



Agriculture,  
Food Security  
and Climate Change

## **Common Vision and Adapting the Strategies of the Water and FACCE JPIs**

### **Workshop Report**

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**Available at:** [www.waterjpi.eu](http://www.waterjpi.eu)

## Disclaimer

This publication [communication] reflects the views only of the author, and the European Commission cannot be held responsible for any use which may be made of the information contained therein.

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## Table of Content

<b>Table of Content</b> .....	<b>iii</b>
<b>List of Abbreviations</b> .....	<b>iv</b>
<b>Executive Summary</b> .....	<b>v</b>
<b>1. Introduction</b> .....	<b>1</b>
1.1 Joint Programming Initiatives .....	1
1.2 WaterWorks2015 Co-funded Call .....	1
1.3 WaterWorks2015 Additional Activities .....	2
<b>2. Methodology</b> .....	<b>3</b>
2.1 Workshop Attendees.....	3
2.2 Workshop Programme .....	3
2.3 Workshop Material.....	3
<b>3. Workshop Proceedings</b> .....	<b>4</b>
Opening: Welcome & Introduction from Water and FACCE JPIs.....	4
Session-1: JPI Visions and SRIAs of both JPIs .....	4
Session-2: Commonalities and differences, gaps to fulfil.....	5
Session-3: Possible synergic activities and shared strategy.....	9
Session-4: Common vision: identified key messages, targets, timeline, process .....	12
<b>4. Final Recommendations</b> .....	<b>17</b>
4.1 Knowledge Gaps.....	17
4.2 Prioritisation Exercise.....	17
4.3 Identified Commonalities.....	17
4.5 Strategic Research Agendas Updates.....	19
4.6 Key Messages.....	19
Annex 1: List of Attendees .....	20
Annex 2: Workshop Programme .....	21
Annex 3: Identified Core Themes in the Strategic Research Agendas.....	22
Annex 4: Research Needs.....	25

## List of Abbreviations

ANR = National Research Agency, France  
BLE = Federal Office for Agriculture and Food, Germany  
CAP = Common Agricultural Policy  
EC = European Commission  
EEA = European Environment Agency  
EPA = Environmental Protection Agency, Ireland  
ERA = European Research Area  
EU = European Union  
FACCE = Agriculture, Food Security and Climate Change  
FPO = Funding Partner Organisation  
H2020 = Horizon 2020  
IA = Innovation Action  
IEEP = Institute for European Environmental Policy  
IFD = Innovation Fund Denmark  
IPCC = Intergovernmental Panel on Climate Change  
Irstea = National Research Institute of Science and Technology for Environment and Agriculture, France  
JPI = Joint Programming Initiative  
PRIMA = Partnership for Research and Innovation in the Mediterranean Area  
RDI = Research, Development and Innovation  
RIA = Research and Innovation Action  
R&I = Research and Innovation  
SRIA = Strategic Research and Innovation Agenda  
SRA = Strategic Research Agenda  
TAP = Thematic Annual Programming  
UN SDGs = United Nations Sustainable Development Goals  
WFD = Water Framework Directive  
WssTP = Water Supply and Sanitation Technology Platform



## Executive Summary

The ERA-NET Cofund WaterWorks2015 is a collaboration between two Joint Programming Initiatives (JPIs), the Water JPI “Water Challenges for a Changing World” and the FACCE-JPI “Agriculture, Food Security and Climate Change”. Achieving a “Sustainable water use in agriculture, to increase water use efficiency and reduce soil and water pollution” is at the intersection of the two JPIs, contributing to the implementation of their respective Strategic Research and Innovation Agendas.

This ERA-NET Cofund constitutes another step towards the planning and implementation of the Water JPI activities, and aims at further reducing the fragmentation and dispersion of EU water-related Research and Innovation activities and supporting EU policies and initiatives in the field of water.

One of the joint activities implemented in the framework of the project is dealing with the “Common vision and adapting the strategies of Water and FACCE JPIs”. The aim of this activity is to facilitate continuous progress in two strategy pillars, by developing of a Common Vision between both JPIs, and update of their respective strategic research agendas and action plans.

The first steps towards a Common Vision between the Water JPI and FACCE-JPI were discussed during a joint workshop in June 2017. The workshop, gathering experts from both JPIs, aimed at identifying commonalities and possible synergies that could be developed between the two initiatives. Knowledge gaps and RDI needs in which both JPIs should put more focus were identified, and further recommendations were elaborated in terms of prioritisation and areas for which an update would benefit the strategic research agendas.

## 1. Introduction

### 1.1 Joint Programming Initiatives

The Joint Programming Initiatives (JPIs) are intergovernmental initiatives aiming at strengthening European leadership and competitiveness in Research and Innovation (R&I). In particular, the Water JPI ([www.waterjpi.eu](http://www.waterjpi.eu)) responds to the grand challenge of “Achieving Sustainable Water Systems for a Sustainable Economy in Europe and Abroad”, while the FACCE-JPI ([www.faccejpi.com](http://www.faccejpi.com)) is dedicated to meeting the challenge of “Ensuring food security and sustainable agriculture under climate change while protecting ecosystems and natural resources”. The Water and FACCE JPIs have been harmonising and mobilising National and Regional Research & Innovation (R&I) Programmes to address these grand challenges. This joint effort has required a transnational and multi-disciplinary approach to the economic, ecological, technological and societal challenges facing world water resources.

The ERA-NET Cofund WaterWorks2015 responds to the Horizon 2020 (H2020) Societal Challenge 5 Call topic Water-3 [2015]: *Stepping up EU research and innovation cooperation in the water area*. This ERA-NET Cofund builds on the joint efforts conducted up to now in the planning and implementation of Water JPI activities, and aims at i) a maximisation of the scarce human and financial resources towards the definition and implementation of a Joint Call for R&I proposals, ii) a reduction of the fragmentation of water-related R&I activities, iii) a better synergy and coordination between national and EU funding in the water-related research fields, iv) supporting EU policies and initiatives in the field of water, and v) developing international cooperation in water research.

WaterWorks2015 is pooling resources from the 32 participating research programme owners / managers of 23 countries to implement a joint call for proposals, with EU co-funding in the area of sustainable water use in agriculture and forestry. WaterWorks2015 brings together 6 organisations belonging to both JPIs, 15 countries from the Water JPI, 3 countries from the FACCE-JPI, as well as 9 organisations from associated and third countries. Additional Activities will also be carried out to further support the implementation and strategy of the Water JPI, for in-depth cooperation between partners and to strengthen synergies with the FACCE-JPI. The project will contribute especially to the following challenges:

- Ensuring the provision of water resources for the agricultural, forestry and freshwater aquaculture sector in a context of global climate change and consumers’ demands for more ecologically friendly products. The reuse of treated water from different sources (e.g. industries, cities) should be further exploited;
- Protecting humans against health risks if additional water sources, such as reuse, are made available;
- The more sustainable growth of the agriculture, forestry and freshwater aquaculture sectors whilst paving the way towards job creation in all these economic areas.

### 1.2 WaterWorks2015 Co-funded Call

On the 16<sup>th</sup> February 2016, 25 Funding Partner Organisations (FPOs) from 22 countries launched a co-funded transnational and multidisciplinary call for research and innovation proposals on the topic “Sustainable management of water resources in agriculture, forestry and freshwater aquaculture sectors”, which comprises the following challenges:

- Increasing the efficiency and resilience of water uses;
- Monitoring and reducing soil and water pollution;
- Integrating social and economic dimensions into the sustainable management and governance of water resources.

