Western Australia Fracking Inquiry Submission
By Amy Williams

The direction the Australia government is choosing to take regarding energy security, food security and the conservation of our great nation's flora and fauna is genuinely terrifying. At this rate, there will be no Great Barrier Reef, there will be water shortages, there won't be enough food produced within Australia to feed its growing population. The people governing our country are far too short-sited, worrying about short-term economic growth and failing to see the bigger picture. Many thousands of jobs will be created if Australia moves toward renewable energy, not to mention the thousands of jobs that will remain in tourism if the remaining pockets of pristine Australian environment are protected. As a mother of 2 children, I implore you to abandon fracking and look toward renewables. Countries such as Germany are leading the way, showing the rest of the world that renewables can provide adequate energy to a population. Lets learn from these countries and become world leaders in sustainable energy production to ensure a bright future for generations.

Following are exerts from an essay I wrote in 2016 as a student at Murdoch University. The professor who marked this essay scored it 94%, thus indicating the high quality of research and citation….

Reducing greenhouse gas emissions has been high on the global agenda for many years and with the effects of climate change becoming increasingly evident, calls for cleaner energy have intensified. Natural gas, which is predominantly composed of methane, emits up to 87% less carbon when burned for electricity compared with coal (Chen & Randall, 2013). It has been predicted that increasing electricity production from gas in Australia to 30 or 50% by 2030 would reduce carbon dioxide emissions by 54 or 103 M tonnes per annum respectively (ACOLA, 2013). This argument is often used by unconventional gas extraction advocates and, if electricity generation was the only consideration, then moving from coal to natural gas would clearly contribute substantially to reducing global greenhouse emissions. However, methane itself is a greenhouse gas with a far greater capacity for trapping heat in the atmosphere than carbon dioxide (Howarth, 2014). Methane emissions occur during the flaring and venting processes involved in fracking; and as a result of leakage at and around well sites, as well as from gas gathering, transmission and distribution pipelines (Vickas, Mcmanus & Dey, 2015). Total greenhouse gas emissions during an unconventional gas extraction life cycle are high; with contributions from fuel combustion, electricity use, water treatment, land clearing, and emissions associated with extraction, production and transport of life cycle inputs (Vickas, Mcmanus & Dey, 2015). Vickas et al (2015) identified significant differences in the number and type of emission sources considered in Environmental Impact Assessments (EIA's) of individual CSG extraction sites within Australia, noting than some EIA's were "…highly deficient in capturing the complete CSG lifecycle".

When total emissions were taken into consideration, excluding those from the end use of CSG, the Environment Impact Statement for the APLNG project predicted that the operation of all planned CSG-LNG projects in the Gladstone region of Queensland would comprise 3.2% of Australia's predicted annual emissions in 2030 (Vickas, Mcmanus & Dey, 2015). Given that the Australian government aims to reduce national emissions to 5% below 2000 levels by 2020, this is a significant proportion (Vickas, Mcmanus & Dey, 2015).

Ground and surface water contamination is another potential environmental impact resulting from fracking. Hydraulic fracturing fluid (HFF) consists predominantly of water, however it also contains a variety of chemical additives including hydrochloric acid, polyacrylamide, isopropanol, ammonium persulfate, borate salts and glutaraldehyde (Mrdjen & Lee, 2016). In Australia, at least 45 chemicals have been used in HFF; each performing a particular function such as dissolving minerals and aiding in crack formation, reducing bacterial growth, restricting fluid loss, reducing friction in the fissures, ndustrial corrosion of metal components and assisting in post fracture fluid recovery by reducing viscosity (Davies, Gore & Khan, 2015)(Batley & Kookana, 2012). 'Produced water' is a combination of HFF flowback and the hypersaline water associated with shale and coal seam beds that is brought to the surface during the process of extracting methane (Davies et al, 2015). Produced water not only contains the chemical additives used in the HFF, but also heavy metals such as magnesium, aluminium, iron, strontium and barium, radioactive materials, volatile organic compounds (VOCs) and air pollutants such as benzene, toluene, ethylbenzene and xylene (Finkel, 2015). Produced water returns to the surface at a rate of up to 100kL per day and may be re-injected, stored in dams or containment ponds, or treated and disposed of or used for livestock watering and agricultural irrigation (Batley & Kookana, 2012). Surface water contamination from produced water may occur as a result of spills during transportation, leaks from storage ponds and disposal of inadequately treated produced water (Norris et al, 2016). In addition, not all of the HFF returns to the wellhead after injection has ceased and there are fears that this water may migrate upwards and contaminate shallow aquifers (Norris et al, 2016). In 2014, energy company Santos were fined for contaminating an aquifer in New South Wales with CSG produced water containing uranium at levels 20 times higher than safe drinking water guidelines (Short et al, 2015). An EPA study in Wyoming, U.S.A found increased concentrations of benzene, xylenes, gasoline range organics, diesel range organics, hydrocarbons and high pH in two shallow monitoring wells (Vengosh et al, 2014). Researchers have provided strong evidence for stray gas contamination of groundwater within 1km of shale gas extraction operations in Canada and the U.S., posing potential flammability and explosion risk to homes with private domestic wells (Vengosh et al, 2014).

