



## WEX Global 2017: Programme Working Document

---

SEVILLE 7<sup>TH</sup> – 9<sup>TH</sup> NOVEMBER 2017

CIRCULAR SOLUTIONS IN WATER AND ENERGY FOR THE 4<sup>TH</sup> INDUSTRIAL REVOLUTION

SPONSORED BY:



### Overview

The increasingly manifest impacts of global climate change demand new ways of managing our use of water, energy and indeed all natural resources. The World Economic Forum's 2016 global risk report emphasized "the potential for climate change to exacerbate water crises, with impacts including conflict and more forced migration, calling for improved water governance to adapt to climate change and accommodate a growing population alongside economic development".

Klaus Schwab, Executive Chairman and founder of the WEF has written about a "Fourth Industrial Revolution", characterized by a fusion of technologies which will blur the lines between the physical, digital, and biological spheres in ways which are already apparent in the water sector.

Another recent report entitled "**Less is More: Circular Economy Solutions to Water Shortages**", by Dutch bank ING and Netherlands-based independent water knowledge institute Deltares claims that

Circular economy solutions for global water stress offer the potential to save 400 billion m<sup>3</sup> of water yearly, equivalent to 11% of global water demand and almost the entire annual water consumption of the USA.

WEX Global 2017 will shine a light into the future by examining new approaches and technology combinations that will revolutionize the management of water and energy. It will bring together world leading experts to make a sense of a fast changing environment, where continuous innovation will be needed to challenge existing assumptions of current best practice and modes of operation. Every participant in the water sector will have a key role to fulfill in this new dynamic to optimize the world's resources. Forward looking institutions, companies and stakeholders are invited to join this trailblazing summit in order to determine how to grow the circular economy by connecting the individual pillars of water, energy and waste within the wider context of industries, municipalities and civil society

## **Water, Energy and the Circular Economy**

### **1. Water 4.0 and the Circular Economy**

The water sector is already leading the way in deploying new combinations of technologies in the search for more sustainable solutions. Ramping up the circular economy will certainly be at the heart of any 4th Industrial Revolution and the better management of existing resources will be one of the primary drivers behind what Schwab calls “the transformation of entire systems of production management and governance”. However the true impacts of the acceleration of innovation and the velocity of the disruption will nevertheless be difficult to predict for even those at the cutting edge of innovation in the water and energy sectors.

### **2. Government Policy, Regulation and the Circular Economy**

The scientific truth of the impact of climate change is now widely accepted in most countries around the world. Most experts agree that government has a clear role to play in engaging all stakeholders in the creation of new opportunities within the context of the circular economy.

- What are the drivers increasing the urgency for informed action?
- Is there a need for data driven and empirical solutions to meet these challenges?
- What are the key elements of government strategy that will provide a foundation for future action?
- What technical and operational challenges across the water energy nexus can be identified by government at local, regional and national levels?
- New tools to improve better management of water and energy resources by government, utilities and business.

### **3. Water Cycle Management and Water Reuse**

The twin drivers of climate change and rapid population growth means that identifying additional water resources is of urgent and fundamental importance. The better management of the water cycle encompassing existing surface and groundwater resources, together with new initiatives in water reuse, reclamation and desalination, are becoming increasingly important components of an integrated approach to water resource management.

The implementation of new water reuse projects in particular is a clear example of how the circular economy is creating new water for both potable and non-potable water applications in agriculture, the urban environment and industry.

#### 4. [Building Resilience in the Water Sector](#)

The manifest need to build long term resilience into the long term planning of water companies in all parts of the world, becomes ever more apparent as they face the need to step up to the four common challenges of population growth, ageing infrastructure, environmental degradation and climate change.

Securing the long term resilience of the water sector is of critical importance to all stakeholders and the adoption of circular solutions together with the technologies of the 4<sup>th</sup> industrial revolution will be central to achieving that goal.

Meeting the challenge also requires the cooperation of all partners to develop a strong understanding of future needs, explore every option to meet these needs, and to build consensus on a plan for delivery.

- Understanding future needs
- The importance of taking a long term view
- The roles of government, business and consumers
- Enhancing the natural resilience of catchments
- Role of new technology

#### 5. [Integrating Action on Water, Energy and Waste in the Circular Economy](#)

Water, Energy, and waste policies should be inextricably linked as all have considerable environmental impacts. Whilst it is often tempting to overlook the environment during difficult economic times, the challenges of producing and using energy and water resources sustainably and protecting our natural environment equally represent an opportunity to pursue sustainable economic growth.

- What is the potential for integrated closed-loop systems for recycling water and waste material help to achieve the twin goals of meeting consumer demands whilst bringing about a step change in the improved sustainability of water resources?
- What is the role of government in planning and integrating waste material and water reuse projects?
- Will innovative changes in public policy be critical in driving the transformation towards a circular economy?