The Water JPI & FACCE-JPI 2016 Joint Call topic partially covered the five priority themes described in the Strategic Research and Innovation Agenda (SRIA) of the Water JPI and in the Strategic Research Agenda (SRA) of the FACCE-JPI

The aim of the 2016 Joint Call is to enable transnational, collaborative Research, Development and Innovation (RDI) projects addressing questions relating to the water challenges faced by society. The FPOs particularly wished to i) promote trans-disciplinary research, ii) encourage proposals combining basic and applied approaches, iii) stimulate mobility of researchers within the consortia, iv) enhance collaborative research and innovation during the project's lifespan and beyond, and v) promote international cooperation in the water area.

Within the WaterWorks2015 ERA-NET Cofund project, the tasks related to the 2016 Co-funded Call are implemented by the Work Package 2 "Co-funded Call management: from preparation to launch", Work Package 3 "Co-funded Call management: from evaluation to proposal selection" and Work Package 4 "Monitoring and Impact assessment". This call seeks to maximise the benefits from synergies with other RDI activities taking place within partner countries, and therefore complement the harmonisation of National and Regional Agendas. After the completion of the 2-step evaluation of the proposals, the FPO representatives took a decision on the funding of 21 research projects. More information are available on the Water JPI website.

### 1.3 WaterWorks2015 Additional Activities

In addition to the 2016 Joint Call, the implementation and coordination of other joint activities is foreseen within the frame of the ERA-NET Cofund project. Within the Work Package 6 "Additional Activities on Strategy" managed by the National Research Agency – ANR (France), the Task 6.1 is dealing with the "Common vision and adapting the strategies of Water and FACCE JPIs". The Federal Office for Agriculture and Food – BLE (Germany) is leading this activity.

The aim of this Work Package is to facilitate continuous progress in two strategy pillars, namely the development of a common vision between the Water and FACCE JPIs, and providing input for the update of their respective SRAs and Implementation Plans. This objective will be achieved through the development of a common framework and an action plan identifying themes and already covered topics, possible overlapping activities and synergies that could be developed between the two JPIs. This common vision will lead to an alignment of the two SRAs in the common RDI area of Water & Agriculture, and the development of international cooperation in the water challenges area.

This report contains the proceedings of the first workshop towards a "Common vision and adapting the strategies of the Water and FACCE JPIs". The one-day workshop took place in Bonn on the 21<sup>st</sup> June 2017. Eighteen people, experts as well as members of both the Water and FACCE JPIs participated in this workshop. This workshop provided the occasion for participants to discuss the visions, strategic agendas and implementation plans of both JPIs.

The objectives of this workshop were to:

- Gather relevant experts of both JPIs to discuss the common vision, give input for the update of the strategic agendas and the implementation plans;
- Identify knowledge gaps and RDI needs.

## 2. Methodology

The first workshop towards a “Common vision and adapting the strategies of the Water and FACCE JPIs” was organised by the Federal Office for Agriculture and Food - BLE (Germany), with the support of the WaterWorks2015 partners, FACCE-JPI partners, as well as of the WaterWorks2015 and Water JPI Secretariats.

### 2.1 Workshop Attendees

The workshop gathered eighteen participants from the two JPIs. The external experts invited for this workshop were suggested by WaterWorks2015 partners. A number of eleven experts were chosen, invited and confirmed their participation, but in the end eight external experts participated due to last minute cancellation. Additionally, the workshop was open to all WaterWorks2015 partners (including Water JPI and FACCE-JPI partners).

Annex I provides the list of all attendees.

### 2.2 Workshop Programme

The Workshop included a plenary session in the morning and in the afternoon, and four sessions for group discussions. During the group discussions, the participants split up into three groups according to their interest and their expertise.

The first plenary session provided a general introduction to both Water and FACCE JPI objectives and the expected outcomes of the workshop. This was followed by four sessions. Each session started with a short overview in the plenary, followed by group work.

The sessions were organised and led as follows:

- Session 1 “JPI Visions and SRIAs of both JPIs” (60 minutes) - Bjørn Kaare Jensen (IFD)
- Session 2 “Commonalities and differences, gaps to fulfil” (75 minutes) - Esther Diez Cebollero (Irstea)
- Session 3 “Possible synergic activities and shared strategy” (90 minutes) - Heather McKhann (FACCE-JPI Coordinator)
- Session 4 “Common vision: identified key messages, targets, time line, process” (75 minutes) - Maurice Héral (Water JPI Chair)

The second plenary session provided an overview of key achievements of the day and organisational issues explained by Vera Steinberg (BLE).

The agenda is provided in Annex 2.

### 2.3 Workshop Material

Prior to the Workshop, the agenda of the Workshop and relevant documents such as the Implementation Plan and European and International Strategy (for FACCE-JPI) and the Introduction to the SRIA v2.0, Key Achievements and the Implementation Plan (for Water JPI) were distributed to the participants. For the group discussions, participants were provided with RDI need templates as well as a list of identified core themes both appearing within the FACCE-JPI and Water JPI (Annex 3). For the last session, six questions were prepared and distributed to the participants, answering the questions in groups.

All presentations were sent to the participants after the workshop together with the proceedings and are available on the Water JPI website.



### 3. Workshop Proceedings

#### Opening: Welcome & Introduction from Water and FACCE JPIs

##### **Opening Words**

Klaus Budde (BLE) provided a short introduction on the history of the venue and the role of the BLE organisation, which includes both national and trans-national activities. Klaus highlighted the importance of the workshop to develop a Common Vision for Water and FACCE JPIs and adapt the relevant areas in the strategy of both JPIs to complement each other.

##### **Welcome**

The Water JPI Chair, Maurice Héral, and the FACCE-JPI Coordinator, Heather McKhann, gave a few words on each JPI to introduce the joint workshop. This first Common Vision workshop will aim to enable both JPIs to work towards meeting the GPC task of coordinating together, not to work in isolation.

##### **Short introduction to FACCE-JPI and Water JPI's Expectations for the Workshop Maurice Héral, Water JPI Chair & Heather McKhann, FACCE-JPI Coordinator**

##### **Questions and Answers:**

*In response to a question regarding how the JPIs will work jointly, it was explained to be able to do this the JPIs will need to explore the complementarities and identify where it is useful for Water and FACCE JPIs to work together, such as in joint alignment activities and also joint calls. It is up to the members of both JPIs to work together to identify opportunities for collaboration into the future.*

#### Session-1: JPI Visions and SRIAs of both JPIs

**Moderator:** Bjørn Kaare Jensen

The Water and FACCE JPIs have similar structures with a significant focus on European cooperation and working with third parties. Reaching out internationally is also highlighted as important for both initiatives. Working together may yield a stronger approach and input from the JPIs at the European Commission (EC) programme committee level. Together it may be possible to have a greater influence on the competitive calls within the EC also.

A primary difference between the strategic research agendas of these JPIs is that the Water JPI has a Strategic Research and Innovation Agenda (SRIA), while the FACCE-JPI does not have the innovation aspect in its Strategic Research Agenda (SRA). Water JPI has integrated the water challenge and the need for water efficiency in food production as a theme in the strategy, while FACCE-JPI does not have such a reference point to the water issues within agriculture.

