Horizon Scanning to Identify Emerging Environmental Health Concerns: Community-Based Strategies to Shift from Reactive to Proactive Approaches

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Horizon scanning to identify emerging environmental health concerns: Community-based strategies to shift from reactive to proactive approaches

ABSTRACT: Emerging environmental threats increasingly challenge public health systems, and these risks often outpace the ability of scientists and policymakers to respond effectively. To address this gap, horizon scanning offers a proactive approach to identify early signals of potential threats, enabling timely research and policy action. This commentary synthesizes insights from a 2024 workshop convened by the National Institute of Environmental Health Sciences and proposes strategies to develop a horizon scanning Community of Practice (CoP) for improved identification and response to emerging environmental health risks. This commentary addresses key challenges identified during the 2024 workshop including slow risk assessment, fragmented data systems, and limited cross-agency communication. We also review existing successful frameworks for horizon scanning, including the Delphi method (using structured collective intelligence for foresight), the U.S. Interstate Technology and Regulatory Council Contaminants of Emerging Concern framework, and additional interdisciplinary collaboration models. We identify that effective models share common features: Clear objectives, structured yet flexible communication, and inclusion of diverse stakeholders, including nontraditional experts and affected communities. Empowering stakeholder "champions" and leveraging existing tools and networks enhance collaboration and efficiency. We propose that developing a horizon scanning CoP requires transdisciplinary collaboration, shared data standards, and inclusive engagement. Starting with focused, scalable efforts and building on existing frameworks can improve preparedness and enable more proactive, coordinated responses to emerging environmental health threats.

KEYWORDS: CONTAMINANTS OF EMERGING CONCERN, ENVIRONMENTAL CHEMISTRY, ENVIRONMENTAL TOXICOLOGY, HORIZON SCANNING, COMMUNITY OF PRACTICE

INTRODUCTION

Worldwide, numerous public health threats such as environmental pollution, emerging toxic contaminants, ecological changes, and extreme weather can initiate or exacerbate disease (World Economic Forum, 2026). These threats can arise unexpectedly, yet regularly, and rapid mobilization of scientific resources to respond to such situations can be difficult. Certain hazards may also accumulate before the scientific community has the knowledge to characterize them as problematic. Horizon scanning serves as a structured approach to gather intelligence about possible future environmental and health threats, identifying knowledge gaps and generating new insights that inform research agendas and, in turn, shape more proactive and resilient policies. This approach prioritizes data generation and timely action with minimal barriers upon early indication of public health threat (Bengston, 2013; Sutherland & Woodroof, 2009). Horizon scanning can empower us to look broadly when identifying emerging developments of potential relevance to the environment and public health, and it can support scientists and policymakers in anticipating future opportunities and managing risks (Amanatidou et al., 2012; Könnölä et al., 2012). The aim of horizon scanning is to identify salient signals of emerging issues that could shape the future of a policy area in sufficient time to proactively initiate research and develop policy and practical responses (Sutherland et al., 2010). Such signals can arise on the periphery or outside of a given policy area, affected by drivers of change including political, economic, social, technological, legislative, and environmental (PESTLE) factors. Horizon scanning may offer improved preparedness for times of need and can increase community resilience against potential environmental threats (Sutherland et al., 2019).

