



**SHEER WP8 Report, 17.10.2016
for the Progress / PMT Meeting in ...
(Dr Rachel Westwood, KeU)**

Short summary of the progresses of the period: 12-18 months WP8

- **Staff actively involved in the WP**

Dr Rachel Westwood, WP leader, Keele University
Sam Toon, Keele University
Nigel Cassidy, Keele University
Catherine Isherwood, RSKW
Andrew Gunning, RSKW
Nelly Montcoudiol, Glasgow University
Paul Younger, Glasgow University
Stansilaw Lasocki, IGF-PAS
Grzegorz Lizurek, IGF-PAS
Paolo Gasparini, AMRA
Raffaella Russo, AMRA
Jose Angel Lopez Comino, GFZ
Konstantinos Leptokarpoulos, IGF-PAS
Simone Cesca, IGF-PAS
Janusz Mirek, IGF-PAS
Torsten Dahm, IGF-PAS
Beata Orlecka-Sikora, IGF-PAS
Monika Staszek, IGF-PAS

All partners are involved in dissemination of the project. The names listed here are those that have contributed articles to the SHEER newsletter, have given posters or presentations at a conference or participated in another dissemination event.

- **Objectives expected during months 12-18**

Publication of the latest issues SHEER newsletter
Ongoing review and development of the website and social media channels
Engagement with stakeholder and dissemination of results, news and progress
Exploring risk assessment methodologies for shale gas operations and the applicability of ISO31000:2009

- **Summary of Progress**

Task 8.1

Monitoring activity is currently being undertaken at Wysin, Poland, (via WP3 & WP7). Seismic and air quality monitoring started in Summer 2015. Hydrological monitoring began in December 2015. The full seismic monitoring network has been operational since Autumn 2015. The network comprises of six broadband seismic stations, three surface small scale arrays, each composed of at least eight short period stations, and three shallow borehole sensors. Monitoring is performed by using a coherence based event detection algorithm, already in-use at GFZ Potsdam for monitoring local microseismicity. The algorithm automatically predicts a rough estimation of the location. Events are visually revised and classified.

To assess the monitoring performance before fracturing operations started, seismic data from the pre-operational phase was used to estimate the level of seismic noise. This information was used to assess the detection performance of the monitoring setup. To achieve this goal a realistic synthetic microseismic catalogue and synthetic waveform dataset have been created. Synthetic waveforms, generated for a local crustal model and realistic source parameters, are superposed to real noise traces to reproduce true monitoring conditions. The synthetic dataset can be used to evaluate the detection rates and magnitude of completeness, which turns to vary among Mw 0 and 1, depending on the temporal variation of the noise conditions.

Preliminary application to real data shows that, although a large number of signals were detected both in the pre-operational and fracking phases, detections mostly correspond to a variety of seismic signals generated out of the study volume or to seismic noise. So far, a single microseismic event has been clearly identified up to June 2016 originating from the area surrounding the horizontal wells.

The air pollution monitoring started in July 2015, with a complete dataset available from August 2015. The air components are measured at Stary Wiec (located near Wysin). Air pollution monitoring is continuing according to the extended monitoring plan. At the moment all declared pollutants and greenhouse gases are measured continuously. The station is visited and equipment is serviced regularly, at least once a month. Data from the station is transmitted on-line and analysed daily. Some minor technical problems occurred during the operation of the station, but this did not affect the quality of the data set (data are available for over 90% of time of the planned measurement time).

Preliminary results from the data analysis and modelling confirm the hypothesis that the influence of shale gas exploration and exploitation activities on air quality is negligible (so far).

Water contamination monitoring has been underway since December 2015. To date, eight field visits and sampling rounds have been undertaken and continuous monitoring is in place at the four boreholes. The baseline monitoring was completed in June, when the hydraulic fracturing process was begun. Post-fracturing monitoring is ongoing. Samples of the frac fluid and flowback fluid were provided courtesy of PGNiG and were analysed to identify key trigger species that might indicate escape of either into the groundwater. The laboratory analysis schedule has been updated based on the findings from these analyses and the results from the baseline water analyses.

At the moment, apart from the negligible seismic event in June 2016, no relevant effects of shale gas operations have been recorded for the three hazards identified by the project. The results from monitoring activities will be continuously collected by this task in accordance with WP3. Final guidelines will be edited by this task at month 36.