External Factors - the developments in the strategies of the Water and FACCE JPIs need to respond to:

- Consider how the United Nations Sustainable Development Goals (UN SDGs) tie in
- Change the perceptions of end-users e.g. wastewater treatment plants being considered energy and resources factories
- Be aware of the economic context – accessing new markets, developing economies
- Evolve the JPI Process
- Monitor progress in related initiatives (H2020, European Innovation Partnerships, Water Alliance etc.) and exploit opportunities to work together with them
- Enable scientific and technological breakthroughs.

Internal Factors - the developments in the strategies of the Water and FACCE JPIs need to respond to:

- Coordinate the participant programmes
- Evolve the partnership
- Understand the partner's view on the Common Vision.

#### **Questions and Answers:**

*The aquaculture research area must be explored more thoroughly by both. How do you see the role of aquaculture between FACCE and Water JPI?*

*The approach to food production in aquaculture is similar efficiency-wise to agriculture. The collaboration between the Water and FACCE JPIs provides an opportunity to identify these links and explore this further. It is a component of food production also. Some additions to the strategies which link aquaculture with agriculture regarding water reuse for intensification of farming may be relevant.*

## **Session-2: Commonalities and differences, gaps to fulfil**

Moderator: Esther Diez Cebollero

The Water and FACCE JPI 2016 Joint Call on “Sustainable management of water resources in agriculture, forestry and freshwater aquaculture sectors” is an example of how the JPIs have succeeded in working collaboratively together. The aim of the call was to combine basic and applied approaches, promote collaborative RDI, trans-disciplinary research, mobility and international cooperation in the water area.

The three challenges addressed by the 2016 Joint Call were:

- Increasing the efficiency and resilience of water uses;
- Monitoring and reducing water pollution;
- Integrating social and economic dimensions into the sustainable management and governance of water resources.

To build on the Joint Call collaborations, the aims of the workshop Working Group breakout exercises were set out as follows:

- To get a better understanding of commonalities and differences;
- To prioritise common RDI topics; and
- To identify RDI gaps.

The attendees were requested to break up into three equally sized working groups at the beginning of each session exercise, with each working group composed of a mix of Water JPI and FACCE-JPI experts and funders. The complement of the working groups changed for each session. To facilitate the discussion, a table where the common issues were highlighted was prepared by the moderator and distributed.

A list of identified core themes both appearing within the FACCE-JPI and Water JPI strategic agendas is provided in Annex 3.

**Exercise I: Try to prioritise all the common issues presented so far:**

- **1: top priority --- RDI issues to be addressed in the short term (1-2 years)**
- **2: medium priority --- RDI issues to be addressed in 3-4 years**
- **3: low priority --- RDI issues to be addressed in the long term (over 4 years)**

Results of prioritisation exercise are presented in Table I. It was highlighted that a reason must be given as to why a particular priority was given by the working groups.

**Table I:** Results of prioritisation exercise by the attendees.

Topics	Working Group-1	Working Group-2	Working Group-3
Assessment & Validation of ES	2	2	1
Precision agriculture smart-water systems	3	1	2
Water reuse for agricultural purposes	2	1	2
Adaptive water management	1	1	2
Big Data	3	3	2
Water Scarcity	2	1	1

All experts agreed that the research priorities versus implementation of research results must be explored further to identify (i) what the research projects must be targeted at, and (ii) what will need to be considered as a caveat to this prioritisation exercise.

**Working Group-1**

- Precision Agriculture Smart-Water Systems is given a low priority as there is deemed to be a lot of research in this area already.
- Big Data is important but compared to the other options this is a lower priority.

**Working Group-2**

- Assessment and Validation of Ecosystem Services are not well established or well understood by the government, more time is required to develop this.
- Precision Agriculture Smart-Water Systems is being covered by a FACCE ERA-NET as part of the third phase which has broadened precision agriculture to include precision food systems which have aspects of production and could be leveraged to include a section on precision irrigation in the next phase.
- Precision agriculture, water reuse, water scarcity & adaptive water management are all linked and these research areas should exploit these links.
- Big Data - There is a huge amount data available, and must all be included in an interlinked database for future decision makers.

**Working Group-3**

- Assessment & Validation of Ecosystem Services:
  - o Large amount of research already going on in this field
  - o Water and agriculture researchers must work together more

- Develop assessment methods that span both water and land use are required
- Investigate further the strong link between Ecosystem Services and water scarcity, as water scarcity impacts on the delivery of the Ecosystem Services
- Anthropogenic societal pressures on water from an ecological and water resource point of view
- Agriculture outputs are Ecosystem Services that are integrally linked to the nutrient cycle, biodiversity and landscape aesthetics
- Payment for Ecosystem Services is important to define the value.
- Land use and environmental risk of floods and their impact on the effect of floods for water quality in flood risk models, and how it can be linked to the long term use and management of the agricultural activities.
- Intensification of flood risk due to climate change must be mitigated against downstream to minimise the impact on ESS loss and anthropogenic risk for cities.
- Water Reuse for Agricultural Purposes
  - Water reuse is more of a matter of political acceptance and governance.
  - Change behaviour and awareness in governance and politics to implement environmental technologies
  - The environmental technologies need to be affordable to implement.
- Precision Agriculture Smart-Water Systems
  - Precision farming must be developed beyond the research phase into implementation at a farm scale
  - There is a lot of research in this area, the challenge is to review the research results available and identify how to bring this to the field.
- Adaptive Water Management
  - Important but is part of water scarcity / availability area especially in terms of agricultural crop patterns
  - All available methods and conditions must be available to be implemented
  - Catchment services must also be considered which considers socio-economic services, Ecosystem Services and natural capital.
- Big Data - The consideration of big data is a separate thing, it is not particularly underdeveloped but is a horizontal need across all sectors rather than water and agriculture specifically.
- Water Scarcity
  - Water should be used sustainably and it is vital that the resilience of the water supply is protected
  - There is a mismatch between the supply and demand during certain times of the year and regionally within the country
  - Climate change adaptation and mitigation are relevant to strengthen the work towards water scarcity via precision agriculture and environmental technologies

## Exercise II: Identify RDI Gaps – see also Annex 4

1. Soil pollution
  - Not explicitly mentioned in either strategic agenda
  - Heavily impacted by pollutants infiltrating through soil layers
  - Integration of the food nexus within the Water JPI's SRIA
2. Further consideration of UN SDGs
3. Scarcity, efficiency and reuse of water caused by population increase which in turn increases the pressure on food production and this increased water demand to provide this is affected. Climate Change is accelerating the existing process rather than creating the issue.
4. Food Nexus
5. Water Framework Directive (WFD) and Common Agricultural Policy (CAP) interactions: The WFD makes provision for River Basin Management Plans for best management practices implemented at farm scale but assessed at catchment scale. The connection between a CAP paying farmer and its responsibility towards the WFD is unclear. End-Users' main needs is less diffuse pollution in rivers which would satisfy the WFD implementation and farmers could be paid for the best management practice implementation. CAP and WFD Policies will be reviewed within a year of each other and it would be good to be present in right moment.
6. Bio-economy - new interests from industry and side streams which can include useful products to be used in the Pharmaceutical Industry, reused in Agriculture to produce more business jobs and a healthier environment. Policy relevance is huge within the bio-technology effort which the EC is pushing a lot.
7. Study on effects of pesticides and antibiotics. Expected impact will include the improvement of ecological health. End user benefit to farmer and institutions. Policy relevance is huge on antibiotics and dealing with emerging contaminants.
8. Mixtures of contaminants and combined stress should be explored, also the climate change linkage that may affect the toxicity for chemicals is another aspect. The health effects of these contaminants are not addressed in either of the SRIAs, it is mentioned indirectly in Water JPI Subtheme 2.1.2 "Understanding and predicting the environmental behaviour and effects of by-products, pollutants and pathogens, including their environmental effects", it is proposed that it should be amended by adding and health effects at the end of the Subtheme.
9. EC discussing the minimum policy requirements for water reuse. Stringent regulations in countries can be more stringent on the health or on the environmental technologies side (wastewater reuse).
10. Internationally, a focus on India and China is encouraged as they have a huge production, water consumption and huge challenges both on water quantity (to get enough water) and water quality (water pollution).
11. Functional biodiversity – low biology input in all topics. More biology should be brought into this and be linked it to ecosystem function so that further on it can be linked to the ecosystem services for water and soils in agricultural systems.

