" needs to be added to the nexus paradigm: water–energy–food–health–climate and ecosystems.
- All participants were in agreement with the cross-cutting issues identified as being a critical element to the new SRIA and, in particular, the need for genuine and real engagement with the public to empower citizens and society – across all sectors of society, globally and locally, as well as rural and urban.
- The "value" of water and its sustainable management was raised as a common theme that needs to be embraced, as well as how society, by its very behaviour, can have a positive impact on both the quality and the quality of water, especially if it is managed and viewed using a holistic/catchment approach.
- It was proposed that the SRIA 2.0 subthemes 3.1, 5.1 and 5.2 could also fall under the umbrella of research infrastructures (Developing market-orientated solutions for the water industry; Closing the water cycle gap – enabling sustainable management of water resources; Strengthening the socio-economic approaches to water management, respectively).

3.7 Post-event Feedback

After the workshop, the Slido event was left open for a further 3 days to allow attendees to add additional feedback if they wished. This was an important consideration as there was very limited time for attendees to move between rooms at the conclusion of each breakout session and provide further input and highlight critical questions.

The ideas raised following the final workshop discussion during Plenary Session 4 were as follows:

- Missed as topic: global decreases of sediment transported from source to sea. In Rhine e.g. 70% reduction since 1952. Impacts on fertility, etc.?
- Theme D kicked out many subthemes allocated to their theme. Did they assess their relevance as required by the process? If no, who will do that? General coherence.
- Were All SRIA 2.0 subthemes pre-allocated to new themes? No double allocation? With the many overlaps identified, who will have a look at global coherence?
- Pollution/water quality could be developed in a single theme or along risk value chain (source and management in Theme C, pathway in D and targets in A and B).
- In fact, research priorities regarding consequences of global and climate change water scarcity on migration were not considered?!!
- Pollution still a high concern in the political and water utilities arenas. See outputs of Aqua Publica event In Brussels. Should appear in the Water JPI SRIA.

Very detailed feedback was provided via Slido after the event on the subthemes and research priorities for each theme. This feedback is detailed below (as provided by the attendees).

Post-event Feedback: Plenary Session 4 Ideas
Missed as topic: global decreases of sediment transported from source to sea. In Rhine e.g. 70% reduction since 1952. Impacts on fertility, etc.? Have more information
Theme D kicked out many sub-themes allocated to their theme. Did they assess their relevance as required by the process? If no who will do that? General coherence
Were All SRIA v2 sub-themes pre-allocated to new themes? No double allocation? With the many overlaps identified who will have a look at global coherence?
Pollution/water quality could be developed in a single theme or along risk value chain (source and management in Theme C, pathway in D and targets in A and B)
In fact, research priorities regarding consequences of global and climate change water scarcity on migration were not considered?!!
Pollution still a high concern in the political and water utilities arenas. See outputs of Aqua Publica event In Brussels. Should appear in the Water JPI SRIA

Post-event Feedback: Ideas and Comments on the proposed Subthemes and Research Priorities
Theme A: Ecosystems
Proposal of reformulation 1.1.5 as follows: Devising new governance approach, regulatory and economic instruments to maintain and increase water/ecosystem services
Proposal of reformulation 1.1.4 as follows: Integrating ecosystem services into land use planning and water resources management
1.2.1 Need to integrate in the title the vertical dimension of water ecosystem, connectivity between surface flow and underground flow, water in soil, wetlands
In 1.1.2 and .1.1.4, need to take into consideration as rationale the importance of being able to draw/co-build scenarios/trajectories of ecosystem and . . .
. . . 1.1 being able to draw/co-build scenarios/trajectories of ecosystem based on observation/model, to provide arguments for services preservation
1.2.2 NBS for the remediation and mitigation of degraded water bodies (surface and subsurface), aquatic ecosystems and groundwater dependant ones
1.2.2 need to take into consideration technical feasibility, sociological acceptance, economic cost (direct, indirect) of various NBS
Suggestion of reformulation for 1.3.2: developing innovative solutions/tools for adaptation to hydroclimatic extreme events, namely floods
Maybe the subtheme 1.3 Managing . . . extreme events, should find its place in the Theme D related to sustainable water management
If 1.3 is in Theme D, one additional research priority in 1.2 could be 1.2.4 nature-based solutions for flooding mitigation
Nature-based solutions should allow to improve ecosystem services, i.e. quality of water, fauna, flora and quantity with retaining water, infiltration to subsoil
1.1.1 Assessing the structure and functioning of ecosystems
Water value and usage: climate change resilience reducing adverse effects of water uses (biodiversity structure and function, quality and pollution aspects)
Theme B: Health and Wellbeing
2.3. Understanding and minimising the risks associated with water infrastructures and climate change effects (instead of natural hazards)
climate change effects are wider and include extreme events, sea level raise, temperature increase and impact on infrastructure, assets, water quality
Progressing to water more water resistant cities close to 1.3.3; suggest merging both, and kept it in Theme B
2.3.3 Availability of safe water from one health perspective: link with ecosystem services, with preservation and protection? Is it linked to ecosystem?
2.3.3 safe water one health perspective addresses it Treatment assets and supply infrastructure?
2.3.4. Assessing . . . water reuse strategies: should not consider only bio circular economy, or watering public gardens; but also the geological compound
2.3.4 . . . water reuse strategies – bio-geo- circular economy considering impact on soil, return flow to groundwater and as well aquifer recharge
Theme C: Water Value and Usage
C 1 Future proofed water technologies, infra + systems: there are redundancy, between 3.1.1, 3.1.2 and 3.1.3 namely. Suggestion of 4 to 5
3.1: Research priorities: 3.1.1 Technological Treatment solutions (hybrid, flexible, agile, energy +) of wastewater addressing as well emerging contaminants
3.1: Research priorities: 3.1.2 Innovative approaches to assets management (sustainability, . . .); 3.1.3 Treating security of critical infrastructures (CC + Cyber)

