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- on line at <https://frackinginquiry.wa.gov.au/have-your-say>
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- by post - Independent Scientific Panel Inquiry, Locked Bag 33, Cloisters Square, Perth WA 6850

Re: “Listening to the Experts” - Public Submission to WA Public Fracking Inquiry 2018

Introduction and My own experience

I am an Indigenous person from the West Kimberley region of Western Australian, I am a Peter Cullen (Water Leadership) Fellow with scientific qualifications as a social and a biophysical scientist. I am advocating against fracking on the basis of my own experience nationally and internationally I understand that this form of industrialisation is contraindicated to human and environmental health and wellbeing. There is overwhelming international evidence of the contamination to ground water and the guarantee and added burden that at some point ever frack well will fail. This is well evidenced in the Kimberley in regards to the long term failure of water bores due to corrosion and long term exposure to the elements.

The search for shale oil and shale gas has commenced in the Canning Super Basin. This basin is approximately several hundred thousand square kilometres in size and is located within the Fitzroy River Catchment, extending into the Pilbara region of WA. Fracking has direct impacts on peoples land, water, food, energy security as well as community wellbeing. The **Mission and Values of the Shire of Broome states the Shire must be a Sustainable Community** that is inclusive, attractive, healthy and pleasant to live in, to use our land so as to preserve our history and environment, respects the rights and equality of our citizens and manages our future growth wisely.

I refer to the Shire of Carnamah and Shire of Coorow who have a moratorium on fracking in their respective Shires. It is evident from this approach these two independent Shires have valued the importance of social, cultural, human and environmental wellbeing and not simply the pursuit of economic capital and the development at all cost agenda. The State of Victoria in response to the evidence provided by industry and citizens has planned moratorium on this industry. My experience from working with other scientist from France confirm that France has also upheld its citizens rights not have this industry in their country and have banned fracking.

The industrialisation to the Kimberley region from 'fracking' will affect agriculture, tourism, heritage and communities. My experience also tells me that we are in a time of Climate Change and great uncertainty our state and country are in grave financial debt and we need serious investment to be in a economic position to transition away from fossil fuel extractions and the release of greenhouse gases into the atmosphere. My research and scientific inquiry including publications cites the opportunity to shift from fossil fuel extraction to industries of natural and cultural capital much of this can be found in the geo heritage and cultural heritage of the Fitzroy River as a national asset and a globally unique river system. The evidence documented in **Natural capital at risk** (2013) as seen in International trade markets and International Monetary Fund advise from the World Bank; people around the world will defend the natural assets of the commons; land, water, clean air, food energy, with access to information on the right to petroleum and geothermal energy planning and development. I recently commissioned an extensive scientific report to show how geo parks can become part of the new economy for the region along with bio-prospecting and wildharvest.

The term 'genocide', as coined by Polish Jurist Raphael Lemkin, refers to the physical and cultural destruction of social groups.¹ The practice is broader and more multifaceted than mass murder and aims to destroy the identity and foundations of a particular group.² Correspondingly, ecocide is the atrocity of severely destroying or wiping out a specific environment.³ The term ecocide speaks to the nexus between ecological destruction and genocide. The victims of ecocide include humans and the environment itself.⁴ Ecocide has a particularly genocidal impact for Indigenous peoples who depend on Country for their survival and their cultural and spiritual health.⁵

Furthermore, the evidence coming from the eastern states have evidenced contamination of beef and dairy and stud horse breeding. It is clear from the terms of reference that the Board of Inquiry have been provided with the intent of not banning this industry rather the challenge to regulate its use. I have found no scientific or industry model at either national or international levels as evidence that this industry can be managed particularly when much of the fugitive emission are lost in the extraction process to the atmosphere and to ground water.

Context - Listening to the Experts

The search for shale oil and shale gas has commenced in the Canning Super Basin. This basin is approximately several hundred thousand square kilometres in size and is located within the Fitzroy River Catchment, extending into the Pilbara region of WA. The Basin is reported to be approximately 500 000 sqkms onshore and an additional 100 000 sqks off shore. If fracked it is likely to be the largest man made disaster in the world.

"Listening to the Experts", There has been considerable Australian evidence from the east coast on the implications of this industry for human, animals and environmental health and wellbeing. The hydraulic fracturing (fracking) industry is booming. So are industry cash settlements and property buyouts for people who say fracking has ruined their water, lowered their house prices and destroyed their quality of life. From farm animals dropping dead overnight to low birth weights in human infants, fracking is becoming synonymous with harm, and the process is seen to harm ecosystems, as well as animal and human health.

Water

The State government policy on Water does not preclude fracking in town water-supply areas and there are no official buffers between fracking operations and private dwellings. It is of great concern to many people in the Shire of Broome that the Department of Water does not have a right of veto over fracking in proclaimed groundwater areas

The report on the water for the Kimberley and the Canning Basin in 2013, entitled "Regional Kimberley water level from 2010 to 2030" written by the Water Department of the Western Australian Government is particularly incomplete in relation to forecasting the water needs of the industrial sector, as can be seen in the following remark, 'the lack of presentation of the needs assessment for water for the Fitzroy River Catchment, and no comment on the water needs of Canning Basin'.

The Signed Agreement between Department of Water (DoW) and Department of Mines & Petroleum

The purpose of the Agreement is to:

¹ Raphael Lemkin, *Axis Rule in Occupied Europe: Laws of Occupation – Analysis of Government – Proposals for Redress* (Washington, DC: Carnegie Endowment for International Peace, 1944): 79–95; Martin Crook and Damien Short, "Marx, Lemkin and the genocide-ecocide nexus", (2014) *The International Journal of Human Rights* 18:3, 298-319

² Irene Watson, "Dressed to Kill" in *Aboriginal Peoples, Colonialism and International Law*, (Routledge, 2015), p 112.

³ Amy Hay, University of Texas, Pan-American, Review of David Zierler's *The Invention of Ecocide*, quoting Yale plant biologist Prof Arthur Galston at a Conference in 1970 on "War Crimes and the American conscience": <https://networks.h-net.org/system/files/contributed-files/env-roundtable-2-1.pdf>

⁴ Martin Crook and Damien Short, "Marx, Lemkin and the genocide-ecocide nexus", (2014) *The International Journal of Human Rights* 18:3, 298-319, at 307

⁵ Ibid, at 308. See also Polly Higgins 'Eradicating Ecocide' lawyer and advocate who is seeking to criminalise ecocide:

<http://pollyhiggins.com/>

- i. Facilitate ongoing collaboration and cooperation between two departments in fulfilling their statutory, policy and communication functions.
- ii. Support the functions of the departments in recognising that the protection of water resources, and the responsible development of petroleum and geothermal resources industry, are both priorities for the Government of Western Australia.
- iii. Support the timely, efficient and transparent exchange of information between the departments on matters relating to the protection of water resources.

As both departments have statutory, policy and communication responsibilities it is imperative to secure the investment required to evaluate the process, impacts and outcomes of the signed Agreement. The following principle as agreed to between DoW and DMP, is that **"Water resources and petroleum and geothermal resources in their natural state belong to the people of Western Australia (the same applies to the people in the Shire of Broome)"**.

The document makes reference to other relevant regulatory bodies, Department of Mines and Petroleum, Environmental Protection Authority, Department of Health, Department of Environment and Regulation, Department of Environment (Federal) and Department of Aboriginal Affairs. The policy right refers to the potential impacts on public health, to drinking water, environmental implications and potential impacts on areas of Aboriginal heritage and cultural significance.

I am advocating to this public inquiry the Precautionary Principles should remain the foundation and the Board of this Inquiry consider the potential for legal liability in regards to individual and not company or government failure of fiduciary duties in regards to progressing the industrialisation of fracking in this state, at this time.

Doctors for the Environment Australia

I refer to the advocacy by Doctors for the Environment Australia, who confirm they have a responsibility as doctors to advocate for the health of current and future generations. These Australian Doctors believe the risks from fracking are potentially serious, and difficult to manage and are likely to be long-lived.

They relate to:

1. Land access and degradation: reaching and extracting gas in fossil fuel deposits involves drilling and sometimes hydraulic fracturing (fracking) of underground structures; an activity that requires vehicular access to and permanent alienation of land, sometimes prime agricultural land, sometimes treasured natural habitat. This adversely affects the well-being of farming (agriculture, pastoral and grazing) families using the land, the well-being of communities that enjoy the habitats and damage to eco-systems from clearing native vegetation.
2. Underground chemical injection: to free gas trapped in shale or coal seams, large volumes of chemical-containing-liquids are forced under pressure into the seams. Most of these chemicals have not been assessed for human health safety and there is a risk of them entering underground aquifers or ground water, where risks are largely unknown. Water contamination can potentially also affect food and water security for humans (and animals). Regardless of where activity takes place, no safe modelling of water can be accurate because leakage and flow from aquifers is not well understood and difficult to measure.

3. Air pollution: Violate organic compounds and hydrocarbons (include carcinogen/cancer causing benzene) are released during unconventional gas operations, from venting, holding tanks, ponds, compressors and other infrastructure. Some of these mix with nitrous oxides from diesel-fuelled machinery creating ground-level ozone. This air pollution poses a probable risk to workers and the people (and animals) nearby.
4. Global climate: gas is simply another fossil fuel that, when burnt, inexorably will add to the green-house gas burden of our planet and add to the serious health risks of climate change. The use of gas in power generation has been promoted because it has a significantly lower carbon footprint than coal but when fugitive emissions from well- heads and transit and distribution of gas are measured, the carbon footprint may be little better than coal.
5. Another major concern occurs when the deep geology is fractured, the geological structure is turned to rubble and moves around like marbles deep below the surface. Evidence from experts across the globe believe this is a major contributor to increase earth quakes and the release of toxic methane gas into the environment. From a Kimberley savannah system context this could become a major contributor to large scale bush fires fuelled by the fugitive emissions of methane gas.

Doctors for the Environment Australia hold the view further development of the unconventional gas industry is seen as **unsafe unless it complies with the WA Public Health Act (2014)** as they cite serious threats to human health from unconventional oil and gas at many levels. To this end the WA Public Health Bill (2014) must have due regard to serious potential or real threats to human health from the petroleum and mining industry. Furthermore, litigation case in Australia and across the world identify individuals rather than companies as the target for prosecution and compensation.

Western Australian Public Health Bill 2014

The WA Public Health Bill (2014) is very clear that the “Person involved in the administration of this Act must perform their function and with due regard to the objects and principles of this Act (1984). I draw attention to the WA Public Health Bill (2014) whose objects and principles identify:

- a. To promote and improve public health and wellbeing and to prevent disease, disability and premature death; and
- b. To protect individuals and communities ...from diseases and other public health risk, and to provide, to the extent reasonably practicable, a health environment for all residents living in (the Broome Shire and other) Western Australians; and
- c. To promote the provision of information to individuals and communities about public health risks; and
- d. To encourage individuals and communities to plan for, create and maintain a healthy environment; and
- e. To provide for the prevention and early detection of ...other public health risks, and certain, other conditions of health; and
- f. To support programs and campaigns intended to improve public health; and
- g. To facilitate the provision of information to decision-making authorities for public health risks and benefits to public health that may result in certain proposals; and
- h. To provide for the collection, disclosure and use of information about the incidence and prevalence of ...other public health risks...and certain other conditions of health for the research or public health purposes; and
- i. To reduce the inequalities in public health of disadvantaged communities; and
- j. To provide for functions relating to public health to be performed by Local Governments.

In the pursuit of the objects of the Act, regard must be had to both sustainability principles and the precautionary principles to ensure intergenerational exquity for current and future generations of Australians.

Sustainability Principles:

- (1) Sound public health practices and procedures should be adopted as a basis for sustainability for the benefit of all people and the community today, while consideration is given to the public health, social, economic, (cultural) and environmental needs of future generations
- (2) Public health, social, economic and environmental factors should be considered in decision-making, with the objective of improving community wellbeing and the benefit to (current) future generations.
- (3) Public health practices and procedures should be cost effective and in proportion to the significance of the public health risks, and consequences being addressed.

Precautionary Principle

- (1) If there is a public health risk, lack of scientific certainty should not be used as a reason for postponing measures to prevent, control or abate that risk.
- (2) In the application of the precautionary principle, decision should be guided by –
 - (a) A careful evaluation to avoid, where practicable, harm to public health; and
 - (b) An assessment of the risk weighted consequences of the options.

Principles of Intergenerational Equity

The present generation should ensure that public health is maintained or enhance for the benefit of future generations.

