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CSIRO's Gas Industry Social and Environmental Research Alliance refutes The Australia Institute report

CSIRO's Gas Industry Social and Environmental Research Alliance refutes the claims made in the document 'CSIR...who?' published by The Australia Institute in July 2020.

It is important that communities living in gas exploration and development regions of Australia are provided with the highest quality, robust and trusted science with which they are able to make up their own minds in relation to social acceptance of the gas industry.

Equally it is important that industry and state and territory governments have access to this same world class science in order to ensure best practice and minimise risks to the environment.

In this respect, CSIRO has an important role to play in the national interest and it does so through its own Gas Industry Social and Environmental Research Alliance (GISERA) in order to maintain its independence and research quality.

The Australia Institute report makes a series of misleading claims about CSIRO GISERA's research into the air, water and soil impacts of hydraulic fracturing at specific CSG well site locations in the Surat Basin. The following factual information refutes these misleading claims.

Choice of field sites and number of wells

The study was designed to look at the air water and soil impacts that occur when a specific well is subject to hydraulic fracturing operations. It was not designed to look at the cumulative impacts of natural gas development.

Both the air quality report (*Measurements of air quality at a hydraulic fracturing site in the Surat Basin, Queensland - Final Report)* and the water and soils quality report (*Assessing the potential impacts of hydraulic fracturing on water and soil quality in the vicinity of well sites in the Surat Basin, Queensland)* clearly state that the study is specific to hydraulic fracturing activities at the specific sites identified within the Surat Basin in Queensland.

The air quality report states:

"*The representativeness of the study and the scalability of data to other well sites in the Surat Basin or other locations will depend on a number of factors including the representativeness of the HF processes employed, underlying geology, structure of the coal seam, well depths as well as meteorology etc*."

In addition, the water and soils quality study states:

"*This study assessed the impact of HF on water and soil quality at two locations in the Surat Basin. It was not intended to be a national or regional assessment. However, with proper contextualisation and consideration of differences between locations and differences in industry practices, the outcomes of the study may provide insights into likely impacts at other locations*."

The comprehensive nature of the research relates to the intensive investigations carried out at specific well sites by a multi-disciplinary team of scientists before, during, and after hydraulic fracturing operations:

- The water and soil quality study fieldwork collected 113 water samples and 40 soil samples from creek waters, groundwater, flowback water, produced water, samples of hydraulic fracturing, and soil cores from

well pads and nearby areas. The samples were then subjected to 22 analytical procedures to determine the concentration of over 150 chemicals including organics, inorganics and radionuclides.

- The air quality study is the one of largest atmospheric surveys of its type conducted in Australia, and the largest undertaken in an Australian CSG field. The air quality study made continuous measurements of pollutant gases and airborne particle concentrations at two fixed air quality monitoring stations and 5 solar powered air quality monitoring systems located on a 600ha property containing 10 CSG wells. This production field was typical of others. Continuous monitoring began in July 2017 before the wells were drilled and concluded in November 2017 following well completions. In addition to continuous measurements, a total of 178 filter samples of particulates and 981 samples of gaseous pollutants were collected at the site. Overall, the airborne levels of > 100 chemicals were analysed for and reported including 5 out of 6 National Environment Protection Measure (NEPM) prescribed Ambient Air Pollutants, and all of the NEPM prescribed Air Toxics, as well as mercury, radon and > 50 organic compounds. As part of this study, the levels of 54 volatile organic compounds (VOCs) including 4 of the 5 prescribed NEPM air toxics were also measured in 250 samples collected at two CSG development sites before during and after HF at 21 wells in 2016/17.
- The soil laboratory study tested 30 spill scenarios (5 soil types x 2 depths x 3 fluid combinations) and microbial assessments were carried out immediately on these microcosms, after 3-7 days, and again after 28-60 days. Two sets of experiments were conducted - the degradation experiment was repeated since, in the first experiment, a faster than expected degradation of chemicals in the native soils was observed.

CSIRO Research Independence

CSIRO GISERA's research is not conducted on behalf of the gas industry but rather on behalf of the communities who live in these regions. These communities actively participate in GISERA through the Regional Research Advisory Committees by determining what research is undertaken including this project.

At the start of the project, CSIRO researchers had complete freedom to review and select gas field study locations where hydraulic fracturing operations were to be conducted. This was undertaken through site familiarisation visits and carried out in-line with published and independently peer-reviewed study design and methodology.

