

Climate and Health Alliance and Public Health Association of Australia in conjunction with University of Melbourne Social Justice Initiative invite you to a Preview Screening of the new short film:

The Human Cost of Power

How coal and unconventional gas are driving climate change and harming our health

*This new short film directed by award winning science journalist **Alexandra de Blas** and produced by Fiona Armstrong explores the health impacts associated with the massive expansion of coal and unconventional gas in Australia: The human cost of power.*

The Human Cost of Power was produced for the Climate and Health Alliance and the Public Health Association of Australia. This event is supported by University of Melbourne Social Justice Initiative.



CLIMATE
HEALTH
ALLIANCE



The frack files

Why are communities around the world rising up against oil and gas extraction through the controversial process of fracking? We present the essential information and key issues, sorting the myths from the reality. Researched and written by **DANNY CHIVERS**.



The battle for Balcombe: in leafy Sussex, southern England, protesters walk in front of a lorry being escorted into the proposed fracking site by police.

Timeline 1949-2000

1949: An early, small-scale form of vertical fracturing is used to improve output from oil wells in Oklahoma and Texas. Oil and chemicals are pumped into existing wells, without horizontal drilling.

1953: Water is first used to stimulate oil wells. A typical

operation uses 2,800 litres of fluid and 180 kilograms of sand.

1960s: The US government experiments with underground nuclear explosions to get hard-to-reach gas out of shale rock, without success.

1970s: The use of high-volume or 'massive' vertical fracturing

becomes more common in US oil fields. Up to a million litres of fluid and half a million kilograms of sand are pumped down existing wells, improving output dramatically.

1980s: Horizontal oil drilling is pioneered along the Texan Gulf Coast.

1991: Horizontal fracking is carried out on shale for the first time.

1998: Mitchell Energy (now Devon Energy) develops a 'slickwater fracturing' technique that radically reduces the costs of horizontal hydraulic fracturing into shale.



Sources: Carl T Montgomery and Michael B Smith, 'Hydraulic fracturing: history of an enduring technology', *JPT*, December 2010; nin.tl/1hVNAil
CE Bell and others, 'Effective Diverting on Horizontal Wells in the Austin Chalk', *SPE*, 1993; nin.tl/19R83q0



Some call it an energy revolution, others

a toxic threat. It's been hailed as the dawn of a new energy era and condemned as the final deadly fossil rush that will carry us over the climate cliff. Some governments have banned it, while others are offering tax breaks and eagerly rewriting local laws to smooth its arrival.

It's not hard to see why horizontal high-volume slickwater hydraulic fracturing – or fracking – has hit the headlines around the world. It's a new process (see p.12 for a diagram that explains it) that dangles the possibility of an oil and gas bonanza just when conventional sources are becoming ever harder to find, making it of great interest to speculators, fossil fuel corporations and revenue-hungry governments alike. At the same time, its potential environmental impacts have had concerned communities up in arms, and climate change campaigners have been horrified at the suggestion that billions of tonnes of carbon that were locked up in rock formations might now see the light of day.

What happens over the next few years will probably determine whether fracking becomes common practice around the world, the preserve of a few enthusiastic states, or is abandoned as a dangerous dead-end.

Cracked foundations: where did fracking come from?

While 'vertical' fracturing – pumping fluid into existing oil and gas wells to increase output – has been around for a long time, the horizontal technique now being used to crack fossil fuels out of shale and coal seams only became economic in the late 1990s (see Timeline). It was pioneered by a US fossil fuel industry desperate to squeeze more fuels out of a country where conventional oil and gas output had passed its peak.

The industry stepped up a gear in 2005, when exemption from clean water legislation via the 'Halliburton loophole' allowed companies to push ahead without the need for extra permits or public consultation. In the

US, fracking is also exempted from six other key pieces of regulation relating to hazardous waste and pollution.¹ This follows years of fierce lobbying by the industry; according to Sourcewatch, pro-fracking lobbyists poured \$239 million into the campaign coffers of US political candidates between 1990 and 2011, and spent a further \$726 million on lobbying from 2001 to 2011.²

It seems to have been money well spent, with a major shale boom unfolding from 2006 to the present day. According to the US Department of Energy, at least two million US oil and gas wells have now used fracking, and up to 95 per cent of new wells are using the technique. This accounts for 43 per cent of the country's oil production and 67 per cent of its natural gas production.³ Analysts IHS Global Insight used industry figures to calculate that horizontal fracking could supply 100 years' worth of US natural gas demand; however, that figure is disputed (see below).⁴

Hot air: who's pushing it?

Fracking fever is spreading, with oil and gas companies seeking licences for shale drilling in dozens of countries. Politicians attracted by the potential boost to their national GDPs and tax revenues – as well as visions of freedom from fuel imports – have been keen to smooth the way for the industry, or at least not to stand in its path. US President Barack Obama said in his 2012 State of the Union address: 'Nowhere is the promise of innovation greater than in American-made energy... The development of natural gas will create jobs and power trucks and factories that are cleaner and cheaper, proving that we don't have to choose between our environment and our economy.'

In March 2013, New Zealand/Aotearoa Prime Minister John Key accused anti-fracking campaigners of 'scaremongering' and claimed the practice had been happening safely in the country 'for the last 30 years'.⁵ This is a common – and misleading – argument used by fracking advocates all over the world, who

Continued on p.14

2001-2012

2001: US Vice-President Dick Cheney (ex-CEO of oil services company Halliburton) leads an 'energy task force' that touts the benefits of fracking and downplays the risks.



2005: The US Congress votes to exempt fracking from the Clean Water Act and Safe Drinking Water Acts. Cheney's involvement causes the amendment to be dubbed the 'Halliburton loophole'.

2006: Fracking begins in

British Columbia, Canada.

2006-08: US natural gas reserves expand by 35% as fracking spreads across the country. A single 'frack' now uses up to 19 million litres of water.

2007: Cluster drilling of multiple bores from a single

pad begins.

2010: 60% of all new oil and gas wells worldwide now utilize fracking.

2012: The International Energy Agency calculates that fracking now produces around 14% of the global gas supply.

Alex Trembath, 'US Government Role in Shale Gas Fracking History', *The Breakthrough*, 2 March 2012; nin.tl/1hVO6xc
Andrew Nikiforuk, 'Shale Gas: Myth and Realities', *The Tyee*, 7 January 2013; nin.tl/19R8nVH

WHAT THE FRACK...?

Fracking is a process of drilling sideways deep underground, then injecting fluid at high pressure to fracture shale (a kind of sedimentary rock) or coal formations releasing natural gas or oil trapped within.

Fracking is short for horizontal high-volume slickwater hydraulic fracturing. In the past such fracturing was only practised on vertical wells.

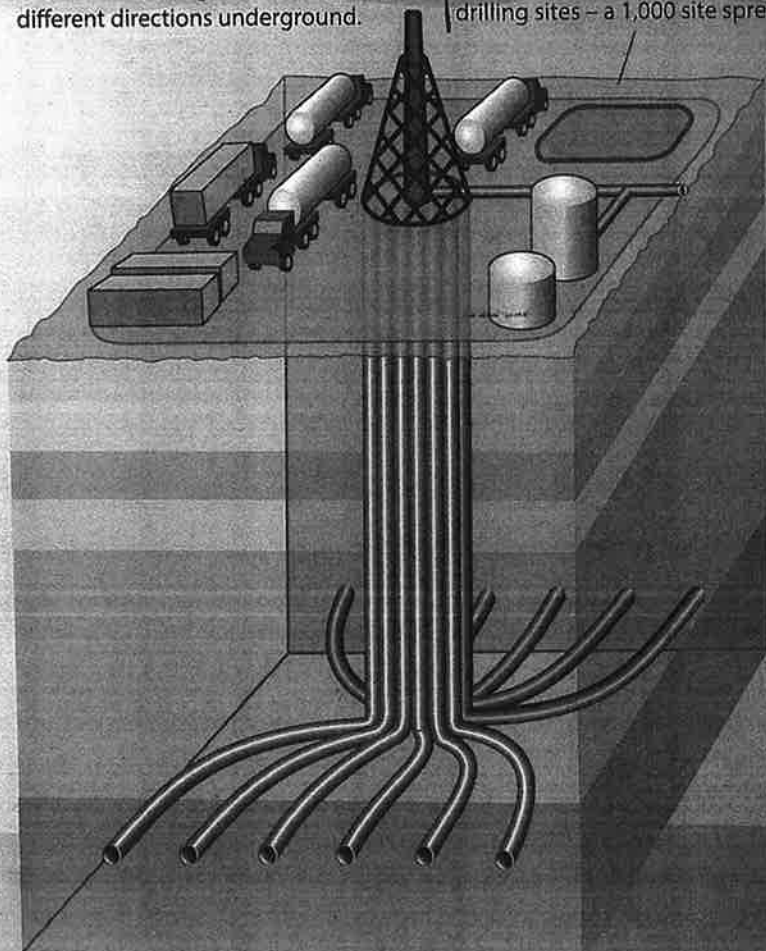
Wastewater can release toxic volatile organic compounds (vocs) on evaporation.

