



Water Works 2015-2020 in Support of the Water JPI ERA-NET Cofund Action



WATER-3-2015: Stepping up EU research and innovation cooperation in the water area

**Second Water JPI Knowledge Hub Workshop 2018
Proceeding**

(WP7, Task 7.1)

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List of Abbreviations

AEI:	Agencia Estatal de Investigación (Spain)
AKA:	Academy of Finland (Finland)
AllEnvi:	Alliance nationale de recherche pour l'Environnement (France)
ANR :	Agence Nationale de la Recherche (France)
COST:	European Cooperation in Science and Technology
DBPs:	Disinfection By-Products
EIP:	European Innovation Partnership
EPA:	Environment Protection Agency of Ireland
EU:	European Union
EUREAU:	European federation of national water services
EWI:	Flemish Department Economie, Wetenschap & Innovatie
FACCE-JPI:	Joint Programming Initiative on Agriculture, Food Security and Climate Change
FCT:	Fundação para a Ciência e a Tecnologia (Portugal)
FORMAS:	Swedish Research Council Formas (Sweden)
IC4Water:	Coordination and Support Action in support of the Water JPI
ICT:	Information & Communication Tools
IPR:	Intellectual Property Rights
JPI:	Joint Programming Initiative
KH:	Knowledge Hub
KHEP:	Knowledge Hub on Emerging Pollutants
LCA:	Life Cycle Analysis
MINECO / AEI:	Ministry of Economy, Industry and Competitiveness / State Research Agency (Spain)
NORMAN:	Network of reference laboratories, research centres and related organisations for monitoring of emerging environmental substances
RDI:	Research, Development and Innovation
SRIA:	Strategic Research and Innovation Agenda
SAG:	Stakeholders Advisory Group
STB:	Scientific and Technological Board
ToR:	Terms of Reference
UN SDGs:	United Nations Sustainable Development Goals
WaterWorks2015:	Eranet Cofund project in support of the Water JPI
WssTP:	Water supply and sanitation Technology Platform

Executive Summary

This report contains the proceedings of the **Workshop** of the Emerging Pollutants Knowledge Hub developed by the Water Joint Programming Initiative (Water JPI). The establishment of a Knowledge Hub is part of one of the additional activities of the ERA-NET Cofund program **WaterWorks2015**.

The aim of the Water JPI Knowledge Hub is to build a network for **selected research groups whose work is targeted at stakeholders**. The network will, **within a specific research area**, establish a critical mass of research and technological excellence, integration and sharing of knowledge, infrastructures, data and modelling tools, training and capacity building, in addition to improved communication and networking between stakeholders and the scientific community.

The **objective** is to focus on end-users' needs and the generation of new knowledge. It supports a bottom-up perspective for the creation of a network involving researchers and stakeholders by promoting researchers' knowledge exchange and sharing infrastructure.

The purpose of this Knowledge Hub Workshop was to establish **Water JPI Knowledge Hub on Emerging Pollutants (KHEP)** to one of the additional activities of the **WaterWorks2015** project (Work Package 7, task 7.1).

The workshop took place in Stockholm on the 15th of March 2018 and it united 45 people, including invited experts (the seed-group of the KHEP [researchers with funds from previous Water JPI calls and/or from national funded research projects]; funding partners of the Water JPI; members of the Advisory Boards, and experts invited to present key note speeches and participate in the workshop.

The overall aim with the workshop was to discuss how the efficiency and effectiveness of the Water JPI Community activities could be improved based on the question: Can we do more with what we have?

The objectives of this workshop were to set-up the Water JPI KHEP by:

- Exchange of views and experiences as summarized below in the workshop proceedings
- Set-up the Knowledge Hub by:
 - Identifying the possible outputs (cf. list of possibilities in the KH Terms of Reference)
 - Selecting a Knowledge Hub Coordinator, the Knowledge Hub acronym and name: the organisation of the Knowledge Hub (KH) was discussed by the experts but the experts needed more information and input before being able to select a coordinator. The task was postponed to the upcoming KH workshop.
 - Starting to work on a "Policy Brief": connection to Water JPI and other possible outputs were discussed, however, the experts asked for more information from the steering committee on the possible funding. Therefore, this task was not completed during the Stockholm workshop.

The results from the workshop are summarized as follows:

- Positive reaction to setting up and being involved by the groups in the KH;
- Large exchange of views and experiences between participants;
 - Discussion around key scientific challenges (Risk minimization systems and strategies; Mixtures of pollutants; Closed Water Loops; Green chemistry and product design; Risk perception ...).
- Two possible outputs were suggested during the workshop:

- Proposal for a COST action, but possibly more targeting a policy audience
- Peer-review publication covering the state of the art but also discussing gaps in knowledge and why they matter for a policy audience.

The next KHEP workshop will be held in Helsinki on the 5th June 2018 in conjunction with the Water JPI 2018 Conference: Emerging pollutants in freshwater ecosystems on 6th - 7th June 2018.

It will also be possible for the network to meet at the XENOWAC II conference in Limassol, Cyprus on the 10-12 October 2018 (<http://www.xenowac2018.com/>). The Water JPI, in cooperation with the conference organizers and the JPI Oceans and Anti Microbial Resistance (AMR) will held a JPI side event on these activities to enlarge discussion with the scientific communities and collect inputs for the KHEP activities.

1. Introduction

1.1. Aim of this Report

This report contains the Proceedings of the 2018 Workshop of the Water JPI Knowledge Hub on Emerging Pollutants. The report and the master presentation are available on a webpage dedicated to the [Water JPI Knowledge Hub](#).

This report is organised as follows:

- Section 1 provides an introduction and background to the Water JPI and Knowledge Hubs
- **Section 2** provides an overview of the methodology of the workshop;
- **Section 3** provides the summary of the plenary sessions;
- **Section 4** provides the results of discussions held in the breakout sessions; and
- **Section 5** provides a conclusion of the workshop.

This report was prepared based on the presentations and notes provided by the breakout session Rapporteurs.

1.2. Water Joint Programming Initiative

The Competitiveness Council of the European Union agreed on the launch of Joint Programming Initiatives (JPIs) in 2008¹. JPIs² were at the time conceived to support the new means of European cooperation in response to the perceived limitations of the policy instruments available at the time. Even though the Framework Programme had already achieved considerable success, as measured by the number of participations and collaborative projects, the lack of collaboration and coordination between national public Research, Development and Innovation (RDI) programmes had been reported within the RDI policy arena³.

