



Project Acronym and Title:
**M4ShaleGas - Measuring, monitoring, mitigating and managing the
environmental impact of shale gas**

**SHALE GAS ENGAGEMENT IN THE US AND CANADA: A CASE-STUDY
REVIEW AND RECOMMENDATIONS FOR BEST PRACTICE**

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Public introduction

M4ShaleGas stands for *Measuring, monitoring, mitigating and managing the environmental impact of shale gas* and is funded by the *European Union's Horizon 2020 Research and Innovation Programme*. The main goal of the M4ShaleGas project is to study and evaluate potential risks and impacts of shale gas exploration and exploitation. The focus lies on four main areas of potential impact: the subsurface, the surface, the atmosphere, and social impacts.

The European Commission's Energy Roadmap 2050 identifies gas as a critical fuel for the transformation of the energy system in the direction of lower CO₂ emissions and more renewable energy. Shale gas may contribute to this transformation.

Shale gas is – by definition – a natural gas found trapped in shale, a fine grained sedimentary rock composed of mud. There are several concerns related to shale gas exploration and production, many of them being associated with hydraulic fracturing operations that are performed to stimulate gas flow in the shales. Potential risks and concerns include for example the fate of chemical compounds in the used hydraulic fracturing and drilling fluids and their potential impact on shallow ground water. The fracturing process may also induce small magnitude earthquakes. There is also an ongoing debate on greenhouse gas emissions of shale gas (CO₂ and methane) and its energy efficiency compared to other energy sources.

There is a strong need for a better European knowledge base on shale gas operations and their environmental impacts particularly, if shale gas shall play a role in Europe's energy mix in the coming decennia. M4ShaleGas' main goal is to build such a knowledge base, including an inventory of best practices that minimise risks and impacts of shale gas exploration and production in Europe, as well as best practices for public engagement. The M4ShaleGas project is carried out by 18 European research institutions and is coordinated by TNO-Netherlands Organisation for Applied Scientific Research.

Executive Report Summary

Shale gas source rocks are widely distributed around the world and many countries are investigating their shale gas potential. With any development, potentially affected people have a right to be heard, and public engagement can both improve decision making and increase the acceptability of decisions. We review engagement efforts carried out around shale development in the US and Canada, where large-scale development has been underway for more than a decade. Although engaging the public and other stakeholders with shale development is not easy -due to many factors including inequitable impacts, scientific uncertainty and mistrust of industry and government- we find that a multitude of parties (e.g. companies, government, community groups) are carrying out engagement using a variety of formats (e.g. public meetings, citizen science, qualitative research).

However, despite burgeoning engagement activity in North America, much of it is not occurring at the earliest stages of development. Engagement activities rarely ask the most fundamental of questions - whether shale development should proceed at all- and instead commonly focus on questions of impact minimisation, regulation and gaining support. Furthermore, the majority of activities tend to elicit the responses of interested and affected parties, with much less attention to views of the wider public. Going forward, we recommend that engagement activities be afforded the time and resources to be carried out thoughtfully and thoroughly. Consideration might be given to who participates and how they participate, with engagement beginning at the earliest stages of development. We recommend that methods be selected and adapted according to the specific circumstances, participants, and goals of the engagement; and that engagement activities facilitate multi-way communication and deliberation. We also suggest that openness and transparency be maintained throughout, with a strong commitment to following recommendations that emerge.



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1 INTRODUCTION

1.1 Context of M4ShaleGas

Shale gas source rocks are widely distributed around the world and many countries have now started to investigate their shale gas potential. Some argue that shale gas has already proved to be a game changer in the US energy market (EIA, 2015). The European Commission's Energy Roadmap 2050 identifies gas as a critical energy source for the transformation of the energy system to a system with lower CO₂ emissions that combines gas with increasing contributions of renewable energy and increasing energy efficiency. It may be argued that in Europe, natural gas replacing coal and oil will contribute to emissions reduction in the short and medium terms.

There are, however, several concerns related to shale gas exploration and production, many of them being associated with the process of hydraulic fracturing. There is also a debate on the greenhouse gas emissions of shale gas (CO₂ and methane) and its energy return on investment compared to other energy sources. Questions are raised about the specific environmental footprint of shale gas in Europe as a whole as well as in individual Member States. Shale gas basins are unevenly distributed among the European Member States and are not restricted within national borders which makes close cooperation between the involved Member States essential. There is relatively little knowledge on the footprint in regions with a variety of geological and geopolitical settings as are present in Europe. Concerns and risks are clustered in the following four areas: subsurface, surface, atmosphere and society. As the European continent is densely populated, it is most certainly of vital importance to understand public perceptions of shale gas and for European publics to be fully engaged in the debate about its potential development.

Accordingly, Europe has a strong need for a comprehensive knowledge base on potential environmental, societal and economic consequences of shale gas exploration and exploitation. Knowledge needs to be science-based, needs to be developed by independent research institutes with a strong track record in shale gas studies, and needs to cover the different attitudes and approaches to shale gas exploration and exploitation in Europe. The M4ShaleGas project is seeking to provide such a scientific knowledge base, integrating the scientific outcome of 18 research institutes across Europe. It addresses the issues raised in the Horizon 2020 call LCE 16 – 2014 on *Understanding, preventing and mitigating the potential environmental risks and impacts of shale gas exploration and exploitation*.

1.2 Aims and objectives of this report

We can learn much that will help us to anticipate potential European shale gas development by reviewing what has already occurred in the US and Canada, where shale development for gas and oil has grown significantly in the last ten years. This has been made possible by favourable market conditions and government investment, alongside the development of directional and horizontal drilling, 3D seismic imaging, and importantly by hydraulic fracturing ('fracking') techniques, whereby pressurised



liquid, sand and chemicals are injected into deep shale formations to fracture the rock and facilitate the flow of oil and gas. Such techniques have been deployed for up to 20 years in some US states, and in some cases full-scale extraction is now taking place (e.g., Pennsylvania, Wyoming, Texas). In others, proposals have been surrounded by significant environmental and legal controversy, on occasion leading to local, regional or state-wide moratoria and bans (e.g., New York, Maryland). In Canada, rapid development has concentrated in the western provinces of British Columbia and Alberta, while the practice has been the subject of moratoria and bans in eastern provinces (Quebec, Nova Scotia, New Brunswick).

Engagement is an important part of development, particularly controversial development like shale gas. On a basic communication level, people have a ‘right to know’ about the risks they may face (Renn & Levine, 1991). They also must be able to understand which risks are important to them (Morgan et al., 2002), and make informed voting choices or ‘buy in’/opt out of particular technologies. In democratic societies, potentially affected people also have a right to be heard, and public participation can both increase legitimacy and improve confidence in decision makers (Beierle & Cayford, 2002; Fiorino, 1990). Furthermore, Cotton argues that in the case of shale development, where risks and benefits are unevenly distributed, environmental justice can only be achieved by *re-localising* the scale of fracking governance, which in turn requires effective community participation and decision making (Cotton, 2017). Another motive for engagement is that some aspects of lay risk judgments are as sound (or more so) than expert risk judgments, meaning that local knowledge can add a valuable layer to risk understandings and improve the quality of decisions; ultimately leading to more sustainable choices (Fiorino, 1990; Irwin & Wynne, 1996; Stern & Dietz, 2008). Public engagement is not only desirable, but in some cases a prerequisite for development. For example, in Canada, where the rights of Aboriginal Peoples may be affected, governments have a constitutional obligation to consult them (Council of Canadian Academies, 2014). Likewise, US states on the Marcellus shale play are now required to publically disclose the chemical constituents of frac fluid (Whitton et al., 2017).

