EUROPEAN COMMISSION
Information Society and Media Directorate-General

ICT addressing Societal Challenges
ICT for Sustainable Growth

Expert Consultation on ICT for Water Management

Brussels, 11/06/2010

Purpose of the consultation

It is widely recognised that Information and Communication Technologies (ICT) enable and support water resources management and contribute to achieve the vision of Integrated Water Resources Management (IWRM).

The purpose of this consultation was to discuss research needs in the domain of ICT for water resources management, which could be addressed in upcoming Calls for Proposals. There are two major EC funding opportunities for projects involving ICT: the Seventh Framework for Research and Technological Development (FP7); and the ICT Policy Support Programme (ICT PSP) under the Competiveness and Innovation Programme (CIP) which focuses on stimulating the uptake of new ICT applications via pilots.

The meeting also explored the need for priority actions to be launched by DG Information Society and Media (DG INFSO) in the context of the broader interest which has been built up to increase efficiency in water management and foster EC investment in research and innovation for 2020.

This report summarises the main issues raised in this consultation which could constitute the basis for possible future activities on this field, to be launched by DG Information Society and Media.

This one-day consultation involved 15 participants of which 11 were experts from industry, academia and water-related associations. The list of participants and hyperlinks to the contributions of the experts are included in the annex to this report.

1. Session on priority ICT actions

A round-table discussion focused on the identification of possible new R&D ideas and themes to be specified in future calls relevant both to FP7 and ICT PSP programmes. The invited experts were asked to express their assessment of priorities regarding immediate requirements for development, integration and validation of ICT solutions in urban water management.

The following issues were highlighted in the discussion:

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1.1 In the domain of smart pipes, where applications of RFID and Micro-Electro-Mechanical Systems (MEMS) are promising, there is a real need for creating a critical mass on research to be launched at European level, with an appropriate economy of scale, including energy consumption issues, concerning the whole water industry. Today there are certain difficulties in reading information from the pipe network through road materials. Despite some commercial products (such as, for instance, 3M balls), there would be room for a widely available industrial solution.

1.2 Concerning Decision Support Systems (DSS) much work was done recently in the frame of the Neptune Project, led by the Centre for Water Systems of the University of Exeter (http://centres.exeter.ac.uk/cws/projects/project-neptune) and involving two leading UK water service providers - Yorkshire Water Services and United Utilities, a major provider of power and automation technologies – ABB and UK universities. Its aim is to advance knowledge and understanding about water supply systems, in order to develop novel, robust, practical techniques and tools to optimize efficiency and customer service, through dynamic control or other means. The approach, at a stage of a pre-operational prototype involving network monitoring, evaluation in real-time of the risk, decision support, location of the problem, and work order sent to a technical team for repair, tends in fact to manage the industrial business process and to deliver the rules for its improvement. Although limited to water quantity, it is very promising that the DSS can be used for better assessment of the invariance of the water supply business process.

1.3 There is no common agreement whether research on the control loop modelling in the heterogeneous data environment and provision of a middleware solution is the appropriate direction to be followed. Common sense based models provide sometimes an acceptable solution from the operators point of view.

1.4 With regard to middleware, this depends strongly on the communication bus between sensors and processor. There is definitely a need for improvement of the communication protocols. In addition, R&D efforts on ICT concern three priority areas:

- Security & encryption in the architectures for metering
- Technology architecture
- Integrated sensors for water quality measurements (hormones, medicine, bacteria, pollution)

1.5 Deployment of Wi-Fi to transmit data at not wired places is not realistic at the present state of the battery life.

1.6 The issue on whether manufacturers are widely accepting to use open standards relates more to the question about a minimum compliance to be respected by the industry. Support actions in order to improve the dissemination and communication of research results, would greatly improve the present situation in this respect. In particular this would stimulate consensus building-up on minimum compliance among stakeholders and key actors in the ICT Sector.

1.7 It may be worth to investigate whether changing consumers' behaviour - through pricing strategies and legal and regulatory revisions related to the Water Framework Directive and compliance of national regulations with EU regulations -, could also constitute a possible direction of overall improvement of water management issues in urban areas. The examples of Sweden and USA were cited, where modification of the

law on billing has created the framework conditions to stimulate innovation and new business cases involving the industry and stakeholders.

