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| **To:**  | Directorate General for Research & Innovation European CommissionSDME 2/2B-1049 Brussels – BelgiumRTD-ENV-H2020STAKEHOLDERS@ec.europa.eu  |
| **From:** | The European Network of Freshwater Research Organisations EurAquaDr. Antonio Lo Portochair@euraqua.org  |
| **Subject:** | EurAqua response to:*CONSULTATION OF STAKEHOLDERS ON POTENTIAL PRIORITIES FOR RESEARCH AND INNOVATION IN THE 2018-2020 WORK PROGRAMME OF HORIZON 2020 SOCIETAL CHALLENGE 5 'CLIMATE ACTION,ENVIRONMENT, RESOURCE EFFICIENCY AND RAW MATERIALS'* |
| **Date:** | April 8, 2016  |

EurAqua is the European Network of Freshwater Research organisations. It comprises 25 member institutes originating from 24 EU Member States and European Economic Area countries (Annex 1). The EurAqua Partner institutions are leading, generally public, freshwater research institutions in the EU Member States and the European Economic Area. They generally: are key advisors to ‘water management’ Ministries and other regional water authorities, have an international profile, and link to water management industry. Within their respective countries, the EurAqua members are closely connected to other relevant research institutes.

EurAqua welcomes the opportunity to respond to CONSULTATION OF STAKEHOLDERS ON POTENTIAL PRIORITIES FOR RESEARCH AND INNOVATION IN THE 2018-2020 WORK PROGRAMME OF HORIZON 2020 SOCIETAL CHALLENGE 5 'CLIMATE ACTION, ENVIRONMENT, RESOURCE EFFICIENCY AND RAW MATERIALS.

The EurAqua response to this stakeholder consultation has been developed on the basis of the EurAqua Research Agenda (under finalization), and after a discussion in EurAqua’s management board meeting. The basis for discussions was provided by items addressed at the individual Institutes and in combination with transnational research agenda’s from different Joint Programming initiatives.

EurAqua has also been in close contact with the Water supply and sanitation Technology Platform (WssTP). and the Partnership for European Environmental Research (PEER). EurAqua overall supports the points raised in their position. However, these positions do not fully encompass EurAqua’s views concerning the consultation.

The EurAqua position on the five consultation questions is presented in the next pages.

For questions concerning this position, please contact Mr. Michiel Blind at secretary@euraqua.org .

Kind regards,



Dr. Antonio Lo Porto

EurAqua Chair

Kind regards,

**Question 1**

What are the challenges in the areas of Societal Challenge 5 'Climate action, environment, resource efficiency and raw materials' that require action under the Work Programme 2018-2020? Would they require an integrated approach across the Horizon 2020 Societal Challenges and Leadership in Enabling and Industrial Technologies?

Europe faces a number of major challenges. The economic crisis has left many people unemployed and forced governments to austerity. Rightfully, much emphasis is being put on growth and jobs. According to the UN “three out of four of the jobs worldwide are water-dependent. In fact, water shortages and lack of access may limit economic growth in the years to come, according to the 2016 United Nations World Water Development Report, Water and Jobs, which was launched on 22 March, World Water Day, in Geneva. Hence water security supports jobs”, or in other words: **Lack of water, less jobs.**

The migration crisis, too, poses major challenges, not only in Europe and at its borders, but also in those parts of the world where people decide to migrate from. “A well-documented path can connect water scarcity to food insecurity, social instability and potentially violent conflict. As climate change amplifies scarcity worries, more secure water supplies could help the lives of millions in conflict zones” (WRI, 2015). In other words: **Lack of water is one driver for migration.**

The EU has endorsed the United Nations’ Sustainable Development Goals. While water is only in the headline of two goals (“Clean Water and Sanitation” and “Live below water”), most other goals are directly targeting or relating to water, for example: The first target of “Climate Action” concerns “Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries”, which evidently includes floods and droughts. The first goal of “Live on land” reads: “By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements”. In other words: **Lack of proper attention to water will hamper reaching the Sustainable Development goals.**