A single frack pad can drill up to 16 wells extending horizontally in different directions underground.

Each drilling site is the size of a football field and is cleared of vegetation. Fracking areas are dotted with drilling sites – a 1,000 site spread is not uncommon.

Aquifer

Any leakage could cause serious contamination.



Shale gas – natural gas trapped within shale formations.

Tight gas – retrieved from rocks of extremely low permeability, sandstone and limestone.

Coal seam gas (CSG) or coal bed methane (CBM) – natural gas extracted from coal beds.

Tight oil – oil from shale formations. Not usually called shale oil in order to avoid confusion with 'oil shale' (or kerogen, a substance requiring heating to be turned into fuel).

How a well is fracked

- 1 A huge rotary drill bores down from a frack pad to depths of 1.5 to 3 kilometres (though there are proposals to allow fracking at shallower depths). When it hits the gas or oil bearing shale it continues horizontally for a further kilometre or more.
- 2 The uppermost parts are cased with cement and steel. The horizontal bore has a steel casing down which small explosive charges are set off by a perforating gun in order to punch holes.
- 3 Now flush millions of litres of frack fluid – a slurry of water, sand and chemicals – under great pressure into the bore to make hairline cracks in the rock. The sand keeps the cracks propped open.
- 4 The fluid is pumped back up for several days to open the bore to allow the gas or oil to flow up. Between 40% and 70% of the fluid stays behind. Each well can be fracked 10 times if required.
- 5 For gas, cap the well until a pipeline is in place. For oil, fill up tankers.
- 6 Now start on the next well from the same pad, extending in a different direction, and repeat the process.

- Non-productive wells are closed off by inserting cement plugs.
- Disposal of recovered frack fluid is a headache. Best practice is to reuse it. But often it is off-loaded on ill-equipped municipal treatment plants or even surreptitiously dumped.
- Frack fluid remaining in wells is freshwater contaminated with chemicals and effectively removed from the water cycle – millions of litres per well.

Escaping methane
and VOCs.

Lung-damaging ozone pollution
when truck fumes mingle with VOCs.

Drilling rig
35 metres high.

400 tanker trucks per site,
carrying water and supplies.

Casing of steel (malleable) surrounded
by cement (rigid). Critics point out
the combination cannot have the
permanency claimed by industry.

Industry claims casing failure rates of
under 1%; independent researchers
6-7%. In the long run, *all* casings will fail.

Methane gas and toxic chemicals
can contaminate the water supply.

Frack fluid rises again, now mixed with
heavy metals (like lead and arsenic) and
radioactive substances leached from
the rocks. Methane concentrations are
17 times higher in drinking-water wells
near frack sites.

Natural gas is released
from the cracked rock.

Frack fluid pushed
in great volumes
at high pressure
to crack the gas-
bearing shale.

Punctured casing allows
fluid to burst through.

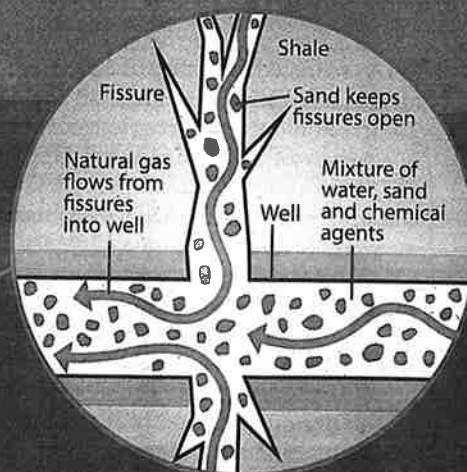
Slickwater – what's in frack fluid

- 98.5% water
- 1% sand
- 0.5% chemicals

In the US over 600 chemicals have been tracked down by independent researchers – companies don't disclose what they use. Known toxins, including carcinogens and neurotoxins, are among them.

Chemicals are used to reduce friction (that's why it's called slickwater); also acids, rust and scale inhibitors, anti-microbials, gelling agents and solvents.

If, say, 10 million litres of water are used to frack one well, then that makes 50,000 litres of chemicals. For a 1,000-well field, the amount of chemicals used is staggering, even allowing for recycling of frack fluid. Which is why industry is making promises (outside the US) of greatly reduced chemical use and even chemical-free fracking.



The Big Story FRACKING

Continued from p.11

prefer not to acknowledge that the new horizontal fracking methods are a very different beast from the smaller-scale vertical fracturing of the past.

In response, critics have been quick to point out the lobbying influence of the oil and gas industry. The World Development Movement found that a third of British government ministers had direct links to fossil fuel corporations and the banks that finance them.⁶ A recent investigation by the *Vancouver Sun* found that oil and gas lobbyists are more successful than any other industry at getting time with politicians in the shale-rich Canadian state of British Columbia.⁷

As knowledge of the practice has grown, resistance to fracking has sprung up in almost every country where it has been launched. Bans or moratoria on the practice are currently in place in France, Ireland, Romania, Bulgaria, Luxembourg, the Czech Republic and parts of Australia, Canada, Spain, Argentina and the US. However, many campaigners fear that these measures may only be temporary, as governments prepare regulation to supposedly make fracking 'safe'.

The US fracking experience is often presented as a success story, where the technology has been tried and tested in preparation for its spread around the world. In reality, the technique has been rushed into large-scale use with inadequate environmental monitoring and regulation and small consideration for the long-term impacts. Only time will tell what the real environmental and economic consequences of the great US shale gas experiment will be – but the signs do not look good.

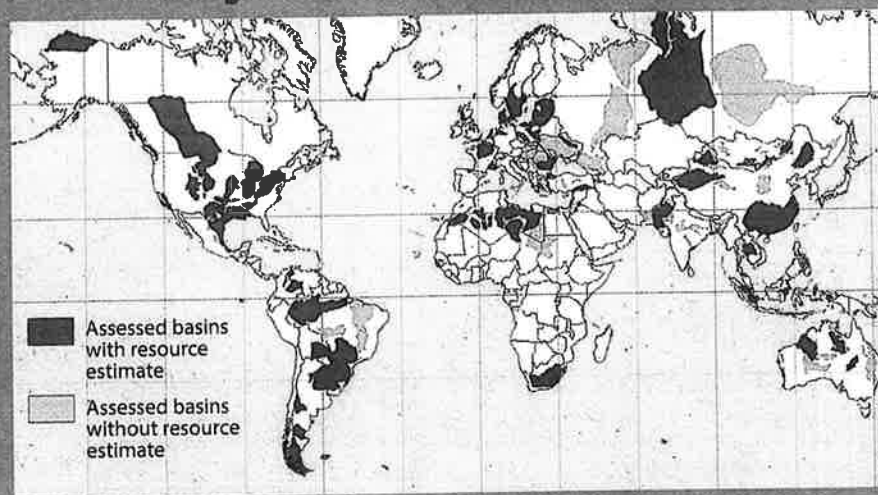
Planet for shale: how much is out there?

The US Energy Information Administration (EIA) reported in June 2013 that it had identified 345 billion barrels of shale oil and 207 trillion cubic metres (tcm) of shale gas, in a survey of 41 countries covering most of the world's populated land area.⁸ This is the amount that the EIA believes is 'technically recoverable' and represents 11 years of current global oil use and 62 years of current global gas use.⁹

However, 99 per cent of this shale gas and all of the shale oil is classified as 'unproven' – in other words, these are purely estimates based on the size and location of shale formations and the current industry assessment of how much oil and gas can be recovered over the lifetime of a fracking operation. The EIA admits that these numbers will remain 'highly uncertain' unless proven with test wells.

The experience of the US doesn't lend much confidence to these industry estimates. Leaked

Shale oil and gas basins worldwide (May 2013)



internal EIA documents admit that fracking companies tend to overstate the size of their reserves by basing their estimates on the gas extracted from the best locations (or 'sweet spots') in shale formations.¹⁰ They also note that fracking produces an initial rush of fuel which then drops off sharply, meaning that it may not be economic to extract all the gas or oil from each well – companies choose to take the first, most profitable burst and then move on.

The independent Energy Watch Group recently concluded that when these factors were properly accounted for, shale gas production in the US was likely to peak in 2015, and that shale gas outside the US was unlikely to reach full development 'since geological, geographical and industrial conditions are much less favourable.'¹¹

A report by the Energy Policy Forum is even more scathing about the EIA's estimates, concluding that US shale oil and gas reserves have been 'over-estimated by a minimum of 100 per cent and by as much as 400-500 per cent'.¹² The report's author, financial analyst Deborah Rogers, told the US Senate that the EIA's track record in forecasting was 'dismal', and that by its own admission the EIA had over-estimated natural gas production 66 per cent of the time and oil 60 per cent of the time in 2012.¹³

Far from being an energy boom, shale gas could turn out to be no more than a bubble. As economics professor Robert Ayres recently wrote for *Forbes* magazine: 'My opinion... is that the fracking boom is



Impure as the driven snow: a fracking site for extracting oil outside Williston, North Dakota, in March this year.