In my submission I have provided additional Attachments as scientific evidence to make the the point the Unconventional Gas Industry in the Kimberley as it relates to the Canning Basin must consider both known and unknown faults and folds, it further recommends additional science in order to fully understand the hydro geological structure of such an extensive basin. Depending on the extent of further analysis and interpretation required, the following work would be beneficial in ascertaining further knowledge:

- Stage A: Obtaining independent baseline studies pertaining to the area of interest. This would require a geological ground reconnaissance and mapping of surface waters and, chemical analysis of surface waters and groundwater where able. It would be recommended that chemical analysis of surface and ground waters be an ongoing practise.
- Stage B: Professional Development session/s to offer a broader understanding of the fundamental processes of geology and hydrogeology.
- Stage C: A regional scale geological and hydrogeological desktop study comprising a review of case studies relevant to the client's project and, a review of pertinent public reports available from GSWA, Department of Water and other governmental agencies and resource companies.

This unknown scientific work makes it highly unlikely that this industry can not be regulated without the confidence of this science!

The other paper from eminent human rights lawyers identifies the potential human rights impacts of the 'extreme energy' process, specifically focussing on the production of shale gas, coal-bed methane (CBM) and 'tight oil', known colloquially as 'fracking'. Most importantly, this evidence advocates a new field for human rights impact assessment with regards to this Industry and its relationship to human and environmental health and wellbeing.

Recommendation 1:

A need for human rights impact assessments

The United Nations Environment Programme (UNEP) has issued a 'Global Alert'⁷² on the issue of fracking development, warning of significant environmental risks to the air, soil and water (contamination and usage competition); ecosystem damage; habitat and biodiversity impacts; and fugitive gas emissions – which will endanger carbon reduction targets. In terms of public health, UNEP⁷³ warned of risks of pipeline explosions; release of toxins into air, soil and water; and competition for land and water resources needed for food production and that unconventional gas would likely be used 'in addition to coal rather than being a substitute'⁷⁴ and would thus pose a threat to the development of sustainable economies.

Recommendation 2:

A Regional Management Plan

If this industry is to proceed then there need to be a regional management strategy established independent but funded by government to ensure environmental and human rights impacts are assessed, monitored and evaluated throughout the state of WA. In the case of the West Kimberley region a Fitzroy River wide Catchment Management Plan with bipartisan support and investment be established for a minimum of 3 years to monitor all projects to observe and monitor cumulative impacts on our greatest natural and cultural assets the Fitzroy River and the Canning Basin, with emphasis on water, agriculture, pastoralism, tourism and human health and wellbeing.

Analysis of the 2014 Canning Coastal Seismic Survey and Preliminary Interpretation – Fitzroy Trough

**SUBMITTED ON A NO PREJUDICE BASIS TO N. PETHICK FOR THE PURPOSE OF
THIS WA 2018 PUBLIC INQUIRY INTO" FRACKING"**

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Analysis of the 2014 Canning Coastal Seismic Survey and Preliminary Interpretation

Fitzroy Trough

This analysis is intended to provide gainful knowledge on the geological and hydrogeological aspects pertaining to the Fitzroy Trough by analysis of the Canning Coastal Seismic Survey and Preliminary Interpretation – Balance GGE.

Introduction

The 2014 Canning Coastal Seismic Survey (CCSS) was a collaboration between the Geological Survey of Western Australia (GSWA) and Geoscience Australia (GA). The survey comprised a 20-second seismic reflection and gravity data across 700km from Pardoo Roadhouse to Stumpy's Jump-up on the Gibb River Road. The CCSS data acquisition was funded by the Western Australian State Government's Royalties for Regions *Exploration Incentive Scheme (EIS)*, the processing was funded by the Australian Federal Government.

The 20-second seismic reflection survey was processed in two profiles, a 20-second profile and an 8-second profile. The 20-second profile reflects depths to 50km and was aimed to further understand the basement structure beneath the Canning Basin; the basement comprises stratigraphic units of the Proterozoic (2.5Ga- 541Ma) Era at depths between ~12km-38km. The 8-second profile reflects the upper ~15km comprising stratigraphic units from the Ordovician (485Ma-444Ma) to Cretaceous (145Ma-65Ma) Periods. It is the 8- second profile of which aids in the exploration and mining of resources and the identification of groundwater aquifers.

The CCSS allows for interpretation of regional tectonic processes of which the Canning Basin and its basement were exposed to during the Proterozoic (2.5Ga-541Ma) Era to the Cretaceous (145Ma-65Ma) Period. More specifically, seismic surveys reflect regional geological structures and spatial stratigraphic correlations; such geological structures include faults and folds, stratigraphic correlations include the vertical and horizontal extent of stratigraphic units.

To ensure analysis and interpretations are systematic and thorough, seismic surveys are used in conjunction with other geophysical and geological datasets; such datasets may include magnetotelluric surveys, gravity surveys, drill-hole data, hydrogeological maps and, topographic and geological maps.

Analysis & Interpretation

Regional tectonic activity:

The Fitzroy Trough is bound at the south-west margin by a north-east steeply dipping fault which reaches a depth of approximately 13km; this fault has been identified as the Fenton Fault which developed as a normal dip-slip fault. The north-east margin of the Fitzroy Trough is interpreted as a sag structure dipping south-west with no major bounding fault. These margin types are evidence of extensional tectonic processes where basins are essentially created and sediment deposition prevails. It was during this extensional tectonic activity where the sediments of the Ordovician (485Ma-444Ma) to the early Triassic (252Ma-201Ma) Periods were deposited.

Throughout the interior of the Fitzroy Trough, there are many geological structures such as faults and folds. Faults and folds are a response to large scale tectonic processes, faults occur during either extensional or compressional tectonic processes whereas folds are restricted to compressional tectonic processes. The 8- second reflection profile highlights the extent of these faults and folds to depths of ~12km.

8-second seismic profile of the Fitzroy Trough:

It is interpreted that the central and southern portions of the interior contain the majority of the faults and folds. There is evidence that a fault zone exists within the southern portion with up to 13 near vertical thrust faults reaching approximate depths of (+/-) 7km. This fault zone has a lateral extent of approximately 45km. In addition, an interpretation by GSWA question the existence of an igneous intrusion directly below a portion of the abovementioned fault zone, this however requires further analysis for a sufficient confidence of this interpretation. Many small and larger scale folds are also evident in the southern portion.

The central portion of the interior shows a minimum of 3 near vertical thrust faults reaching depths from (+/-) 8-10km. Folding appears within the central portion however it is evident that the intensity of folding diminishes northward.

The northern portion of the interior shows minor folding with one main deep-seated near vertical thrust fault, the Pinnacle Fault. Interestingly, a well, Wattle 1, was drilled to the south of this fault.

Further information on this is included in the following pages of this report.

The Fenton Fault on the south-west margin, although its development was interpreted as a normal dip-slip fault, the CCSS reveals the movement along this fault has been reversed during compressional tectonic activity and currently remains structurally as a thrust fault.

There is no evidence that any of these faults penetrate the surface, many do however appear to contact but not penetrate, the unconformably overlying stratigraphic units. These overlying stratigraphic units are interpreted to pertain to the Late Jurassic (201Ma-145Ma) to the more recent Quaternary (10Ka to present) Periods and appear to have been subjected to very little tectonic activity i.e. there is no appreciable deformation and are shown as relatively planar stratigraphic units. In locations within the Dampier Peninsula, many groundwater aquifers are known to exist within these interpreted planar stratigraphic units, these include the Broome Sandstone along with surficial aquifers above the Broome Sandstone and confined aquifers below the Broome Sandstone (Laws, 1991). The hydraulic connection between these aquifers is unknown and little more can be derived from analysis of the CCSS without including drill-hole data or hydrogeological assessments.

As evident in the CCSS, the geological folds of the Fitzroy Trough appear to be upright and open; open folds have a geometric angle of $127^{\circ} - 70^{\circ}$. Geological folds are an expression of compressional tectonic activity and can be associated with fault systems i.e. where there are folds, faults are commonly present depending on the forces of the tectonic processes and rheology of the rocks and minerals. Other geological structures are also associated with folds, these are fractures and joint structures but are too small to be identified in such a seismic survey.

Stratigraphic correlations is limited to the relative thicknesses and the visual stratigraphic order of the rock units within the Fitzroy Trough. Drill-hole data, literature reviews and geological surveys would be required to ascertain the names of each stratigraphic unit.

Nature of faults and folds:

Faults can influence the migration of hydrocarbons, hydrothermal fluids and groundwater by means of either impeding or enhancing flow. The ability of faults to impede or enhance flow is governed by post-tectonic processes of which cannot be identified from seismic

surveys, inferences can however sometimes be made for example, magmatic intrusions often lead to hydrothermal fluids flowing through pathways of least resistance such as the planes of early formed faults. Hydrothermal fluids will in time mineralise and fill the void space within the fault plane, this process commonly impedes flow. It must be noted however that subsurface geological processes are complex and thorough interpretations should include the analysis of many datasets.

Other structures associated with faults include fracture and joint structures which act similarly to faults in flow regimes; these associated structures are not in the scale of the CCSS and thus their presence cannot be determined from analysis of the CCSS. Drill-hole data, where available, would need to be rigorously reviewed to determine the existence of any such associated structures.

Geological folds are structures which basically comprise of anticlines and synclines. In a diagrammatic sense, anticlines are the apex of a fold, synclines are the base of a fold. Due to the low density of hydrocarbon compounds, hydrocarbons essentially migrate towards the anticline of a fold where they will accumulate given there is an impermeable surface to impede and trap the flow within the anticline. Again, this process is complex and includes other intrinsic factors in flow migration.

The natural nature of hydrocarbon migration is up-gradient whereas the natural nature of groundwater flow is down-gradient, these natural tendencies can however be influenced by subsurface pressure gradients in which natural migration pathways is reversed, for example, groundwater flow can be up-gradient or down-gradient subject to the surrounding pressure gradients.

Flow regimes are ultimately complex in nature and is therefore imperative to understand the locations and properties of faults, folds, pressure gradients and geometric gradients in the exploration of resources and groundwater systems. Further analysis of flow regimes would require a comprehensive analysis of complimentary geophysical and geological datasets.

Recommendations

Depending on the extent of further analysis and interpretation required, the following work would be beneficial in ascertaining further knowledge:

- Stage 1: CCSS analysis - pertains to this report and has thus been completed.
- Stage 2: Obtaining independent baseline studies pertaining to the area of interest. This would require a geological ground reconnaissance and mapping of surface waters and, chemical analysis of surface waters and groundwater where able. It would be recommended that chemical analysis of surface and ground waters be an ongoing practise.
- Stage 3: Professional Development session/s to offer a broader understanding of the fundamental processes of geology and hydrogeology.
- Stage 4: A regional scale geological and hydrogeological desktop study comprising a review of case studies relevant to the client's project and, a review of pertinent public reports available from GSWA, Department of Water and other governmental agencies and resource companies.

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Extreme energy, ‘fracking’ and human rights: a new field for human rights impact assessments?

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This article explores the potential human rights impacts of the ‘extreme energy’ process, specifically focussing on the production of shale gas, coal-bed methane (CBM) and ‘tight oil’, known colloquially as ‘fracking’. The article locates the discussion within a broader context of resource depletion, the ‘limits to growth’ and the process of extreme energy itself. Utilising recent secondary data from the United States and Australia, combined with the preliminary findings of our ethnographic fieldwork in the United Kingdom, the article outlines a *prima facie* case for investigating ‘fracking’ development through a human rights lens. Indeed, based on considerable emerging evidence we argue that ‘fracking’ development poses a significant risk to a range of key human rights and should thus form the subject of a multitude of comprehensive, interdisciplinary human rights impact assessments (HRIAs) as a matter of urgency. Finally, given the close relationships between government and extractive industries, we argue that these impact assessments must do more than bolster corporate social responsibility (CSR) statements and should be truly independent of either government or industry influence.

Keywords: extreme energy; fracking; human rights; impact assessments; environment; hydraulic fracturing; corporate social responsibility

Introduction

Limits to growth, extreme energy and the 'minimally good life'

While the theory and practice of 'human rights' has produced many differing conceptions, justifications, formulations and relativistic exceptions,¹ for the purposes of this article we will principally utilise the relatively uncontentious, empirically grounded, 'minimalist'² conception articulated by legal scholar James Nickel. For Nickel, contemporary human rights standards are justified moral and legal claims 'universally held' by all persons vis-à-vis their governments, coupled with their corresponding moral and legal duties that governments, at all levels, owe their citizens in order for them to lead a 'minimally good life'.³ National and international institutions bear the primary responsibility of securing human rights and the test for successfully fulfilling this responsibility is the creation of opportunities for all individuals to lead such a life. The realisation of human rights requires establishing the conditions, positive and negative, for all human beings to lead minimally good lives and thus should not be confused with attempts to promote the highest possible standards of living, or the best or most just form of economic system, or a morally perfect society. The impression that many have of human rights as being unduly utopian testifies less to the inherent demands of human rights and more to the extent to which the fairly modest aspiration of a 'minimally good life'⁴ for all is so far from being realised in the world today. Here, we are not just talking about the seemingly infinite number of discrete human rights violations around the world, about which much has been written, but also the systemic denial of the 'minimally good life' for millions of people that seems to be the inevitable by-product of the capitalist mode of production⁵ and about which much less has been written. Perhaps the most well-known debate in the human rights literature is the exchange between Rhoda Howard-Hassman and Admandiata Pollis. The debate highlighted contrasting interpretations of the pros and cons of the spread of global capitalism for human rights, but it is the former's⁶ faith in capitalism's 'long term' prospects for the enhancement of human rights that is symptomatic of a distinct academic and popular denial of the two most important and unsavoury facts facing humanity today – the 'limits to growth' and anthropogenic climate change.