Europe’s policy on energy and climate comprises both climate mitigation and adaptation. In particular in the field of adaptation, adapting to changing hydrological regimes will require new solutions, which meet the demands of society within the limitations of resource availability. Clearly, the water footprint of energy production is significant, and energy security is heavily reliant on water resources, be it for conventional fuels, biofuels, hydropower and several other new ‘sustainable’ energy sources. In the field of energy infrastructure, many installations are potentially at risk from floods. In other words: **Energy security is worryingly intertwined with water.**

The growing world population, both in number and in wealth, will put additional burden on water resources for food production. Adding the need for biofuels from agriculture will further pressure diminishing water resources. In other words: **Food security is dependent on adequate water supply.**

Besides climate change driving investments in water related infrastructures, much of Europe’s water infrastructure (for floods, irrigation, surface water transport, water supply and sanitation) is nearing its end-of life. Even in better economic times, the investments required for maintaining, replacing and adapting our infrastructures is enormous. On the other hand, failing water infrastructures poses a significant risk for disruption of society. **Water related infrastructure is an often underappreciated critical infrastructure.**

EurAqua welcomes Europe’s initiatives on ecosystem services, nature based solutions, the EcoInnovation action plan, the Life programme and the Horizon 2020 programme as a means to improve the way we look and work with nature and, in particular with fresh water resources and risks. Nevertheless, so far such initiatives have not yet provided the innovative tools that bring us closer to meeting objectives of several European policies, such as the Water Framework Directive, the Flood Directive or the Habitat Directive, global objectives such as Convention on Biological Diversity and Convention on the Protection and Use of Transboundary Watercourses and International Lakes. EurAqua acknowledges that climate change considerations are now included in the development of River Basin Management Plans, but wishes to point out that European sectorial and environmental policies are not aligned and exploited to the full potential and, with exceptions, only limitedly anticipate climate change. **Water policies can benefit from improved awareness and policy adaptation in other, in particular sectoral policies.**

While water quality aspects have not been mentioned explicitly in above sections, water quality is essential for its use, for public health and ecosystem functioning. **When discussing water, quantity and quality need to be fit for purpose.**

Following from the above and the expertise of the EurAqua member institutes, we consider that water, in its fullest extent, is essential to meet Europe’s challenges.

1. To achieve a resilient society at acceptable societal cost, adequate water management targeting availability of adequate quality water and flood protection is essential.
2. To achieve adequate water management at acceptable costs, we need to focus our efforts to speed up the entire research and innovation chain in the field of water and simultaneously address governance and regulatory issues.
3. While focus and problem ownership is essential, water is truly a horizontal challenge (see box 1), which requires commitment from and collaboration with all water-use sectors, most importantly the energy and agricultural sectors.

Building on the previous considerations, EurAqua identified 4 headline challenges:

1. **Extreme hydrological events**
While much has been accomplished, both floods and droughts remain a significant risk to society. How can we enhance society’s resilience to extreme hydrological events? What innovative products and services are required, which improve the resilience at equal or lower cost?
2. **Reduce and avoid combined threats from chemical pollution and their by-products**The society need to move away from the use of environmentally harmful chemicals towards sustainable products and industries. This requires good knowledge of which chemicals are preferred from an environmental perspective, but also technological knowledge about the requirements for good products. It requires cooperation within the industry-consumer-regulator nexus.
3. **Ecosystems: Enhancing services, application of nature based solutions and restoration.**As descried above Europe is likely to fall short on reaching several environmental Directives. EurAqua understands the importance of the economic reality, but is convinced that there is no conflict between growth and environmental protection – indeed, a strong push forward will facilitate growth both in the sector and as a result of long term cost avoidance due to increase efficiency and working with nature.
4. **Basin Wide Management**To enhance efficiency in actions targeting good ecological status, flood risk and biodiversity, it is essential to look from the field scale to the full basin scale. Improved knowledge and tools will provide the basis for decisions with high basin wide impact with respect to reaching policy targets and improving overall resilience.