The fundamental motivations behind horizon scanning are not new: Many core principles have previously been applied through collaborative efforts to identify and address emerging environmental health challenges. Past collaborative initiatives demonstrate how these principles can be applied to both emerging technologies and newly recognized emerging contaminants (a term used broadly to describe chemicals or agents that are newly detected, insufficiently characterized, or newly recognized as potential risks). For example, the National Nanotechnology Initiative brought together government, academia, and industry to collaboratively evaluate potential environmental and human health implications of emerging nanotechnologies before widespread adoption. By promoting early information sharing on topics such as safe design, occupational exposures, and environmental fate, the initiative demonstrated a proactive approach to identifying and managing potential risks (National Academy of Sciences, Engineering, and Medicine, 2020). Spurred by these same principal goals, numerous existing mechanisms presently aim to address public health emergencies, including emerging contaminant exposures. For example, the National Institute of Environmental Health Sciences (NIEHS), which is one of 27 institutes within the U.S. National Institutes of Health (NIH) and is responsible for environmental health research, has several initiatives aimed at addressing emerging contaminants and disasters. The Emerging Contaminants and Issues of Concern (ECIC) Program (NIEHSa, n.d.) aims to develop and implement strategic approaches that leverage NIEHS capabilities for fit-for-purpose research to inform public health decision-making; similarly, the Disaster Research Response (DR2) program (NIEHSb, n.d.) provides training, funding, and a resource portal to support human health researchers across organizations in responding to disasters with a range of public health approaches. Where individual emerging contaminants are concerned, the Interagency 6PPD-Quinone (2-((4-methylpentan-2-yl)amino)-5-(phenylamino)cyclohexa-2,5-diene-1,4-dione) Working Group, coordinated by the National Toxicology Program (NTP), connects federal partners to address the emerging environmental contaminant 6PPD-quinone (Tian et al., 2021) through communication, data sharing, and coordinated research planning; through this working group, partners are able to collectively identify research gaps, reduce duplicative efforts, and accelerate understanding of the contaminant's environmental and potential human health impacts. Together these groups aim to improve early detection of toxicant threats, improve health impacts assessments, and mitigate exposures to toxicants not yet regulated in sources such as air, drinking water, food, and household products. Complementary approaches exist across sectors at other federal institutions.

Despite these considerable efforts, rapid mobilization of scientific resources to emerging environmental health concerns remains difficult. Screening emerging chemicals for exposure and toxicity risks can be time-consuming and financially intensive. Clear communication must then occur among federal, state, private and public researchers and communities in order to share evolving information, discuss concerns and risk probabilities, and make further decisions about how best to use resources and funding. Even with existing cross-talk between institutions, agencies lack mechanisms or rapid communication infrastructures by which to work together when disasters occur. Thus, it is critical to develop communication systems by which to share innovative research and approaches across agencies so that timely and resource-streamlined action is possible to protect public health.

Horizon Scanning Workshop

To address these collaboration challenges, NIEHS convened a two-day workshop in May 2024 to establish a forum for coordinating efforts to advance horizon scanning methods for identifying and improving responses to emerging contaminants, emergencies, and issues of concern (NIEHS, 2024). The workshop panel and participants included global and United States experts in the public and private sectors with expertise in horizon scanning, chemical analyses, epidemiology, environmental health, toxicology, and policy (see Tables 1 and 2 for a list of workshop panel and organizers). On Day 1, the experts shared perspectives and support for the horizon scanning approach, including current practices across government, gaps and weaknesses, and ways that implementation might be advanced through a Community of Practice (CoP; Wenger-Trayner, 2023).Several participants collectively defined this CoP as a voluntary system for collective expert inquiry, communication, and reflection to develop shared intelligence on identifying and addressing emerging environmental concerns. Workshop themes included chemical and non-targeted methodology to identify contaminants; geospatial mapping approaches to identify sources and populations affected by pollutants; and non-traditional strategies for collecting input. Day 1 ended with a "think tank" breakout discussion to generate ideas on "Where do we go from here to advance horizon scanning and work toward a Community of Practice?" This discussion served as the foundation for Day 2 breakout groups and round-table discussions to identify principal needs and goals for working toward a CoP (see Figure 1).

