Chapter 12

How Can Understanding Community Concerns About Hydraulic Fracturing Help to Address Them?

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Additional information is available at the end of the chapter

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Abstract

Hydraulic fracturing has been the focal point of widespread and global public debate. While the resources sector typically sees hydraulic fracturing as a low-risk method for accessing the coal seam and shale gas reserves required to meet growing public demand for energy, some in the community perceive it as an unmanageable and unacceptable risk. Concerns about hydraulic fracturing and the coal seam gas (CSG) industry include the health impacts of chemicals used, contamination of water supplies from fugitive gas after hydraulic fracturing, equity of land and water access, long term impacts on groundwater, and the full life cycle emission of greenhouse gases from CSG compared to that of coal. This paper highlights the main psychological drivers behind some of these concerns and a possible approach to effectively address them.

1. Introduction

Hydraulic fracturing has been used to increase the rate and total amount of oil and gas extracted from reservoirs for many decades, so why has it now sparked community concern and global public debate? Part of the answer is gas consumption, particularly unconventional gas consumption.

Gas is the third largest global energy source, currently accounting for around 21 per cent of global primary energy consumption. Global gas consumption has increased at an average annual rate of 2.8 per cent since 2000, to reach 128 166 petajoules (PJ) in 2010. It is a relatively flexible and clean fuel and is projected to be the fastest growing non-renewable energy source over the next 20 years[1].

Over the past decade Australia's gas consumption grew by 4 per cent per year. In 2009–10 gas accounted for 23 per cent of Australia's primary energy consumption and 15 per cent of the energy used for electricity generation. Gas consumption in Australia is projected to increase by 2.9 per cent per year over the next 20 years[1].

Gas is Australia's third largest energy resource after coal and uranium[1]. Australia has both conventional and unconventional gas resources such as coal seam gas (CSG), tight gas and shale gas. In 2011, Australia's economic demonstrated resources (EDR) and subeconomic demonstrated resources (SDR) of conventional gas were estimated at 173 000 PJ[1]. There are significant CSG resources in eastern Australia that are being developed for domestic use and liquefied natural gas (LNG) export. The EDR and SDR of CSG were estimated to be around 101 434 PJ, in 2011[1]. According to the Australian Gas Resource Assessment (2012), Australia is likely to possess significant shale gas and tight gas resources, although as yet these are poorly quantified as exploration for these commodities within Australia has only recently commenced.

In 2009–10 the amount of gas produced in Australia was 2005 PJ, 10 per cent of which was from CSG production. Around 48 per cent of Australia's gas production that year was exported as LNG. Gas production in Australia is projected to reach 8274 PJ over the next 20 years, with production from both conventional gas and CSG to rise[1].

Over the last five or so years there has been an increase in CSG production in eastern Australia and in some cases this has occurred in locations that previously had no gas or oil production. The rapid growth in CSG production coupled with the use of hydraulic fracturing has raised community concerns about the technology. While the resources sector typically sees hydraulic fracturing as a low-risk method for accessing the coal seam and shale gas reserves required to meet growing public demand for energy, some in the community perceive it as an unmanageable and unacceptable risk. This is an underlying reason why hydraulic fracturing is causing concern and debate.

Why do these opposed perceptions exist, and is it possible to reconcile them? This paper outlines the main concerns the general public have about CSG and hydraulic fracturing based on the observations of public discourse in the media, social media and direct involvement in researching and communicating environmental and social impacts of CSG developments. It also highlights the main psychological drivers behind these concerns and a possible approach to effectively address them.

2. Public concern about CSG extraction and hydraulic fracturing

The CSG industry has the potential to provide substantial economic benefit to Australia. The Hon Martin Ferguson, Minister for Resources and Energy and Minister for Tourism, has said "In Queensland alone, if the industry reaches its forecast potential, it will be responsible for more than 20,000 jobs, provide $243 billion in tax to the Australian Government and result in real incomes in Queensland rising by $28,300 per person over the period from 2015 to 2035"[2].

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In February 2012, *The Australian* published the results of a poll that gauged the top-of-mind issues for Queensland voters during the State election campaign. While health and the economy remain the priority for Queensland voters, 40 per cent of respondents opposed and 27 per cent were undecided about the $60 billion CSG industry, far outnumbering the 33 per cent of supporters[3].

The reasons why members of the general public, such as environmental groups, Aboriginal groups, suburbanites in Brisbane and Sydney, directly affected farmers/landowners and their communities oppose the CSG industry include:

- the legitimacy of new fossil fuels in a carbon-constrained world;
- pure emotional reactions (of individuals and groups) to the industry;
- equity of land and water access, this extends to questions of 'who benefits?' and 'is any benefit worth the disruption to established community ways of life?';
- impact on agricultural land and food security;
- long term impacts on groundwater;
- the full life cycle emission of greenhouse gases from CSG compared to that of black (and brown) coal;
- management and disposal of treated CSG wastewater and salt; and
- robustness of environmental regulation and perceived regulatory complicity motivated by revenue goals.

