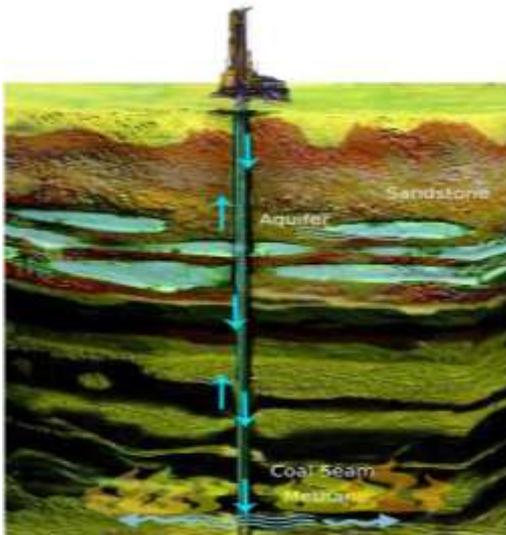


FACT & ACTION SHEET

COAL SEAM GAS

SUMMARY: *In the last F&A session we talked about counting the Cost of Coal. Coal has very obvious impacts on the environment and is associated with significant local and global health risks. For these reasons many industry leaders and politicians promote natural gas as a more environmentally friendly option. However, no energy source is perfect. This month, learn about the process of coal seam gas (CSG) extraction, where it is being carried out in Australia and the concerns over its impacts on health and the environment. The issue of CSG extraction is extremely controversial, with both sides of the debate being extremely polarized. Where necessary, the two sides of the debate and materials produced by both sides will be used, to aid in understanding the complex issues surrounding CSG and how they are being presented. However, as doctors and medical students, we focus on practicing Evidence Based Medicine. Therefore, question the motives and evidence behind both sides of the argument. As you will find, evidence is lacking on both sides. The biggest issue we face is not knowing what the potential impacts of CSG activities are. Therefore, this month we will be writing to Tony Burke (Minister for Sustainability, Environment, Water, Population and Communities), asking for a moratorium on CSG until the full impacts of CSG on the environment and human health are better understood.*

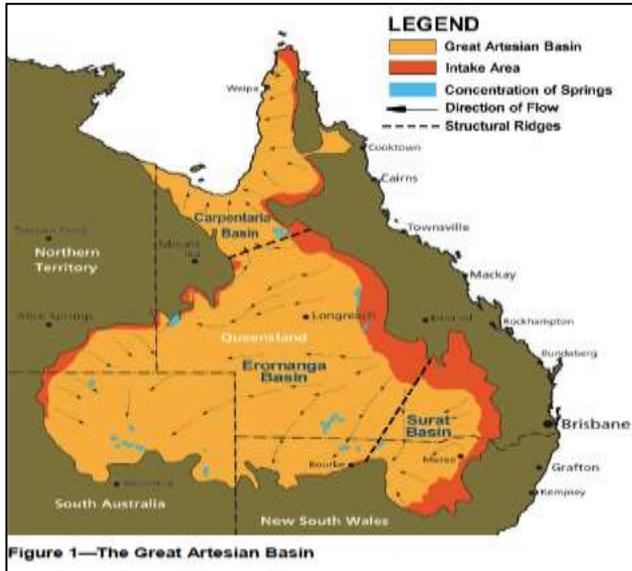
Background



Coal seam gas (CSG) is methane, the same gas that makes up conventional natural gas. Conventional natural gas is extracted from pockets within sandstone, but CSG is found within coal seams. The coal seams can be found both above and below aquifers, many of which are sources of water for drinking and agriculture.

A common method of CSG mining is to fracture (fracking) the coal seam with thousands of litres of water mixed with

sand and BTEX (volatile organic compounds that can cause neuropathies). This fracking method changes the pressure of the stored gas, and stimulates the coal bed seam that releases more methane gas. The water is drawn back to the surface, along with the released methane gas. The gas is then collected, compressed and sent off for use or further processing. However, in Australia, not all CSG wells need fracking.



Coal seam gas is predominantly rich in the Surat and Bowen Basin, within central and northern QLD, as well as the Clarence-Moreton Basin in SE QLD and NE NSW. The Surat basin is a part of the Great Artesian Basin and the Bowen Basin underlies parts of the Great Artesian Basin. Both are important sources of fresh water for humans and agriculture. However, CSG exploration and mining is expanding too many regions of Australia.