From an industry perspective, as opposition to shale development increases in many regions, companies are increasingly recognising the importance of public engagement, and that effective engagement is essential in order to obtain a ‘social license’ to operate (see Brändle et al., 2016). Without engaging the public in meaningful conversation, shale developers cannot hope to proceed in a way that is truly acceptable. The public may wish to place conditions on development that can be easily met through discussion and adapting proposals; or alternatively, engagement may highlight ‘red-line’ risks whereby no level of negotiation or compensation will lead to acceptance. In both cases, it benefits both industry and public to have these conversations early. Publics and other



stakeholders¹ are adept at deliberating complex technologies and risks given the time, information and resources to do so (Pidgeon et al., 2017).

This report aims to survey the enormous breadth of engagement activities that are taking place around shale development in the US and Canada. In doing so, we hope to shed light on the varied opportunities that are available for engagement between different parties, and help inform future engagement strategies in North America and elsewhere. This is particularly of interest in Europe, where shale development is at a more emergent stage. We begin by reviewing case-studies of engagement in the US and Canada, before drawing on these -alongside insights from the literature- to make recommendations for future engagement. Whilst we concentrate on cases where the public are the participants rather than the conveners of engagement, we recognise that publics are proactively engaging with development across the US and Canada. We therefore also include a section on engagement by activists (both in support of and in opposition to shale development) and discuss guidance for communities engaging with industry.

Throughout the report, we use the term ‘engagement’ to describe the ways in which industry, public and other actors interact with each other. Historically, such engagement would have been limited to a one-way flow of information between communicators and the public, who it was felt just needed to ‘understand the numbers’ in order to accept a risk (Fischhoff, 1995). However, engaging the public about risk has moved beyond constituting a means of persuasion to a two-way exchange that recognises the importance of psychological, cultural and social factors (Fischhoff, 1995; McComas, 2006; Pidgeon et al., 1992). Thus participation can occur on a number of levels: from nonparticipation through informing (‘tokenism’) to partnership and citizen control where citizens have the most power in determining the end product (Arnstein, 1969).

There are myriad ways to carry out engagement. Chilvers (2010) categorises these as either micro or macro, and as invited or uninvited:

- Invited micro public dialogue – members of the public are invited to participate (in interaction with stakeholders, scientists and policy makers) in highly structured and managed group dialogue organised in terms of a host decision-making institution
- Invited macro/informal public engagement – open, unstructured public engagement (which can incorporate forms of dialogue) that occurs in wider public arenas beyond formal decision-making institutions (but can be initiated by them) in directly shaping public understandings and policy more indirectly.

¹ For clarity, we use the term ‘publics’ to refer to a traditional conceptualisation of the ‘general public’, and ‘stakeholders’ to refer to those with a particular interest or concern in shale development, such as landowners, regulators etc. We recognise that publics are also stakeholders, and that these categories are somewhat arbitrary; however some distinction is useful when considering engagement amongst different parties.



- Uninvited public engagement – organic, spontaneous public engagement (which can incorporate forms of dialogue) initiated and organised by citizens themselves rather than decision institutions, which may be directed at their own actions and/or challenging formal institutions.

Engaging the public and other stakeholders with shale development is not easy, due to a number of factors. Firstly, shale development is complicated by multi-scalar and inequitable impacts, scientific uncertainty, urgency, mistrust, and inequitable information accessibility/provision (Liss, 2011; North et al., 2014; Small et al., 2014). Risk information is contested: for example, Clarke et al. (2012) note that the same data can be interpreted to inform the conclusion that shale gas will mitigate or increase greenhouse gas emissions. High levels of uncertainty render shale development a ‘post-normal’ risk -a problem too complex or too uncertain to yield to science alone (Rosa, 1998)- rendering public engagement a matter of co-production by publics and traditional science communication, whereby publics can participate in the risk characterisation process (Chilvers & Kearnes, 2015; Pidgeon et al., 2017).

A linked issue is the complexity of shale development, which encompasses local level and large-scale societal questions (Clarke et al., 2012). Pidgeon et al. (2017) argue that shale gas poses particular challenges associated with the ‘energy trilemma’ (the reconciliation of climate, security and affordability goals), which disparate publics are likely to evaluate differently. Pidgeon et al. (2017, p. 180) note, “the public’ is not a single entity, but will comprise many groups with very different views on the possible balance between the risks and benefits of hydraulic fracturing. Some people might prioritize the environment and climate change, while others will view energy affordability and reliability of supply as more important. Others will be completely averse to any suggestion of a technology that risks polluting a local water supply in their local area, albeit with some level of scientific uncertainty, however small that might be’.

Whitton et al. (2017) outline the ways in which US governance systems pose further barriers to engagement. One is that the ‘complex web’ of governance from federal through regional, state and local, provides no clear pathway for participation (Whitton et al, 2017, p. 12). Shale companies operate at a number of different scales: some operate more than a thousand wells in a state, while others operate only one (Nash, 2013), which means that inevitably some companies have a lot more capacity and resources for engagement than others. Furthermore, shale development corporations often outsource many of the activities that pose environmental risks to service companies, who are not the ones that hold the permits, report chemical constituents to FracFocus, and so on (Nash, 2013). The dispersed nature of shale activities, and the changeable nature of the actors involved (e.g. as leases are bought and sold) also make it difficult to learn from past experiences (North et al., 2014). Another complicating factor is the private ownership of subsurface rights in the US, limiting participation in such transactions (Whitton et al., 2017). Together with this, shale development has largely been regulated under the auspices of existing conventional oil and gas regulation, meaning that public engagement with new regulations has been limited (Whitton et al., 2017). Also, lack of transparency in shale operations has meant that publics have found it difficult to access



information in order to engage (Whitton et al., 2017). Finally, opportunities for participation are limited in some states by legislation, for example in Boulder County (Colorado) and in Pennsylvania, where the Oil and Gas Act ‘essentially pre-empts the ability of local communities to regulate oil and gas activity’ (Whitton et al., 2017 p17). Denton, Texas, is another case point, where the town’s ban was overturned by state legislation that secures the state government’s unilateral authority over oil and gas development (Rice, 2016).

Another factor complicating engagement is common across all risks: different people require different information, depending on many factors including their values and experience (Clarke et al., 2012). People also have different levels of knowledge about shale development, many showing little awareness of the issue, particularly in areas not affected by development (Thomas et al., 2017b). This means that that if asked to state their opinion (e.g. in a one-off survey), they will draw on their ‘mental models’ of other technologies (Morgan et al., 2002) or respond to whatever information is available. For example, they may respond negatively to the word ‘fracking’ or positively to the word ‘technology’ (Evensen et al., 2014; Pidgeon et al., 2009). When asked, individuals are often ambivalent or polarised in their responses (Barvosa, 2015), meaning basing governance decisions upon their views can be difficult.

