

Risk Characterization and Communication: Challenges and opportunities in the context of disasters

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An aerial photograph showing a severe train derailment. Multiple large, cylindrical tanker cars are overturned and scattered across a dry, brushy landscape. Some cars are lying on their sides, while others are partially crushed. A small red boxcar is visible in the upper left. In the bottom right, a car is labeled 'DOWX 73168'. Another car in the center has 'MAX 110664' and 'SHPX 211106' visible. The text 'Making sense of a complicated situation...' is overlaid in white. The background shows a railway track and some bare trees.

Making sense of a
complicated situation...

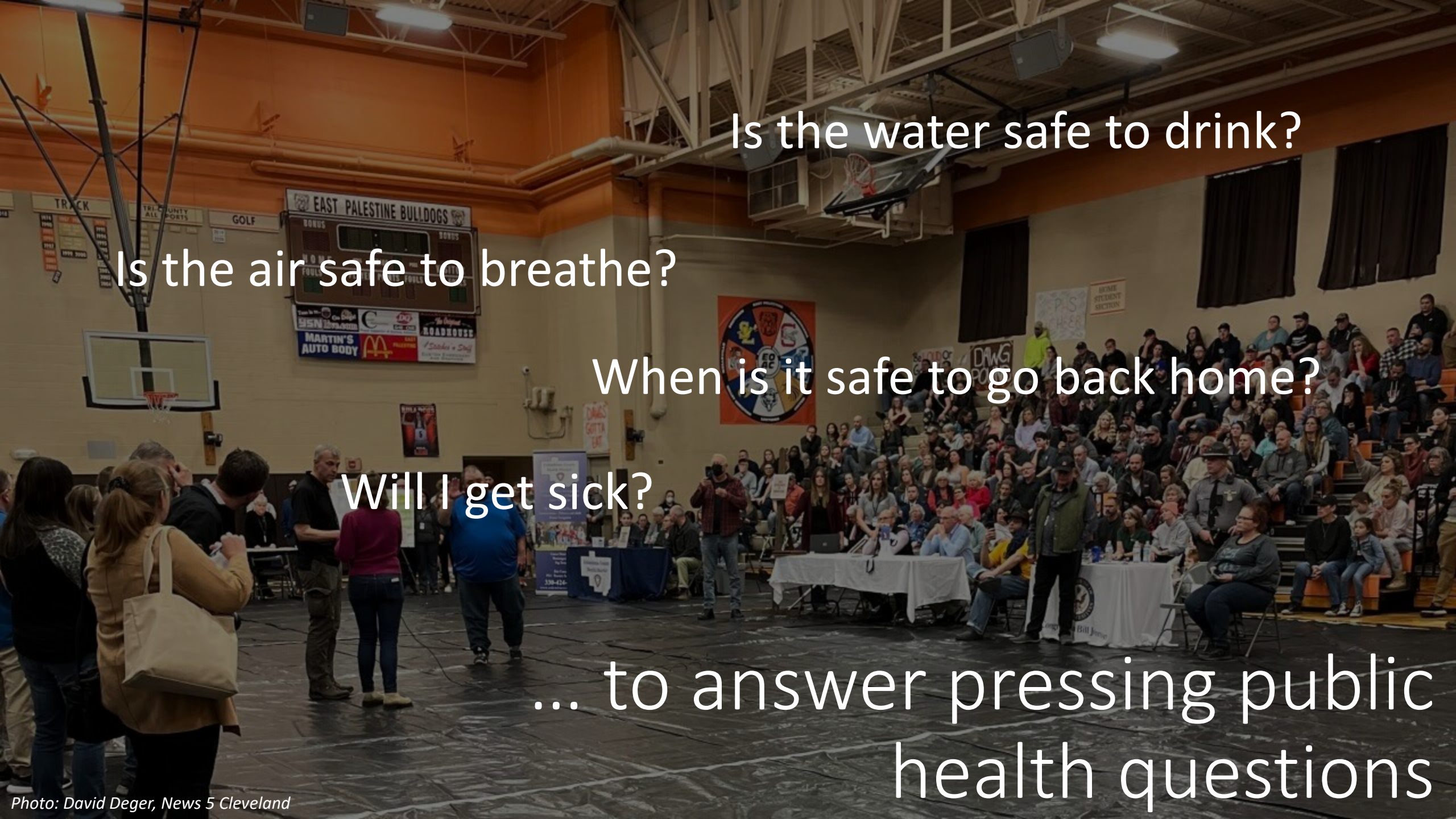
Is the water safe to drink?

Is the air safe to breathe?