The 1972 Club of Rome report *The Limits to Growth*⁷ utilised a system dynamics computer model to simulate the interactions of five global economic subsystems, namely: population, food production, industrial production, pollution and consumption of non-renewable natural resources, the results of which posed serious challenges for global sustainability. A recent study collated historical data for 1970–2000⁸ and compared them with scenarios presented in *The Limits to Growth*. The

analysis shows that 30 years of historical data compares favourably with key features of the 'standard run' scenario, which results in collapse of the global system midway through the twenty-first century. The key driver behind the Limits to Growth prediction – and arguably the one most poised to quickly cause global economic collapse – is the depletion of non-renewable energy sources, especially of oil and natural gas.⁹ Despite the best efforts of the fossil fuel industry to propagate a paradigm of energy abundance, especially in the United States (US),¹⁰ global production of conventional oil has already peaked and – barring incredibly unlikely huge new discoveries of easily extracted oil – must soon decline as predicted in *Limits to Growth*.¹¹ New discoveries of oil and natural gas liquids¹² have dropped dramatically since their peak in the 1960s, and the world now consumes four to five barrels of oil for every one discovered.¹³ Because oil production from conventional fields drops globally by 5% each year, it is thus assured that such fields will eventually 'run out'.¹⁴

This downward global trend in oil discovery and supply has not gone unnoticed by the major international actors, namely states and multi- and trans-national corporations, who have taken various actions since the end of the Cold War to secure access to remaining conventional oil supplies. An examination of major international conflicts in the Persian Gulf region alone since 1990 demonstrates the determination of countries such as the US to maintain control of conventional energy resources.¹⁵ Indeed, conventional energy supplies have become so precious to many states that 'energy security'¹⁶ is now an overriding objective within which foreign and domestic policies situate the procurement of oil (and other energy sources) as a matter of national security. Such a discourse often elevates concern for the global fossil fuel market over other considerations such as the environment and human rights.¹⁷

This change in rhetoric to boost the perceived necessity of fossil fuels is furthered by the influence of major energy corporations upon state governments. As numerous internationally reaching corporations, such as Exxon Mobil and ConocoPhillips, have developed larger economies than many sizeable states,¹⁸ their power has correspondingly grown. Since such companies' business models centre on fossil fuels, examples of corporate-state collaboration to further non-renewable energy use may be found in varying arenas, from the more than 50 million dollars Koch Industries spent on lobbying the US government between 1998 and 2010¹⁹ and the formation of the American Legislative Exchange Council (which brings private corporations together with elected US state officials to draft new legislation),²⁰ to direct connections between advisors to the United Kingdom (UK) Cabinet Office and energy sector companies such as Centrica and Riverstone.²¹ Because of the overly close, arguably corrupt and undemocratic relationships,²² between politicians and corporate

interests, it could be argued that the exclusion of 'the underground injection of natural gas for purposes of storage' and '... of fluids or propping agents ... pursuant to hydraulic fracturing operations related to oil, gas, or geothermal production activities' from the US Safe Drinking Water Act²³; the British government's determination to make unconventional energy extraction through hydraulic fracturing an 'urgent national priority'²⁴; the failure of the European Union to create legally binding environmental legislation for hydraulic fracturing²⁵; and George W. Bush's administration's policy of attempting to 'refute the science of global warming and install in its place economic and environmental policies that not only ignore but deny the views of the scientific community on climate change'²⁶ are – at the very least in part – results of the wishes of the energy sector. As the 200 largest listed fossil fuel companies spent \$674 billion on developing new energy reserves (five times as much as they spent returning money to shareholders) in 2012,²⁷ the energy industry remains invested in pushing the 'limits' as far as they can go.²⁸

Though corporations may lobby otherwise,²⁹ resource limitations to growth are not the only significant, impending, ecological threats to human rights on a global scale. Carbon dioxide atmospheric concentrations 'have increased by 40% since pre-industrial times', with concentrations of carbon dioxide, methane and nitrous oxide at the highest in at least 800,000 years,³⁰ and the rate of carbon dioxide release is unprecedented, at least in the last 300 million years. The result of this level of pollution – inherently tied to an insistence on using and depleting non-renewable energy sources³¹ – is the phenomenon of climate change, in this context represented by the anthropogenic increase in the earth's surface temperature. Since 1880, the average global temperature has increased by roughly 0.85 degrees Celsius, with most of the increase – 0.72 degrees Celsius – occurring in the past 50 years.³² The effects of this global warming are diverse and range from shrinking glaciers and ice sheets, to the highest rate of sea level rise in the past 2000 years and increasingly frequent extreme weather events; all of which clearly result from 'human influence on the climate system'.³³

Knowing that these two results of humanity's 'addiction' to fossil fuels are imminently approaching, it may be hoped that global use of oil, natural gas and coal are immediately curbed. At present, however, fossil fuels still remain the world's main source of energy, accounting for 81% of global primary energy use in 2010.³⁴ This is undoubtedly due, at least in part, to the current, Western propagated, largely fossil fuel dependent, neoliberal economic model, wherein corporations, being legally bound to pursue profit above all other considerations, continuously, and most often

successfully, lobby for favourable legislation, deregulation and tax incentives. As Bakan noted in his seminal text, *The Corporation: The Pathological Pursuit of Profit and Power*,³⁵ under corporate law, the primary legal duty of the corporation is 'simply to make money for shareholders' and failing to pursue this end 'can leave directors and officers open to being sued.'³⁶ Thus, the multitude of multi-billion dollar companies that depend upon the continued global use of fossil fuels have not only a vested interest in advocating for further non-renewable energy extraction, but arguably, in the current energy market, a legal duty to do so – and at the very least an obligation to continue pursuing oil, coal and natural gas extraction as long as it is profitable (and legal) to do so. Thus, while the use of renewable energy sources is growing,³⁷ they are forced to compete with an established and highly subsidised³⁸ non-renewable market, rather than be allowed to replace it.³⁹

Furthermore, as conventional reserves are depleted⁴⁰ and demand for energy rises, there is increasing pressure to exploit unconventional energy sources.⁴¹ Michael Klare⁴² first coined the term 'extreme energy' to describe a range of relatively new, higher-risk, non-renewable resource extraction processes that have become more attractive to the conventional energy industry as the more easily accessible supplies dwindle. Edward Lloyd-Davies points out, however, that this definition of extreme energy as a category is highly problematic as it is dependent upon specific examples; it lacks 'explanatory or predictive power',⁴³ and leaves open the question of who decides which extractive techniques qualify. A conceptual understanding would suggest that extreme energy is a 'process whereby extraction methods grow more intense over time, as easier to extract resources are depleted'. The foundation of this conception is the simple fact that those energy sources which require the least amount of effort to extract will be used first, and only once those are dwindling will more effort be exerted to gain similar resources. Extreme energy, in this sense, is evident in the history of energy extraction – in the change from gathering 'sea coal' from British beaches and exploiting 'natural oil seeps', to opencast mining and deep-water oil drilling. Viewed in this light, the concept of extreme energy becomes a lens through which current energy extraction efforts can be explained and the future of the energy industry predicted. Using this extreme energy lens necessitates an understanding of 'the amount of energy which is needed to obtain energy', as in this process it is that value which is continually rising. This value may be calculated as either 'net energy' or 'energy return on investment' (EROI), whereby net energy is the available energy for use after subtracting the energy required for extraction, and EROI is the percentage of energy produced divided by the amount required for extraction. When charted together, the net energy available to society is seen to decrease along with EROI in a curved mathematical relationship which forms the 'energy cliff' – i.e. the point at

which EROI becomes increasingly low and net energy drops to zero.⁴⁴

In the extreme energy process the economic system can be conceptualised as consisting of two distinct segments, the part which is extracting, refining and producing energy (the energy industry) and everything else, which just consumes energy. What needs to be clearly understood is that the energy industry is in the rare position where the commodity which it produces is also the main resource it consumes. Therefore, as energy extraction becomes more extreme, while the rest of the economy will be squeezed by decreasing energy availability and rising prices,⁴⁵ the energy industry's rising costs will be offset by the rising revenues it receives. The net result will be a reallocation (through the market or otherwise) of resources from the rest of society to the energy industry, to allow the energy industry to target ever more difficult to extract resources. This process is ongoing as easier-to-extract resources are depleted, and data from recent extraction methods, such as hydraulic fracturing and tar sands extraction, show that industry is increasingly lurching towards the net energy cliff. Such action on the part of some of the largest and most commercially successful trans-national corporations may only be understood as the logical result of the extreme energy process⁴⁶ – there simply are not enough easier-to-extract resources available.⁴⁷

Despite the obvious negative implications of these developments, the process shows no sign of stopping, but continues towards the precipice at an ever-increasing rate, fuelled by ever-increasing levels of energy consumption. Perpetuated by the global economic 'growth' fixation,⁴⁸ increasing amounts of energy are consumed each year,⁴⁹ driving the process over the edge. Of course, industry is not willing to halt the process⁵⁰ as intense demand further pushes up the price of energy,⁵¹ allowing extraction to remain economical – as long as enough resource is extracted at each site and the price stays high. The result is that higher energy consumption leads to faster resource depletion, which in turn results in the acceleration of the extreme energy process. Within this neoliberal economic context of increasing demand and profit potential the results of extreme extraction techniques,⁵² and the consequences of continuing the process, are easily trumped in the interest of short-term profiteering and 'energy security'. Indeed, as Stephanie Malin notes, neoliberal 'normalization' of unconventional energy extraction emerges most saliently regarding environmental outcomes and economic development.⁵³ Despite the prospective consequences of reaching our limits to growth, and with considerable evidence demonstrating a strong correlation between extraction effort and damage to both society and the environ-

ment, the extreme energy process continues to accelerate with potentially disastrous consequences.⁵⁴

The depth of connections already established between the extreme energy process and the 'minimally good life' illustrates the otherwise overlooked insidious nature of this insis- tence upon striving towards the energy precipice. Human rights violations due to climate change and the release of pollutants are yet another side effect of humanity's dependence on fossil fuels that grows in magnitude with each decade. The tropics and subtropics have seen droughts increase in intensity and duration since the 1970s,⁵⁵ and diseases such as malaria are affecting larger portions of the population.⁵⁶ Two hundred thousand deaths in the US each year result from air pollution,⁵⁷ while a heat wave across Europe in 2003 (most likely resulting from global climate change)⁵⁸ left roughly 30,000 people dead.⁵⁹ There is strong evidence to suggest that the worst consequences of anthropogenic climate change on human rights have not yet been felt. As predicted in *The Limits to Growth*,⁶⁰ the effects of climate degradation will rapidly increase with temperature through- out the twenty-first century,⁶¹ resulting in large-scale deaths across Europe due to heat stroke,⁶² worsening droughts across continents,⁶³ further loss of food and water, and a potential, eventual, extinction-level event for humanity if global emissions are not reduced in accordance with the latest climate science modelling. Such events, along with resulting unrest, wars and mass migrations,⁶⁴ threaten people's rights to life and health worldwide.

The rush to scrape the bottom of the fossil fuel barrel is thus creating a veritable perfect storm for current and future human rights abuses. As resources become scarcer our scram- ble to use them grows, increasing the political prioritisation of fossil fuel extraction over ecosystems, human health and security; while increasing demand also ensures that such resources will run out sooner, which in turn will result in further human rights violations as food, health care and other basic needs are no longer met, to say nothing of the abuses to human security which would also necessarily increase. These violations will most likely increase exponentially as resources are depleted – at least, that is, until the sharp population decline predicted in *The Limits to Growth* occurs.⁶⁵

'Fracking' as the latest step in the process

In addition to the infamous 'tar sands'⁶⁶ in Alberta Canada, the march towards the net energy cliff is arguably spearheaded in the West by the most recently developed family of extreme energy extraction methods known as 'fracking', a colloquial expression which usually refers to the extraction of shale gas, CBM (coal-bed methane) and 'tight oil'. The term, however, has become somewhat loaded, such that it is necessary to

outline the contrasting uses and define the senses in which it is invoked in this article. In public discourse about 'fracking' different sides often talk past each other, due to very different understandings of what the issues are, and differing definitions of the term itself. These differences fall along a spectrum that can be understood in terms of the interests of the parties involved.

