Water Works 2014-2019 in Support of the Water JPI
ERA-NET Cofund Action

2016 Water JPI Workshop
Alignment of On-going Projects
Emerging Pollutants, including Pathogens

Report

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List of Abbreviations

CIS:	Common Implementation Strategy
COST:	European Cooperation in the field of Scientific and Technical Research
DG:	Directorate-General
CSA:	Coordination & Support Action
EC:	European Commission
EIP:	European Innovation Partnership
EPAs:	Environmental Protection Agencies
ERA:	European Research Area
EU:	European Union
H2020:	Horizon 2020
JPI:	Joint Programming Initiative
NGO:	Non-Governmental Organisation
NORMAN:	Network of reference laboratories, research centres and related organisations for monitoring of emerging environmental substances
RDI:	Research Development and Innovation
SETAC:	Society of Environmental Toxicology and Chemistry
SRIA:	Strategic Research and Innovation Agenda
WFD:	Water Framework Directive
WssTP:	Water supply and sanitation Technology Platform

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Purpose and Introduction to the Workshop on the Alignment of On-going Projects

The ERA-NET Cofund Action "Water Works 2014-2019 in Support of the Water Joint Programming Initiative (JPI)" (WaterWorks2014) includes specific tasks described as Additional Activities intended to improve the efficiency and effectiveness of the Water JPI community, develop activities foreseen in the Water JPI Implementation Plan and facilitate future calls. To achieve these goals, the Work Package 6 of WaterWorks2014 dedicates specific tasks to thematic meetings about sharing good practices on funding and management, exploratory workshops and alignment of on-going water-related Research, Development & Initiative (RDI) projects.

The 1st Workshop for the Alignment of On-going Projects was organized on 30th November 2016 at the Geological Survey of Austria in Vienna (Austria). The purpose of the workshop was to facilitate the progress in the alignment of projects through:

- Exploring collaborations and synergies for common objectives.
- Identifying stakeholders and discussing how to better target them.
- Identifying gaps in the Strategic Research and Innovation Agenda (SRIA) of the Water JPI.
- Suggesting research needs and topics for work plans, agendas and calls.

Selected water research projects funded by the Water JPI calls, other JPIs, the European Commission and National Funding Agencies were invited to the workshop. The topic of the 2013 Water JPI Pilot Call – "Emerging pollutants, including pathogens" – was selected as the topic of the first workshop, providing an opportunity to encourage synergies between a variety of project researchers in this field. In order to gather expertise and views from different disciplines and explore new synergies, some invited participants were involved in projects outside the realm of emerging pollutants. The topics of the invited projects included water treatment and reuse, water management, water quality analysis and monitoring, modelling, risk assessment, microplastics and nanomaterials in water. A total of 22 researchers representing 20 projects (5 from the 2013 Water JPI Pilot Call, 7 from the 2015 Water JPI Joint Call, 8 national funded projects) attended the workshop together with 23 Water JPI members (Annex 1. Attendance list). The projects participating in the workshop are listed in Table I.

The master presentation of the Workshop is available on the Water JPI website.

Table I. List of projects participating in the workshop

ACWAPUR (2015 Water JPI Joint Call)
AOPI (Finland)
CONPAT (Finland)
DESERT (2015 Water JPI Joint Call)
DeTER (Ireland)
Geosorbents (Finland)
MEPROWARE (2015 Water JPI Joint Call)
MOTREM (2013 Water JPI Pilot Call)
PARME (France)
PEACE (Norway)
PERSIST (2013 Water JPI Pilot Call)
Pioneer_STP (2015 Water JPI Joint Call)
PROGNOS (2015 Water JPI Joint Call)
PROMOTE (2013 Water JPI Pilot Call)
REMANTAS (France)
StARE (2013 Water JPI Pilot Call)
The role of passive sampling in screening and monitoring of new and emerging chemicals (Ireland)
TRACE (2013 Water JPI Pilot Call)
Watintech (2015 Water JPI Joint Call)
WE-NEED (2015 Water JPI Joint Call)

Structure of the Workshop

The workshop included plenary keynotes, a poster session, breakout group sessions and plenary discussions (Annex 2. Agenda). The attendees were asked in advance to identify a breakout group topic, which resulted in the following breakout groups:

a) Ecological status, human risks and environmental risks.
b) Chemical analysis.
c) Microbial resistance.
d) Treatment, reuse and management.

Summary of the sessions

Introduction

(by Dominique Darmendrail (ANR, FR) and Rosa Rodríguez (MINECO, ES))

The speakers gave an overview of the key goals and achievements of the Water JPI and the framework of the workshop. The Joint Programming was presented as an initiative of European Member States and the European Commission providing a new

way to address RDI problems at a European dimension. The major common European societal challenges are now addressed in a coordinated way through coordination of public research, development and innovation programmes in Europe and beyond. The alignment of programmes is expected to make better use of Europe's limited public RDI funding. This approach was followed in ten strategic areas, including water.

The Water JPI was formally approved by the European Council in December 2011, and is dedicated to addressing the ambitious challenge of achieving sustainable water systems for a sustainable economy in Europe and abroad. It is based on a multi-disciplinary approach, which includes economic, ecological, societal and technological considerations. A total of 24 countries representing 88% of the European National Public RDI investment in water have joined the Water JPI and a number of actions have been developed, including the delivery of several versions of the SRIA, a first Implementation Plan for 2014-2016, mapping of water RDI activities and infrastructures in Europe and 7 targeted countries, and joint calls. The activities carried out have contributed to harmonising national water RDI agendas and to guide European research and innovation.