The Water JPI “Water Challenges for a Changing World” (www.waterjpi.eu) was launched in December 2011.

The mission of the Water JPI is to strengthen water RDI collaboration amongst Member States in order to spur Europe’s leadership and competitiveness in the water sector. To this end, the Water JPI will seek opportunities to pool and mobilise appropriate skills, knowledge and resources to offer solutions that address the challenge of “Achieving Sustainable Water Systems for a Sustainable Economy in Europe and Abroad”.

¹ Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions “Towards Joint Programming in research: Working together to tackle common challenges more effectively”, Brussels, 15 July 2008

² Joint Programming Initiatives, brochure 2016
http://www.waterjpi.eu/images/documents/2016/JPIs_brochure.pdf

³ OECD, Meeting Global Challenges through Better Governance: International Cooperation in Science, Technology and Innovation. OECD Publishing, 2012. <http://dx.doi.org/10.1787/9789264178700-en>

For this purpose, the Water JPI looks at:

- a) Aligning the national RDI agendas of member countries, reaching an effective and sustainable coordination of European water RDI and optimising their scope and the resulting funding efficiency;
- b) Involving water end-users for effective RDI results uptake;
- c) Increasing the critical mass of research programmes as a way to multiply the scientific impact of European research;
- d) Increasing cooperation among European water actors; and
- e) Developing a catalogue of jointly programmed activities whose global budget amounts to at least 20% of the total water RDI budget of partner programmes.

As of March 2018, the Water JPI membership includes 22 partner countries (plus the European Commission) and three observing member countries (Belgium, Hungary and Greece) that collectively represent 88% of European public RDI investment in water resources. New Water JPI memberships from November 2017 are Latvia (from Observer Status) and South Africa (Associated partner status).

As a result of coordination activities, Water JPI member countries have approved as of June 2016, a common Strategic Research and Innovation Agenda ([SRIA](#)) that lays down RDI priorities for the following 5 scientific themes:

- Maintaining Ecosystem Sustainability and Human Well-being;
- Developing Safe Water Systems for the Citizens;
- Promoting Competitiveness in the Water Industry;
- Implementing a Water-Wise Bio-Based Economy; and
- Closing the Water Cycle Gap- Improving sustainable water resource management.

1.3. Knowledge hub activities within the Water JPI actions

Increasing the alignment of national programming and their effectiveness are crucial elements of the Joint Programming Process, for reaching the critical mass required by the Global Challenges to meet and for improving the efficiency and effectiveness of investment in research and innovation. This may be reached by several types of activities (cf. table 1).

Knowledge hubs are thematic networks consisting of selected research groups within a defined area of research targeted at stakeholders. These knowledge hubs are typically set up following joint call activities. They also contribute to the strategy activities of the Water JPI. In addition to improved communication and networking with stakeholders and the scientific community, the added value of the knowledge hub instrument includes establishing a critical mass of research and technological excellence, integration and sharing of knowledge, infrastructures, data and modelling tools, training and capacity building.

Knowledge Hubs:

- Provide the researchers with enhanced opportunities for mobility and sharing of/access to infrastructure.

- Allow access to EU legislation.
- Foster Knowledge exchange and transfer.

Table 1- Types of Alignment activities

Levels & approaches	Potential enabling / confirming actions (alignment criteria)
Strategic	RDI Mapping; Identification of National Programmes; The EU Regulatory Framework; Foresight and Consensus Activities; SRIA as a Unifying Unit; Consolidation of Priorities*
Funding	Funding Foreigners / Foreign Institutions; Implementation of Real Common Pot; Harmonised and Predictable Timelines and Funding Rules
Operational	Common/harmonised Rules for: Participation in All Water JPI Activities, Project Reporting, Project Monitoring, Project Evaluation
Scientific	Database and Information Technologies Development; Standardization of Research Practices/Outputs; Mobility Schemes, including shared access to Research Infrastructures; Knowledge Hubs; Open Access and Open Data approach

Within the Water JPI, several alignment activities are planned for enabling the optimal use of national research funds. Within [WaterWorks2015](#), the Work Package 7 is focusing on Water JPI **alignment activities**.

[WaterWorks2015](#) has been designed to support the implementation of the Joint Programming Initiative “Water Challenges for a Changing World” (Water JPI). WaterWorks2015 responds to the Horizon 2020 (H2020) Societal Challenge 5 (SC5) 2015 Call topic Water-3 [2015]: Stepping up EU research and innovation cooperation in the water area. [WaterWorks2015](#) is a collaboration between the two Joint Programming Initiatives (JPIs), Water JPI “Water Challenges for a Changing World” and FACCE JPI “Agriculture, Food Security and Climate Change”.

Water JPI partners have identified several actions to attain alignment activities. Some of these actions are finalised or ongoing (e.g. joint foresight, mapping of European RDI actors in the field of water, the approval of a common SRIA, the writing-up and update of an implementation plan, the launch of stakeholder consultations, cooperation between JPIs, and set-up of a **Knowledge Hub**) whereas others are planned in the near future (e.g. training of researchers, and the shared use of RDI infrastructure).

The development of knowledge-transfer platforms, including a Knowledge Hub, was identified by Water JPI partners as one of the priority actions to be launched by the initiative in order to achieve the objectives of alignment, critical mass and cooperation.

A “knowledge hub” is understood to be a “network consisting of selected research groups within a defined area of research. The added value of the Knowledge Hub includes the establishment of a critical mass of research and technological excellence, the integration and sharing of knowledge, infrastructure, data and modelling tools, training and capacity building, as well as improved communication and networking with stakeholders and the scientific community”.

WaterWorks2015 have now conducted two out of four planned Knowledge Hub workshops/meetings:

- The objective of the first workshop was to define the vision and operational/ managerial aspects of the Knowledge Hub tool with the Water JPI funding partners, and
- The second workshop's main objective was to **launch the Knowledge Hub on Emerging Pollutants** as part of the additional activities, and with the purpose of supporting alignment and international cooperation actions in the WaterWorks2015 supporting project.

A process to review the progress of the Knowledge Hub will be undertaken in 2019. A second Knowledge Hub is foreseen under the [IC4WATER](#) project for considering the development of such tool in the international / global context.