Post-event Feedback: Ideas and Comments on the proposed Subthemes and Research Priorities
3.1: Research priorities: 3.1.4 Devising innovative strategies for water capture (retain in soil, infiltration to subsoil) and water storage
3.1: Research priorities: 3.1.5 Risk based assessment of implementation of technological solution (?) – under climate change, Cybersecurity, in terms of health quality
3.2: Water smart circular economy and societies; ok with water resources efficiency and allocation across sectors (plus link with Theme D) link with NEXUS WEFE
.2: Water smart circular economy and societies; investments prioritising what will be the Research priorities? New economic model? to be more explicit
.2: Water smart circular economy and societies; Water quality fit for use to be integrated in 3.1. under water Treatment plant technologies
Theme C: cross cutting issue, regarding Smart monitoring and control systems ok (cross to 3.1 and 3.2): Long term water demand forecasts and scenarios ok
Earth observations not a research priority! A tool to assess water demand, water consumption (i.e. agriculture, crops fields)
3.2 too many items! focus on water resources efficiency and allocation across sectors, long term water demand new form of governance and management (collective)
3.2: tb continued . . . developing integrated adaptive agriculture/forestry management/but also inter-sector at catchment scales and territories
3.2 tbc . . . risk management for environment/health and reducing adverse effects of water uses to be considered in B or in A (preservation and protection)
3.3 Empowering the public/w. users in valuing water should be clearer: more systemic and paradigm changes in common resources management: consequences for water
3.3 Empowering the public . . . water footprinting to be considered
3.3 Empowering the public . . . Values of water, Groundwater insurance to cope with global changes, for next generation
3.3 Empowering the public . . . research need in terms of tool, Decision Framework, participative approach, i.e. link with Theme D 4.3
3.3 Empowering the public . . . research needs in term of social representation of water value
Theme D: Sustainable Water Management
Nexus has its place in this Theme D. Suggest addressing both Water Energy nexus, plus Water Energy Food and Ecosystem nexus
What is behind water and health nexus? It is not to bridge, function of social issues, food and diets?
4.2. Closing Water Cycle Gap (?) seems it was not clear in the current SRIA !!
4.2.3 – ref 5.1.1: RDI infrastructure promotion should be on Theme A Ecosystem (i.e. eLTER ESRI)
4.2.3 – ref 5.1.1 tb continued . . . promoting, capitalizing and valorising environmental data from monitoring at Water Treatment assets, in surface, and groundwater?
4.2 Closing Water Cycle Gap: in Demonstration and Living Labs, expectation of water resource management at catchment scale for diff users, emphasize on trajectories
4.3. Enabling sustainable MWR: 4.3.2 is already included in Theme A. For 4.3.1 and 4.3.3, vulnerability and resilience of socio economic group have to be in
Theme D: other topics to be lineated: focus on urban and agriculture areas to be included in 4.3.1 and 4.2.1
In the 4.2 Closing Water Cycle Gap, there is also the previous 5.1.3 to keep it, concerning Management Aquifer recharge (link potentially to Demo sites)
other topics to lineate: resources Recovery and reuse, circular economy: both in Theme C (value) and Theme D Under closing water cycle gap

Post-event Feedback: Ideas and Comments on the proposed Subthemes and Research Priorities
Value of water, accountability, transparency, cost . . . to be integrating in 4.3 Enabling sustainable management of water resources: in 4.3.1 and/or 4.3.3
new type of numerical modelling (routines, codes) for integrating water resource management (various coupling: land use, scenarios, economics, geochemical, . . .)
need to integrate Research priorities of Theme A Ecosystem, regarding 1.3.1 and 1.3.3

Appendix A
List of Attendees

First name	Surname	Company	Work country
Panos	Balabanis	DG Research and Innovation, EC	EC
Robert	Barouki	INSERM Université de Paris	FR
Thomas	Berendonk	TU Dresden	DE
Ivar	Berthling	Research Council of Norway	NO
Susanne	Bieker	Fraunhofer Institute for Systems and Innovation Research	DE
Peter	Bjørnsen	UNEP–DHI	DK
Jos	Brils	Deltares	NL
Palina	Bruyek	Technological University Dublin – Tallaght Campus	IE
Craig	Bullock	University College Dublin	IE
Desseille	Celine	HERA	FR
Rachel	Clarke	RPS Ireland	IE
Olga	Covaliova	Institute of Chemistry	MD
Aimie	Cranch	EPA Ireland	IE
Matthew	Crowe	EPA Ireland	IE
Eve	Daly	National University of Ireland Galway	IE
Dominique	Darmendrail	ANR	FR
Elvira	de Eyto	Marine Institute	IE
Anna	Di Noi	ISPRA	IT
Nathalie	Dörfliger	BRGM (French Geological Survey)/AllEnvi	FR
Hannah	Fearon	RPS Ireland	IE
Laura	Forsström	Academy of Finland	FI
Olivier	Gaillot	RPS Ireland	IE
Jeremy	Gault	MaREI Centre, ERI, University College Cork	IE
Laurence	Gill	Trinity College Dublin	IE
Alan	Gilmer	Technological University Dublin	IE
Lena	Goldkuhl	Luleå University of Technology	SE
Harri	Hautala	Academy of Finland	FI
Anna-Stiina	Heiskanen	Finnish Environment Institute	FI
Herman	Helness	SINTEF	NO
Paul	Hynds	Technological University Dublin	IE
Bjorn Kaare	Jensen	GEUS	DK
Kevin	Jewell	Federal Institute of Hydrology	DE
Juha	Kämäri	Ministry of Agriculture and Forestry	FI
Rosanna	Kleemann	University College Dublin	IE
Karoliina	Koho	BONUS EEIG/BANOS CSA	FI
Károly	Kovács	EWA	HU
Norbert	Kreuzinger	Technische Universität Wien	AT
Jussi	Kukkonen	University of Eastern Finland	FI
Kristina	Laurell	FORMAS	SE
Corinne	Le Gal La Salle	University of Nîmes	FR

