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ENVIRONMENTAL Science & Technology

August 5, 2014
Volume 48
Number 15
pubs.acs.org/est



Special Issue:
Understanding the Risks of
Unconventional Shale Gas Development



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ON THE COVER: New technologies and expanding scales and locations of operations for unconventional oil and gas development have spawned strongly polarized views regarding its benefits and risks at local, regional, national, and global scales. This special issue explores current scientific understanding and research needs for the environmental, human health, and socioeconomic risks of shale gas development, as well the present status and new initiatives for risk governance in the U.S. and other nations.

SPECIAL SECTION: UNDERSTANDING THE RISKS OF UNCONVENTIONAL SHALE GAS DEVELOPMENT

Comment

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dx.doi.org/10.1021/es502459b

Special Issue: Understanding the Risks of Unconventional Shale Gas Development

Paul C. Stern, Thomas Webler, and Mitchell J. Small*

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dx.doi.org/10.1021/es502111u

Risks and Risk Governance in Unconventional Shale Gas Development

Mitchell J. Small,* Paul C. Stern, Elizabeth Bomberg, Susan M. Christopherson, Bernard D. Goldstein, Andrei L. Israel, Robert B. Jackson, Alan Krupnick, Meagan S. Mauter, Jennifer Nash, D. Warner North, Sheila M. Olmstead, Aseem Prakash, Barry Rabe, Nathan Richardson, Susan Tierney, Thomas Webler, Gabrielle Wong-Parodi, and Barbara Zielinska

A broad assessment is provided of the current state of knowledge regarding the risks associated with shale gas development and their governance. For the principal domains of risk, we identify observed and potential hazards and promising mitigation options to address them, characterizing current knowledge and research needs. Important unresolved research questions are identified for each area of risk, however, certain domains exhibit especially acute deficits of knowledge and attention, including integrated studies of public health, ecosystems, air quality, socioeconomic impacts on communities, and climate change. For these, current research and analysis are insufficient to either confirm or preclude important impacts. The rapidly evolving landscape of shale gas governance in the U.S. is also assessed, noting challenges and opportunities associated with the current decentralized (state-focused) system of regulation. We briefly review emerging approaches to shale gas governance in other nations, and consider new governance initiatives and options in the U.S. involving voluntary industry certification, comprehensive development plans, financial instruments, and possible future federal roles. In order to address the multiple disciplines and complexities of the evolving shale gas system and reduce the many key uncertainties needed for improved management, a coordinated multiagency federal research effort will need to be implemented. A broad assessment is provided of the current state of knowledge regarding the risks associated with shale gas development and their governance. For the principal domains of risk, we identify observed and potential hazards and promising mitigation options to address them, characterizing current knowledge and research needs. Important unresolved research questions are identified for each area of risk; however, certain domains exhibit especially acute deficits of knowledge and attention, including integrated studies of public health, ecosystems, air quality, socioeconomic impacts on communities, and climate change. For these, current research and analysis are insufficient to either confirm or preclude important impacts. The rapidly evolving landscape of shale gas governance in the U.S. is also assessed, noting challenges and opportunities associated with the current decentralized (state-focused) system of regulation. We briefly review emerging approaches to shale gas governance in other nations, and consider new governance initiatives and options in the U.S. involving voluntary industry certification, comprehensive development plans, financial instruments, and possible future federal roles. In order to encompass the multiple relevant disciplines, address the complexities of the evolving shale gas system and reduce the many key uncertainties needed for improved management, a coordinated multiagency federal research effort will need to be implemented.

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dx.doi.org/10.1021/es405432k

Regional Variation in Water-Related Impacts of Shale Gas Development and Implications for Emerging International Plays

Meagan S. Mauter,* Pedro J. J. Alvarez, Allen Burton, Diego C. Cafaro, Wei Chen, Kelvin B. Gregory, Guibin Jiang, Qilin Li, Jamie Pittock, Danny Reible, and Jerald L. Schnoor

The unconventional fossil fuel industry is expected to expand dramatically in coming decades as conventional reserves wane. Minimizing the environmental impacts of this energy transition requires a contextualized understanding of the unique regional issues that shale gas development poses. This manuscript highlights the variation in regional water issues associated with shale gas development in the U.S. and the approaches of various states in mitigating these impacts. The manuscript also explores opportunities for emerging international shale plays to leverage the diverse experiences of U.S. states in formulating development strategies that minimize water-related impacts within their environmental, cultural, and political ecosystem. The unconventional fossil fuel industry is expected to expand dramatically in coming decades as conventional reserves wane. Minimizing the environmental impacts of this energy transition requires a contextualized understanding of the unique regional issues that shale gas development poses. This manuscript highlights the variation in regional water issues associated with shale gas development in the U.S. and the approaches of various states in mitigating these impacts. The manuscript also explores opportunities for emerging international shale plays to leverage the diverse experiences of U.S. states in formulating development strategies that minimize water-related impacts within their environmental, cultural, and political ecosystem.

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dx.doi.org/10.1021/es404621d

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Comment on "Silicone Wristbands as Personal Passive Samplers"
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Comment on "Mechanochemically Enhanced Degradation of Pyrene and Phenanthrene Loaded on Magnetite"
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[dx.doi.org/10.1021/es502900g](https://doi.org/10.1021/es502900g)

Response to Comment on "Mechanochemically Enhanced Degradation of Pyrene and Phenanthrene Loaded on Magnetite"
Joseph-Ezra Hadas, Nasser Ahmed,* Ben-Ari Julius, and Mingelgrin Uri

Additions and Corrections

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[dx.doi.org/10.1021/es502417v](https://doi.org/10.1021/es502417v)

Correction to Occurrence of Surface Polysulfides during the Interaction between Ferric (Hydr)Oxides and Aqueous Sulfide
Moli Wan,* Andrey Shchukarev, Regina Lohmayer, Britta Planer-Friedrich, and Stefan Peiffer

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[dx.doi.org/10.1021/es502114e](https://doi.org/10.1021/es502114e)

Correction to Verifying Emission Reductions from Heavy-Duty Diesel Trucks Operating on Southern California Freeways
Kathleen H. Kozawa,* Seong Suk Park, Steven L. Mara, and Jom D. Herner