

INTRODUCTION

I am a long-term Territorian, having lived here since 1977. I understand the importance of economic development for the NT. However, with global awareness of climate change, I can't help but be concerned about the potential environmental and social impact of development in the NT.

The Territory should aspire to economic and environmental sustainability. We should be encouraging industries that will benefit the residents, in the immediate future, and in the long run. We should be minimising the impact of these industries on the environment, in part to protect our existing industries, particularly tourism and agriculture.

Part of this long-term development strategy must include investment into sustainable energy from renewable sources, and careful and balanced consideration of any resource development outside of that.

The Territory has the advantage of being youthful, flexible and adaptive. We should be progressive with our development, rather than investing in the volatile and poorly-regulated gas industry.

Poor market regulation and questionable investment decisions have resulted in an ongoing imbalance between Australian domestic and export gas supplies, resulting in ongoing artificially-inflated domestic gas prices. This does not support a prosperous and sustainable investment for the NT in the long-term.

As such, the potential environmental costs related to the gas extraction process cannot be justified.

CLIMATE CHANGE - THE WORLD CANNOT AFFORD MORE FOSSIL FUELS

"Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, sea level has risen, and the concentrations of greenhouse gases have increased. The atmospheric concentrations of carbon dioxide, methane, and nitrous oxide have increased to levels unprecedented in at least the last 800,000 years. Carbon dioxide concentrations have increased by 40% since pre-industrial times [c. 1750 onward], primarily from fossil fuel emissions and secondarily from net land use change emissions" (IPCC, 2013). "Human influence on the climate system is clear... It is extremely likely that human influence has been the dominant cause of the observed warming since the mid-20th century" (IPCC, 2014).

The world's combined scientific community (represented by NASA, the World Meteorological Organisation and the Intergovernmental Panel on Climate Change) says that climate change is happening fast. So fast, that animal and plant species cannot adapt fast enough to survive rising temperatures, melting icecaps and some of its other consequences.

This is borne out by many news reports including items about polar bears beginning to struggle to survive because of melting polar ice and loss of the corals of the Great Barrier Reef from coral bleaching events triggered by rising sea temperatures (see <http://www.abc.net.au/news/science/2017-03-16/coral-graveyards-grow-as-bleaching-becomes-the-new-normal/8353030>).

With islands already disappearing under the sea, island countries are desperate for action and many major coastal cities of the world are at risk.

In fact, despite what US President Trump and others would like to believe, evidence of human-induced climate change is incontrovertible.

Scientists all over the world, including Australia's scientists, are demanding that governments address the issue. (See <https://blogs.scientificamerican.com/observations/an-open-letter-from-scientists-to-president-elect-trump-on-climate-change/> and <https://www.theguardian.com/science/2016/aug/25/letter-signed-by-154-australian-experts-demands-climate-policy-match-the-science>).

GAS IS A FOSSIL FUEL

In terms of climate change and the damage caused by greenhouse gases, all fossil fuels are a risk.

The burning of gas involves the release of carbon dioxide and its production involves release of methane, which contribute to climate change. Gas is a fossil fuel the use of which is contributing to climate change – and as an energy source, it does not compare favourably with renewable energy:

Extracting natural gas uses environmentally-unfriendly measures with side effects that may be long lasting. It is also costly in real terms. It is known to have high ongoing costs of production (for water, pipes, chemicals, explosives, sand, power for extraction, transport of materials to the site, transport of gas to point of sale, gas processing costs, post-production well-capping etc). However it has other costs that are not normally made clear to the community, for example whereby the industry occupies and changes land that is rendered less productive for other purposes, or causes damage that requires mitigation.

Large scale renewable energy facilities have many of the same input costs, for land used, for construction of power generation and distribution facilities and so on, but renewable energy requires no processing, its use of land is often compatible with other productive purposes and once it is established, there are few ongoing costs.

Gas has always been promoted as a 'safer' option than coal. This claim is premature. Further research is required about the issue because recent developments cast doubt on the environmental benefits of natural gas (especially as a result of escaping methane gas), see <http://www.abc.net.au/news/2017-04-17/csg-could-increase-methane-emissions-near-condamine-river/8445758>.

SOLAR POWER IS CHEAPER THAN FOSSIL FUELS IN MOST CAPITAL CITIES

The Climate Council says solar energy is now cheaper in Australia than retail power prices in most capital cities. The price is also expected to fall a further 40%-70% by 2040.