*Box 1: Water as a crosscutting issues, illustrated by H2020 headlines:*

1. *Pillar 1:*
	1. *Research Infrastructures are essential to gain understanding on all (sectorial) aspects of water.*
2. *Pillar 2, LEIT:*
	1. *ICT – smart sensors, supercomputing, parallel computing are essential for water management. Likewise, ICT, though its energy consumption exerts pressure on water resources.*
	2. *SPACE – Earth observation is an important means for monitoring the state of the environment and improve forecasts of the hydrological cycle.*
	3. *LEIT ‘NMP’ required for novel technologies and engineering w.r.t. water technologies and (aging) asset management and engineering.*
3. *Pillar 3:*
	1. *SC1: Water and public health, water borne diseases and water quality*
	2. *SC2: Water is essential for food production. While inland water management appears prominently on the cover, significant effort has not yet been taken.*
	3. *SC3: Water for energy and energy for water*
	4. *SC4: Engineering for infrastructure for (eco-friendly) waterborne transport*
	5. *SC6: Solving water issues by improving our understanding of the cultural and historical background leading to the current status.*

*SC7: Addressing water security, both in terms of water use and in terms of flood risks, and the entire disaster risk framework, are essential to increase society’s resilience*

Question 2: What is the output/impact that could be foreseen? Which innovation aspects could reach (market) deployment within 5-7 years?

EurAqua thinks that within 5-7 years science based tools and services can be in place to achieve many policy objectives in the environmental field at less societal costs. However, this work needs to be accompanied with strong and targeted measures and policy action in other water-use sectors. Besides cost-effectiveness, this will increase resilience and hence avoid costs due to natural hazards and shocks, The strong European position in the field of water will be maintained, even though international partners step up their effort to deal with water issues.

More concretely, EurAqua thinks that:

1. Earth observation and in situ monitoring tools, sophisticated assessment system analysis tools can quickly advance to a marketable level.
2. New solutions in grey and nature based engineering can be developed that are globally applicable.
3. New materials can be patented that have less contaminating effects, shifting our industry in the forefront of environmentally acceptable production.

Question 3: Which gaps (in science and technology, innovation, markets, policy, financing and governance, regulation etc.) and potential game changers, including the role of the public sector in accelerating changes, need to be taken into account?

The science, technology and innovation on water management is well advanced, though critical knowledge gaps and technological advances required to harvest the fruit of the scientific advances remain. These are mainly described in response to question 5.

The most important driver besides advancing our understanding of hydrological and environmental sciences is the role of policy and regulations. First of all, as mentioned before, the urgent need to focus on water with a problem owner, needs to be supported by full acknowledgement and commitment of key water use sectors, in particular energy and agriculture when it comes to water quantity, and agriculture and chemical industry when it comes to waterbodies used as a sink of pollutants. Second, coherency of existing policies needs to be critically reviewed. New technologies typically endure a more difficult path to implementation as (environmental) policies are developed with old technologies in mind, the regulatory difficulties of osmotic (blue) energy are just an example.

While climate change and demographic changes are often considered in water management, other potential developments, in particular disruptive technologies, policies and developments need to be properly analyzed. Intense immigration for example can deeply impact water resources management and allocation in targeted countries, while at the same time creating problems with the abandonment of cultivated land and agricultural landscape degradation. In the recent past newly appeared technologies developed in a very rapid way showing at the end a sensible impact on water management: GPS, Internet, cell-phones have had significant impact on the society and quickly found its way into water management. Biofuels has exerted significant pressure on water systems, as do microplastics. Rapidly changing dietary requirements in developing countries will lead to a large increase of meat consumption, which in turn will require a great increase in water consumption to feed the animal stocks. What opportunities and threats will follow from new materials and technologies: graphene based materials, 4th agricultural revolution, 3D printing, …. ?