1.4. Water JPI Knowledge Hub Theme: Emerging Pollutants

The theme of the first Water JPI Knowledge Hub is Emerging Pollutants ([Water JPI Strategic Research & Innovation Agenda](#) Theme 2). **Emerging pollutants (pollutants of emerging concern)** are “chemicals that are not commonly monitored but have the potential to enter the environment and cause adverse ecological and human health effects”, such as polar compounds, pharmaceuticals, personal care products, perfluorinated and organo-silicon compounds, endocrine disruptors, disinfection by-products (DBPs), antibiotic-resistant bacteria and viruses, cyanotoxins, microplastics and nanomaterials. Emerging risks of established pollutants are risks resulting from a newly identified hazard to which a significant exposure may occur, or from an unexpected new or increased significant exposure and/or susceptibility to a known hazard⁴.

Future RDI actions need to address knowledge gaps regarding the behaviour of emerging pollutants in the environment (water, soil, air, living organisms) and their long-term impact on the health and lives of ecosystems and citizens. Future RDI should contribute and improve the analysis and detection of emerging pollutants, to the treatment of water through more innovative techniques, and to better understanding of the social behaviour around emerging pollutants and water management practices based upon the use of recycled water resources.

“Emerging pollutants and emerging risks of established pollutants: assessing their effects on nature and humans and their behaviour and opportunities for their treatment” constitutes one of the scientific subthemes identified in the Water JPI SRIA (subtheme 2.1). This subtheme can be broken down into three main research needs:

- **Research need 2.1.1.** Developing analytical techniques for groups of substances;
- **Research need 2.1.2.** Understanding and predicting the environmental behaviour and effects of by-products, pollutants and pathogens, including their environmental effects;
- **Research need 2.1.3.** Remediation of pollutants: developing strategies and new technologies to reduce pollutants (DBPs, emerging pollutants, pathogens, including their environmental effect).

A full description of subtheme 2.1. is available in the Water JPI SRIA 2.0⁵.

⁴ http://www.efsa.europa.eu/sites/default/files/scientific_output/files/main_documents/escoemriskdefinition.pdf

⁵ <http://www.waterjpi.eu/images/documents/SRIA%202.0.pdf>

2. Methodology

The 2018 Water JPI Knowledge Hub Workshop was organised by FORMAS (Sweden), with the support of EPA (Ireland), the [WaterWorks2015](#) partners and the Water JPI Secretariat (ANR, France). This section is to set out the aims and objectives of the workshop including the theme, attendees invited, and the outline of the programme into plenary and breakout sessions.

2.1. Workshop Aim and Objective

The objectives of the first workshop, held in Stockholm on 15 March 2018, were to set-up the Water JPI Knowledge Hub on Emerging Pollutants by:

- Exchange of views and experiences as summarized below in the workshop proceedings
- Set-up the Knowledge Hub by:
 - Identifying the possible outputs (cf. list of possibilities in the KH Terms of Reference)
 - Selecting a Knowledge Hub Coordinator, the Knowledge Hub acronym and name: .
 - Starting to work on a “Policy Brief” in connection with other Water JPI activities.

2.2. Workshop Theme

The first Knowledge Hub of the Water JPI will be built around the topic of “Emerging Pollutants” as it was the [2013 Pilot Call](#) topic.

Emerging pollutants or **pollutants of emerging concern**, are “chemicals that are not commonly monitored but have the potential to enter the environment and cause adverse ecological and human health effects”, such as polar compounds, pharmaceuticals, personal care products, perfluorinated and organosilicon compounds, endocrine disruptors, disinfection by-products (DBPs), antibiotic-resistant bacteria and viruses, cyanotoxins, microplastics and nanomaterials. See section 1.4

2.3. Workshop Attendees

The workshop took place in Stockholm on the 15th of March 2018. 45 people attended, including invited experts (the Seed-Group of the Knowledge Hub on Emerging Pollutants (researchers with funds from previous Water JPI calls and/or from national funded research projects; funding partners of the Water JPI; members of the Advisory Boards, and experts invited to present key note speaks and participate in the workshop. The list of participants is provided in **Annex I**.

2.4. Workshop Programme

The workshop programme is detailed in Annex 2, consisting of a plenary session detailing the objectives of the Knowledge Hub and the workshop were outline, followed by two parallel breakout sessions to discussion views and exchange knowledge and identify challenges. The second session

related to the implementation plan specifically the selection of a coordinator for the Knowledge Hub and an acronym and name .

2.4.1 Plenary session

The plenary session provided a general introduction to the workshop with the main objective to introduce the knowledge hub, its aim and objectives. It gave some background on the topic of Emerging Pollutants, and linking this to the Water JPI, the public needs and the economic perspective together with experiences from research and practice and how to target relevant stakeholders.

2.4.2 Breakout Sessions

The subjects for the two breakout sessions were:

- EXCHANGE OF VIEWS AND EXPERIENCES
 - Views on the research area within Emerging Pollutants and Water Research
 - What are the major challenges ahead for this research area?
 - Who are the important actors/stakeholders?
- IMPLEMENTATION
 - Selection of a Knowledge Hub Coordinator
 - Selection of the Knowledge Hub acronym and name

Workshop participants were split into four working groups, each with one rapporteur (see Table 2). The Steering Committee members present had a separate meeting in parallel to the breakout session for discussing financial issues.

Table 2 – Breakout session, working group members and rapporteurs.

Working Group No.	Members	Rapporteur
1	Lutz Ahrens, Damia Barcelo, Valeria Dulio, Kristof Demeestere, Teppo Vehanen, Staffan Filipsson	Miguel Angel Gilarranz (Mineco / AEI, Spain)
2	Don Pierson, Javier Marugán, Corinne Le Gal La Salle, Fiona Walsh, Agathe Euzen, Pierre-Francois Staub	Mats Svensson (Swedish Agency for Marine and Water Management, Sweden)
3	Ute Thorenz, Enda Cummins, Elzbieta Plaza, Titus Msagati, Dermot Diamond	Margaret Keegan (EPA, Ireland)
4	Daniel Hellström, Raf Dewil, Andrew Johnson, Serge Chiron, Henning Sørnum, Andrea Rubini	Gert Verreet (Flanders Dep EWl, The Netherlands)

2.4.3 Summary session

Miguel Angel Gilarranz (MINECO/AEI, Spain) summarized the main discussion points and conclusions from the four working groups. These conclusions were then discussed in the wrap session. The final discussions were moderated by **Kristina Laurell** (FORMAS, Organiser of the workshop).