The Climate Council says that in Australia 'Solar power is cheaper, has no (ongoing) fuel costs, is non-polluting and it is clear that it will be a key of Australia's future.'

The CSIRO energy division's principal research scientist Paul Graham told a Senate select committee that there is no technical reason why Australia could not use 100% renewable energy.

<http://reneweconomy.com.au/csiro-says-australia-can-get-100-per-cent-renewable-energy-86624/>

He said 'there were no barriers to 100 per cent renewable energy, and lower levels could be easily absorbed'.

<http://www.abc.net.au/news/2017-02-27/100-per-cent-renewable-network-possible/8306482>

Furthermore, the energy market, particularly the 30 minute settlement rule, currently 'favours incumbent gas generators at the expense of fast-response new technology such as battery storage', (see also <http://www.smh.com.au/business/the-real-reason-our-power-companies-block-battery-systems-20170329-gv8ybe.html>).

Energy expert Dr Matthew Stocks, from the College of Engineering and Computer Science, at Australian National University gave evidence to the select committee that a system based on renewables could provide a 'stable balanced system with a combination of wind and PV and pumped hydro storage.'

It should be encouraging for the NT and other jurisdictions that the ACT is already providing 35% of its energy requirements from renewables - <http://www.canberratimes.com.au/act-news/mugga-lane-solar-farm-opens-bringing-act-to-35-per-cent-renewable-energy-20170302-gup673.html>

It is also clear that there are many potential investors who are willing and able to contribute towards renewable energy projects and who compete to be able to do so. (See <http://www.abc.net.au/news/2017-04-30/community-energy-projects-selling-out-within-minutes/8476794>)

TERRITORIANS VOTED AGAINST FRACKING

In the most recent election for the Legislative Assembly, many Territorians voted against fracking because of a wish to protect our local population from harm and avoid global harm by contributing to climate change.

Climate change is a risk for the long term. It's a risk that gets progressively more dangerous for the generations that follow us on earth, our children and grandchildren, and fracking is only a short-term energy solution. (Most wells produce for a few decades at most.)

SAFETY ISSUES - CONTAMINATION

DIFFICULTY OF TESTING ACCURATELY TO DETERMINE STATUS QUO

If this industry goes ahead in the Northern Territory, it is going to be difficult to determine what contamination may have occurred as a result. Detailed 'base-line' data is not yet available to record what is the normal background level of materials and contaminants in soil, water and air around the locations where test wells have already been drilled.

Territorians cannot rely on any environmental assessment that is done now in the vicinity of the test wells, because any current results could already be showing differences from the natural environment.

SAFETY OF THE CHEMICALS USED

It is claimed by gas extraction industry representatives that chemicals and substances used in fracking are common 'household chemicals'.

Many are apparently chemically similar to products commonly found in households, but this is not comforting. Clearly there are serious risks from the use of household versions already – chlorine (volatile and dangerous, as any pool owner can tell you, and produces fumes that are toxic. Masks should be worn when using it); detergent (useful in cleaning but still poisonous and believed to be carcinogenic in some circumstances); salt (sterilises or poisons soil so plants and animals cannot survive); boron kills ants and other insects and will be a risk to biodiversity; acid of any kind has the potential to affect all living creatures, not just the ones in the pipes, etc – and the problem of antibiotic resistant microbes might be even more difficult for the world to manage if antibacterial agents are escaping underground.

The fact that chemicals are **common** doesn't mean they'd be safe if they turned up in drinking water, soil or air.

And they may not remain safe if left sealed underground after extraction is completed – long-term, interactions may occur that cause other as yet unidentified problems.

REGULATION AND LEGISLATION IS NO GUARANTEE OF SAFETY

Territorians have difficulty putting their trust in industry safeguards and regulation.

We don't trust the safeguards because there have been many episodes in recent history of pollution and environmental damage from spills of industrial chemicals and other industrial accidents where managers, politicians and corporations have let down their community.