Activity Number 1:

Watch this video from Four Corners to get an overview of the topic.

<http://www.youtube.com/watch?v=878wfO4kfGo&feature=related>

Activity Number 2:

Watch the video on this webpage

<http://www.wewantcsg.com.au/coal-seam-gas>

(Please note this video is funded by the Australian Petroleum Production and Exploration Association (APPEA). This resource was chosen to illustrate the arguments that are commonly employed by those who are in favour of CSG.)

Activity Number 3:

To understand the location of CSG exploration and mining in Australia, go to this webpage, scroll down to the map, and type in the name of your city. Use the 'Coal Seam Gas Hotspots' buttons under the map to see areas of highest intensity mining

<http://www.abc.net.au/news/specials/coal-seam-gas-by-the-numbers/>

Salinity

Salinity is already a huge problem in Australia, due to the toxic effects on agriculture, habitats for local animal species, and contamination of potable water supplies. Further exacerbations of salinity in Australia could

threaten our food production capacity and the capacity of landholders to continue productively using their land.

Water that flows up from the coal seam is brackish, about 1/6 the salinity of seawater. If it is deemed safe to do so, this water is reinjected into aquifers. Some of this water is desalinated by reverse osmosis and released back into the environment, an energy intensive process that produces salt as a byproduct. In some cases, where there are no feasible alternatives, the water is placed in evaporation dams, which also produces salt as a byproduct. Because the amount of water that is predicted to be produced by CSG varies greatly (as well as the salinity of the wastewater), it's hard to say exactly how much salt will be produced. But it's safe to say that at least [20 million tonnes of salt](#) will be produced as a result of CSG.

Concerns over Water Contamination and Depletion:

Many of the concerns that are held about CSG centre on water, such as contamination and depletion of valuable resources. These concerns are summarized as follows:

- CSG may contaminate aquifers due to:
 - The injection of chemicals into aquifers during the process of CSG extraction
 - Cracking between aquifers as a result of drilling or fracking
 - Mobilization of naturally occurring minerals

Furthermore, water extraction due to CSG activity could depressurize aquifers, leading to contamination between aquifers, or leakage onto the surface. Because aquifers are important sources of drinking water and water for agricultural purposes, they would become unsuitable and dangerous for future use.

- CSG companies are exempt from the water allocation schemes that affect the landowners on whose land they operate. CSG activities could result in the extraction of around [300 GL of ground water each year](#). This is more than half the current yearly extraction of the Great Artesian Basin.
- The movement of water within and potentially between aquifers and coal seams is not fully known. While the CSG companies have some data about this, due to their [commercial interests](#), it has not been released. The potential consequences of aquifer contamination and depletion could be disastrous to both domestic water supply and agricultural supply.

Fracking

For those of you who have watched gaslands, you'll remember that much of the concern around CSG was due to the process called fracking. Fracking is a process that breaks up the coal seam to improve gas and water flow. Fracking involves injecting a mix of water, sand and chemicals into the coal seam. Not all the chemicals that are used in the process are known, as ["much of the information regarding the identity and concentration of chemicals used in fracking fluid is considered by the industry to be proprietary and therefore confidential"](#). Currently, in NSW, fracking has been banned. The State Inquiry recommended that it remains banned until the safety of fracking chemicals has been assessed.

The Australian Petroleum Production and Exploration Association (APPEA) has released a list of [fracking chemicals](#) that have been used in Australia, which they compare to common household products, but 'fracking fluids do vary'. [As Dr David Shearman and Dr Marion Carey write](#), "Potentially hazardous chemicals reportedly used in Australian fracking operations, include ethylene glycol, glutaraldehyde, fumaric acid, 2-butoxyethanol. [Ethylene glycol](#), for example, is used in anti-freeze. In the body it can be metabolised to acidic compounds causing a metabolic acidosis or to oxalate crystals which cause renal impairment when deposited in the glomerulus. *Just because we may have hair bleach or antifreeze in the cupboard does not mean it is safe to drink it.*"

It is also commonly stated that the chemicals used for fracking only make up a tiny proportion of the fracking fluid, as you saw in the first video you watched, the APPEA states that the chemicals only make up 1% of the fluid. That may be the case, but if large volumes of fracking fluid are used in CSG activities, then there may be large releases of toxic chemicals into the environment. In the scientific community we've progressed a long way past the often incorrect assumption that 'the solution to pollution is dilution'.

