Water Joint Programming Initiative Submission
Public Consultation on the JPI Climate's Research Agenda 2016-2025

Date: 31/03/2016

With or without climate change, water-related challenges are already high and complex, and research is on-going to preserve water resources, vital for our societies.

Concerning the water on the continental surface and associated aquatic environment, climate change will further reinforce the tensions on the resources by confirming and increasing them. Thus, the immediate threat posed by climate change, calls for a strong commitment to research that will deliver possible solutions to our policy and decision makers. This information is necessary at fine regional scales (typically river basins/catchments), close to the territories which must take some management or adaptation options or evaluate the consequences of certain choices in relatively close time horizons. The focus of our research is, therefore, within this global, changing and empowering context.

1. The modification of rainfall cycles, rise in temperatures or in extreme climate events will impact the seasonal distribution of water resources, the aquatic environment, their biodiversity, the related ecosystem services, and natural associated risks (floods, aggravated low-flow, etc.). It is all about quantifying these impacts, and to take them into account in public policies and management practices. Research Development & Innovation (RDI) needs include, for example:
   - ⇒ Multiple pressure–impact–response relationships in aquatic, riparian and groundwater-dependent ecosystems: improving knowledge of the direct and indirect effects of climate change and climate change adaptation strategies. Assessing the vulnerability of ecosystems to climate change impacts and the role of aquatic systems in nutrient and carbon fluxes and other global biochemical cycles in response to climate change and extreme events.
   - ⇒ Maximising the reliability of projections of precipitation on various spatial scales and timescales, forecasting the incidence of drought events under climate change scenarios (notably at the regional scale), improving the historical database of past events to establish the risk of future events in response to the effects of climate change, improving the short- to medium-term forecasting of extreme events (notably at the regional scale).
   - ⇒ Managing the effects of hydro-climatic extreme events: developing integrated modelling across surface water and groundwater, coastal and fluvial systems, hydrological and meteorology, water and sediment transport, developing innovative (or improved) tools (such as Early Warning Systems (EWS)) for adaptation to hydro-climatic extreme events, especially floods, developing and setting up technological (e.g. a smart city approach to integrating sensors and EWSs) and integrated systems for the prediction and risk management of urban floods (overflows in advanced wastewater treatment facilities, urban hydrology, surrounding river flow, hydrodynamics, drainage design).

2. The models integrated into the entire water cycle must include the different uses of water. In the contexts of imbalance between the supply of and demand for water or the related services, tensions will continue to increase between these uses and between the objectives of protecting the resource and environments, and those pertaining to economic uses (energy, agriculture,

etc.). Therefore, it is all about preserving the water resources by sharing as best as possible the available resources between agriculture, industry and civil society, while controlling consumptions and removal. For that there is a need to maintain and develop an interdisciplinary and integrated research, for general understanding of these complex systems, combining the knowledge in the field of ecology, social sciences, economics, geography, environmental sciences, geosciences, technology, etc.. RDI needs include, for example:

⇒ Promoting water RDI infrastructures for a better understanding of hydrological processes on different scales, improving access to data and the assessment of uncertainties related to climate change mitigation, climate adaptation strategies and the monitoring of the global water cycle.

⇒ Strengthening socio-economic approaches to water management: integrating economic and social analyses into decision-making processes. Setting up risk management strategies taking into account socio-economic needs, environmental dynamics/risks and land use in areas vulnerable to droughts and floods.

⇒ Developing people-centered monitoring, including both expert and local knowledge.

⇒ Preparing strategies for improving the handling of extreme weather events through the collection and analysis of post-disaster data (including practices/measures), the training of decision-makers in terms of needs to adaptation to climate change impacts (e.g. water utilities / infrastructures management).

⇒ Developing risk-based decision-making and planning tools including social sciences, economics, effective communication and conflict resolution.

The **JPI Climate Strategic Research Agenda (SRA)** identifies four interconnected work modules, which represent the priority research areas where knowledge is needed:

1. Moving towards reliable decadal climate predictions;
2. Climate services research;
3. Sustainable transformation of society; and
4. Decision-making tools.

The iterative process for updating the **Water JPI Strategic Research & Innovation Agenda (SRIA)** built on a thorough review of documents, including the **Climate JPI Research Agenda**. The research priorities included in these four Climate JPI priority research areas have multiple relations with various areas identified in the **Water JPI SRIA**, among them:

- **Provide reliable climate information for the next few decades up to the centennial scale**: The characteristics of extreme events are not well known due to the sporadic nature of extremes and the limited availability of long time observation series. An increased use of global reanalyses would boost research on past extreme events. Improving climate models in terms of resolution and parameterisations relevant for extreme events and increasing the number of model simulations, would offer better perspectives for addressing the likelihood and magnitudes of extreme events under climate change
- **Improve the observation, understanding and modelling of key processes and mechanisms**: Enhancing the scientific understanding of key processes, mechanisms, feedbacks, system (in)stability, as well as teleconnections and circulation patterns that are significant for climate on decadal timescales and potentially linked to instabilities in the climate system. Improving the representation in process models critical for precipitation and the water cycle, the weather and climate events, climate variability and teleconnections as well as

anthropogenic and natural perturbations (such as land use change, atmospheric constituents, volcanoes, aerosols...).