Exploitation of unconventional oil and gas is a new, more extreme form of fossil fuel extraction, targeting much less permeable rock formations than previous conventional oil and gas extraction. It is characterised by the drilling of dense patterns of, usually horizontal, wells (up to eight per square mile or more) in conjunction with other more intense processes such as hydraulic fracturing and de-watering. Different rock formations can be targeted, such as shale (shale gas and oil) and coal (CBM), but the negative impacts on the environment and society are very similar. For many local people affected, 'fracking' has come to mean petroleum extraction companies turning up where they live and coating the area in hundreds or thousands of well-pads, compressor stations and pipelines alongside large volumes of truck traffic with some likening it to an 'invasion' and 'occupation',⁶⁷ bringing with it a large variety of negative consequences for them and their environment.

The word 'fracking', however, is derived from 'fracking', a much more narrowly defined industry slang for 'hydraulic fracturing', one particular stage of unconventional petroleum (oil or gas) extraction. A scaled-up form of hydraulic fracturing (high volume), involving injecting fluids under high pressure to crack the rock, is often used to release hydrocarbons during unconventional oil and gas extraction. The communities living with the consequences of unconventional oil and gas extraction are mainly concerned with the impact it has on them and their environment. Unconventional oil and gas extraction is a complex process, involving pad construction, well drilling, casing, stimulation (often including but not limited to hydraulic fracturing), extraction and transport, along with well plugging and abandonment (or failure to do so). All these stages have a consequent impact on their local environment and, due to the fact that fracking requires so many more wells covering much larger areas, these impacts mount up to a far greater extent than for conventional extraction and production.

In an era of peaked conventional supplies,⁶⁸ extractive industries are principally concerned with finding new fossil fuels to extract in order to ensure continued profits, the cumulative impacts of which are likely to be seen as little more than simple 'externalities' for the companies involved. Focused as they are on getting gas and oil out of the ground, regardless,

the industry and their government supporters are concerned to utilise the technologies for just that. Moreover, they work on a drilling site by drilling site basis, and the cumulative impact of the whole process seems to be of little concern. It is also useful in their public relations to focus on micro details rather than the macro picture, and a narrow definition of 'fracking', as simply hydraulic fracturing, helps promote the impression that fracking is simply conventional extraction plus hydraulic fracturing, rather than an entirely different process with very different impacts. Quite possibly one of the reasons the term 'fracking' has become synonymous with unconventional oil and gas extraction more generally lies in the choices made by the industry in their early promotional pitches to investors. Indeed, in the early part of the last decade, it seems that to raise funds for exploration a simple technological explanation was preferred when pitching to non-experts. The industry chose to focus attention on hydraulic fracturing as the key ingredient out of a complex array of technological processes. It is not difficult to understand why the idea of a new, high-tech well completion method, 'massive slick-water hydraulic fracturing', which was going to single-handedly revolutionise the industry by allowing access to a wealth of previously untapped resources, was an attractive sales pitch to investors. A more accurate view of unconventional oil and gas, as requiring much more effort, drilling greater numbers of much more expensive wells in order to produce much less oil/gas, does not sound like such an attractive proposition in comparison. It is therefore unsurprising that the terminology used to describe the industry (and the understanding of the issues involved) has become somewhat skewed by this initial spin.

Given that this article deals with the impact of unconventional extraction on people and the environment from a human rights perspective, the issues raised are the wider ones surrounding the overall effects of the entire more-intense extraction process, rather than ones specific to particular technologies the industry may or may not use. For this reason it is far more appropriate to use this wider definition of 'fracking', rather than the more narrowly defined industry slang that has the effect of limiting discourse to just the narrow technical process of hydraulic fracturing itself, as if it could occur in an isolated vacuum without its necessary production infrastructure. Even so, it should still be acknowledged that since there are often significant levels of confusion surrounding the use of the term, the particular understanding being used should always be defined. Thus, to be clear, in this article 'fracking' is being used in its wider sense to include all of the required industrial elements of hydraulic fracturing, from huge quantities of water, to compressor stations, truck traffic and waste disposal.

In the countries where ‘fracking’ development has taken place it has been controversial and divisive. Supporters of unconventional gas development often claim that it reduces gas prices, creates employment opportunities and provides ‘energy security’, all the while producing lower carbon emissions than coal. Its detractors often contest all such claims, usually pointing to contrary data emerging from the US and Australia. Indeed, in numerous studies from both countries, local communities most affected by developments often cite considerable negative impacts on the environment and human health, including groundwater contamination, air pollution, radioactive and toxic waste, water usage, earthquakes, methane migration and the industrialisation of rural landscapes,⁶⁹ the cumulative effect of which has led to calls for the United Nations Human Rights Council (HRC)⁷⁰ to condemn fracking as a threat to basic human rights, particularly the rights to water and health. Fracking development is fast becoming a human rights issue.⁷¹

A need for human rights impact assessments

The United Nations Environment Programme (UNEP) has issued a ‘Global Alert’⁷² on the issue of fracking development, warning of significant environmental risks to the air, soil and water (contamination and usage competition); ecosystem damage; habitat and biodiversity impacts; and fugitive gas emissions – which will endanger carbon reduction targets. In terms of public health, UNEP⁷³ warned of risks of pipeline explosions; release of toxins into air, soil and water; and competition for land and water resources needed for food production and that unconventional gas would likely be used ‘in addition to coal rather than being a substitute’⁷⁴ and would thus pose a threat to the development of sustainable economies.

Most of the academic papers on the impacts of fracking have focused on such issues as the macroeconomic benefits of a ‘shale gas revolution’, the ‘green’ credentials of shale gas,⁷⁵ and the levels of environmental impact and responsibility for it.⁷⁶ The few human impact investigations undertaken have come from investigative journalists,⁷⁷ small non-governmental organisations (NGOs)⁷⁸ and documentary filmmakers.⁷⁹ While valuable, such studies have been limited in scope and were not comparative. Recently anthropologists and sociologists have started to document the social and political discourses of fracking and the surrounding social conflicts in discreet Australian communities⁸⁰ and perceptions of risk and opportunity in American communities,⁸¹ but they predominantly engage in discourse and perception analysis rather than invoking an impact-based analysis. A recent sociological study of the UK context takes a similar discourse analysis approach, albeit at an earlier stage of development, i.e. the exploration stage.⁸² Though such studies highlight the relevant priorities – and possible weaknesses – of arguments

for and against fracking, they do not utilise an interdisciplinary approach that would engage with scientific findings that speak to an empirical reality beyond individuals' 'perceptions', nor do they systematically interrogate how individual perceptions and behaviours are affected by wider social structures and institutionalised power.

Taking a broader, more structurally aware approach, a recent study has shown that 'neo-liberal logic' has led stakeholders to self-regulate their behaviour in order to facilitate fracking, by seeing its current role in rural industrialisation, its potential environmental and health outcomes, and its economic outcomes as part of a 'new normal'.⁸³ The consequences of this normalisation of loss of agency therefore raises fundamental questions about the ability of communities to resist extractive operations and make informed choices about the sources of their energy. Green criminologists have also called for a more theoretically robust approach to the study of ecological harms and crimes.⁸⁴ A recent study by Shelley and Opsal⁸⁵ of the social and ecological impacts of energy extractive practices on local communities implies that green criminologists are starting to investigate this issue, documenting not only illegal actions but also processes and outcomes that are 'harmful' to humans, animals and the environment. In a recent paper de Rijke noted:

the extraordinary expansion of the unconventional gas industry has ... led to questions about social power and the rights of individuals and local communities, the role of multinational corporations in politics and rural service provision, as well as related questions regarding fundamental processes of democracy, capitalist economies and social justice⁸⁶

while the

close relationship between governments and powerful multinational corporations brings to the fore questions about political influence and human rights.⁸⁷

Thus, to address these 'important conundrums', de Rijke advocated further academic research into fracking from multiple perspectives, including social impact assessments. Given the weight of evidence of human impacts that is emerging from countries with a mature fracking industry, such as the US and Australia, we suggest it is time to meet de Rijke's call through the human rights lens, i.e. the creation of comprehensive interdisciplinary human rights impact assessments (HRIAs) of fracking.

The last ten years has seen a growth in HRIAs that have been developed by a variety of actors as an extension of, or improvement on, social impact assessments (SIAs), which in turn developed from environmental impact assessments (EIAs). Recent academic literature on HRIAs⁸⁸ has identified a number of distinct advantages of such assessments over broader SIAs. With recent UN-based developments regarding the human rights due dili-

gence obligations for companies,⁸⁹ particularly in the extractive industries, the HRIA methodology is valuable because it uses a set of norms and standards that are based on shared values and, therefore, represents a solid normative foundation on which to base impact assessments.⁹⁰ Second, human rights represent legal obligations of states, rather than simply aspirations, and so HRIAs may compel duty-bearers to act to protect the rights of rights-holders.⁹¹ Third, HRIAs require a disaggregation of impacts to ensure that the effects on vulnerable groups are identified, such as women, children and indigenous groups. The human rights approach also encourages respect for stakeholder rights to information, participation, transparency and accountability⁹² and a commitment to 'improving the quality of life of people and communities'⁹³ and a desire to influence policy and practice to that end. The methodological focus of a HRIA is an evidence-based evaluation of commitments made by a state and the actual ability of individuals, groups and communities in a country to enjoy these rights. HRIAs provide (intergovernmental) organisations, governments and companies with instruments to better focus their human rights efforts; and civil society, community activists and NGOs can use them as an analytical and lobbying tool. A HRIA can be done before the activity takes place (*ex ante*), or after the activity has taken place (*ex post*).

What is missing, both from academia and the world of public policy are impartial inter-disciplinary human rights-based investigations of a range of effects, impacts and changes brought on by fracking projects and experienced by individuals, families and communities in countries with a developed industry, such as Australia and the US, so as to better understand actual and potential human rights impacts for future affected communities in those countries and in countries at pre-production stages. At the same time research must include data collected from sites with different levels of industry maturity as evidence from the US has shown that support for fracking reduces with experience of cumulative impacts.⁹⁴ It is vital that this research commences forthwith since many countries currently at various exploration stages (e.g. the UK, Poland, Romania, Botswana, South Africa and Argentina) are seeking to move to full production within the next five years and production is already beginning in some countries (e.g. China, India and Indonesia), while established producers will seek to expand when, and where, possible. This is all taking place without adequate research on the social and human rights impacts of such development and how these relate to the environmental impacts. Indeed, the next five years represent a crucial window of opportunity for stakeholder communities, civil society organisations and NGOs to meaningfully engage with those proposing fracking development; impartial, community-based HRIAs will greatly aid this endeavour.

In the balance of this article we demonstrate that there are at least ten areas of concern that would provide key ‘indicator’ data for such assessments due to their inherent connection with the fracking process and its social and political context. These areas are: water, air, land, health, freedom of peaceful assembly, freedom of expression, liberty and security of the person, right to a fair trial, right to respect for the private and family life, and anthropogenic climate change.

Many of the negative effects of fracking have revolved around these key issues, each of which has a legal basis in human rights and an obvious connection to Nickel’s ‘minimally good life’. Thus, an examination of each topic is essential to making the *prima facie* case for assessing fracking’s human rights impacts in an interdisciplinary manner that goes beyond existing ‘perception’ studies to include additional empirical data, often from scientific sources.

Water

One of the most contentious and widely publicised environmental, and we would argue human rights, issues connected with fracking is the water impact: groundwater contamination, water use and contaminated water waste disposal. Shale gas production is a highly water-intensive process, with a typical single well requiring around five million gallons of water, and an average well-pad cluster up to 60 million gallons, to drill and fracture, depending on the basin and geological formation.⁹⁵ The vast majority of this water is used during the fracturing process, with large volumes of water pumped into the well with sand and chemicals to facilitate the extraction of the gas; the remainder is used in the drilling stage, with water being the major component of the drilling fluids. Once that water is used by the industry it is no longer a useful resource for society. While increasing quantities of water are being recycled and reused in the US, freshwater is still used in large quantities for the drilling operations as ‘produced’ water is more likely to damage the equipment and reduce the chance of a ‘successful well’. The industry’s requirements⁹⁶ for such quantities of freshwater are clearly a serious concern in water-scarce regions of the world and in places with high cumulative demand for water.