The European Commission is also a partner of the Water JPI and has supported its implementation with several actions: WatEur CSA, WaterWorks2014 ERA-NET Cofund, WaterWorks2015 ERA-NET Cofund and IC4Water CSA. These actions include joint calls and a number of activities for strategy, implementation and dissemination. So far, three joint calls have been launched with topics addressing the RDI needs identified in the SRIA: "Emerging water contaminants - anthropogenic pollutants and pathogens", "Research and Innovation for Developing Technological Solutions and Services" and "Water in Agriculture, Forestry, Aquaculture".

The WaterWorks2014 supporting project includes Additional Activities designed to contribute to the implementation of the Water JPI and to render more effective and efficient RDI programmes. The alignment of on-going RDI projects is one of these activities, and it is also linked to the development of the Water JPI Knowledge Hub, which will be implemented within the WaterWorks2015 action. The 1st Workshop on the Alignment of On-going Projects aims to reduce the isolation of the project teams / consortia, fill knowledge gaps during their execution and explore collaborations and synergies. The alignment is also expected through the identification of stakeholders, discussion on the strategies to target them and revision of the Water JPI SRIA to identify gaps in relation to emerging pollutants. The discussion on the RDI needs in the field of emerging pollutants is also of great interest for the elaboration of agendas and work programmes.

Keynote: Impact on policy of RDI activities

(by Damià Barceló (ICRA-CSIC, ES))

The keynote presentation by Prof. Damià Barceló highlighted the need to transfer RDI results in the field of emerging pollutants to society, and reviewed the challenges that the researchers face when approaching stakeholders. The presentation focused on recent projects targeted at policy makers.

As an initial approach, the main challenges related to water availability and uses, and their links with energy and food, were discussed. These challenges are global as 80% of the human population is at risk and 72% of large rivers show a high threat level, to the occurrence of resource scarcity in addition to water scarcity.[1] Projections indicate that the pressure on water availability and uses will increase in the future due to economic growth and climate change, affecting biodiversity and food supply.

There is a gap in knowledge on eco-hydrology during periods of water scarcity that must be filled in consultation with stakeholders. In particular, the role of multiple stressors during periods of water scarcity is a major concern, since 30-60 % of the global river network is temporary and some permanent rivers are shifting to temporary due to climate change and water extraction. Managers and policy makers need information relating to stressors, receptors and the implications for biodiversity and human wellbeing during periods of water scarcity.

Bridging the gap between science and water resource management requires the design of specific actions from the moment a project is conceived. Views of scientists and water resource managers are complementary rather than mutually exclusive, but the research language must be adapted to a more managerial language style, and use the communication channels and fora that are routinely used by the managers. The execution of a research project must consider also the different working "time scales" used in science (long-term) and management (daily pressures). In spite of difficulties relating to public concern on the issue of climate change and water scarcity, particularly in the Mediterranean area, engagement between researchers, water managers and policy makers can still be facilitated. Adapting water management to new needs requires tools from different knowledge areas. The Water Framework Directive constitutes the regulatory core around which new management practices have to be set, but many aspects require technical and scientific support. The interaction between projects to produce common policy briefs is more effective than working alone.

In the field of emerging pollutants there are many opportunities to generate valuable results for the stakeholders. There are many substances that are not part of routine monitoring programmes but may be candidates for future regulations, depending on

[1] Vörösmarty C.J. et al., Nature 2010(467), 555–561

research on their (eco)toxicity, potential health effects, public perception and occurrence in the various environmental compartments. Examples of RDI needs are the development of more sensitive and validated analytical methods for environmental samples, technology for effective and efficient removal and control, identification and quantification of the effects of emerging pollutants in wild biota, wastewater-fed agriculture and aquaculture, and microbial resistance to antibiotics, among others.

Poster session

Each project presented a poster providing the most relevant information about the consortium, research objectives, methodology, results, potential collaborations, stakeholders, conclusions, etc. The posters were collected and made available in advance to the attendees on the Water JPI website. During the poster session, the attendees used sticky notes to mark the posters, which were relevant to their research, indicating also the potential collaborations, synergies, approaches from other fields to the problems addressed by the projects, etc. Templates (Annex 3. Templates) were provided to the participants to keep a record of the relevant projects and the questions received from the other attendees. This session facilitated the sharing of knowledge and experience as well as the identification of possible collaboration between projects.

The posters of all participating projects can be accessed at the website of the Water JPI.

Breakout group sessions

There were four breakout sessions and participants attended the session they considered most relevant to their area of research and expertise. Each group was moderated by a chairperson and had a rapporteur:

a) **Ecological status, Human risks and environmental risks**. Chair: Elve Lode (TLU, EE), rapporteur: Prisca Haemers (RWS, NL). Projects: CONPAT, PEACE, PERSIST, PROGNOS, TRACE, WE-NEED,
b) **Chemical analysis**. Chair: Øyvind Mikkelsen (NTNU, NO), rapporteur: Miguel A. Gilarranz (MINECO, ES) Projects: AOPI, Geosorbents, MOTREM, The role of…, PROMOTE.
c) **Microbial resistance**. Chair: Robert Konecny (UV, AT), rapporteur: Mats Svensson (SWAM, SE). Projects: DeTER, Pioneer_STP, REMANTAS, StARE.
d) **Treatment, reuse, management**. Chair: Steven Eisenreich (VUB, BE), rapporteur: Alice Wemaere (EPA, IE). Projects: ACWAPUR, DESERT, MEPROWARE, PARME, StARE, Watintech.