Despite these obstacles, engagement is essential and should also be effective. Poorly executed dialogue and communication processes can ‘rapidly escalate concerns’ around the siting of energy technologies (Pidgeon & Demski, 2012, p. 41) while well-executed engagement campaigns offer many potential benefits including better decision making and increased trust (Beierle & Cayford, 2002; Fiorino, 1990). In such cases, a company’s favourable actions may not only benefit themselves individually, but also the wider industry (Potterf et al., 2014). Here we review engagement efforts carried out in the US and Canada in order to provide clarity on this issue and insight into the strengths and weakness of particular case studies, in order to make recommendations for future. We also discuss insights from the wider risk communication literature that may be helpful when developing engagement strategies. It is hoped that the outputs of this report will help inform effective engagement in order that the public and other stakeholders are given meaningful opportunities to engage in the shale debate and shape the issues that might affect them.



2 SHALE DEVELOPMENT IN THE US AND CANADA: A REVIEW OF ENGAGEMENT

2.1 Review methodology

We reviewed engagement efforts carried out around shale development in the US and Canada. The review does not include all of the companies, interest groups, activists, agencies and academics that have been involved in such engagement - this would be an insurmountable task. Instead we aim to encompass the enormous breadth of activities undertaken, and in so doing provide an overview useful to community, academic, government and industry stakeholders interested in shale development issues in North America and elsewhere. The engagement efforts reviewed here were collated by snowballing from reports, recommendation by experts, and by carrying out internet searches using Google (e.g. “Canada anti-fracking”) and Google Scholar (e.g. “public engagement hydraulic fracturing USA”). Sources include government reports, websites and peer reviewed literature.

It is difficult to say definitively which engagement efforts have succeeded and which have failed. This is because a multitude of factors come into play when decisions about development are made, and because formal evaluations of engagement exercises can be problematic (Rowe et al., 2005; Rowe et al., 2008) and are rare - for a UK shale example, see Icaro (2014); for an example in the realm of genetically modified crops, see Rowe et al. (2005) and Pidgeon et al. (2005). Webler (1995, p.1) illustrates some of the difficulty in ‘evaluation’ by reflecting on a participation project deemed a ‘complete failure’ by officials seeking to site a landfill. He imagines the victorious residents celebrating their success in rejecting the landfill, and asks, whose preferred outcome should be used to base an evaluation? It is not only the industry perspective that is relevant, but also sponsor perspectives, participant perspectives and normative perspectives on how engagement in general should be conducted (Rowe et al., 2005). Due to the inherent subjectivity and conditionality in answering such a question, participation efforts cannot be easily evaluated according to the success of their outcome. Webler (1995) instead proposes a model of participation that assesses fairness and competence: everyone should have equal participation opportunities, and have access to the best available information (Webler, 1995). Rowe and Frewer (2000) also concentrate on the effectiveness of the process rather than the outcomes, categorising evaluation criteria into two types: acceptance criteria (how acceptable is the method to the wider public?) and process criteria (what about the process ensures it takes place in an effective manner?), as follows:

Acceptance criteria:

- Public participants should comprise a broadly representative sample of the affected population
- The process should be conducted in an independent and unbiased way - managers and facilitators should be independent and seen to be independent
- The public should be involved as early as possible
- The output should have a genuine impact on policy and be seen to do so



- The process should be transparent: the public should be able to see what is going on and how decisions are made

Process criteria:

- Participations should have access to the appropriate resources to be able to fulfil their brief (including relevant information, human resources and material resources)
- The nature and scope of the task should be clearly defined
- The process should provide mechanisms for structuring and displaying the decision making process
- The process should be cost effective

The case studies reviewed here are summarised in Table 1, and described in more detail in section 2.3. They are divided into five broad sections, within which there is inevitably some overlap. First are those that might be described as constituting solicited, or ‘invited’ public input (Clarke et al., 2012; Wynne, 2007): engagement by industry, alliances/consortia, government and academics. These are followed by those that might constitute unsolicited or ‘uninvited’ input: typically activists campaigning to bring about change, such as securing a lease deal or banning fracking in their municipality. For each, we provide a summary of the following facets: who runs the process, the methods of engagement, the stage of development in which engagement occurred, what issues were explored, who participated, and whether there was provision for multi-way communication. It is useful to elaborate on why each of these is relevant.

The first aspect -who runs the process- is important because it is suggested that organisers and facilitators should be appropriately qualified, and participation efforts should be carried out in an independent and unbiased way – and be viewed as such (Rowe & Frewer, 2000). The second aspect is the method of engagement, which can range from a Tweet, through in-depth interviews with affected landowners, to ongoing stakeholder collaborations. This is useful to scope the types of engagement activities that are available. The third is the stage of engagement, which it is recommended are as early as possible in the development process (Rowe & Frewer, 2000; Royal Commission on Environmental Pollution, 1998; Stern & Fineberg, 1996; Wilsdon & Willis, 2004). Here we utilise a typology described by North et al. (2014) who describe public and stakeholder participation in shale development in terms of the various stages of an environmental decision process (Stern & Fineberg, 1996). There are nine stages in all, here distilled to the following six aspects that are used in the analysis presented below: early engagement (problem formulation and process design, including selecting options and outcomes), learning (including joint fact-finding and citizen science), decision making, and post-development (monitoring, evaluation and adjustment). In practice, these categories often overlap. For example, early engagement may include fact finding by interested citizens.

The fourth aspect in the table relates to what issues are explored and the desired outcome, both of which Rowe and Frewer (2000) suggest should be clearly defined. The



fifth relates to who participates, ideally being those who are broadly representative of the affected population (Rowe & Frewer, 2000). The final aspect is whether there is provision for multi-way communication rather than one-way information transfer; to enable the public to have meaningful input into decision processes rather than simply be communicated to (Fischhoff, 1995). The final column in our table contains further notes, including observations about aspects such as the extent of public awareness about the programme of engagement, its transparency, resource provision, the clarity of the task, and the structure and display of the decision making process. These constitute further potential criteria by which to evaluate participation efforts (Rowe & Frewer, 2000; Rowe et al., 2005) but are more difficult to gauge in the absence of formal evaluations.



2.2 Summary Table

Table 1: Summary of case studies reviewed.

	Who runs the process?	Method of engagement	Stage of engagement	Issues explored / desired outcomes	Participants	Provision for multi-way communication	Notes
Industry							
Industry-led community liaison	Individual companies and their representatives (e.g. PR firms); intermediate organisations.	Various, including: sponsorship of public events, employing community liaison officers, conferences	Various	Disseminating information, gaining community acceptance/support, minimising impacts	Various, including: concerned individuals, community beneficiaries, community leaders	Varies	See Cabot Oil and Gas Corp (below) for specific example
Cabot Oil and Gas Corp, Pennsylvania	Companies	Various, including Twitter Q&A, Instagram, blog, presentations and podcasts	Post-development	Information dissemination, general information on hydraulic fracturing, specifics about policies, information about Dimock trial	Public	Focus on information dissemination, with some interactive activities	Some engagement is in response to Dimock water contamination trial, but some engagement was occurring beforehand
Grievance / complaint hotlines	Companies	Phone-lines, sometimes in-person meetings	Post-development	Hearing concerns	Concerned public, industry officials	Tends to be limited	Little is known about how often / how effectively complaints are addressed (North et al, 2014)
Social Impact Assessments	Usually consultants	Various, including qualitative interviews, quantitative data collection	Throughout, from early engagement to post-development	Identification and management of potential social impacts (e.g. positive and negative, long-term and short term)	Various stakeholders	Yes	Good practice sees stakeholder engagement plans set out clear objectives and outline how views will be acted upon
Comprehensive Development Plans (Maryland)	Applicants (companies)	Public meetings	Early	Land-use planning	Industry, public, government (reviews the Plans)	Unclear	The statutory deadline for this proposed action is October 1 st 2017
Alliances and Consortia							
Marcellus Shale Coalition	Marcellus Shale Coalition (alliance of industry stakeholders)	Website, fact sheets and reports, speakers, conferences.	Various	To provide information on the positive effects of responsible natural gas production	Industry, policymakers, regulators, media and 'other public stakeholders'	Minimal	A resource for industry stakeholders and means by which to communicate benefits of development
Center for Responsible Shale Development (CRSD)	Center for Responsible Shale Development (alliance of energy producers and	Stakeholder collaboration	Post-development	Development of performance standards, independent certification	Environmental organisations, shale development companies	Limited public input	Transparency through publishing summary audit reports on the website



