

The Knitting Nannas - Perth Loop

We peacefully and productively protest against the destruction of our land, air, and water by corporations and/or individuals who seek profit and personal gain from the short-sighted and greedy plunder of our natural resources. We support energy generation from renewable sources, and sustainable use of our other natural resources.

One of our concerns is the impact gasfields have on our community. This has been well documented in all countries that host Unconventional Hydraulic Fracturing including Australia.

The communities find that they have no voice, are disregarded and seen with contempt before, during and after the process.

This does not build strong communities – it destroys communities, families and individuals. Unfortunately, even leading to the worst case scenario - suicide.

Please read the literature below compiled by Dr Bryan Whan. There is enough evidence alone here to ensure that this must never go ahead in Western Australia.

Information review on unconventional gas development for WA scientific inquiry

Prepared by Dr Bryan Whan for Lock The Gate Alliance

9.6 Impacts on mental health, psychosocial wellbeing and community cohesion

There are many avenues through which the unconventional gas industry can harm mental health and individual and community wellbeing (9.9).

- The initial phase impacts include distress and anxiety due to disagreements that split the community into those who support the industry and those who oppose it.
- In the 'boom' phase, tight-knit communities can feel inundated with strangers coming in, swamping unprepared health and mental health services. Crime may also increase. Such impacts are detrimental to the social cohesion, and for some, the moral character of the community.
- In the post-construction phase, jobs decline dramatically and housing demand drops. Production ramps up with drilling and fracking, with its 24-hour lights, noise, odours, tree clearing and truck movements - causing some people to feel a loss of control, loss of peace and a feeling of being trapped and unable to escape.
- These phases present risks of depression, anxiety and increased use of alcohol and other drugs for coping.

Doctors for the Environment Australia note that 'water and air pollution, water shortages, permanent degradation of productive agricultural land and loss of livelihood and landscape all have mental health consequences for communities living in a gas field' (9.21).

A 2013 study involving 12 workshops established that CSG operations in south west Queensland placed rural communities 'under sustained stress' (9.22). Study participants reported that mining and CSG operations 'significantly impacted or exacerbated issues such as the health, social fabric and economy of the community', and the authors noted that local health services faced 'unsustainable pressure'.

A 2014 article in the Medical Journal of Australia noted that 'gas developments can have numerous and considerable social and psychological effects, which may exacerbate more direct health risks' (9.23).

A 2014 CSIRO study (9.24) noted that local farmers perceived the nature of CSG development in South West Queensland as an 'invasion' or 'occupation', whilst a previous study in Chinchilla found residents describing a 'tsunami of change' (9.25).

Interacting and engaging with CSG companies also have a significant negative impact on farmer's wellbeing (9.26), resulting in issues of stress, conflict and disconnection.

A survey of 378 Australian farmers, predominantly from Queensland and NSW, published in the Journal of Environmental Psychology in 2016 (9.27), found that farmers concerned about the impacts of coal seam gas on their health, community and the environment, were more likely to report symptoms of depression and decreased levels of wellbeing.

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The industry and Governments justify the development of unconventional gas because it will create local jobs, revive ailing rural communities, and provide tremendous economic benefits.

What the literature and experience show

10.1 Impacts on the community

In the course of its work supporting landholders and communities facing the impacts of unconventional gas developments, Lock the Gate Alliance hears firsthand about the impact unconventional gas development is having on the livelihoods, health and well-being of Australian farming families living adjacent to and surrounded by gas activities. These harmful impacts include: intimidation, coercion and bullying by UG companies; intolerable noise and light pollution from flaring, traffic and UG infrastructure; contamination and depletion of water in farm bores; rivers bubbling with methane; bores running dry; stock losses associated with pipeline construction and water contamination; costly and time consuming interruptions to farming operations; huge trucks and heavy machinery on small local roads affecting lifestyle, safety and road infrastructure; dust impacts on pasture; increases in weed infestation; industry workers leaving mess from pipeline construction in farm paddocks; workers destroying fences and leaving gates open; properties not able to be sold; credit being denied; mental health impacts resulting from dealing with companies and the impacts of industry development; and physical health symptoms including respiratory ailments, headaches, rashes, nausea and vomiting, and nose, throat and eye irritations.

For many affected landholders, these impacts affect all facets of life and are making their living situation untenable. Personal testimonies of a number of affected landholders can be viewed in a series of short films compiled by the Lock the Gate Alliance talking about the impacts on them (10.1).