The work in the breakout groups was divided in two sessions. In the first session, the discussion was focussed on collaboration, the impact of collaboration and the resources and framework needed. The discussion points raised were:

- Potential collaborations identified based on techniques, methodology, sharing data, etc. Assess if they are feasible and likely to occur, and what effect they would have on the impact and outcomes of the on-going and future projects.
- Collaborations that are less likely to occur but that could lead to new approaches. For example, those that could lead to including researchers from new fields, not commonly involved stakeholders, etc. The discussion was not limited to the projects participating in the workshop, but also extended to the research in the field of emerging pollutants.
- Framework and resources needed to achieve the collaborations identified.
- Recent advances that can change the view of the community on certain topics, and maybe lead to reformulation of on-going workplans.

In the second session the discussion was focussed on stakeholders, gaps in the Water JPI SRIA and RDI needs. A flexible criterion was considered to identify the stakeholder groups, thus including policy makers, regulatory agencies, researchers, users (such as water enterprises, water utilities, river basin management bodies, farmers, industry, etc.), media and the public. The discussion points raised regarding stakeholders were:

- Stakeholders in the field of emerging pollutants and assessment of their power and interest in relation to projects. Power was defined as the capacity to influence a project or use the results, and interest as the willingness to influence or support a project (Annex 3. Templates used to facilitate discussion).
- Identification of strategic stakeholders for this area.
- Strategies and actions for the involvement of stakeholders.

The main discussion points raised regarding gaps and RDI needs were:

- New breakthroughs and uncertainties in the field.
- Gaps in relation to the Water JPI SRIA.
- Where is more knowledge needed to understand the problem, and in what cases does the application of RDI results require more knowledge.

Wrap-up of the breakout group sessions by rapporteurs and plenary discussion

(Chair: Padraic Larkin (Water JPI Co-Chair))

This section is based on the notes from the rapporteurs and chairs of each breakout group, and provides an overview of the main points of discussion.

Ecological status, human risks and environmental risks

The projects participating in this breakout group identified links between the measurement and monitoring of emerging pollutants in surface and groundwater. The

common opinion was that such a workshop on a dedicated research area was very welcome and facilitated collaboration between international projects.

Regarding the type of collaboration needed in the field, the group discussed some specific areas and data collection:

- Develop a common understanding of the characterisation of measurements and monitoring techniques.
- Share research sites, and monitoring strategies and characterisation.
- Open project data from one project to other selected groups, thus generating multiple uses of the data collected in the field and enhancing knowledge gathered from an experimental site.
- Open the experimental sites to other research projects in areas such as social sciences, political economics, etc. This can promote a more holistic approach to the challenges caused by emerging pollutants.

In order to develop the type of collaborations described, the participants highlighted the need for long-standing commitment to the research. Examples of actions are:

- Long term research sites to measure the influence of climate change, such as "super sites" or living labs open to researchers from different countries.
- Research networks (e.g. knowledge hub) that could facilitate the creation of a continuous line of projects in this field.

A general remark regarding the framework for Water JPI funded projects was that some partners were in difficulty because funding was not available at the same time for all countries.

The group identified a large number of stakeholders (32) that were grouped in the following categories:

- Local, national, European and international regulators, and policy-makers.
- Water catchment management boards.
- Water treatment authorities.
- Water users and polluters: households, industry, farmers.
- Non-Governmental Organisations (NGOs)

Most of them (23) were defined as highly interested in the projects, although not always with the power to influence them.

The relationship between researchers and stakeholders can vary from one case to another. In some projects, the stakeholders participate as partners in the project and also financially support the research. Some river basin authorities allow research in their river basins. Some water users are hampering the dissemination of research results because it is not in their immediate interest and they direct their efforts to other priorities. Very often, stakeholders are not involved, not because a lack of

interest, but rather because of a lack of time. The Water JPI could use events and workshops to promote stakeholder engagement at national and EU level. The Knowledge Hub is an option.

Discussion on research gaps in the SRIA in the field of emerging pollutants led to the following conclusions:

- Microplastics and their link with toxic pollutants should be included.
- The influence of climate change on water balance and therefore its effects on emerging pollutants in the water should be considered.

The group also gave some feedback on the Water JPI projects:

- JPI calls are intermediary between national and EU calls. As they are not as complex as H2020 calls, they are a good way to help young scientists to enter the international cooperation arena.
- The project funding is geared towards basic research. The funding is too low to also include dissemination and stakeholder engagement.
- The Water JPI could facilitate similar activities to COST with a view to developing research continuity and consortium building.

Chemical analysis

As a first approach, the group discussed the collaborations and links identified during the poster session. Examples of these collaborations during the lifetime of the research projects and for the future include:

- Assessment of efficiency in the removal of emerging pollutants in water treatment plants.
- Monitoring strategies for real-time control in water treatment plants
- Online and passive sampling.
- Identification of polar contaminants, designated as novel because the difficulty of identification.
- Toxicological effects of polar contaminants and behavior in treatment processes.
- Long-term sampling combined with accounting for missing events or short life contaminants and intermediates. Application is possible for instance in lake monitoring.
- Complementing research in water treatment with analytical capabilities.

