Health Effects Institute Energy Research Program

Literature Review Scoping Meeting: Human Health Literature Related to UOG Development

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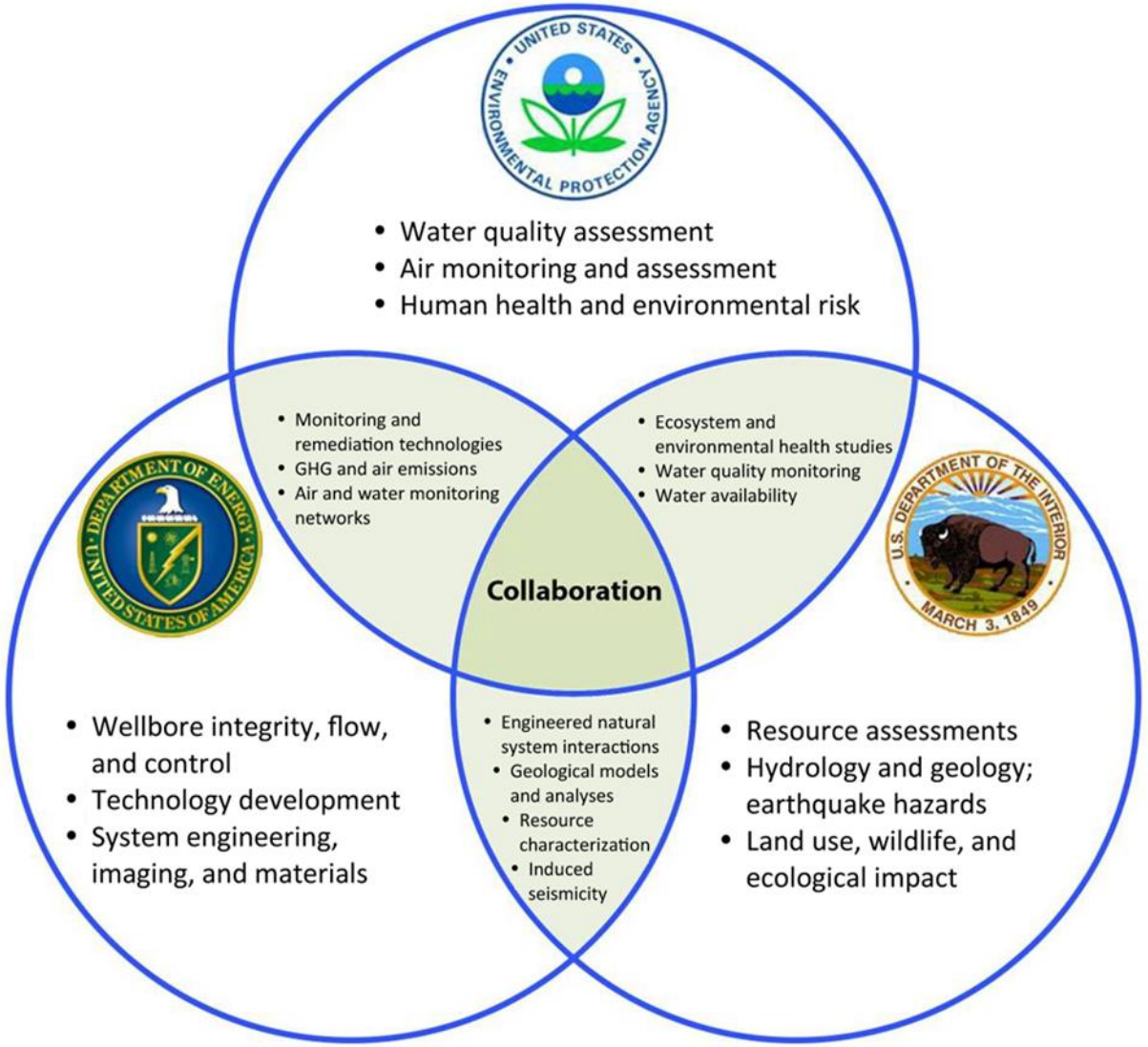
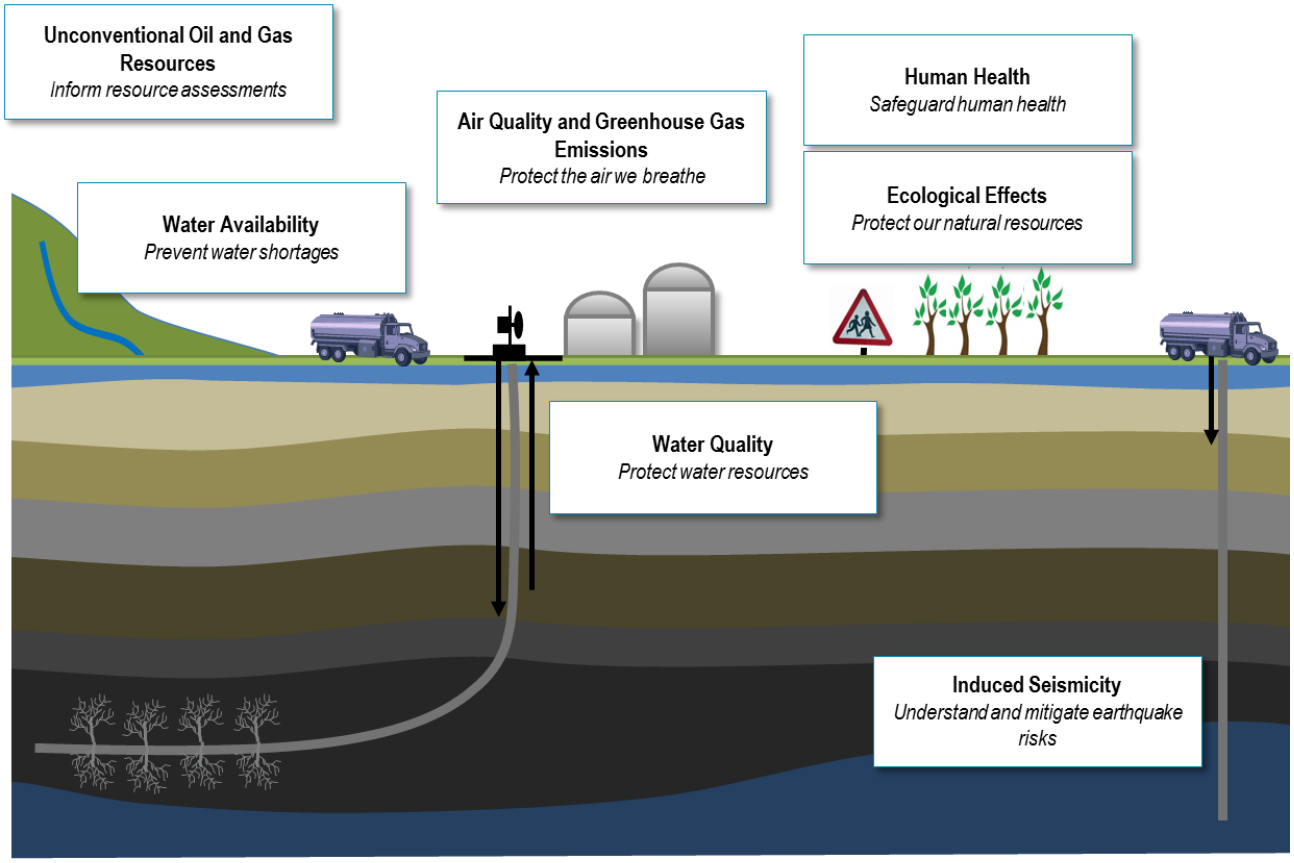