While the gas companies move on once the commercially viable gas has been extracted, the communities suffer long term (1.3). The unconventional gas mining leaves massive damage, and the community must foot the bill. Yet the community did not want it.

Queensland's experience shows that reality does not match the unconventional gas industry's claims. Few benefits are realised outside the gas industry, and there are serious social and economic effects on local communities and existing businesses (10.2).

10.2 Unconventional gas led to a degradation of public resources in QLD

A study in the Darling Downs of Queensland between 2008 and 2013 by the industry-funded Sustainable Minerals Institute at the University of Queensland surveyed stakeholders from different sectors in the local community including the local business community, agriculture, local government, advocacy groups and environmental consultants, as well as the mining and

unconventional gas industries (10.3). Far from mining and unconventional gas providing economic benefits, local businesses felt that it had reduced financial capital, human capital, infrastructure, social capital and natural capital. Local businesses had to compete with inflated gas industry wages to recruit and retain staff, and they experienced increased rent and competition for services. There were disruptions to farmers from the rollout of access roads, pipelines, water treatment plants and other infrastructure.

10.3 Community cohesion and wellbeing:

The Queensland and NSW experience has shown that when an unconventional gas industry is forced upon communities against their wishes, there is potential for significant conflict and social upheaval and disruption as a result (1.6). Lock the Gate members and local community groups report a range of impacts on their mental and emotional wellbeing, including:

- A sense of injustice that they do not have the right to refuse access to companies for UG activities and that this industry is being forced on an unwilling population.
- Fear and anxiety about the impacts of the unconventional gas industry on their family's health and the quality of the air and water they rely upon.
- Concern about the impact of unconventional gas development on the economic viability of their farms and property values.
- A sense of anger and betrayal that governments are supporting industry rather than communities in the development of the unconventional industry.
- A sense of anger that the industry is being pushed ahead rapidly without proper consideration of the impacts and before proper scientific studies have been done and baseline data collected.

Doctors for the Environment Australia note that the lack of a veto right for landholders in relation to unconventional gas development, the stress involved in dealing with companies (often against their will), the lack of full information and disclosure on the realities of unconventional gas development, and the often underhanded tactics employed by companies contributes to a sense of powerlessness, betrayal and frustration amongst landholders and affected communities. The injustice and powerlessness contribute to distress and poorer mental health outcomes. Unconventional gas development can 'divide previously close-knit rural communities, increasing tension and disharmony'.

According to DEA, in eastern Australia, the stress and disruption caused to farmers has already been shown to force some of them to leave a CSG drilling area, allowing once productive lands to lapse into disuse. In the USA long-time residents are moving, unable to bear the changes the gas industry has wrought on their landscape and community.

A study on landholders in Queensland found that unconventional gas operations placed rural communities under sustained stress, with study participants describing significant impacts on the health, social fabric and economy of local communities (10.4).

10.4 Boom Bust impact

The scale of the 'bust' after the short unconventional gas construction period ends is severe, and long-term job opportunities are extremely limited. Queensland Treasury figures reveal that more

than 10,000 fly-in-fly-out jobs have been lost in the Surat Basin since the CSG construction boom peaked in 2014. In June 2014 there were 14,490 non-resident jobs in the region, and by June 2016 that had reduced to just 3,820 jobs (10.5), similar to pre-CSG levels.

The gas industry frequently makes claims about delivering substantial flow-on jobs in regional communities, particularly in the services industry, and job multipliers are frequently used to derive large job estimates. However, research undertaken by CSIRO's Gas Industry Social and Environmental Research Alliance found that job spill-overs into non-mining employment in the Surat Basin were negligible (10.6).