The participants discussed the context and gaps driving the collaborations:

- There is a demand for real-time, sensitive, cheap and easy to use analytical methods and tools. It is difficult to find all these characteristics together in a single analytical method.
- Real-time response is needed at water treatment plants, but it is only possible for a few contaminants and intermediates. There is a general interest in broadening

the scope of application of sensors. Identification of lumps of chemicals with associated risks is also an alternative.

- Facilities management is based on monitoring using the techniques established in the market. In order to spread the use of new techniques and parameters, these need to be included in monitoring programmes and in policy. Currently, measuring and disclosing parameters not required by regulations is an uncommon practice and can be perceived as a threat to the public image of the organisation operating the facilities.
- There is technology available for the analysis of a wide range of pollutants, although still there are some gaps.
- Detailed information about all potential parameters is not possible on a routine basis, as they are mostly measured in laboratoriess after sampling and not on-line at the plant.
- There is interest in risk-based approaches, including fast detection and screening methods, decision-making tools and detailed analysis once a risk is identified.

Regarding the type of interactions needed among different areas in the analysis of emerging pollutants, potential collaborations were identified:

- Groups using different methods to collect and combine different techniques, producing information at a different time scale (e.g. sensors and passive samplers).
- Risk assessment groups can define the link between the presence of a certain chemical, or lumps of chemicals, its concentration and the risks, thus driving sensors or analytical methods. Modelling is needed since there are multiple synergistic and antagonistic effects, etc. Modelling is also needed to be able to transfer information between different scenarios and catchments.
- Coordination with groups working on accumulation of pollutants in biota to identify proper indicators. For instance, the indicators based on the accumulation of substances in fish are not totally indicative of the risks.
- Collaboration with managers (e.g. basins, water utilities) to define where and what to measure. This can help in the development of better methods tailored according to the type of risks, hot spots, contamination sources, etc.
- Users of sensors, such as water utilities, should define the type of routine maintenance and associated cost they can afford, and this can then be taken into account for method development. The cost of specific sensors can be accepted by users if the data obtained have value.
- Materials and surface chemistry groups can help the development of sensors resistant to a higher variety of environments (e.g. avoid fouling and failure), and to rapid changes in conditions.
- Robots can increase the area monitored by a single sensor, helping to have more representative data and reduce investment in sensors.

The identified collaborations which could be impactful include:

- Tailor-made monitoring devices and strategies, which could be designed for specific purposes, thus addressing different problems, and regulation needs at the catchment scale.
- Monitoring (which could be better adapted to changing situations) could provide indicators of global change.
- Environmental monitoring could be improved by using multi-analytical approaches.

For the identified collaborations to be effective, proper funding instruments are needed. In addition to this, the following would facilitate the collaborations:

- Regulations should allow scaling-down and working at catchment scale, thus making it easy to pay attention to local conditions and problems.
- Regional balance in projects is an added value, but only if the developments can be transferred from one region to another and if scaling-up is possible.
- More importance should be given, in the funding schemes, to the involvement of water end users.
- Harmonisation of databases from basins, projects, etc. and availability of data can contribute to more ambitious approaches.

A large number of stakeholders, including water companies and facilities, manufacturing industries, authorities, policy makers and managers, citizens, infrastructure and equipment companies, farmers, aquaculture, forestry, scientists, etc. were identified. The large number and the broad profile scope are indicative of the magnitude of the challenges related to the occurrence of emerging pollutants in water, and in the environment in general. The discussion about the profile of the stakeholders and the strategy for engagement with them was focussed on the following:

- Water treatment plants and utility staff are important stakeholders in water-related research projects. They can indicate what type of RDI results are more relevant for them, thus influencing the projects. Likewise, they can be well targeted through projects which have common objectives for researchers and companies, and both of them receive funding.
- Authorities (national EPAs, water, food, basins, etc.) are influential when involved in projects as they are responsible for the legal framework. They can be more easily approached at a small-scale level (e.g. city). Adaptation of RDI results for policy briefs targeted at certain authorities can be effective. To foster collaboration, authorities should be asked to provide an agenda of challenges to be addressed by researchers. In doing so lobbying risks should be managed, thus resulting in a system more open for the whole scientific community.
- Farming and the forestry sector are a focus of many projects and can influence the results, however the interest in applying the RDI results is usually low because they have limited resources and different concerns. The collaboration could be channeled through associations, cooperatives, etc. representing the sector, and facilitated if incentives for their involvement are available.

- Chemical and pharmaceutical industries begin the life cycle of some emerging pollutants. They produce the substances and also wastewaters, therefore the power to influence the research projects is high. The interest is not the same in all countries. In some cases, it is easier for a researcher to involve a foreign company, rather than a national one, in his/her research project.
- City planners and developers should be considered as a powerful stakeholder. Attracting their interest can result in better strategies to secure good quality water, even during periods of water scarcity and floods.

Regarding new RDI needs and gaps in the Water JPI SRIA, the group agreed that the SRIA was a robust document and that no major research needs were missing. The discussion showed the importance of further progress in the standardisation of analytical procedures and sampling, in particular in cases where the detection limit is important to assess effects. The interest of new combinations of techniques with different time resolution was also discussed.

