



Joint Position Paper of AquaEuropa, EurAqua, EWA, EWP, Eureau and WssTP
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Water in Horizon 2020, with a focus on priority 5 “Climate action, environment, resource efficiency and sustainable use of raw materials”

Introduction

AquaEuropa, EurAqua, EWA, EWP, Eureau and WssTP highly appreciate the initiative of the European Commission to gather stakeholder input on Challenge 5 of Horizon 2020 at this time as the first calls are starting to be formulated. The FP7 framework has proven to be an unprecedented program to improve the scientific excellence base in water research and to enable key European parties in the water sector to work together: the water sector expects the new approach of Horizon 2020 to strengthen the water innovation capacity (both research in new areas and breaking through the barriers to enable new innovations to reach the market) even further if we are to tackle the challenges for the future.

Strengthening international cooperation is key in the vision of the water sector as 90% of global growth the coming decade will be outside of Europe. The yearly global turnover in the water sector is 375 billion euros with an expectancy of over 630 billion euros for 2020 (annual growth 6 %). With a current global market share of over 30 % the EU water sector is well placed to remain a global leader although this cannot be taken for granted.

Summary Position

In the perspective of the water sector the following topics are of key importance to foster excellence, industrial leadership and to solve the societal challenges of Europe related to water.

Sub-challenge 1: Fighting and adapting to climate change

- 1.1 Improve the understanding of the feedback loop of climate change in the water cycle and the provision of reliable climate – water system projections.
- 1.2 Adapt to climate change through a smart portfolio of water adaptation by users (rural and urban, industry/energy and agriculture), water management, water cycle management, green infrastructure and geo-engineering practices.
- 1.3 Adapt to coastal and salinity changes due to sea level rise

Sub-challenge 2: Sustainably managing natural resources and ecosystems

- 2.1 Prevent & monitor water pollution
- 2.2 Develop sustainable transitions in (the use of) urban and industrial water systems “the next generation of urban and industrial water systems”
- 2.3 Restore natural river flows, water-ecosystems, wetlands and floodplains and stimulate ecosystem services



Sub challenge 3: Ensuring the sustainable supply of non-energy and non-agricultural raw materials

- 3.1 Recover raw materials from waste water of larger cities
- 3.2 Improve water stewardship in the raw materials supply chain

Sub challenge 4: Enabling the transition towards a green economy through eco-innovation

- 4.1 Ensure green energy solutions, energy efficiency and energy generation in the (waste) water sector
- 4.2 Combine KE(S)T technologies and water technologies for break through innovations.
- 4.3 Design integrated wastewater: bio-recovery of nutrients and metals.
- 4.4 Design zero waste water processes
- 4.5 Develop eco-engineering for water- en landscaping, building with natural processes
- 4.6 Develop green infrastructure solutions integrating functionality and biodiversity

Sub challenge 5: Developing comprehensive and sustained global environmental observation and information systems

- 5.1 Develop water as focal area for satellite data: Mining of both in situ and satellite data
- 5.2 Develop(web-)services and mobile services, specifically on floods & droughts.

Water in the other five priority areas of Horizon 2020

Water is essential for all societal activities. Therefore water needs to be an integrated element in the other parts of the Horizon2020 challenges as well.

This position paper lists the main research and innovation topics for the Horizon2020 priorities 'personalised health and care', 'sustainable food security' 'the transition to an efficient, sustainable, safe and competitive energy system', 'Smart, green and integrated transport' and 'Inclusive, innovative and secure societies' in the last paragraph.



Sub-challenge 1: Fighting and adapting to climate change



With compliments to the Earth Observatory NASA

The water sector proposes the following two key priorities for the topic “fighting and adapting to climate change” in Horizon 2020:

- 1.1 Improve the understanding of the feedback loop of climate change in the water cycle and the provision of reliable climate – water system projections

Drought-affected areas are forecast to increase from 15 percent of global cropland today to around 44 percent by the end of this century (World Bank, 2013). An average global warming of 4 degrees Celsius could raise sea levels up to 5 feet, affecting more than 360 million city dwellers living in coastal zones.