Various kinds of corporate or government carelessness or ignorance or wilful neglect resulted in:

Cigarette companies knowingly ignoring scientific findings for financial reasons and to avoid responsibility for cancer deaths

Chemical poisonings – for example Union Carbide failure at Bhopal in India, said to be an example of ‘corporate indifference to human welfare’ with several thousand people killed and upwards of 50,000 more poisoned at the time, and water still polluted 30 years later; and the Minamata mercury poisoning disaster in Japan which was only identified years later

Salinity of soils and agricultural disasters producing long-term harms; many deaths known to be caused by smog and air pollution from illegal logging

Poor maintenance of aircraft resulting in plane crashes

Illegal logging and mining in Leyte causing mudslides that killed thousands, including hundreds of primary school children

Nuclear accidents, with the top few being Fukushima, Chernobyl, Kyshtym and Chelyabinsk Russian accidents, Windscale in the UK, 3 Mile Island in the USA, etc

Other mining disasters have produced environmental consequences:

- Ok Tedi gold mine in PNG
- Rum Jungle nearby in the NT
- Ranger uranium mine at Jabiru – overflows from tailings dams occurred many times, some not openly reported, despite regulation and work of Office of Supervising Scientist
- BHP & Vale in the Samarco mine disaster in Brazil
- Asbestos miners and Hardy asbestos products

Many terrible industrial incidents also related to petroleum industries and many left behind long-term or permanent messes, for example:

- Exxon Valdez oil spill in Alaskan waters
- Shell Deepwater Horizon spill in Gulf of Mexico
- Montara oil spill off Timor Leste
- Contamination of groundwater in Wyoming, Pennsylvania and Texas.

There are industrial accidents caused by corporate failures and negligence; there are accidents resulting from individual failure, ignorance, carelessness or simple fatigue; there are accidents caused by unexpected equipment failures and complications from unusual climatic events and sheer bad luck.

Most accidents appear to be the result of a chain of failures, including regulatory gaps.

It will be said that the Territory can manage these risks in an onshore gas extraction industry by ensuring gas extraction and processing is governed by a regime of strict and careful regulation. However, regulation changes at the whim of whatever government is in power and cannot be relied upon. In the recent past, water regulation intended to protect future water resources and guarantee access for Indigenous Territorians was changed at the direction of government. Each time a new government comes to power, industry safeguards may be changed and all governments can change every few years.

Furthermore, successful regulation would rely on careful supervision and prompt enforcement. Such a process is difficult in such a huge jurisdiction as the Territory and has notably failed in various other Territory extractive ventures. For example as mentioned above, the Ranger uranium mine has overflowed its tailing ponds on various occasions, despite being subject to legislation and regulation. Also there are anecdotal reports by Territorians travelling in remote regions that some remote mining ventures have contrived to avoid official supervision so they can continue with unsanctioned environmentally harmful activities. These activities have reportedly left contamination that will remain for Indigenous Territorians to live with and future generations to deal with.

In any case, Federal governments have overruled Territory legislation before, in relation to euthanasia. The Territory's right to make its own laws under self-government was overturned under pressure from particular Federal Cabinet ministers. It is not hard to imagine that similar pressure from a fossil fuel lobby or a coal-loving Federal Cabinet minister might result in Territory regulation being overturned on the pretext that it was 'not in the national interest'.

COSTS AND RISKS OF INDUSTRY

Fracking presents a combination of costs and risks, both known and potential:

- It requires huge amounts of fresh water resources for its extraction – water is a scarce resource in the areas of the NT, and the gas companies will be competing with Territorians for access to their surface and ground water supplies
- It affects large areas of land: it involves construction of roadways which themselves consume land, which divide up the area and make other pastoral and agricultural activities more difficult and consequently less efficient. In other words, it reduces the productivity of the land
- It requires lots of electricity – again, this is an expensive and scarce resource for NT
- It uses huge amounts of sand for each drill and this will have to be mined - so the industry is destructive of other landscapes that will require restoration after it is gone
- It requires the transport of chemicals over long distances – and this involves many opportunities for things to go wrong. Think of the train derailment accident in the NT that contaminated the Edith River, the Genesee Wyoming derailment near Hugh River – these accidents caused contamination that required months of environmental clean-up. Many other incidents of contamination from conventional mining activities are spoken about anecdotally and not reported officially
- In the extraction process, large quantities of methane – a worse greenhouse gas than carbon dioxide – are lost directly into the atmosphere. This escape may go on for many years and has not been adequately assessed. Until it can be, and until operators can prevent the escape of methane, the gas extraction industry cannot claim to be 'cleaner than coal'. (see <http://www.abc.net.au/news/2017-04-17/csg-could-increase-methane-emissions-near-condamine-river/8445758>)
- It brings dangerous materials to the surface of the earth. These include toxic substances from the extraction process and naturally occurring radioactive materials. These materials get to the surface of earth through the pipes that have been drilled into the earth, and sometimes as much as 4 kilometres underground, through whatever is there, including the aquifers