	environmental organisations)						
FracFocus Chemical Disclosure Registry	Ground Water Protection Council and Interstate Oil and Gas Compact Commission (US); British Columbia Oil and Gas Commission (Canada)	Searchable website database containing chemical disclosure information provided by companies	Learning / post-development	To provide public access to reported chemicals used in hydraulic fracturing	Industry, public	Limited	Disclosure is obligatory in some US states. Some chemicals are state secrets so are not listed.
Government							
Interstate Oil and Gas Compact Commission (IOGCC)	Government agency	Stakeholder engagement via training, meetings, research projects. Public engagement via website, presentations and outreach activities, e.g. 'Energy Awareness Month'	Learning and post-development	Maximise oil and natural gas resources while protecting health, safety and environment; disseminate information to this effect	Stakeholders (government, industry, environmental organisations); public (limited).	Limited public input	Part of their remit is to manage FracFocus.
Did You Feel It? Citizen Science, USGS	United States Geological Survey (USGS)	Online reporting of earthquake experiences by public	Learning and monitoring	Record of earthquakes	Public with access to the internet (likely interest sample)	Yes – citizens provide the data, and can freely access the maps, plots and datasets created by USGS.	The USGS is the science agency for the US Department of the Interior
Marcellus Shale Advisory Commission	Committee of experts convened by the Governor of Pennsylvania, Tom Corbett	Public meetings, and invited input via letters and emails. Publically available report	Post-development (adjustment)	Review statutes, legislation, regulation and policies on the Marcellus Shale, and provide recommendations to mitigate environmental and social impacts.	Public (likely interested parties / concerned individuals); stakeholders (particularly industry, but also health professionals and others) participated as members of work groups.	Yes	Potential bias due to make-up of the Commission. Lack of transparency when listing public comments (not clear what criteria are used for inclusion).
Boulder County, Colorado	Boulder County, Colorado	Public meetings, hearings and open house events	During a moratorium prior to expansion of oil and gas drilling	Information gathering, revisions to regulations, extension of moratorium. Clearly defined.	Public, industry, legal advisors, County staff. Interested and affected parties (not representative).	Variable – e.g. open houses 'to give interested residents more information' about the proposed regulatory changes. Hundreds of public comments also recorded.	Website with lots of information and links, including videos of public hearings.
Alberta Energy Regulator (formerly Energy Resources Conservation Board), Alberta	Alberta Energy Regulator / Energy Resources Conservation Board – regulatory body	Written and telephone survey, plus 8 interviews. Publically available report	Early	To learn how other jurisdictions were regulating unconventional gas development	Regulators in Canada, US and outside of North America.	Yes – elicits responses from regulators. No public engagement phase.	Scoping project. Information sharing with the participating regulators (and report is available online). Public perceptions are



							communicated via the regulator
BAPE, Quebec	BAPE (office of public hearings on the environment)	Public inquiry including numerous public hearings. Publically available report	Early	Scoping of issues around sustainable development of the shale gas industry	Individual citizens, groups, municipalities and the industry	Yes	Difficult to evaluate because the main documents are in French.
Nova Scotia Independent Review Panel on Hydraulic Fracturing	Independent panel of experts, commissioned by Province of Nova Scotia and the Nova Scotia Department of Energy	Submission of evidence, commentary on discussion papers, public meetings. Publically available report	Early	Scoping of various issues including various potential (positive and negative) impacts	Citizens, environmental organisations, industry, municipalities, community organisations.	Yes	High degree of transparency and participation.
New Brunswick Commission on Hydraulic Fracturing	Government commission	Meetings and online submissions. Publically available report	Early	Evidence-based review into hydraulic fracturing, to understand the root causes of the conflicts surrounding shale gas and to identify how New Brunswick might move forward. Focus on values as well as 'facts'	Various stakeholders including industry, community, indigenous elders, environmental groups, academics	Information gathering from various stakeholders. Unclear what information was provided by the commission	Report is relatively brief and provides limited detail on how conclusions were reached
Academic							
PSE Healthy Energy	Academics	Information dissemination via website: original research, summaries, presentations, infographics, links to data and information on how to access scientific papers. Also provides online educational modules	Various	Generates, translates and disseminates information to identify 'reasonable, healthy and sustainable energy options'	Academics, policy makers, grassroots and advocacy groups	Limited	Focuses on unconventional gas and oil, but also provides information on renewable energy
Pennsylvania State University Marcellus Educational Consortium	Pennsylvania State University and business partners	Educational programs	Learning	Helps identify educational needs; provides expertise on Marcellus topics; facilitates discussions among community members, business leaders and others; disseminates information	University, businesses, local stakeholders	Limited	Includes sections for landowners, community and government. Features webinars, maps and frequently asked questions
Scholarly studies of public perceptions of shale development	Academics, think tanks	Surveys, interviews, focus groups, ethnographic research etc.	Have tended to be post-development, but some pre-development studies also	Various, including awareness, perceptions of risks and benefits, attitudes, views on	A variety of samples including interested and affected parties, stakeholders and more	Tends to be largely one-way elicitation of public opinion via surveys and interviews, but some	Transparency of results and methods at point of publication tends to be good, though transparency



