# Highlights - MIT Water Summit 2016 - Water Utilities of the Future

The 2016 MIT Water Summit focused on technological, economical, and political issues surrounding the future of water utilities. Here we present event highlights as well as 1-page summaries of two working groups. A very big thank you to all speakers, sponsors, and attendees for making the event possible, leading to great dialogue and promising connections between participants. Recordings of the keynotes and panels can be viewed at mitwatersummit.com *-the MIT Water Club*

***2 days, 240 participants:*** ***50% students & faculty*** ***30% industry*** ***20% non-profit***

**5 Moderated Panels featuring 20 invited speakers**

Visions for the Future — Role of Policy — Role of Economics — Utility-Industry Partnerships — Entrepreneurship

**Keynote highlights:**

***George Hawkins*** GM and CEO of DC Water, had a message especially for students in the audience: *You are in the right place, at the right time, with the right topic and the right people! This is an incredible time in water because of the crisis we face. There is no other industry with the obligation and the dedication to support every life form on this planet. We got the best product ever: who else gets to sell life-giving resource to everybody, everywhere, all the time?*

***Stephen Estes-Smargiassi*** Director of Planning and Sustainability at Massachusetts Water Resources Authority, empowered his staff to think creatively about how to be more efficient and re-create a struggling system originating in the 18th century, and within a generation, turn it into an exemplary provider of water services, ready to sustainably meet future challenges.

***Christopher Gasson*** publisher of Global Water Intelligence, shared his view on water market trends. While globally expenditure on communal utilities ($300 bn yearly) is greater than that on private domestic solutions ($150 bn), the latter sector is growing 3x faster. This privatization trend towards point-of-use treatment is worrying, diminishing the equity of water for poor and rich, and hindering our ability to tackle regional problems as a community. However, the Internet-of-Things is poised to re-animate assets underground, changing the concept of a utility to become a decentralized, real-time monitored and responsive network managing flows and connecting with customers.

**Technology Showcase & Poster Networking Sessions, featuring over 20 presenters**

**Working Groups:** action plans for future utilities & wastewater research at MIT, see following pages.





**2017 MIT Water Summit: 6 - 7th November 2017** (Monday-Tuesday)

***Water-Food Nexus: water's global role and flow through food production, from agriculture to aquaculture***

Organized annually by the MIT Water Club to explore current problems and potential solutions surrounding water resources around the world, the 2-day summit is a gathering of students and faculty from MIT and the greater Boston area as well as leaders from industry, finance, government, and academia. Next year's event will also feature:

**•career-fair •working-groups •café-table-topics and more!**

**Thank you to all our 2016 sponsors:**

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The 2016 MIT Water Summit convened a group of water experts from diverse fields to discuss how MIT can become a global leader in the treatment, re-use, and management of wastewater. The recommendations made to MIT during this discussion are presented in this executive summary.

### Why should MIT be a leader in wastewater management?

Management and treatment of wastewater is critically important around the world. A volume of over 330 $km^3$ (~ 2/3 of the Mississippi river's annual flow) is produced by municipalities, agriculture, and industry every year, much of which is discharged into waterways with inadequate or no treatment at all[1]. This should change: not only must effluent water be dealt with in a socially equitable and environmentally sustainable manner, in many cases wastewater also contains lost resources and energy, presenting untapped economic value which could be generated using new technologies and strategies.

### Wastewater: part of "One Water"

Wastewater must be considered not as an isolated waste stream, but instead as an integral part of the larger cycle of water collection, use, treatment, and re-use. Water is the single largest volume good transported within cities today, and water is the component of the food-water-energy nexus directly impacted by pollution and climate change. As a primary link in this "One Water" cycle, wastewater should be an area of focus at MIT, because the solutions to tomorrow's water problems will require a holistic view of the entire water cycle.

### How can MIT take a leading role?

MIT should strive to offer global leadership in the field of One Water by defining research priorities, developing required technologies, and training the next generation of water professionals. It is recommended that this is done via the following actions:

- *Work with both local and international partners to encourage knowledge exchange and collaboration:* Collaboration with utilities, government, universities, and industry benefits all parties involved. Locally, good candidates for this type of collaboration are the Massachusetts Water Resources Authority, Boston Water and Sewer Commission, and Massachusetts Clean Energy Center, among others. However, water challenges facing the rest of the world are different from those facing New England. MIT should continue to engage on water issues with institutes around the world, seeking to focus research questions and open a pipeline for student internships.
- *Foster the next generation of water professionals*: Research and internship programs with water companies and utilities will prepare undergraduate and graduate students to enter the field and help bring new ideas to the industry, as well as transfer knowledge from today's water professionals, who have an average age of over 50.
- *Utilize the MIT campus to test, develop and showcase new water technologies*. Water reclamation and energy harvesting can eventually be implemented in MIT's day-to-day operation to improve campus resilience. A physical test-bed would help researchers develop and commercialize new technologies.