In the case of CBM extraction the major water use is the dewatering of the coal seams, in order to allow the gas to flow. This involves pumping large quantities (hundreds of thousands of litres per day) of water out of each well. The overall effect of pumping out such large amounts of water, when multiplied by potentially thousands of wells in any given region, is usually to dramatically lower water tables in the area, since freshwater aquifers nearer the surface tend to drain down into the coal seams when water is removed from them. For instance, the Queensland Water

Commission predicts a massive water table drop of 700m in some areas due to CBM extraction.⁹⁷ So while the mechanisms are very different, the overall impacts of shale and CBM extraction on water availability are just as serious. Such demand pressures are already being felt in areas of the US and Australia, leading to pressure on water sources and competition for withdrawal permits.⁹⁸

The large quantity of water used by the fracking industry is but one of many serious concerns. The contamination of groundwater sources,⁹⁹ from failure in the well casing over time,¹⁰⁰ what industry refers to as 'zonal isolation' failure, is a very serious issue across regions that have seen considerable fracking development to date, and has duly featured as a central public relations battleground for industry and pro-fracking governments. Even so, arguably the most concerning issue with fracking's use of water is the issue of produced/waste water treatment and disposal, often simply referred to as 'waste water management'. And yet, the risks in this regard go well beyond the concerns of corporate risk minimisation. Indeed, the whole process of dealing with fracking's waste water is a highly risky business for local populations and the environment, with considerable risks of water or soil contamination from surface leaks and spills.¹⁰¹ But perhaps the most concerning issue with waste water is that it can contain significant amounts of radioactive material¹⁰² due to the 'naturally occurring hypersaline brines associated with the formations targeted for natural gas production'.¹⁰³ For instance, radium has been found to be building up in rivers downstream of shale gas waste discharge points in Pennsylvania,¹⁰⁴ while a company has been fined for contaminating an aquifer with CBM (termed coal seam gas (CSG) in Australia) waste containing uranium in New South Wales, Australia.¹⁰⁵

Summarising much of the data, a recent landmark US study by Vengosh et al. argues that the overall risks posed by fracking development for water are fourfold (a similar, though subtly different list could be produced for CBM¹⁰⁶ extraction)¹⁰⁷:

- Contamination of shallow aquifers in areas adjacent to shale gas development through stray gas leaking from improperly constructed or failing gas wells.
- Contamination of water resources in areas of shale gas development and/or waste management by spills, leaks or disposal of hydraulic fracturing fluids and inadequately treated wastewaters.
- Accumulation of metals and radioactive elements on stream, river and lake sediments in wastewater disposal or spill sites, posing an additional long-term impact by slowly releasing toxic elements and radiation to the environment in the impacted areas.
- Reduction of water supply through withdrawals of valuable fresh water from dry areas and overexploitation of limited or diminished water resources for shale gas

development.

The human right to water was first recognised within the UN system by the Committee on Economic, Social and Cultural Rights through their 2002 General Comment 15, which located it implicitly in the rights to an adequate standard of living and to the highest attainable standard of health set out in Articles 11 and 12 of the International Covenant on Economic, Social and Cultural Rights (ICESCR), respectively. In 2005, the Special Rapporteur of the Sub-Commission on the Promotion and Protection of Human Rights issued draft guidelines for a resolution on the right to drinking water and sanitation,¹⁰⁸ which were adopted by the Sub-Commission in 2006 as the Guidelines for the Realization of the Right to Drinking Water and Sanitation. The HRC followed the guidelines with a request for the High Commissioner for Human Rights to study the scope and content of human rights obligations related to access to safe drinking water and sanitation under current international human rights instruments.¹⁰⁹ The results of the study were presented to the HRC in 2007 and included the High Commissioner's recommendation that '... it is now time to consider access to safe drinking water and sanitation as a human right'.¹¹⁰ An independent expert on the issue of human rights obligations related to access to safe drinking water and sanitation was established by the HRC in 2008, and in July 2010 the UN General Assembly adopted resolution 64/292 recognising the 'right to safe and clean drinking water and sanitation as a human right this is essential for the full enjoyment of life and all human rights'.¹¹¹ In March 2011 the independent expert's mandate was extended and the title altered to Special Rapporteur on the Human Right to Safe Drinking Water and Sanitation.¹¹²

Though the right to clean drinking water and sanitation has now been affirmed by the General Assembly and the HRC,¹¹³ there is no explicit international instrument on the right. Rather, the HRC has defined the human right to water and sanitation to derive from the right to an adequate standard of living and found it inextricably related to the rights to health, life and human dignity. Additionally, numerous international instruments include the right to water and sanitation. The 1979 Convention on the Elimination of Discrimination Against Women (CEDAW)¹¹⁴ is the earliest such example, stating the right of women to water and sanitation as elements of the right to adequate living conditions. Subsequently, International Labour Organization (ILO) Convention 161 of 1985¹¹⁵ referred to the right of workers to sanitary installations, the 1989 Convention on the Rights of the Child (CRC) stated the right of children to clean drinking water,¹¹⁶ both the 1990 African Charter on the Rights and Welfare of the Child and the Protocol to the African Charter on Human and Peoples' Rights (ACHPR) on the Rights of Women in Africa¹¹⁷ include the rights to safe drinking water, and, most recently, the 2006 Convention on the

Rights of Persons with Disabilities (CRPD) includes the rights to clean water services as a subset of the right to social protection.¹¹⁸

With such evidence of wide international acceptance of the human right to water and sanitation, and considering the place of this right within the context of a 'minimally good life', it is thus appropriate to consider access to clean water and sanitation a fundamental human right and necessary to consider the impact of the fracking industry on that right. Despite its widespread use in the US for over a decade, hydraulic fracturing has only recently been scrutinised to determine if and what its effects are on human rights. Under the special procedures of the HRC, the Special Rapporteur on the Human Right to Safe Drinking Water and Sanitation, Catarina de Albuquerque, concluded her 2011 mission to the US by outlining serious concerns over the effect of a range of polluting activities associated with the hydraulic fracturing process, observing a distinct: 'policy disconnect ... between polluting activities and their ultimate impact on the safety of drinking water sources. The absence of integrated thinking has generated enormous burdens, including increased costs to public water systems to monitor and treat water to remove regulated contaminants and detrimental health outcomes for individuals and communities.'¹¹⁹ While a comprehensive report on the effects of hydraulic fracturing on water quality is expected from the US Environmental Protection Agency late 2015,¹²⁰ there have recently been other, smaller-scale studies revealing water contamination due to fracking processes. Ingraffea et al.'s review of compliance reports from conventional and unconventional oil and gas wells drilled in Pennsylvania between 2000 and 2012¹²¹ reveals that casing/cement impairment is six times more likely to occur in shale gas wells than in conventional wells. Such flaws may result in cases of subsurface gas migration into the water supply, as has already occurred in the state. Indeed, published data demonstrate evidence of 'contamination of shallow aquifers with hydrocarbon gases ... contamination of surface water and shallow groundwater from spills, leaks, and/or the disposal of inadequately treated shale gas waste-water ... [and] accumulation of toxic and radioactive elements in soil or stream sediments near disposal or spill sites ...' from hydraulic fracturing throughout the US.¹²² Qualitative data from Colorado have further revealed complaints of water contamination from residents living near fracking sites that are often intentionally misunderstood, assigned a different cause, or diluted by state regulatory bodies.¹²³ Recently the Pennsylvania Department of Environmental Protection disclosed details of 243 cases in which fracking companies were found by state regulators to have contaminated private drinking water wells in the last four years.¹²⁴ Cumulatively, these reports indicate likely impairment of the right to water for residents living near fracking sites.

Air

A major, and often under-appreciated, impact of fracking is air pollution. Despite water issues gaining the majority of press and public attention, it is becoming clear that for most people reporting health problems associated with fracking, air pollution is far more likely to be the initial cause.¹²⁵ This is because air pollution will be present as soon as drilling begins and it is much harder to avoid exposure to it. In comparison, the effects of water pollution take much longer to emerge and it can take years for well casings to degrade causing the wells to leak. Also, in the West at least, using alternative sources once a problem is spotted can mitigate water contamination issues. A particularly serious air pollutant produced by fracking is ozone, a powerful lung irritant that contributes to asthma and other breathing disorders, and which can form as a result of reactions between leaking methane and nitrogen oxides emitted from exhausts of diesel-powered equipment. Areas with previous pristine air such as the Upper Green River Basin in Wyoming are now seeing ozone levels spiking higher than those seen in Los Angeles, with people complaining of watery eyes, shortness of breath and bloody noses.¹²⁶ Ground-level ozone is a component of smog and a costly, high-priority public health risk. Ozone exposure can cause irreversible damage to the lungs and significantly increase the chance of premature death. In addition, numerous other chemicals present in natural gas at the well-head (including hydrogen sulphide, benzene¹²⁷ and other volatile hydrocarbons) can adversely, and seriously, affect air quality. Moreover, we need to consider the whole unconventional gas extraction and production process when considering the effects of such developments. In terms of impacts on localised air quality, emissions from trucks, compressors, pumps and other equipment used in the drilling and production process contain a complex mixture of benzene, toluene and xylene as well as other volatile organic compounds (VOCs).¹²⁸ Dust levels must also be considered: drilling activities and associated site traffic generate significant levels of dust while the small particle-size silica sand used in hydraulic fracturing can cause silicosis, an incurable lung disease, and increases the risk of lung cancer.¹²⁹

Fracking operations release VOCs 'at each stage of production and delivery'¹³⁰ and while ozone is usually associated with automobile exhaust emissions, fracking generates it when VOCs in wastewater 'ponds' evaporate and come into contact with well site vehicle and generator diesel fumes.¹³¹ VOCs and ozone pollution have been detected at dangerous levels at fracking sites in the US across Colorado, Wyoming and Utah. Indeed, a major study in North-Eastern Colorado¹³² found exceptionally high levels of VOCs in the air and traced the chemical signature of around 55% of them directly back to gas and oil operations. Over significant periods in 2011, the level of ozone pollution in rural Wyoming's gas

drilling areas exceeded that of Los Angeles and other major cities, and with an upper limit of 116 parts per billion, exceeded the US Environment Protection Agency's healthy limit of 75 parts per billion.¹³³ Uintah County, Utah, an area with some of the highest-producing oil and gas fields in the country, has experienced dangerously high levels of VOCs and resultant ozone for over five years: the amount of VOCs released in 2013 in Uintah County alone was calculated as the equivalent of emissions from 100 million automobiles.¹³⁴

A University of Colorado Denver, School of Public Health study documented dangerous airborne levels of benzene¹³⁵ – known to cause multiple forms of leukaemia and other blood disorders – near hydraulic fracturing operations.¹³⁶ The study found elevated risks of cancer for residents within half a mile of a drilling site. In another study focussing on North-ern Texas,¹³⁷ ambient air testing near gas drilling operations found excessive amounts of many toxic chemicals, including benzene and carbon disulphide, an extremely high-risk pollutant, possessing what the Texas Commission on Environmental Quality called 'disaster potential'.¹³⁸ These chemicals were traced back to the drilling operations, as the testing location had 'virtually no heavy industry other than the [natural gas] compression stations'.¹³⁹ Another report identified significant amounts of over 40 health-harming chemicals in the air near drilling sites in Colorado and although none were detected at levels above United States Environmental Protection Agency (EPA) limits, that study and others have noted that the EPA's ambient air quality standards may not be strict enough.¹⁴⁰ Health standards often do not fully account for long-term health effects of chemicals and enhanced risks to vulnerable populations¹⁴¹ such as pregnant women, young children and the elderly.¹⁴²

A University at Albany Institute for Health and the Environment study¹⁴³ recently identified eight highly toxic chemicals in air samples collected near fracking and associated infrastructure sites across five states: Arkansas, Colorado, Pennsylvania, Ohio and Wyoming. Chemicals detected included two benzene and formaldehyde (proven human carcinogens) and hexane and hydrogen sulfide (two potent neurotoxins). The study found that for 29 out of 76 samples, concentrations far exceeded federal health and safety standards, in some cases by several orders of magnitude. Moreover, in some instances highly elevated levels of formaldehyde were found up to half a mile from a wellhead. Indeed, in Arkansas, seven air samples contained formaldehyde at levels up to 60 times the level known to raise the risk for cancer.¹⁴⁴ According to the study's lead author 'this is a significant public health

risk ... Cancer has a long latency, so you're not seeing an elevation in cancer in these communities. But five, 10, 15 years from now, elevation in cancer is

almost certain to happen.’¹⁴⁵ When considering the fundamental right to clean air (minimally, air that is free from harmful levels of pollution), as a necessary aspect of the ‘minimally good life’, it is necessary to first note that access to air – like water – ‘was an entitlement so natural and fundamental that it was probably inconceivable that the continued availability of this access had to be guaranteed as a human right’.¹⁴⁶ Accordingly, an explicit right to air is not found in any UN human rights instruments or special procedure. Despite this apparent international inattention to the right to clean air, numerous national and regional bodies have recognised the positive obligation of governments to ensure clean air for their populace, either as a component of other internationally recognised rights or as an aspect of the right to a healthy environment.