3. Summary of the Plenary Session

Mats Svensson, JPI Governing Board member representing the Swedish Agency for Marine and Water Management, launched the workshop by presenting on the **concept of Knowledge Hub (KH)** in the context of knowledge transfer and management. The KH should be adapted taking into account the communities it's targeting (scientists, policy-makers, etc). He summarised the challenges of **Emerging Pollutants** in a broad perspective relating this to our common needs and global goals such as the 2030 agenda and the United Nations Sustainable Development Goals (UN SDGs).

Dominique Darmendrail, the Water JPI Coordinator, presented the aims and objectives of the Water JPI Knowledge Hub in the context of the Water JPI activities and the overall aim with the workshop.

Daniel Hellström, the Swedish Water & Wastewater Association, described the public and economic perspectives of Emerging Pollutants within the water management systems. EUREAU, as the European network of national water services associations from 29 countries, published policy recommendations based on the Article 191 of the European Union (EU) Treaty on the functioning of the EU, recommendations which have three pillars:

- i) source control approach;
- ii) avoid end-of-pipe solutions as much as possible; and
- iii) the application of the Polluter Pays Principle (mainly based on the producer responsibility).

He summarised the Research and Innovation needs as identified by the water services community, in relation to measurement issues, knowledge about transport and transformation of the substances, health risk assessment approaches and economic considerations from cost effective technologies to a new approach to producer responsibility. Finally, he gave an overview of the four Swedish water-related Knowledge Hubs (Dag&Nät, DRICS, VA-teknik Södra, VA-Kluster Mälardalen).

Staffan Filipsson, Environmental Research Institute, presented on the different water related testbeds used for research development and demonstration, by different stakeholders communities, promoting a transdisciplinary approach for meeting Swedish and global demands. These facilities target mainly wastewater treatment, water reuse and resource efficiency quality optimisation, from small to full-scale demonstrations and prediction of product quality by data modelling. Finally, he introduced the Sino – Swedish partnership on environmental technologies for future cities.

Kristina Laurell (Formas) summarized the proposed ⁶Terms of References (ToR) for this Knowledge Hub (see Annex 3). The ToR include:

- **Duration:** Two years - 2018 and 2019
- **Costs:** Covered by Funding Organisations for the Researchers to attend four meetings over two years, i.e. two meetings per year. The funding organisation are to cover the researchers for traveling and hotel costs for their participation in these meetings, based on a trip-by-trip basis.
- **Coordination:** The costs of the coordination of the Knowledge Hub will be covered by the WaterWorks2015 project. The coordinator will be reimbursed for travelling costs and cost related to the coordination of the Knowledge Hub.
- **Enlargement of the KHEP:**
 - Connection to Water JPI calls: The Water JPI Pilot Call projects will be completed or close to completion when the KHEP is launched.
 - Funding Organisations should consider the allocation of extra funds.
 - Funding Organisations should ask their researchers if they want to participate on their own costs.

Please note that following the discussions at the workshop, the ToR are currently under revision as there was lack of clarity on a number of issues highlighted by the attendees. The revised ToR will be presented at the next KH meeting.

4. Results of Breakout Sessions

4.1 Exchange of Views and Experiences

Much of the early discussions related to revising the concept of KHEP and the need for clear and detailed documents related to its set up and procedures. Currently there is a lack of clarity and understating of what is be required of the participants and the end goal of the KHEP for the of the Water JPI for a better understanding of the needs to be fulfilled. Workshop attendees required clarifications on the following issues:

Pollutants and risks to consider: It has noted that chemical compounds of concern have evolved to a wider range of pollutants including chemicals, nanomaterials, genetic materials and microorganisms. The focus has to be in chronic aspects and not in accidental aspects.

List of Stakeholders to consider: the main stakeholders to target are Industry (those on the side creating the issue: companies with large specialty in chemicals, companies offering technological solutions – technologies providers and major sectors using water that may be affected by emerging contaminants, e.g. agriculture), Water and Wastewater Utilities, the general Public and NGOs (including consumer associations), Policy Makers and agencies (from EU to local levels), WHO the Research Communities and the Media.

Motivations to be involved in Knowledge Hub as a researcher / scientist :

- building relationships, networking

- Working with experts in same field to exchange on common issues (shared problems, solutions) and to determine a joint research agenda
- Harmonised Approaches
 - Sharing data; capacity building
 - Sharing comitology and terminology
 - Standardised methods and approaches
 - Connecting to NORMAN (for this specific KH)
- Good examples
- Funding options
 - New Calls to encourage collaboration
 - Transnational projects
 - Cofunding model already in place with Water JPI
- Added benefit of the transnational research
- Exchanging with a large variety of stakeholders, from different levels of implementation (local to EU levels).

Scale of the problem to consider: The behaviour and transformation of substances (e.g. more toxic metabolites) makes it a very complicated subject, but also the absence of clear environmental impact signals and ‘cocktail effect’ makes it difficult to disentangle cause-effect relationships needed for effective and efficient policy interventions. Laboratory testing has a limited number of end-points compared to the real situation in the environment. There is a need for methods to identify the level of risks, so that it is possible to eventually rank them and focus action on all risks above acceptable risk (starting with the largest risks). Retroactive analyses of correlations found between market & use introduction of substances and observation / measurement of correlative possible effects in the environment would be a powerful instrument (cf. neonicotinoids).

Importance to work with actors & Stakeholders:

- Helpful for creating the necessary trust
- Interaction raising the legitimacy and helping to determine how trade-offs can be struck. Co-production of useful knowledge gives a better return on investment than undertaking science with no direct application.
 - However, involving stakeholders is not straightforward as it requires a systematic effort and you need to engage constructively with stakeholders
- Raising awareness of all (local and regional communities, teachers, journalists, ...) on key issues such as safe levels, remaining concentrations of emerging pollutants in consumed products, managing real vs. perceived risks.
- Interesting stakeholders to involve are of course those with a stake in it, or those that should be concerned:

Areas and disciplines to involve in the KHEP (see below): the list below presents the ones identified during the workshop discussions. Note the order does not reflect any priority.

4.2 Scientific Challenges in relation to Emerging Pollutants

The four groups discussed on scientific challenges related to pollutants and risks, in particular for Society, researchers and innovators.

