

# Science for Environment Policy

## Fracking: leaking wells cause gas-contaminated groundwater

**Contamination of drinking water** in areas close to several fracking sites in the Marcellus and Barnett Shales, USA, is caused by structural problems leading to wells leaking natural gas into aquifers, a new study suggests. The researchers measured trace amounts of chemicals, called noble gases, which formed signatures of the sources of gas contamination in over 130 samples. These findings suggest that, rather than coming from natural sources, such contamination in the area of the investigation is an engineering problem to do with the wells themselves, the researchers say. They stress the importance of ensuring the structural integrity of the wells, which can be done in an affordable manner.

**Hydraulic fracturing**, or 'fracking', is the process of using high pressure fluids to extract natural gas trapped within layers of shale rock deep underground. These resources have raised interest, notably as a possible substitute for more carbon-intensive [fossil fuels](#).

In many parts of the world, fracking has met with strong opposition due to concerns about its environmental and health effects. For example, natural gas has been found in drinking [water](#) near fracking sites, leading to concerns that the gas released by fracking is contaminating drinking water aquifers.

To investigate these concerns researchers measured the ratios of noble gases, such as neon and argon. Different layers of the earth and the air have different compositions and types of noble gases. These gases do not typically react with other chemicals, but can be transported alongside natural gas. This allows the ratios of different noble gases to act as a signature of where natural gas had come from, and the source of contamination to be identified, whether released from human-derived or from naturally occurring sources.

Overall, 113 samples were taken for analysis from drinking water wells above the Marcellus Shale and 20 samples from the Barnett Shale, both located in the US. These included samples taken from close to fracking sites (less than a kilometre) and further away (greater than a kilometre from the drilling site).

They identified eight clusters of water samples with ratios of noble gases that suggested they had escaped from fracking sites. Of these, four could be linked to gas leaking from bore holes due to a failure to properly seal the space between the bore hole and the well pipe, three were indicative of poorly joined or corroded pipe casings, and a final one due to cracked or broken well pipes.

The findings suggest that natural-gas-contaminated drinking water in the investigated area is not due to gas bubbling up through the earth, but rather it is caused by the wells themselves leaking gas close to the surface, some of which seeps in to drinking water aquifers. The researchers say this indicates that the problem is more of an engineering challenge, rather than the fracking process itself causing a vertical migration of gas. At the same time, they note that further research is needed to assess whether the significant amount of water and high pressures used for fracking influence the structural integrity of wells.

There remain a number of other environmental and public health concerns regarding fracking. These include potential to cause earthquakes<sup>1</sup>, the large amounts of water consumed during fracking and contamination of both terrestrial and aquatic ecosystems with waste products<sup>2</sup>, among others. These are all issues that will need to be further researched.



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