

Federal Efforts to Characterize Exposures to Contaminants of Emerging Concern

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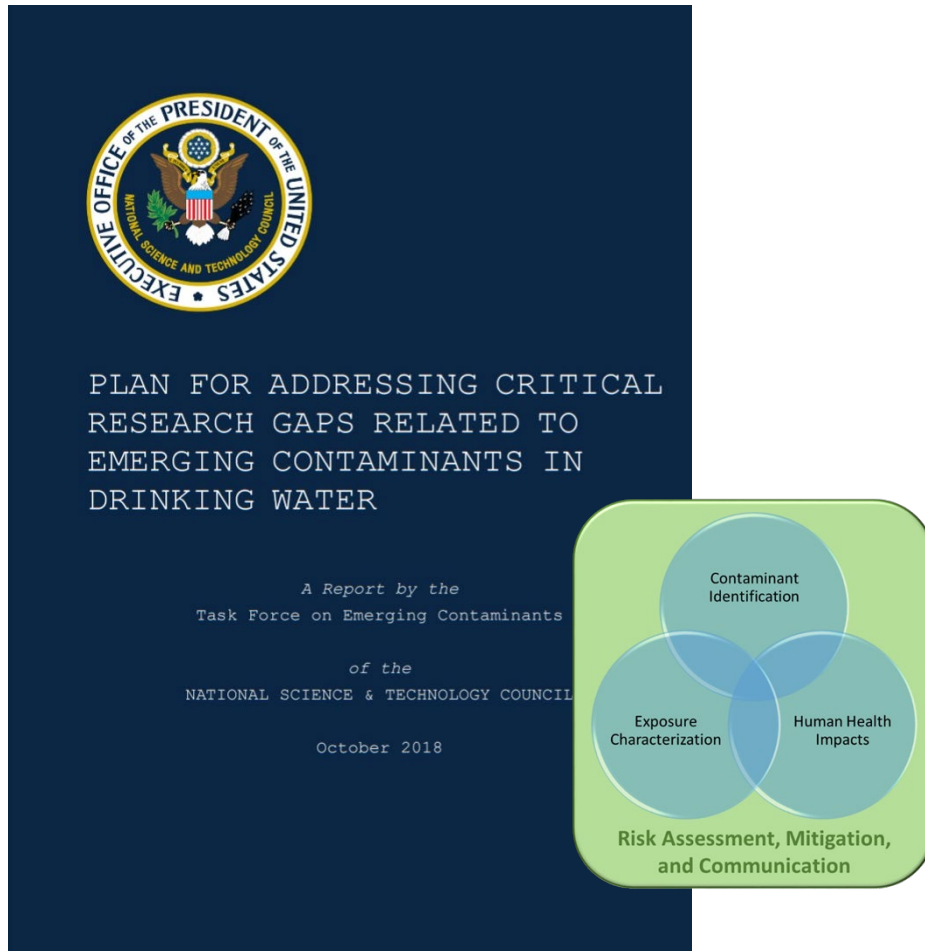
CONGRESSIONALLY-MANDATED 2018 CROSS AGENCY PLAN ON CONTAMINANTS OF EMERGING CONCERN IN DRINKING WATER

Focuses on **critical research gaps**:

- Contaminant Identification
- **Exposure Characterization**
- Human Health Impacts

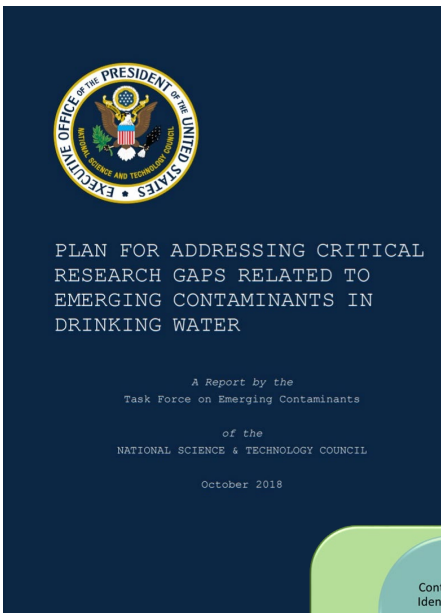
Contaminants include:

- Physical, chemical, biological, or
- Radiological substance or
- Matter in water



