Substantial water pollution risks from hydraulic fracturing: research

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Stony Brook University scientists have found that the disposal of contaminated wastewater from hydraulic fracturing – commonly known as "fracking" – wells producing natural gas in the Marcellus Shale region poses substantial potential risks of river and other water pollution that suggests additional regulation to reduce the potential of drinking water contamination.

In a paper titled "Water Pollution Risk Associated with Natural Gas Extraction from the Marcellus Shale," which appears in the August 2012 issue of the journal *Risk Analysis*, published by the Society for Risk Analysis, Stony Brook doctoral student Daniel Rozell, P.E., and Sheldon Reaven, Ph.D., a professor in the Department of Technology and Society and the School of Marine and Atmospheric Sciences, found that "Even in a best case scenario, an individual well would potentially release at least 200 m3 of contaminated fluids."

Fracking involves pumping fluids underground into shale formations to release pockets of natural gas, which are then pumped to the surface. The Marcellus Shale region covers approximately 124,000 square kilometers from New York to West Virginia and is being intensely developed.

The researchers found that disposal of the large amounts of fracking well wastewater presents risks from salts and radioactive materials that are "several orders of magnitude larger" than for other potential water pollution pathways examined in the new study. Other water pollution

pathways studied include a tanker truck spilling its contents while transporting fluids used in the drilling process going to or from a well site; a well casing failing and leaking fluids to groundwater; fracturing fluids traveling through underground fractures into drinking water; and drilling site spills at the surface caused by improper handling of fluids or leaks from storage tanks and retention ponds.

The disposal of used hydraulic fracturing fluids through industrial wastewater treatment facilities can lead to elevated pollution levels in rivers and streams because many treatment facilities "are not designed to handle hydraulic fracturing wastewater containing high concentrations of salts or radioactivity two or three orders of magnitude in excess of federal drinking water standards," according to the researchers. The wastewater disposal risks dwarf the other water risks, although the authors say "a rare, but serious retention pond failure could generate a very large contaminated water discharge to local waters."
In trying to understand the likelihood and consequences of water contamination in the Marcellus Shale region from fracking operations, Rozell and Reaven use an analytical approach called "probability bounds analysis" that is suitable "when data are sparse and parameters highly uncertain." The analysis delineates best case/worse case scenarios that risk managers can use "to determine if a desirable or undesirable outcome resulting from a decision is even possible," and to assess "whether the current state of knowledge is appropriate for making a decision," according to the authors.

The authors found that "Any drilling or fracturing fluid is suspect for the purposes of this study" because "even a benign hydraulic fracturing fluid is contaminated once it comes into contact with the Marcellus Shale." They suggest that "regulators should explore the option of mandating alternative fracturing methods to reduce the wastewater usage and contamination from shale gas extraction in the Marcellus Shale." These would include various alternatives such as nitrogen-based or liquefied

petroleum gas fracturing methods that would substantially reduce the amount of wastewater generated.

The authors concluded that “future research efforts should be focused primarily on wastewater disposal and specifically on the efficacy of contaminant removal by industrial and municipal wastewater treatment facilities.”

More information: Paper online: onlinelibrary.wiley.com/doi/10 … 24.2011.01757.x/full

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