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WATER CHALLENGES FOR A CHANGING WORLD

AN UNTAPPED RESOURCE?

European water policy is faced with the challenge of moving to a sustainable framework that can adequately meet the needs of populations across the continent. The transdisciplinary approach adopted by the Water JPI promises to tackle the issue from economic, ecological, societal and technological perspectives



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Can you begin by outlining the main aims and objectives of the Joint Programming Initiative – Water Challenges for a Changing World (Water JPI)?

The Water JPI is part of the broader JPI process. In 2008, the European Research, Development and Innovation (RDI) agents were called upon to identify Grand Challenges which could benefit from a European approach. These Challenges correspond to knowledge fields in which the efforts of individual European countries will never be sufficient. 10 such Grand Challenges were identified covering different aspects (eg. health, culture, natural resources). The Water JPI, set to commence its Programming activities in 2013, is one of them. Today 17 European countries and the EC are partners of the Water JPI. JPIs focus on developing joint RDI activities and coordinating the national and regional RDI agendas.

European efforts to meet the current water RDI standards in Europe will be formulated in three coordinated directions: Horizon 2020, the Water JPI and the European Innovation Partnership (EIP) on Water. Coordination between these three pillars will be required for effectiveness.

European water policy has ambitious goals and deals with complex and systemic issues. It sets challenges for European RDI in the field of water: developing new knowledge and reinforcing mechanisms for knowledge and technology transfer. The Water JPI aims at tackling the ambitious challenge of achieving sustainable water systems for a sustainable economy in Europe and abroad. This will be obtained through a multidisciplinary approach encompassing economic, ecological, societal and technological considerations.

To contextualise this issue, could you summarise the challenges that Europe's water sector faces?

The Grand Challenge of the Water JPI is certainly ambitious, as it addresses a number of issues of significant importance. Firstly, there is a growing gap between global water demand and water supply. The fast approaching bio-based economy will exert pressure to enlarge this gap. Secondly, with growing water demand and the discharge of different types of pollutants to the environment, our ecosystems will be threatened by overexploitation of water sources and increased quality problems. Thirdly, human activities and climate change are expected to intensify drought in some areas and flooding in others. This will result in damage to the ecosystems and society as a whole. Coordination of

national and regional RDI policies and programmes will be used to tackle the different aspects of the Grand Challenge: economic, ecological, technological and societal.

According to the *Global Water Intelligence Report 2011*, the European water market will have an estimated turnover of US \$43 billion in 2015, while the worldwide turnover will amount to \$246 billion. The European water industry can benefit from this market, developing customised solutions for site-specific problems. To be competitive, investments in generating knowledge and its valorisation are essential.

Access to water is a basic societal need. Its quantity and quality affect the health and wellbeing of citizens in Europe and abroad, and this is of course strongly related to economic strength. Yet the anthropogenic pressures and the degradation of biological integrity of ecosystems contribute significantly to the decrease of water resources. Ecological challenges include the preservation and protection of waters as a crucial asset for sustainable development.

The current development of water technology is insufficient to meet the Grand Challenge of achieving sustainable water systems. Consequently, major scientific and technological breakthroughs are needed in all areas of water use and management. Crossovers are required with related scientific fields, such as energy, sensors, nanotechnology and health.

How are you tackling the ambitious goal of achieving sustainable water systems for a sustainable economy in Europe?

The Water JPI will address its objectives through the implementation of a Strategic Research and Innovation Agenda. At this time, efforts focus ▶

WHO ARE THE WATER JPI?

Today 17 European countries and the EC are partners of the Water JPI, along with five observer countries. The current partner countries add up to more than 90 per cent of the national public investment on water RDI in Europe.

Partner countries:

Austria, Cyprus, Denmark, Finland, France, Germany, Ireland, Israel, Italy, The Netherlands, Norway, Poland, Portugal, Romania, Spain, Turkey, UK

Observer countries:

Belgium, Greece, Hungary, Sweden, Latvia

on the development of this document, which will be built around five research topics: maintaining ecosystem sustainability; developing safe water systems for citizens, promoting competitiveness in the water industry; implementing a water-wise bio-based economy; and closing the water cycle gap.