### Thrust & Coordination

We imagine a multidisciplinary water center similar to the MIT Energy Initiative in mandate. In this, the MIT Abdul Latif Jameel World Water and Food Security Lab is well poised to take a leading role. Such a center would not only bring together stakeholders in academia and industry and offer research funding, it would convene faculty and researchers with the common goal of performing impactful water research. This would encourage multi-disciplinary collaboration and result in much needed efficient progress on water-related research.

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[1] J. Mateo-Sagasta, L. Raschid-Sally, and A. Thebo, "Global Wastewater and Sludge Production, Treatment and Use," in *Wastewater: Economic Asset in an Urbanizing World*, P. Drechsel, M. Qadir, and D. Wichelns, Eds. Dordrecht: Springer, 2015, pp. 15–39.

## Summary - Working Group - Boston's Water and Sewage System

As part of the MIT Water Summit 2016, a group of participants met to discuss the challenges that water utilities face, focused on the particular case of the Boston Water and Sewage Commission. BWSC is an exemplar utility due to its history of good management and strong leadership, and this session highlighted the lessons of Boston for fellow utilities, while bringing fresh eyes to BWSC's remaining challenges, summarized here:

**Main Challenge** There is a decline of public trust in utilities, concurrently the public takes for granted the uninterrupted and flawless delivery of a vital product. This poses the biggest obstacle against securing the necessary funding for both maintenance and long-term investments through tariff changes, while the political appetite for large infrastructure investments is uncertain.

**Main Lesson** Long-term planning is critical, even more so is courage to request funding and sell the necessity for investments. Complacency or timidity today inevitably lead to greater costs and loss of trust in the future.

**Public Awareness & Support** Need to engage a public that does not fully appreciate the services provided beyond metered tap water (sanitation and fire protection) nor is aware of shared responsibility for house service lines, which are often the source of lead contamination. Solutions include:

- Substantial investment (ex. 8% of budget) in Public Relations: social media outreach, clean accessible facilities, physical community presence ("water trailer"), all increase public awareness of utility's hidden service and value proposition, and builds trust, engagement, and ultimately funding.
- Smart metering benefits: abnormal usage notification to customers increases appreciation and engagement, and information on potential lead service line (checked during meter installation) increases transparency and safety.

**Finances** While most of a utility's costs are fixed, revenues are variable and declining due to positive increase in water conservation by consumers. Investments in upgrades involve high stakes: minimal error-tolerance makes piloting and implementing innovations difficult, costly, and slow. Solutions include:

- ring-fencing of budget, crucial to allow long-term investing by utility.
- transfer proven technology from largest utilities (able to innovate) to smaller ones (avoiding the risks). Examples:
  - Geographic Information System: facilitate routine network maintenance & emergency response
  - Swimming pipe-inspection robots: reduce leaks (currently 15% of water is lost), prevent critical main breaks

**Climate Change** Uncertainty in long-term impact on quality & quantity of coastal groundwater and surface supply

- Integrate utility's asset management plan with advanced modeling platforms: allows planning for short-term system optimization (stormwater flows) and long-term sustainability (changing rain patterns, sea-level rise)
- Design consideration: include climate change impact on flood risks as a key concern for every new facility plan

**Emerging Pollutants** Difficult to adapt treatment for new waste such as micro-beads or micro-fibers in dilute stream. Systemic solutions such as recent ban on micro-beads is a successful example of prevention at the source.

**Human Capital** Need to rejuvenate the workforce while transferring the institutional tacit knowledge of long-time employees. A positive work & recruiting environment can be supported by providing technological training, summer intern programs, and partnerships with universities.

**Research Needs** We are at the threshold of the "Internet Of Things" transforming water systems into monitored, responsive, adaptable networks, with the potential to improve our efficiency of water usage. Related & further topics:

- IoT integration: need to improve scalability of real-time monitoring & analysis tools to pinpoint contaminations and leaks, monitor usage. Find technical approaches to decrease costs of rehabilitation of pipe systems underground. Explore potential benefit and concerns with network of wastewater sensors gathering information on public health.
- Social science: compare efficacy of initiatives by utilities around the world in nudging consumer behavior. How do we divert consumer spending from bottled products to utilities providing 1000x cheaper, quality water?
- Governance & Policy: how to transfer successful approaches from role-model utilities to struggling ones, improving coordination across the current landscape of patchwork water policy between operators and regulators.
- Long-term, systemic approach: analyze life-cycle impact of policies and consumer behavior to stop pollution before dilution, increase efficiency, but maintain equity of service.

**Learn More** Ours is not the first session to focus on the water utility of the future. See the following resources:

➡Water Environment Federation: The Water Resources Utility of the Future: A Blueprint for Action
➡National Association of Clean Water Agencies: Promoting Innovation to Address 21st Century Challenges
➡NACWA - WEF - WE&RF - WaterReuse - EPA: Water Resources Utility of the Future Today Recognition