At the national level, the obligation of the state to protect its people from detrimental pollution has been affirmed in countries across the world. Some of the most explicit references to air pollution have come from Asia, as the Supreme Court of India, in *Subhash Kumar v. State of Bihar* (1991), stated that the right to life includes the right to pollution-free water and air.¹⁴⁷ Additionally, the Human Rights Commission of Malaysia, a national human rights institution established by the Malaysian Parliament in 1999, has asserted that the right to liberty within the Malaysian Constitution obliges the government to provide clean air, based on their analysis of Malaysian national and case law.¹⁴⁸ More generally, environmental rights, as such, are recognised in 92 state constitutions, spanning every continent, from Portugal to Mexico to Indonesia, Brazil to Madagascar to Russia.¹⁴⁹ Even with such limited examples of a state-recognised right to clean air specifically, this conglomeration of national acknowledgement of the right to a clean environment demonstrates that the human right to air is broadly recognised, despite the absence of a UN mechanism.

Examining regional human rights law further reveals the general acceptance of a right to clean air, in so far as it is consistent with a general right to a healthy environment. Article 24 of the ACHPR expressly states the right of ‘[a]ll peoples ... to a general satisfactory environment favourable to their development’.¹⁵⁰ In the Americas, the Additional Protocol to the American Convention on Human Rights in the Area of Economic, Social and Cultural Rights affirms in Article 11 that ‘[e]veryone shall have the right to live in a healthy environment’, and that it is the state’s obligation to ‘promote the protection, preservation, and improvement of the environment’.¹⁵¹ Within Europe, the European Court of Human Rights (ECtHR) ruled that air pollution specifically could be a violation of the right to respect for home and private and family life in *Lopez Ostra v. Spain* (1994).¹⁵² The court has also found that denying

access to *fresh* air contributes to degrading and inhumane treatment.¹⁵³ In the case of *Öneryildiz v. Turkey* (2004), the ECtHR ruled that the government has a duty to protect private property from environmental risks, as an element of the right to the peaceful enjoyment of possessions.¹⁵⁴ Thus, evidence within each of the three most prominent regional human rights legal systems suggests that there exists a general right to a healthy environment – which must arguably include the right to clean air.

Finally, while the UN system has not recognised the right to clean air as it has the right to water, connections between human rights and a healthy environment have recently been enhanced at the global level. The introduction of an independent expert on human rights and the environment in 2012 demonstrates the growing acceptance that '[a] safe, clean, healthy and sustainable environment is integral to the full enjoyment of a wide range of human rights, including the rights to life, health, food, water and sanitation'.¹⁵⁵ More recently, the HRC has recognised that 'environmental damage has negative implications for the effective enjoyment of human rights, in particular of the right to life, the right to the enjoyment of the highest attainable standard of physical and mental health, [and] the right to an adequate standard of living and its components ...'.¹⁵⁶ On air quality specifically, the NGO Subcommittee on Poverty Eradication submitted, in a report to the UN Human Rights Council, that there exists an inherent right to clean air that should be universally enjoyed as a component of the right to 'life-sustaining natural resources'.¹⁵⁷ As of 2012, 177 UN member states recognise the right to a healthy environment either 'through their constitution, environmental legislation, court decisions, or ratification of an international agreement ...'.¹⁵⁸ Whether or not the right to clean air is explicitly stated, it is vital to a healthy environment, the rights to life and health (discussed below) and many others, in short it is vital to the minimally good life. Thus, the current and potential effects of fracking upon air quality represent not just an environmental threat, but also a threat to the enjoyment of human rights.

Land

Fracking production has a considerable visual and physical impact on local landscapes. Indeed, fracking involves cluster well-pads, compressor stations, new site access roads, waste water containers/ponds and high-volume site traffic. Industry and government denials aside, the empirical reality of fracking developments is a considerable industrialisation of rural areas.¹⁵⁹ Land can also be impacted through water, air or soil pollution as we have seen above, along with damage to livestock, vegetation and wildlife¹⁶⁰ and damage associated with fracking-induced seismic activity.¹⁶¹ While earthquakes may not be very serious for local

properties, although some have certainly been damaged, they can damage the cement well casing, increasing the likelihood of what the industry calls 'zonal isolation failure' – in other words well casing failure – as happened already at the exploration stage in the UK at Cuadrilla's Presse Hall test site in Lancashire¹⁶² – and which could result in methane leaks and groundwater contamination.

Colorado has seen significant direct and indirect effects on wildlife, including population declines and direct mortality, in gas development areas and recent discoveries of new oil reserves and changing industry technology have dramatically altered the course of development as well as the landscape of the state.¹⁶³ In the mountainous regions of the Marcellus shale region fracking drilling leads to soil ground erosion, and loosened sediments quickly enter surface streams, contaminating cold-water fish habitats and drinking water sources.¹⁶⁴ Even so, beyond these issues, perhaps the impact that will draw the most attention from local residents is the likely impact on local property values. As US researcher Richard Heinberg writes 'the various forms of land damage from fracking often result in decreased property values, making resale and farming difficult, and also making it harder to acquire mortgages and insurance. Properties adjoining drilling sites are often simply unsellable, as no one wants to live with the noise, the bad air, and the possibility of water pollution.'¹⁶⁵

These impacts will of course multiply with each new development instigated in response to the short production cycle of the average fracking cluster. Indeed, fracking requires 'heroic rates'¹⁶⁶ of drilling to maintain production levels, and therefore enormous numbers of drilling sites. Fracking also impacts land far from drilling sites as it requires key material inputs such as sand – which itself needs to be mined and is used as a proppant (to hold hydraulic-induced fractures open).¹⁶⁷ For example, fracking in Pennsylvania, Texas and North Dakota uses sand mined in Wisconsin, Minnesota and Iowa, which itself destroys farmland, impacts wildlife and degrades waterways, while tiny silica particles dislodged by mining, when taken up by winds, can result in higher rates of silicosis and cancer in local populations.¹⁶⁸

In this context, the right to land can be viewed as the right to land free from severe ecological destruction and its negative effects upon human health and property values. This right, as a human right threatened by fracking, is comprised of the rights to respect for privacy, the family, and home, and protection of property – both of which have been legally established in numerous national, regional and international legal instruments. The 1966 International Covenant on Civil and Political Rights (ICCPR) includes the right not to be 'subjected to arbitrary or

unlawful interference' to one's 'privacy, family, home or correspondence'.¹⁶⁹ This right is also found in the European Convention on Human Rights (ECHR),¹⁷⁰ the American Convention on Human Rights (ACHR),¹⁷¹ and the Arab Charter on Human Rights.¹⁷² Within the European context especially, this right to privacy, family and home has been used in cases of environmental degradation before the ECtHR. Although in most cases – relevant to the discussion of fracking's impact on the land – the court found no violation of this right, it did assert that violation was possible due to environmental destruction that directly affects human well-being (*Kyrtatos v. Greece* (2003)),¹⁷³ damage to a home by nearby industry (*Dubetska and Others v. Ukraine* (2011)),¹⁷⁴ or excessive levels of noise and dust (*Martinez Martinez and María Pino Manzano v. Spain* (2012)).¹⁷⁵ Such findings are largely related to the right to protection of property, found in the Protocol to the ECHR,¹⁷⁶ the ACHR,¹⁷⁷ the ACHPR,¹⁷⁸ the Arab Charter on Human Rights,¹⁷⁹ in addition to numerous national constitutions.¹⁸⁰ The ECtHR case of *Flamenbaum and Others v. France* (2012)¹⁸¹ highlights the connection between these two rights as the court asserted that a drop in the market value of property, due to industry activities that could violate the right to privacy, the family and home, would be a violation of the right to protection of property.¹⁸² Therefore, when the rights to privacy, family, home and protection of property are read to include protection from pollution, environmental harm that affects human well-being, and damage to the home – including protection from arbitrary property devaluation due to nearby industrial activities – it is apparent that the effects of fracking on the land are capable of legally violating human rights.

Health

While scientific studies on the health impacts of fracking are still in their relative infancy, partially due to the time lag between environmental impacts and provable human health consequences, there is an emerging body of literature and growing awareness of recurring health defects found in residents living near fracking sites.¹⁸³ The recently publicised Texas lawsuit by Robert and Lisa Parr against Aruba Petroleum, in which a jury awarded the family \$3 million, was based on the health effects they experienced following the arrival of fracking to their community. The Parrs complained of nosebleeds, vision problems, nausea, rashes and blood pressure issues¹⁸⁴ – symptoms similar to those which have been reported near drilling sites in Colorado,¹⁸⁵ Pennsylvania¹⁸⁶ and other unconventional natural gas operations.¹⁸⁷

Recent reports have also noted connections between maternal proximity to unconventional drilling sites and birth defects, including congenital heart defects, neural tube defects and low birth-rates, though

these studies again lack the robust and comprehensive nature required to find a causal link between fracking-related pollution and health impairments.¹⁸⁸ Despite this, the quantity of studies showing correlations between fracking and health problems is rising fast, with people living near fracking wells in Pennsylvania more than twice as likely to report upper-respiratory and skin problems.¹⁸⁹ Serious ailments have been reported by families living in close proximity to drilling operations of the Eagle Ford Shale in South Texas,¹⁹⁰ and increases in coughs, chest tightness, rashes, difficulty sleeping, joint pains, muscle pains and spasms, nausea and vomiting, spontaneous nose bleeds and skin irritations have been observed among residents living near CBM wells in Tara, Queensland.¹⁹¹

These reports are also deeply concerning for people living in countries at the exploration stage, especially where the authorities mean to protect public health in the development process but fail to take on board the latest peer-reviewed health studies. Indeed, for those UK residents living near proposed fracking sites, such as Preston New Road and Roseacre in Lancashire, Public Health England's (PHE) 25 June 2014 report was so inadequate in its coverage that there is some suggestion that it amounted to 'gross scientific misconduct'.¹⁹² A robust interdisciplinary human rights-based investigation seeking health indicator data would go well beyond PHE's meagre review of just 25 publications,¹⁹³ up until their arbitrary cut-off date of December 2012, as there have been over 90 relevant reports published since. Many of these reports were considered in the New York State Department of Health's far more comprehensive report, which was instrumental in New York State recently issuing a moratorium on all fracking development on the basis that the public health risks were too great.¹⁹⁴

The various aspects of fracking's ecological footprint holistically demonstrate the potential for environmental rights violations to reach a severity capable of abusing the human rights to health and life. These rights, enshrined in numerous national and international instruments, including the International Bill of Rights, have been defined broadly by the UN and other bodies to include rights related to ecological preservation.¹⁹⁵ The right to health is 'an inclusive right', comprising not only the right of access to health care but also the right to reasonable protection from detriments to health, such as 'access to safe and potable water and adequate sanitation' (see above) and to a healthy natural environment.¹⁹⁶ The right to life is, of course, intrinsically linked to the right to health, as human life may be endangered by environmental degradation severe enough to damage human health.¹⁹⁷ The European Court of Human Rights has, for instance, ruled that a state may violate

right to life by not informing residents of nearby potential environmental safety risks or by failing to enact practical measures to avoid those safety risks.¹⁹⁸ In the following section we discuss the currently under-researched civil and political dimensions of proposed fracking development in a key emerging context: the UK's 'second dash for gas'.¹⁹⁹ The research sought to explore official responses to anti-fracking protests in the UK, with specific reference to the police response to anti-fracking protests. The discussion refers to civil and political rights that are all recognised in the UK's 1998 Human Rights Act (HRA), the ECHR and the ICCPR. These encompass the right to freedom of peaceful assembly, the right to freedom of expression, the right to liberty and security of the person, the right to a fair trial, and the right to respect for a private and family life. All of the rights discussed stem from the context of protest as a response to the proposed introduction of fracking in the UK, and are supported by primary research gathered through an online survey and interviews.

Freedom of peaceful assembly

Our UK-based primary research focussed on two exploratory (potential fracking) sites and their targeted protests: Balcombe in West Sussex²⁰⁰ and Barton Moss in Salford.²⁰¹ Conflict arose at both of these locations due to the responses of Sussex Police and Greater Manchester Police (GMP), respectively, to these peaceful protests, conducted most commonly by protesters attempting to delay the delivery of equipment or chemicals by walking in front of the lorries delivering these items to the drilling site. The results of these actions by the police have been threats to, and arguable violations of, civil and political rights recognised in the HRA, ECHR and ICCPR. The right to peaceful assembly is articulated in Article 11 of both the HRA²⁰² and the ECHR,²⁰³ and Article 21 of the ICCPR.²⁰⁴ All of these articles place restrictions upon how the right to freedom of peaceful assembly can be expressed, which are of immediate relevance to this discussion, seeking as they do to balance the right of the individual citizen with the legal powers of the state. In the context of this discussion, as a protest is an assembly, any action which prevents individuals from peacefully protesting is a violation of the right to peaceful assembly.