## Session-3: Possible synergic activities and shared strategy

Moderator: Heather McKhann

The FACCE-JPI Coordinator, Heather McKhann, led the third session focusing on a primary aim of the workshop, by determining questioning what lies at the point of intersection of the strategic agendas for both JPIs. Heather proposed that the output of the joint working would be a chapter in the respective strategic research agendas for both JPIs on the research areas of joint interest.

As part of the workshop documentation, a tabulated list of strategic agenda items and call themes from both JPIs and the potential linkages was distributed for discussion (Annex 3). The commonalities were identified under the following headings:

- Pollution
- Water-energy-food nexus
- Food security
- Ecosystem services
- Environmental technologies
- Bioeconomy
- Climate change adaptation/ mitigation
- Sustainable intensification

**Exercise III: Identify what is at the intersection between the two strategic agendas, identify what research areas that are in common should be treated together between JPIs.**

The attendees were tasked with breaking into working groups with an even complement of Water JPI & FACCE-JPI experts and funders, and were provided the table and allocated three of the nine commonalities per working group to identify the options for collaboration between the two JPIs.

### Working Group-I, Common Topics I – 3

#### Topic 1: Pollution

In FACCE-JPI the pollutants mentioned are specifically nitrates.

Water JPI Subthemes 1.1.3, 2.1.1, 2.1.2 & 2.1.3 are all applicable to both JPIs but should be focused on the following:

- Pesticides and Antibiotic contaminants of shared interest.
- Quality of the soil and water issues caused by sludge application.
- There are sufficient management tools available.

#### Topic 2: Water-Energy-Food Nexus

This is listed similarly in both strategic agendas.

### **Topic 3: Food Security**

- Water availability and water efficiency must be considered a pre-condition for ensuring food security.
- Nutrient cycle and the effects it has on groundwater and indirectly on health and eutrophication of surface waters.

## **Working Group-2, Common Topics 4 – 6**

### **Topic 4: Ecosystem Services**

- Investigate the common link to soil resources and how to integrate ecosystem services into the management of water resources.
- Evaluating methodologies and developing valuation which will assess and put a monetary value on the services of ecosystems in the management of natural resources.

### **Topic 5: Environmental Technologies**

- Market-oriented solutions and the assemblage of existing technologies must be developed for real life production.
- Promoting water RDI infrastructures related to water requirements created by cropping of different plant species.
- Removing barriers to innovation and assembling existing technologies.
- Merge the interests of maximising the efficiency of technologies to use fewer natural resources and the need to sustainably use water.
- Promoting a strong focus on digital technologies especially the social aspects of technologies to ensure adoption by the end user.

### **Topic 6: Bio-economy**

- Developing, testing and evaluating innovation (Water JPI SRIA Subtheme 5).
- Resource recycling of wastewater.
- Recovering products from human, wastewater, urban, industrial and the agri-food industry.

## **Working Group-3, Common Topics 7 – 9**

The common interests within topics 7 – 9 found in the respective strategic agendas of Water and FACCE JPIs lie in Theme 4 predominantly, Theme 2 when linked to intensification and potentially Theme 5, where it deals with water management, governance and socio-economic challenges.

### **Topic 7: Climate Change Adaptation**

- Factors influencing drought and water scarcity including climate change and demand for food and water, and the adaptation options and management options throughout the food chain to monitor water scarcity.
- The approach to climate change for the common areas of interest must be linked.
- The economic impacts of extreme events.



- The FACCE-JPI Core Theme (CT) 4 “Adaptive water management in agriculture, watershed management, flood management, irrigation technologies and water re-use” is highly relevant to the Water JPI.
- Amend Water JPI Subtheme 1.1.3, to state it is about establishing Ecosystem Services with respect to the availability of water.
- Amend FACCE-JPI CT1 “Phenotyping, genotyping, breeding and reproduction for adaptation to climate change with crop, pasture and livestock species and evaluating alternative species” to state “breeding for drought tolerance in plants” (water related traits)
- The prediction elements in Water JPI Subtheme 1.3.1 & FACCE-JPI CT4 “Adaptation options to climate change and increased climatic...” could be joined by linking climate crop / livestock models to impacts on drought and water scarcity. Drought is linked to climate change but also human demand and this could affect agriculture production and therefore food security. “Developing adaptation measures” in Water JPI Subtheme 1.3.1 can be amended to ‘recycling measures’.
- Amend FACCE-JPI CT4 “Regional strategies to adapt production systems to cope with climate change” to include “extreme events like flooding and drought”.
- Amend Water JPI Subtheme 5.1.1 to link the data from climate to production, to the impact on food security.
- Reformulate Water JPI Subtheme 5.1.2 to encapsulate FACCE-JPI needs more specifically.

#### **Topic 8: Climate Change Mitigation: Not at the intersection between**

- A link between carbon sequestrations in soil with respect to water.

#### **Topic 9: Sustainable Intensification of Agriculture**

- Develop the link between eutrophication and nutrient cycles.
- Develop the link between Agri-Forestry and water in respect to water budget and how long-term strategies to retain water must be explored further.
- Aquaculture farming research needs.
- Innovation in terms of governance social acceptance.
- Sustainable intensification must be tied in to the water-wise bio-economy.
- Amend the FACCE-JPI CT2 “Environmentally sustainable intensification of agricultural systems” to “Impacts of intensification of agriculture on water and vice versa”.



## Session-4: Common vision: identified key messages, targets, timeline, process

**Moderator:** Maurice Héral

There were a number of areas highlighted where both strategic agendas required updates in order to bring together the common interests of both JPIs. These areas were:

❖ Investigate the effects of water on food security and vice versa	❖ Investigate the role of the forests in terms of water budget
❖ Avoid fragmentation	❖ Use the knowledge to develop innovative ways to fight against drought
❖ Elaborate on the climate links to water and agriculture	❖ Explore soil contaminant links to human health
❖ Aquaculture quality and impact of aquaculture in terms of nutrients and impact of aquatic ecosystems	❖ Must identify the research areas that have sufficient knowledge and those where the demand lies

### Exercise IV: Identify key messages, targets and areas requiring more research for the development of the joint Common Vision based on the proceedings of the Workshop.