Area	Challenge
Challenges for Science:	
Risk and Exposure Assessment For Ecosystems and Human Health, although they should be considered together	<p>Fate, Transport and Effect assessment</p> <p>Hazard assessment</p> <p>Health impacts - Chronic and Acute Effects to be assessed</p> <p>Ranking of micro-pollutants and their effects – what is a problem?</p> <p>List of substances and acceptable levels – will not capture everything</p> <p>Development of low-cost treatment technologies which are efficient and safe that can be applied in locations where water resources are scarce</p> <p>Feed into the development of water quality guidelines and Guidelines for remediation</p> <p>Risk minimization tools and strategies, including technical and societal approaches for mitigation of the effects and risks including different disciplines relevant in the research in emerging pollutants: chemistry, ecotoxicology, human toxicology, Ecology, limnology, microbiology and particularly resistance to antibiotics, Hydrology, civil engineering and Materials science.</p>
Mixture of pollutants – mixture cocktails	<p>They represent the real situations and add complexity in managing situations due to synergies, co-transport (e.g. by micro-plastics). There more understanding and knowledge is needed regarding:</p> <ul style="list-style-type: none"> • Exposure routes and impacts • Fate and transport Mechanisms • Links cause-effects • Long-term effects • Ranking risks • The possible added contribution of climate change.
Macro - Modelling	<p>Exposure, fate and transport models</p> <p>Hotspot identification</p> <p>Simplification and communication of outputs and identification of options</p> <p>Models to be understandable for the public and politicians</p>

Identification of Different Sources of Emerging Contaminants	<p>Broad range of Environmental chemistry tools providing knowledge and solutions for:</p> <ul style="list-style-type: none"> • Sampling • Monitoring • Measurement • Understanding fate of pollutants <p>With consideration of transformation products (by using list may not capture transformative products)</p>
Treatment and Remediation technologies	<p>Water treatment technologies</p> <p>Fit-for-purpose technologies (i.e. those designed to achieve specific treatment goals).</p> <p>Life Cycle Assessment methods and tools.</p> <p>Global effect on climate change from the development of the technology</p> <p>No or reduced impact of the new technology</p> <p>Sustainable technology (for Energy, water)</p> <p>Link to analytical approaches, risk assessment and remediation limits</p> <p>Conflicting Interests</p>
Risk minimisation / green chemistry and product design	<p>Substitution of products</p> <p>Anticipation of possible risks.</p>
Analytical Approaches	<p>Standardisation of methods and sample preparation</p> <p>Reduce uncertainty</p> <p>New contaminants - transformative compounds</p> <p>Alignment of analytical approaches for comparison purposes</p> <p>Reduce costs of analysis</p> <p>Funding model to maintain analytical equipment</p>
Monitoring approaches	<p>Monitoring frequency vs. costs</p> <p>Proxy measurements</p> <p>Monitoring in real time</p>
Integrated approaches	<p>Consequences on the Water – Food – Energy – Health Nexus</p> <p>Creation of smart molecules</p> <p>New economic approaches to feed decision-making</p> <p>Improving policy development with innovations</p>
Challenges for Society and Researchers	
Source Removal and Control	<p>Involve citizens as consumers and generators</p> <p>Raw Material Analysis</p> <p>Industry Buy-in – fingerprinting an issue</p> <p>Communication of Risk</p>
Management of closed Water Loops	<p>Emerging Pollutants concentrate due to water reuse. Related risk management and knowledge is therefore needed.</p>
Risk Communication / Risk Perception	<p>Risk Communication tools for:</p> <ul style="list-style-type: none"> • Managing the risk of losing the interest of the society in the field of Emerging Pollutants.

	<ul style="list-style-type: none"> Increasing the public awareness of the important of the research in this field and engaging the public Contributing to education for managing and mitigating risks. <p>Around topics such as “is water a commodity or a human right?”</p>
Citizen Involvement	<p>Communication and Visualisation of Risk Use of big data Interpretation of environmental indicators Citizen science Influence of environmental indicators</p>
Risk mitigation	<p>Reduction and stopping of the releases of Emerging Pollutants by achieving a balance among treatment, substitution of products and reduction in the use of products.</p>
Managing and balancing the interests of the different stakeholders	<p>Balancing demands of Producers of chemicals and products, Citizens, and Authorities, etc. Getting the change implemented</p>
Risk Management	<p>Risk reduction: treatment technologies, exposure Communication to stakeholders, increasing awareness and the involvement of citizens. Prioritization tools, including modelling, for risk assessment.</p>
Cross-cutting challenges	
Information & Communication Tools (ICT) and computing methods and tools:	<ul style="list-style-type: none"> Holistic approaches Big data Data mining Computing Workflows Modelling, including validation of the proposed models Transferring research results in policy (i.e. drinking water pollution and disinfection products) Tools for sharing knowledge

4.3. General considerations about the KHEP

In addition to the two questions proposed by the Water JPI, the workshop attendees highlighted that:

- The KHEP should be driven by main societal drivers / challenges that condition all actions such as agri-food production in scarce water situations, safe drinking water, healthy environment as top

priority for human populations; the societal relevance is very strongly conditioned by other factors, such as stakeholders involved, local and regional conditions.

- A holistic approach should be considered when proposing solutions:
 - As prevention measures are privileged in all EU policies, feasibility of separation sources of emerging contaminants at source to improve treatability & reduce downstream risks should include societal issues (e.g. acceptability of keeping urine separate of patients on medicines)
 - Developing and implementing cost-effective circular economy options (e.g. reuse of wastewater in agriculture) should be designed so that the risks of emerging pollutants are minimized.
 - Some groups of substances (e.g. pharmaceuticals that are almost not substitutable) may require very specific solutions. Even when solutions are available, the scale of their application may require careful consideration of unwanted side effects (e.g. other environmental externalities of increased use of energy).
- The KHEP should contribute to a better evidence policy, by identifying the real extent of the problem (rather than a potential problem), providing good assessment methods that allow us to focus reliably, while being aware of the remaining challenges and communicating on the existing risks:
 - There is no zero risk, each risk level has a price, large discrepancy of 'willingness to pay' / societal valuation of ecosystem services. But danger of only valuing those services which have a direct economic benefit [-> link with market instruments to make 'polluter pays' work better]

The structure of the Knowledge Hub, three core activity pillars of core activity were reviewed by the four groups which also suggested additional tasks to be considered in the KHEP:

1. Data:

- There is a need for collecting and sharing data in a more harmonized way.
- Some of these platforms are already available and the objective of the KH should not be to develop new ones, but the KH could contribute to a progress in their use.
- Good sharing of data produced will result in better exploitation of them.