Question 4: Which areas could benefit from integration of horizontal aspects such as social sciences and humanities, responsible research and innovation, gender aspects, international cooperation?

“On 28 July 2010, through Resolution 64/292, the United Nations General Assembly explicitly recognized the human right to water and sanitation and acknowledged that clean drinking water and sanitation are essential to the realization of all human rights. The Resolution calls upon States and international organisations to provide financial resources, help capacity-building and technology transfer to help countries, in particular developing countries, to provide safe, clean, accessible and affordable drinking water and sanitation for all.” (<http://www.un.org/waterforlifedecade/human_right_to_water.shtml>)

EurAqua would like to point out that in order to deliver sufficient and save water to society, the freshwater systems need to be protected and properly managed, but this can not be done without proper involvement of civil society.

More specificly: social science and humanities can and should often play a significant role in water management research. In particular if solutions or barriers are due to cultural backgrounds, the added value of social science and humanities is relevant.

With respect to responsible research and innovation, EurAqua would like to point out that (in-)direct negative effects of H2020 research results on water resources can be considered problematic at best, and un-ethical at worst. Hence we would like to encourage the European Commission to explicitly include water issues into consideration in responsible research and innovation considerations.

Considering gender issues, EurAqua would like to point out improved management of water resources will also provide a better, and possibly more nearby source for supply in developing countries. The document “Mainstreaming Gender in Water and Sanitation Gender in Water and Sanitation” (November 2010) provides a relevant overview on the gender in relation to water supply and sanitation, and hence to the availability of healthy water resources.

With respect to international cooperation, EurAqua would like to point out that this needs to be discussed on a case by case basis. In general, water is a global matter and international cooperation is obvious. A strong European water sector, able to positively deal with the above mentioned challenges, can reinforce or acquire a leading position in the world market and will be in the position to contribute to address global challenges.

Question 5: In view of the recent evolution of the socio-economic and policy context (see point 3 of this document), what are the emerging priorities for Societal Challenge 5?

**Extreme hydrological events**

While much has been accomplished, both floods and droughts remain to be a significant risk to society. How can we enhance society’s resilience to extreme hydrological events? What innovative products and services are required, which improve the resilience at equal or less cost?

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|  | 'Growth, jobs and investment' | 'Energy Union andClimate' | 'Digital Single Market' | 'A Stronger Global Actor' |
| Use of grey-blue-green solutions. Different solutions needed to address droughts and floods. Research needs for mitigation/adaptation options and their effects, including side effects on biodiversity, climate and including aspects such as flashfloods, effects on intermittent rivers and sediment transport.  | **++** | **++** |  | **++** |
| Decade-long strategies, considering long term trends in society and nature, and technology foresight |  | **+** | **+** |  |
| Research on alignment of policies required. Solve contradictions and bottlenecks between policies, e.g. the relation between blue energy and WFD and Habitat Directive, food production and policy versus WFD and Habitat Directive.  | **+** | **++** |  | **+** |
| Early responses – forecasting of extreme events. Need for on-line monitoring – for early responses but also for setting up models. | **+** | **++** | **++** | **+** |
| Soil/sediment aspects. Soil is mainly lost during extreme events – sediments are transported during extreme events. |  | **+** |  |  |
| Extreme events causing shock effects (temperatures, floods, etc.) – effects on eco-systems, species, biodiversity, impact on hazardous substances and nutrients. Important for reaching the objectives in the directives –  |  | **++** |  | **+** |

**Ecosystems: Restoration, enhancing services and application of nature based solutions.**

As descried above Europe is likely to fall short on reaching several environmental Directives. EurAqua understands the importance of the economic reality, but is convinced that there is no conflict between growth and environmental protection – indeed, a strong push forward will facilitate growth both in the sector and as a result of long term cost avoidance due to increase efficiency and working with nature.