1.8 Development of cheap, low energy chlorine sensor would answer a real need. Existing sensors are energy and water demanding, thus they are not convincing solutions. The cost of measurements of a parameter such as chlorine, is very high (pH is low). Such sensors need a daily maintenance service, whereas the cost of ownership is very high. In addition there is no common European methodology how to calibrate them. Such an idea may generate critical mass if the members of the water industry agree to work together to develop a European sensor, for a smart and stable chlorine sensor, very robust in terms of energy consumption.

1.9 Future market of low cost sensors detecting leaks for individual households is clearly a target for manufacturers. However some important questions remain, such as whether these sensors should be stand-alone or connected to the meter.

1.10 The water utility industry has a number of opportunities to explore and find solutions. In this context, instead of very large advanced projects, a smaller size activity related to research, development and validation of existing or emerging technologies would greatly respond to present needs.

2. Expert positions

In response to the list of questions outlined in the note prepared by DG INFSO, the invited experts prepared the presentations, which are annexed in the Annex 2 to this report. A summary of the main issues raised is given next.

2.1 An unranked list of challenges, as seen from the academic perspective, includes: combined efforts on integration of the real-time monitoring of resources; architectural needs related to functional, dependable, and energy-efficient/self-sustainable requirements on sensors and actuators; fusion of data from heterogeneous sensors; and enhancement of model-based predictions of water supply and demand, both in terms of their precision and shortening of computational time. In particular, the importance of water scarcity and flood management issues was underlined, stressing the role which ICT plays in the management of information related to water resources. Lack of maturity of DSS for water management is affected by lack of data (or data of insufficient quality), what is in turn a barrier for deployment. [See presentation details at Annex A2.1- Dr. Harald Ruess, FORTISS GmbH, University of Munich.]

2.2 The utility operator approach focuses on the real-time monitoring of networks (treatment plants submitted to an industrial process control are relatively well controlled). In the wider perspective of the development of cities of tomorrow, asset management and energy efficiency are definitely pertinent in the holistic vision of urban water management and should also be considered. The framework logic from measurements to decision support and operational implementation of management rules, can still be improved at several levels (AMR, real-time leak detection and water quality management, inverse modelling, DSS, etc.). However, asset management issues appear to be as well important for improvement of the overall efficiency of the water distribution systems. In the latter, possible solutions may be buried asset electronic identification and RFID tagging devices at the pipe and “through road” condition assessment sensing technologies. If these are accompanied

by an important R&D effort, they may bring answers to existing operational management issues. The needs of industrial stakeholders in charge of urban water management and distribution were also stressed, both in terms of quality and quantity. [Annex A2.2 -Dr. Jacques Boudon, Suez Environnement]

2.3 The advances of the "Smart Metering solution and Long Range Automated Meter Reading", used by the utility operator for the deployment in the Paris area and other urban areas in France, demonstrates the feasibility of such a metering system. The key elements of that operational system include AMR, a frequency resulting from EC decision DEC/2005/928, including for metering applications, and a VHF network for data concentrators in buildings, combined with GSM/GPRS transmission capacity to data management centres. Up to 2015, almost 1 million AMR are expected to be installed in France alone. There are obvious benefits today for customers and utilities with the provision of the technology enabling on-line services :

- More frequent invoicing based on real data reading
- More precise (both in space and time) leak detection
- Improved capacity of backflow detection and measurement
- Contribution to development of environmental friendly attitude
- Improved action efficiency control

In the future, these on-line services may be extended to variable tariff options, advices etc. The Commission introduced in March 2009 the M441 standardisation mandate for smart metering, in the field of measuring instruments for utility meters (including smart metering). [See presentation details at Annex A2.4 - Eric Farnier, LYONNAISE-DES-EAUX]
(http://www.cen.eu/cen/Sectors/Sectors/Measurement/Documents/M441.pdf)

2.4 A smart grid and smart water metering solution has been deployed in the Netherlands. Today one-way (AMR) and two-way (AMI: Advanced Metering Infrastructure) data flow solutions are major drivers of the market. However the technology is evolving fast and AMR may become obsolete as energy companies move to advanced metering infrastructures. In the face of new capital investment, smart grid components are becoming increasingly cost competitive. The list of major challenges include, among other, issues related to development of a business model for cooperation between water and other utilities as well as privacy / security / encryption and standardisation (technology, protocols) aspects. As far as technology architecture is concerned, integration of components / systems / communication / local vs. global event handling, appear to be the most relevant.
[See presentation details at Annex A2.5 - Henk Jan Top, Accenture]

2.5 There is already available Advanced Metering Infrastructure (AMI) in 2010, which can be adapted to both traditional and smart network topologies. The industrial needs in the domain for the next decade (vision 2020) are driven by a pragmatism :

- Search for added-value products, such as low cost sensors or extension of meter life
- Improvement of system robustness through data transmission (optimum data packet size vs. cost and power consumption, baud rate, multi-utility feasibility)
- Development of strategies for active control, which accounts for variable pressure distribution systems, scenario modelling, etc.