When is it safe to go back home?

Will I get sick?

... to answer pressing public
health questions



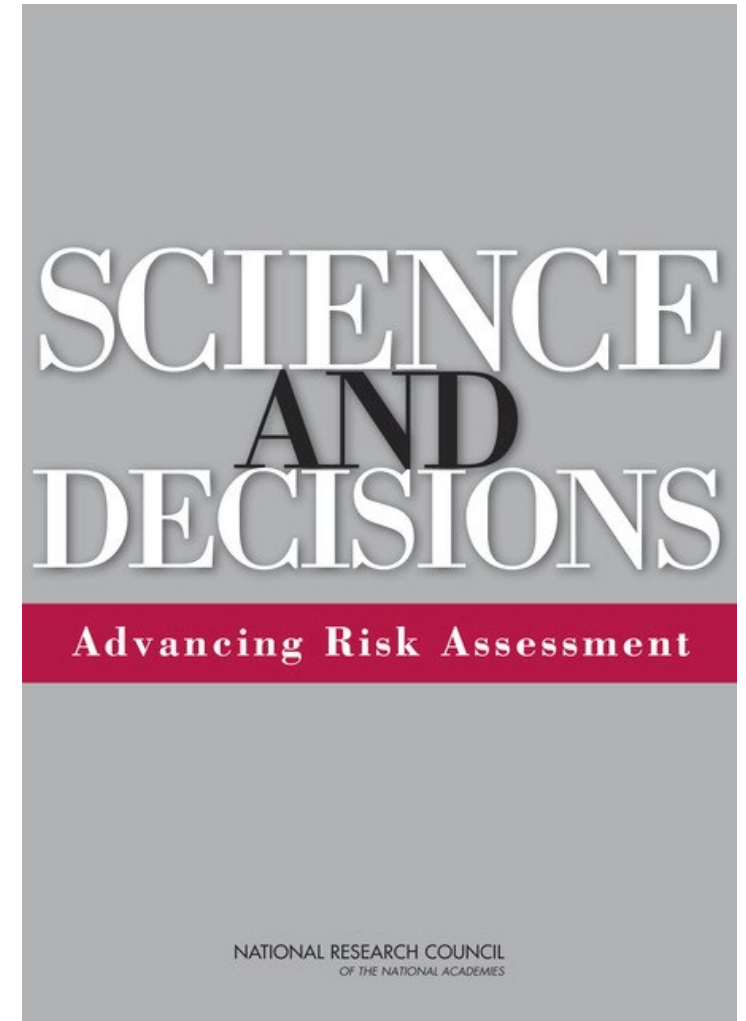
Previous sessions in this workshop

- Environmental Monitoring and Exposure Science
 - Measurements of chemicals in environmental media (air, water, soil)
 - Data collection methodologies, gaps, and uncertainties
- Human Health Impacts
 - Efforts to collect data on symptoms and adverse health conditions that may be related to exposures caused by the disaster
 - Identification of persons likely to be highly exposed and/or more vulnerable to experience health effects given exposure
- Community and Provider Reflections
 - First-hand insights that can aid in exposure estimation, consideration of concurrent stressors, and identification of communication gaps