Countries with significant shale and/or coalbed methane deposits (estimates of unproven resources).

This table does not include tight gas (fracked from rocks of low porosity such as sandstone and limestone, not shales), which is estimated at 45 tcm globally with the largest deposits in the US (13 tcm), China (10 tcm), and Canada (7 tcm).¹⁴

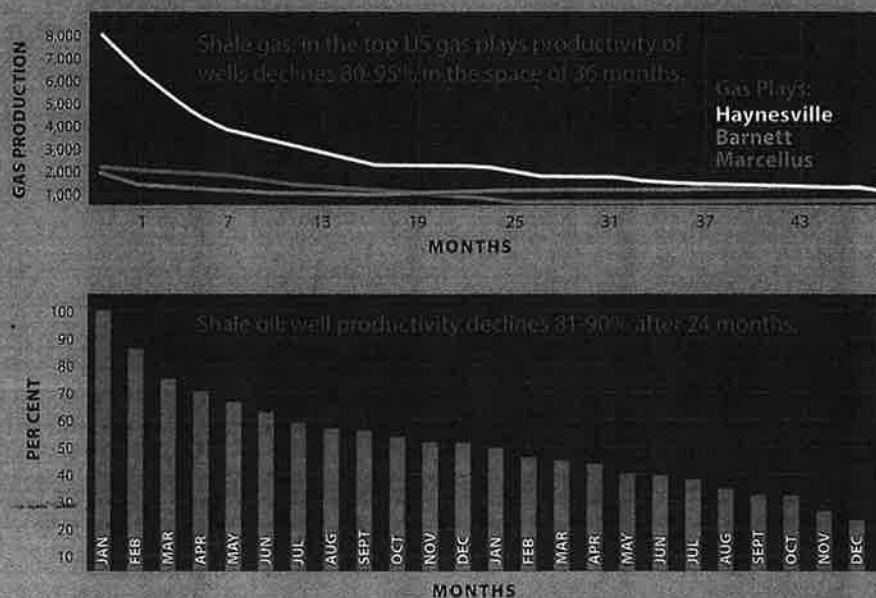
Region/ Country	Potential recoverable shale gas (trillion cubic metres) ¹⁵	Potential recoverable coalbed methane (trillion cubic metres) ¹⁶
Bulgaria	<1	<1
Denmark	1	-
France	4	-
Germany	<1	3
Netherlands	1	-
Poland	4	4
Romania	1	-
Spain	<1	-
Sweden	<1	-
United Kingdom	1	3
Europe	13	10
Russia	48	See below
Other former Soviet states	14	See below
Former Soviet Union	62	20 - 116
Canada	16	6 - 76
Mexico	15	<1
United States	19	11
North America	51	17 - 87
Australia	12	8 - 14
China	32	30 - 55
Indonesia	1	<1
Mongolia	<1	-
Thailand	<1	-
Asia and Pacific	46	38 - 69
India	3	1
Pakistan	3	1
South Asia	6	2
Algeria	20	-
Egypt	3	-
Jordan	<1	-
Libya	3	-
Morocco	<1	-
Tunisia	1	-
Turkey	1	-
Western Sahara	<1	-
Middle East and North Africa	28	-
South Africa	11	1
Sub-Saharan Africa	11	1
Argentina	23	-
Bolivia	1	-
Brazil	7	-
Chile	1	-
Colombia	2	-
Paraguay	2	-
Uruguay	<1	-
Venezuela	5	-
South America & Caribbean	40	-
WORLD TOTAL	207	88 - 285

Drill & decline

Fracked shale gas and oil wells are not productive for long, with extraction levels dropping swiftly – therefore new wells have to be dug continually just to try to maintain levels. In North America the best fields have already been tapped and no new discoveries are on the horizon.

In the US, 30-50% of shale gas production needs to be replaced each year – that's over 7,000 new wells.

For tight oil (oil from shale formations) 40% of production needs new wells each year.



partly – perhaps largely – hype, and that a lot of the small investors now being solicited by various investment publications will lose their shirts.⁷

Double trouble: what about coal seam gas?

Fracking isn't only used on shale formations. It can also crack methane gas out of coal deposits, producing coalbed methane (CBM), also known as coal seam gas (CSG). This gas has been produced using other methods for many years, but the latest fracking technology can greatly enhance the process.

According to the International Energy Agency (IEA) there is an estimated 118 tcm of potentially available CBM around the world, or 36 years of current global gas demand.¹⁷ However, as with shale oil and gas these are untested approximate industry figures. Country-by-country estimates reveal huge ranges of uncertainty (see Table), and Halliburton believes that only 29 per cent of the IEA's estimate is actually recoverable.¹⁸ Horizontal hydraulic fracturing for CBM is already under way in several countries such as the US, Canada and particularly

Australia. In Britain, plans to frack for coalbed methane are further advanced than for shale, with planning permission granted for at least 60 CBM wells.¹⁹

Sucked dry: a risk to water supplies?

Each fracking well uses somewhere between 9 and 29 million litres of freshwater over its lifetime.²⁰ The British water industry group Water UK estimates that a typical 1,000-well fracking field would require two million litres per day during its peak, equivalent to the water use of 13,000 people.²¹ In communities already facing water stress – and those in line for increased droughts as the climate changes – this can have a highly significant impact. For example, the town of Barnhart in Texas ran out of water completely this summer, with local fracking operations at least partly to blame.²²

After each fracking operation, between 30 and 60 per cent of the water flows back up to the surface where it is collected for disposal. This water contains the chemicals and sand that were added as part of the fracking process, and also metals, salt and other minerals that transferred into the water while it was underground. In

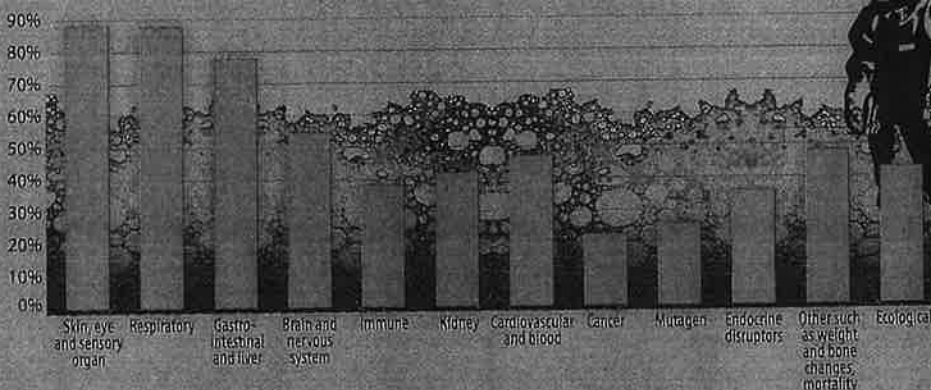
The Big Story FRACKING

Chemical brew

Fracking fluid is roughly 98.5% water, 1% sand (which keeps fissures propped open) and 0.5% chemicals. In the US full disclosure of these chemicals is not required and the mix can remain a proprietary secret. A Halliburton executive told the Colorado Oil and Gas Commission that revealing the composition of fracking fluid was 'much like asking Coca-Cola to disclose the formula of Coke'.

An independent study conducted by The Endocrine Disruption Exchange found a total of 649 chemicals of which 362 were successfully identified.

The chart below shows the health effects associated with them.



The immediate effects of exposure could be 'burning eyes, rashes, coughs, sore throats, asthma-like effects, nausea, vomiting, headaches, dizziness, tremor, and convulsions. Other effects, including cancer, organ damage, and harm to the endocrine system, may not appear for months or years later.'

In Britain the only additives that would be permitted would be polyacrylamide, hydrochloric acid and a biocide (to kill algae) which would need to be kept at levels deemed safe. However, in Canada assurances of chemical-free fracking were soon broken by the industry.

the US, much of this wastewater is simply pumped back into expired gas and oil wells, or dumped into waterways. It is not yet clear what will happen to this water elsewhere in the world where empty wells are not available, or where local environmental regulations require more responsible disposal. Meanwhile, the remaining 40 to 70 per cent of the contaminated water is left underground at the fracking site. So with every well, millions of litres of freshwater are polluted and removed from the reach of humans – or ecosystems – for the foreseeable future.

Thousands of leaks and spills have been reported from fracking sites – the industry itself admitted to 1,000 incidents in one year in North Dakota alone.²³ However, government and industry continue to write them off as unfortunate one-offs rather than inherent problems.