First name	Surname	Company	Work country
Xavier	Le Roux	FRB/INRA	FR
Helen	Liu	University College Dublin	IE
Antonio	Lo Porto	Water Research Institute (IRSA-CNR)	IT
Kerstin	Magnusson	IVL Swedish Environmental Research Institute	SE
Zakhar	Maletskyi	Norwegian University of Life Sciences	NO
Gerard	McCormack	RPS Ireland	IE
John	McEntagart	EPA Ireland	IE
Sinead	McGlynn	TechWorks Marine	IE
Kevin	McGuigan	RCSI	IE
Heather	McKhann	INRA	FR
Liam	Morrison	National University of Ireland Galway	IE
David	Murphy	Intrigo	IE
Sinead	Murphy	Galway-Mayo Institute of Technology	IE
Nick	O'Brien	WaterColab	IE
David	O'Connell	Trinity College Dublin	IE
Aisling	O'Connor	EPA Ireland	IE
Hatice	Ökten	İzmir Institute of Technology	TR
Jens	Olsson	Swedish University of Agricultural Sciences	SE
Graham	O'Neill	Technological University Dublin	IE
Niamh	O'Neill	RPS Ireland	IE
Ray	Parle	Health Service Executive	IE
Marie	Pettenati	BRGM (French Geological Survey)	FR
Yolanda	Picó	University of Valencia	ES
Gilles	Pinay	Irstea	FR
Fiona	Regan	DCU	IE
Jean-Daniel	Rinaudo	BRGM (French Geological Survey)	FR
Alec	Rolston	An Fóram Uisce – National Water Forum	IE
Andrea	Rubini	Water Europe	BE
Aki Sebastian	Ruhl	German Environment Agency	DE
Kathryn	Schoenrock	National University of Ireland Galway	IE
Katharina	Schütze	Federal Institute of Hydrology	DE
David	Schwesig	ARC/IWW	DE
Huseyin	Selcuk	İstanbul Üniversitesi	TR
Lisa	Sheils	EPA Ireland	IE
Henning	Sørum	Norwegian University of Life Sciences	NO
Dorothy	Stewart	EPA Ireland	IE
Hans	Stielstra	DG Environment, EC	EC
Ken	Stockil	Central Solutions	IE
Marlen	Vasquez	Cyprus University of Technology	CY
Teppo	Vehanen	EIFAAC	FI

First name	Surname	Company	Work country
Maria	Viklander	Luleå University of Technology	SE
Marko	Virta	University of Helsinki	FI
Fiona	Walsh	Maynooth University	IE
Alice	Wemaere	EPA Ireland	IE

Appendix B
Workshop Programme

2019 Water JPI Experts Workshop
Drafting the new Water JPI Strategic Research and Innovation Agenda (SRIA 2025)

Day/date: **Tuesday 22 and Wednesday 23 October 2019**
Location: Dublin, Ireland
Venue: Radisson Blu Royal Hotel, Golden Lane, Dublin

Programme – Day 1

From 9.30 am: Registration & Coffee (Pre-function Area)

10.15 am–11.15 am: Plenary Session 1 (Goldsmith Hall 1)
Setting the Scene

Chaired by **David Schwesig** (Water JPI Advisory Board member, ARC, Aqua Research Collaboration)

10.15 am: Welcome

Alice Wemaere
Environmental Protection Agency, Ireland

10.20 am: Water JPI & Key Achievements

Dominique Darmendrail, Water JPI Coordinator
Agence Nationale de la Recherche, France

10.30 am: Water JPI Vision 2030 – Proposed Directions

Olivier Gaillot
RPS, Ireland

10.45 am: Common Vision between the Water & FACCE JPIs

Heather McKhann, FACCE-JPI Coordinator
Institut national de la recherche agronomique, France

11 am: Question and Answers

11.15 am–11.45 am: Tea/Coffee Break (Pre-function Area)

11.45 am–12.45 pm: Plenary Session 2 (Goldsmith Hall 1)
The Wider Context – Keynote Presentations

Chaired by **Fiona Regan** [Water JPI Advisory Boards member, Dublin City University (Ireland)]

11.45 am: Key Water Research Priorities in the context of the UN SDGs

Peter Koefoed Bjørnsen
UN Environment – DHI Centre on Water & Environment, Denmark