2. Networking and partnering:

- KH definitively facilitate interaction among researchers and projects, leading to sharing and harmonization of methodologies.
- Internal communication within the community working in Emerging Pollutants and interaction among different disciplines and brainstorming on different points of view can lead to more holistic approaches with higher impact.
- The KH can facilitate the creation of more robust consortia for applying in calls. The KH can participate in the definition of the topics for calls, so that the call addresses better the existing challenges.

3. External communication and reach out:

- The KH can help to elaborate a consensus view on the challenges for society and to transmit it to the public, policy makers, etc.
- It is not an easy task for researchers and the contribution of specialists in communication is needed.

The main concerns expressed by the different groups are related to:

- Details about the expected outputs (How far do we want to go?)
- How to cover the costs related to the participation to the KH (vs. what is proposed so far).

4.4. Proposed Outputs of the KHEP

The groups proposed two possible outputs:

- A proposal of [COST action](#), but possibly more targeting a policy audience?
- The preference would be mainly a peer-reviewed paper, led by a group of authors covering the state of the art but also discussing gaps in knowledge and why they matter for a policy audience. This paper's impact can then be amplified by further outreach e.g. through targeted approach of specialised journalists that serve particular audiences of professionals and /or segments of the public.

In order to move forward, the following measures were proposed:

- Need to have dedicated representation from some key stakeholder organisations at the next meeting, e.g. of a leader of a water cluster, or a representative of the agri-food sector that is particularly potentially affected by the presence of emerging contaminants in water
- Discussion with stakeholders on risk management and acceptance, for indicating that this concept of risk is very central to addressing the communication between the Knowledge Hub and the potential users of its work.
- Possible IPR issues: There were no specific views on intersessional work other than that it would be best be led by this proposed group of co-lead authors from among the KH experts.

5. Conclusions and Implementation

The overall aim with the workshop was to discuss how the efficiency and effectiveness of the Water JPI Community could be improved based on the question: Can we do more with what we have?

The implementation of the Water JPI Knowledge Hub on Emerging Pollutants should:

- Link projects to the strategy of the Water JPI
- Bring the identified gaps and outputs from the funded projects into the development of the Water JPI SRIA.

The targeted projects are from:

- Water JPI 2013 Pilot Call
- 2015 Water Joint call
- 2016 Water JPI Joint call
- Other international collaborative projects
- Relevant national projects.

5.1. Lessons learned

What is a KH: the discussions between the Seed-Group and the Steering Committee members highlighted the need to further develop the KH concept, better define the objectives with regards to the potential available resources.

Conclusion: The suggestions developed during the workshop should be considered by the Steering Committee and integrated in the KHEP ToR to be revised.

Why we did not select a Coordinator: The question is rather, who is going to select the Coordinator? The owner of the resources can select the Coordinator. The Seed-Group may nominate an expert based on the skills and experiences. At this first meeting the preparation of the selection process was not sufficiently prepared. The Seed-Group did not know anything about each other and therefore it was not possible to nominate the Coordinator.

Conclusion: A formal proceeding of the nomination of the Coordinator needs to be prepared.

Why the development of the Knowledge Hub needs administrative and financial support:

There needed to be clarity on how this KH will be support and where those resources will come from. A workshop is a meeting working area where problems can be discussed and new solutions may be developed. However, the analytical work required by some possible outputs needs other facilities and other resources.

Conclusion: Clarity on funding requirements and resources needs to be resolved, in particular with regard the selected coordinator and the additional administrative and financial supports.

5.2. Next Steps

Following on from the discussions a number of steps are listed below, in setting up the Water JPI Knowledge Hub on Emerging Pollutants, which is seen as a positive undertaking.

- Produce a 'Who's Who' booklet for the KHEP
- Clarify the ToR in order to answer many of the questions raised at the Stockholm Workshop
- Organisation of a second KHEP workshop in June 2018 for:
 - Selection of the Knowledge Hub Coordinator, with a clear mandate
 - Selection of the Knowledge Hub acronym and name
 - Start work on an implementation plan, outputs, in particular developing "Policy Briefs".

Annex 1: List of Stockholm KH Workshop Attendees

First Name	Last Name	Organisation	Country
Lutz	Ahrens	Swedish University of Agricultural Sciences	Sweden
Juliette	Arabi	Water JPI Secretariat	France
Damia	Barcelo	IDAEA-CSIC	Spain
Esther	Chacon	MINECO/AEI	Spain
Serge	Chiron	Montpellier University	France
Enda	Cummins	UCD	Ireland
Dominique	Darmendrail	Water JPI Coordinator	France
Gema	del Rio	CDTI	Spain
Kristof	Demeestere	Ghent University	Belgium
Raf	Dewil	KU Leuven	Belgium
Anna	Di Noi	ISPRA	Italy
Dermot	Diamond	Water JPI STB, DCU	Ireland
Valeria	Dulio	INERIS	France
Agathe	Euzen	Water JPI STB, LATTIS-CNRS	France
Staffan	Filipsson	Environmental Research Institute	Sweden
Laura	Forsström	AKA	Finland
Carla	Garcia Dumay	Irstea	France
Miguel Angel	Gilarranz	MINECO/AEI	Spain
Prisca	Haemers	IenW	The Netherlands
Daniel	Hellström	Swedish Water & Wastewater Ass.	Sweden
Andrew	Johnson	CEH	UK
Margaret	Keegan	EPA	Ireland
Maja	Kolar	MINECO/AEI	Spain
Ivo	Krustok	MoE	Estonia
Kristina	Laurell	FORMAS	Sweden
Corinne	Le Gal La Salle	Nimes University	France
Antonio	Lo Porto	Water JPI SAG, Euraqua	Italy
Javier	Marugán	Universidad Rey Juan Carlos	Spain
Titus	Msagati	WRC	South Africa
Rui	Munhá	FCT	Portugal
Gilles	Neveu	Water JPI SAG, INBO	France
Don	Pierson	Uppsala University	Sweden
Elzbieta	Plaza	KTH	Sweden
Lisa	Sheils	EPA	Ireland
Maria Chiara	Sole	ISPRA	Italy
Pierre-Francois	Staub	AFB	France
Mats	Svensson	Swedish Agency for Marine & Water M.	Sweden
Henning	Sørnum	NMBU	Norway