10.5 Employment impacts (*The Australia Institute, 2017 7.19*)

- While gas companies continually spruik the promise of more jobs for local communities as a justification for unconventional gas development, the simple fact is that it is a relatively small employer in the long term.
- The majority of gas industry jobs are required for the short construction phase only, they are not ongoing, as modern gas fields are highly mechanized and need very few people to operate them. Local employment opportunities are minimal with the majority of skilled workers being brought in from elsewhere with fly-in-fly-out workforces.
- The industry has made some incredible claims about its capacity to employ. In 2012 it claimed it created 100,000 jobs whereas the Australian Bureau of Statistics showed there were only 9,372 additional jobs. A 2011 report prepared for Santos by Allen Consulting Group found that a potential coal seam gas development in Northwest NSW would increase employment opportunities in NSW by 'around 2,900 ongoing full time positions', even though the project would only create about 30 gas industry jobs. Over 500 jobs would apparently be created in the public sector, at taxpayer expense (10.7).
- Far from creating many additional jobs, the coal seam gas industry has been found to reduce employment in certain sectors. The Office of the Chief Economist's 2015 Review into the Socioeconomic Impacts of Coal Seam Gas in Queensland reported that 1.8 agricultural jobs are lost for every CSG job created (10.8). Similarly, a study of Queensland's unconventional gas expansion by CSIRO's Gas Industry Social and Environmental Research Alliance found that for every 10 additional people employed in coal seam gas, 18 agricultural jobs were lost (10.9, 10.10).
- The Chair of the NT Fracking Inquiry claimed there could be 32,000 jobs created by fracking in the NT, yet the Australia Institute states from the Inquiry's own research, there is a very high probability that no long term jobs will be created in the Northern Territory. Even the best case would be for only 500, but this was a very low probability. The Research Director of the Australia Institute criticised the inquiry chair, saying its own commissioned research had been ignored. The Chair later admitted she had quoted the wrong figure. (10.19,10.20). Interestingly, the APPEA claimed that up to 6,300 new long-term jobs could be created (2.1).

10.6 Property values and credit Availability

Rabobank, the world's leading specialist in food and agribusiness banking, stated risks from unconventional gas mining included reductions in farm productivity, efficiency, land values and credit availability. It also indicated that concurrent CSG mining and agricultural activities could result in problem loans or defaults (10.11).

In 2016 it was revealed that a Queensland family was unable to obtain a bridging loan using their property for equity, because the property had four coal seam gas wells on it. The Commonwealth bank stated that coal seam gas wells on the land make the security unacceptable for residential lending purposes (10.12, 10.13).

10.7 Insurance

Insurance companies have refused to insure against risks associated with unconventional gas extraction, both in Australia and in the USA. In the USA, homeowners can be confronted with uninsurable property damage for activities that they cannot control (10.14).

In the north west of NSW, farmers have been refused insurance cover for risks and contamination associated with unconventional gas extraction (10.15).

Landholders are concerned they may be liable for any negative impacts caused by hydraulic fracturing. In 2014, the NSW Chief Scientist released a report, which concluded that the CSG industry was markedly under-insured and that landholders were likely to bear a substantial risk as a result (10.16).

Meat and Livestock Australia has advised there is a genuine risk that landholders may ultimately be responsible for liabilities arising from unconventional gas activities if they lead to personal injury, property damage, or contamination (10.17).

The Rural Industries Research and Development Corporation cited a case study in Queensland where a landowner was advised by their supply chain partners that they would be liable for any contamination caused by coal seam gas activities. Neither the CSG company nor the insurer would agree to indemnify the landholder against that risk (10.18). Legal advice indicated:

- Gas companies are refusing to include provisions in access agreements to accept liability for any contamination that may occur.
- Gas companies in Australia are under-insured and do not have adequate insurance to cover the types of risks that CSG activities bring.
- Some graziers have reported that insurers have examined the risk to them of unconventional gas contamination and found it too high to offer insurance.

One must ask the obvious question: **Why don't the companies cover the liabilities if the process is so safe and free of risks?**

10.8 USA experience

The impacts on the community in Australia are a repeat of the experience in USA. Sixty-four studies showed industry claims of job creation and economic benefits were exaggerated, and economic analyses found that property values, tax revenues and tourism diminished (1.7).

10.9 Experiences in dealing with social impacts in Queensland (10.21,10.22, 10.23)

Dr Wayne Somerville, a clinical psychologist in northern NSW, has dealt with mental health impacts arising from unconventional gas industrialisation in NSW and Queensland (10.21). Turning rural

areas into gas fields creates social, psychological and environment stresses that undermine mental health. The impacts from unconventional gas industrialisation arise not only from its adverse impacts on the environment and human health, but also from the negligent approach to risk management from gas companies, regulators and political supporters. Governments promote interests of mining companies over individuals, small businesses and farming communities. The inability to control access to property, loss of property values, and damage to land, destroys farmers livelihood and the legacy for their children.