12.15 pm: Key Water Policy developments

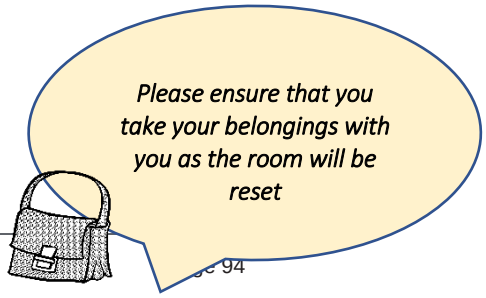
Hans Stielstra (via Video Link)
Water Unit, DG Environment on Policy Developments, EC

12:45 pm: Water Research & Horizon Europe

Panos Balabanis (via Video Link)
DG Research, EC

1.15 pm: Question and Answers

1.30 pm – 2.30 pm: Lunch (Pre-function Area)



2.30 pm–5.20 pm: Breakout Sessions – Part 1 – As per Registration

Breakout Session Research Themes 2020–2025:

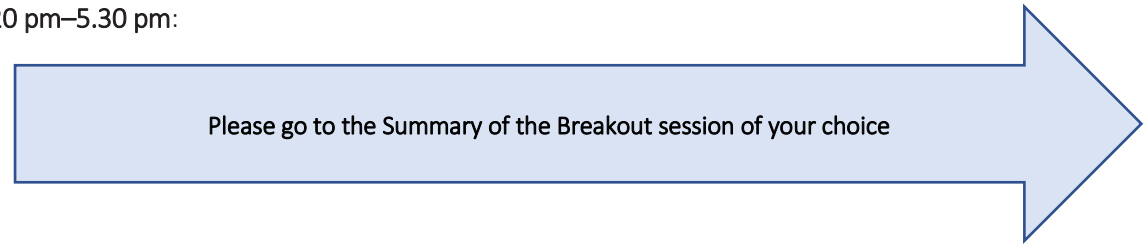
- Ecosystems (Swift Suite)
  Chaired by: **Xavier Le Roux** (Coordinator & CEO of BiodivERsA), France
- Health & Wellbeing (Field Suite)
  Chaired by **Robert Barouki** (Coordinator of the Horizon 2020 HERA project), France
- Water Value & Usage (Sky Suite)
  Chaired by **Jean-Daniel Rinaudo** (Water PI Advisory Boards member, The French geological survey (BRGM)), France
- Sustainable Water Management (Goldsmith Hall 1)
  Chaired by **Károly Kovács** (past president of the European Water Association), Hungary

2.30 pm–5.20 pm: Group Discussions covering:

- Key RDI Priorities for each of the Water JPI proposed new Research Themes 2020–2025 (focusing on the research *priority* level rather than *topic* level)
- Agreeing/grouping into Subthemes

4pm–4.20pm: Tea/Coffee Break (Pre-function Area)

5.20 pm–5.30 pm:



5.30 pm–6 pm: Breakout Sessions Summary Part 1 – OPEN

Giving an opportunity to all attendees to listen to and comment on the outcomes of one of the other Breakout Session discussions they did not attend.

Led by Breakout Session Rapporteurs & Chairs

slido

Group Photo
End of Day 1
7.30 pm: Dinner @ Radisson Blu Royal Hotel, Golden Lane, Dublin

Programme – Day 2

From 8.00 am: Registration & Coffee

Please go to the Breakout Session allocated upon Registration

8.30 am–12 pm: Breakout Sessions – Part 2 – As per Registration

Breakout Session Research Themes 2020–2025:

- Ecosystems (Swift Suite)
  Chaired by: **Xavier Le Roux** (Coordinator & CEO of BiodivERsA), France
- Health & Wellbeing (Field Suite)
  Chaired by **Robert Barouki** (Coordinator of the Horizon 2020 HERA project), France
- Water Value & Usage (Sky Suite)
  Chaired by **Jean-Daniel Rinaudo** (Water PI Advisory Boards member, The French geological survey (BRGM)), France
- Sustainable Water Management (Goldsmith Hall 1)
  Chaired by **Károly Kovács** (past president of the European Water Association), Hungary

8.30 am–11.20 am: Group Discussion covering:

- Feedback received during the 30-minute exchange between groups
- Expected impacts and possible trade-offs
- Cross-cutting issues
- Research infrastructure needs/gaps

10:20 am–10:40 am: Tea/Coffee Break (Pre-function Area)

11.20 am–11.30 am:

Please go to the Summary of the Breakout session of your choice

11.30 am–12 pm: Breakout Sessions Summary Part 2 – OPEN

Giving an opportunity to all attendees to listen to and comment on the outcomes of one of the other Breakout Session discussions they did not attend.

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Led by Breakout Session Rapporteurs & Chairs

12 pm–1 pm: Lunch (Pre-function Area)

1 pm–1.30 pm: Plenary Session 3 (Goldsmith Hall 1)
Feedback from Breakout Sessions

Chaired by **Antonio Lo Porto** (Water JPI Advisory Boards member, EurAqua, European Network of Freshwater Research Organisations)

1 pm: 5-minute Summary of Breakout Session

Breakout Session Rapporteurs

1.30 pm–3.30 pm: Plenary Session 4 (Goldsmith Hall 1)
General Discussion

Chaired by **Antonio Lo Porto** (Water JPI Advisory Boards member, EurAqua, European Network of Freshwater Research Organisations)

1.30 pm–2.30 pm: Part 1: Where are we at?

slido

- How did we deal with the cross-cutting issues?
- Potential Overlap & Synergies
- Review of the proposed Structure
- Targets for the Vision 2030

slido

2.30 pm–3.30 pm: Part 2: Shaping the Horizon Europe Water4All Partnership

- Introduced by **Panos Balabanis** (Via Video Link, DG Research, EC)
- Discussions led by **Andrea Rubini** (Water Europe) and **Dominique Darmendrail** (Water JPI Coordinator)