Land Rights

Disputes over land rights between CSG companies and land owners (farmers) have resulted in much distress to the latter group. It is certainly worth considering the impact that this situation has on mental health.

Most farmers in Australia own their land under freehold or it is used under a pastoral lease. To most Australians it can seem a bit confusing, that CSG companies are allowed on to their property, while the landowner can otherwise exclude whomever they want from their land. The reason for this discrepancy is quite simple and is based on the centuries old system called the *Doctrine of Tenure*. Under this system the Crown reserves the right to undertake extraction of petroleum on your land, or authorize

others to, much in the same way that the Crown reserves the right to buy back your land for essential infrastructure. CSG companies who buy the rights to the extract on the landowner's property must enter a 'negotiation' with landholders to access and use their land. This involves discussions over compensation and is supposed to include community and land owner consultation over issues such as placement of infrastructure. The very recent NSW parliamentary inquiry found that there is a discrepancy over rights, with the CSG companies having the upper hand and often failing to carry out the required consultations.

Pace of development

Opponents to CSG and journalists have commonly described the rapid development of CSG as a 'mad rush'. The APPEA has hit back at this, saying that it implies 'greed and haste' and is biased reporting. However, the [NSW parliamentary inquiry](#) did find that "the industry's development has outpaced the Government's ability to regulate it". Clearly there is a need to slow down the development of the CSG industry, to meet the ability of the Government to regulate it.

Many claims of pollution and adverse health effects are currently anecdotal, as the ability to regulate and investigate the many thousands of wells that are now operational is insufficient. Incidents that have been [recorded](#), by the Department of Environment and Resource Management (DERM) in Queensland, in the first half of 2011, include spills of CSG water, discharge of CSG water into the environment, exceedance of discharge levels, excessive vegetation clearance and release of BTEX chemicals into the environment. CSG extraction has already resulted in release of toxic chemicals and produced water into the environment. There is an obvious need for more regulation, assessment and enforcement.

Health Impacts of CSG

The adverse health effects of CSG include:

- Air contamination: volatile organic compounds (VOCs) are released during the process of CSG mining, such as methane separation. Fracking the coal seam beds, and drawing back the wastewater into evaporation ponds, releases many toxic chemicals into the atmosphere. The direct effects are respiratory irritation from inhalation of these chemicals.
- VOCs also facilitate the formation of ground-level ozone, which is another respiratory irritant and impairs lung function.

- In addition to the physical effects of water and air pollution from CSG mining, it can also contribute to mental health problems for local communities living close to a gas field. When the mining companies initially survey the land and subsequently use it as a gas field, agricultural land will be damaged or destroyed, which has major impacts on the farmers' livelihood. However, farmers often have no say in whether or not a company is allowed to carry out a CSG operation on their land. This leaves the farmers with feelings of anxiety, frustration and disempowerment.
- The risks from fracking are as yet unknown, but there have been reports of at least two gas explosions in different sites, and saline water leakage. Therefore, further investigations need to be made into the "operational safety" of CSG mining.
- If things were left at the status quo, then CSG mining may continue without health safeguards and CSG may have already done its damage on the health of local communities. Therefore, it is absolutely paramount that we take preventative action now.

Action

Write to Tony Burke MP, Federal Minister for Sustainability, Environment, Water, Population and Communities; and Tanya Plibersek MP, Federal Minister for Health. Minister Burke has previously established the Interim Expert Scientific Committee on CSG and Coal Mining, but there is a bias towards experts from the CSG industry, and a lack of health professionals.

Also write to your local MP, who can hopefully advocate for your views when the issue of CSG mining comes up.

In your letter, please raise the following key points:

- **Place a moratorium on CSG extraction until these conditions are met**
- The potential health effects of chemicals that are used in CSG extraction are characterized
- The cumulative risks that may be posed to environmental and human health due to widespread CSG extraction are quantified
- The potential for aquifer contamination and cross contamination is better understood
- A health impact assessment protocol for future and current CSG operations is instituted.

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