Commentary Objective

This commentary reviews the approaches presented during the workshop, synthesizes workshop findings, and proposes actionable steps for building a horizon scanning CoP. We consider how these models can inform future strategies for horizon scanning, and we identify common themes that are pivotal to creating successful horizon scanning action plans. We focus on existing local (e.g., U.S. state), national (e.g., U.S. federal), and international collaborations and cross-talk as foundational models on which to build bridges for horizon scanning across networks. Although many examples presented are drawn from U.S. federal agencies and initiatives, given that almost all workshop participants were based in the UNITED STATES, the principles discussed are intended to be broadly applicable and are complemented by examples from international and multinational collaborations. We consider common themes among these models that should serve as guidelines for establishing a CoP moving forward.

Challenges in Emerging Contaminant Research

Workshop experts and participants identified research challenges facing emerging contaminant and disaster response research related to data resources, policy decisions, communication and community engagement, as well as technical challenges (see Figure 1). Key to identifying solutions to these research challenges include building transdisciplinary networks to foster communication, recognizing differences in policy and missions. A CoP can apply different collaboration models (discussed below) to address these challenges.

GROUNDWORK FOR HORIZON SCANNING: BUILDING ON EXISTING WORK

The NIEHS workshop featured several speakers who presented on existing environmental health action models that had been successful in their respective disciplines, communities, or countries. Each model demonstrates collaboration that effectively leverages resources and may therefore serve as an example of the attributes that should be prioritized in a horizon scanning CoP. Here, we specifically consider several collaboration models that can be best leveraged with a wide variety of stakeholders. We identify common themes among those successes, as well as identify the use cases in which these models are best applied. Consequently, we also consider that different models are appropriate for different questions, and that the availability of multiple models may help create a fit-for-purpose approach to apply horizon scanning to a given emerging concern.

The Delphi Method

Included in these models is the Delphi method, a structured foresight method to use a broad range of collective intelligence to identify and shortlist future issues which could pose risks or present opportunities for policymakers (Shaping Tomorrow, n.d.). The Delphi method is based on building a structured communication framework via multiple rounds of questionnaires sent to a panel of experts. Here, experts are asked to answer a scoping question – for example, "Describe ten future issues that could have a positive or negative impact on environmental health which policymakers or other stakeholders may need to respond to in the future." The responses are collated and anonymized before being sent back to the panel to identify their top-priority issues. Shortlisted issues can then be returned to the panel so that each member can individually identify their top ten. Collating these responses can generate a set of top issues for policy makers to determine next steps: For instance, 1) do nothing, 2) monitor the situation, or 3) act. This method leverages the collective wisdom of a panel of experts, is anonymous, iterative, systematic, goal-oriented, and long-term future-focused (Hines et al., 2019). The Delphi method is useful for many scenarios where open communication can be difficult, such as chemical pollution issues. It is advantageous for gathering input from stakeholders across multiple sectors to better understand emerging risks and barriers to collaboration (Sutherland et al., 2025). It also collects this input anonymously to foster unbiased and factual responses: In a multi-sector discussion, economic and political influences, public perceptions, and stakeholder vulnerabilities can pose barriers to honest input. It can also be conducted virtually, which offers an opportunity to expand its reach into broader, national, and multinational stakeholder networks. The Delphi model's approach of collecting and disseminating anonymous ideas, and then anonymizing follow-up thoughts and responses, removes these biasing barriers, effectively empowering a blinded peer-reviewed process (Rowe, 1999). Particularly where chemical pollution is concerned, the iterative and systematic anonymous nature of the Delphi model is helpful for leveraging global expertise. The Delphi Method is one of 12 futures-thinking tools described in the Futures Toolkit developed for the United Kingdom (UK) Government Office for Science, which provides insights on these tools and their implementation (GOV UK, 2024). It has been utilized in the UK to identify future chemical issues that could impact policymaking in this area (Green et al., 2023).