Though the direct impact of climate change on the water cycle is widely recognized many knowledge gaps in our understanding and their implications on water quantity and water quality remain. To make maximum use of the remaining adaptation time the water sector proposes to take substantial action in this field now.

Partnerships are key to achieving break-through success by focusing on demonstration projects to embed in systems already in practice, involve private partners which can offer new solutions and public authorities, water managers and research partners alike. The USA, BRIC countries, Africa and Japan are key international partners for this priority.

- 1.2 Adapt to climate change through a smart portfolio of water adaptation by users (rural and urban, industry/energy and agriculture), water cycle management (small and large), green infrastructure and geo & civil engineering practices

To be ready for the climate impacts on the water cycle (both small and large cycles) water users require a thorough understanding of the portfolio of adaptation options. Currently experiences and innovation initiatives are scattered, lack scale and still depend too much on single initiatives and voluntary action. The impact at catchment scale, the intervention options (and their uncertainties) and the options to change water user practices all need to be researched and understood thoroughly to be able to gain this level of readiness.

Adaptation requires long time scales; therefore the water sector proposes this topic as a first priority for Horizon 2020. Success will depend on creating true exchanges between public-public / public-private and private initiatives to obtain clarity about the (technical and financing) options, their effectiveness and their replicability in other catchments. The USA, BRIC countries, Africa, Japan and Latin America are key international partners for this priority.



Sub-challenge 2: Sustainably managing natural resources and ecosystems

The water sector sees three key Horizon2020 priorities for this sub-challenge:

2.1 Prevent & monitor water pollution

Prevent pollution

Freshwater pollution is one of the main causes of biodiversity loss and unsafe drinking water sources worldwide. Achieving good status for water bodies and preventing new pollution throughout Europe still requires strong action. More persistent droughts will further increase the need for action. Water pollution and economic activity of key EU sectors (energy, agriculture and chemicals) need to be decoupled: a strong focus on innovative in situ remediation is key to achieve this goal. Specifically there is an urgent need to promote technology development to remove priority substances and emerging substances. Measures and processes that will be able to enhance up stream source control rather than end of pipe treatment will be important.

Monitor pollution

40% of European water bodies still have an unknown chemical status. Although it is certainly a clear obligation of the member states, for a wide range of substances monitoring is clearly insufficient and inadequate in many member states. Emerging pollutants, like pharmaceuticals, are only monitored by a few member states on a project base, while the monitoring practice for (candidate) priority substances can be improved as well. Developing more reliable and affordable water quality monitoring and ways to effectively address the polluter is a key priority for research and will have a huge global market potential. Many SMEs are active in designing new water quality sensors, though often they lack a test market with several real end-users to enable them to demonstrate benefits and then gain production efficiency through scale up. Breaking the monitoring dilemma is essential for pro-active action.



Partnerships between states at river basin level to enhance monitoring, which involve industries, end-users and providers of monitoring are key to achieving break-through success. The USA, India, China and Brazil are key international partners for this priority.

2.2. Develop sustainable transitions in (the use of) urban and industrial water systems "the next generation of urban and industrial water systems"

There is an urgent need for integrated urban and industrial water system innovations in Europe. Many stakeholders face new challenges and are now starting their decision making processes on how to deal with them. Investments in urban water systems are high and have a long return on investment. Implementing new innovative solutions have proved to be very difficult as the status quo has often been experienced as satisfying and low risk and



coordination of directives has proven to be difficult in practice. Many parts of Europe have a heavily ageing water infrastructure (both in waste water and drinking water supply networks). Approximately 34 % of waste water treatment facilities need to be significantly improved (currently below 2nd degree, WHO 2010). Ageing waste water infrastructures (~75 years) in large cities face decreasing flow rates and unsustainable levels of exfiltration. Further urbanization, higher risks of flooding and uncertainty in water availability and more specific water demand from agriculture, industries and urban population increase the importance for innovations in those systems. Innovations in industrial water management can greatly increase the reliability of supply for industry and at the same time reduce costs. Combined with increased up stream control, upgrading water treatment, closing the water cycle, water reuse and improving or replacing the existing infrastructure offer great possibilities for new sustainable practices throughout society. The customer is believed to be the key driver of the new innovation wave specifically in the urban areas.