The gas industry and its political supporters appear to believe the industry is entitled to an assumption of innocence i.e. that unconventional gas is safe unless the community can prove otherwise (10.21). This is the reverse to other industries, such as the pharmaceutical industry, where the industry must prove a new product is safe before it is approved. There is community concern that it appears the regulatory authorities do not have the interests of the community at heart.

Rev Graham Slaughter (10.22) witnessed how the rapid expansion of the unconventional gas industry marched over people's lives and communities with very little long-term benefit, compared to the pain, suffering and disruption that has occurred. It is clear co-existence is not possible. There was a strong distrust of the Government, as queries were ignored and there was a reluctance to properly investigate health problems. The lure for wealth took precedence over community well-being, as mining companies had greater access to water and farmers' land could be taken over.

Dr Geralyn McCarron, a Brisbane GP, outlined studies to indicate the Queensland Government has failed in its duty of care to people in the gas fields (10.23). Despite warnings from the AMA, appropriate research and regulations were not initiated. Data collected by the gas industry showed that emissions of air toxins known to cause human health escalated. Particulate matter known to cause cardiovascular and respiratory diseases were up 6,000% to 1,926t. Oxides of nitrogen, which affect the eyes, throat and lungs, were up 500% to 10,000t. Formaldehyde, an irritant to eyes, nose and throat, and can cause cancer, increased from 12kg to 160t. Problems raised with the Government have been ignored and treated with contempt. High levels of volatile organic compounds around homes, radioactivity, toxic fumes from flares, acid rain, and cancer concerns were reported without any action. The gas industry claimed that steel particles coated by sulphur and chlorine were sugar deposits left by insects!

9.6 Impacts on mental health, psychosocial wellbeing and community cohesion

There are many avenues through which the unconventional gas industry can harm mental health and individual and community wellbeing (9.9).

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- In the 'boom' phase, tight-knit communities can feel inundated with strangers coming in, swamping unprepared health and mental health services. Crime may also increase. Such impacts are detrimental to the social cohesion, and for some, the moral character of the community.
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CONCLUSION

1. The citizens of this land must have the democratic right to say no but the community has **no rights to veto**. This must be changed prior to any exploration taking place.
2. We want to see **exploration** for unconventional gas **banned** immediately
3. We want a **ban** on **simulated hydraulic fracturing** immediately

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Prepared by Dr Bryan Whan for Lock The Gate Alliance

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Further information	
	www.dontfrackwa.com.au
	www.frackfreewa.org.au
	www.lockthegate.org.au

To Whom It May Concern

Six years ago on a flight to America I watched the film Gaslands. I was shocked about the unconventional hydraulic fracturing taking place there. Five months later on the return flight was Gaslands II. I thought, 'thank goodness this is not happening in Australia'. Then about two years ago Frackman, an Australian movie about Tara QLD and the fracking happening there was shown and I was stunned. How could this be? How could this be happening in Australia when there were such dire things happening in America? Had we not learnt anything?

It was then that I knew I had to get involved. We had to stop short-term-gain for long-term-pain industry happening to our beautiful state:

- a state where water is so precious – it's our life blood;
- a state so beautiful that tourists flock here to see the abundance of wilderness;
- a state where the air is still so clear and pure in the rural areas; a state where rural people live healthy lives;
- a state where bushland is cared for and respected. It's a magnificent place – we must keep it that way.

I have been involved in Landcare for the past 30 years. Salinity was the main area. You know, there are things you can do to try and slow or even halt the salinity creep. There are things you can do with saline water which is three times more salty than the sea but with Fracking - **once its fracked – there is no turning back. It is forever** – and that's the scary part. **No** amount of regulations will protect our health, land and water. Just read the literature. It's all there. Thousands of scientific peer reviewed studies. How many do you read from industry I would ask?

Having read the recommendations from the 2015 inquiry, I am wondering what recommendations have been acted on?

My submission will focus on Simulated Hydraulic Fracturing (SHF) and biodiversity and regulations.

Listed below is the Terms of Reference for this process. I am concerned that it is about the implementation of HFS on the environment rather than the pros and cons of HFS. Already the assumption is made that it is going ahead.

Terms of Reference

The **scientific** inquiry is to undertake an assessment and report on the potential impacts arising from the implementation of hydraulic fracture stimulation (fracking) on the environment of Western Australia, outside of the Perth metropolitan, Peel and South-West regions.