Microbial resistance

Some projects funded by the Water JPI in this topic were already networking using/via other initiatives. The field of microbial resistance due to antibiotics in water is a good example of collaboration and a number of examples were identified among the projects participating in the breakout group:

- Standardised protocols for sampling and analysis can be transferred to other projects and types of waters (e.g. groundwater vs. seawater). Large-scale sampling and filtering technology can improve detection, although analysis of mult-resistant bacteria and genes in small samples is also required.
- The database generated by one project can be used by other projects to include new targets.
- Projects dealing with water treatment could include a new target related to antibiotics, resistant micro-organisms, genes, etc. This could be made easier with the help of groups working with a broader set of antibiotics, micro-organisms, etc.
- New in-situ detection systems and comparison to older technology (GS, MS etc.) can improve monitoring.
- Methodology used in projects dealing with microplastics could be used for looking at Trojan horse effects for micropollutants and microplastics.
- Expertise in the detection of free DNA in water samples, sludge, sediments, etc. and also adsorption and biodegradation can be useful to others to study development of resistance.
- Collaboration with a water treatment project can help to elucidate the fate of antibiotics and resistant bacteria during and after the treatment.

In terms of collaboration, there are some topics that can act as joint focal research points, in particular microplastics, photochemicals and the study of the mutation mechanisms.

In general terms, the type of collaborations needed in the field to progress in the diagnosis of problems and abatement measures include:

- Harmonisation and monitoring technologies.
- Laboratory inter-calibration study of micropollutants.
- Harmonisation of sampling and storage techniques.
- Partnering with corporations.
- Benchmarking of water treatment technologies.

Collaboration in the field of microbial resistant and related emerging pollutants can be facilitated by certain resources, structures and frameworks, such as:

- Mechanisms for sharing of information and consolidation of the collaboration among the projects connected by networking activities. Conferences/Workshop of common interest can act as meeting places for continuing networking (e.g. SETAC conference).
- Networking activities related to inter-calibration, including new information available at chemical libraries.
- Clustering topics within the Water JPI SRIA and preparing information for future agendas (e.g. Water JPI SRIA 3.0).
- Follow-up of this workshop with the same group of people. Improve the workshop structure, for instance, poster session combined with flash oral presentations.
- Networking with key industry partners.
- Improve mobility within the projects funded by the Water JPI and between projects funded by different JPIs, for instance student exchange and joint training.
- Provide mechanisms for equipment mobility and expert mobility for exchange of advice, increase the quality of existing equipment.

The field of microbial resistance caused by antibiotic pollution has grown substantially in the last few years, but there are a large number of uncertainties and gaps to be addressed by future research, in particular:

- Assessment of representative networks for sampling and sites, i.e. determine where microbial resistance is and to what extent. The consideration of local and regional issues should be included.
- Implement strategies for the off-take of individual genes.
- Role of particular types of antibiotics that have been tested and anthropogenic pollutants. The relation to the concentrations that are applied and the threshold for building up of antibiotic resistance should be considered. There is a need for more quantitative data.

- Identification of biomarkers and long-term cumulative effects. Ecotoxicology is still lacking in the study of chemical cocktail effects. Multiple resistant bacteria presence is currently not part of the ecological status in Water Framework Directive.
- Understanding and modelling of resistance spread.
- Standardisation of monitoring and procedures for the comparison of national data.
- Screening to identify the antibiotic resistance genes that should be targeted, together with the study of the context in which they appear.
- Risk assessment, risk prevention and mitigation measures.

As in the other topics discussed, there are a large number of stakeholders. The most relevant ones identified were:

- The Pharmacological sector, responsible for the development of better medication or application techniques.
- The Pharmacies, providing information and take-back schemes.
- The health sector including health authorities, releasing dose recommendations.
- The environmental regulatory/legal sector.
- Veterinary sector in terms of animal treatment.
- Education sector, as it can provide information about multiple resistance and relationship to consumption and husbandry usage, stewardship and better control.
- Food industry.
- Government, addressing the socioeconomic impacts.
- Aquaculture industry.
- Water companies, although they are competitors and may be interested in excluding the others.
- Wastewater/Sewage companies and sludge treatment facilities.
- Public and NGOs

Actions for targeting and engaging with these stakeholders could include:

- Informing society by creating a public pressure on the Pharmacological and health sector.
- Newspaper articles.
- Social media: Facebook, etc.
- Material for Schools.
- Lectures at medical schools.
- Development of Bathing Water Directive and the Water Framework Directive. Interaction with Common Implementation Strategy (CIS) groups and national focal groups.
- DG Environment hearing.

Treatment, reuse, management

The breakout group discussion on the topic of water treatment, reuse and management, identified the following ways of fostering and improving collaboration within on-going projects:

- Common activities should be included in the project in order to make the collaboration between partners more efficient (e.g. horizontal activities, such as modelling).
- Development of researchers' exchanges between the partners' institutions.
- Joint demonstration sites.
- Sharing of/access to Research Infrastructure in partners' institutions.
- Including collaboration as an evaluation criterion during the evaluation of research proposals, although there is a need for some flexibility.

The collaboration across on-going projects can be fostered by sharing Stakeholder Advisory Groups between projects. Water JPI Networking workshops are useful in this sense, as well as Knowledge Hubs.