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|  | 'Growth, jobs and investment' | 'Energy Union andClimate' | 'Digital Single Market' | 'A Stronger Global Actor' |
| Land-sea interactions: Technologies, services and strategies are required to control pollution inputs in the transitional waters, protect vulnerable ecosystems and prevent salt water intrusion, balancing between sectorial demands land use and transitional ecosystems. | **++** | **+** |  | **++** |
| Ecosystem services enhancement: Technologies, services and strategies are required such as Green design and landscape bio-resource management practices are required to stop further deterioration of ecosystems and their services, and ideally increase their service value, restoring their functioning. Special attention needs to be given to scale issues (from ditch to basin), and socio-economic aspects such as distribution of costs and benefits, rights of access and utility. | **++** | **+** |  | **++** |
| Morphodynamics and sediment strategies: While projects such as FP7-REFORM have provided valuable insight, effective river restoration and operational management is still hindered by a lack of insight concerning river morphology and managing (clean and polluted) sediment flows. Downstream erosion and sedimentation poses, in particular in urban areas, significant problems for water and sediment management. The scientific basis about the effects of existing and future (green) infrastructure needs deepening to increase more reliable, predictable designs of infrastructure. Specific attention need to be given to combined and basin wide effects | **+** | **+** |  | **++** |
| Nature-based solutions for ecosystem-based water management: While much work is commissioned today (i.e. 2016-2017), EurAqua feels that in order to be successful, a two-year focus is insufficient to achieve the objectives of the European Commission. In particular governance issues will need to be addressed, for example the distribution of costs and benefits of nature based solutions, as the responsibilities of authorities change. | **++** | **+** |  | **++** |

**Reduce and avoid combined threats from chemical pollution and their by-products**

The society need to move away from the use of environmentally harmful chemicals towards sustainable products and industries. This requires good knowledge of what chemicals are preferred from an environmental perspective, but also technological knowledge about the requirements for good products. It requires cooperation within the industry-consumer-regulator nexus.

We also need to deal with the threat to man and environment from the chemical pollution already released to the environment and circulation in existing products, processes and waste.

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|  | 'Growth, jobs and investment' | 'Energy Union andClimate' | 'Digital Single Market' | 'A Stronger Global Actor' |
| A sector oriented approach to avoid use, circular use and ultimately the use of environment-friendly chemicals.  | **++** |  | **+** | **++** |
| Develop better holistic risk analysis framework (beyond REACH) to avoid new chemicals and future hazards from the ever increasing mix of chemicals of potential concern. | **+** |  | **+** | **++** |
| Better tools and techniques for detection and effects (understanding and predicting effects (multi pollutants – multi stress); analytical techniques for groups of chemicals) | **+** |  |  | **++** |
| Remediation/decontamination/water treatment | **++** |  |  | **++** |
| Better tools to assess and manage combined risks (multi pollutants – multi stress) at the catchment scale. | **+** | **+** | **+** | **++** |

**Basin Wide Management**

To enhance efficiency in actions targeting good ecological status, flood risk and biodiversity, it is essential to look from the field scale to the full basin scale. Improved knowledge and tools will provide the basis for decisions with high basin wide impact with respect to reaching policy targets and improving overall resilience.

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|  | 'Growth, jobs and investment' | 'Energy Union andClimate' | 'Digital Single Market' | 'A Stronger Global Actor' |
| Integrated water resources management, policies and technologies concerning water, energy and agriculture adaptation to global change (Water-Food-Energy-Ecosystem nexus improvement), | **++** | **++** |  | **+** |
| Interdisciplinary approaches and DSS (including monitoring, databases, meta-modelling, scenario building and stakeholder involvement, participatory monitoring). | **++** | **+** |  | **+** |
| Improvement of WFD implementation through advanced multiscale modelling, better River Basin Management and Program of Measures design, linking to basin-wide water use models (in particular in the field of energy and agriculture) and including results of scenario and technology foresight studies. Such progress allows to develop basin plans based on mosaics of detailed models, pressures and measures.  | **++** | **++** |  | **++** |

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