				regulation, comparisons with other energy options	representative survey samples. Tend to be in areas already experiencing development, with some upstream studies also	multi-way deliberative approaches	of process can be difficult to gauge without formal evaluation procedures
Activism							
Individual action	Individuals	Voting, placing placards on lawns, participating in protests and rallies	Various, often pre-development	Various – can include supporters and opponents of shale development	Individuals engaging directly with government, industry, other community members and law professionals	Varies	
Gasland film and website	Written and directed by Josh Fox	Documentary film and associated website including blog, Twitter feed, interactive map	Post-development (region dependent)	Information dissemination, focusing on hazards associated with hydraulic fracturing	Aimed at public audience. Affected publics are film’s subjects. Often screened at public events	Yes. Affected publics are featured in the film, and the public can participate through hosting film screenings, contacting elected officials, supporting local organisations and adding stories to the website	The Gasland film was pivotal in shaping public perceptions of fracking in the US and elsewhere
Anti-fracking groups	Varies from global organisations to local grassroots movements	Information provision, protest, political lobbying, support for legal challenges	Early through to post-development	Focus on the risks associated with fracking, and a common goal to ban the practice	Various, including NGOs, local communities, interested publics. Some movements involve celebrities	Yes	The anti-fracking movement in the US and Canada has had some success in contributing to bans (though impact is difficult to attribute)
Denton Drilling Awareness Group, Texas	Non-profit educational group, whose board members are all long-time Denton residents, and include professors, a lawyer and a professional musician	Public vote. Activists raised awareness by e.g. canvassing, voter registration, puppet shows and coffin races (Rice, 2016)	Post-development (secured a ban on drilling after it had been underway for some years)	Ban fracking within city limits	Awareness group and voters	Yes	The success of the engagement exercise was thwarted by State and industry. The story was covered in mainstream media in the US and further afield
Council of Canadians	Social action organisation	Information provision including blogs, factsheets and guides. They also organise demonstrations, speakers, events and meetings.	Various	Oppose fracking and facilitate others to do so	Activists, members of the public	Encourages public participation, e.g. through lobbying government officials	The Council campaigns on trade, water, health care, democracy, and energy and climate
FracTracker	Non-profit organisation that ‘studies, maps, and	Website with data, maps and studies; research	learning / post-development	Provision of information to increase transparency	Includes the alliance’s own data sets and crowd-	Yes – public contributions encouraged	Supports advocacy groups



	communicates the risks of oil and gas development'	collaborations and outreach activities.		of and access to data and information.	sourced data. U.S. focus with some international data.		
Landowner coalitions	Community committee of landowners	Committees negotiating between drilling companies, legal representatives and the community. Information gathering and sharing	Early, before leases are signed	Desired outcomes are information gathering and better deals on leases for residents. Also includes attempts to widen benefits beyond landowners to the wider community.	Community committee, industry, community members (directly via committee, and through educational seminars)	Yes between stakeholders, though general public (non-landowners) input may be more limited.	Provision of information to other communities by making lease information publically available. Communication and updates to other members. Educational outreach



2.3 Case studies

2.3.1 Industry

Overview

Engagement has become increasingly important to companies as they attempt to secure a ‘social license to operate’ (Brändle et al., 2016) or face the possibility of protest, lawsuits, moratoria, or outright bans. Regardless of whether engagement is mandatory or voluntary, the oil and gas industry is realising that companies active in community engagement, and who listen and respond to community concerns, are viewed more positively (Potterf et al., 2014). Indeed, the business and management approach tends to frame social license to operate in terms of risk management, whereby engaging the public is a means to reduce reputational and economic risks (Jones et al., 2013; Morrison, 2014). Much industry engagement focuses on disseminating information about a project and gaining community acceptance/support, and therefore tends to be one-way. However, some engagement (particularly in Social Impact Assessments) is more interested in identifying (and facilitating the management of) potential social impacts, so seeks a higher level of public participation.

Engagement led by shale development companies can be carried out by the companies themselves (often by dedicated community liaison officers or outsourced to PR/media companies), by consultants, by intermediate organisations that act as go-betweens for industry-community communication, or as part of a consortium (see section 2.3.2). Participants tend to be members of the host communities, and/or are stakeholders such as land owners, community leaders and community beneficiaries. Such engagement occurs at various stages of development: in some cases prior to exploration (e.g. in the case of Social Impact Assessments), but more often during operations (e.g. organising community events, providing sponsorship, running question-and-answer sessions, blogging, and maintaining complaint hotlines).

Community liaison led by shale development companies

Shale development companies publicise community engagement projects of many kinds on their websites. Large independent drilling company Williams Energy, for example, runs an ‘Adopt-a-School Program’ whereby employees volunteer by helping teachers with classroom assignments, reading with children or participating in school activities (The Williams Companies, 2017), while international giant Shell runs school festivals and meals on wheels alongside high profile sponsorship deals (Shell United States, 2017). Smaller independents are also active in community engagement efforts, for example Payson Petroleum, which organises ‘Rig UP and BBQ’ events for investors (Payson Petroleum, 2017). Often, a shale development company will hire a public relations (PR) or communications firm to carry out their public engagement activities.

In one of the few studies to explicitly explore perceptions of shale industry engagement, Potterf et al. (2014) report 28 interviews with 34 key informants in diverse leadership positions (e.g. judges, religious leaders) in active oil and gas producing counties of the Eagle Ford Shale play, Texas. They find that corporate citizenship and its perception varies across companies, with some viewed as going above and beyond while others are



perceived as making donations to look good but having little community level impact (Potterf et al., 2014). They found that ‘serious and sustained communication and engagement was the exception rather than the rule’ and that industry efforts to engage with community leaders to address local concerns vary widely; but that when they are present these efforts are effective (p. 3). They also found that information provided by industry to community leaders does not necessarily get passed on to other community leaders or the wider public, and that providers of service organisations (e.g. housing authorities) and church leaders were consistently unaware of industry information. They suggest therefore that ‘failure to communicate with these organisations is a missed opportunity to pre-emptively address social concerns’ (p.3).

Potterf et al. (2014) corroborate other research (Prakash & Potoski, 2007), finding that negative behaviour from individual companies can reflect poorly on the industry as a whole. ‘Leaders were particularly annoyed when they sensed that communication efforts were done simply for ‘public relations’ purposes, or when industry responses involved token or symbolic gestures’ (Potterf et al., 2014, p. 3). However, companies that are active in community engagement and who listen and respond to community concerns are viewed more positively than those that are not (Potterf et al., 2014). Indeed, ‘the ‘best’ industry actors are those who are willing to make investments in things that help improve community life, whether or not these investments directly benefit the industry’ (Potterf et al., 2014, p. 4). Community liaison officers, responsible for leading public relations projects and maintaining links between communities and industry, tend to be viewed positively by community leaders (Potterf et al., 2014).

Intermediate organisations such as the South Texas Energy and Economic Roundtable (STEER) and the Eagle Ford Consortium (EFC) in Texas have been set up to act as ‘go-betweens’ for industry-community communication, and have had some success in improving community-industry relations (Potterf et al., 2014). STEER, which represents the 16 largest operators in the Eagle Ford Shale region, defines itself as the “bridge connecting the oil and natural gas industry to South Texas communities [working] to ensure that all stakeholders throughout the Eagle Ford Shale region are able to effectively maximise opportunities in a responsible and collaborative way” (STEER, 2016). As part of their engagement efforts they award Eagle Ford Excellent Awards that acknowledge companies’ efforts in preserving the environment and contributing to communities. The EFC aims to ‘develop and foster effective lines of communications with oil and gas industry and local communities such as public schools, non-profit groups, workforce training and education providers, and others’ (EFC, 2017). A potential drawback of intermediate organisations such as these is that they may increase power imbalances between groups of organised companies and local communities working independently (Ellis et al., 2016).

Cabot Oil and Gas Corp, Pennsylvania (US)

Cabot Oil and Gas gained notoriety in 2016 when they were ordered to pay millions of dollars to families in Dimock, Pennsylvania in a legal case related to water contamination. It is one of many companies involved in hydraulic fracturing who are carrying out public engagement. Their activities have included outreach projects,



Twitter question-and-answer sessions and a blog ‘created by the External Affairs team at Cabot Oil & Gas Corporation in the hopes to highlight the various events and outreach efforts around Pennsylvania and beyond’ (Cabot Oil & Gas Corporation, 2017). A whole section of their website is dedicated to social responsibility, including information on their water policy, which they describe as being ‘designed to meet and exceed the current state regulations governing water use and protection’ (Cabot Oil & Gas Corporation, 2016).