[See presentation details at Annex A2.6 - Ian Holms-Higgin, ELSTER]

2.6 The lead of electric and gas utilities industry over water and heat in introducing technological standards of smart metering, was noted. Attention is drawn to certain market tendencies such as, increasing battery life vs. regulations on content of > 2 grams of lithium (classified as dangerous goods), increasing number of data registered by meters, incorporation of data loggers and alarm functionalities.

[See presentation details at Annex A2.7 - Jacob Hansen, KAMSTRUP]

2.7 It was also noted today's lack of maturity of Wireless Sensor Network (WSN) devices for application in the real-time monitoring and control on a wide scale of metering networks in pass-through monitoring mechanism. On the other hand, application of grid monitoring of the risks of industrial pollution of water resources seems feasible through measurement and BoT (Behaviour over Time) analysis of two different sets of variables:

- Concentrations of pollutants (several chemical products)
- The quality parameters of water environment (oxygen, CO, CO2, etc.)
- Monitoring of the level of accumulation of pollutants in sediments and/or consumable water sources could be also of great practical interest.

[See presentation details at Annexes A2.8 and A2.9 - Nuno Cunha, CRITICAL SOFTWARE]

3. Additional contributions for consultation and follow up actions

Further feedback regarding the issues raised in this consultation is welcome to be provided through our contact mailbox:

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You may also get additional updated information at our web site:

http://ec.europa.eu/ictforsg

Annexes:

Annex 1 : DG INFSO background document "ICT for Water Management – Issues and questions to be discussed with domain experts and stakeholders" (<<Water Management - Issues Questions (v-04062010).doc>>)

Annex 2: Expert views & positions: references and links

A2.1 : Dr. Harald Ruess "ICT-based Water Resources Management" (<<Ruess_20100610_ict_for_ewater.ppt>>)

A2.2 : Dr. Jacques Boudon " ICT for Water Management ? Tentative list of needs" (<< Boudon_ICT Brx 110610.ppt>>)

A2.3 : Klaus-Dieter Axt, Serge Frank "AQUA Association" (<< Frank-100611_AQUA ICT Presentation.ppt>>)

A2.4 : Eric Farnier "ICT for Water Management - Smart Metering solution and Long Range Automated Meter Reading" (<<Farnier_ICT for Water Management - Suez Environment_LDE – 20100611>>)

A2.5 : Henk Jan Top "Smart Grids and Smart Water Metering in The Netherlands" (<<Top_100611 smart metering water EC.pdf>>)

A2.6 : Ian Holms-Higgin "ICT for Water Resource Management" (<<Holms-Higgin_ICT IWRM IHH.pdf>>

A2.7 : Jacob Hansen "A Partner in Energy Metering" (<<Hansen_ICT Water Management EU_1.ppt>>)

A2.8 : Nuno Cunha "" (<<CUNHA comments.doc >>)

A2.9 : Rui Avelãs Nunes "Dependable Technologies For Critical Systems" (<<csw-energy-offer-en.pdf>>)

A2.10: Klaus-Dieter Axt "A Guide to Smart Metering – Empowering people for a better environment" (<<www.esmig.eu >>)

Annex 3: List of Participants

DG INFSO :	Colette Maloney (Head of Unit ICT for Sustainable Growth)
	Manuel Do Carmo Monteiro (Deputy Head of Unit ICT for Sustainable Growth)
	Antonios Barbas and Feodora Von Franz (Project Officers Unit ICT for Sustainable Growth)
Experts :	Klaus-Dieter Axt, European Smart Metering Industry Group
	Jacques Boudon (Chief Scientist of CIRSEE, Suez Environnement)
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	Eric Farnier, Technical Directorate, Innovation and Diversification, Suez Environnement)
	Céline Hervè-Bazin, Liason Officer, The European Water Supply and Sanitation Platform WSSTP
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Rapporteur :	Marc Erlich (SOGREAH Consultants)