According to Kassie Siegel at the Center for Biological Diversity, a not-for-profit US research and campaign group: 'The regulators are under huge pressure from the industry not to investigate these problems – we saw this in Wyoming this year, when the Environmental Protection Agency abandoned its research into local pollution from fracking. Their results were showing fracking-related chemicals in nearby groundwater, which resulted in uproar from the industry – and now the EPA have dropped the study.'

Farm animals

Farm animals

“ Direct exposure to hydraulic fracturing fluid occurred in two cases: in one, a worker shut down a chemical blender during the fracturing process, allowing the release of fracturing fluids into an adjacent cow pasture, killing 17 cows in one hour; the other was a result of a defective valve on a fracturing fluid tank, which caused hundreds of barrels of hydraulic fracturing fluid to leak into a pasture where goats were exposed and suffered from reproductive problems over the following two years. Exposure to drilling chemicals occurred during a blow-out when liquids ran into a pasture and pond where bred [impregnated] cows were grazing; most of the cows later produced stillborn calves with congenital defects. ”

Michelle Bamberger and Robert E Oswald
Michigan Department of Natural Resources and Animal Health, Ne-
Michigan Department of Natural Resources and Animal Health, Ne-

An extract from **Michelle Bamberger** and **Robert E Oswald**, 'Impacts of gas drilling on Human and Animal Health', *New Solutions*, 2012. Bamberger is a veterinarian and Oswald is a professor of molecular medicine at Cornell University. Theirs is the first peer-reviewed research on fracking's links to animal health.

In the US fracking generated
1,060 billion litres
of toxic wastewater in 2012.



Enough to submerge
Washington DC
in a **6 metre** deep lagoon.

Source: Environment America, *Fracking by the Numbers*, October 2013; nln.it/19d8mz

‘Meanwhile, when spills and leaks happen the people affected are often only given compensation by the companies if they sign gag orders that prevent them from speaking out about the problem. For example, a case has just come to light where two children in Pennsylvania have been given a lifelong ban on talking about fracking. All of this makes it difficult to get the word out about the real effects this technology is having on people’s lives.’

A recent study found hazardous levels of methane in water from wells near fracking sites in Pennsylvania, and used its atomic make-up to confirm that it came from shale gas operations rather than natural sources.²⁴ The presence of methane in drinking water was memorably documented in the film *Gasland*, when a Colorado resident was able to set his tapwater on fire (see also our interview with the film’s director Josh Fox).

From Texas comes evidence of elevated levels of arsenic and other heavy metals in drinking water near fracking sites.²⁵ As this kind of evidence starts to pile up, reports from both the EU and the UN have called for a cautionary approach to fracking. The UN Environment Programme states: ‘Hydrologic fracking may result in unavoidable environmental impacts even if [the gas] is extracted properly, and more so if done inadequately... Even if risk can be reduced theoretically, in practice many accidents from leaky or malfunctioning equipment as well as from bad practices are regularly occurring.’²⁶

A 2011 study for the European Parliament was concerned that ‘At a time when sustainability is key to future operations it can be questioned whether the injection of toxic chemicals [into the ground] should be allowed, or whether it should be banned... as long-term effects are not investigated.’²⁷

‘Despite all the evidence, the US government seems determined to shrug off any responsibility for protecting the health of its citizens from the risks of fracking. The great shale gas experiment continues to charge ahead with little regulation or oversight; rather than the industry having a duty to show that their practices are safe, it instead falls to affected communities to prove the negative impacts on their lives and livelihoods.’

Dust, trucks and tremors: other local impacts

Air pollution has been blamed for the presence of toluene and xylene (which can cause central nervous system damage among a host of other ill effects) in the bodies of the majority of residents living near certain shale gas wells in Texas. These fracking sites are under investigation by the authorities as the most likely culprit.²⁸ However, it isn’t yet possible to know if this was an isolated incident or a common occurrence at fracking sites, as the necessary research has not been done.

The extra road traffic from fracking is harder to dispute. One Texas study found that each well required almost 600 one-way truck journeys during its construction and operation.²⁹ A typical drilling site could have up to 1,000 wells.

There is similar controversy over the impacts of gas flaring at fracking sites. Lawrence Dunne, a physics professor at London South Bank University with a background in flame modelling, decided to speak out when he



Flared gas from the fracked oil fields of the Bakken Shale in North Dakota burns brighter than the lights of Minneapolis, a city of 3.3 million people. As the state’s oil industry pursues oil which has a price 30 times higher than natural gas, there is less incentive to capture it for sale. In 2012 flaring represented \$1 billion in fuel going up in smoke, with the environmental impact of adding a million cars to the road. In a relative world, flaring the gas is still less environmentally damaging than letting the methane escape into the atmosphere.

Source: Ceres, *Flaring Up*, 2013; nln.it/1U1cxQUjz

The Big Story FRACKING

discovered his own village of Balcombe in Sussex had been chosen as a potential fracking site. He told the media: 'There has been no environmental assessment of the health consequences of the flaring of gas emissions over populations anywhere in the world... In my view, flaring emissions over populations with a high density of flares would be disastrous... It is a disgrace to pretend otherwise.'

Fracking operations can also create micro-earthquakes. Although they're very small, the cumulative effect of these quakes can create real problems; in a recent case in Arkansas local residents received compensation from two oil companies for damage to their homes from 1,000 minor tremors.³⁰ These events may also damage the wells themselves, increasing the risk of leaks and contamination. They could pose a much greater risk in regions prone to more serious seismic activity, such as New Zealand/Aotearoa, as new research has shown that areas which have suffered fracking-related earthquakes may then be more vulnerable to larger, natural quakes in the future.³¹



Cash for gas: good for the economy?

'We produce more natural gas than ever before – and nearly everyone's energy bill is lower because of it.' – Barack Obama, 2013 State of the Union address.

'Fracking has real potential to drive energy bills down [and] create jobs in Britain.' – British Prime Minister David Cameron, August 2013.

According to the World Bank, US natural gas prices have dropped to less than a third of European levels, thanks to the shale gas boom.³² Meanwhile, the US Chamber of Commerce claims that 1.7 million jobs have been created so far in the country, with a total of 3.5 million predicted by 2035.³³ However, critics have challenged this rosy picture. Citizens' rights group Food and Water Watch points out that low energy prices in the short term risk locking the US into greater gas dependence, and thus higher energy costs once the shale boom is over.³⁴ A shift to renewables and energy efficiency would be a much more effective long-term strategy for affordable energy. Meanwhile, industry-backed reports touting the benefits of shale gas ignore many of the costs which will need to be paid for years to come, such as the price of pollution clean-up, health impacts, damage to industries such as tourism, farming or fishing, reduction in property prices and the incalculable costs of climate change. Once these effects are factored in, shale gas starts to look very expensive indeed.

Independent reports into the true economic impacts of fracking make much more sobering reading than the gleeful industry-funded studies. Research from Cornell University and Pennsylvania State University shows how natural gas extraction follows a 'boom and bust' pattern.^{35,36} Job increases tend to be much lower than predicted and largely filled by specialists from outside the affected community. There are local economic benefits during the boom but these tend to be lower than expected and come with costs such as soaring local prices,

Oil production technology is giving us ever more expensive oil with ever-diminishing returns for the ever-increasing effort that needs to be invested.

Raymon Pierrehumbert, Professor of Geophysical Sciences at the University of Chicago.

The industry has massively oversold its jobs record. Since 2003, oil and gas jobs account for less than 1/20th of one per cent of the overall US labour market. Numerous industry-funded studies count strippers and prostitutes as 'new' jobs created by the spread of fracking.

Energy educator **Richard Heinberg**, from his book *Snake Oil: How fracking's false promise of plenty imperils our future*, Post Carbon Institute, 2013.

Britain

When test drilling triggered two small earthquakes in Lancashire in 2011, a temporary moratorium was imposed on fracking, but it was lifted in 2012. The British government has now embraced the technology with enthusiasm, offering tax breaks to fracking companies and £100,000 (\$160,500) incentives to local communities. This announcement came alongside the revelation that Treasury officials were holding secret meetings with fracking industry representatives around twice a month.⁵⁰ As test drilling has spread, so has local opposition, with over 40 anti-fracking groups springing up around the country. Things came to a head in August 2013 when local opponents to a fracking licence in the Sussex village of Balcombe were joined by activists from national climate and social justice groups. Following a series of blockades and numerous arrests, the company involved has, at least temporarily, withdrawn its fracking application.

IT'S
FRACKING
BONKERS!

thousands of new heavy traffic movements, the crowding out of other businesses and an influx of transient workers putting a strain on local services. Once the wells run dry, the extra jobs – and workers – vanish, bringing financial disaster to local businesses that had grown up around them and leaving behind an industrialized landscape and expensive, bloated public infrastructure. US counties that relied heavily on extraction industries did worse economically than other counties in the long term, with greater levels of income inequality, slower employment growth and lower educational attainment.