Agenda implementation will require a number of different actions. The development of joint activities will soon begin, with the publication by mid-2013 of a joint call for proposals. This will lead to RDI groups from different countries in Europe working together on projects with a European dimension, and funded by their national programmes. Partner countries will coordinate their national and regional agendas to exploit synergies and avoid duplications. This is a long-lasting process which will feed on the success of JPI activities. It is expected that through effective coordination at national level, partner countries will be able to obtain more RDI results per unit investment.

To what extent is your approach multidisciplinary and how important is this to achieving your objectives?

A multidisciplinary approach is essential to tackling the variety of challenges described above. As a consequence, the associated RDI programmes from partner countries show large differences in approach in a number of dimensions. Some programmes are thematic, focusing on specific aspects of the water challenges (from ecosystems to water technology, social sciences or applied mathematics); others just specialise on water or cover the whole variety of scientific fields. Some emphasise research and are only interested in the production of unspecific knowledge; others finance innovation in companies through the implementation of focused scientific knowledge. Some finance bottom-up, blue sky research, and select proposals on excellence; others use a top-down approach, and offer very focused, thematically narrow calls for proposals. Finally, some programmes specialise on projects, while others also focus on mobility or infrastructure. The successful uptake of the RDI results ensuing from Water JPI activities will be significantly boosted by an effective multidisciplinary approach.

With global investments in water technology increasing every year, the water market is very competitive. How is Europe keeping up with this? Has there been an increase in job availability in the sector?

To remain at the forefront of this competitive business, innovation is essential. European water businesses must enhance their capacity to cope with economic uncertainties, as well as demographic, behavioural and climatic changes. In recent decades, the development of business opportunities outside Europe has been very important. European corporations and SMEs are populating the water world, particularly emerging countries. Sustaining this international presence and business heavily depends on the innovation potential, and therefore on the production and valorisation of knowledge.

Ecosystem services and biodiversity are intrinsically linked with water. To what extent is the Water JPI working in these related areas to improve water sustainability?

An integrated, transdisciplinary research approach is particularly required to analyse and control the influence of external factors on biodiversity and on ecosystem services. The Water JPI is committed to address aspects such as the exhaustion, overexploitation and depletion of water resources; pollution; climate change, inducing short- to long-term variations in water availability; extreme events (droughts and floods); sea water intrusion; and morphological changes/infrastructures and works on rivers and lakes.



OBJECTIVES

This JPI has designed a set of objectives representing a contribution to the 2020 vision for the European Research Area, including:

- Involving water end-users for effective RDI results uptake
- Attaining critical mass of research programmes
- Reaching effective, sustainable coordination of European water RDI
- Harmonising national water RDI agendas in Partner Countries
- Harmonising national water RDI activities in Partner Countries
- Supporting European leadership in science and technology

Pollutants are damaging the natural balance of European ecosystems. Among its goals, this JPI aims at developing indicators and models for monitoring threats, risk assessment and early warning, as well as enhancing ecosystem resilience to stress with regards to human pressures.

What role can industry play in water reuse and nutrient recovery?

The possibilities for industrial action in water are enormous. The EC has developed a resource efficiency policy which is currently being realised through developments in raw materials and circular economies for a number of industrial commodities. Industries are charging cities and factories for their water treatment services. In the near future, nutrient (and energy) recovery from waste water could very well finance these services. In the medium term phosphorous depletion will threaten agricultural production worldwide; however, this critical nutrient could be extracted from agricultural waste water and reused for fertilisation. Circular economies for this and other elements will enable the control of ecosystem degradation while contributing to secure agricultural production; nutrient recovery brings benefits to all actors in the water arena.