The Inquiry will:

- Identify **environmental, health, agricultural, heritage and community impacts** associated with the process of hydraulic fracture stimulation in Western Australia, noting that impacts may vary in accordance with the location of the activity;
- Use credible scientific and historical evidence to assess the level of risk associated with identified impacts;
- Describe regulatory mechanisms that may be employed to mitigate or minimise risks to an acceptable level, where appropriate;
- Recommend a scientific approach to regulating hydraulic fracture stimulation; and

Will the thousands of scientific articles that we bring to you be read thoroughly and assessed? I would guess that there is more scientific documentation out there against Fracking than for and by the industry. Which holds more importance then? Documents stating the environmental, health, community and heritage impacts or those from industry saying how safe it is and how transparent they are?

Please keep in mind that the clear majority of us who oppose Fracking have nothing to gain through our submissions and our opposition to it personally. I would advise you to particularly take notice of submissions from those who are in favour of Fracking who do not have any vested interest; in any shape or form, rather than industry of course, who have has a lot to gain economically.

Regulations

The Terms of Reference state the Inquiry will describe regulatory mechanisms that may be employed to mitigate or minimise risks to an acceptable level.

Let me share with you parts of the Western Australian Biodiversity Conservation Act 2016 and the Queensland Biosecurity Act 2014. I have bolded the issues I feel are relevant to Fracking.

The objects of this Act are —

- (a) **to conserve and protect biodiversity and biodiversity components in the State; and**
- (b) to promote the ecologically sustainable use of biodiversity components in the State.

Principles of ecologically sustainable development

The principles of ecologically sustainable development are as follows —

- (a) decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations;
- (b) **if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation;**
- (c) **the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations;**
- (d) **the conservation of biodiversity and ecological integrity should be a fundamental consideration in decision-making;**
- (e) improved valuation, pricing and incentive mechanisms should be promoted.

Schedule 1 — Matters for which regulations may be made

[s. 255(2)]

1. The taking, possession, **disturbance**, keeping, breeding, feeding, release, buying, import, export, supply, storage and transportation of fauna and the conduct of any business involving one or more of those activities.
5. **Activity that is, or is likely to be, detrimental or harmful to fauna or flora or the habitat of fauna or flora.**
10. **The control of environmental pests.**
 153. **Disturbing fauna**
 - (1) **A person must not disturb fauna unless the person has lawful authority to disturb it.**

Penalty for this subsection:

 - (a) if the offence involves a cetacean — a fine of \$500 000;
 - (b) if the offence involves a critically endangered species that is not a cetacean — a fine of \$500 000;
 - (c) if the offence involves an endangered species that is not a cetacean — a fine of \$400 000;
 - (d) if the offence involves a vulnerable species that is not a cetacean — a fine of \$300 000;
 - (e) if the offence involves specially protected fauna that is not a cetacean — a fine of \$200 000;
 - (f) in any other case — a fine of \$50 000.
 156. **Use of prohibited device or prohibited method when taking or disturbing fauna**
 - (1) **A person must not use any prohibited device or prohibited method in the taking or disturbance of fauna.**

This information is from the Queensland Biosecurity Act 2014

All Queenslanders have a 'general biosecurity obligation' (GBO) under Queensland's [Biosecurity Act 2014 \(PDF, 1.5MB\)](#).

This means that everyone is responsible for managing [biosecurity risks](#) that are:

- **under their control and**
- **that they know about, or should reasonably be expected to know about.**

Under the GBO, individuals and organisations whose activities pose a biosecurity risk must:

- **take all reasonable and practical steps to prevent or minimise each biosecurity risk**
- **minimise the likelihood of causing a 'biosecurity event'**, and limit the consequences if such an event is caused
- **prevent or minimise the harmful effects a risk could have**, and not do anything that might make any harmful effects worse.

To properly understand your responsibilities under the GBO, you need to understand what is meant by 'biosecurity risks' and 'biosecurity events'.

A biosecurity risk is the risk that exists when you deal with:

- any pest, disease or **contaminant**
- something that could carry a pest, disease or **contaminant** (e.g. animals, plants, soil, equipment—known as 'carriers').

A biosecurity event is an event that:

- **has, or may have, a significant harmful effect on human health, social amenity, the economy, or the environment** and
- is caused by a pest, disease or contaminant.

When necessary, Biosecurity Queensland **takes formal compliance action** to ensure an individual, business or other organisation improves the way they manage biosecurity risks. Not complying with the GBO is an offence. Biosecurity Queensland may also seek a court order or the amendment, suspension or cancellation of a permit or other approval.