Communities – and even families – are frequently divided by extraction booms, as some take up employment in the industry

while others suffer its impacts or attempt to oppose it. Caleb Behn is a member of a First Nations community whose lands within British Columbia are being encroached on by one of the world's largest fracking operations. In an upcoming documentary, *Fractured Land*, he describes his personal struggle: 'Half of my family supports the industry and half works actively against it... you're trapped in between worlds, and between your people and between issues.'³⁷

Experts have been quick to point out that the different geology, mineral rights regimes, regulatory environments and energy markets around the world mean that the US shale boom is unlikely to be replicated elsewhere. The economist Nicholas Stern – famous for his assessment of the costs of climate change – has called the British government's claim that fracking would bring down national energy prices 'baseless economics', because gas in Europe is traded through a large interconnected market and so a slight increase in gas production in any single European country would have an insignificant impact on domestic prices.

Bridge or barrier: do we need it?

'Gas energy – currently America's largest domestically produced fuel – could prove to be the keystone to solving the nation's energy crisis by serving as the "bridge fuel" to the next century's renewable energy technologies.'

– President of American Gas Association (AGA), 1981.

'Burning natural gas is about one-half as carbon-intensive as coal, which can make it a critical "bridge fuel" for many countries as the world transitions to even cleaner sources of energy.' – Barack Obama's 'Climate Action Plan', June 2013.

Canada

The Canadian government was quick to jump on new fracking technology from its southern neighbour, launching into shale and tight gas extraction in British Columbia (BC) and Alberta from 2005. Over 7,000 wells have been drilled in BC alone, and life has been made even easier for the frackers by the infamous Bill C-38, which dismantled large parts of Canadian environmental law when it passed through Parliament in 2012. As with tar sands extraction, indigenous communities are in the frontline of the impacts – and are also leading the fightback. As part of the Idle No More movement, activists from the Mi'kmaq and Maliceet First Nations have been spearheading anti-fracking demonstrations and blockades in New Brunswick. Following strong resistance from the Tahltan First Nation and other environmental campaigners, fracking has been banned in the Sacred Headwaters area of BC, while Quebec has imposed a moratorium on the practice.



We've been building this bridge for over 30 years. It's time to reach the far shore.

In fact, rather than being a bridge, there's evidence that gas expansion is acting as a roadblock to renewables. The British government's Committee on Climate Change has warned that a new 'dash for gas' would draw investment away from clean energy and make it impossible to meet national carbon reduction targets.³⁸

There is a growing body of evidence that renewable technology is already good enough for us to transition away from fossil fuels altogether. Reports such as Zero Carbon Britain and Zero Carbon Australia have laid out national decarbonization models, while the UK Tar Sands Network has developed an interactive graphic showing how everyone on the planet could have a good quality of life without burning any fossil fuels.^{39,40} This could be done using existing renewable technology and a fairer sharing out of global energy use.⁴¹

This latter is the tricky bit. It's perfectly possible for everyone to have a good, 'modern' quality of life on about a third of the average European per capita energy use. It could happen if we all had access to good sustainable transport options, properly heated/ventilated homes, locally produced food, and if we all bought less consumer junk and took fewer flights than the current norm in industrialized nations. If the wealthy global minority reduced their energy use along these lines, it would allow the rest of the world to come up to the same sustainable level, powered entirely by existing renewable technology.

However, with the current global economy based on the idea of endless growth at all costs, the rush to pursue every possible energy source, no matter how destructive, continues.



the dame in under a CC licence

The Big Story FRACKING

Diminishing returns

The Earth has enough oil and gas resources to fry the planet several times over – but they are not within our reach. While chasing the bubble of fracked fossil fuels, we risk losing out on developing in time the renewable sources of energy essential for our future.

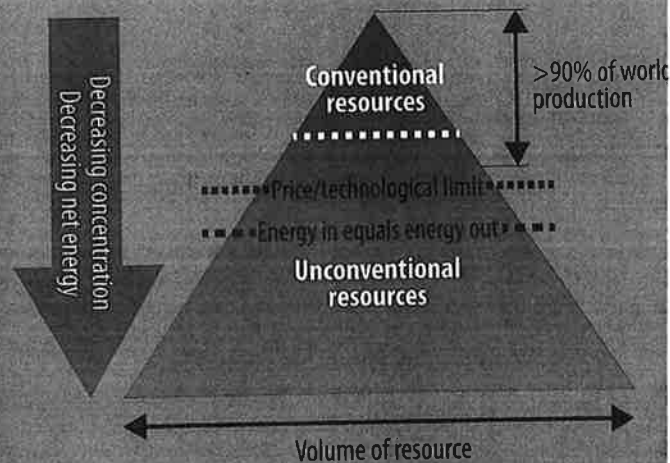
This pyramid shows the fossil fuel scenario from a purely economic perspective.

The world still depends on conventional fossil fuel energy which offers high-quality fuel for a relatively low cost. But as these resources cannot fulfil demand we move down the pyramid to try to extract from more

unconventional resources, which are lower in quality and more dispersed. The first barrier is the limits of technology to extract them at a price that is still viable. Fracked fuel is pushing up against this barrier in many instances.

Further down the pyramid the resources become so dispersed that a second barrier presents itself. Now, it would require more energy to extract the fuel than the fuel itself would provide. Thus the vast majority of hydrocarbon resources remain totally inaccessible.

Source: J David Hughes, *Drill, Baby, Drill*; Post Carbon Institute, February 2013; shalebubble.org/drill-baby-drill



The debate heats up: climate impacts

Fracking proponents like to claim that shale gas exploitation has reduced the climate impact of US electricity production, by reducing demand for coal. Far from being a climate baddie, fracking is actually helping America to go green!

Is this true? Well, coal use in the US has definitely been dropping. Between 2006 and 2011, the amount of coal used to generate electricity fell by 22 per cent.⁴² However, researchers at CO₂ Scorecard have used industry figures to calculate that the lower price of gas in relation to coal only caused about a third of this reduction, with the rest due to other factors such as pollution regulation and environmental campaigning. At the same time, the rush of cheap gas also discouraged an even larger amount of renewable energy and efficiency from getting off the ground, meaning that the overall environmental benefit has been small and short term at best.⁴³

Meanwhile, there is still uncertainty over whether fracked gas really has a lower climate impact than coal. When natural gas is burned to generate electricity, it releases half as much CO₂ as coal per kilowatt hour generated. However, this is not the full story, as the extraction and transport of gas also results in the leakage of methane into the air – and methane is a powerful greenhouse gas. Scientists have calculated that leakage rates of three per cent would make gas as bad for the climate as coal.⁴⁴ A furious debate is raging within the scientific literature, with one team from Cornell University adamant that US fracking operations routinely exceed the three per cent limit; while other researchers call the Cornell result an ‘outlier’ and state that with proper management these ‘fugitive

emissions’ of methane can be kept well under control.^{45, 46} Burning shale gas may be less damaging to the climate than coal in theory, but how often this is true in practice remains an open question.

But all of this may miss the point. While the fossil fuel industry and politicians continue to wrangle over annual greenhouse gas emission rates, the wider climate change debate has moved on. Leading scientists are now telling us that rather than focusing on the amount of carbon pumped out per year, we should be setting targets based on how much fossil fuel we can afford to extract.⁴⁷ Even the conservative International Energy Agency (IEA) has admitted that we need to leave two-thirds of confirmed fossil fuel reserves in the ground to have even

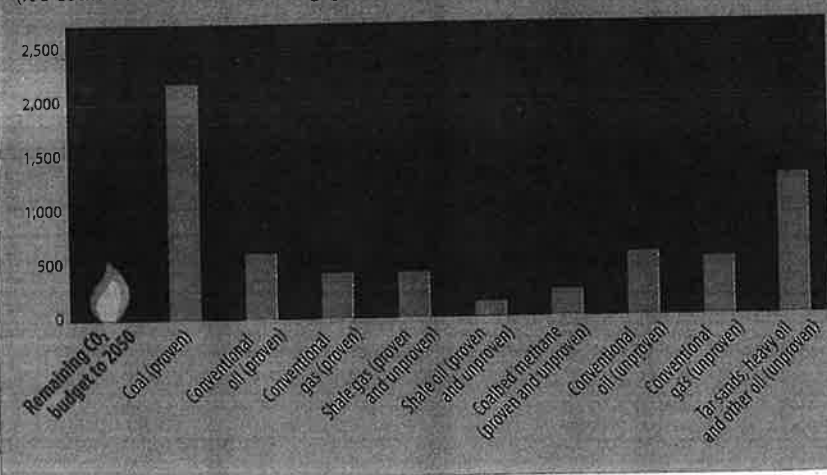
Just as there is no such thing as a little bit pregnant, neither is there any such thing as a little bit of fracking. Due to the economies of scale and required infrastructure, fracking is an all-or-nothing, shock-and-awe operation. Either the drillers come into an area and plaster it with well pads – or they don’t come.