Can you outline the economic benefits – not only in the agriculture sector but across the board – available to those that successfully reduce water waste?

Adjusting water use to requirements will not only bring economic benefits to all sectors, but – most importantly – will be required from all sectors. While agriculture is and will remain the most water-consuming sector in Europe, in many instances it is also very efficient. For example, urban irrigation in private households has often been found to use between two and four times its water requirements. This situation is far worse than in agricultural irrigation, where water costs, water scarcity and professional management lead to far more efficient water use.

Will farmers improve their benefits by using water more cautiously? I do not think this is the case in the long run, since prices will adjust to reward farmers for the utility their products give to end-users. However, what is certainly true is that farmers will not be able to secure water resources for

KEY QUESTIONS

The Water JPI will target the remaining key knowledge gaps in this area, including the following questions:

- Which are the critical new contaminants, such as polar compounds, pharmaceuticals or emerging pathogens including viruses?
- How can we predict their environmental behaviour and treatment, and what impact do they have on human health?
- To what extent are these contaminants removed by natural processes in water and soil, or by physical techniques in drinking water treatment?
- How can the quality of the produced water be maintained over time and throughout the distribution system?
- Which health risks could result from new water concepts such as supply of hot water, cooling towers, water reuse and water in the city?

their farming operations if they misuse water quantity and quality.

What research in water infrastructures is still needed to improve their design and maintenance?

Water infrastructure requires research to improve performance both under standard and critical conditions, to reduce vulnerability to natural and manmade hazards, and to reduce operation and management costs. New materials, standards and management models are required for the cost-efficient exploitation of these resources. Millions of kilometres of pipelines and remote pumping stations, valves, treatment plants and reservoirs represent a dream opportunity for the information technology sector. Communications, expert systems, telemetry and remote control are only incipiently exploited at present, and will soon be standard procedures in developed and developing countries. Market possibilities for infrastructure design, construction and operation are virtually unlimited and required in significant measure to sustain European market penetration.

You have set an ambitious target to achieve sustainable water systems for a sustainable economy. What do the next 10 years hold for the Water JPI?

The EIP on Water will support innovation efforts by removing barriers to innovation and actively supporting innovation activities. Given that both the EIP and the Water JPI will start their activities in 2013, while Horizon 2020 will start in 2014, the European water RDI sector is on the move!

Our objectives are set for 2020, and require very important efforts in the seven years to come. The Water JPI has committed to extending joint programming to 20 per cent of the national funds used for water RDI in Europe. This means mobilising more than €70 million a year, representing about half of the water RDI funding effort currently performed by the Framework Programme (€130 million a year). Although the Water JPI has set a wide variety of objectives, the capacity to mobilise resources through the implementation of Joint Activities is indeed a key success indicator. Building a culture of Joint Programming in Water is another key milestone to be reached by 2020 ●

THE CHALLENGES

Water JPI has identified a multidisciplinary approach as being critical to addressing the following four areas:

1

THE ECONOMIC CHALLENGE

The European water sector is of prime economic importance, as it offers jobs for thousands of citizens across Europe. Investments in water technology around the world increase every year in a market which has become very competitive

2

THE ECOLOGICAL CHALLENGE

Preservation and protection of waters is a crucial asset for sustainable development. It is essential to enhance the absorbing and self-purification capacity of the landscape and water ecosystems to reduce the transfer and storage of pollutants and maintain biodiversity and ecosystem services

3

THE SOCIETAL CHALLENGE

Water is a natural resource necessary for societal wellbeing. Water fulfils a multitude of services and functions for a sustainable livelihood. Water reuse and nutrient recovery from municipal, industrial and agricultural waste water offer economic advantages and societal gains

4

THE TECHNOLOGICAL CHALLENGE

Specific innovations in monitoring technologies and developments in information systems and methodologies are required to address the complexity of water systems and water issues. Many capital-intensive water infrastructures require research to improve design and maintenance, maximise societal benefit and moderate costs