#### 6. [Phosphorous Recovery and Nutrient Removal in the Water Cycle](#)

Phosphorous and nitrogen recovery are critical issues for wastewater treatment engineers, managers, and regulators. With incidents such as the 2014 Toledo, Ohio algal bloom, which left half a million people without drinking water and the advent of new regulations, there is also a manifest

need to further reduce the discharge of effluent nutrients, to protect surface waters by limiting the growth of algae and other aquatic vegetation.

Research to find efficient and cost effective technologies to improve nutrient recovery from wastewater and to protect drinking water sources is therefore a key challenge for organizations in both the public and private sectors.

- What are the key drivers of innovation in the field of nutrient recovery?
- What are the main barriers to technology adoption?
- Has climate change made algal blooms the new normal?
- Recent advances in algal toxin detection, removal and treatment

#### **7. Membranes, Nano - Filtration and the Fourth Industrial Revolution:**

The rapid development of innovative membrane technologies particularly in nano-filtration, epitomises the way in which the physical, biological and digital spheres, are combining in the 4<sup>th</sup> Industrial Revolution to revolutionise the treatment of both industrial and municipal waste streams

Emerging membrane technologies are at the heart of the circular economy. They have made water and wastewater treatment processes safer, less expensive, less energy intensive whilst playing a significant role in reducing the water footprint of many industries.

- What are the latest trends in the development of new membrane technologies?
- What will be the impact on the on-site treatment of waste streams in industries such as food processing, brewing, winemaking, pharmaceuticals and other large consumers of water resources?
- How significant will be the role of nano-technologies in leading the 4<sup>th</sup> Industrial Revolution across the global water sector

#### **8. Energy Positive Water and Wastewater Treatment**

Strategies for optimising process efficiency will become increasingly important for both municipalities and industrial water users. The vast consumption of energy by water and wastewater treatment plants alone is driving the need for innovation in the more imaginative and efficient use of resources. In the USA, The Electricity Power Research Institute (EPRI) has stated that savings of more than 20% could be achieved by process optimisation and the use of more advanced technologies

However, stricter regulations, population growth and rising prices means that the demand for energy to operate Water and Water treatment plants could grow by as much as 20% in the next decade

- How important are government initiatives such as energy audit tools and online benchmarking systems that enable utilities to compare and evaluate comparative energy use?
- To what extent are selecting the right technologies dependent upon greater collaboration at an early stage between the clients, consultants, designers, engineers

and technology suppliers that are involved in the commissioning, designing and operations of a plant?

- What technologies can be developed or implemented to reduce energy consumption at treatment plants?

#### 9. *Bio Solids Management and the Circular Economy*

The beneficial reuse of products obtained from the wastewater treatment process is increasingly seen as an economically and ecologically important part of the wastewater treatment process. New technology and continual innovation means that sludge is now converted in to a variety of valuable products which can be beneficially reused and which save vast amounts of time energy and money previously spent on disposing of solid waste. Examples include, high grade fertilizers, bio fuel for motor vehicles, heat energy and biogas. This revolution has created multiple opportunities within both the public and the private sector.

#### 10. *Water Quality, Waste Stream Reduction, and Energy Efficiency in Industrial Operations*

Industrial users are both the largest consumers of water and the biggest dischargers of organic effluent. As much as 85% of incoming water used in many industrial applications ultimately flows into the sewers. This represents a substantial cost to industry as a large consumer of water resources.

In the coming year's water supply costs and wastewater treatment are likely to be driven even higher by a range of factors including ageing infrastructure, increased demand, water scarcity, climate change and increasingly stringent regulation. Clearly there is a significant business risk to industry which means that reducing water and energy usage will remain a critical priority.

- What are the pathways to more effective and sustainable wastewater management?
- What are the regulatory and non-regulatory drivers affecting investment levels?
- What are the tools needed to reach optimal process efficiency?
- What options are available for on-site wastewater treatment to reduce disposal costs?
- The importance of establishing the full cost of water as a factor in cost benefit analysis of the available options
- The importance of water awareness and sustainable management in establishing industry as a responsible part of the community

#### 11. *Desalination and Re-Use Technologies*

Increasing water scarcity, coupled with continued population and industrial growth, climate change and environmental degradations are making water a precious resource which is driving the mandate for water reuse and desalination throughout the world.

There is a dramatic growth in Direct and Indirect Water Reuse in industries such as Gas and Oil, Mining, Power, Food & Beverage and Agricultural Recycling. ZLD and environmental considerations have therefore become major focuses of the Water Industry with interconnected Energy issues playing an increasingly critical role.

The rapid expansion of reuse capacity has been made possible by quantum leaps in the development of new technologies covering the evolution of membranes, improved energy efficiency, a reduction in the use of chemicals and the improved carbon footprint of the next generation of thermal plants.