Richard	Tavares	Water JPI Secretariat	France
Ute	Thorenz	Federal Institute of Hydrology	Germany
Fiona	Walsh	Maynooth University	Ireland
Kata-Riina	Valosaari	AKA	Finland
Teppo	Vehanen	Water JPI SAG, EIFAAC	Finland
Alice	Wemaere	EPA	Ireland
Gert	Verreet	Flanders Dep EWI	Belgium
Saskia	Wohlgemuth	Jülich	Germany

Annex 2: Stockholm KH Workshop Programme

08.30 – 09.00	<i>Welcome Coffee and Registration</i>	
09.00 – 09.15	Welcome and opening of the meeting	Mats Svensson, Swedish Agency for Marine and Water Management
09.15 – 10.00	TOUR DE TABLE - brief introduction of experts and funding partner organisation representatives	All attendees
10.00 – 10.15	INTRODUCTION - the Water JPI and the Water JPI Knowledge Hub, its aims and objectives	Dominique Darmendrail, Water JPI Coordinator
10.15 – 10.30	The public and the economic perspectives	Daniel Hellström, Swedish Water & Wastewater Association
10.30 – 11.00	<i>Tea & Coffee break</i>	
11.00 - 11.45	Water Infrastructure, Research and Stakeholders – a transdisciplinary perspective	Staffan Filipsson, Swedish Environmental Research Institute
11.45 – 12.00	Building the Knowledge Hub and targeting the stakeholders	Kristina Laurell, Formas
12.00 – 13.00	<i>Lunch Break</i>	
13.00 – 16.00 <i>Coffee break included</i>	<p>BREAK-OUT SESSION: EXCHANGE OF VIEWS AND EXPERINCES - a bottom-up perspective</p> <ul style="list-style-type: none"> • The research area within Emerging Pollutants and Water Research • Major challenges ahead for this research area • Particularly important actors/stakeholders 	Chaired by Steering Committee members
16.00 – 16.30	<p>IMPLEMENTATION</p> <ul style="list-style-type: none"> • Selection of a Knowledge Hub Coordinator • Selection of the Knowledge Hub acronym and name 	Experts – Seed Group
16.30 – 17.00	NEXT STEPS - Next meeting in Helsinki in June 2018, draft programme and expected outcomes	<i>Kristina Laurell, Formas</i>
17.00 – 17.30	Recap on decisions and A.O.B	<i>Experts – Seed Group and Steering Committee</i>
17.30	<i>Closure of the workshop followed by a network event!</i>	

Annex 3: Terms of Reference for Knowledge Hub on Emerging Pollutants

Terms of References

To be revised at Helsinki meeting 5th June 2018

Water JPI Knowledge Hub on Emerging Pollutants



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1. Water JPI Knowledge Hub Theme on Emerging Pollutants

The first Knowledge Hub theme is Emerging Pollutants (Water JPI SRIA Theme 2). **Emerging pollutants (pollutants of emerging concern)** are “chemicals that are not commonly monitored but have the potential to enter the environment and cause adverse ecological and human health effects”, such as polar compounds, pharmaceuticals, personal care products, perfluorinated and organo-silicon compounds, endocrine disruptors, disinfection by-products (DBPs), antibiotic-resistant bacteria and viruses, cyanotoxins, microplastics and nanomaterials. Emerging risks of established pollutants are risks resulting from a newly identified hazard to which a significant exposure may occur, or from an unexpected new or increased significant exposure and/or susceptibility to a known hazard⁷.

Future RDI actions need to address knowledge gaps regarding the behaviour of emerging pollutants in the environment (water, soil, air, living organisms) and their long-term impact on the health and lives of ecosystems and citizens. Future RDI should contribute and improve the analysis and detection of emerging pollutants, to the treatment of water through more innovative techniques, and to better understanding of the social behaviour around emerging pollutants and water management practices based upon the use of recycled water resources.

“Emerging pollutants and emerging risks of established pollutants: assessing their effects on nature and humans and their behaviour and opportunities for their treatment” constitutes one of the scientific subthemes identified in the Water JPI SRIA (subtheme 2.1). This subtheme can be broken down into three main research needs:

- **Research need 2.1.1.** Developing analytical techniques for groups of substances;
- **Research need 2.1.2.** Understanding and predicting the environmental behaviour and effects of by-products, pollutants and pathogens, including their environmental effects;
- **Research need 2.1.3.** Remediation of pollutants: developing strategies and new technologies to reduce pollutants (DBPs, emerging pollutants, pathogens, including their environmental effect).

A full description of subtheme 2.1. is available in the Water JPI SRIA 2.0⁸.

The aim of the Water JPI Knowledge Hub on Emerging Pollutants is to build a network for **selected research groups whose work is targeted at stakeholders**. The network will, **within a specific research area**, establish a critical mass of research and technological excellence, integration and sharing of knowledge, infrastructures, data and modelling tools, training and capacity building, in addition to improved communication and networking between stakeholders and the scientific community.

The **objective** is to focus on end-users’ needs and the generation of new knowledge. It supports a bottom-up perspective for the creation of a network involving researchers and stakeholders by promoting researchers’ knowledge exchange and sharing infrastructure.

⁷ http://www.efsa.europa.eu/sites/default/files/scientific_output/files/main_documents/escoemriskdefinition.pdf

⁸ <http://www.waterjpi.eu/images/documents/SRIA%202.0.pdf>

2. Implementation of the Water JPI KHEP

This section consists of a description of the expected outputs from the activities performed with the knowledge hub. The activities of the development of the Knowledge hub are described in set-up of the knowledge hub. Finally, a time-schedule is suggested for the first two years of the Knowledge Hub together with the costs for each step in the development plan.

2.1 Expected Outputs and Added-Value

Expected Outputs

The expected outputs of the Water JPI Knowledge Hub include (but are not limited to):

- Peer-reviewed publications (additional / related to the cluster);
- Online thematic forum;
- State of the Art Report;
- Foresight exercises (participating in events / workshops...);
- Providing input into the update of the SRIA;
- Knowledge exchange;
- Mutual learning;
- Exchange of good practices;
- Fostering coordination and sharing of results;
- Fostering mobility and sharing of infrastructure;
- Developing common practices / Standard methodologies developed;
- Presentation at Water JPI events; and
- Preparation of policy briefs, joint scientific publications, joint topic synthesis, harmonisation of protocols, working seminar outputs.