- So there is potential for contaminating above ground water in rivers and streams, and underground reservoirs. This cannot yet be assessed adequately due to a lack of knowledge about the collection and behaviour of water in different underground water bodies, and their potential to spread any contamination that might occur.
- Territory water bodies, above and below ground, are known to be interconnected, but to the best of my knowledge, they have not yet been adequately mapped. Until the connections and the ways water flows between water bodies is known, it would be potentially disastrous if any contamination entered into any surface or underground water body. It is not reasonable to say that only certain agricultural or pastoral producers would be affected by contamination of a particular water body from a particular well, when it is not known where that water flows underground. By the time something goes badly wrong and other producers are able to prove they are affected, the contamination might have cost many producers their livelihoods and the NT an important industry
- There is known potential for accidents involving the extraction process, as well as delivery pipes and storages (see ACCIDENTS RELATED TO FRACKING IN THE USA below) – recent reports show there have been many contamination incidents in the USA where fracking is underway. (For example, there was a recent incident where a North Dakota pipeline ruptured and spilled more than 130,000 gallons of oil into a creek. The same company responsible has had 36 other spills since 2006, releasing a total of more than 320,000 gallons of petroleum products into the environment. Reported in AAP news item dated 13 December 2016)
- There is potential for causing damage to underground structures of the earth as indicated by USGS earthquake data from Oklahoma and Pennsylvania (vs California). These earthquakes are not related to natural movement of tectonic plates but are appearing in otherwise stable land, apparently as a result of leftover contaminated fluids being injected back underground.
- On top of all this, the NT has a small population spread over a large area. Many of the residents of remote areas are Indigenous people whose country is vital to their wellbeing and whose future livelihood relies on other industries that would be affected by any damage to the environment.
- The resources to carry out a basic assessment of water, soil and air in those areas of the NT are limited and a baseline assessment has not yet been done. Without baseline data, how can we show what environmental effects there are? Let alone the social, emotional and financial impact on the residents.
- The communities that occupy land subject to exploration and affected by the ‘test’ fracking wells in the Beetaloo Basin are already reporting adverse health effects from other mining, and experiencing emotional distress at observing burning plumes of escaping gas.

Future development of the north cannot rely on an industry that will be here for a few decades at most, and may cause so much damage to the environment. Sustainable development will need to include other resource extraction, pastoral and agricultural industries, fishing and tourism particularly for Indigenous communities in regional and remote areas where other employment opportunities are limited.

Water resources are precious and maintenance of Australian’s renowned clean environment for food production and the beauty of natural ecosystems for tourism in those locations will depend on their water supplies. Plentiful safe potable water supplies will be vital.

We cannot afford mistakes, and the community owes it to Indigenous Territorians that what remains of their environment is preserved.

ACCIDENTS RELATED TO FRACKING IN THE USA

I was surprised to hear media reports about representatives of the petroleum industry giving information to the NT's scientific inquiry about there being 'little evidence of any permanent damage' from fracking.

Other than data related to health outcomes and environmental damage, there is convincing data linking significant earthquakes to activities related to fracking. The US Geological Survey has reported a rapid increase in the number of 'induced' earthquakes over the past several years in central and eastern USA, caused by wastewater injection, oil recovery and fracking processes. For example, Oklahoma and Kansas both had a jump in the number of earthquakes after 2010 as the numbers of wells steadily increased. But then Kansas introduced limits on wastewater disposal and achieved a 60% drop in the number of earthquakes. Oklahoma did not introduce limits on wastewater disposal and the number of earthquakes there has increased.

Others seem to think there has been negligible contamination of water bodies from fracking. However a recent report released from Duke University indicates that between 2 and 16% of fracked wells spill hydrocarbons or pollutants into their surroundings every year from the time the well is drilled until production is completed (generally decades). The report recorded that in just 4 states, there were over 6,600 spills in 10 years, some of them small and some enormous. About half the spills were related to 'storage and moving fluids via flowlines', presumably through pipes that rupture or crack. (Their figure varies from EPA reports of 457 spills over 8 states over 6 years, because the EPA only looked at spills that occurred during the hydraulic fracturing process itself.).

The report was published in the Journal of Environmental Science and Technology on 21 February 2017, and its lead author was Lauren A Patterson.