Article 11(2) of both the HRA and the ECHR detail how the only restrictions placed upon the freedom of peaceful assembly should be those 'prescribed by law', and are required 'in the interests of national security or public safety' or 'for the prevention of disorder or crime'. In addition, Article 11(2) in both the HRA and ECHR also states that '[t]his Article shall not prevent the imposition of lawful restrictions on the exercise of these rights by members of the armed forces, of the police or of the administration of the State'. Article 21 of the ICCPR gives less detail as to

how the right to peaceful assembly should be controlled by the state, as it does not reference armed forces, police or state administration. The right to freedom of peaceful assembly in the ICCPR is therefore less restrictive than the expression of the same right in the HRA of the UK, drafted over three decades later.

The online survey gave valuable insight into the general experience of anti-fracking protestors, at least as far as can be gauged from a selective form of research. Of the 168 respondents, 98 had personal experience of direct action against fracking in the UK. Of that 98, 79 had either interacted with the police or witnessed interactions between the police and other protesters during that experience. Of those interactions, 56 (over 76%) experienced or witnessed excessive use of force by members of the police, 64 (over 87%) experienced or witnessed unnecessary use of force by members of the police, and 61 (over 83%) experienced or witnessed unnecessary arrests. These figures provide, minimally, a generalisation of how the police responded to anti-fracking protests in the UK.

The overwhelming majority of both survey and interview respondents believed their right to freedom of peaceful assembly was prevented from being realised by the actions of police officers. The majority of comments below therefore illustrate the ways in which police failed to facilitate the right to freedom of peaceful assembly, as expressed in peaceful protest. This failure mostly involved the use of violence to inhibit individuals' ability to peacefully protest, but also extended to the removal of individuals from the protest site (without arrests being made) and unlawful arrests. Most interview respondents made reference to the fact that police were not facilitating any form of peaceful protest. With reference to Barton Moss, one respondent described how 'in terms of actual policing [...] It was very difficult to run a campaign', due to GMP's control over the protestors' actions.²⁰⁵ Another respondent described how they were removed from the Barton Moss protest by two police officers who 'were interfering with my right to protest' as 'they did stop me from actually demonstrating',²⁰⁶ illuminating the extent to which police were capable of forcibly preventing peaceful protest without making arrests. With regard to lorries, around which most protest activity revolved, one respondent described how police tactics changed between Balcombe, where one lorry was escorted at a time by the police, and Barton Moss: 'When we went to Barton Moss they decided to use the convoy system, bringing in anywhere between ten and fifteen trucks at a time [...] that way they undermined our ability to slow the process down.'²⁰⁷

The change between Balcombe and Barton Moss was suggested as police altering their response to anti-fracking protest 'in light of what they learnt at Balcombe'.²⁰⁸ Aside from the changes to the escorting of lorries, a consistently referenced constant between the two protests was the use of violence by members of the police to prevent the realisation of the right to freedom of peaceful assembly through protest. In interactions with the police at both Balcombe and Barton Moss, interview respondents described how they were 'kicked and pushed and punched',²⁰⁹ 'pushed and shoved in the back',²¹⁰ 'pushed off the road by the police',²¹¹ and 'shoved in the back repeatedly'.²¹² Police interactions were described as 'rough',²¹³ 'ultra aggressive',²¹⁴ and 'very, very aggressive',²¹⁵ resulting in interactions in which 'bones got broken'.²¹⁶ The interactions of police with other protestors was described as 'shoving people, pushing people, trying to knock people over, trying to get people on the ground',²¹⁷ 'kicking their ankles',²¹⁸ and 'deliberately kicking up the backs of legs'.²¹⁹ These data, gathered from interviews and alluded to in the experiences of survey respondents, indicate the primary method by which GMP and Sussex Police prevented the realisation of peaceful protest, supplemented by unlawful arrests, and is a far cry from police claims of acting 'professionally and fairly'.²²⁰

Further to police interference, indications of county council involvement in the controlling and dismantling of protests have appeared. The West Sussex County Council obtained a possession order for land where Balcombe protesters were camped, forcing them to relocate. Though the council provided a new area for the protest, it forbade camping on the site due to the safety risk posed by a nearby unlit road.²²¹ The Salford City Council, covering the Barton Moss site, has been shown to meet regularly with the GMP and IGas during anti-fracking protests, sharing information and intelligence and discussing levels of acceptable police force. This is in contrast to the council's level of cooperation with protesters, as reportedly none of the councillors visited the protest site.²²² To be sure, there have been significant issues with suppression of anti-fracking protests outside the UK. The fracking industry and governments in the US, Canada and Australia appear to often consider resistance by local people to be an 'insurgency', and anti-fracking groups, particularly in poorer or marginalised communities (HRIAs would need to disaggregate data in this regard), are routinely labelled as terrorists,²²³ subjected to psychological warfare operations,²²⁴ intimidation²²⁵ and police violence.²²⁶

Freedom of expression

The right to freedom of expression is detailed in Article 10 of both the HRA²²⁷ and ECHR²²⁸ and Article 19 of the ICCPR.²²⁹ This freedom is understood in Article 10(1) of the HRA and the ECHR as the 'freedom to hold opinions and to receive and impart information and ideas without interference by public authority', and in Article 19(2) of the ICCPR as the 'freedom to seek, receive and impart information and ideas of all kinds [...] either, orally, in writing or in print'. With relevance to the preceding discussion on the right to peaceful assembly, this freedom can be expressed in the form of protest.²³⁰ Although every instance in which police responses have restricted the right to peaceful assembly could also be discussed here, it will suffice to say that any unlawful restriction of protest through 'interference by public authority' can be considered a violation of the right to freedom of expression.

In addition, as indicated by the human rights legislation, the right to freedom of expression is concerned more generally with the imparting of information or ideas. One interview respondent made reference to banners outside the homes of residents on Barton Moss Lane, who lived in proximity to both the Barton Moss protestors' camp and IGas' exploratory drilling site. The interview respondent explained how the occupants of the buildings had made banners saying 'No shale' and 'No methane gas mining here'.²³¹ These banners, although located on the private property of the residents, had prompted GMP to visit and request that the banners be removed – seemingly in contravention of the right to freedom of expression. As with police response to protest, the interference by public authority is explicit here: GMP's actions interfered with the ability of the residents to 'hold opinions' and 'impart information and ideas' through the medium of anti-fracking banners. If this request did not violate the right of the residents to freedom of expression then reference must be found within the domestic and international legislation for legitimate interference by public authority.

The HRA, ECHR and ICCPR all contain details as to how and why the right to freedom of expression may be curtailed by the representatives of the state. Article 10(2) of both the HRA and the ECHR state that this right 'may be subject to such formalities, conditions, restrictions or penalties as are prescribed by law', which are clarified as 'the interests of national security' and 'the prevention of disorder or crime'. Similarly, Article 19(3) of the ICCPR states that the right to freedom of expression 'may [...] be subject to certain restrictions, but these shall only be such as are provided by law', which are, in Article 19(3), described as being 'For the protection of national security or of public order'. For the request by GMP not to have violated the residents' right to freedom of expression, the presence

of the banners must be considered a threat to national security or public order, or their removal must be considered necessary to prevent crime. These three scenarios appear to be legally unfounded, unless the anti-fracking movement itself is considered a threat to 'national security'. The banners may have encouraged activity at the Barton Moss protest camp, but that would only prompt legal justification for their removal if said activity was considered to be a threat to public order, or to constitute a crime. As the majority of protest activity fell within the remit of the right to peaceful assembly, such claims would appear to be legally unfounded, rendering GMP's request unlawful.

Liberty and security of person

The right to liberty and security of person is articulated in Article 5 of both the HRA²³² and ECHR,²³³ and Article 9 of the ICCPR.²³⁴ This right is of relevance to the context of UK anti-fracking protests due to the arrests made by GMP and Sussex Police, which are required by domestic and international legislation to be lawful in order to not violate this particular right. Indeed, Article 5(1)(c) of both the HRA and the ECHR require 'lawful arrest [...] on reasonable suspicion of having committed an offence', and Article 9(1) of the ICCPR states that 'No one shall be subjected to arbitrary arrest or detention.' In addition, Article 5(2) of both the HRA and the ECHR states that 'Everyone who is arrested shall be informed promptly [...] of the reasons for his arrest and of any charge against him', and Article 9(2) of the ICCPR states that '[a]nyone who is arrested shall be informed, at the time of arrest, of the reasons for his arrest and shall be promptly informed of any charges against him'. Any arrest made which could be deemed unlawful under the above descriptions would therefore violate the right of the individual arrested to liberty and security of person.

First, references were made in several interviews to the concept of arrest quotas, whereby police would carry out specific numbers of arrests over consecutive days. At Barton Moss, throughout the autumn and winter of 2013, one interview respondent recalled how 'there were five arrests every day', and that 'officers were heard to say "We need one more arrest."' ²³⁵ There was a belief that the use of arrest quotas was 'almost certainly

planned in advance', and designed as 'a long term plan' which would ensure that 'eventually everyone would be arrested'.²³⁶ More explicitly, patterns of arrest seemed to follow this trajectory: 'you're arrested, you get bailed, next time you get arrested in breach of bail'.²³⁷ Over a period of time, such a cycle would decrease the effectiveness of the protest camp's actions and increase the likelihood of its disbandment.

In addition to arrest quotas,²³⁸ interview respondents referenced the use of arbitrary arrests in both Balcombe and Barton Moss, whereby individuals felt arrests had no legal basis and were used as a way of 'undermining people's morale' because 'it puts people off protesting'.²³⁹ Arrests were described variously as 'clearly random',²⁴⁰ 'quite random',²⁴¹ and 'completely random',²⁴² with one respondent expressing the most telling sentiment, that: 'there was a risk that at any time you could be arrested'.²⁴³ Such arrests, made without legal basis, would be in direct contravention of the right to liberty and security of person. The prevalence of violations is best indicated by the discrepancy between the numbers of arrests of anti-fracking protestors in Balcombe, 126 in total, with those who have been found guilty and sentenced in court, a mere 14.²⁴⁴ In addition to quotas and arbitrary arrests, allegations were made during an interview of arrests being knowingly made on unlawful charges by GMP. At Barton Moss, the lorries travelled down Barton Moss Lane to reach the IGas drilling site, a designated private road with footpath access for the public, which is, according to an interview respondent who resides in the area, 'clearly signposted at the top'.²⁴⁵ The same respondent described how police made arrests on Barton Moss Lane for 'the crime of obstructing a public highway', which is an entirely unlawful charge given that the road is private with public footpath access, and therefore does not constitute a public highway.²⁴⁶ Furthermore, the respondent described how, at a court hearing of individuals charged with this crime in November 2013, 'a solicitor informed the court that Barton Moss Lane was a private road which has public footpath access'.²⁴⁷ However, the respondent states that GMP 'continued to make arrests under that crime until [...] February', meaning that, 'for nearly three months they continued to arrest for a crime that wasn't a crime'.²⁴⁸

Thus in this example, both the initial and later arrests are therefore unlawful, causing violations of the right to liberty and security of person through failing to comply with basic requirements of lawful detention. As an additional requirement of making lawful arrests, police officers must, as indicated above, inform individuals of the charges under which they are being arrested. One interview respondent described how, at Barton Moss '[...] when people were arrested, if they were told anything, it was when

they were separated from the walk [...] once they were actually in the police van they might be told what they were being arrested for'.²⁴⁹ Another respondent stated, also with reference to Barton Moss and the GMP, 'the police have been acting illegally at various times and they've been impeding the legal right to protest', with specific reference here to unlawful arrests.²⁵⁰ Such testimony suggests that the GMP's actions were designed to disrupt the anti-fracking protestors' right to freedom of peaceful assembly, apparently through unlawful activity.

Fair trial

The right to a fair trial is articulated in Article 6 of the HRA²⁵¹ and ECHR²⁵² and Article 14 of the ICCPR.²⁵³ Article 6(3) of the HRA and ECHR detail the 'minimum rights' which an individual charged with a criminal offence is entitled to, and Article (14)(3) of the ICCPR is similarly concerned with such 'minimum guarantees'. Under these provisions an individual must 'be informed promptly [...] and in detail, of the nature and cause of the accusation against him'. Consequently, any instance in which an anti-fracking protestor is arrested and not informed 'promptly' of the charges or suspicion under which he or she is being charged, would contravene the right to a fair trial in the HRA, ECHR and ICCPR. As we outlined earlier, such circumstances have been experienced at Barton Moss protests.