- **Better tools/methods for providing climate services:** A collaborative approach must be taken to data availability, the development of climate scenarios, an understanding of the strength and nature of the impacts of climate-related events on human activity as well as the nature of the uncertainties involved to arrive at comprehensive and consistent Climate Services
- **Understanding the social dimensions of climate change:** Explores new modes of knowledge production and contributes to social learning. The overall aims at enhancing the connectivity of knowledge between disciplines (interdisciplinarity) and beyond, by bridging between science, society and policy (transdisciplinarity).
- **Integrating global climate change analysis and assessment:** Support development of robust and inclusive global scenarios that are consistent with global assessments of climate change and enhance communication of these via increase interdisciplinary and trans-disciplinary development within and outside the climate change community.

The following themes & subthemes of the **Water JPI SRIA** 1.0 (published in 2014) were identified as very relevant to some of the knowledge gaps identified by the Climate JPI:

1.3. Managing the effects of hydro-climatic extreme events and multiple pressures on ecosystems

- Understanding the causes of drought/scarcity; predicting drought events and water scarcity
- Developing innovative (or improved) tools for the protection and prevention of hydro-climatic extreme events
- Improved water management to mitigate the harmful impacts of extreme events

2.2. Minimising risks associated with water infrastructures and natural hazards

- Towards urban flood proof cities
- Improving the performance of water systems
- Assessing the impact of water scarcity on safe drinking water

5.2. Strengthening socio-economic approaches to water management

- Integrating economic and social analyses into decision-making processes

5.1. Enabling sustainable management of water resources

- Promoting adaptive water management for global change

Other RDI needs were identified in the **Water JPI SRIA**, but are not included in the **JPI Climate SRA.** These include, for example:

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

- Establishing multiple pressure–impact–response relationships in aquatic, riparian and groundwater-dependent ecosystems

3.1. Developing market-oriented solutions for water industry

- Promoting innovative approaches to asset management

4.1. Improving water use efficiency for a sustainable bio-economy sector

- Progressing towards future-proof agricultural water use

For more information, please consult: www.waterjpi.eu

The Water JPI is currently finalising its next version of its SRIA (version 2.0), which is due to be approved by the Governing Board in April 2016. The following research needs were identified by the

Water JPI Advisory Boards at their last meeting (21/03/2016), as being of particular relevance to the Climate JPI with the possibility of synergies and/or Joint actions (e.g. exploratory workshop(s) to further identify the needs for possible Joint call(s)):

- ⇒ Developing approaches for assessing the ecological functioning of ecosystems;
- ⇒ Understanding and managing ecological flows;
- ⇒ Integrated eco-technological solutions for the remediation and mitigation of degraded water bodies and aquatic ecosystems;
- ⇒ Understanding the causes of drought/scarcity, predicting drought events and water scarcity and developing adaptation measures;
- ⇒ Developing innovative (or improved) tools for adaptation to hydro-climatic extreme events, especially floods.

It will be important to clearly identify the policy relevance of the research needs included in the Climate JPI SRA. In addition, the relevance of the Climate JPI to the UN Sustainable Development Goals could possibly be strengthened. Currently, there is one sentence in the draft SRA: *"Furthermore, JPI Climate will aim to play a key role in linking research on adaptation and on mitigation with the 2030 Sustainable Development Goal on Climate and addressing connectivity of development pathways across and beyond Europe. Such inter-linkages need to be explored, assessed and evaluated across scales and objectives."*
We would therefore suggest that at least the relevant goals be listed in the SRA, for example:

- ⇒ SDG 13: Take urgent action to combat climate change and its impacts
- ⇒ SDG 6: Ensure availability and sustainable management of water and sanitation for all
- ⇒ SDG 7: Ensure access to affordable, reliable, sustainable and modern energy for all
- ⇒ SDG 2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture

The link and synergies with other JPIs& EU initiatives need also to be reinforced in the Climate JPI SRA, e.g. with the:

- ⇒ Water JPI;
- ⇒ FACCE JPI;
- ⇒ Horizon 2020 (Societal Challenge (SC) 5, but also SC2, 3, 4 and 7);
- ⇒ Climate KIC.

Collaboration between the Climate & Water JPIs, under the Water JPI Theme 5 (*Closing the Water Cycle Gap*) should be further investigated, especially under the forthcoming Water JPI proposal **WaterWorks2017**, in response to the ERAnet COFUND topic of the Horizon 2020 Societal Challenge 5 Work Programme 2017, on ***Closing the water gap***, for which Cooperation and coordination with other ERA-NETs and/or JPIs to increase synergies on cross-cutting issues, where appropriate, is encouraged.

Contact:
Water JPI Secretariat: Waterjpisecretariat@agencerecherche.fr