Contaminants of Emerging Concern (CEC) 2023 Framework

Other formal U.S. state-based coordinating models can foster flexible frameworks at the state level for stakeholders to generate transdisciplinary action, such as the Contaminants of Emerging Concern (CEC) 2023 Framework issued by the Interstate Technology and Regulatory Council (ITRC; ITRC, 2023). The ITRC is a state-led United States national coalition of regulators, industry experts, citizen stakeholders, academia, and federal partners that work to achieve regulatory acceptance of environmental technologies and innovative approaches. Because many environmental regulatory responsibilities in the United States are shared between federal and state governments, organizations such as ITRC facilitate coordination across states while engaging federal agencies and other partners. The ITRC's CEC Framework addresses challenges presented by the need to communicate risks and provides stakeholders with access to common information. The CEC Framework codifies a working definition of CEC so that stakeholders have common vocabulary: Specifically, the ITRC defines CEC as "substances and microorganisms including chemical, biological, or radiological materials known or anticipated in the environment, that may pose newly identified risks to human health or the environment." Additionally, through a series of four factsheets focused on CEC Monitoring Programs; Identification of Key CEC Variables; Risk Perception and Communication; and Adoption of Analytical Methods for Identifying CEC, the CEC Framework provides a scientifically informed, peer-reviewed, systematic body of guidance to assist states and other stakeholders in formulating their own CEC programs. The model is technically based, yet broad enough to leverage state values, priorities, and needs. It provides guidance intended to equip all interagency partners to address challenges presented by new or insufficient data, insufficient experience, statewide differences in CEC monitoring programs (or, in some cases, lack of state CEC monitoring programs), and articulates the need to evaluate, prioritize, and communicate CEC risks. In doing so, it provides simultaneous flexibility for state-to-state situations and resource availability while establishing guidelines and standards. In late 2025, ITRC completed a guidance for Biological CEC that is rooted in the U.S. Center for Disease Control (CDC), U.S. Environment Protection Agency (USEPA), and World Health Organization's (WHO) "One Health" approach that seeks to optimize the health of people, animals, and ecosystems while recognizing our interconnectedness and interdependence; the ITRC continues to provide training on these communication frameworks to pursue better engagement with federal groups and agencies (ITRC, 2025).

Square Table Model

While the Delphi method and ITRC CEC Framework are two different beneficial ways of implementing structured and peer-reviewed conversation across multiple regions and over time, sometimes a smaller model that allows informal yet more direct conversation is most appropriate. The horizon scanning workshop thus also introduced participants to a "Square Table" model that has been used by the U.S. National Science Foundation (NCI, 2021) to engage researchers whose fields typically do not overlap. This model refers to physical set-up for conversations between four researchers in diverse fields: Around one table with four sides, each side of the table hosts researchers from two fields to address a specific issue. This structure is meant to enable self-facilitated, open-ended interactions between diverse researchers connected through horizon scanning efforts and allows the participants to collectively assess needs and identify perspectives from each group. By considering the four "squares" of Idea Generation, Idea Elaboration, Idea Implementation, and Idea Championing, participants can better identify and leverage multiple individual areas of expertise and consider how best to integrate them, as well as bringing in additional areas of expertise that they may not immediately consider, including non-scientist perspectives.

Ongoing Collaboration Initiatives

In addition to discussing communication models like the Delphi method, the ITRC framework, and the Square Table model, workshop speakers shared several additional UNITED STATES interagency communication initiatives for horizon scanning in which they are actively engaged. These models take the ideas and insights surfaced through communication and move them into practical steps and decision-making. Here, we consider a few of those models, again considering common themes of successes and best use cases for these action models. Through these examples shared at the NIEHS Horizon Scanning Workshop, we examine how solid communication processes can lead directly into meaningful action, especially when dealing with fast-moving or uncertain environmental health challenges.