The attendees were asked to consider the below questions in their working group:

1. Identified key messages of the workshop
2. Are there any other relevant documents to consider when updating the SRA/SRIA?
3. Which aspects of the joint Common Vision would you
  - a. Focus on and target?
  - b. Try to avoid?
4. Which research areas within your field are not considered yet enough in the strategic agendas and where do you see the research demand?
5. Is there anything you would like to point out which is important to keep in mind for the future joint work of the FACCE and Water JPIs?
6. Are there final comments to add / is there anything you felt was missed during the workshop regarding the SRIA?

#### Working Group-I

1. Key Messages:
  - There are substantial topics similar, so there is a good potential for synergies
  - Some gaps showed up e.g. water availability and health issue
  - Within Water JPI, there are many agricultural engineers/agronomists, not so much hydrologists (disciplines) → are all relevant disciplines represented? Also in Water JPI Advisory Boards?
  - Perhaps more people could be presented in the workshop that were involved in the SRIA development.
2. Relevant documents to consider:
  - Foresight documents
  - 2016 EU Biodiversity Strategy Midterm Review 2020 (+ecosystem services)
  - Water Supply and Sanitation Technology Platform (WssTP) Water Vision 2030 'The Value of Water: Towards a Future proof model for a European water-smart society'

- H2020 2018-2020 Work Programme
- Institute for European Environmental Policy (IEEP) 2017: Policy dept. B. Agriculture and Rural Development
- Intergovernmental Panel on Climate Change (IPCC) reports on Climate Change impacts on water resources and food security
- JPI Climate
- European Environment Agency (EEA) docs on agriculture and climate change
- National legislations

### 3. Common Vision

Focus on	Try to avoid
Water and food security need to be linked and consider the impact of climate change on this.	Fragmentation of research should not be repeated.
Water demand management including that of the ecosystems.	
Include the UN Development Goals	
Need to ensure research reaches the field / practitioners by connecting to more local issues rather than global.	
Water availability research related to water storage and recharge.	
Water quality standards don't exist for certain water uses.	
Attention to behavioural research so can adopt and change behaviour.	
Dynamics between soil and water	

### 4. Research areas not considered enough / Research Demand:

- There needs to be increased and improved dissemination of the JPIs' strategic agendas and activities
- Further attention must be given to how the research is taken up by commercial industries.
- Water availability: Water storage and recharge
- Re-use: how to define quality? Standards for safe water use? Why use drinking water for heating?
- Water fit for its purpose, but when is it fit for which purpose?
- Behaviour research to adopt other behaviour
- Soils: Dynamic between soil and water, leaching of chemicals saturated and unsaturated zones in the water cycle

### 5. Keeping in mind for future work:

- Dissemination of JPI results could be improved to the "non-JPI" community (more widely disseminated, JPI not known to everyone)
- The national ministries could also play a role here

#### Innovation:

- There could be meetings on how JPI results can be used for uptake by companies, commercial products, start-ups
- Innovation does not stop at research
- JPI could stimulate uptake of research results

### 6. Final comments:

*None*

## Working Group-2

### 1. Key Messages:

- Water security (including quality) for food security (including quality and include affordability / quantity too).
- There are a large number of issues of common interest.
- There is a defined connection between the water resource and food production.
- Problem of continuity across JPIs on pollutants including pesticides etc.
- Need to think a bit broader on the trans-disciplinarity of common interests.
- Urgent to start a significant collaboration effort between the JPIs as you cannot separate water and agriculture.
- Water is not looking at the food chain, bio-economy is specific to food for FACCE but much broader on water – these links need to be tightened.
- Gaps in both agendas on freshwater aquaculture, forestry, water and soils, contaminants especially those used by agriculture that can transfer to the waterbodies and vice versa in irrigation.

### 2. Relevant documents to consider:

- SRIA for JPI Climate
- relevant WFD policy documents, sustainable food production, evolution of water scarcity and consequences
- information from the Food Agriculture Organisations and SDGs
- WssTP SRIA
- Work Programme for the Partnership for Research and Innovation in the Mediterranean Area (PRIMA) and other relevant documents.

### 3. Common Vision

Focus on	Try to avoid
Drivers including climate change, demographic development, water consumption calculation / water budget for production	Fragmentation on a national / regional scale (i.e. strong national coordination within ministries and agencies)
Ecosystem Services and functions	Fragmentation in Sector / Actors / Stakeholders / Funders
Water Scarcity	
Precision Agriculture	
Management of Natural Resources	
Circular Economy	
Water Reuse	
Addressing the Policy / Socio-Economic aspects	
Ecosystem Health	
Water Value	
No information on Water footprint related to import/export available yet	

4. Research areas not considered enough / Research Demand:
  - Bio-economy in both (not at the heart of them but must keep in mind) especially in including companies
  - Focus on customer / end user behaviour (including acceptability)
  - Water security
  - Socio-economic & governance scientists
  - Footprint of product
  - Desire for clean water
5. Keeping in mind for future work:
  - The Funders are not necessarily just one agency per country.
6. Final comments:
  - Three sessions built on each other but we don't seem to have gotten much further. More experts and more work ahead of time. More funders than experts, need more Experts (some dropped out last minute). It could be a good suggestion to bring both advisory boards from each JPI to meet. Potentially invite climate expert as it falls into the overlap – plan to oversubscribe in numbers.
  - Idea of bringing together experts would be a good idea in relatively short term and also with relevant staff members. FACCE JPI experts in theme 1 that may want to come to Exploratory Workshop.

### Working Group-3

1. Key Messages:
  - There are similar topics relevant to both JPIs.
  - Gaps became clearer.
  - Issue on water availability and health.
  - Multi-disciplinarity of people involved.
  - Mostly engineers involved which is not a good cover of different disciplines. Need more people who know the SRIAs.
  - JPIs have found their “niche” but there is a need for more collaboration
  - Need for each JPI to look into other JIP's agendas
  - Workshops are very useful to know what other JPIs are doing
2. Relevant documents to consider:
  - CIS Groups documents
  - SCAR (Foresight) documents
  - Policy briefs paper from the commission/Parliament
  - Networks of associations
  - National papers
  - Outputs from national workshops on RDI needs
  - Scientific associations
  - Regulatory + strategy documents (e.g. strategy on biodiversity), including international documents (e.g. China)
  - COST actions
  - Any project already funded by the JPIs

### 3. Common Vision

Focus on	Try to avoid
Water and food security more linked due to climate change	Do not overlap with other initiatives
Water demand management including that of the ecosystems	Working in isolation within Europe
Fragmentation of research should not be repeated	
Need to ensure research reaches the field / practitioners	
Must connect to more local issues rather than global	
Water availability – research on water storage and recharge	
Water quality standards don't exist in certain water uses	
Attention to behaviour research so can adopt and change behaviour	
Dynamics between soil and water	

### 4. Research areas not considered enough / Research Demand:

- Need to consider the possibility of sharing the research infrastructures – big data, open access. Eco-genomics.
- Examples of infrastructures:
  - o Small instrumental research
  - o Catchments
  - o Big instrumental tools for analytical actions → metagenomics (analysis of communities). Importance of infrastructure
- Multi-scale modelling to see impact at different scales.
- Implementation of policy and relevant documents including WFD.
- Update of results and how the results are transformed and used in practice.
- How you can measure the impact of research?

