



## **Shale Gas Exploration and Exploitation Induced Risks - SHEER**

Paolo Capuano (1,2), Beata Orlecka-Sikora (3), Stanislaw Lasocki (3), Simone Cesca (4), Andrew Gunning (5), Janusz jaroslawsky (3), Alexander Garcia-Aristizabal (2), Rachel Westwood (6), and Paolo Gasparini (2)

(1) University of Salerno, Department of Physics "E. R. Caianiello", Fisciano (SA), Italy (pcapuano@unisa.it), (2) Center for the Analysis and Monitoring of Environmental Risk (AMRA), Napoli, Italy, (3) Institute of Geophysics, Polish Academy of Sciences, Warsaw, Poland, (4) GFZ German Research Centre for Geosciences, Telegrafenberg, 14473 Potsdam, Germany, (5) RSKW Ltd, United Kingdom, (6) School of Geography, Geology and the Environment, Keele University, United Kingdom

Shale gas operations may affect the quality of air, water and landscapes; furthermore, it can induce seismic activity, with the possible impacts on the surrounding infrastructure.

The SHEER project aims at setting up a probabilistic methodology to assess and mitigate the short and the long term environmental risks connected to the exploration and exploitation of shale gas. In particular we are investigating risks associated with groundwater contamination, air pollution and induced seismicity. A shale gas test site located in Poland (Wysin) has been monitored before, during and after the fracking operations with the aim of assessing environmental risks connected with groundwater contamination, air pollution and earthquakes induced by fracking and injection of waste water. The severity of each of these hazards depends strongly on the unexpected enhanced permeability pattern, which may develop as an unwanted by-product of the fracking processes and may become pathway for gas and fluid migration towards underground water reservoirs or the surface.

The project is devoted to monitor and understand how far this enhanced permeability pattern develops both in space and time. The considered hazards may be at least partially inter-related as they all depend on this enhanced permeability pattern. Therefore they are being approached from a multi-hazard, multi parameter perspective. We expect to develop methodologies and procedures to track and model fracture evolution around shale gas exploitation sites and a robust statistically based, multi-parameter methodology to assess environmental impacts and risks across the operational lifecycle of shale gas. The developed methodologies are going to be applied and tested on a comprehensive database consisting of seismicity, changes of the quality of ground-waters and air, ground deformations, and operational data collected from the ongoing monitoring episode (Wysin) and past episodes: Lubocino (Poland), Preese Hall (UK), Oklahoma (USA), Groningen Field (Netherlands), Gross Schönebeck (Germany), The Geysers (USA), Cooper Basin (Australia).

Best practices to be applied in Europe to monitor and minimize any environmental impacts will be worked out with the involvement of governmental decisional bodies, private industries and experts

This work was supported under SHEER: "Shale Gas Exploration and Exploitation Induced Risks" project n.640896, funded from Horizon 2020 - R&I Framework Programme, call H2020-LCE-2014-1