True uptake of new available solutions and innovative SMART interactive technology will be key in driving these new developments, though experiences nowadays are scarce. There is a need for an integrated public-private approach for the urban water cycle at its core, involving government, utilities, end-users and stakeholders as well as industry, to focus on business models to meet future demands for both quality and quantity. The USA, Brazil, India and China are key international partners.

2.3 Restore natural river flows, water-ecosystems, wetlands and floodplains and stimulate ecosystem services

Restore natural river flows, manage (and reduce) water demands, restore wetlands and floodplains and stimulate ecosystem services

Water demands will rise with an increase in population and industrial, agricultural, energy and household water consumption while the risk of droughts increases worldwide (although in both trends there will be many regional variations).

The World Economic Forum identified the water supply crisis as one of the top five global risks. Innovations are needed to reduce demands significantly in all fields. Private partnerships involving best achievers in certain industries are necessary. Program development needs to incorporate the large international enterprises with European roots, which have global knowledge and expertise to offer.

The knowledge base should integrate the concept of 'environmental flows' and take into account the ecosystem services supported by water. Water demands need to be managed holistically and use price-incentives. River flows, natural floodplains and wetlands need to be restored. SMART interaction with many users by river basin authorities is key to achieve this goal. Australia, India, China, the USA and Brazil are key countries to focus on in the international cooperation of Horizon2020 for this topic.

Sub challenge 3: Ensuring the sustainable supply of non-energy and non-agricultural raw materials

3.1 Recover raw materials from waste water of large cities



Europe's cities have great potential for high quality recycling and recovery of raw materials from waste water: 43 % of EU waste water pollution load is generated by 586 big cities (corresponds to 2% of the total EU agglomerations). This challenge needs to be taken up by establishing partnerships between the larger cities, together with the waste water authorities and waste management and recycling industry and research organizations to come to innovative solutions. Cooperation is needed with selected cities in the USA and Australia.

3.2 Improve water stewardship in the raw materials supply chain

The different steps in the raw materials supply chain, such as mining, processing, distribution and use have a large water footprint with respect to river and groundwater resources. In particular water use in the first stages (mining and processing) has received limited attention till now, while the impact of accidental spills to these stages have been significant. Water stewardship (water foot printing tools combined with improvement plans and implementing innovative technology) is hence needed to reduce the water impact of those activities, both in terms of quantity and quality. This will benefit and increase the licence to operate of European industries and their suppliers acting worldwide. Cooperation with USA, Australia, Canada and BRIC are welcome.

Sub challenge 4: Enabling the transition towards a green economy through eco-innovation

Water is the largest sub-sector among the eco-innovation industry and Horizon 2020 should also focus its activity in breaking innovation obstacles in the water management. For the sub challenge 4 the water sector envisages the following six key priorities, cross cutting to some of the other sub challenges:



- 4.1 Ensure green energy solutions, energy efficiency and energy generation in the (waste) water sector
- 4.2 Combine KE(S)T technologies and water technologies for break through innovations.
- 4.3 Design integrated wastewater: bio-recovery of nutrients and metals.
- 4.4 Design zero waste water processes
- 4.5 Develop eco-engineering for water- en landscaping, building with natural processes
- 4.6 Develop green infrastructure solutions integrating functionality and biodiversity

Sub challenge 5: Developing comprehensive and sustained global environmental observation and information systems

- 5.1 Develop water as focal area for satellite data: Mining of both in situ and satellite data

Water needs to be focal area for satellite data collection (hydro-informatics, water quality, hydrological cycles and interdependencies) and open public data policy: water quality, water availability and water allocation and use; relation between water and biodiversity and habitats; the impact of climate change on the water system and extreme events (floods and droughts)

Mining of both in situ and satellite data is necessary:

- Collection, harmonising and integration of in situ data for validation / completion of satellite data and data continuity is needed. International open networks of in situ data-centres for water management are required, this to improve understanding of the processes.
- Satellite data collection should focus on the development of high risk/high reward satellite instrument prototypes for observations reducing uncertainties in the relation between climate change, the effect on the hydrological cycle and impact on water users.
- Integration of in situ and satellite data into a global, coastal and large river basin observation and information systems; ensure data compatibility with integrated assessment models (e.g. GEO BON); intelligent data analytics based on (real-time) big data for monitoring and visualizing evolutionary behaviour of energy systems and operational energy systems behaviour.
- Statistical treatment of historical satellite data combined with local environmental data for real-time pattern recognition, prevention and early warning systems development.