Biologist **Sandra Steingraber**, from her book *Raising Elijah: Protecting our children in an age of environmental crisis*, Da Capo, 2011.

Carbon budget

Gigatonnes of potential CO₂ locked up in different fossil fuel resources

The chart does not include unproven coal, as this would not fit on the scale (it’s estimated at over 40,000 gigatonnes of potential CO₂).



Poland

The fracking industry came to Poland in 2009 with grand promises to unlock a 300-year supply of shale gas. Faced with geological challenges and fierce local protests they then proceeded to revise that number downwards to 100 years, then 60, and now just 30. At least 50 test wells have been drilled, but only one or two sites are believed to be in production, no gas is yet being sold, and most major companies have now pulled out of the country. All eyes are now on the last big player, Chevron, and its ongoing battle with local farmers who are actively blockading its attempts to test drill in the village of Zurawlow in eastern Poland. Since 3 June 2013 the two sides have been at a stand-off with no equipment able to enter the site. Farmers have now been served with legal papers and so the battle is set to spread to the courts.

Chevron



a 50 per cent chance of avoiding disastrous runaway climate change.⁴⁸ For a 75 per cent chance of success, we need to leave 80 per cent underground.⁴⁹

So even if we stopped using coal tomorrow, we could still only burn just over half of proven conventional sources of oil and gas (see graphic). There is no space at all in this equation for unconventional fuels; their extraction is quite simply incompatible with maintaining a liveable climate.

The arguments over coal displacement and relative emissions are ultimately irrelevant. We need to transition rapidly away from *all* fossil fuels, and attempting to launch a whole new industry based on extracting and burning yet more of the stuff seems like utter folly.

China

China contains some of the world's biggest reserves of shale gas, and in its last five-year plan the government announced the intention to extract 6.5 billion cubic metres (bcm) of the fuel by 2015. However, this target now seems unlikely to be met before 2020, as the only two Chinese companies with experience in this area – Petrochina and Sinopec – have announced that they only expect to obtain 1.6 bcm between them in the next two years. Their difficulties largely stem from water availability, the depth and complexity of the shale, and complications over land rights. Shell has been brought in as a partner to provide expertise, but there are reportedly tensions between the transnational and the domestic Chinese corporations. Public information on fracking in China is limited, but as awareness of the practice grows it will be interesting to see how China's burgeoning environmental movement chooses to respond.



Fracked off: the fightback

It was seismic testing by US companies that first alerted a group of Polish farmers that something strange was happening in their previously non-industrial rural landscape. Following damage to farm buildings from sudden subsidence and contamination of their drinking wells with an oily substance, community members began investigating this strange new industrial activity.

According to Lech Kowalski, a filmmaker who was working alongside the farmers: 'The media was full of pro-shale propaganda and no-one from the government was visiting these areas to explain what was going on. The only way the community could learn about fracking was through the internet – once they'd managed to get the information translated from English.'

Kowalski's film *Drill Baby Drill* documents that farming community's success in creating enough public and political concern around fracking to prevent Chevron from drilling in their area. Anti-fracking protests in Poland have since further escalated.

In Australia, the fracking industry crept into south Queensland, and then started spreading south, searching primarily for coalbed methane. Coal and gas companies offered landowners A\$1,500 (US\$1,390) to drill on their land, while providing little or no information to people in adjacent plots. In 2010, concerned locals came together to form the Lock the Gate Alliance, pledging to deny the companies access to their land. A high-profile 50-day blockade in the Northern Rivers region united climate activists and conservative farmers in an unprecedented display of solidarity, costing the fracking firm Metagasco tens of millions of dollars and contributing to the company's withdrawal from the area in March 2013. The movement is now spreading across New South Wales and also Victoria, where campaigners have succeeded in getting a moratorium on fracking.

In Britain, the sleepy Sussex village of Balcombe has become an unexpected battleground, with locals joined by anti-

Companies have agreed to pay £100,000 [\$160,500] to every community situated near an exploratory well... If shale gas is extracted, one per cent – perhaps as much as £10 million – will go straight back to residents.



British Prime Minister **David Cameron** tries to sell the fracking dream, August 2013.



fracking protesters from around the country in a series of blockades against test drilling by oil company Cuadrilla. In Tunisia, the General Labour Union (UGTT) has organized a national campaign against fracking in response to the government signing a deal with Shell. In France, vocal protests forced the government to declare first a moratorium and then a national ban on shale gas extraction. In October a legal challenge to the ban was rejected by the French constitutional court, effectively protecting against future challenges.

These campaigns have been indebted to the work of US activists, who have documented the unfolding impacts of fracking in their country and have achieved some notable victories of their own, including a moratorium on the practice across New York State.

There's a strange paradox here. While fracking is a major threat to the climate, it also seems to be providing a much-needed boost to climate change campaigning, by bringing together people from all walks of life into unlikely new alliances. Cam Walker from Friends of the Earth Australia, who helped to set up the Lock the Gate Alliance, explains: 'This movement started with a very purposeful focus on the local issues, to get the maximum number of people on board. But we've found that as people learn more about fracking, they

start to rethink their opinions on the wider issues, too. In just two years Lock The Gate has moved from a pretty conservative starting position to publicly stating that we don't need coal and gas and should be developing renewables instead.

'We're witnessing something very new here. Ten years ago, urban climate activists were typically at loggerheads with farmers over environmental issues, but now we're building amazing alliances that are moving beyond fracking and developing a genuine, alternative, progressive politics outside the mainstream. There's a real shift happening on the ground that hasn't yet translated into the world of party politics but is inspiring an impressive wave of activism, including pre-emptive action in communities that the fracking industry hasn't even got to yet.'

Danny Chivers is an environmental writer, researcher and performance poet. He is author of *The No-Nonsense Guide to Climate Change*, and was one of 21 campaigners who occupied a gas-fired power station in Nottinghamshire, England in October 2012, in protest at government plans to expand gas power.

With thanks to Caleb Behn, Zahara Choudri, Sam Geall, Lech Kowalski, Lian Lundy, Hugh Macmillan, Sarah Newton, Dom O'Dwyer, Borislav Sandov, Kassie Siegel and Cam Walker.

Bulgaria

In 2011, environmental campaigners discovered that the government was quietly parcelling up large areas of the country for fracking leases, including part of the northeastern farming region of Dobrodja, known as the 'granary of Bulgaria'. Small groups of protesters began holding unofficial demonstrations, blocking traffic outside the Ministry of Energy by walking back and forth across the road, and turning up with banners at events attended by the Prime Minister. By January 2012 the anti-fracking movement had gathered 51,000 petition signatures and 60,000 Facebook followers, and were holding a large demonstration every month. On 14 January 2012 thousands of people marched in 15 Bulgarian cities, while solidarity demonstrations took place in London, Paris and Copenhagen. Four days later Bulgaria's parliament voted 166 to 6 to ban fracking.