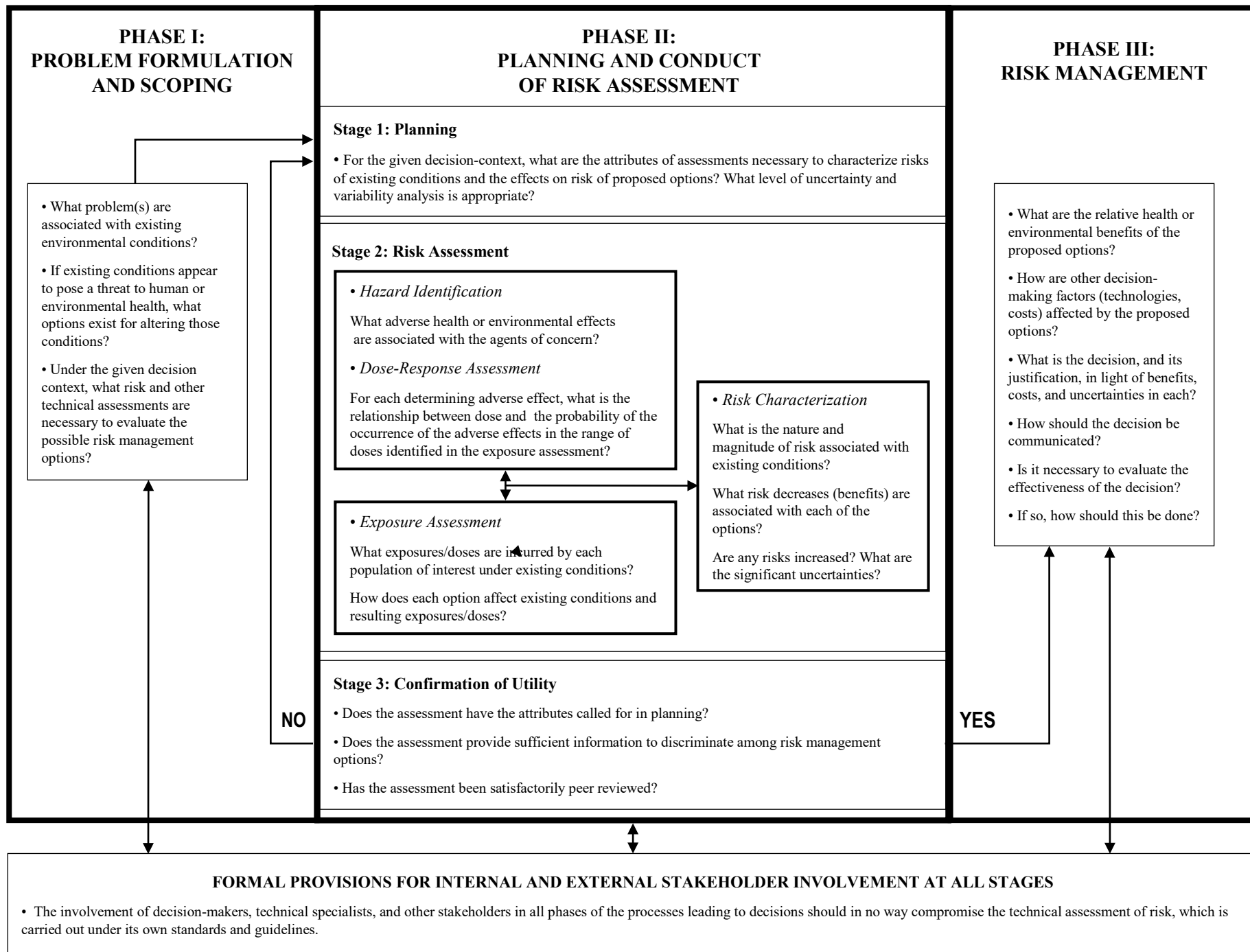
How do we make sense of what we have?

Risk Paradigm

- A paradigm for leveraging data and methods from environmental measurements, exposure science, toxicology, epidemiology, and much more
- Provides a framework for integrating these data streams to support characterizations of risk that can help inform decision-making and management of those risks



National Research Council. 2009. Science and Decisions: Advancing Risk Assessment. Washington, DC: The National Academies Press.
<https://doi.org/10.17226/12209>.



Problem Formulation and Scoping

- Sets the stage for analysis of risks – what are the questions we need to answer?
- Involves:
 - Identification of hazardous agents of concern
 - Description the exposure scenarios
 - Identification highly exposed and vulnerable populations
 - Identification of interventions/alternatives available that may reduce risks

In the context of a disaster:

- What chemicals were released/formed?
- Who is exposed, and how were they exposed?
- Who is more likely to become sick from the exposure?
- What can be done to reduce exposures or minimize risks?

Planning and Conduct of Risk Analysis

- Hazard Identification
 - *Evaluate evidence describing hazard-outcome relationships*
- Dose-Response Assessment
 - *Quantify dose-response relationships*
- Exposure Assessment
 - *Estimate magnitude of exposure to hazard among populations of interest*
- Risk Characterization
 - *Integrate prior steps to provide estimates of cancer risk and non-cancer hazards and describe associated uncertainties*

In the context of a disaster:

- What evidence suggests exposure to released/newly formed chemicals can make people sick?
- How does the risk of becoming sick change as exposure increases?
- For each chemical, how much did the different groups of exposed persons breathe, ingest, or have contact their skin?
- Given everything we know, how likely is it that different groups of people will get sick?
- What are the most important gaps in our knowledge and how do they influence our confidence in answering these questions?