Grievance / complaint hotlines

Many companies run grievance or complaint hotlines to allow the public to express concerns, but little is known about how often or how effectively the complaints are addressed (North et al., 2014). However, some municipalities require industry operators to ensure responsiveness. For example, in Collier Township, Pennsylvania, the municipality has enforced a 24-hour phone line, response time limits and a requirement for an industry representative to be available at least once a week to hear concerns (North et al., 2014).

Social Impact Assessments

Social Impact Assessments (SIAs) identify and manage the social issues associated with a project, and include engagement with potentially affected communities (IAIA, 2015). The global oil and gas associations IPIECA² and IOGP³ provide guidance on how best to carry out such assessments for oil and gas development. In *A Guide to Social Impact Assessment in the Oil and Gas Industry*, IPIECA (2004) outline the typical issues that SIAs address, including changes to demographics and (positive and negative) impacts upon economy, health, social infrastructure, resources, psychological and community aspects, cultural property and social equity (i.e. who gains and loses). They state that SIAs should ideally be participative exercises with local, national and international stakeholders, whose views are incorporated throughout the project lifecycle (IPIECA, 2004).

A variety of tools can be used to collect data in a SIA, including qualitative interviewing, participatory approaches and the collection of quantified data such as household assets and health data (IPIECA, 2004). In their *Environmental-Social-Health Risk and Impact Management Process*, IOGP (2017) also describe an approach to systematically assess and manage a project’s environmental, social and health aspects, which is underpinned by stakeholder engagement from the earliest stages through project development and execution, through operations and retirement. They state that two-way communication should provide information about the project, seek input on defining the project, mitigation measures etc., and incorporate these into the project design and execution. As with the IPIECA guidance, IOGP advocate a cycle of

² IPIECA is a global not for profit oil and gas industry association that provides a forum for encouraging continuous improvement in industry performance (IPIECA, 2017).

³ The International Association of Oil and Gas Producers (IOGP) is a worldwide consortium of oil and gas producers, and a forum for members to ‘identify and share knowledge and good practices to achieve improvements in health, safety, the environment, security and social responsibility’ (IOGP, 2017).



continuing engagement with ongoing preparation, engagement, feedback and review. It is suggested that the Stakeholder Engagement Plan should set clear objectives, outline in what ways and how frequently stakeholders will be consulted and how their views will be documented, analysed and acted upon (IOGP, 2017). Esteves et al. (2012) describe ‘good’ SIA practice as: participatory; supporting affected peoples, proponents and regulatory agencies; increasing understanding of change and capacities to respond to change; seeking to avoid and mitigate negative impacts and to enhance positive benefits across the life cycle of developments; and enhancing the lives of vulnerable and disadvantaged people (see Esteves et al., 2012 for further detail).

Consiglio and industry colleagues (including BP, Chevron and ExxonMobil representatives) provide a useful summary of the 2004 IPIECA Guide (Consiglio et al., 2006). They describe SIA as an effective risk management tool for companies and an opportunity for communities to give input on a project. Amongst other recommendations they suggest that: NGOs may offer potential opportunities for helping to identify, evaluate and address social issues; stakeholders should be assessed for their ability to influence the project or their vulnerability to negative impacts from it; and that care should be taken to manage community expectations and avoid making any promises that cannot be kept (Consiglio et al., 2006). They recommend that an assessment team of experienced SIA practitioners is appointed (typically consultants), and reiterate the importance of engaging stakeholders early and often. Finally, they stress the importance of local knowledge in exposing issues that are not evident through a review of media and publications (Consiglio et al., 2006).

Social Impact Assessments are not currently mandatory in the US or Canada. However, Consiglio et al. (2006) recommend that SIA should be carried out in some form; whether as a formal SIA or some form of social assessment as part of a more integrated environmental, social and health assessment.

Comprehensive Development Plans (e.g. Maryland, US)

Comprehensive development plans (CDPs) establish guidelines for the growth of a community, often dealing with land use issues. As part of its Oil and gas exploration and production regulations, Maryland’s Secretary of the Environment has proposed mandatory public participation opportunities and access to information through comprehensive development planning, the permit review process for each well, and provisions requiring the disclosure of chemical information (Maryland Register, 2016). The regulations are still under review (Maryland Department of the Environment, 2017a), but have a statutory deadline of October 1st 2017 (Maryland Department of the Environment, 2017b). Maryland’s Department of the Environment stipulates that CDPs would outline the operator’s oil and gas development plans over a period of at least five years, and allow the operator to plan its development to minimise surface impacts before beginning development (Maryland Department of the Environment, 2016). Applicants must complete the CDP before applying for a permit for hydraulic fracturing, and the public will have opportunity to comment on the draft CDP at a public meeting in the area covered by the Plan (Maryland Department of the Environment, 2016). Small et al. (2014, p. 8295) suggest that comprehensive gas development plans



such as Maryland's 'have the potential to significantly improve industry and state shale gas governance, particularly when they incorporate best practices for public participation', while acknowledging that an expanded federal role may also be necessary. Others have criticised the CDPs for removing state authority to approve, deny or place conditions on the CDP (Earthworks, 2016), although the Maryland Department of Planning states that CDPs are reviewed for consistency with the State's growth management laws (Maryland Department of Planning, 2017).

2.3.2 Alliances and consortia

Overview

A number of alliances have been formed with a purpose of bringing together interested parties to share information, to improve shale development practices and facilitate interactions across state boundaries (e.g. Small et al., 2014). These include alliances between shale development companies (e.g. The Marcellus Shale Coalition), between industry and environmental agencies (e.g. the Center for Responsible Shale Development), joint initiatives between non-profits and government bodies (e.g. FracFocus). They also include government consortia (e.g. Interstate Oil and Gas Compact Commission) and educational consortia (e.g. Penn State University), which are discussed in sections 2.3.3 and 2.3.4 respectively. Our case studies show limited direct public engagement, instead focusing on engagement with industry and regulatory stakeholders, albeit with publically accessible website interfaces.

Marcellus Shale Coalition (US)

The Marcellus Shale Coalition works with companies involved in the exploration, production and supply of shale gas in the Marcellus and Utica Shale plays. Their aim is to 'provide in-depth information to policymakers, regulators, media and other public stakeholders on the positive effects responsible natural gas production is having on families, businesses, and communities across the region' (Marcellus Shale Coalition, 2017). They run training and workshops aimed predominantly at those active in the oil and gas industry, as well as joining other industry coalitions (Ohio Oil and Gas Association and West Virginia Oil and Natural Gas Association) in running the annual *Shale Insight* conference. On their website marcelluscoalition.org they provide 'fact sheets', reports and information on recommended practices, and have a Speaker's Bureau 'dedicated to providing factual information to the public', who can be booked for community events and public presentations (Marcellus Shale Coalition, 2017).

Center for Responsible Shale Development (CRSD), US

Previously the Center for Sustainable Shale Development (CSSD), CRSD is a non-profit organisation focused on industry self-regulation in the Marcellus. Its vision is to bring together environmental and gas industry leaders committed to driving continuous innovation and improvement of shale development practices within the Appalachian Basin' (CRSD, 2016). At the heart of their work is 'protection of the environment and the people and communities affected by the shale gas industry' (CRSD, 2016). The Center is a forum for collaboration between various environmental organisations and shale operators, who have jointly developed performance standards for activities



including water recycling, water monitoring, flaring limits and green completions. They provide independent third-party certification for companies who meet their performance standards, and publish summary audit reports on their website.