1 Earthworks' Oil and Gas Accountability Project, *The Oil and Gas Industry's Exclusions and Exemptions to Major Environmental Statutes*, October 2007; nin.tl/1cRDgKR
2 Sourcewatch, sourcewatch.org/index.php/Fracking 3 Note: this probably includes vertical as well as horizontal fracking. US Energy Department; nin.tl/19R73IA 4 IHS Global
Insight, 2009; nin.tl/1hVMsvu 5 Rob Maetzig, *Business Day*, 22 March 2013; nin.tl/1hVPMR3 6 wdm.org.uk/carbon-capital/nexus 7 Chad Skelton, 'Oil, gas companies are top BC
lobbyists', *Vancouver Sun* 18 April 2013; nin.tl/1hVQ6FH 8 EIA, 'Technically Recoverable Shale Oil and Shale Gas Resources', 13 June 2013; eia.gov/analysis/studies/worldshalegas
9 Calculated from 2010 data, from the 2012 IEA *World Energy Outlook*, 2012; nin.tl/1gJVUgK 10 *The New York Times* website, 'Federal Officials Quietly Question Shale Gas'; nin.tl/1gJPo9L 11 Energy
Watch Group, *Fossil and Nuclear Fuels - the Supply Outlook*, March 2013; nin.tl/1aMlyni 12 Deborah Rogers, *Shale and Wall Street: Was the decline in natural gas prices orchestrated?*,
Energy Policy Forum, February 2013; nin.tl/1gJRfG 13 Nafeez Ahmed, theguardian.com, 21 June 2013; nin.tl/1gJUQtf 14 UK Energy Research Centre, *A review of regional and
global estimates of unconventional gas resources*, September 2012; nin.tl/1csTLdz 15 EIA, *Technically Recoverable Shale Oil and Shale Gas Resources*, June 2013; eia.gov/analysis/
studies/worldshalegas 16 Energy Edge, energy-edge.net/ntcdm.htm 17 IEA, *World Energy Outlook 2011*; worldenergyoutlook.org/goldenageofgas 18 Halliburton, 2009; nin.
tl/1gJYkfr 19 Frack Off, 2012; frack-off.org.uk/coal-bed-methane-the-evil-twin-of-shale-gas 20 CIWEM UK, 2012 Policy Position Statement 'Hydraulic Fracturing (Fracking)
of Shale in the UK'. 21 Jim Marshall, *WaterUK*, 17 July 2013; nin.tl/1csYImB 22 *The Guardian*, 11 August 2013; nin.tl/15HJMIW 23 Nicholas Kusnetz, 'North Dakota's oil boom
brings damage along with prosperity', *Propublica*, 7 June 2012; nin.tl/1csYImB 24 *Procedia*, Vol 7, 2013; nin.tl/15HOMxv 25 Theodor Meyer, 'New study finds high levels of
arsenic in groundwater near fracking sites', *Propublica*, 8 August 2013; nin.tl/1ct13ht 26 UNEP, 'Gas fracking: can we safely squeeze the rocks?', November 2012; unep.org/pdf/
UNEP-GEAS_NOV_2012.pdf 27 European Parliament, *Impacts of shale gas and shale oil extraction on the environment and on human health*, 2011; nin.tl/15HSA8k 28 Dianne
Rahm, 'Regulating hydraulic fracturing in shale gas plays', *Energy Policy*, 2011; nin.tl/1ct6HJF 29 marcellus-shale.us/road_damage.htm 30 The Atlantic Cities, 29 August 2013;
nin.tl/1ct93iu 31 Climate Justice Taranaki, 14 August 2013; nin.tl/15HY5E2 32 blogs.worldbank.org/prospects/node/1278 33 Institute for 21st Century Energy; energyxxi.org/
americas-energy-future 34 Food and Water Watch, *US Energy Insecurity*, 2012; nin.tl/1ctdXvP 35 Susan Christopherson and Ned Rightor, 'How shale gas extraction affects drilling
localities', *Journal of Town and City Management*, 2012; nin.tl/1ctgar8 36 Jeffrey Jacquet, *Energy Boomtowns & Natural Gas*, NERCED, 2009; nin.tl/15i4wXP 37 fracturedland.com
38 Committee on Climate Change, 13 September 2012; nin.tl/1ctiY75 39 zerocarbonbritain.com 40 Beyond Zero Emissions, bze.org.au 41 twoenergyfutures.org 42 EIA; nin.
tl/1ctps5N and EIA, *Monthly Energy Review* June 2012; nin.tl/18IVGzX 43 Shakeb Afsah and Kendyl Salcito, 'Shale Gas and the Fairy Tale of its CO₂ Reductions', CO₂ Scorecard,
7 August 2012; nin.tl/1ctqRdq 44 Over a standard 100 year period. See The Carbon Brief; nin.tl/18IXp8J 45 Robert Howarth and others, 'Methane Emissions from Natural Gas
Systems', 25 February 2012; nin.tl/18IVGzX 46 David JC Mackay and Timothy J Stone, *Potential Greenhouse Gas Emissions Associated with Shale Gas Extraction and Use*, Department
of Energy & Climate Change, 9 September 2013; nin.tl/18IZ3qH 47 *Nature*, April 2009; nin.tl/1cttZ98 48 IEA, *World Energy Outlook 2012*; nin.tl/18IZQrE 49 Grantham Institute
and Carbon Tracker, *Unburnable Carbon 2013*; nin.tl/18m12eu also ABC News, 26 June 2013; nin.tl/1ctvLXW 50 businessGreen; nin.tl/16Nz1Jl



Stills from *Gasland Part 2*.

'We cannot have democracy without freedom from fossil fuels'

Filmmaker JOSH FOX's documentary *Gasland* catalysed global outrage over fracking. With *Gasland Part II* recently released, he talks to us about industry smears and toxic cash.



The public response to *Gasland* was phenomenal.

It was an appropriate reaction to a state of crisis. But no matter how popular something is you still have to campaign. We would show 10, 20 or 30 minutes [of the film] on the side of the road before it was even done. We would go out there and use it to educate people. We've never stopped. I've done a tour of 250 cities.

The oil and gas industry reaction was predictable...

I was quite surprised that they attacked the film. I thought they would completely ignore it. They got people to watch it who would never have watched it!

They spent hundreds of millions of dollars trying to combat the message of the film in every conceivable form. If you search my name or *Gasland* on Google, you come up with their misinformation campaign. They've done YouTube videos, they've done two feature films, they go on the news, they've bought ads promoting natural gas. It's not just me they are fighting, it's the truth and the science that drilling contaminates people.

On the internet and in the media you've been called anything from a liar to a luddite. What kind of influence on public perception has this had?

I think it creates doubt. It's like when the tobacco industry was shown to be harming people's health, they created bogus reports. They engaged universities in fake science. That confuses people.

However, I don't think they've had the reach that the clips from the film, people setting alight their water, have had. We've kind of won this PR war. People overwhelmingly don't want fracking.

So I don't think [the industry's propaganda] really works, but it creates delay. They deny the science because it interferes with the worldview they want to promote – that we need to be dependent on oil and gas – and they want to make money. We don't need that dependency any more, which is why they are getting so hysterical.

What does fracking do to communities?

There is a high probability of water contamination and increased air pollution, depending on how close you are.

You're overrun by thousands of truck trips every single day. You have a high fatality rate among workers in the gas industry,

seven times the US average – a lot of that is truck accidents.

You have a community that ends up being fractured, because inevitably there are people who make money and are in favour and there are people who are devastated, upset and angry.

After a while, the whole reason for your town's existence is to extract oil and gas. The Gulf of Mexico has now been reduced to an oil and gas zone, with an ecology that no longer functions, with a coastline that no longer serves its public, with a fish and seafood base that you can't use any more, with an eco-system that has crashed, and with people working in that industry who have no other choice. You reduce the value of those areas simply to the value of the oil or gas. Your schools are sponsored by the oil and gas companies, as are your roads and highways, you don't have a place to combat that pervasive element.

What message does the fracking saga in the US send out about corporate power and its influence on government and democracy?

When you have all that toxic cash running into our state and federal government, the citizens are squeezed out of that picture. I believe we cannot have democracy without freedom from fossil fuels. Because they are so dominant in our democratic political systems, not just in the US but in Australia and other countries.

The government's been hijacked by a very small group of people who are enormously wealthy. When you have a political system so influenced by money you really have devolved into a kind of plutocratic rule where a tiny group of people who have billions of dollars are dictating policy over hundreds of millions. This situation has to change.

People's movements, community involvement – do they give you hope?

Oh absolutely, I'm hopeful every day. The anti-fracking movement worldwide is one big community. You can go anywhere in the world and find people who are fighting the same scenario and they're in the same boat and these are people who you link arms with, they're friends, they're people who will really understand what you are going through. That gives life a lot of meaning.

Interview by Dinyar Godrej.

The people's campaign

Opposition to fracking has come from local communities, bringing together people from many walks of life.

ARGENTINA

Rise up for the Dead Cow

Vaca Muerta, or Dead Cow, is the unlikely name of a supergiant shale oil and gas field in Argentina, the third largest of its kind in the world. Wanting to frack it for all it's worth is Argentina's largest corporation, the majority state-owned oil company YPF, hooking up with the US giant Chevron.

Chevron has form in this part of the world. Ecuador continues to fight the oil company in court over environmental damage in the Amazon. And until recently the Argentine judiciary was debating a freeze of Chevron's assets in the country. So the union with YPF has not been met with cheers all around.

All of Argentina's fracking projects currently under way can be found in one of the country's most pristine regions, mythical Patagonia. Vaca Muerta is in the southern province of Neuquén – also the hottest spot in the fight against fracking in Argentina.

Local people are not giving up their resources and their livelihoods without a fight. Grassroots organizations across Argentina are opposing this latest attempt at solving the country's deep-rooted energy crisis, potentially at a very high environmental and social cost.

At the forefront are indigenous communities, such as the Mapuche people in Neuquén. 'Our land is already completely polluted by conventional oil exploitation by transnational companies,' says Lefxaru Nawel from the Mapuche Confederation of Neuquén. Fracking, he says, has only come to make things worse. 'The Mapuche community of Gelay Ko saw the first fracking well in Latin America. This has aggravated the existing situation – over there they can't drink the water, a lot of people are sick due to pollution, and six months ago our *longko* [leader] Cristina Lincopan passed away – she was the biggest fighter against fracking.'

Lincopan died on 14 March 2013 of pulmonary hypertension, after she was unable to receive a lung transplant. She was 30. 'We strongly suspect that environmental pollution had a lot to do with her diagnosis,' said the community's *werken* [spokesperson], María Pichiñan, at the time.