What is of concern to me is that statements in relation to unconventional gas in WA such as, “will be regulated,” are really only worth the paper that they are written on. The Western Australian Biodiversity Conservation Act 2016 was written with environmental protection as a top priority, yet the Mining Regulations 1981 over-rides it. It is very clear that mining is more important than environment, so I suspect that the environmental regulations may be pretty weak.

It has been seen very clearly throughout Australia’s Fracking debacle, that regulations, such as the Queensland Biosecurity Act 2014 are blatantly being ignored and abused by industry. Here are some incidents in Australia to date.

- *Peter Lindsay, a former CSG industry regulator in the Queensland Government (DERM) claimed that some of the infrastructure in Queensland is already failing (1.3).*
- *An example of the effect of corrosive water on cementing and casing is provided by deep oil exploration wells drilled in the Perdika/Great Artesian Basin in NT in the 1960s. Now, some fifty years later, the steel casing has almost entirely corroded away, resulting in inter-aquifer contamination. This well required expensive rehabilitation works to stem artesian flow. This single bore cost the Northern Territory and Commonwealth Governments \$500,000 to plug as the company responsible for the well was insolvent. This example highlights the issue of operator insolvency due to the boom and bust cycles of oil and gas development which complicate efforts to hold liable parties responsible and provide for timely environmental reclamation.*
- *A scalded area in NSW’s Pilliga Forest has not recovered almost 10 years after a wastewater spill by Eastern Star Gas. Wastewater leaking from a pond in the Pilliga (on tenements that Santos bought from Eastern Star Gas) resulted in the contamination of groundwater with uranium and arsenic.*
- *There have been numerous reports of water contamination and health impacts by people living close to Australian CSG fields in Camden, NSW and on the Western Darling Downs in Queensland.*
- *In Western Australia a well in the Whicher Range, east of Margaret River was fracked in 2004 using diesel as the fracking fluid because other fluids caused the clay soils to swell. The experimental technique failed and 53% of the 1.1m litres of diesel remains trapped down the well. (5.15, 5.16, 5.17)*
- *Hovea 8, a well in the northern Perth Basin, was shut in 2011 due to casing corrosion during production, only eight years into its operational life (5.2, 5.14).*
- *In the Robe River oilfield of the Carnarvon Basin during the 1980's, some old wells were bleeding gas and saline water (5.2).*

1.3	Lock The Gate video: A fractured country, An unconventional invasion. http://www.lockthegate.org.au/our_films
5.2	Vogwill R., 2017. Western Australia’s Tight Gas Industry – A review of groundwater and environmental risks. Conservation Council of Western Australia.
5.14	http://www.originenergy.com.au/files/Quarterly_Report_30_June_2011.pdf
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5.16	ASX Announcement Amity Oil Sept 8, 2004 http://www.antaresenergy.com/wp-content/uploads/2011/08/2004-09-08ASXSYD7526HMM_WR-5.pdf
5.17	Question On Notice No. 1553 asked in the Legislative Assembly on 31 October 2013 by Mr C.J. Tallentire:

The question I would ask is ‘Where were the regulations protecting these things from happening, and why didn’t the regulations stop them from happening? Saying that there will be strict regulations, as you can see above, means nothing.

Why are we looking at introducing an industry to Western Australia that will destroy our tourism; that would send the gas and dollars off-shore; that would cause multitudes of problems as seen over east and in the US and other places in the world; that would increase our carbon footprint three times (5.18) – the list goes on.

5.18	A recent report shows that the domestic carbon footprint from all of WA’s unconventional gasfields would be THREE times more than what Australia’s entire energy sector can emit to comply with the Paris Agreement. The report concludes that rather than risk stranded assets by investing in gas, it would be much smarter for WA to take advantage of its vast renewable energy resources. http://climateanalytics.org/latest/western-australias-gas-gamble
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This information was taken from Whan .B ‘Information summary on unconventional gas development for a scientific Inquiry’, 2018

It may not be possible to fully restore sites in sensitive areas following well completion or abandonment particularly in areas of high agricultural, natural and cultural value (European Commission Report). Over a wider area, with multiple installations, this could result in a significant loss of natural habitats.