3.45 pm: Wrap-up and Closure of the Workshop
End of Day 2

Appendix C
Biographies of the Chairpersons and Speakers

Session 1

Chairperson

David Schwesig

David Schwesig is an environmental scientist with a focus on biogeochemistry and the water cycle (PhD from University of Bayreuth, 2001). He is research coordinator of the IWW Water Centre (Mülheim an der Ruhr, Germany), a research and innovation hub for the drinking water sector. In the Stakeholders Advisory Group (SAG) of JPI Water, David represents the ARC, a European network of applied water research institutes, which has carried out a number of large-scale European research projects with and for the water sector. He is responsible for shaping and implementing the research and innovation agenda of the IWW and ARC and for initiating and coordinating European and national research and development projects.

Speakers

Alice Wemaere

Alice Wemaere has a BSc and MSc in Chemical Engineering and a MSc in Environmental Sciences. She holds a PhD looking at lake eutrophication and geographic information system modelling of nutrient loadings from a catchment into surface waters. Alice has been working with the EPA Research Programme since 2004. Until recently, she was responsible for the EPA Water Research Pillar and, in the past, has managed the EPA research publications and website. Since December 2016, Alice has been the EPA Research Manager, with responsibility for the full EPA Research Programme. She is the national contact point for BiodivERsA and the Climate and Water JPI and Horizon2020 Societal Challenge 5 (Climate Action, Environment, Resource Efficiency & Raw Materials) and, since 2017, she has also been the National Delegate for Societal Challenge 5.

Dominique Darmendrail

Since November 2014, Dominique Darmendrail has been the coordinator of the EU Water JPI, which aims to increase coordination in European RDI and address issues such as user participation, attaining targets in the coordinated use of funds and progress in the integration of RDI agendas and activities. She also coordinates the Coordination and Support Actions IC4Water for the development of international cooperation in research and innovation in the water area.

Since July 2014, she has been the programme manager for environmental technologies at the French National Research Agency (ANR).

She holds a doctorate in hydrogeology and hydrogeochemistry from the University of Bordeaux (France). She was the Head of BRGM's Environment and Process Division from 1998 to 2007, and European Affairs representative within BRGM from May 2010 to July 2014, while being the secretary-general of the Common Forum on Contaminated Land in Europe (www.commonforum.eu), European network of contaminated land policy experts and International Committee on Contaminated Land (www.iccl.ch).

Olivier Gaillot

Olivier Gaillot is an agricultural and environmental engineer and Director of Environment, Energy and Resources at RPS. He is responsible for the delivery of high-profile projects, together with business growth and development. He advises private and public clients on a broad range of projects on environmental assessment, energy recovery and sustainable resource management. Olivier has extensive experience in managing and providing strategic direction for large-scale national SEA/Appropriate Assessment (AA) projects for the EPA, Department of Communications, Climate Action and Environment (DCCAE) and

Department of Housing, Planning and Local Government (DHPLG). Most recently, Olivier has led the delivery of a number of projects to assist public authorities in the implementation of the WFD.

Heather McKhann

Heather McKhann has a doctorate from the University of California, Los Angeles and was awarded a National Science Foundation (NSF) postdoctoral fellowship. Following several postdoctoral positions in France and the Netherlands, she joined INRA in 1999, working on natural genetic variation in plants, particularly related to freezing and drought tolerance. She coordinated a trilateral project funded through the European Research Area Network (ERA-NET) Plant Genomics. Since November 2009, she has worked as a European affairs officer at INRA. Heather coordinates the executive secretariat of the FACCE-JPI, which brings together 24 countries around the challenges of sustainable agriculture and food security under climate change. She is also work package leader in several Coordination and support action (CSA)s and ERA-NETs past and present.

Session 2

Chairperson

Fiona Regan

Fiona Regan is Professor in Chemical Science at DCU and Director of the DCU Water Institute. Fiona studied environmental science and technology and completed a PhD in analytical chemistry in 1994. Following postdoctoral research in optical sensing at DCU, in 1996 she took up a lecturing position at Limerick Institute of Technology. In 2002 Fiona joined the School of Chemical Sciences as a lecturer in analytical chemistry; in 2008 she became senior lecturer and in 2009 she became the Beaufort Principal Investigator in Marine and Environmental Sensing. Fiona's research focuses on environmental monitoring and she has a special interest in priority and emerging contaminants, as well as the establishment of decision support tools for environmental monitoring using novel technologies and data management tools. Her work includes the areas of separations and sensors (including micro-fluidics), materials for sensing and antifouling applications on aquatic deployed systems. Fiona is a member of the Water JPI Scientific and Technological Board and a member of the Royal Irish Academy (RIA) Climate Change and Environmental Sciences Committee.

Speakers

Peter Koefoed Bjørnsen

Peter Koefoed Bjørnsen is Director of the UNEP–DHI Centre on Water and Environment located in Denmark. The centre provides expertise to support UNEP's water-related activities. UNEP is the UN custodian agency for several of the indicators that countries report on as part of the 2030 Agenda for Sustainable Development. The centre led the baseline reporting for the SDG target on water resources management. Peter holds a PhD in aquatic ecology from the University of Copenhagen and has 25 years of work experience with the Government of Denmark, the Global Environment Facility and the UN.