National Emerging Contaminant Research Initiative (NECRI): In addition to initiatives such as ITRC, another example of an ongoing collaboration initiative is the 2022 National Emerging Contaminant Research Initiative (NECRI; OSTP, 2022) and the NECRI Implementation Plan (OSTP, 2024) subsequently released in 2024. Originally initiated by Congress, this working group of federal interagency stakeholders identified critical CEC research and coordination priorities, and established five goals to address those needs: 1) Decrease time from CEC identification to risk mitigation; 2) Promote technological innovation to discover, track, understand, and mitigate CECs; 3) Develop and display tools and approaches for CEC decision-making; 4) Coordinate transdisciplinary CEC research activities among federal and non-federal partners; and 5) Foster transparency and public trust when communicating about CECs. The NECRI Implementation Plan, released two years later by an established CEC Strategy Team, builds upon NECRI by articulating specific short-term and long-term activities to work toward these five goals. Specifically, activities in the implementation plan create a structured approach to address NECRI research gaps and define measurable outcomes for the successful implementation of NECRI. The Implementation Plan also includes guidance and examples for how UNITED STATES federal agencies can collaborate and coordinate CEC research, as well as a decision tree for stakeholders to use when coordinating extramural funding opportunities.

Best Practices for Non-Targeted Analysis (BP4NTA): The Best Practices for Non-Targeted Analysis (BP4NTA) is an organization founded by chemists from the USEPA and the National Institute of Standards and Technology (NIST) that formulates guidelines and cooperative working agreements for harmonized non-target analysis (NTA) practices (BP4NTA, n.d.). NTA, using mass spectrometry, is commonly employed for exploring complex samples and identifying novel contaminants (Manz et al., 2023; Schymanski et al., 2015). BP4NTA specifically engages non-target scientists and other interested stakeholders in understanding their uses of (and barriers to use of) NTA: The group aims to establish consensus guidelines for NTA users to harmonize communication and reporting standards. Based on surveys of stakeholder questionnaires and responses (Nason et al., 2025), combined with iterative user buy-in, BP4NTA is developing a suite of materials to provide quality assurance/quality control (QA/QC) frameworks and study guidelines (Peter et al., 2021). The BP4NTA has also been active in promoting accessible chemical compound databases and libraries, and in leading transdisciplinary and United States interagency efforts to establish common practices for linking NTA data with toxicity and fate data. These harmonized guidelines are critical not only for establishing common practices and standards, but for ensuring these practices are firmly in place when rapid or emergency responses are needed: Metrics for NTA success in rapid response situations include speed of analysis, confidence in chemical identifications, extent to which hazard assessment is possible, and transferability of designed NTA method/workflow (Sloop et al., 2023).

Military Programs: Action models for horizon scanning are also critical for specialized populations such as military personnel: Military populations often experience unique environmental exposures that can also inform civilian environmental health research and emergency preparedness (Geretto et al., 2021). The U.S. Defense Health Agency and Department of Defense have several initiatives to identify and characterize chemicals of concern for military and military workforce communities. Because exposures sources, stressors, and risks are different for military personnel and first responders, unique well-defined research programs focused on military needs and expectations are critical. Included in these mechanisms is the Toxic Exposures Research Program (TERP), one of the Congressionally Directed Medical Research Programs, that supports research on numerous military chemical hazards including burn pits and other airborne hazards; neurotoxin exposures; Gulf War Illness; prophylactic medications; pesticides; and more (CDMRP, n.d.). Toxic Exposures Research Program's goal is to speed the development of disease treatments, cures, and preventions to provide maximum benefit to service members, veterans, and the public. Collectively, these coordinated funding and planning efforts ensure that horizon scanning specifically for military hazards is proactively addressed.

CONSIDERATIONS FOR CREATING A COMMUNITY OF PRACTICE

Collectively, these models demonstrate that horizon scanning requires both mechanisms for identifying emerging signals and structures for translating those signals into coordinated action. Although they differ in purpose, scale, and degree of formal structure, the models discussed here each integrate diverse expertise to address uncertainty. Some approaches emphasize foresight and early identification of potential concerns (e.g., Delphi and Square Table models), whereas other approaches focus on standardization, coordination, and implementation after an issue has been recognized in order to harmonize action moving forward (e.g., ITRC, NECRI, and BP4NTA).