Task 8.2

- A review of the applicability of ISO 31000: 2009 to the project outcomes particularly around strategy, plans and feedback mechanisms has been conducted.
- Development of a methodology for the assessment of risks in shale gas operations has been completed. This has included the development of standard matrices for both technical risk and business risk to stakeholders in shale gas developments. We are examining risk assessment protocols which consist of:
 - scenario development;
 - generic risk matrices;
 - generic mitigations;
 - application to the monitoring regime of a particular site in Wysin, Northern Poland.
- Cost benefit analysis of the monitoring regime in terms the development of shale gas operations
- Applying the outcomes from the cost benefit analysis to other shales gas sites in Europe as identified in WP5.3 Generic settings.

Task 8.3

The following Dissemination activities have been conducted during this period:

Date	Event	Partners involved
06/06/16	SHEER 1st Annual Meeting in Naples, Italy	All (lead by AMRA)
24/06/16	Poster: Acoustic emission detection of an underground hydraulic fracture experiment using continuous waveforms at the GeoX Advanced Seismology workshop in Postdam, Germany (see details below)	GFZ
30/06/16	Grzegorz Lizurek talks about SHEER on Radio TOK http://goo.gl/0l0yzA	IGF
06/07/16	Various colleagues attended the UK Onshore Oil and Gas Summit in Manchester. Distributed leaflets. Paul Younger gave a talk: "Fuelling the Future: The UK's unconventional oil and gas revolution"	UG, KeU
11/07/16	Attended 7th International Geosciences Students Conference in Katowice, Poland. Talked to the students attending the event about SHEER	IGF
06/09/16	Presentations and posters at the ESC in Trieste, Italy	IGF, GFZ
13/09/16	Colleagues attended the APPG Unconventional Oil and Gas 'Lessons from America and British regulation'. Distributed leaflets and SHEER News 3.	KeU, RSKW
13/09/16	Presentation of findings from WP3 at the GeolSoc Groundwater - Our Hidden Asset conference in Birmingham	RSKW
21/09/16	Presentation of findings from WP3 to the Central Scotland Regional Group of the Geological Society	RSKW, UG
10/12/16	Attended UK Shale Summit in Manchester. Distributed leaflets and SHEER News 3. Andrew Gunning gave a talk: "The SHEER project: Understanding, preventing and mitigating the potential environmental impacts and risks of Shale Gas Exploration and Exploitation"	RSKW, KeU

The 2nd edition of "SHEER News" was distributed on 29th April 2016.

The 3rd Issue of "SHEER News" was distributed on 26th August to 140 recipients via the MailChimp service. The email was opened by 43.6% of the recipients and 27.1% clicked through to the newsletter, which was available to download via the SHEER website. The newsletter featured:

- An article in memory of Professor Paolo Gasparini
- A report on the SHEER first annual meeting by Keele University.
- Two technical articles from IGF PAS. One on "Statistical description of the induced seismic processes" and the other on "Stress drop distribution for seismic hazard assessment".
- Summary of new Publications
- A technical article on the geomechanical modelling of hydraulic fracturing from Keele University.
- A technical article entitled "High-Level Conceptual Models for Determination of Potential Impacts on Groundwater Resources" from RSKW and Glasgow University.
- A summary of SHEER partners' participation in meetings and events.

The 4th issue is being compiled by AMRA and is due for publication by Christmas 2016.

A Research Gate page (12 followers, 72 reads) and a LinkedIn group (63 members – industry and academia) have been set up for the project, which along with the twitter (79 followers) and Facebook (66 likes) pages are active at disseminating the news, research and progress of the project.

Task 8.4

In accordance with the main objective of the task, all the PIs of the other successful projects under the H2020 call LCE16-2014 have been invited to the first annual meeting of the SHEER project, held in Naples from 7th-9th June 2016. Christopher McDermott from University of Edinburgh and Jan Ter Heege from TNO attended the meeting showing, respectively, the major findings of the FracRisk and the M4ShaleGas projects. The SHEER consortium will continue showing its interest in the collaboration with other LCE16 projects, participating to the main meetings. Alexander Garcia (AMRA) is going to participate to the FRACRISK meeting which will be held in Milan on 27th-28th October. All the objectives of the task have been achieved.

- **Significant results**

SHEER first annual meeting successfully held in Naples 7-9 June 2016

SHEER News Issues 2 and 3 published

Setting up LinkedIn and Research Gate groups

Table 1. Deliverables due at the date

Del. no.	Deliverable name	Versi on	WP no.	Lead beneficiary	Nature	Disseminatio n level¹	Deliver y date from Annex I (proj month)	Actual / Forecast delivery date Dd/mm/y yy	Status No submitted/ Submitted	Contractu al Yes/No	Comment s

Deliverables due at the date

Please complete this table if deliverables are due for the reporting period

1PU Public PP Restricted to other programme participants (including the Commission Services)
RE Restricted to a group specified by the consortium (including the Commission Services)
CO Confidential, only for members of the consortium (including the Commission Services)