There is also general uncertainty of the scale of the industry, as well as the uncertainty of environmental and social impacts across the landscape and over time. Such uncertainty may contribute to and/or reflect existing public anxiety about the ability to personally and collectively exert control over their interests, environment and well-being. These are deep human emotional needs, perturbation of which can prompt highly emotional responses.

Furthermore, public anxiety is buttressed by a host of specific issues about the practice of hydraulic fracturing that include the:

- mobilisation of native contaminants that have previously been confined within coal seams;
- introduction of harmful chemicals via direct injection;
- fate of chemicals used;
- health impacts of chemicals used and those mobilised by hydraulic fracturing;
- contamination of water supplies from fugitive gas after hydraulic fracturing;
- seismic activity and tremors associated with the drilling and fracturing process;
- degree of control over the fracturing process; and
- capacity to prevent and/or remediate accidents.

The unconventional gas industry, scientists and regulators tend to believe the above mentioned risks are generally understood and manageable. However, some in the community, such as environmental groups, suburbanites and farmers, perceive these risks to be not well understood.

The general tenor of public concerns regarding hydraulic fracturing is not unique, and its proponents may be able to learn from the experience of other technical advances that have challenged community acceptance. Genetic modification of foods[4-6] and the purification of treated sewerage for drinking water[7, 8], for example, have each aroused concerted community campaigns against their introduction. A range of studies have been conducted to understand the underlying (psychological/sociological) concerns about each technology[4, 9, 10].

3. The role of attitudes and risk perception

Public acceptance of science and technology can be examined on different levels. Commonly, the concept of attitudes provides the framework for social research in this area. Psychologists define an attitude as a tendency to evaluate a particular entity with a certain degree of favour or disfavour [11]. Risk perception might be regarded as a specific form of an attitude towards a specific entity[12].

In terms of genetically modified (GM) foods and crops, knowing the amount or extent of benefits alone is not sufficient to determine public acceptability. Consideration of the perceived risks of the technology also needs to be taken into account[13].

There has been research that suggests people tend to perceive risk-benefit as an inverse relationship[14, 15]. It has also been suggested that if perceptions of the risks related to any potential hazard or technology are sufficiently high, no amount of benefits are liable to make it acceptable[16].

The term ‘risk’ is further complicated by the perceptual multidimensionality of the concept. People do not perceive the risk of hazards according to a single dimension related to predicted injuries or fatalities but interpret risk according to several independent perceptual factors, termed ‘dread’, ‘familiarity’ and ‘number of people exposed’[17]. Other research looking at food technologies and hazards has uncovered similar dimensions, which have been termed ‘severity’, ‘number of people exposed’ and ‘unknown risks’[18].

The commonly found dimension of ‘familiarity’ or ‘unknown risks’, means that people might judge a technology to be ‘risky’ if they know little about it and/or they *perceive* that science and scientists know little about it[13]. Risk ‘severity’ has also been shown to be an important dimension to people when forming risk perceptions[19], as has perceived lack of control over preventing or early remediation of incidents[20].

For some of the general public, the perceived risks of the CSG industry and hydraulic fracturing far outweigh the benefits and, hence, there is opposition to the industry and use of the technologies associated with the industry.

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Technical experts and the general community often have different attitudes towards and understandings of the risks and benefits associated with hazards[21-23]. This can create dissonance between technical and public discourse. Notwithstanding that, the general community tends to reference the judgement of experts and authorities when making risk assessments. In the absence of specific knowledge, risk assessments made by the general community may be primarily informed by the trustworthiness of the responsible authority and its sources of information[24].

4. The role of trust

Trust is another factor that is of great importance in understanding public acceptance and adoption of new technologies. The general public's trust in regulatory institutions and the motives of scientists or in information about the risks and benefits of particular technological applications of science and technology play an important role.

If a source is distrusted, it matters little how full or persuasive their information is. Hazard acceptability has been linked empirically with both risk perception and level of trust[25].

In terms of the unconventional gas industry, there is a general lack of trust in gas developers and lack of confidence in government to properly regulate the industry. Information provided by gas developers and/or government agencies about techniques, processes, regulation and risk management used in exploration and production of unconventional gas in Australia is generally treated with suspicion and distrust.

An added challenge is the perception of credibility: expertise relevant to the gas industry frequently resides in or is partially dependent upon the gas industry; and technical experts rarely personally inhabit the geography of perceived risk. Such are the foundations upon which attempts to address general public concerns must be built.

It is important to understand how people's attitudes and values influence their acceptance or rejection of the CSG industry, hydraulic fracturing and more generally the unconventional gas industry.

