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Shale gas: report highlights potential environmental risks

The risk of contamination of ground and surface waters and leakage of methane emissions remain key concerns associated with shale gas projects, according to a recent assessment. This is particularly the case if monitoring and regulatory systems are not rigorously enforced. In addition, investment in shale gas could divert resources needed to develop a low-carbon economy, suggest the report's authors.

Advances in technology – meaning the integration of hydraulic fracturing in horizontally drilled wells – make it now possible to extract natural gas trapped in underground layers of shale rock. Water, chemicals and sand are injected under high pressure into wells to crack the shale seams and release the gas in a process known as hydraulic fracturing, or 'fracking'. Other than the vertical portion of drilling and the final production well head, however, development and extraction processes differ between conventional gas and unconventional shale gas production. Whilst some conventional gas wells in the EU have been stimulated using limited hydraulic fracturing methods, high volume hydraulic fracturing and horizontal drilling – the preconditions for shale gas production – are likely to be novel practices in the EU.

The report focuses on the potential effects of shale gas extraction in the UK. Shale gas has only been extracted on a commercial scale in the US, but with many shale reserves in Europe, it could potentially contribute to Europe's energy security. However, there are some concerns surrounding its possible environmental impacts. For example, there is a risk that groundwater could be polluted by toxic chemicals in the fracturing fluid or from leakage of methane emissions. Contamination could also arise from poorly constructed, operated and sealed wells, or from poor management of flowback water.

Other environmental concerns relate to local impacts of withdrawing high volumes of water needed for the extraction process, particularly under future climate change scenarios. Furthermore, noise pollution, especially in densely populated areas and the effects of increased traffic related to the construction sites and extraction of the gas could also cause problems. The report also suggests that the extraction sites could be eyesores on the landscape, and potentially cause earthquakes. For example, an earth tremor of magnitude 2.3 in the UK last year was linked to hydraulic fracturing of an exploration well for shale gas.

Compared with the production and use of conventional natural gas sources, in the case of the UK there would be only a small increase in emissions of greenhouse gases (GHGs). However, if methane emissions escape during the extraction process and are not captured, emissions from shale gas might be 30% higher than emissions from conventional gas. If shale gas was used instead of coal, however, carbon emissions would be lower.

By 2050, global emissions of CO_2 from the combustion of shale gas could contribute up to 29% of the total emissions budget required to avoid global warming of no more than 2°C. Only tight control of a global cap on carbon emissions, together with use of carbon and capture technology, is likely to avert the possibility of additional shale gas emissions aggravating future climate change. One of the major problems associated with estimating the impact of shale gas is establishing the extent of shale gas reserves. Estimates of reserves of shale gas around the world are considerable, yet still uncertain as only exploration drilling can confirm whether technically recoverable resources can be exploited economically. For the UK, if shale gas replaced imported gas, the country's CO_2 emissions would remain within the country's carbon budget. However, exploitation of shale gas reserves could reduce investment in alternative energy sources and jeopardise the government's obligations to meet renewable energy targets and reduction of GHGs.

A further issue relates to regulations concerning groundwater protection, environmental impact assessments and use of chemicals in the fracturing fluid. At present, EU Member States are responsible for implementing EU legislation in these areas, but there is no consistency of assessing impacts and risks of shale gas projects across all countries.

Source: Broderick. J., *et al*. (2011) *Shale gas: an updated assessment of environmental and climate change impacts.* A report commissioned by The Co-operative and undertaken by researchers at the Tyndall Centre, University of Manchester.
The report is free to download from: http://www.tyndall.manchester.ac.uk/public/index.html#shale-threat

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