The scientists judged their site selection based on a range of factors including:

- locations where hydraulic fracturing rigs were planned to be active,
- availability of power to operate monitoring stations,
- suitable terrain and road access for equipment
- proximity to desired features i.e. local waterways and groundwater bores, and
- access to regional townships to facilitate extended periods of field work.

In relation to the air quality study, the study site and location of monitoring stations were selected before the wells were drilled and located where the best continuous sampling could occur.

CSIRO GISERA's Governance

CSIRO's GISERA has in place strict governance arrangements that ensure the independence of CSIRO researchers and the integrity of all research projects. These arrangements also guarantee input from community and independent representatives that participate in GISERA's Regional Research Advisory

Committees. This ensures that all scientific results are independent of industry and governments, and all meeting minutes, communiques, project proposals, reports and fact sheets are made available for public scrutiny on the GISERA website (www.gisera.csiro.au). This process has ensured CSIRO's independence for over 10 years in GISERA.

The scope of this particular study was derived from a decision by the majority-controlled community and independent members of the Queensland Regional Research Advisory Committee. Over $2 million was needed to investigate in detail the *in-situ* impacts on air, water and soil when a specific CSG well is subjected to hydraulic fracturing.

It is appropriate that industry and governments contribute to funding of this type of work subject to the guarantee of independence that the governance principles ensure. This project took place in the Surat Basin of Queensland over a period of 3 years and is the first of its kind. The study undertaken by CSIRO's GISERA has enabled further insights into the process of hydraulic fracturing - research that is needed but has not been available in Australia until now.

This work was undertaken with a range of University Partners and external providers including Australian Nuclear Science and Technology Organisation, Macquarie University, The University of Queensland - Queensland Alliance for Environmental Health Sciences (QAEHS), and NATA accredited measurement providers – Ecotech and SGS Leeder.

Impact on soil microbiology and other findings

The soil research noted clearly that hydraulic fracturing fluid had a marked impact on nitrifying microorganisms in soil, which had not recovered in the experimental microcosms after 66 days. Furthermore, the impact of produced water on nitrifying microorganisms in soil was much lower but variable among surface soils, and three out of five surface soils showed complete recovery by the end of the experiment.

It also noted that soils may show recovery over a longer time period. In addition, the grinding and homogenisation of soils under laboratory conditions would have destroyed the soil microstructure and thereby eliminate refugia for microorganisms that is a feature of field soils. This may generate a faster recovery under field conditions.

Also, important to note is that well pads are specifically engineered to contain a spill so that it does not make direct contact with surface soils. Hence, the assessment here considered a very worse-case scenario.

As a result of these considerations, the researchers recommended a longer-term field–based study to assess the true impact of HF fluid of soil microbial functions and plant growth, especially under field conditions and this is something that CSIRO's GISERA intends to address in the future.

In addition, the CSIRO researchers found that:

- Levels of most atmospheric pollutants were well below relevant air quality objectives for the majority of the study period.
- Short-term increases in the concentrations of NO2, CO, PM10, PM2.5, TSP, BTX and formaldehyde above background were at levels below air quality objectives, with the exception of infrequent dust events.
- Well development activity was not associated with measurable enhancements in O3, SO2, mercury, radon and methane.
- Direct emissions of pollutants to the air from these HF-specific sources was unlikely to have contributed significantly to airborne concentrations.

- Reverse osmosis treatment was effective in reducing the concentrations of identified contaminants of concern to below the highly stringent Australian guidelines for freshwaters.
- During routine well operation (20 days after hydraulic fracturing) radionuclide activities were very low and were below highly stringent international guideline levels for drinking water.
- Sampling of nearby groundwater bores for an extensive range of potential contaminants did not indicate any impacts of CSG operations on water quality.
- Sampling from a local creek adjacent to one of the study areas did not indicate signs of contamination relating to CSG activities.
- Soil sampling from across drill leases and nearby background sites did not reveal any contamination that could be associated with CSG activities during HF operations.

This information provides a more complete picture of the work and results generated under our project that examined air, water and soil impacts of hydraulic fracturing in the Surat Basin, Queensland.

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Read more about the Air Water and Soil Impacts of Hydraulic Fracturing in the Surat Basin

Fact sheet

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Project page – phase 2

Project Reports:

Air quality

Water and soil quality

Soil laboratory analysis