These communication models and interagency initiatives provide groundwork for addressing future challenges and identifying opportunities in horizon scanning. Strengths and distinctions between the models presented here suggest that a horizon scanning CoP should not replace existing initiatives but rather serve as connective infrastructure that links complementary approaches. Here, we focus on the elements that enable successes of existing models and interagency initiatives, and we discuss how these lessons might inform the development of a horizon scanning CoP.

Defining Purpose and Scope

The existing horizon scanning models explored above each originate from a clearly defined goal and scoping question. No one model or initiative aims to address all concerns with emerging environmental contaminants at one time; rather, each of these models are fit-for-purpose. A horizon scanning CoP would not duplicate these missions; rather, it would become the voluntary network connecting these fit-for-purpose models in order to create a persistent capability for forecasting and a methodological learning network (Wenger, 1998). Thus, considerations for appropriate scope and fit of a new horizon scanning model should include clarity about the overarching purpose of the horizon scanning model; specific objectives and evaluation criteria; and appropriate geographical, temporal, and stakeholder scope.

Including Multiple Stakeholders

Additionally, while these approaches are each unique in scope and shape, they each have a clear method of including multiple stakeholders. The models examined here each facilitate a structured communication framework that is designed specifically to remove barriers to transdisciplinary conversation and collaboration. By creating systems to facilitate cross-talk between disciplines and organizations, these communication models leverage the collective wisdom of a broad range of experts. Involving multiple members is a crucial tenet of any CoP (Wenger, 1998); participants identified that multiple stakeholders should be invited to participate in a CoP. Engagement and cross-communication between scientific stakeholders from academia, government, industry, and non-profit organizations will enable the sharing of varied resources and valuable expertise. Additionally, it is critical to include stakeholders in roles “outside the box” from usual emerging contaminant experts – namely, those other than scientists. Specifically, in addition to including scientists from government, academia, industry, and non-profits, participants identified the need to engage leaders from other sectors (e.g. those without basic science or life sciences training), including:

- Business and economy experts
- Humanities and social science researchers
- Community members, particularly those from communities with higher exposure risks
- Policymakers and diplomacy experts
- Behavioral scientists
- Community engagement professionals, such as social workers, librarians, and organizers

Empowering Champions

Casting such a wide net does more than include multiple voices: It also empowers multiple stakeholders to act as horizon scanning champions in their own domains. Champions act as two-way communicators and advocates who report on issues, needs, and progress both to their own communities and to the core CoP members. Broad input from community, national, and international champions empowers horizon scanning to operate widely from a macro lens to consider issues that may fall outside the stereotypical purview of government stakeholder research and operation. Champions can also facilitate inclusion of additional areas of expertise – such as sociology, economics and politics –that core community members might not immediately consider. For example, a director of a regional public health nonprofit may be able to serve as a horizon scanning champion by reporting emerging concerns from local clinics, sharing trends and observations, and communicating with regional healthcare providers about emerging risks so that providers can prepare for future health risks (Chibi & Galea, 2025). Identifying and supporting champions from multiple sectors is critical to better leverage multiple individual areas of expertise and consider how best to integrate them.

Involving Momentum by Starting Small

Finally, participants discussed how the communication models and interagency initiatives presented at the workshop serve as powerful examples, and even lay the framework, for starting the process of horizon scanning even if a system is imperfect. Multiple keynote speakers during the two-day workshop emphasized that above all, the key to establishing horizon scanning communities is simply to start, even if only with a small scope at first. Additionally, speakers highlighted how this small scope can be method-focused, and how one form of starting small is to leverage existing tools that have already been successful. For example, wastewater experts highlighted how wastewater monitoring methods have been able to be broadly applied as a horizon scanning tool for a range of health inquiries (Cai et al., 2026; Truyens et al., 2025). Specifically, wastewater monitoring techniques have also been applied to monitor enteroviruses, illicit drugs, alcohol consumption, tobacco use, dietary patterns, and biological agents, as well as across epidemiology frameworks of surveilling communities, neighborhoods or buildings. With the help of stakeholder champions, critical momentum around one focus area or one method can then be built. By starting small and utilizing existing tools horizon scanning is both feasible and manageable: Workshop participants discussed how they might pick a known emerging issue to develop a scoping question to first address, utilize a communication model such as those explored here, and then plan interagency cross-talk goals. By taking these actions together, step by step, we work organically toward a CoP.