Regarding the engagement of stakeholders, the following actions were proposed based on the experience and lessons learnt by the participants:

- Setting up Project Advisory Boards after the proposal is awarded. The Advisory Board members are nominated by the partners and invited to participate in all meetings. In the example provided, the Advisory Board members' travel costs are covered by the partners who nominated the members, and not from the Water JPI project budget.
- Targeted Publications. Prepare more technical paper (i.e. not just scientific) which could be published in a journal which is read by water companies.
- Clustering of Water JPI Projects at Water JPI level. Consider clustering of the Water JPI (national budget could, maybe, contribute to this).
- Stakeholder Events at National Level. Could consider a joint event with several projects, and focussed on dissemination to stakeholders.
- Co-design and co-development at project level. Stakeholders should be involved in the design and development of the research projects – not just in the dissemination. This would maximise the impacts which really should be the "end game" for the Water JPI. A project communication strategy should be developed in these cases, and the research outputs would need to be translated (message targeted at stakeholders). The WssTP and the EIP on Water could help to identify stakeholders. In the case of society, which is particularly relevant when dealing with acceptance of new technologies, Consumers Associations could be considered.

- Interact at the local level. Organise technical information days where demonstration to the local stakeholders of the use of technology/solutions can be made. Attend relevant exhibitions / fairs / demonstration days at the local level.

The interaction with stakeholders and linking with them takes time and this may not be a priority for all academics. Knowledge transfer requires specialist skills, but some academics may not have the time or the interest to develop such skills. Therefore, projects may need to consider having a dedicated budget/Work Package on this.

The main RDI Needs and Gaps discussed were:

- Agricultural system capacity to degrade some compounds.
- Long-term reuse management strategies.
- Knowledge about the compounds that Pharmaceutical companies are developing.
- Relating biological activity with pollution event.
- Long-term and short-term effect of compounds/emerging contaminants.
- Passive sampling for emerging contaminants – developing low-cost solutions.
- Effect-based monitoring.
- Emerging contaminants and drinking water treatment processes.
- Research should be linked to the revisions of the WFD in 2019;
- Interactions between various contaminants in terms of toxicity levels – linking chemical concentrations and toxicity.
- Full-scale land spreading of sediments and sludge.
- Impacts of extreme events (floods) on flush effect of contaminants.

The participants in the breakout group also discussed the logistics and management issues related to the projects they are executing:

- The reduction of the budget during the Call Evaluation Process and/or the elimination of project partners during Call Eligibility Check and Evaluation Process would require an adjustment of the proposal scope. This is currently not the case as applicants are requested to keep the same scope.
- Delays in payments for some partners result in delays of the projects. The possibility of time extension needs to be clarified.
- Consortia to be clearly informed of the Project Management and Reporting guidelines and templates, as well as be provided with the contact details of the Follow-Up Secretariat for contacting them for any issues relating to the overall project. This information also needs to be easily accessible from the Water JPI website.
- It was suggested the Water JPI consider making IP considerations a compulsory requirement in the Consortium Agreement.

Discussion

After the presentation by the rapporteurs of the discussion in the breakout groups some aspects were revised in a plenary session. Some of the participants were involved in other actions that facilitate networking, such as COST. It would be interesting that the Water JPI provide a similar framework, supporting researchers to meet and discuss how to continue collaboration when on-going projects finish and think about new consortiums from previous mutual knowledge, which can be particularly important for young researchers willing to develop new projects. On the other hand, the Water JPI should not duplicate existing instruments.

The involvement of citizens is a usual gap in projects. The role of the Social Sciences researchers is important in this sense. Some of the attendees commented on their collaboration with groups in this area, mainly with the objective of economic evaluation, treatment cost, etc. Social Sciences groups can also help to engage with stakeholders, disseminate and transfer knowledge, media analysis, etc.

The opportunity of engaging stakeholders through project advisory boards is interesting and can lead to some changes in the objectives or tasks. It would be advisable to involve the stakeholders from the creation of the proposal.

Keynote: The Knowledge Hub of the Water JPI

(by: Kristina Laurell (FORMAS, SE))

The speaker discussed the nature of the knowledge gathered in initiatives such as the Water JPI. Knowledge is an intangible valuable resource that cannot be separated from competence. The transfer and dissemination of knowledge is a key issue. In order to address this, the Water JPI is building a Knowledge Hub that will be a network of selected research groups and targeted at stakeholders. The Knowledge Hub will establish a critical mass of research and technological excellence. The purpose of the Knowledge Hub is to integrate and share knowledge, infrastructures, data and modelling tools, training and capacity building, in addition to improved communication and networking with stakeholders and the scientific community.

Different instruments are currently being explored by the Water JPI to build the Knowledge Hub, which requires workshops helping to define and build it. In the longer term, the Water JPI aims at building an overall Water JPI Knowledge Hub based on Knowledge Hubs built around clusters of projects, stakeholders, etc. on a common RDI topic. Thus, the first Knowledge Hub will focus on the research area of emerging pollutants.

During the discussion, the difficulty to reach a common definition and understanding of define what a Knowledge Hub is arose. It could be:

- Built around researchers and/or around knowledge, etc.

- A meeting place for researchers, and also for stakeholders

Overall the Water JPI, researchers and stakeholders must benefit from being part of the Knowledge Hub of the Water JPI.

In the interaction with stakeholders, it is important to understand real problems and communicate and transfer the knowledge and technology that can be used. Therefore, a Knowledge Hub could be a place to foster interaction and discussion between researchers and stakeholders.

The researchers will clearly benefit from the Knowledge Hub, especially if it is implemented soon and gives continuity to the Water JPI Pilot projects near completion, as a way to continue with this interaction with the stakeholders. It is important to establish synergies and collaboration in the topic selected for building the Knowledge Hub, but there is some uncertainty about how the critical mass can be built. Attention has to be paid to complement and not duplicate networks already established. For instance, the Water JPI will not duplicate actions developed by other initiatives such as NORMAN or COST actions, since in the proposed Knowledge Hub of the Water JPI the research funding agencies will be also involved, as well as the stakeholders (i.e. not only involved in governance of the network).