Panagiotis Balabanis

Since 1990, Panagiotis Balabanis has worked at the DG Research and Innovation of the EC, where he is head of the sector "Water" in the Circular Economy and Bio-based Systems Unit. In this context, he deals with issues related to water, resource efficiency and the circular economy, with a view to supporting the transition to a healthy planet that is climate neutral by 2050 and operating within safe planetary boundaries. During this time, Panagiotis Balabanis has been involved in the definition and implementation of successive research programmes in the field of the environment and sustainable development. Panagiotis Balabanis holds a Diploma from the Agricultural University of Athens, Greece, and a DEA (Diplome de d'Etudes Approfondies) and a PhD in the "Mechanics of mass and energy exchanges" from the University J. Fourrier,

Grenoble I, France. Before joining the EC, he worked as a research associate at the Agricultural University of Athens.

Breakout Sessions Chairpersons

Xavier Le Roux

Xavier Le Roux holds a PhD in ecosystem ecology (University of Paris). He has played a key role in the development of the European research area on biodiversity as chairperson of BiodivERsA (40 ministries, agencies and foundations from 25 countries) since 2008, and is actively involved with BiodivERsA partners and EC services in the preparation of a EU partnership on biodiversity.

He is an INRA senior scientist and research team leader at the Microbial Ecology Centre of Lyon-Villeurbanne (France). He has published over 115 papers in peer-reviewed international journals and has been a member of the Academy of Europe since 2014. He was the Director of the Foundation for Research on Biodiversity (which is the science–society platform for biodiversity in France) from 2008 to 2012. He has been a member of the Development Team of the Natural Assets Knowledge-Action Network of Future Earth since 2017 and a member of the Scientific Advisory Board of the EU LifeWatch ERIC infrastructure since 2019.

Robert Barouki

Robert Barouki is a Professor of Biochemistry and Molecular Biology at the University Paris Descartes and head of the Inserm unit “Toxicology Pharmacology and Cellular Signalling”. He also heads the clinical metabolomics and proteomic biochemistry laboratory at the Necker Enfants Malades hospital. During the last 20 years he has studied the impact of environmental contaminants on human health and the mechanisms of action involved in those effects. In particular, he has studied the biological consequences of the activation of the dioxin receptor AhR by different ligands and delineated the mechanisms of toxicity using “omics” technologies. He has also studied the effects of combinations of different contaminants and integrated those studies in the larger scope of the exposome concept and approaches and exposure and effect biomarkers. As head of the clinical metabolic biochemistry department, he has developed multiplex targeted proteomic and metabolomic assays, notably in the field of metabolic diseases and in toxico-dynamics.

Robert Barouki coordinates or participates in several European projects on the exposome, human biomonitoring and endocrine disruptors. In a more general perspective, he has been involved in the networking of French and European research in the field of environment and health and he has a keen interest in communicating scientific concepts and data to a large audience. He was awarded the OPECST-Inserm 2018 prize for his efforts to transfer scientific knowledge to policymakers.

Károly Kovács

Károly Kovács is the past-President of the EWA, the President of the Hungarian Water Association and the President of the Hungarian Water Cluster

Károly Kovacs is linked to several environmental technology developments and patents. As a CEO and project manager, he has participated in the construction of over 150 municipal and industrial wastewater treatment plants and thousands of kilometres of public sewers and in the design, modernisation, construction, operation, evaluation and assessment of several water systems. Furthermore, he has been involved in the development, production and sales of water, sewerage and drainage products, both in the domestic market and in international markets. He has played a key role in the design and development of methodology and guidance for Central and Eastern Europe for selecting least-cost projects in water supply and wastewater disposal, known as the Dynamic Cost Comparison Calculation (DCCC). His knowledge and expertise were also essential in the development of the Multipurpose Infrastructure Assessment Database (MIAD) software. As

an ambassador for the value of water and related services, he regularly negotiates with professionals and representatives of the business, scientific and social sectors and participates on 20–30 international forums annually as speaker, moderator or trainer.

His special fields of expertise are as follows:

- efficiency improvement of water utilities;
- design and implementation of water and wastewater infrastructure;
- sludge management;
- rainwater management;
- management and organisational audits;
- methodological development;
- option analysis using dynamic cost comparison;
- training programme development;
- water and wastewater regulatory issues;
- EU tendering procedures;
- benchmarking; and
- feasibility studies and implementation.

Károly Kovacs was awarded the Gold Shaft Cover Award 2011 and the Gold Cross of Merit of Hungary in 2013.

Jean-Daniel Rinaudo

Jean-Daniel Rinaudo is a senior environmental and resource economist at BRGM (French Geological Survey), where he coordinates a small research team working on environmental and risk economics. Initially trained as an agricultural engineer (Montpellier SupAgro, 1994), he specialised in agricultural and resource economics (PhD, University of Auvergne, 2000). Before joining BRGM, he worked for the International Water Management Institute in Pakistan, where his research focused on the political economy of irrigation management reforms. His current research mainly focuses on the institutional and economic dimension of groundwater management. Most of his research is conducted in France, but he also works in Australia, Morocco and Chile. He is currently developing new research activities in the field of natural disaster economics, focusing on methods to assess economic vulnerability and resilience. Jean Daniel Rinaudo is also an associate researcher at the Montpellier University G-EAU research unit. He has served as a member of the Scientific Council of the Adour-Garonne River Basin Agency for 6 years. He has also been a member of the Scientific and Technical Board of the Water JPI since 2019.