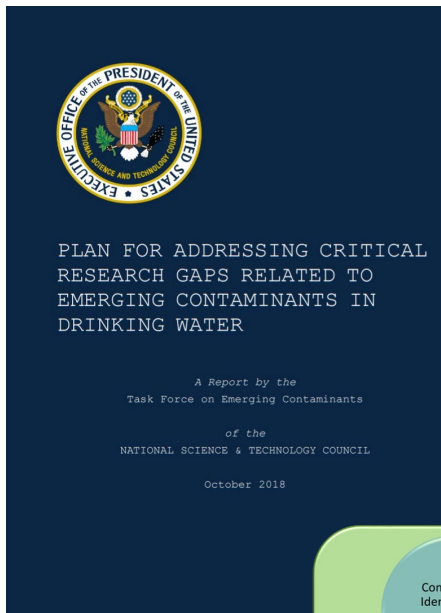
EXPOSURE CHARACTERIZATION FOR CECs - OVERVIEW

- CECs can be introduced into drinking water *prior to, during, or after* treatment.
- To successfully identify and quantify exposure, data are needed across the CEC *lifecycle* from source to tap on:
 - Occurrence
 - Transformation
 - Fate and transport
- This work includes *assessments* in:
 - Distribution systems
 - Drinking water treatment plants
 - Source water



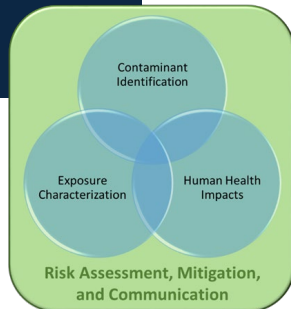
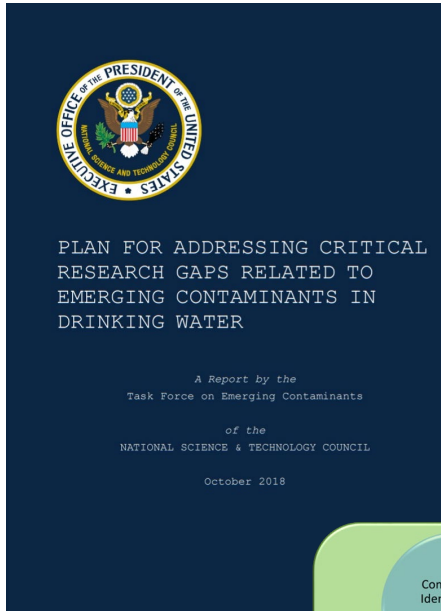
The long-term goal is reducing health risks by minimizing the likelihood of exposure.

EXPOSURE CHARACTERIZATION FOR CECs – ADDRESSING CRITICAL RESEARCH GAPS



- ✓ **Conduct research on distribution system composition and integrity**
- ✓ **Develop models and collect data to assess exposure at the tap**
- ✓ Study distribution-system-specific and source-specific exposure scenarios
- ✓ Investigate the influence of consumer behavior and demographics on human exposure

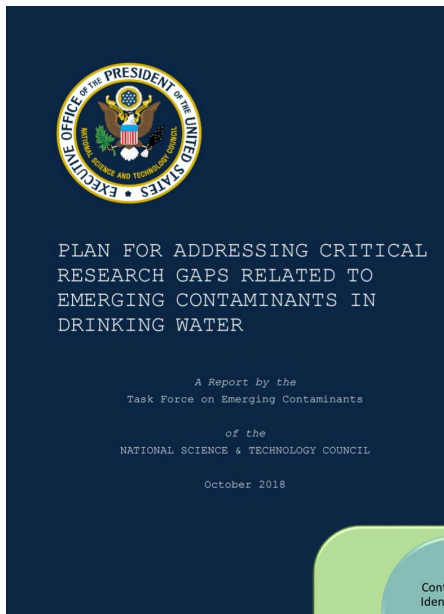
ADDRESSING CRITICAL RESEARCH GAPS - DISTRIBUTION SYSTEM COMPOSITION AND INTEGRITY



- Condition of the distribution important but not necessarily systematically examined, e.g.,
 - Harmful by-products may result from chemical interactions
 - Microbial contaminants may be introduced through breaks

- Key research areas include:
 - Contact of piping materials with residual chlorine
 - Potential exposures to pathogenic microorganisms from infrastructure failures

ADDRESSING CRITICAL RESEARCH GAPS - DEVELOP MODELS TO ASSESS EXPOSURE AT THE TAP



- Not feasible to conduct research collecting samples at every tap
- Knowledge gained should:
 - Be transferrable
 - Become part of a longer-term effort to develop models of exposure to inform iterative model development and refinement
- Focus on developing the methodology to integrate datasets generated by a wide range of disciplines (e.g., engineering, environmental health science, microbiology, chemistry) and measuring techniques.