- 5.2 Develop (web)services and mobile services, specifically for flood & drought management

Development of early warning systems and decision-support systems for end-users (e.g. farmers, hydropower, spatial planners, emergency organisations, tourism) on extreme weather events, both for floods and droughts. Innovative data assimilation technology can create for more accurate predictions on different spatio-temporal scales. Open public services as well as SMEs for specific user groups are promising partners to jointly play a key role in the development of new innovative water services.



Water in the other five Horizon 2020 priorities

Water is essential for all societal activities. Therefore water needs to be an integrated element in the other parts of the Horizon2020 challenges as well.

This paragraph lists the main research and innovation priorities from the perspective of the water sector for the other five priority areas of Horizon 2020:

Priority 1: Personalised health and care

1.1 Include the key advice 'Drink water' in health programs for the elderly

Drinking water is of great importance for good health and an easy, accessible and affordable way, specifically for elderly people, to increase their well-being. Health programs therefore need to incorporate this advice. This will have a significant impact in reaching the goal to increase the average healthy lifespan of everyone in Europe by two years by 2020.

Priority 2: Sustainable food security

Ensuring the availability of the right quantities of water at the right time is a key priority for sustainable food security. Agriculture is facing a huge challenge to profitably double their production by 2030 with less available water and a reduction in water pollution load. This field proves a huge international innovation potential. Key priorities are:

2.1 Strengthen water ecosystems by water management practices and pollution reduction

2.2 Address the impact of climate change mitigation and adaptation through the water cycle on agricultural production.

2.3 Combine enabling technologies to reduce water use in irrigation (more crop per drop).

2.4 Develop the water footprint (blue, green and grey) of products and water stewardship of agricultural water users.

Priority 3: Transition to an efficient, sustainable, safe and competitive energy system, in the face of increasing resource scarcity, increasing energy needs and climate change

The energy sector is one of the main users of water in Europe and has a large impact on water quality and availability. Research into these impacts need to be included in this part of Horizon 2020.

3.1 Reduce the use of cooling water and its impact on water systems

3.2 Prevent the negative impact of a transition to biofuels on the water system

3.3 Develop environmental impact assessment techniques for shale gas projects on ground water, specifically drinking water sources



3.4 Develop safe and sustainable aquifer Thermal Energy Storage and District Heating and Cooling Networks:

3.5 Develop Blue-Energy (Energy production utilizing osmotic differences)

3.6 Develop effective wave energy

3.7 Optimize sustainable large-scale and small-scale Hydropower

Priority 4: Smart, green and integrated transport

Key priority with an important water dimension is:

4.1 Adapt intensified inland shipping routes for climate change

Inland waterways and coastal and inland harbours are critical infrastructures for reliable, affordable and clean transport. Inland shipping is highly significant in regions with navigable waterways; major EU seaports have set targets for containers up to 45% by inland waterway transport which means that container volumes must quintuple in the next years. This shows that current transport patterns are at a turning point. An increasing number of companies are looking for innovative transport solutions by waterway to save significantly on costs and emissions.

At the same time water ways will be experiencing the effects longer drought periods. Adapting waterways and harbours, including condition-based maintenance will be necessary. Rivers and canals do much more than transport, they are lifelines for the communities and natural areas they cross, integrated development of waterways is therefore key.

Priority 6: Inclusive, innovative and secure societies

5.1 Prepare for crisis management in the water sector

Secure societies are prepared for water related hazards, such as flooding, landslides, water scarcity and heat waves and know how to respond and restore when they occur. For example how to get their critical infrastructure as the drinking water supply and waste water treatment up and running after a flood. Coping with these disasters is a key field for innovations within this priority.