General Remarks

Alignment of on-going RDI projects is a goal for the Water JPI in order to increase the efficiency of the community. RDI projects can also benefit from collaborations with other projects and relevant stakeholders, which can lead to new approaches to tackle challenges in their field. The identification of stakeholders and the key research needs and knowledge gaps can help with alignment. Topics of common interest, such as emerging pollutants, are very relevant to foster and facilitate such collaboration between research projects, resulting in a more focussed debate in this particular area. A Follow-up to this workshop is recommended, and could be extended to include stakeholders. Some modifications in the structure, such as including flash presentations could improve mixing among the participants.

Researchers are receptive to the concept of new collaboration with other relevant research projects, as well as with other disciplines. There is also some margin to improve collaboration within the transnational and/or transdisciplinary research projects. Such collaboration could be promoted by including it as a criterion during the evaluation of the proposals. Financial support for networking and long-term collaboration is required, although some opportunities, such as conferences of common interest, could be used to facilitate this interaction. Workshops and meetings on a dedicated research field such as emerging pollutants facilitate the collaboration between international projects.

Different types of collaboration within and between research projects can be achieved, some of them being more effective and acting as "glue" actions (e.g. modelling, intercalibration, open data, sharing advisory boards). Sharing of data, infrastructures and sites are highly demanded. Transdisciplinary collaboration is recognised as highly beneficial but is more difficult to achieve.

Targeting stakeholders is important to bring the RDI results to the society. A large number of stakeholders and profiles were identified, showing the complexity and magnitude of the concerns related to emerging pollutants. Most of the projects participating in the workshop are already collaborating with stakeholders. Involvement of stakeholders from the design of the projects is preferable, although the observed interest from some of the stakeholders is low. Interest increases when stakeholders are together (e.g. citizens and consumer associations). Authorities are important stakeholders that can be more easily engaged, especially at the local level. In addition to this, regulation considering local effects, standardisation of methodologies and databases are required.

Specific stakeholder's engagement strategies are needed to target stakeholders: common language, policy briefs, materials for schools, targeted events, professional exhibitions, etc. There are clear pros and cons to the engagement of stakeholders, above all the researchers must accept the need to devote time and endeavour to keep contacts active. Some actions such as mobility, training, advisory boards for projects, etc. can help to bridge the gap between researchers and stakeholders. Suitable funding mechanisms are needed for long-term collaboration to address complex challenges.

The SRIA of the Water JPI is a robust document reflecting most of the research needs highlighted by the participants. As a general comment, the definition of emerging pollutants should be under constant revision.

The main research needs that should be addressed by the community working on emerging pollutants were identified during the workshop as:

- Monitoring and sensors,
- Risk assessment,
- Modelling,
- Interaction with microplastics,
- Discrepancy between ecological and chemical status,
- Long-term vs. short-term effects,
- Cumulative effects,
- Biota response,
- Role of agricultural systems in degradation,

- Long-term reuse management strategies and spreading of sediments and sludge.
- The responses under climate change and extreme events should be clarified.
- Microbial resistance: sampling, offtake of individual genes, methods providing quantitative data, thresholds and mechanisms of resistance, risk assessment and mitigation.

The feedback received on the Water JPI funding included positive opinions about the lower complexity of the calls in comparison to EC ones, which is good for helping young researchers trying to internationalise their research activity. Some aspects of the call, eligibility check and evaluation, such as the reduction of budget and the elimination of partners should be clarified. There is also a demand of more information about project management, reporting and intellectual property considerations. Main difficulties during the execution of the projects come from availability of funding at different time for the partners. On the other hand, the engagement of stakeholders and communication are difficult due to limited budgets.

While the structure and objectives of the proposed Water JPI Knowledge Hub and objectives require further clarification, the Knowledge Hub was perceived as an interesting and worthwhile tool to continue collaboration and engage stakeholders. Thematic knowledge hubs can help to channel interaction and build critical mass.

Annex 1. Attendance list

Name	Last name	Organization/Project
Áine	Murphy	EPA (IE)
Aldo	Covello	MIUR (IT)
Alfieri	Pollice	MEPROWARE project (2015 Water JPI Joint Call)
Alice	Wemaere	EPA (IE)
Anna Maria	Christoforou	RPF (CY)
Anne	Heponiemi	AOPI and Geosorbents projects (FI)
Carles	Borrego	TRACE project (2013 Water JPI Pilot Call)
Celia	Manaia	StARE project (2013 Water JPI Pilot Call)
Christian	Alecke	BMBF (DE)
Corinne	Le Gal La Salle	PERSIST project (2013 Water JPI Pilot Call)
Damia	Barceló	IDAEA-CSIC (ES)
Dearbhaile	Morris	DeTER project (IE)
Dominique	Darmendrail	ANR (FR)
Donald	Pierson	PROGNOS project (2015 Water JPI Joint Call)
Elve	Lode	TLU (EE)
Fiona	Regan	Project: the role of passive sampling in screening and monitoring of new and emerging chemicals (IE)
Gaetano A.	Vivaldi	DESERT project (2015 Water JPI Joint Call)
Germana	Santos	FCT (PT)
Giuseppina	Monacelli	ISPRA (IT)
Graham	Leeks	NERC (UK)
Harri	Hautala	AKA (FI)
Ignasi	Rodriguez-Roda	Watintech project (2015 Water JPI Joint Call)
Ilkka	Miettinen	CONPAT project (FI)
Ion	Marin	AS (MD)
Javier	Marugán	MOTREM project (2013 Water JPI Pilot Call)
Jens	Aamand	ACWAPUR project (2015 Water JPI Joint Call)
Joaquin	Serrano	MINECO (ES)
Juliette	Arabi	ANR (FR)
Kata-Riina	Valosaari	AKA (FI)
Kristina	Laurell	FORMAS (SE)
Laura	Raaska	AKA (FI)
Laurent	Duclaux	PARME project (FR)
Luca	Nizzetto	PEACE project (NO)
Maja	Kolar	FECYT/MINECO (ES)
Marta	Carballa	Pioneer_STP project (2015 Water JPI Joint Call)
Mats	Svensson	SWAM (SE)
Miguel A.	Gilarranz	MINECO (ES)