THEMATIC AREAS THAT SUPPORT COLLABORATIONS

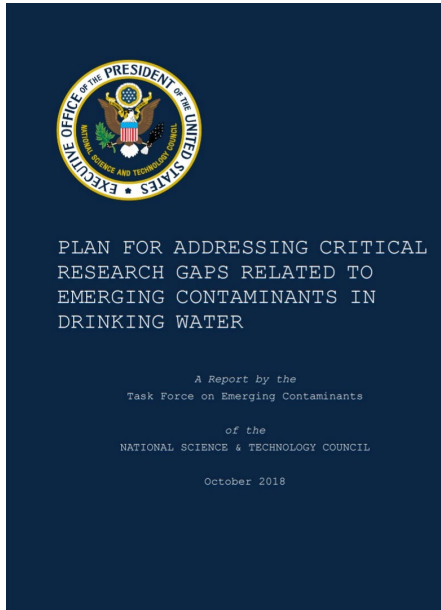


Research Gap		Standards, Process, and Protocol Development	Data Management, Analytics, and Informatics	Cross- Government Coordination*	Outreach
Contaminant Identification	Improve water sampling design	X	X	X	
	Improve CEC monitoring technology	X	X	X	
	Continue development of rapid analysis tools for contaminant identification in mixtures	X	X	X	
	Accelerate development of computational tools, such as AI, that automate the incorporation and processing of CEC data	X	X	X	
Exposure Assessment	Conduct research on distribution system composition and integrity				X
	Develop models and collect data to assess exposure at the tap	X	X	X	X
	Study distribution-system-specific and source-specific exposure scenarios	X	X	X	X
	Investigate the influence of consumer behavior and demographics on exposure			X	X
Human Health Impacts	Develop computational tools for rapid human health risk evaluation	X	X	X	
	Build tools to assess human health risks under realistic exposure scenarios	X	X	X	X
	Improve human health assessment methods for CEC exposure during sensitive developmental periods	X	X	X	
	Build understanding of the psychology of CEC events				X
	Develop methods to identify alternative safe chemicals			X	

*This coordination refers to research involving three or more agencies or involving coordination between the Federal Government and State, local, and Tribal entities.

Anticipated Timeline to reduce research gap	
	Near term (0-3 years)
	Mid- to long-term (>3 years)

LEARNING FROM EXAMPLES OF COLLABORATIVE ACTION



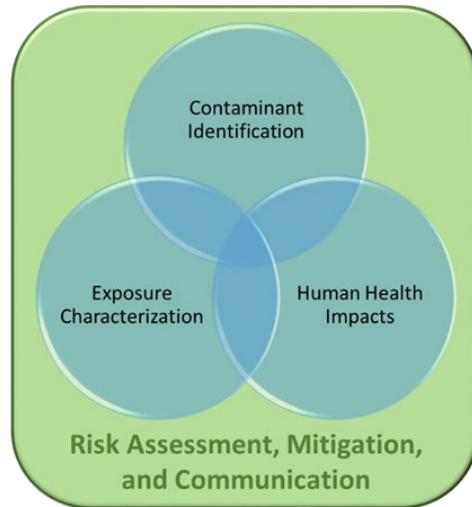
Box 1. The Norman Early Warning System (NormaNEWS)

When a new contaminant that is potentially harmful to human health is found in drinking water, it is often difficult to characterize the historical temporal and spatial distribution of exposure. This is especially difficult when the given contaminant is either found in low concentrations or has not been previously targeted in water analyses. To retrospectively characterize the historical distribution of the CEC, researchers have used non-targeted analyses and methods. The European Norman Early Warning System (NormaNEWS) provides a unique example of an approach and collaboration. The network of laboratories collects historical data, specifically high resolution and accurate tandem mass spectrometry, to examine the occurrence of contaminants that were not considered when the data was first collected and analyzed.¹⁰ This demonstration project (using non-targeted methods) successfully developed models, methods, and software to conduct analyses that could be useful for evaluating U.S. drinking water.

¹⁰ Alygizakis, N.A., Samanipour, S., Hollender, J., et al. "Exploring the Potential of a Global Emerging Contaminant Early Warning Network through the Use of Retrospective Suspect Screening with High-resolution Mass Spectrometry." *Environmental Science & Technology* 52, no. 9 (2018): 5135-5144.

NATIONAL DEFENSE AUTHORIZATION ACT (NDAA) 2020

SUBTITLE D – CONTAMINANTS OF EMERGING CONCERN



Current Research Areas include:

- Exposure
- Effects
- Risk Characterization
- Risk Mitigation
- Risk Communication

Exposure

- Includes: - Ingestion - Inhalation - Dermal routes
- Encompasses: - Contaminant identification - Exposure pathways - Sources
- Explores: - Analytical techniques supporting these topic areas

ACKNOWLEDGEMENTS

2018 Cross Agency Team

NDAA Inter-Agency Workgroup

Participants on all Technical Teams (TTs)



THANK YOU