Risk Management and Communication

- Examine relative benefits and costs of proposed intervention strategies
- Integrate results of risk analyses with other key considerations to weigh intervention strategies
 - Technological feasibility, costs, societal values, tradeoffs, other considerations
- Propose and justify selected interventions
- Develop and implement communication strategy



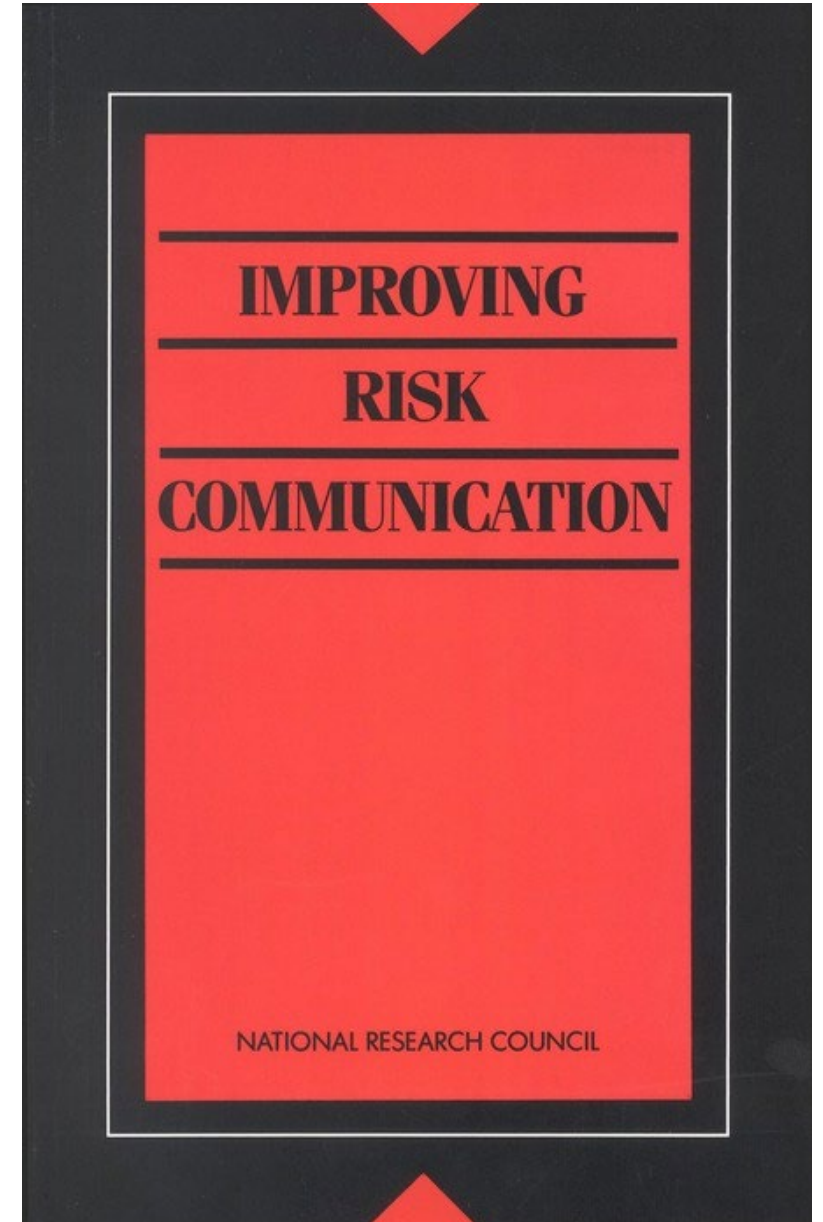
Gene J Puskar/AP Photo

Acknowledging the complexity and other challenges in the context of disasters

- Approaches to risk assessment were built to handle one chemical at a time vs. reality of many chemicals and other stressors
- Interactions between chemicals and other stressors are generally poorly understood and rarely quantified
- Data gaps necessitate making judgments in the face of uncertainty
- We have to act fast!
- Communicating among stakeholders under these circumstances is essential but can be extremely difficult

Communicating during a crisis

- Goals of risk communication – what are we trying to accomplish?
- Trust and credibility: Even before the message(s) – the communicator and the context
- Fragmentation/dispersion of authority
- Communicating within the limits of available knowledge/in the face of substantial uncertainty
- “Safe” and subjectivity
- How to reach people in the modern era



Panelists

- Dr. Weihsueh Chiu will describe his work translating EPA air measurements into estimates of exposure and risk
 - *Exposure Assessment and Risk Characterization*
- Dr. Sue Fenton will present an NIEHS report detailing a scoping review of the priority contaminants involved in the disaster
 - *Hazard Identification and Dose-Response Assessment*
- Dr. Wes Vins will share his experience as a health commissioner involved in communication on the front lines of the East Palestine response
 - *Risk Communication*
- Dr. Antony Williams will demonstrate new USEPA cheminformatic tools that can aid in rapid chemical assessment
 - *Hazard identification and Dose-Response Assessment*