FracFocus, US (and Canada)

FracFocus is the ‘national hydraulic fracturing chemical registry’, managed by the Ground Water Protection Council and Interstate Oil and Gas Compact Commission (FracFocus, 2017b). The website was created to provide public access to reported chemicals used for hydraulic fracturing. It also provides information on the fracturing process, the purposes that various chemicals serve, and information on groundwater protection. It is not intended to replace state governmental information systems, but is currently used by 23 states as a means of official chemical disclosure (FracFocus, 2017b). Participating oil and gas companies submit the data on a voluntary or regulatory basis (FracFocus, 2017b). Some chemicals are listed as ‘proprietary’ due to Trade Secret provisions provided for in state law (FracFocus, 2017b). Although shale operations became more transparent in the US with the advent of FracFocus, a report by the US Department of Energy Secretary of Energy Advisory Board Task Force Report detailed on FracFocus (cited in The Scottish Government, 2014) found that a large proportion of reporting wells claimed at least one trade secret exemption. A companion website is run by the British Columbia Oil and Gas Commission in Canada (FracFocus, 2017a), and provides similar disclosure information to the US site.

2.3.3 Government

Overview

Governmental engagement ranges from encouraging conversations between stakeholders across different states (Interstate Oil and Gas Compact Commission), to facilitating citizen science via online interfaces (USGS Did You Feel It?), and carrying out detailed assessments to inform policy. The latter, which make up a large part of governmental engagement, vary in quality, with Canada’s Nova Scotia Independent Review Panel on Hydraulic Fracturing standing out as particularly thorough. Most of the assessments engage members of the public, while the Alberta Energy Regulator/ERCB report focusses on engaging regulators, albeit eliciting their responses on stakeholder and public perceptions. Public meetings are a common method of engagement for governmental reports, as well as invited input via letters and emails. The engagement therefore tends to involve input from the most concerned individuals, rather than from a more representative sample of the public. Most of the reports that we reviewed were carried out at early stages of development (or during moratoria) as fact-finding and scoping projects, with the exception of the Marcellus Shale Advisory Commission, which was undertaken while large-scale shale development continued.

Interstate Oil and Gas Compact Commission (IOGCC), US

This is a multi-state government agency that ‘assists member states efficiently maximise oil and natural gas resources through sound regulatory practices while protecting our nation’s health, safety and the environment’ (IOGCC, 2017). The Commission is the US’s only dedicated forum for governors, state appointees and policy staff focusing on



oil and gas issues. The Commission's various committees and workgroups carry out projects to advance the US's 'energy future', and are comprised of member governors, state oil and gas regulators, industry and the environmental community. To do this, they survey states on key issues, catalogue and share information, and facilitate the exchange of information between the different stakeholders. They also carry out public outreach to 'educate the American public about our domestic oil and natural gas industry and the IOGCC's role in its promotion and preservation' (IOGCC, 2017). Their engagement efforts also include co-managing FracFocus (see 2.3.2).

Did You Feel It? (US)

Did You Feel It? (DYFI) is a USGS citizen science initiative that creates maps, plots and datasets from data submitted by people who felt an earthquake. DYFI collects intensity data using the online DYFI Questionnaire and then combines users' responses. The data is also used to calibrate maps based on ground measurements recorded by seismometers (USGS, 2017). The maps show for example earthquake report clusters in Oklahoma, where wastewater disposal from hydraulic fracturing has been linked with increased incidents of earthquakes (e.g. Ellsworth, 2013).

Marcellus Shale Advisory Commission (US)

The Marcellus Shale Advisory Commission was created through executive order of the Pennsylvania Governor in 2011, and was charged with developing a set of recommendations for the development of unconventional natural gas in the Commonwealth of Pennsylvania (Whitton et al, 2017). Meetings were advertised and open to the public, and testimony and other material presented there were posted on the Commission's website. The Commission held 21 public meetings at which members of the public were permitted to speak, and also invited public input via letters and emails. Around 120 members of the public addressed the Commission in person, and more than 650 electronic mail and other written comments were received (Governor's Marcellus Shale Advisory Commission, 2011). Towards the end of their report, the Commission list 'several prominent and consistent themes' (p118), though it is unclear by what criteria these themes were chosen to be presented in the report. Many of the comments expressed dissatisfaction with the composition of the Commission, which was perceived to have too many members of the natural gas industry and of the Governor's Administration. These experts were appointed by Governor Corbett and were lacking in grass-roots and community representation (Governor's Marcellus Shale Advisory Commission, 2011). Despite this drawback, the engagement exercise did have a clear impact on policy, with the Commission's recommendations forming the foundation for Act 13, which updated the state's legislation (Whitton et al., 2017). Importantly, the Act included two elements that improved the transparency of shale operations for the public: an increase in the range of households and municipalities to be notified of permit applications; and the requirement for companies to disclose hydraulic fracturing chemicals through FracFocus (Whitton et al., 2017).

Boulder County, Colorado (US)

Boulder County carried out public engagement concerning the revision or maintenance of oil and gas regulations during a temporary moratorium on accepting new applications



for oil and gas development, which lapsed in May 2017. (Boulder County, 2017a). Multiple methods of participation were used during the engagement, including open house events (with one-way information provision), hearings and invited public comments. As with the majority of engagement exercises like this, it likely elicited participation from interested and affected parties rather than a more representative sample of the ‘general’ public. During the consultation, the website stated that ‘based on the Public Hearing, the Board believes that the responsible state and federal agencies may not be adequately addressing these impacts’ (Boulder County, 2017b). It should be noted that while the public were asked to consider whether existing regulations are sufficient or should be modified, and whether a moratorium should be extended, many of the public comments received indicated that a more appropriate question would have been, ‘should shale development go ahead at all?’, i.e. what Cotton (2017) terms the ‘need case’. However, such a question is rendered largely irrelevant in this case on account of the Colorado Supreme Court having stated that local bans and lengthy moratoria are not permitted under state law (Boulder County, 2017a).

Alberta Energy Regulator, Canada

The Alberta Energy Regulator (formerly Energy Resources Conservation Board /ERCB) is Alberta’s primary energy regulator (a single regulator -the BC Oil and Gas Commission- also exists in British Columbia with similar regulations and requirements). The Alberta Energy Regulator carried out a jurisdictional review in 2011 (ERCB, 2011) as part of an Unconventional Gas Regulatory Framework Project ‘to develop and implement a new regulatory framework for the development of Alberta’s CBM [coalbed methane], shale gas, and tight gas by 2011’ (ERCB, 2011) p1). The objective was to learn how other jurisdictions were regulating unconventional gas development, what issues had been encountered, and how they were managed. A key aspect of the review was a written and telephone survey of the key oil and gas regulators in other jurisdictions (in Canada, the US, and outside of North America), most of which have more experience with shale development. The review team also interviewed eight companies to garner industry perspectives on regulatory frameworks. Although its primary purpose was for use by the ERCB, it was also shared with the jurisdictions that participated, and is available online (ERCB, 2011).