Conclusions: Laying Groundwork for the Future

Collectively, the workshop discussed here represents a pivotal window for building on successes of past environmental health research. It shifts thinking toward a forward-looking horizon scanning approach that enables a more rapid process of identifying potential future risks, opportunities, and emerging contaminants of concern. This, in turn, can reduce the need for reactive responses to widespread chemical and other environmental exposures to better prepare for drivers of change in the future. To this end, engaging with non-traditional partners such as economists, social researchers, and the humanities, as well as integrating advanced tools to enhance environmental monitoring and toxicity predictions, can help strengthen foresight and preparedness. To rise to this challenge, we must draw on diverse expertise, foster broad consultation, and predict both emerging risks and new possibilities. Creating a common data language and enabling greater data sharing will be essential, as will incorporating community voices—since they live with these exposures on a daily basis and bring critical perspectives. Progress will require embracing inclusive and transdisciplinary approaches, and forging stronger collaboration across policy areas, institutions, and borders; equally important is ensuring that the insights from these efforts are widely shared and thoughtfully considered. By doing so, we can lay the groundwork for more resilient, informed, and adaptive policymaking for the future. Together, these steps will strengthen the environmental health community's ability to anticipate and respond to emerging threats before they become crises.

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Figure 1: Workshop agenda

Figure 1 depicts the agenda for the two-day workshop. The eight presentations and three discussion session informed a think tank discussion on Day 1. This discussion then informed round table and breakout discussion on Day 2 that focused on defining a Community of Practice. This graphic was made using public domain clip art.

Alternative text: Diagram depicting the agenda and progression of the two-day workshop. On Day 1, three sets of presentations and discussions—horizon scanning overview, current efforts, and research gaps, encompassing eight presentations—provided the foundation for a think-tank discussion, “Where do we go from here?” Think-tank topics included generation and sharing of new and existing data, incorporating communities and communicating information across stakeholders, and moving from reactive to proactive assessments. These discussions informed Day 2 roundtable discussions and breakout groups focused on community-based and policy strategies, data storage, chemicals and mapping, communities of practice, and emerging topics.

Figure 2. Approaches for addressing challenges for horizon scanning

Figure 2 presents challenges for studying emerging contaminants identified at the horizon scanning workshop (bottom box) which can be addressed by creating a community of practice (top green) using different communication and collaboration strategies (middle of figure). This graphic was made using public domain clip art or clip art from Chat GPT.

Alternative text: Diagram depicting approaches for building and sustaining a community of practice to address challenges in horizon scanning. The upper portion identifies four approaches—Square Table, Champions, Delphi, and ongoing collaborations—surrounding a graphic representing a collaborative community. The lower portion organizes horizon-scanning needs and challenges into four areas: Technical challenges, resource gaps, policy decisions, and communication and community involvement. Examples include rapid analytical and toxicity-evaluation methods, data quality and sharing, education and funding, prioritization of chemicals, risk-informed decision-making, collaboration among scientists and stakeholders, community engagement, and establishing trust with affected communities.

Graphical abstract

Horizon scanning empowers us to gather intelligence about possible environmental and health threats, identifying knowledge gaps and generating new insights to shape proactive action. This graphical abstract was created by author Kirsten Overdahl using public domain clip art, and is an original image that has not been published elsewhere

Alternative text: Illustration depicting horizon scanning for potential environmental health concerns across diverse settings and sources. A figure looking through binoculars toward a globe represents horizon scanning. Surrounding the globe are images representing urban, residential, rural, and coastal environments, as well as pharmaceuticals and personal care or consumer products. Together, these images illustrate the broad range of environments and potential sources of chemical exposures considered in horizon scanning.