The arrest of protestors on Barton Moss Lane for the crime of obstructing a public highway also concerns the right to a fair trial through connections with the provision of legal aid. As discussed above, protestors were unlawfully arrested in 2013 and early 2014 for obstructing a public highway whilst walking in front of lorries on Barton Moss Lane. An interview respondent involved with the Barton Moss protests described how individuals 'can't claim legal aid for an offence of obstruction of a public highway under the current rules',²⁵⁴ and expressed concern that GMP's continued arrest of protestors under this crime was a deliberate ploy to ensure protestors 'wouldn't be able to defend themselves' financially.²⁵⁵ In legislative terms, Article 6(3)(c) of the HRA and ECHR detail the minimum right that any individual charged with an offence and without financial provision for legal representation 'be given it free when the interests of justice so require', and Article 14(3)(d) of the ICCPR similarly states that any such individual must 'have legal assistance assigned to him, in any case where the interests of justice so require'. By charging protestors with a crime which legal aid was not provided for, GMP and, perhaps more so – the Crown Prosecution Service, were knowingly prompting judicial proceedings in which many protestors would be unable to meet the financial costs of a court case. If protestors had instead been arrested for crimes which did receive legal aid, and

indeed were actual crimes in this context, such a tactic would have no basis. Fortunately, pro bono legal support was provided, or protesters would have been prevented from being able to obtain legal representation against the charges they faced. In that scenario, given the unlawful nature of the initial arrest, the 'interests of justice' would have been seriously compromised.

Respect for a private and family life

The right to a private and family life is articulated in Article 8 of both the HRA²⁵⁶ and the ECHR,²⁵⁷ as 'Everyone has the right to respect for his private and family life, his home and his correspondence', while Article 17(1) of the ICCPR states that 'No one shall be subjected to arbitrary or unlawful interference with his privacy, family, home or correspondence.' It is the precise wording of these articles which allows for interpretations to be made as to how this right has been threatened or violated in the context of anti-fracking protests, through monitoring of communications and covert surveillance of protesters.

Several interview respondents raised concerns of police surveillance of email accounts, telephones and social media. Although, as one interview respondent indicated, such activities are 'difficult to prove',²⁵⁸ other interview respondents were insistent in their belief of surveillance activity, stating that 'We knew that they were monitoring our Facebook pages, our emails and our phones' at both Balcombe and Barton Moss,²⁵⁹ and 'I have no doubt that they were bugging certain people's phones' and 'keeping a close eye on people's Facebook pages' in Balcombe.²⁶⁰ Concerns for some anti-fracking protestors over the security of information were such that one respondent described how, when important details about protest action in Balcombe required discussion, the individuals involved would 'get together and speak about it rather than using [social] media'.²⁶¹ Seemingly to confirm fears of surveillance, another respondent described how a list of press contacts on an email account were 'scrambled',²⁶² preventing messages from reaching the majority of the list.

In addition to covert surveillance through technology, members of the anti-fracking movement have become increasingly concerned over police infiltration via social media accounts or undercover individuals joining specific campaigns or protest camps. Indeed, a request made as part of this primary research for online survey respondents was met with the suggestion that the collation of such information was likely to be a database for police use. Furthermore, one respondent believed that the police were providing drilling companies with information gathered about protestors, stating that 'We'd have to strongly suspect [...] that covert intelligence was shared between Greater Manchester Police and iGas.'²⁶³ Such mistrust indicates significant concerns surrounding the police, the internet and confidentiality. It also demonstrates why concerned individuals, as mentioned above, prefer face-to-face conversations over online or telephone interactions.

In order for any surveillance of communications to be lawful, Article 8(1) of both the HRA and ECHR require that any restrictions placed upon the right to respect for a private and family life are '[...] in accordance with the law and [are] necessary in a democratic society in the interests of national security, public safety or the economic well-being of the country, for the prevention of disorder or crime'. The use of covert surveillance by either GMP or Sussex Police would indicate a belief that anti-fracking protesters threatened 'national security' or 'public safety', or increased the possibility of 'disorder or crime'. As mentioned previously with reference to the right to freedom of expression, given that the majority of protest activity fell within the remit of the right to peaceful assembly, such claims would appear to be without legal foundation.

In the UK, potential future rights concerns may well go beyond circumstances surrounding specific protest sites if the behaviour of Kent police towards an open academic debate is indicative of a national policing approach towards this issue. In November 2014 they asked a university to provide a list of members of the public who were due to attend a public debate on fracking.²⁶⁴ From subsequent 'freedom of information' requests it was revealed that if such a list were forthcoming Kent police would have conducted 'some R&D'²⁶⁵ – presumably meaning the individuals would be researched somehow. Such police behaviour should not be analysed as if it occurs in a vacuum. It is vital to consider the broader political context and in particular the 'political spectacle'²⁶⁶ that has been constructed around fracking in the UK. On the surface it may seem that the extraction of shale gas is considered necessary for 'the economic well-being of the UK' and hence 'in the national interest', and is simply being prioritised over individuals' fundamental civil and political rights; but if we were to investigate a little

deeper, a more politically concerning picture may emerge, especially considering recent evidence likening the precarious nature of the US 'fracking boom'²⁶⁷ to that of a government supported 'Ponzi scheme'.²⁶⁸ As Noam Chomsky warns, 'the terms, United States, Australia, Britain, and so on, are now conventionally used to refer to the structures of power within such countries: the "national interest" is the interest of these groups, which correlates only weakly with the interests of the general population'.²⁶⁹ A critical awareness of such observations is vital to conducting nuanced interdisciplinary HRIAs in our view. Such assessments should, as far as possible, investigate and analyse the 'close relationship between governments and powerful multinational corporations', which de Rijke²⁷⁰ warned of with unconventional gas production in the Australia, and its impact on policy and the subsequent policing of dissenting voices. For example, in the UK much of the public fracking debate has been conducted in a context which involves a government wanting to 'go all out for shale' while at the same time having a 'lead non-executive director' at the Cabinet Office, Lord Browne, who is also the Chairman of shale gas company Cuadrilla Resources. There have been illuminating 'freedom of information' requests in the UK that have demonstrated collusion between key politicians and industry figures on such matters as how best to 'manage' public perceptions and manufacture consent in order to 'fast track' fracking development.²⁷¹ Environmental consultant and extreme energy expert Paul Mobbs has highlighted numerous political-industry connections that are deserving of public attention and which raise fears of 'malfeasance' in public office.²⁷² Mobbs argues, 'politicians might call for a "balanced debate on shale", but arguably it is they who are peddling a manufactured rhetoric'.²⁷³ This is because the political process has been hijacked by lobbyists paid by the industry, whose manipulative tendrils reach right inside the Government.²⁷⁴

By drawing upon the experience of individuals in the UK, this discussion has sought to expose the extent to which the civil and political rights of anti-fracking protestors and individuals living in proximity to exploratory drilling sites have been threatened or violated as a result of the proposed introduction of fracking. The police response to anti-fracking protests, seemingly prompted by the need to protect governmental policy, has violated the right to freedom of peaceful assembly itself, in addition to threatening and violating other rights in the context of anti-fracking protests. Arguably then, the proposal of introducing fracking in the UK has already violated internationally and domestically recognised rights, with actual implementation of this particular method of energy extraction expected to only further impact human rights, of an economic, social and cultural nature as well as civil and political.

Anthropogenic climate change

While issues such as industrialisation of the landscape, water, air, noise pollution and citizens' ability to participate and protest are all important issues to consider in human rights impact assessments, perhaps the most important issue to consider is fracking's impact on greenhouse gas emissions and anthropogenic climate change. The latest climate science suggests that we can only burn approximately one-third²⁷⁵ of known conventional fossil fuel reserves if we are to avoid catastrophic, runaway climate change.²⁷⁶ Thus, scientists such as James Hansen and Kevin Anderson argue that unconventional sources such as shale gas need to be left in the ground. Indeed, taking recent climate science seriously calls into question the whole idea of 'unconventional' extraction. If we are to avoid runaway climate change and a potential extinction event for mankind, then, as leading climate scientist James Hansen puts it, 'we must rapidly phase out coal emissions, leave unconventional fossil fuels in the ground, and not go after the last drops of oil and gas. In other words, we must move as quickly as possible to the post-fossil fuel era of clean energies.'²⁷⁷ Tyndall Centre climate scientist Kevin Anderson concurs, 'the only responsible action with regard to shale gas, or any 'new' unconventional fossil fuel, is to keep it in the ground – at least until there is a meaningful global emissions cap forcing substitution. In the absence of such an emissions cap, and in our energy hungry world, shale gas will only be combusted in addition to coal – not as a substitution, as many analysts have naively suggested.'²⁷⁸ Despite this, there is considerable industry and government propaganda concerning the use of unconventional gas as a so-called 'bridge fuel', a proposition which is highly dubious and likely false. Robert Howarth's recent paper 'A Bridge to Nowhere: Methane Emissions and the Greenhouse Gas Footprint of Natural Gas' shows that over the crucial 20-year-period (in which we need to drastically reduce emissions to avoid the worst of climate change), both shale gas and conventional natural gas have a larger GHG footprint than do coal or oil, largely due to fugitive methane emissions.

While no explicit legal right to protection from climate change – or similar – exists, the negative effect of climate change on the enjoyment of numerous human rights is well documented. A connection between climate change and human rights was first drawn by the Inuit Circumpolar Council in their 2005 petition to the Inter-American Commission of Human Rights Case against the US.²⁷⁹ The Inuit Council claimed that excessive greenhouse gas emissions from the US violated their right to culture through advancing climate change. While this case was dismissed by the Inter-American Commission as inadmissible,²⁸⁰ it brought considerable attention to two important texts: the International Council on Human Rights Policy report which highlighted the 'human rights concerns raised by anthropogenic climate changes'²⁸¹ and Human Rights Council Resolution 7/23 which explicitly states '... climate change poses an immediate and far-reaching threat to people and communities around the world and has implications for the

full enjoyment of human rights'.²⁸² An Office of the High Commissioner for Human Rights (OHCHR) study on climate change, called for in Resolution 7/23, was conducted later that same year and not only elaborated on human rights violations due to climate change, but also upon the legal mechanisms in human rights, environmental and other areas of law that oblige states to address climate change and protect their denizens from its consequences.²⁸³ Following the study, in 2009 Human Rights Council Resolution 10/4 stated that climate change is currently directly and indirectly negatively affecting human rights,²⁸⁴ a view that was affirmed by the Human Rights Council Panel Discussion on the relationship between climate change and human rights later that year.²⁸⁵ A seminar convened by the OHCHR in 2012 also found the same conclusion.²⁸⁶ Indeed, from the above discussions of various human rights and their relationship to the environment, as well as the consequences of climate change, the threat of climate change to the minimally good life is immediately apparent, and, therefore, the right to live free from the negative effects of climate change should be considered implicit within the human rights legal framework. Thus, via its contribution to anthropogenic climate change we find another possible avenue through which fracking activities are capable of violating human rights.

Conclusion

The hegemonic neoliberal version of capitalism under which most of us now live has such a significant thirst for fossil fuels that their extraction tends to trump all other concerns. As resources become scarcer and we scrape the bottom of the fossil fuel barrel through the use of more energy intensive, higher risk and environmentally destructive extraction processes, the relationship between resource development and human rights becomes ever more problematic. Indeed, human rights violations due to climate change are but another side effect of humanity's dependence on fossil fuels that is growing in magnitude with each passing decade. These violations are likely to increase and be felt more acutely as resources are depleted, quite possibly until the sharp population decline predicted in *The Limits to Growth* occurs. If there were not considerable evidence emerging, on an almost daily basis, concerning the actual, and potential, impacts and dangers of fracking development in countries with a mature industry such as the US, Canada and Australia,²⁸⁷ it is highly likely that the UK's anti-fracking movement would not be its fastest growing social movement and the protests in which violations of civil and political rights have occurred may not have taken place. As things stand, however, it seems that citizens' civil and political rights are being violated in defence of their environmental, economic, social and cultural rights.

This article has shown the extent to which the process and infrastructure of fracking developments has the capacity to threaten and violate a wide range of internationally

recognised human rights, including rights to water, air, land and health. Additionally, our research suggests the rights to peaceful assembly, freedom of expression, liberty and security of the person, fair trial and a private and family life have also been violated in the state response to protests opposing fracking development. These rights encompass the principles codified in international human rights legislation and the civil liberties recognised in many state constitutions. It is only with more research into the actual impact of these energy technologies on human rights that violations can be identified and hopefully stopped and remedied. Importantly this research must be industry independent, and must do more than appear on annual CSR statements. It should also be independent of government given the close relationships between governments and extractive industries and the tendency of government-sponsored reports to be suspiciously limited²⁸⁸ or to include dubious 'REDACTED' sections on public release.²⁸⁹ In sum, there is an urgent need for independent, comprehensive, evidence-based interdisciplinary HRIAs to provide valuable impact data and analysis. Such assessments will be a vital tool for communities in the defence of their rights when faced with immanent extreme energy developments and governments intent on unsustainable fossil fuel extraction.

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13. Paul Mobbs, 'Sheet E1. Peak Energy: The Limits to Oil and Gas Production', Free Range 'Energy Beyond Oil' Project, <http://www.fraw.org.uk/publications/e-series/e01/e01-peak>

- [energy.html](#); Heinberg, *Snake Oil*, 25.
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