A recent USA study documents the failure of plant and soil systems disturbed by drilling and fracking activities to return to pre drilling conditions following rehabilitation – even after 20-50 years. (8.5)

An interdisciplinary study published in Science 2015 demonstrated by studying the reduced amount of carbon absorbed by plants and accumulated biomass that the accumulating land degradation from the unconventional gas industry in the US (8.6)

Ecological experts in Australia have identified that the considerable surface footprint of Coal Seam Gas (CSG) infrastructure represents a serious threat to biodiversity fragmentation through direct clearing of bushland, loss of native vegetation, fragmentation of important remnant vegetation, spread of invasive weeds and an increase in fire risk. (8.7)

In Queensland, farmers have reported serious invasions of weeds. One cattle farmer has initiated legal action after he had to destock his property in Dalby after a sudden infestation of African lovegrass weed following CSG activities. (8.8)

Lawyers in Queensland representing farmers dealing with CSG industry consider that weeds may ultimately be one of the biggest legacies of the CSG industry. (8.9) and have highlighted the weaknesses of biosecurity measures.

8.5	Allred, B. W., Kolby Smith, W., Tridwell, D., Haggerty, J. H., Running, S. W., Naugle, D. E., & Fuhlendorf, S. D. (2015). Ecosystem services lost to oil and gas in North America. Science, 348 (6233), 401-402.
8.6	Allred, B. W., Kolby Smith, W., Tridwell, D., Haggerty, J. H., Running, S. W., Naugle, D. E., & Fuhlendorf, S. D. (2015). Ecosystem services lost to oil and gas in North America. Science, 348 (6233), 401-402.
8.7	Williams J., Stubbs T. & Milligan A. (2012) An analysis of coal seam gas production and natural resource management in Australia. A report prepared for the Australian Council of Environmental Deans and Directors by John Williams Scientific Services Pty Ltd, Canberra, Australia
8.8	http://www.abc.net.au/news/2014-08-23/farmer-claims-csg-companies-spread-weeds-on-southern-qld-property/5661016
8.9	https://www.shine.com.au/blog/coal-seam-gas-law/weeds-csg-insidious-legacy/

There are extensive databases providing scientific evidence of the risks and harms.

ROGER: Repository for Oil and Gas Energy Research (PSE) – 1400 papers (1.24)

The Physicians Scientists and Engineers for Healthy Energy maintains a citation database on shale and tight gas development involving about **1400** citations (1.24) - abstracts and links to scientific papers and peer-reviewed journal articles. <http://www.psehealthyenergy.org/site/view/1180>

1.24	ROGER Repository for Oil and Gas Energy Research. Physicians Scientists and Engineers for Healthy Energy: Study Citation Database on Shale and Tight Gas Development https://www.psehealthyenergy.org/our-work/shale-gas-research-library/
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Compendium of Scientific, Medical, and Media Findings Demonstrating Risks and Harms of Fracking – 1200 papers
(1.26, 1.7 concernedhealthny.org/compendium/)

The New York based health organization, the Concerned Health Professionals of New York, has compiled the Compendium of Scientific, Medical, and Media Findings Demonstrating Risks and Harms of Fracking - a fully-referenced compilation of the evidence for the risks and harms of fracking that brings together findings from the scientific and medical literature, government and industry reports, and journalistic investigation

1.26	Concerned Health Professionals of New York & Physicians for Social Responsibility. (2018, March). Compendium of scientific, medical, and media findings demonstrating risks and harms of fracking (unconventional gas and oil extraction) (5th ed.). concernedhealthny.org/compendium/ and psr.org/resources/fracking-compendium.html
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This estimate includes the amount of land that has been cleared for roads, well sites, pipelines and related infrastructure in each state. However, the total amount of habitat and landscape affected by fracking is much greater. In treasured open spaces, a single well-pad can mar a vista seen from miles around. A study of fracking development in Pennsylvania estimated that forest fragmentation affected more than twice as much land as was directly impacted by development.

<https://frackinginquiry.nt.gov.au/inquiry-reports?a=476739>

Table E3 Indicative project scenario parameters

Element	Scale
Approximate number of wells drilled per annum	10
Maximum number of wells in operation	257 (in 2042)
Number of well pads (8 wells/pad)	32
Length of gas field roads	55 km (1.7 km for each pad)
Length of gathering pipes	32 km
Area of disturbance (for pads, roads, gathering pipes and camps)	10.9 square kilometres (1,090 ha)
Area of disturbance for pipelines (Armadeus tie-in 50 km; Armadeus duplication 300 km; Northern Gas Pipeline duplication 622 km). It is assumed that the pipeline duplications are on similar alignments to existing pipelines)	Approximately 116 square kilometres (11,600 ha)

In August 2016, the Australian state of Victoria declared a permanent ban on fracking on the grounds that the risks outweighed any potential benefits.