The communities are not alone in their fight. Backing them are prominent personalities such as Argentine Nobel Peace Prize recipient Adolfo Pérez Esquivel and the Argentina Without Fracking network, formed by a group of

intellectuals and artists.

Sociologist Maristella Svampa from Argentina Without Fracking traces the roots of the relatively new anti-fracking movement to the groups that were already campaigning against mega-mining and for other environmental causes within their communities. By combining a legal strategy with street protests and education campaigns, they have managed to ban fracking in 22 sub-provincial districts. They have also halted exploration in three wells, one of them in the protected area of Auca Mahuida in Neuquén.

Their biggest achievement, however, has been putting the issues of fracking, and the rights of the communities affected by it, on the national agenda. This has helped gain the support of thousands, including some leftwing parties which have incorporated the issue into their political campaigns.

As these small organizations, dotted around the country, slowly work towards an integrated strategy, they also face several challenges. The general population's lack of interest is one, according to Svampa. But most importantly, she adds: 'We're up against massive economic interests, we know how much power the oil lobby has, and that they are investing a lot of money to silence the debate.'

For Nawel, the main enemy is the provincial government and its eagerness to accommodate the oil companies. 'Our opinion has never been sought. The government should guarantee the rights of the Mapuche and of all the people in Neuquén, yet they have been absolutely racist, constantly attacking the Mapuche people.'

The next step in the fight is to open up the debate, moving beyond the rejection of fracking. 'We want to discuss how the country will overcome its total dependency on hydrocarbons,' says Nawel. 'If this keeps going on, we can't think of a dignified future.'



Argentina Without Fracking argentinasinfracking.org

By Celina Andreassi.

AUSTRALIA

Lock that gate

What do you get if you combine a rightwing radio 'shock jock', conservative farmers and environmental activists? The surprising answer is a loose but effective coalition against fracking for coal seam gas (CSG) in Australia.

With more than 437 million hectares of Australian land – an area 18 times the size of Britain – covered by petroleum and gas licences or applications, it's clear that energy companies are eyeing a big gas payday.

Standing in their way is the unlikely alliance of campaigners and community groups concerned about the impact of fracking upon their water – a highly prized resource on the parched continent.

Perhaps the most unlikely convert to this environmental cause is Alan Jones, a radio host who once said he wanted to put former prime minister Julia Gillard 'into a chaff bag' and throw her out to sea. He has also called the science of climate change a 'hoax' and 'witchcraft'.

But, recently, Jones has been aiming his fire squarely at the fracking industry, using language that wouldn't appear out of place for the Occupy movement. He has accused political parties of being in bed with large resource companies to crush ordinary people in order to expand fracking, which he calls 'the asbestos of tomorrow'. He told a rally in August that pro-mining proposals put forward by the government 'would be acceptable legislation drafted by Vladimir Putin, but not here in New South Wales'.

While Jones has provided the populist hyperbole, the heartbeat of the anti-fracking movement is the Lock the Gate Alliance, a network of community activists and environmentalists who support farmers' rights to prevent entry of fracking companies on to their land.

Anti-fracking rallies have been held across the country, including a co-ordinated stunt where

thousands of protesters spelt out the words 'No CSG' on several New South Wales beaches. Lock the Gate has also supported symbolic blockades of farms to keep out resources firms, with Drew Hutton, the co-founder of the Australian Greens, arrested as a result of an action.

'I had one grazier tell me that the Queensland government has said there is a four pillar economy but they are relying on just one leg of the chair, which is mining,' said Ellie Smith, local co-ordinator for the alliance in the Galilee Basin, an area in central Queensland that contains a large amount of untapped gas and hosts the majority of the 40,000 wells dotted across the country. 'That's all the government seems to care about.'

'On one farm just north of Emerald, the mining company said that the farmer would lose two metres in depth from his water bore by 2020, but the actual drawdown has been five metres already.'

'The landholder has an agreement that the mining company will provide him water if his water runs out, but that only lasts as long as the mine does. He wants to pass his wheat farm on to his kids and grandkids, but they may have no access to water. It's an awful situation to be in.'

So far this motley opposition has wrested a promise from the federal government to ensure all new developments that may impact the water table are assessed by both state and national governments. Greater success has been achieved in Victoria where overwhelming popular opposition led to a moratorium – but there are fears the government there looks likely to lift it.

With a new conservative, seemingly pro-fracking, government in power in Canberra, Lock the Gate and Jones look ready to fire up once again to protect the interests of farmers and rural communities.

Lock the Gate Alliance lockthegate.org.au

By Ollie Milman.

SOUTH AFRICA

Fight Goliath

At approximately 400,000 square kilometres, South Africa's ancient semi-desert region the Karoo is its largest ecosystem, covering 40 per cent of the country's landmass. Despite a fierce environment and scarce water supplies, it is home to thousands of plant species and a high diversity of animal life, including rare endemic species. But a fracking storm threatens to erupt.

South Africa remains heavily reliant on coal for electricity. Rolling blackouts have become commonplace as the National Grid struggles to cope. The government believes shale gas is the answer to the energy crisis. Because, if the US Energy Information Administration is to

(top) Mapuche flags flutter in front of YPF's wells in Campo Maripe, Argentina, during a blockade in August by the Mapuche community.
(middle) Claiming the land: a Lock the Gate group in action.
(bottom) Frack apocalypse in an animation for a rap track produced by South Africa's Treasure Karoo Action Group.



Lock the Gate Alliance



Treasure Karoo Action Group

The Big Story FRACKING

be believed, the Karoo lies on top of a massive 13.7 trillion cubic metre reserve of shale gas. The promise of cheap energy and jobs could be potential vote winners in elections scheduled for next year.

The anti-fracking movement is picking up steam and demonstrations continue across the Karoo. The Facebook page of the Treasure Karoo Action Group (TKAG) has over 8,000 members.

'People here are very, very concerned. They have a unique relationship with the land and depend upon it for their survival,' says Jeanie le Roux, Director of Operations at TKAG.

Groundwater serves as a lifeline to these communities. 'If this becomes contaminated due to fracking, there would be huge implications for agriculture and tourism. We have no infrastructure in place to support the shale gas industry. All the construction and trucks would create large amounts of dust and have a terrible impact on the local ecology and the sheep farming industry.'

Despite forming less than three years ago, TKAG has enjoyed significant success fighting the government and those who have expressed an interest in exploiting the reserves. In 2011 the

group secured a moratorium on fracking, only for the government – with one eye on elections – to lift it a year later.

When Shell launched a media campaign to convince the public of the benefits of fracking, the group reported it to the Advertising Standards Authority (ASA) for its misleading adverts and media statements. Shell was found guilty on four counts and ordered to withdraw the campaign.

The group will now proceed with a legal campaign to prevent fracking in South Africa. 'This is a very unfair fight. We're a small non-profit organization and we have to take on the government and transnational corporations with a lot of funds, power and experience. However, as Margaret Mead [the American cultural anthropologist] said, "Never doubt that a small group of thoughtful, committed citizens can change the world. Indeed, it's the only thing that ever has."'

Treasure Karoo Action Group treasurethekaroo.co.za

By Aaron Gekoski.

TAKE IT FURTHER

Two key strategies

1 Protests, blockades, occupations

The fracking industry hates being reminded it has a huge trust deficit with local communities. Delays caused by direct action cost money. Protests also cannot be completely ignored by government and, indeed, have led to moratoria or bans.

2 Legal challenges

A strategy being spearheaded in Britain (with the involvement of **Friends of the Earth** and **Greenpeace**), Argentina and South Africa which can cause long delays to fracking proposals. Landowners can also assert their legal right not to permit fracking on their land, as they have done in Australia.

Campaigns

Hundreds of local campaign groups have sprung up opposing fracking. These are the larger coalitions.

Australia

Lock the Gate Alliance lockthegate.org.au

Britain

Frack Off frack-off.org.uk
No Dash for Gas nodashforgas.org.uk

Canada

Stop Fracking Ontario stopfrackingontario.wordpress.com
The Council of Canadians canadians.org/fracking

Ireland

What The Frack what-the-frack.org

New Zealand / Aotearoa

Climate Justice Taranaki climatejusticetaranaki.wordpress.com

US

Americans Against Fracking americansagainstfracking.org
Food and Water Watch foodandwaterwatch.org

Global

Global Frackdown globalfrackdown.org



Watch and read

Gasland and Gasland 2
Fracking Hell nin.tl/HypAqr
Gas Leak! nin.tl/HsKh7M
Fracking in Fermanagh
frackinginfermanagh.info



Shale Bubble shalebubble.org
Frack Off's web compilation
nin.tl/1cu6S1y
EcoWatch ecowatch.com

Oops!

We're out of space.

Read **NI** co-editor Dinyar Godrej's assessment of the political hopes riding on fracking on our website at: nin.tl/185MqfS