### 5. Keeping in mind for future work:

- Improve dissemination of information on the JPIs
- Require more attention on Innovation and how the research is taken up in commercial projects.
- Need more collaborative thematic themes
- JPIs are there to support low TRL projects.
- Different projects funded by the JPIs should be able to do this at project level to identify research and innovation needs.
- It is important to focus more on sustainability, pollution and everything caused by human actions. Focus more on the scientific basis for policy actions – supporting societal challenges inform decisions.

### 6. Final Comments:

- No information on PRIMA – think that there will be overlap between the two JPIs and PRIMA.
- Needs to be a consideration of international issues that are happening outside Europe so please integrate in your plans.

## 4. Final Recommendations

The Water and FACCE JPIs have similar structures with a significant focus on European cooperation and working with third parties. Reaching out internationally is also highlighted as important for both initiatives. Working together may yield a stronger approach and input from the JPIs at the EC programme committee level. Together it may be possible to have a greater influence on the competitive calls within the EC.

### 4.1 Knowledge Gaps

Identified knowledge gaps, where both JPIs should put more focus on include:

- **Aquaculture research:** The approach to food production in aquaculture is similar efficiency-wise to agriculture. The collaboration between the Water and FACCE JPIs provides an opportunity to identify these links and explore this further.
- **Linkage** of water and agriculture researchers must be more in focus
- **Soil pollution:**
  - o Not explicitly mentioned in either strategic agenda
  - o Heavily impacted by pollutants infiltrating through soil layers
- **Bio-economy**
- **Forestry**
- **Water footprint** of products
- **Multi-scale modelling** to see the impact of changes at different scales

### 4.2 Prioritisation Exercise

The prioritisation exercise showed, that according to the attendees, the following topics are the two most important topics to be addressed **by both JPIs**:

- “Adaptive water Management”, and
- “Water Scarcity”

According to the exercise, the topic “Big Data” has the least prioritisation as a lot of data is available already, and many initiatives are going on.

### 4.3 Identified Commonalities

During the workshop, identified commonalities were discussed in order to be able to recognize common research areas and are summarised in Table 2.

**Table 2:** Results of prioritisation exercise by the attendees.

Commonalities	Identified Intersections (extract)
<b>Pollution</b>	<p>In FACCE-JPI, the pollutants mentioned are specifically nitrates.</p> <p>In Water JPI, the Subthemes 1.1.3, 2.1.1, 2.1.2 and 2.1.3 are applicable to both JPIs.</p> <p>More focus should be put on pesticides and antibiotic contaminants and the quality of soil and water issues caused by sludge application.</p>
<b>Water-Energy-Food Nexus</b>	<p>This is listed similarly in both strategic agendas</p>
<b>Food Security</b>	<p>Water availability and water efficiency must be considered as a pre-condition for ensuring food security.</p> <p>Nutrient cycle and the effects it has on groundwater and indirectly on health and eutrophication of surface waters must be explored more.</p>
<b>Ecosystem Services</b>	<p>Investigate the common link to soil resources and how to integrate ecosystem services into the management of water resources.</p> <p>Evaluating methodologies and developing valuation, which will assess and put a monetary value on the services of ecosystems in the management of natural resources.</p>
<b>Environmental Technologies</b>	<p>Market-oriented solutions and the assemblage of existing technologies must be developed for real life production.</p> <p>Promoting a strong focus on digital technologies especially the social aspects of technologies to ensure adoption by the end user.</p>
<b>Bio-Economy</b>	<p>Developing, testing and evaluating innovation (Water JPI Subtheme 5).</p>
<b>Climate Change Adaptation and Mitigation</b>	<p>Factors influencing drought and water scarcity including climate change and demand for food and water, and the adaptation options and management options throughout the food chain to monitor water scarcity.</p> <p>The FACCE-JPI CT4 “Adaptive water management in agriculture, watershed management, flood management, irrigation technologies and water re-use” is highly relevant to the Water JPI.</p> <p>Amend Water JPI Subtheme 1.1.3, to state it is about establishing Ecosystem Services with respect to the availability of water.</p> <p>Amend FACCE-JPI CT1 “Phenotyping, genotyping, breeding and reproduction for adaptation to climate change with crop, pasture and livestock species and evaluating alternative species” to state “breeding for drought tolerance in plants” (water related traits)</p> <p>Amend FACCE-JPI CT4 “Regional strategies to adapt production systems to cope with climate change” to include “extreme events like flooding and drought”.</p>

Commonalities	Identified Intersections (extract)
	Amend Water JPI Subtheme 5.1.1 to link the data from climate to production, to the impact on food security. Reformulate Water JPI Subtheme 5.1.2 to encapsulate FACCE-JPI needs more specifically.
<b>Sustainable Intensification of Agriculture</b>	Develop the link between Agri-Forestry and water in respect to water budget and how long-term strategies to retain water must be explored further Amend the FACCE-JPI CT2 “Environmentally sustainable intensification of agricultural systems” to “Impacts of intensification of agriculture on water and vice versa”.

#### 4.5 Strategic Research Agendas Updates

There were a number of areas highlighted where both SRA/SRIA require updates in order to bring together the common interests of both JPIs, these include:

- Investigation of the effects of water on food security and vice versa.
- Elaboration on the climate links to water and agriculture.
- Aquaculture quality and impact of aquaculture in terms of nutrients and impact of aquatic ecosystems.
- Investigate the role of the forests in terms of water budget.
- Usage of knowledge to develop innovative ways to fight against drought.
- Explore soil contaminant links to human health.

#### 4.6 Key Messages

To sum up, identified key messages include:

- There is a defined connection between the water resources and food production. Thus, there is the need to think broader on the trans-disciplinarily of common interests.
- Water and agriculture cannot be separated.
- Water JPI is not taking the food chain enough into consideration, the bio-economy is specific to food for FACCE-JPI but much broader on water – these links need to be tightened.



## Annex 1: List of Attendees

### 1<sup>st</sup> Workshop towards a Common Vision and Adapting the Strategies of the Water JPI and FACCE-JPI

#	Name	Surname	Organisation	Country
1	Johannes	Bender	Federal Office for Agriculture and Food (BLE)	Germany
2	Jean	Boroto	Food Agriculture Organisation (FAO)	Italy
3	Esther	Diez Cebollero	National Research Institute of Science and Technology for Environment and Agriculture (Irstea)	France
4	Patrick	Flammarion	National Research Institute of Science and Technology for Environment and Agriculture (Irstea)	France
5	Carla	Garcia Dumay	National Research Institute of Science and Technology for Environment and Agriculture (Irstea)	France
6	Maurice	Héral	Water JPI Chair / National Research Agency (ANR)	France
7	Claire	Jacobs	Wageningen University and Research (WUR)	Netherlands
8	Bjørn Kaare	Jensen	Innovation Fund Denmark (IFD)	Denmark
9	Mary	Kelly-Quinn	University College Dublin	Ireland
10	Antonio	Lo Porto	Water Research Institute - National Research Council (IRSA-CNR)	Italy
11	Susana	Loureiro	University of Aveiro	Portugal
12	Heather	McKhann	FACCE-JPI Coordinator / National Institute for Agricultural Research (INRA)	France
13	Áine	Murphy	Environment Protection Agency (EPA)	Ireland
14	Florian	Selge	Project Management Jülich (PtJ)	Germany
15	Vera	Steinberg	Federal Office for Agriculture and Food (BLE)	Germany
16	Kata-Riina	Valosaari	Academy of Finland (AKA)	Finland
17	Teppo	Vehanen	Natural Resources Institute (LUKE)	Finland
18	Marko	Virta	University of Helsinki	Finland