5. The role of a trusted advisor

Science is of course always uncertain, particularly in highly complex, politically charged issues such as CSG, and it cannot dictate what action to take. Deciding what to do occurs through a political process of bargaining, negotiation, and compromise[26]. The degree to which society or a community has a sense of shared values about desirable outcomes and the means to achieve those outcomes is important in the decision-making process. Where value conflicts exist, science has little capacity to reconcile these differences. What science can do in such situations is contribute to the development of new and innovative policy options that might

allow for compromise among the conflicted parties. This is best achieved through the role of Honest Broker of Policy Alternatives[26].

Pielke suggests there are four different roles in how scientists (and other experts) can relate to policy and politics[26]. These four idealised roles are:

1. *Pure Scientist* focuses on research with absolutely no consideration for its use or utility, and therefore in its purest form has no direct connection with decision-makers;
2. *Issue Advocate* focuses on the implications of research for a particular political agenda;
3. *Science Arbiter* seeks to stay removed from explicit considerations of policy and politics like the Pure Scientist, but recognises that decision-makers may have specific questions that require the judgement of experts; and
4. *Honest Broker* of Policy Alternatives engages in decision-making by clarifying and, at times, seeking to expand the scope of choice available to decision makers.

The role of the Honest Broker of Policy Alternatives or Trusted Advisor is critical in the unconventional gas domain in Australia. A Trusted Advisor is inclusive in its communication and engagement with proponents and opponents of CSG; transparent with its governance and research activities; and independent with its scientific research. This enables the Trusted Advisor to be widely perceived as a trusted source of information and advice.

In the CSG space, not only are there environmental impacts but also social challenges to consider. There is a clash of values that exist between proponents and opponents of the industry and some of these clashes include:

- economy versus ecology;
- public benefit versus private disadvantage;
- agriculture versus industry;
- rural lifestyle versus industry development; and
- resource access rights versus autonomy.

Science cannot provide black and white answers to all of the challenges and opportunities associated with the CSG industry. However, by fulfilling a *Trusted Advisor* role, science can help all parties to better understand the range of impacts associated with various development scenarios, and provide a common platform for policy makers, developers and communities to negotiate and make decisions. This approach enables science to contribute to the development of new and innovative policy options that might allow for compromise among opposing parties, and contribute to practical action in spite of conflicting values.

Trusted Advisors were critical in enabling effective political action to address issues such as ozone depletion and acid rain. In these cases, science did not change people's values or beliefs, but it did create new options that allowed for political compromise, given existing values and beliefs[26].

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Another vital aspect of the *Trusted Advisor* is to provide effective communication. Change requires more than science alone; it requires new scientific knowledge to be shared and employed widely, wisely and in a timely fashion: 'For science and technology to deliver full value to society, they must be accessible to as many people as possible and their messages must be easily understood'[27].

There is increasing importance for effective dialogue between science and the public[28, 29] because in democratic societies, the public has an increasing say over the scientific and technological solutions and policies that companies and governments may wish to deploy, through the media, opinion polls and consumer choice[30-32].

In contested spaces such as CSG, timely and effective communication from a *Trusted Advisor* to all interested parties is critical to maintaining trust, independence and integrity. Armed with credibility and multiple policy options (delivered through science) for those involved in the decision-making process, the *Trusted Advisor* can make a significant and positive impact on society.

6. Concluding remarks

Science is an integral part of human society and has established, over the centuries, its value to society. Science continues to play a role in contributing significantly to further improving societal and environmental conditions. However, the context in which science research and development takes place is shifting from minimal to increasing public scrutiny and accountability.

Science and its products are intersecting more frequently with certain human beliefs and values. As science encroaches more heavily on value-laden issues, members of the public are claiming a stronger role in both the regulation of science and the shaping of the research agenda[30].

Community sanction has become a pivotal element in the adoption and implementation of new technologies that impact on society, environment and economy[33]. The technology doesn't need to be new to require community sanction or a 'social licence' as illustrated by the unfolding public debate on CSG and hydraulic fracturing in Australia and, indeed, around the world with regards to hydraulic fracturing. Both Victorian and New South Wales (NSW) state governments have slowed CSG development within their state and have placed moratoriums on the use of hydraulic fracturing due to community pressure.

Facts and figures alone will not earn community support and acceptance of CSG developments and the use of hydraulic fracturing. Achieving community acceptance requires a combination of providing trusted and easy to understand information; addressing the perceived risks people have about hydraulic fracturing; and communicating the risk management plans used in the industry. However, if the source of information is distrusted it matters little how full or persuasive that information is.

The role of the *Honest Broker* or *Trusted Advisor* is essential when there is no values consensus and high uncertainty in the community. In this role science is not used to align with a specific agenda nor is it above the fray; it can help all parties to better understand the range of impacts associated with various development scenarios, and contribute to the development of new and innovative policy options that might allow for compromise among opposing parties.

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