Monica	Riva	WE-NEED project (2015 Water JPI Joint Call)
Olga	Clevering	DGRW (NL)
Øyvind	Walsø	NEA (NO)
Øyvind	Mikkelsen	NTNU (FI)
Padraic	Larkin	Water JPI Co-Chair
Per	Backe-Hansen	RCN (NO)
Prisca	Haemers	IenM (NL)
Robert	Konecny	AEA (AT)
Rosa	Rodríguez	MINECO (ES)
Sabine	Sorge	JÜLICH (DE)
Sara	Rodriguez	StARE project (2013 Water JPI Pilot Call)
Simona	Stoian	UEFISCDI (RO)
Sonia	Suárez	Pioneer_STP project (2015 Water JPI Joint Call)
Stefanie	Pietsch	JÜLICH (DE)
Stéphane	Le Floch	REMANTAS project (FR)
Steven	Eisenreich	VUB (BE)
Urs	Berger	PROMOTE project (2013 Water JPI Pilot Call)

Annex 2. Agenda

Workshop on Alignment of On-going Projects

The Geological Survey of Austria / Geologische Bundesanstalt (GBA), Neulinggasse 38, 1030 Vienna, Austria

November 30th 2016

Agenda

8:30 - 9:00	**Participant Registration**	
09:00 – 09:15	**Welcome and presentation of the workshop and its objectives**	Chair: Rosa Rodríguez (MINECO) Speakers: Rosa Rodríguez (MINECO) & Dominique Darmendrail (ANR)
09:15 – 09:35	**Tour de Table** *1slide for each project. Presented by speaker*	Chair: Rosa Rodríguez (MINECO) Speaker: Miguel A. Gilarranz (MINECO)
09:35 – 10:05	**Impact in policy of RDI activities**	Chair: Rosa Rodríguez (MINECO) Speaker: Damià Barcelò (ICRA-CSIC)
10:05 – 11:30	**Poster session** **Coffee (served from 11:00)**	
11:30 – 13:00	**Working sessions in parallel groups (Part I)** *Breakout group topics:* *1) ecological status, human and environmental risks* *2) chemical analysis* *3) microbial resistance* *4) treatment, reuse, management*	Chairs: Steven Eisenreich (VUB, BE) Øyvind Mikkelsen (NTNU, NO) Robert Konecny (UV, AT) Elve Lode (TLU, EE)
13:00 – 14:00	**Lunch**	
14:00 – 15:45	**Working sessions in parallel groups (Part II)**	
15:45 – 16:00	**Short Break**	
16:00 – 17:25	**Presentations by Rapporteurs and discussion on the outcome of the working sessions**	Chair: Padriac Larkin (Water JPI Co-Chair)
17:25 – 17:45	**The Knowledge Hub of the Water JPI.**	Kristina Laurell (FORMAS, SE)
17:45 - 18:00	**Conclusions and Closure**	
18:00 – 19:30	**Cocktail and networking**	

Annex 3. Templates

Workshop "Alignment of on-going RDI projects" Objectives and templates

Vienna, Austria
30 November 2016

Project acronym	Coordinator/representative	Notes
e.g. EmergingOne	*Marie ..*	*…..*

Poster session

Objectives:
- mutual knowledge;
- first approach to ways of collaboration, synergies and new approaches.

Notes

Who is interested in your project?	**Reasons for the interest**	
e.g. EmergingOne	*e.g.:*	
In what projects are you interested?	**Reasons for the interest**	

Breakout groups. Session 2

Objectives on targeting stakeholders:
- identify the target groups (stakeholders) of the on-going projects.
- Identify strategic stakeholders and those usually not involved
- define actions for better targeting and involvement of stakeholders

Identification of stakeholders

Group/stakeholder	Power (score 1-5)	Comment/ explanation	Interest (score 1-5)	Comment/ explanation
e.g. policy maker				
e.g. farmer association				

Power = how able they are to influence your project or to use your results

Interest= how they want to influence or to support the project

Stakeholder classification grid

+ power, + interest a… b… c…	+ power, - interest d… e… f….
- power, + interest g…. h… i…	- power, - interest j… k… l….

Stakeholder involvement options/mechanisms. Requirements for involvement

+ power, + interest Actions/mechanisms: … … Requirements: …. …	+ power, - interest Actions/mechanisms: … … Requirements: …. …
- power, + interest Actions/mechanisms: … … Requirements: …. …	- power, - interest Actions/mechanisms: … … Requirements: …. …