European Commission

Science for Environment Policy

Shale gas: independent planning is key to reducing environmental impacts of fracking

Funding for scientists, planners and inspectors should be available before any shale gas development begins, a new review recommends. As revenue for such staff is often provided by the development itself, planning, which is vital to provide immediate environmental protection as well as monitoring long-term impacts, is neglected. The researchers also advocate the use of 'adaptive management' as a decision-making framework for this complex issue.

Impacts on water resources form the main concerns around shale gas developments. In this review the researchers first discuss the impacts and risks of shale gas developments on water resources. They then examine the value of 'adaptive management': a framework designed to address such complex environmental issues.

Fracking requires large amounts of water, between approximately 10 000 and 30 000 m^3, depending on the local geology and size and type of the well. Research from the Marcellus shale in the US, which relies mainly on surface water, has shown that small streams are especially sensitive to these water withdrawals, with knock-on effects for the aquatic ecosystem if withdrawals are not managed properly.

The Barnett shale, US, uses mainly groundwater, placing strain on aquifers that already struggle to meet demand. Careful monitoring of rivers, streams and groundwater is therefore needed, the researchers say. They also highlight adjustments that could reduce these impacts, such as the use of undrinkable, brackish groundwater if available, and seasonal timing of water extraction when river flows are high.

Wastewater produced by fracking can potentially also have significant environmental impacts. Between 2010 and 2011 the section of the Marcellus shale in Pennsylvania alone produced 5 million cubic metres of wastewater. Studies in Texas have shown that discharge of fracking wastewater without treatment significantly lowers water quality in the surrounding surface and groundwater and has a negative impact on vegetation.

Fracking wastewater can contain high concentrations of chemicals such as chloride, bromide and radium, and requires specialised treatment before being released into the environment. Some facilities which have been used to treat fracking wastewater, including public sewage works, are not designed for this and US studies have shown increases in chloride concentrations and build-up of radium in sediments downstream from such plants.

Other potential impacts of fracking on water resources include possible seepage of methane or fracking fluids into aquifers, erosion due to construction of wells and infrastructure and accidental spills of waste water or chemicals.

The researchers advocate the use of adaptive management as a decision-making cycle: 1) Acknowledgement of the risks involved in shale developments. 2) Initiation of studies to assess such risks. 3) Development of regionally appropriate management policies and practices. 4) Enactment of policies. 5) Monitoring and recording data of shale gas impacts. 6) Analysing data. 7) Adapting policies and practices using new data.

The researchers stress the importance of good planning. They caution that, as a result of the controversial nature of fracking, the process can stall at step 1 and, by the time step 2 is reached, development has already begun. This is problematic because it can mean that no pre-development baseline data is collected, which are crucial to assess subsequent impacts. They highlight the fact that funding to hire planners, scientists etc. is often generated by shale developers themselves. As a result, development can begin before the 'planning'. The researchers strongly recommend that funding is available for such staff before development begins and that they have appropriate enforcement and compliance tools to ensure best practices.

4 September 2014
Issue 384

Subscribe to free weekly News Alert

Source: Rahm, B. G. & Riha, S. J. (2014). Evolving shale gas management: water resource risks, impacts, and lessons learned. *Environmental Science Processes & Impacts.* 16: 1400. DOI: 10.1039/c4em00018h.

Contact: bgr4@cornell.edu

Read more about:
Climate change and energy, Water, Waste, Sustainable development and policy assessment