Table 1: Workshop Panel

Panel Member	Sector	Expertise
Valerie Adams, PhD	Government/military	Toxicology
Rebecca Clewell, PhD	Government/military	Toxicology
Jennifer Couch, PhD	Government/research	Biotechnical/citizen science
Christine Fisher, PhD	Government/research	Chemistry
Christiopher Green, PhD	Government/research and policy	Environmental toxicology; Horizon scanning
Rochelle Holm, PhD	Academia	Environmental science
P. Grace Tee Lewis, PhD	Non-government organization	Environmental epidemiology; geospatial mapping
Vivek C. Mathrani, PhD	Regional government	Toxicology and risk assessment
Karen L. Mumy, PhD	Government/military	Toxicology
Benjamin Place, PhD	Government/Research	Chemist
Elin Ulrich, PhD	Government/research	Environmental chemistry
Marc A. Williams, Ph.D.	Government/Military	Toxicology

Table 2: Workshop Organizers and Discussion Leads

Organizer	Expertise
Chad Blystone, PhD	Toxicologist
Helen Cunny, PhD	Toxicologist
Suzane Fento, PhD*	Toxicologist
Heather Henry, PhD	Environmental scientist / grant program officer
Ruth Lunn, DrPH	Environmental epidemiologist
Kyle Messier, PhD	Geospatial exposomics and risk mapping
Kirsten Overdal, PhD	Chemist: Exposomics and metabolomics
Sonika Patial, DVM, PhD	Pathologist
Stephanie Smith-Roe, PhD	Genetic toxicology

Graphical Abstract
Horizon scanning empowers us to gather intelligence about possible environmental and health threats, identifying knowledge gaps and generating new insights to shape proactive action. This graphical abstract was created by author Kirsten Overdahl using public domain clip art, and is an original image that has not been published elsewhere

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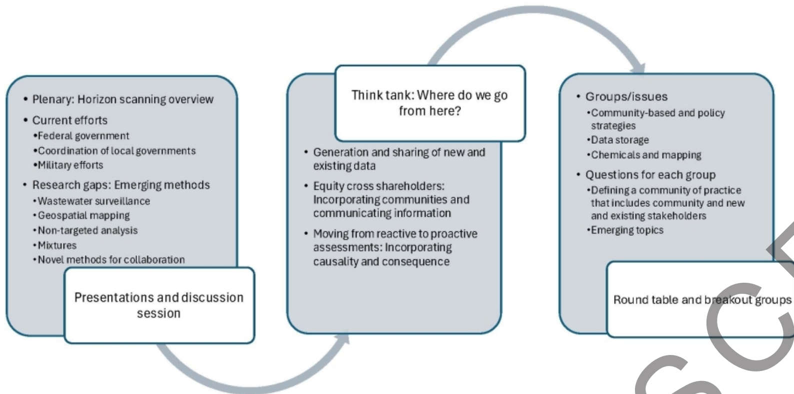

Figure 1: Workshop Agenda. This figure depicts the agenda for the two-day workshop. The eight presentations and three discussion session informed a think tank discussion on Day 1. This discussion then informed round table and breakout discussion on Day 2 that focused on defining a Community of Practice. This graphic was made using public domain clip art.

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Figure 2. Approaches for Addressing Challenges for Horizon ScanningFigure 2 presents challenges for studying emerging contaminants identified at the horizon scanning workshop (bottom box) which can be addressed by creating a community of practice (top green) using different communication and collaboration strategies (middle of figure). This graphic was made using public domain clip art or clip art from Chat GPT.

338x190mm (200 x 200 DPI)