## Annex 2: Workshop Programme

### 1<sup>st</sup> Workshop towards a Common Vision and Adapting the Strategies of the Water JPI and FACCE-JPI

Venue: Federal Office for Building and Regional Planning (BBR)  
Deichmanns Aue 31 – 37, 53179 Bonn

Host: Federal Office for Agriculture and Food (BLE)

Wednesday, 21 <sup>st</sup> June 2017		
Time	Item	Moderator
<i>09.00-09.15 Welcome Coffee and Registration</i>		
09.15-09.30	Opening Welcome  Organisational Issues	Representative from BLE, Klaus BUDDE Representative from the Water JPI, Maurice HERAL Representative from the FACCE-JPI, Heather MCKHANN Task leader, Vera STEINBERG
09.30-10.15	Short introduction to the Water JPI and FACCE-JPI  Expectations for the Workshop	Maurice HERAL, WaterJPI Chair Heather MCKHANN, FACCE-JPI Coordinator  Vera STEINBERG (BLE)
10.15-11.00	Session one: JPI Visions and SRIAs of both JPIs	Bjørn Kaare JENSEN (IFD)
<i>11.00-11.15 Coffee Break</i>		
11.15-12.30	Session two: Commonalities and differences, gaps to fulfil	Esther DIEZ CEBOLLERO (Irstea)
<i>12.30-13.30 Lunch Break</i>		
13.30-15.00	Session three: Possible synergic activities and shared strategy	Heather MCKHANN, FACCE-JPI Coordinator
<i>15.00-15.15 Coffee Break</i>		
15.15-16.30	Session four: Common vision: identified key messages, targets, time line, process	Maurice HERAL, Water JPI Chair
16.30-17.00	Wrap up of the meeting and organizational Information	Vera STEINBERG (BLE)
17.00	End of the meeting	

## Annex 3: Identified Core Themes in the Strategic Research Agendas

KEYWORDS identified in the title of core themes	Water JPI		FACCE	
	How?	Where?	How?	Where?
<b>1. POLLUTION</b>	Quantifying the effects of pollution on biological communities. In this regard, it is necessary to further analyse the links between ecotoxicological tools and biological assessment tools based upon the structure of biological communities.	1.1.3	Mitigation options focusing on the nitrogen cycle.	CTS
	Developing analytical techniques for groups of substances	2.1.1		
	Understanding and predicting the environmental behaviour and effects of by-products, pollutants and pathogens, including their environmental effects	2.1.2		
	Developing biotechnological tools for the detection, monitoring, prevention and removal of pollution from soil and water.	2.1.3		
	Developing monitoring schemes and indicators, assessment methods and management tools to identify, quantify and minimise sources for pollution from agriculture, aquaculture and forestry, as well as to assess impacts of pollution	4.2.1		
	Developing production systems and practices for aquaculture to minimise water pollution and bio-hazards, thus maintaining economically viable production.	4.2.1		
	Comparing combinations of context-specific, cost-effective, acceptable measures to reduce water pollution from agriculture and forestry in various climatic and pedological conditions.	4.2.2		
	Establishing management plans for the prevention of pollution in coastal and inland waters.	5.1.5		
<b>2. WATER ENERGY-FOOD-NEXUS</b>	Supporting the energy–water nexus (namely on efficiency and sustainability)	3.1.4	Identification of new connections between water, food, energy and logistics to realise climate-robust and input-efficient production chains	Cross-cutting issue in CT3
<b>3. FOOD SECURITY</b>			Assessment of climate change risk assessment for value chains, prices, international trade and food security, including changes in consumer behaviours and wastess on food security	CT1
			Cooperation with ICT: smart farming and food security	Cross-cutting issue in CT 2 and CT4
			Identifying the potential role of big data for food security with a focus on collecting data, translating data into information, and promoting and facilitating use of the information by end-users (incl. via open data/knowledge policies)	Cross-cutting issue in CT1, CT2, CT3, CT4 and CT5
			Reducing volatility in agricultural production and food markets in the bioeconomy to stabilise food security in the context of climatic variability	CL3

4. ECOSYSTEM SERVICES	Developing an ecosystem services multi-scale approach based on this better understanding and quantification of the ecological functioning of ecosystems	1.1.1	Assessing and valuing ecosystem services and their resilience in agricultural systems and landscapes under climate change	CT3
	Developing and applying harmonised databases and new methodologies for assessing and mapping the social, economic and environmental value of water ecosystem services.	1.1.2	Designing and assessing the impact of incentive mechanisms to support increased provision of ecosystem services in agriculture, including conditions for uptake and socio-economic elements	CL1 and CL2
	Evaluating methodologies for the valuation and monitoring of ecosystem services and for predicting the impacts of water management measures on ecosystem functioning through full-scale test cases	1.1.2		
	Integrating ecosystem services into management of water resources	1.1.4		
	Developing water treatment processes taking into account the principles of biomimetics (nature-based solutions) and ecosystem services	3.1.2		
	Developing methodologies for valuation of and payment for ecosystem services, including tangible and intangible services	5.2.2		
5. ENVIRONMENTAL TECHNOLOGIES	Developing market-oriented solutions for the water industry	3.1	Assembling existing (and emerging) technologies for primary production, fostering the adoption of improved technologies that are (on the edge of being) mature but not yet widely adopted. Sensors and networks for high throughput environmental monitoring: greenhouse gas emissions, air quality, water quality, soil quality. Remote sensing (satellites and drones, LIDAR remote sensing) applied to agriculture, precision irrigation and energy efficiency, forestry and the environment (CT2 to CT5) Automation and robotics: precision agriculture (including precision irrigation and energy efficiency) and precision livestock breeding	CT2, CT4, CT5
	Enhancing the regulatory framework.	3.2		
	Removing barriers to innovation (including adoption, users' acceptance)	3.2.1	Assembling existing (and emerging) technologies for primary production, fostering the adoption of improved technologies that are (on the edge of being) mature but not yet widely adopted	CT1
	Promoting water RDI infrastructures for a better understanding of hydrological processes on different scales	5.1.1		
6. BIOECONOMY	Improving the efficiency of water use for a sustainable bio-economy sector.	4.1	Reducing volatility in agricultural production and food markets in the bioeconomy to stabilise food security in the context of climatic variability	CL3
	Developing, testing and evaluating innovative and efficient irrigation systems and practices combining crop water requirements, crop physiology, ground-based sensors, imagery satellite, ICT and expert systems. Resource efficiency will be extended to the use of energy and agrochemicals (i.e. fertigation). Systems will be developed for different development environments to ease access to a variety of markets.	4.1.1	Integration of biophysical and socio-economic models to analyse the potential impacts of changes in agricultural policies and in other parts of the bioeconomy sector in Europe, under different climate change scenarios;	CT1
			Modelling the impact (economic, social and environmental impacts as well as impacts on global food security) of changes in the bioeconomy sector in Europe under different policy options	CT1