CITATION: L. Patterson, K. Konschnik, H. Wiseman, et. al. 2017. "Unconventional Oil and Gas Spills: Risks, Mitigation Priorities and States Reporting Requirements" Environmental Science & Technology: DOI: 10.1021/acs.est.05749

Note that the authors stressed the importance of having 'standardized, public data.'

IF FRACKING GOES WRONG IN THE TERRITORY, WHO CARRIES THE RISK?

There is a risk to the developers of gas extraction and other mining ventures when things go wrong, but in general it's risk of financial cost, not personal harm – not a risk to their health or their water or food or the very air that they breathe. The developers, however, gain nearly all the benefits.

These investments are usually foreign owned. (That is, most of the money is borrowed from overseas.). Profits and production from gas extraction ventures mostly go out of Australia to other countries – the overseas companies and the purchasers of their products.

People living in the local areas where these developments take place end up wearing the personal risks. In this case, that means Territorians.

It's already known that global warming is producing changes in evaporation and rainfall patterns across the world. An already scarce water supply may be further reduced in some areas as the climate changes. If it comes to a competition for water between a company drilling for oil or gas, and a food producer, I'd generally prefer to see the food producer win. But it is unlikely a pastoralist, horticulturalist or farmer would have the financial resources to compete with a multinational corporation for something as basic as water.

AND WHAT ARE THE BENEFITS?

JOBS

We are told that this industry will bring many benefits for Territorians. It seems to me that there will be benefits for those who obtain work supporting the industry, and for those who supply goods and services, but the major companies involved are not Territory developers, they are based interstate or overseas.

The jobs the industry brings are mainly FIFO jobs. The actual industry workers needed are unlikely to be found in the Territory because most ongoing jobs in the industry are for highly skilled specialist geologists and drill teams. These workers will transfer from interstate or overseas where wells in fields there are running out.

Of the jobs that are suitable for local workers, most will be in short-term construction and service work.

And of course, as renewable energy projects are developed in the Territory, there will be jobs related to that industry for local workers too.

DEVELOPMENT OF THE NORTH

Petroleum-based industries are able to attract investment funds but they are not the only industries which are attractive to investors. Like in the ACT, investors all over the country and overseas are keen to find renewable energy investment opportunities. Small scale projects have no difficulty finding investors. Even Macquarie Bank has recently positioned itself to invest heavily in renewable energy in the UK (see <http://www.macquarie.com/au/about/newsroom/2017/macquarie-led-consortium-to-acquire-the-green-investment-bank/>).

As the NT turns its attention and its resources to promoting renewable energy developments, it is likely that Territory investors will be similarly keen to participate. Such projects could themselves provide local jobs and there would be more job opportunities for Territorians in the industries that grow in response to a reliable, local renewable energy supply.

If the Territory pursues gas extraction industries instead, this will divert resources that could promote the further development of existing successful industries.

Promotion of gas extraction also has the potential – the real risk – of causing harm to other industries or damaging the ‘clean and green’ Territory image. The risk is that our pastoral industry is disrupted or limited to non-damaged areas, our underground aquifers are contaminated, aquaculture, horticulture, tourism and fishing are gone. The potential is for generations of Territorians with health issues and the consequences of social disruption.

MY CONCLUSION - THE TERRITORY SHOULD WAIT

The resource is a once-only opportunity.

The gas is currently safely stored and at some time in the future if new technologies are developed to limit production of greenhouse gases, it could then be used. It's not going away.

Because of the many unknowns in terms of the risk of worsening climate change, and future environmental damage, we owe it to future generations to oppose further new fossil fuel projects.

No matter how well managed, well prepared and well-intentioned the developers of the proposed onshore gas extraction projects, no-one in the industry can promise there won't be accidents – whether spills, explosions, or further methane escapes.

As in the nuclear industry, or in any mining process, there will be a long-term risk. Wells eventually stop producing and must be closed off. The safety of the production process and closed wells over following centuries depends on the care taken by operators, the geological circumstances and the integrity of materials used. Materials can fail and mistakes are made even in such carefully regulated circumstances as the airline industry so it is foolish to think that another corporate-profit-driven industry such as gas extraction would be perfect.

In my view, there is nowhere near enough potential benefit from an onshore gas extraction industry to compensate for the risks to Indigenous Territorians and all future generations who will gain none of the benefit, and who will have to live with any damage.