Added-Value for Researchers

It is expected that the Water JPI Knowledge Hub will:

- Allow researchers to inform the contents of the Strategic Research & Innovation needs for future funding.
- Provide researchers with opportunities for networking – Apply for other EU funding;
- Facilitate cooperation resulting in high-impact publications.
- Contribute to a greater number of scientific outputs (publications, patents, license, etc.) through collaboration.
- Build the researchers' capacity through integrated, transnational and multi-disciplinary approaches and exchange of Good Practices.
- Provide the researchers with enhanced opportunities for mobility and sharing of/access to infrastructure.
- Contribute to EU legislation evolution.
- Foster Knowledge exchange and transfer.

Added-Value for Funders

It is expected that the Water JPI Knowledge Hub will:

- Ensure that the solutions developed by research have a greater impact on & greater relevance to stakeholders and society;
- Bring together researchers in a more collaborative manner.
- Allow for the collaboration of researchers funded by the Water JPI to continue after the projects are completed.
- Contribute to alignment at project-, researcher- & institution-level.

Added-Value for Policy-makers

It is expected that the Water JPI Knowledge Hub will:

- Provide policy briefs on which they can rely.
- Narrow the gap between science and policy needs, for different categories of stakeholders.
- Provide a more holistic view of water challenges based on a multi-stakeholder approach.

2.2 Setting up the Knowledge Hub

The Water JPI Knowledge Hub on Emerging Pollutants will be set up in March 2018, for a 2 years duration (pilot phase).

It is envisaged that the Knowledge Hub will carry out its activities via:

- 2 meetings per year;
- Online Forum; this could be done via a LinkedIn group set by the Water JPI
- Remotely in between the meetings.

2.2.1 Governance and Participation from Funding Organisations

Funding Organisations participating in the Water JPI Knowledge Hub will compose the Steering Committee for the Knowledge Hub.

The Knowledge Hub Steering Committee will oversee the activities of the Knowledge Hub and ensure their full integration in and complementarity with the overall Water JPI activities.

Costs associated with the Steering Committee activities (i.e. attendance at meetings, time, etc.) will be covered by each Funding Organisation (i.e. in-kind contribution). The Steering Committee is suggested to have meetings by Web-Ex and in conjunction with Advisory Board Meetings and Governing Board meetings.

2.2.2 Experts – Seed Group and Coordinator

Funding Organisations will select researchers from different funding programmes (Water JPI funded projects, national / regional projects, other JPIs, H2020, COST Actions, etc.) for networking and development of new cooperation.

- The **indicative** initial membership for the Seed Group is for 24 months.
- **The initial size** of the “Seed” Group is expected to be **maximum 30 researchers**.
- **The Knowledge Hub will be chaired by a Coordinator elected by the seed group.**

2.2.3 The Role of the Coordinator

- Lead the work with the development of the implementation plan which could include:
 - State of the Art Report
 - Identification and development of the proposed outputs
 - Plans for enlarging the KHEP;
 - Online thematic forum;
 - If requested, support additional foresight exercises;
 -
- Coordinate exchanges within the network for the implementation plan
- Develop agendas for coming meetings with support from the SC
- Report back to the Knowledge Hub Steering Group coordinator

2.2.4 Tentative activities and time table for 2018 and 2019

Within 6 months of the kick-off Workshop, the researchers involved in the Knowledge Hub will be requested to prepare an implementation plan, providing an indicative timeframe, outlining how they will address the expected Knowledge Hub outputs.

6-monthly meetings will be organised and Knowledge Hub Steering Committee members are to facilitate these meetings. Side meetings to already planned Water JPI meetings could be considered, e.g. Networking on on-going projects workshops, Mid-term review meetings. Water JPI Conference.

- **June 2018:**
 - KHEP-Meeting back to back to Water JPI Conference in Helsinki on the 5 June
 - The aim for this meeting is to develop Policy Briefs. The Pilot Call workshop will be an in-put to the development of the first briefs
- **Autumn 2018:**
 - Possibilities to participate in Water Conference in Cyprus
 - On-line network meetings held by the Coordinator with the aim of developing an implementation plan for the KHEP
- **December 2018:**
 - Steering committee meeting with Coordinator
 - Network meeting - Confirmation of the implementation plan

It is expected that the researchers involved in the extended Knowledge Hub will prepare a Business Plan identifying possible funding avenues to sustain/maintain the Knowledge Hub (e.g. future application under COST, Horizon 2020, Mobility actions, etc.).

- **January 2019:**
 - Planning for a Cost action

2.2.5 Budget

Funding Organisations will invite researchers to attend four meetings over 2 years, i.e. 2 meetings per year. Funding Organisations will pay for their travelling and hotel costs or invite the researchers to the meetings on their own costs.

Physical KH meeting costs will be covered under the WaterWorks2015 Task 7.1 Budget. Steering Committee members will cover their own costs for their participation to the KH implementation.

Other possible needs will be considered after the development of the Implementation Plan and its approval by the KH steering committee.

Planned budget for two years pilot phase:

Travelling and accommodations for KH seed group: 22 x 8 000 Euro = 176 000 Euro

Organisation of Workshops: 4 x 5 000 Euro = 20 000 Euro

Cost for Coordinators work: 10 000 Euro

Total cost for 2018 and 2019 = approx. 206 000 Euro

3. Evaluation

Indicators and monitoring will be put in place to ensure that the Knowledge Hub achieve their objectives. This evaluation must be linked to the **Water JPI Impact Assessment activities (currently under development)** including a timeframe for achieving the expected outputs of the Knowledge Hub, taking into consideration their short- Vs. long-term aspect.

Possible Indicators of progress include:

- Number of joint publications which acknowledge the Water JPI Knowledge Hub;
- Number of publications produced with transnational authors / different clusters in a short timeframe;
- Number of new proposals developed by KH seed group members;
- Interoperable databases linked to the Open Water JPI database;
- Standard methods / standards developed;
- Comparative studies developed;
- Effective mobility of researchers between involved countries;
- Good attendance at meetings;
- Number of stakeholders involved in KH activities;
- Number Stakeholder-oriented outputs;