• Water quality assessment
• Air monitoring and assessment
• Human health and environmental risk
• Monitoring and remediation technologies
• GHG and air emissions
• Air and water monitoring networks
• Ecosystem and environmental health studies
• Water quality monitoring
• Water availability
Collaboration
• Wellbore integrity, flow, and control
• Technology development
• System engineering, imaging, and materials
• Engineered natural system interactions
• Geological models and analyses
• Resource characterization
• Induced seismicity
• Resource assessments
• Hydrology and geology; earthquake hazards
• Land use, wildlife, and ecological impact

Research Strategy Topics



Human Health

Safeguard Human Health

Research Questions

- What research is necessary to understand any potential impacts on the health of the nation's population?
- How can any potential negative impacts on human health be mitigated?

Priority Research Needs

- Occupational Studies
- Health Studies
- Toxicity Assessment

Topic 5: Effects of Human Health

"The Steering Committee recognizes that most of the research needed to address potential impacts on human health … would most appropriately be led by federal health agencies."

EPA Research Related to Potential Human Health Effects Associated with UOG Development

- Hydraulic Fracturing Study, including the Hydraulic Fracturing Drinking Water Assessment (HFDWA) (completed in December 2016)
- "Drinking Water Vulnerability and Neonatal Health Outcomes in Relation to Oil and Gas Production in the Appalachian Basin" (grant awarded in August 2017)

HFDWA Main Conclusions

- Hydraulic fracturing can impact drinking water resources under some circumstances.
- Examples of impacts were identified for all five stages of the hydraulic fracturing water cycle.
- Impacts can range in frequency and severity, depending on the combination of hydraulic fracturing activities and local or regional-scale factors.
- Significant data gaps and uncertainties prevent quantifying the number or frequency of impacts nationwide.

HFDWA Main Conclusions

- Circumstances that increase the frequency and severity of impacts include:
  - water withdrawals in times or areas of low water availability, or in areas with limited or declining groundwater resources;
  - spills of high concentrations of chemicals, or large volumes of HF fluids or produced water;
  - injection of HF fluids into wells with inadequate mechanical integrity, or directly into groundwater resources; and
  - discharge of inadequately treated wastewater to surface water, or disposal or storage of wastewater in unlined pits.
- EPA identified more than 1600 chemicals associated with HF activities. Some of the chemicals are known to be hazardous to human health, but most do not have human health, chronic oral, toxicity values.

Areas of Collaboration and Continued Research Needs

- At the January 2015 MAC Technical Summit, it was evident that there is a lot of current research in the human health research area
  - Baseline and real-time monitoring of air quality, water quality, and land impacts
  - Clinical outcomes, healthcare utilization, biomarkers of exposure and effects
  - Risk communication/perception
- But it was also apparent that there was a need to identify locales and communities where complementary research activities are taking place
  - This continues to be a both a short-term opportunity and a long-term research need
  - Such studies take time, especially since the HF chemicals injected and chemicals produced vary with geologic basin

Approach to Literature Review

- Analyze available literature and identify knowledge gaps guided by:
  - Understanding of changes in water quality, water availability, air quality, and other environmental media;
  - Knowledge of likely human exposures and exposure scenarios, including those associated with accidental events;
  - Toxicology (acute and chronic, oral and inhalation) related to likely exposures;
  - Populations and life stages susceptible to exposure and adverse physical and mental outcomes; and
  - Best practices for evaluating potential cumulative risks associated with multiple chemical and non-chemical stressors resulting from UOG development activities.

Consideration for the Task Ahead

- A major benefit of shale gas extraction to Pennsylvania has been the decision to site a multi-billion dollar ethane cracking plant.
- A major distinguishing feature between the cracker plant and the nearby Marcellus drilling activities is the long history of evaluating the emissions from such plants, including monitoring of ambient media.
- In contrast, UGD may lead to PA counties that within a few years may have over a thousand well sites, drilled by perhaps a dozen different drilling companies using different techniques, different hydraulic fracturing fluids, and different disposal practices.
- Studies that look at only one site, no matter how well done, cannot be generalized to all sites.

Based on Goldstein, BD, 2018. "The pertinence of Sutton's law to exposure science: Lessons from unconventional shale gas drilling." Journal of Exposure Science & Environmental Epidemiology. https://doi.org/10.1038/s41370-017-0015-8

Resources

https://www.epa.gov/hfstudy

https://energy.gov/fe/multi-agency-collaboration-unconventional-oil-and-gas-research