



# Constituents of Emerging Concern



How can utilities continue to manage constituents of emerging concern (CECs) in a way that allows them to deliver high-quality services to their customers, protect the environment, and meet regulatory requirements?

## CRITICAL FUTURE DISRUPTORS

For the purposes of this effort, a disruptor is defined as something that interrupts an event, activity, or process by causing a disturbance, problem, or opportunity. Disruptors can arise as barriers to normal operations or may present opportunities to do things differently/innovate.

The following items were chosen by a diverse group of water leaders and experts as the most significant future disruptors that water utilities must anticipate and plan for.



### PUBLIC PERCEPTION

The success of the water sector depends on public confidence. People need to believe that their drinking water is safe and that it is being produced at a reasonably low cost. People also need to believe that wastewater discharges are safe for the environment, and that recycled water is safe for its intended use. Our social media culture allows the assertion of facts without accountability, which can have a significant impact on public faith in institutions. All these factors require the water sector to identify and implement effective strategies for communicating with their customers and the media about CECs.



### POLICY

Will the precautionary approach in the EU Reach regulations be adopted in USA? Despite the recent large infrastructure bill, there is a continuing deficit of government investment in municipalities. Will additional governments move towards adoption of a circular economy?



### TECHNOLOGY

The potential emergence of new destructive technologies and replacement chemicals. The emergence of real-time safety sensors. Potential expansion of non-traditional water sources like atmospheric water capture and desalination. The potential introduction of greener chemistry and expansion of green energy trends.



### INCREASED LEVELS OF INDUSTRIAL PRETREATMENT

The potential introduction of enhanced requirements for industrial pretreatment to prevent CECs from entering water treatment facilities in the first place.

# RESEARCH OPPORTUNITIES

Based on these critical future disruptors, experts prioritized the following targeted research areas:



## DIAGNOSTIC TOOLS

Need for further advancement of diagnostic tools to help identify the presence of CECs closer to real time. Expanding the availability and use of untargeted analysis and data processing workflows. Development of near real-time high-resolution mass spectrometry for monitoring of water quality. Additional strategies for effective management of stormwater.



## REMOVAL/DESTRUCTION TECHNOLOGIES

Identification of best practices for disposal of pharmaceuticals and personal care products that don't involve flushing drugs. Biofiltration – identify additional opportunities to beneficially use the bacteria in treatment processes. Biostable water – identify new ways to improve water quality in the distribution system. CEC transformation through innovative strategies such as biomimicry.



## EMERGING CONSTITUENTS (MICROBES, CONGENERS, CHEMICALS)

Expand CEC research to focus on biological constituents, including antibiotic resistant genes, *Legionella*, and emergent new microbes, possibly utilizing metagenomics. Expand research into microplastics.



## CONSENSUS COLLABORATION AND OUTREACH

Implement strategies to simplify utility engagement with research and avoid duplication of efforts. Increase collaboration through source water protection programs. Enhance inter- and intra-agency coordination. Identify opportunities for the water sector to effectively engage with chemical companies and manufacturers to promote the development of new “replacement” chemicals that are better for the environment. Identify effective communication strategies when we have incomplete understanding of the CECs in question.



## MULTIPLE STRESSORS

Identify strategies to address multiple stressors, including technologies to address occurrence, identify chemical mode of action, fate in the environment, behavior of mixtures, and primary routes of exposure.



## RISKS

Strategies to address legacy CECs widely distributed in the environment. Research to improve risk communication, including strategies to focus media attention on the problems of greatest public health and environmental concern rather than issues of lesser concern. Strategies to determine the health and environmental impacts of alternative chemicals. Greater understanding of the uptake of CECs through the food chain.



## CECS STRATEGY DEVELOPMENT

Additional techniques to elucidate the toxicity of contaminant mixtures. Development of strategies for effect-directed analysis. Identification of cradle-to-grave approaches for newly developed/invented chemicals (i.e., techniques to encourage chemical manufacturers, when developing a new chemical, to develop a corresponding treatment strategy to protect environment before their chemical is released to the market).