Agricultural uses of wastewater as well as flow-back's water spills, raise questions about direct exposure of affected soils, contamination of food crops via bio-absorption through plant roots and impacts on livestock due to ingestion. Studies and case reports have highlighted incidences of death, neurological disorders, aborted pregnancies, and stillbirths from farm animals that have come into contact with wastewater.

Land use changes and transport of invasive species by drilling and fracking operations have led to documented ecological; and monetary harm to soils, forests and natural areas.

In 2017 Penn State University Researchers identified a direct correlation between the spread of invasive non- native plants in forests and specific aspects of fracking operations. Within ten years weeds have spread to over half of the 127 well pads in the survey. Gravel shipments and mud on tyres and undercarriages on trucks unknowingly carried seed.

Mulhollem. J. (2017) Shale gas development spurring spread of invasive plants in Pa Forests. Penn State news.

An interdisciplinary study demonstrated that the accumulating land degradation has resulted in continent-wide impacts, as measured by the reduced amount of carbon absorbed by plants and accumulated by biomass. This is a robust metric of essential ecosystem services such as food production, biodiversity, and wildlife habitat.

Allred, Kolby Smith, Tridwell, Haggerty, Running, Naugle & Fuhlendorf, (2015) Ecosystem Services lost to oil and gas in North America, *Science* 348 (6233) 401-402.

Two Colorado scientists performed a detailed analysis of vegetative patterns – followed chronologically – over a selected group of well pads, including two undisturbed reference sites. They documented the disturbance of plant and soil systems linked to contemporary gas well pad construction and found that none of the pads returned to the pre-drilling condition, even after 20-50 years. Full restoration may take decades of intensive effort.

Minnick & Altward (2015) Plant-soil; feedbacks and the partial recovery of soil spatial patterns on abandoned well pads in sagebrush scrubland. Ecological Applications 25 (1) 3-10.

US forest service es researchers reported dramatic negative effects on vegetation caused by the drilling and fracking of natural gas well in Virginia. They found browning of foliage NEAR THE WELL PAD, LACK OF GROUND FOILAGE and that many trees nearby had dropped their foliage. Dramatic impacts on vegetation were found where drilling and fracking wastewater were sprayed on the land as disposal following completion of the well. 60,000 gallons were sprayed and 115 trees were damaged as well as other evidence of harm. A year later this figure grew to 147 trees.

Adams, Edwards, Ford, Johnson, Sculer, Thomas Van Gundy, Wood (2011) Effects of development of natural gas well and associated pipeline on the natural and scientific resources' of the Fernow Experimental Forest. US Dept of Agriculture www.fs.fed.us/nrs/pubs/qtr/qtr_nrs76.pdf

A paper in the Journal of Agriculture described how natural gas leaks in soil can damage plants and crops. Vegetation dies in the vicinity of gasleaks. Due to the oxidation of methane by methane-consuming bacteria, gas leaks drive down the oxygen concentration to extremely low levels and cause carbon dioxide levels to rise.

Davis SH (1977) The effect of natural gas on trees and other vegetation. *Journal of Agriculture* 3(8) 153-154

Contaminated sites, accidents and other incidents related to CSG/LNG Australia

<http://www.groundswellgloucester.com/resources/downloads/Contaminated-sites.pdf>

Conclusion

1. We need an MDS of **chemical interactions** not just individual chemicals.
2. If the wells fail or companies go to the wall, there should be a fund to 'rescue' property owners and custodians and to try to repair the damage. This should be paid up front by the companies themselves as a **surety**.
3. **Baseline data** must be done first including community health, employee health, flora, fauna, waterways, air quality etc.
4. **Research** must be done – from the **cradle to the grave**.
5. The **precautionary principle** needs to be applied. This principle is expressed in the Rio Declaration, which stipulates that, where there are "threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.
6. The citizens of this land must have the democratic right to say no but the community has **no rights to veto**. This must be changed prior to any exploration taking place.
7. We want to see **exploration** for unconventional gas **banned** immediately
8. We want a **ban** on **simulated hydraulic fracturing immediately**
9. We want **renewable energy** instead and a push to head towards cleaner energy