Sessions 3 and 4

Chairperson

Antonio Lo Porto

Antonio Lo Porto is the chairperson of EurAqua (the network of the public reference research institutes on water in 26 EU Member States), chairperson of the STB of the Water JPI AB .a member of the AB of FACCE-JPI and a member of several WssTP Working Groups. He is a member of the Strategic Coordination Group of the Common Implementation Strategy (SCG CIS) of the EU WFD. He is a research scientist at the Italian Water Research Institute (IRSA-CNR) and is active in the fields of integrated water resources management, river basin planning and irrigation management, diffuse water pollution and EU WFD implementation; at IRSA he acts as International Liaison Officer, mostly operating in the EU, China, India, Iran and the USA. His main interests are in the Mediterranean environment, semi-arid areas, intermittent rivers and drought-stressed environments. He has been involved in several EU-funded research and development projects (Framework Programme 4 to Horizon 2020), as well as in several COST actions as a Management Committee member. He is an Associate Editor of the *Journal of Hydrology* and was Guest Editor of *Water* for a special issue on "Diffuse Pollution". He is the Co-leader (for the EU) of the Working Group "Water Resources Management under Climate Change" in the China–EU Water Platform. He has been the chairperson and/or Scientific Committee member for several international conferences, including in the EU, India, the USA, China, Chile and Brazil. He has experience in working at river basins in Italy, Europe, Tunisia, India and Vietnam. He is the author of more than 120 scientific papers (http://scholar.google.it/citations?user=_wrPwP4AAAAJ).

Appendix D
Slido Feedback, as Provided by the Attendees

Plenary Session 1: Setting the Scene

Ideas raised during Plenary Session 1 via Slido
Will transdisciplinary approaches/methods be promoted by JPI water?
Do you consider digitalisation as one of the future trends for the water JPI?
Will the slides of the plenary sessions be available?
What are the social science challenges within the European context?
Yes, big data
I missed link in water-FACCE to global trend in serious decreases (50–100%) of suspended sediment and thus natural fertilisers going from source to sea?
Comment: if you want scientists to invest energy in dissemination, make it attractive to them. Support them through editing a widely disseminated report series
Missed as topic: global decreases of sediment transported from source to sea. In Rhine e.g. 70% reduction since 1952. Impacts on fertility, etc.? Have more information

Plenary Session 2: The Wider Context

Question	Answers
Is JPI water dealing with poverty alleviation/migration issues in developing countries? Or is this left to other initiatives, e.g. PRIMA?	Water JPI is dealing with water challenges, which may lead to poverty alleviation and migration (e.g. water scarcity)
How to tackle interlinkages between the 4 proposed teams for SRIA v3.0? Is sustainable IWR Management a goal or challenges requiring Specific RDI priorities?	In the past, presented via references in the text and a synthesis table in the SRIA document. Some specific research needs on these linkages were addressed in the theme 5, which was considered to be improved
For 6.4 could other solution than prizing can be imagine such as quota sharing or change of use (i.e. in agriculture), etc. in context of scarcity?	Yes, agree that there could be alternative solutions to direct prizing, such as quota systems. The essential is to acknowledge that water as a resource has a value and is not a free (unlimited) good
SDG 6.6. what about ecological and nutrient compensations as solutions?	Yes, believe those options fall broadly under payment for ecosystem services
How does DG Env currently identify RDI results which could support better implementation of water policies and regulations?	through colleagues at our DG for research, the Commission's joint research centre, our own access to scientific results (articles, etc.) and many other ways – there is a very wide and active network of stakeholders around water policy
In addition to Hans' research needs role of plastics (micro and nano) in increasing chemical exposures and risks	Something to be further investigated?
How Does DG Env contribute to the development of the research framework programme (content of intervention areas? Mission content? Partnership Water4all)	DG ENV is co-lead for the water partnership, along with DG RTD. We are also involved in the marine and freshwater mission, at the moment contributing to the thinking on its main orientations
For Hans, about the water–energy nexus and the sustainable water part in future EU policy, will it be more responsibility for water sector or energy sector?	There seems to be lots of possible entry points if one has the ambition to be more water/energy efficient, or to generate more energy from water. The balance will vary from solution to solution and not all solutions will be equally rewarding financially and ecologically. We do not have a full overview of what is possible and what is feasible. But presumably entire water sector (public and private) feels the pressure to "deliver" on energy and climate ambitions of the EU so understanding this nexus is very important