<b>7. CLIMATE CHANGE ADAPTATION</b>	Establishing multiple pressure–impact–response relationships in aquatic, riparian and groundwater-dependent ecosystems.	1.1.3	Phenotyping, genotyping, breeding and reproduction for adaptation to climate change with crop, pasture and livestock species and evaluating alternative species	CL1
	Understanding the causes of drought/scarcity, predicting drought events and water scarcity and developing adaptation measures	1.3.1	Adaptation options to climate change and increased climatic variability throughout the whole food chain, including market repercussions;	CT4
	Developing innovative (or improved) tools for adaptation to hydro-climatic extreme events, especially floods	5.1.1	Regional strategies to adapt production systems to cope with climate change	CT4
	Improving access to data and the assessment of uncertainties related to climate change mitigation, climate adaptation strategies and the monitoring of the global water cycle.	5.1.1	Strategic adaptation to climate change through improved land management and land use change;	CT4
	Developing indicators to monitor adaptation strategies.	5.1.2	Adaptive water management in agriculture, watershed management, flood management, irrigation technologies, and water re-use	CT4
			Adapting markets, institutions and insurance mechanisms to increased climatic variability and climate change.	CT4
<b>8. CLIMATE CHANGE MITIGATION</b>	Improving access to data and the assessment of uncertainties related to climate change mitigation, climate adaptation strategies and the monitoring of the global water cycle	5.1.1	Contributing to reductions and removals of GHG emissions through carbon sequestration, substitution of fossil-based energy and products, and mitigation of N <sub>2</sub> O and CH <sub>4</sub> emissions by the agriculture and forestry sectors, while reducing the risk of GHG emissions associated with indirect land use change.	CT5
			Developing verifiable GHG mitigation and carbon sequestration measures in farming systems	CT5
<b>9. SUSTAINABLE INTENSIFICATION OF AGRICULTURE</b>	Not explicitly mentioned but it is the main aim of theme 4 (implementing a water-wise bioeconomy)		Environmentally sustainable intensification of agricultural systems	CT2

## Annex 4: Research Needs

### Additions to Research Needs highlighted in Annex 3

#### Key Research Need Title

**Model the impact of interventions (measures) at different scales (from farm to catchment)**

#### Key Objective/-s

Determine the effectiveness of various interventions/measures at farm scale to improve water quality (physico-chemical, ecological and hydromorphological) and achieve the objectives of the WFD at water body/catchment level.

#### TOP 3 Expected Impacts

More accurately targeted interventions/measures that will result in improvements in water quality and achievement of WFD objectives.

#### This topic would answer the following End-Users Needs

Policy  
Land-use management  
Water resource management  
Farmers

#### Policy Relevance:

WFD  
Floods Directive  
EU biodiversity strategy

#### Geographical/Regional Relevance:

European

#### Type of Instrument (Research project, Research & Innovation project, Coordination project, etc.)

Joint Water JPI and FACCE-JPI research project

#### Type of actions (RIA, IA, Knowledge Hub, etc.)

Knowledge hubs, Thematic Annual Programming (TAP) action

#### Additional Information:

-

## Key Research Need Title

**Model the impact multiple stressors on the ecological quality of water in the context of climate change**

### Key Objective/-s

Most water bodies receive a range of pollutants from various land-use activities. A good body of information is emerging from various projects across Europe on the ecological impacts of combinations of some stressors on aquatic biota. The focus has been largely on nutrients and sediment with relatively little multi-stressor research on pesticides and other dangerous substances. Furthermore, to date there has been little effort to develop models (as has been done for nutrients) that will inform land-use and in particular agriculture on impacts of the various combinations of pollutants originating from agricultural activities, and how these impacts may vary with climate change (there is some evidence from the literature that increases in water temperature may exacerbate the negative effects of some stressors).

The objective here is to develop models that will incorporate multiple stressor and inform agricultural practices.

### TOP 3 Expected Impacts

More accurately targeted interventions/measures that will result in improvements in water quality and achievement of WFD objectives.

### This topic would answer the following End-Users Needs

Policy  
Land-use management  
Water resource management  
Farmers

### Policy Relevance:

WFD  
Floods Directive  
EU biodiversity strategy etc.

### Geographical/Regional Relevance:

European

### Type of Instrument (Research project, Research & Innovation project, Coordination project, etc.)

Joint Water JPI and FACCE-JPI research project

### Type of actions (RIA, IA, Knowledge Hub, etc.)

Knowledge hubs, TAP

### Additional Information:

-

## Key Research Need Title

**Model the impact of interventions (measures) in headwaters to improve water quality in the larger downstream reaches.**

### Key Objective/-s

Determine and prioritize interventions in the headwater reaches to improve downstream water quality.

In Europe almost 80% of the length of river network is small headwater streams. These are known to contribute key ecosystem services and have a significant influence of downstream water quality and catchment biodiversity. They are however highly vulnerable to inputs from agricultural activities due to the high land-water interface and their low dilution capacity. There have growing effort by researchers in various countries in recent years to refocus attention on the small stream network to support efforts to improve water and achieve the objectives of the WFD. For example a workshop on 'The Protection and Management of Small Water Bodies ' was hosted by the European Environmental Bureau, in co-operation with the European Commission, the Lithuanian Presidency of the EU and the Freshwater Habitats Trust was held in 2013 and attended by representatives of 60 organisations across Europe. Several other report and review papers have highlighted the significant role of small streams in water quality/land-use management.

The objective here is to investigate and model the contribution of interventions or measures adopted in agricultural practices in the headwater catchment to water quality improvements downstream.

### TOP 3 Expected Impacts

More accurately targeted interventions/measures in headwater catchments that will result in downstream improvements in water quality in the river network.

### This topic would answer the following End-Users Needs

Policy  
Land-use management  
Water resource management  
Farmers

### Policy Relevance:

WFD  
Floods Directive  
EU biodiversity strategy

### Geographical/Regional Relevance:

European

### Type of Instrument (Research project, Research & Innovation project, Coordination project, etc.)

Joint JPI water and FACCE research project

### Type of actions (RIA, IA, Knowledge Hub, etc.)

Knowledge hubs, TAP



## Additional Information:

-

### Key Research Need Title

**Impacts of pesticides, antibiotics and hormones from agriculture and livestock on water resources and their functions and biodiversity**

### Key Objective/-s

1. Analysing the pathway, transformation and biological interaction of agrochemical substances from agricultural application into water resources and evaluation of their impacts on groundwater, limnic and riverine biology regarding ecosystem stability and health.
2. Impacts of multi-resistant germs in aquatic ecosystems, regarding their ecological behaviour, food chains and human health.

### TOP 3 Expected Impacts

- Improvement of ecosystem health by reduction of biochemical active substances
- Management of multi-resistant germs in aquatic environments
- Reduction of human health risk

### This topic would answer the following End-Users Needs

- Limitations of agrochemical usages, antibiotics to protect the environment and biodiversity
- Reduction of human health problems due to multi-resistant germs and

### Policy Relevance:

High, research results would foster lawful limitations of agrochemical usages and their implications. Some substances may become restricted, because of synergetic ecotoxicological effects. The reduction of multi-resistant germs in the environment would support human health management

### Geographical/Regional Relevance:

In areas with intensive agriculture and livestock production.

### Type of Instrument (Research project, Research & Innovation project, Coordination project, etc.)

Research project

### Type of actions (RIA, IA, Knowledge Hub, etc.)

Joint Knowledge Hub with actors of water, agriculture and health

### Additional Information:

This topic is of high relevance due to the increasing of multi-resistant germs in humans and reduced functionality of relevant antibiotics for human recovery of diseases. There is an socio-economic relevance in it, because of costs in agriculture/livestock and in health management.