## **Innovation in Water Management and Infrastructure**

### **12. [The Innovations Forum at WEX Global – Sponsored by aqualia](#)**

An interactive forum featuring short presentations of 6 innovative technologies from invited companies. Each presentation will be followed by questions, analysis and debate involving both the audience and a panel of distinguished experts. The panel will ultimately decide upon the winner of the WEX Global Innovation Award to be presented at the Gala dinner to be held on 08/11/2017 on the second evening of WEX Global

### **13. [Innovative Financing the 4<sup>th</sup> Industrial Revolution in the Water Sector](#)**

Chronic underfunding in the water sector has long been a dominant issue for water professionals in most countries of the world. Whilst the situation is clearly better in the private sector, water utilities have limited capital and operating budgets which often means that the cost of investment in energy saving technologies has been prohibitive and the need to pay for a new generation of advanced software and equipment will add further pressure to existing budgets.

- Will the cost of new technology mean that the benefits of water 4.0 remain beyond the reach of most countries in the world?
- What are the financial solutions that will help undercapitalised organisations invest now, even if the payoff may not be fully realized for several years?
- Will there be a 4<sup>th</sup> generation of financing to accelerate progress towards water 4.0?

### **14. [Smart Cities](#)**

According to a 2012 United States Census Bureau projection, the U.S. population could reach 400 million people by 2051. With people flocking to cities in increasing numbers, there is an urgent demand for smarter cities to enable planners and resource managers to provide a sustainable future for their citizens.

- How will smart cities change the way that we live and what opportunities do they offer for improving the sustainable management of water and energy?
- Managing growth and development in a sustainable way that minimises disruptions and ensures the realisation of world class infrastructure
- Optimising investment through a coordinated and coherent approach to infrastructure development
- Enabling authorities to improve response efforts by sharing real time intelligence across agencies and organisations

### 15. Protecting Water Utilities against Cyber - Attack

Cyber risk is a growing menace and there is growing evidence of water utilities coming under increasing risk from both criminals and even state sponsored terrorism. Earlier this year hackers linked to Syria breached the security of an American water utility and tampered with critical systems to control water flow and there is also evidence that an Iranian-backed group hacked a dam in New York state. The internet of things has exposed SCADA systems to even greater risk whilst a recent study by PWC concluded that the average utilities company holds data worth in excess of £50 million to a cyber-criminal seeking to exploit that information. What practical steps can utilities take to safeguard facilities and customer details from cyber security risks?

### 16. Water Industry Process Control and Automation – The Challenges and Benefits of Smart Data

The challenges of balancing ageing control equipment, maintenance costs, increased pressures for efficiency and sustainability and sourcing resources are driving innovations in process technologies.

- Making the case for Smart Data and what are the costs and benefits?
- How can real time data improve performance and efficiency in water networks?
- Effective use of data to produce measurable results and the importance of predictive analysis
- Understanding the practicalities of implementing smart process control and automation

### 17. Improving Water and Wastewater Asset Management Using Intelligent Monitoring Solutions

Improvements in water asset management and operations efficiency are critical to meeting population and climate challenges. Leaking pipes and ageing infrastructure require more energy and money to deliver drinking water to the consumer and wastewater to the treatment plant. Deferred investment in existing assets increases risk of catastrophic failures and public health emergencies. How can the public utilities take a proactive approach to re-investment and deliver the best long-term solutions for their ratepayers?

- How do intelligent monitoring solutions and asset management systems (e.g. CMMS) enable utilities to be more proactive in the management of their assets?
- What is the impact of better asset management and upgraded equipment on energy efficiency?
- How can advanced technologies be effectively integrated into existing asset management strategies?
- What is the impact of modern sensing technologies and asset management systems and how and when can they be implemented to predict equipment failure, identify leaks, bursts, or collapses to reduce short and long term costs to the ratepayers?
- The recent tragedy in Flint, Michigan has highlighted the risk of ignoring a known buried infrastructure risk, i.e. lead water services. How can such risks be identified, quantified and addressed before a catastrophe occurs, and what role can technology play in the solution?
- Are there any lessons to be learned by the water sector from the high end maintenance systems used in district heating systems?

## Regional Business Forums

Our regional business forums will offer overview of the business climate and opportunities in water and energy in the following 7 different regions of the world:

1. Asia
2. The Middle East
3. Africa – Sponsored by GWK Consult
4. Central and Eastern Europe
5. North America – Sponsored by Cole Engineering
6. Latin America

Each Forum will examine:

- Key policies for adaptation to climate change and population growth to maintain sustainability.
- What do they mean for the future of the water, wastewater and energy industry?
- Effectiveness of the local regulatory frameworks and institutions
- The importance of recognising the strategic importance of water and “co-creating “ solutions
- Investment in the development of sustainable, alternative and renewable technologies
- Developments towards water 4.0
- Financing challenges