Question	Answers
Is there a greater need to research "soft" non tech water management solutions, which may be harder to address/have greater impact, e.g. corporate behaviours	EU R&I activities in water have promoted and will continue to promote a balanced approach between technological, non-technological and social related solutions
For Panos, how missions will connect to clusters and partnerships?	Missions will be implemented within the pillar II "Global Challenges and European Industrial Competitiveness" of Horizon Europe and will contribute to the implementation of several clusters. Their scope, specific objectives, budget, targets, etc. will be identified in the strategic R&I plans and the work programmes calls. Where relevant, partnerships may contribute to the implementation of missions
It's not often that hydromorphology is placed at the top of the list in WFD water body pressures. Does this signify a new recognition of its importance?	It is firstly factual – the EEA tells us that this is one of the main pressures. Secondly, this pressure is less well addressed at EU and national level and will therefore remain unaddressed for a longer period of time. For diffuse pollution from agriculture and from urban areas we have more effective legislation in place, for hydromorphological changes there is more of a grey zone legislation-wise, with exemptions and provisions that are to be locally interpreted
How to contribute to the design and implementation of the partnership Water4all?	The design and implementation of Water4All partnership will be discussed with EU Member States and representatives of key EU water initiatives and partnerships and the private sector, interested and committed to participate. Consultation with other interested stakeholders will take place in events like the one organised by JPI Water in Dublin
Artificial intelligence from cluster 4 can be connected to water as well – monitoring predicting assets to resources – isn't it?	In our view, Water4All is relevant to several clusters of Horizon Europe, including Cluster 4
to reach SGD 6.5. better understanding on tipping points, etc. needed, maybe same advice to understand lack of progress in WFD ecological targets	Yes, IWRM relies on information and understanding across the target areas of SDG 6
Addressed to Hans – how do EC ensure policy based on current scientific data? Do they reach out to scientists?	I think we do, by and large. We have to go through, for every new proposal, modification, evaluation, etc., a regulatory scrutiny board that verifies the quality of our argumentation. This will include looking for proof of statements we make, so this requires us to refer to scientific results or other independent open sources like EEA. Also, we are held to consult experts and the public at large every step on the way which means that if we said things not broadly supported by science this would be very quickly exposed
Missed attention for hydromorphological R&I needs in ppt Hans, but happy to see such attention in ppt Panos (good hydromorphological status is a prerequisite for achieving WFD!)	Thanks for pointing that out!
Addressed to Peter – how important is in you view the lack of knowledge (Red and yellow fields) in relation to the importance of communication?	Knowledge gaps are also important to communicate, but I believe there is primarily scope for improving the communication of what we do know
In hydromorphology, more attention needed besides e-flows to sediment(s) flows	Should be considered in the new SRIA, thanks to your contribution!

Question	Answers
Addressed to Panos – as AMR will kill more people than cancer by 2050, how will research in AMR be increased as significantly as cancer research in EU?	Emerging pollutants in water, including AMR, and their impacts on health will be addressed in both Cluster 1 and Cluster 6 of Horizon Europe
Without sediments, no healthy sea, ocean, inland waters	yes, hence our interest in reducing fragmentation across Europe – with many thanks among others to the Horizon project AMBER. We need to move away from the idea that we need defragmentation of rivers only for the sake of fish moving up and down rivers
Is lack of progress in ecosystems a basic infrastructure issue in most countries (in terms of monitoring, reporting, and access to basic research equipment)?	we made recommendations to Member States in this regard in our assessment of the second generation of river basin management plans, adopted in February of this year. The quality of that infrastructure varies across the EU, of course, but the individual assessment report of MS will highlight where we think the main challenges remain
I feel that research needs linked to a better implementation of the WFD are missing, with the exception of CEC issue	Support to the implementation of EU water policies, including WFD, is part of Cluster 6 EU policy objectives identified in the draft Strategic Plan of Horizon Europe that was opened for public consultation
Hydropower was mentioned by Panos, but is not too visible in the SRIA. Should water and energy be more highlighted in the new SRIA?	specific needs of water dependent sectors were considered as insufficiently highlighted. One of the reasons behind the creation of the Theme C – Water value and usage (to go beyond the water economic sector and Agriculture/Forestry/Freshwater Aquaculture)
@Hans Stielstra Why water policy developments do not substantially address key issues related to biodiversity and environmental services losses?	They are certainly very closely linked though perhaps I didn't show that enough in the presentation. For the future we need to focus not only on the pollution (see the "zero pollution ambition" expressed by Ms Von der Leyden) but also on biodiversity and on sustainable agriculture. There's clearly a role for water policy in all these

Plenary Session 3: Feedback from the Breakout Sessions

Additional Suggestions/Feedback?
Should we have an unique topic on "one health approach" to cope with theme 1 and 2 common issues?
There is a need to interlink biodiversity with policy development and better integrate it in existing legislation
Pollution in themes 1, 2 and 3 at least . . . with different angles!
A lot of overlap between some of the priorities in Themes C and D. Would suggest moving priorities linked to uses & usage to Theme C
How to limit overlaps between assessment of ecosystem services, restauration, remediation . . . from ecosystems and sustainable water management RDI?
Theme 4 also dealing with topics assigned to others? reuse initially assigned to theme 3 . . .
So many overlaps between theme 4 and others . . . should we go for One water concept?
Needs to consider cross cuttings Research priorities between 4 themes as well to stress on rupture Research needs in socio economic for new governance solution
Too much focus on urban areas could make rural populations feel "forgotten" and increase the rural–urban divide
There is a need to rationalise overlaps between themes

Appendix E
Links to Supporting Documentation

Links/references to supporting documentation are provided as follows:

- 2011 Vision. http://www.waterjpi.eu/images/documents/Summary%20of%20the%20Vision%20Document.pdf
- 2016 SRIA 2.0. http://www.waterjpi.eu/water-jpi-sria-2.0
- 2016 Introduction to the SRIA. http://www.waterjpi.eu/an-introduction-to-the-water-jpi-sria
- EEA (European Environment Agency), 2018. *Water Use in Europe – Quantity and Quality Face Big Challenges*. Available online: https://www.eea.europa.eu/signals/signals-2018-content-list/articles/water-use-in-europe-2014
- IUCN (International Union for Conservation of Nature), 2013. Biodiversity *and Water: Two of a Kind*. Available online: https://www.iucn.org/content/biodiversity-and-water-two-kind
- EC (European Commission), 2017. *Fitness Check of the Water Framework* Directive *and the Floods Directive*. Available online: https://ec.europa.eu/info/law/better-regulation/initiatives/ares-2017-5128184_en