The volume of water extracted from groundwater aquifers during CSG extraction is another controversial environmental issue associated with fracking, particularly in Australia where many of the CSG operations in Queensland and NSW overlay the Great Artesian Basin (GAB). The GAB is the world's largest artesian groundwater aquifer system, underlying approximately one-fifth of the Australian land mass (Rijke, Munro & Zurita, 2016). In 2011, the National Water Commission estimated that over 300 gigalitres of water would be extracted from the GAB annually as a result of CSG extraction, accounting for 60% of total allowable withdrawals (Rijke, Munro & Zurita, 2016) (Chan & Randall, 2013). Although 300 gigalitres amounts to only 0.0002% of the GAB total storage capacity, the resulting reduction in pressure and local water levels have already been felt by landholders who have had to sink water bores further (Rijke, Munro & Zurita, 2016). In addition, changes in wetland hydrology and other groundwater-dependent ecosystems may occur as a result of excessive groundwater extraction (ACOLA, 2013). The National Water Commission estimate is considered relatively conservative, however based on case studies of the Surat and Bowen sub-basins, the federal government's "Water Group" believe GAB withdrawals may be considerably higher (Chen & Randall, 2013). With increasing demands on diminishing water resources as a result of growing population and climate change both within Australia and on a global scale, the GAB could be regarded as Australia's greatest asset, even greater than the potential economic gain from the CSG industry.

Landscape fragmentation and the industrialization of farming regions resulting from unconventional gas extraction is yet another environmental concern with potential ramifications for Australia's agricultural productivity, as well as threatened species and ecosystems (Chen & Randall, 2013). Large areas of land are cleared to accommodate the extensive network of pipes; processing, waste storage and treatment facilities; as well as the hundreds of kilometres of roads needed for unconventional gas extraction operations (Chan & Randall, 2013). The ndustrialization of important agricultural areas such as the Gloucester Shire, a prominent beef and dairy farming region in N.S.W., where by 2012, 28 agricultural properties had been bought out by a CSG mining company, has lead to grave fears over the effect on current and future productivity (Sherval & Hardiman, 2014). An epidemiological study conducted in 6 states in the U.S.A. found farm animals living within intensively drilled areas suffered a range of neurological, dermatological, gastrointestinal, respiratory, vascular and reproductive problems (Finkel, 2015). In another U.S. study, milk production was shown to drop significantly in counties of Pennsylvania with active wells compared with nearby counties with few or no wells (Finkel, 2015). Shale gas resources in Australia underlie vast areas of arid and semi-arid landscapes that carry a rich biota of native flora and fauna, including endemics and threatened species (ACOLA, 2013). Development of shale gas in Australia is expected to

result in fragmentation of patches of native vegetation, fauna mortality, spread of invasive species and increased fire risk (ACOLA, 2013).

To conclude, fracking has the potential to cause irreversible damage to the environment. When the entire life cycle of an unconventional gas extraction operation is taken into consideration, green house gas emissions are actually greater than those associated with coal. Ground and surface water contamination is a concern with examples of toxic chemicals and radioactive materials, previously locked within geological formations hundreds of metres below the ground, being found in aquifers. There is also concern surrounding the over-extraction of water from groundwater aquifers, with annual withdrawals of hundreds of gigalitres annually. The effects of this have already been felt in parts of Queensland where farmers have had to to dig deeper bores in order to water crops and livestock. Landscape fragmentation and industrialisation of agricultural land adds to the argument that fracking poses too many environmental risks, which are largely unknown since unconventional gas extraction is still in its relative infancy.