The survey identified a number of challenges facing regulators and industry across virtually all jurisdictions, including those related to: well spacing; public, media and government concern over water contamination; water management; landowner and public concerns; environmental issues including air emissions and effects of surface infrastructure; and regulatory challenges. ‘The most common landowner complaints related to unconventional gas development in jurisdictions surveyed are traffic, noise, light pollution, local air quality, groundwater contamination, spills, general disturbance, and property trespass and damage’ (ERCB, 2011, p. 13). Part of the report summarises regulators’ responses about concerns about unconventional gas that are being raised by landowners, communities, and the public, as well as how these are considered in the regulatory process, and what actions have been taken by the regulator, other government agencies, or industry to address the concerns.



In a later report, the ERCB (2012, p. 4) make recommendations for ‘early and meaningful’ stakeholder engagement in play development plans. These recommendations include early disclosure of development plans, as well as timely, clear and fair opportunities for engagement through ‘meaningful interaction’ and two-way communication. The report states that engagements should demonstrate an understanding of local community and stakeholder concerns and how best to address them, and that stakeholders should have opportunities to input and express concerns. It also recommends that there should be a method of evaluating engagement activities.

BAPE, Quebec (Canada)

Quebec’s Bureau d’audiences publiques sur l’environnement (BAPE, the office of public hearings on the environment) held a public inquiry into ‘various avenues and issues connected with the sustainable development of the shale gas industry’, culminating in a report published in 2011. They gathered contributions from individual citizens, groups, municipalities and the industry, and based their examination on ‘Government and scientific documentation, expert opinions and the experience of people responsible for applying the regulations in Québec, elsewhere in Canada and in the United States’ (BAPE, 2011, p. 245). The effort included a series of public hearings about shale development to ‘establish the facts concerning the issues raised by exploration and the exploitation of shale gas’ (translated from French, Mackay Morin Maynard et associés, 2010, p. 2). They conclude that there is a need for more scientific knowledge and that full scale hydraulic fracturing should not be carried out until a strategic environmental assessment has been completed. They also recommend that a ‘shale gas consultative committee be set up to help ensure that the industry is able to coexist harmoniously with the community’ (BAPE, 2011, p. 245).

Nova Scotia Independent review panel on Hydraulic Fracturing (Canada)

The Nova Scotia Independent review panel on Hydraulic Fracturing (Atherton et al., 2014) represents ‘an early example of the kind of inclusive policy-making processes advocated by North et al. (2014)’ (Wheeler et al., 2015, p. 306). The full report covers various aspects of shale development, including development processes, the resource base, development scenarios, various potential (positive and negative) impacts, public participation, regulatory issues, and a set of recommendations. It is notable in its scope, depth and transparency of process.

The review was overseen by an independent panel of experts from a range of disciplines, including Aboriginal wisdom, economics, environmental geography, social science and petroleum geology. Stakeholders (individuals, organisations, members of the public) were invited to participate in the following ways:

- Commenting on skill sets to be incorporated into the selection process for panelists to serve on the Expert Panel
- Recommending candidate expert panelists
- Bidding for technical advisory work commissioned by the expert panel
- Submitting written evidence.



- Participating in online discussions (on topics such as the resource base, well integrity, public health) and surveys
- Participating in public meetings
- Providing commentary on discussion papers
- Commenting on recommendations

The panel sought to provide a transparent and multi-way engagement process. As such, stakeholders were issued with updates on the review process and the panel maintained a public record of all formal submissions, published the minutes from meetings, and were transparent in their deliberations (including publishing their criteria and method used in appointing members of the advisory group). Each time a discussion paper (which later formed chapters) was released, all participants were informed, and had the opportunity to provide feedback. Transparency was also increased by the report having been written in an understandable format, where complex information was presented in non-technical terms. Appendices included the most common questions asked at public meetings, and answers to them.

One of the principles of the review was the ‘legitimacy of all views’, i.e. that all public commentary and submissions were accepted as legitimate (unless rude or disrespectful). It is difficult to say how representative the participation was, but formal submissions to their panel were received from 215 citizens, 10 professional organisations, six environmental organisations, three industry associations, two municipalities, and two community organisations. Fully 145 of the 290 registered stakeholders were registered as an ‘interested citizen/other’ (Wheeler et al., 2015). Like the majority of engagement exercises reported here (with the exception of some of the scholarly research reported in section 2.3.4), The Nova Scotia review is likely to have gathered opinions predominantly from citizens with an interest in the issues (this is discussed more in section 2.4).

Public and stakeholder submissions formed a key, traceable element of the analysis. Part of the engagement effort was a Public Participatory Risk Assessment, in which 238 unique submissions were analysed, and issues of concern ranked and related to the literature, including a synthesis of the academic review results with the views of the participants. Finally, responses to discussion papers were also taken into account by the authors of final chapters, and in most cases referred to explicitly. Wheeler et al. (2015) also describe how lead authors of the Review revised their papers in response to feedback from fellow panelists and the public.

As a result of the review, the authors note a need for ‘significant period of learning and dialogue’ (p.4) and that development should not proceed at this time. Importantly, the Panel’s conclusion that ‘Nova Scotia should not proceed with hydraulic fracturing for unconventional gas and oil resources at this time’ (Atherton et al., 2014, p. 314), derives in part from the observation that hydraulic fracturing lacks an adequate social license amongst the majority of citizens in the province (according to previously conducted work cited in the report), and was actively opposed by ‘many hundreds’ –the



‘overwhelming majority’- of participants (p. 314), and because of the absence of trust in industry and government (Wheeler et al., 2015). The report also recommends that research should be independently conducted and *of a scientific and public participatory nature*.

New Brunswick Commission on Hydraulic Fracturing (Canada)

Another example of a thorough engagement exercise by a Canadian Provincial government, The New Brunswick Commission on Hydraulic Fracturing was appointed in 2015. Mandated by Premier Gallant, its aim was to provide an evidence based review into hydraulic fracturing in New Brunswick, Canada, to determine whether five conditions could be met: a social license; clear and credible information about impacts; a plan that mitigates impacts; a process that respects obligations to consult with First Nations; and a mechanism to ensure that benefits are maximised for New Brunswickers (New Brunswick Commission on Hydraulic Fracturing, 2016). To do this, the Commission gathered qualitative and quantitative evidence from natural, social/health and applied sciences, met with 228 individuals, and received 135 submissions from individuals and groups representing a mix of opinions, including: Indigenous elders, faith-based groups, academics, environmentalists, farmers, municipalities, rural communities, small businesses, energy companies, and the Anti-Shale Gas Alliance. Their findings included a pervasive view that the current regulatory system was complicated, slow-moving, opaque and unenforceable. They also found that Indigenous people did not trust the current process, prompting the Commission to suggest that an independent regulatory process could help build New Brunswickers’ trust. They also suggested that a broader community conversation is needed and propose a community-centred consultation process.

2.3.4 Academic

Overview

Engagement by academics includes that designed to disseminate evidence-based information and that designed to learn more about public and other stakeholder perceptions of development. The majority of this section focuses on scholarly perception studies, whereby academics have engaged publics and other stakeholders to learn more about their perceptions of and responses to shale development. However, first we consider the work of two academic groups working to engage interested parties via disseminating evidence-led information.

Physicians, Scientists and Engineers (PSE) for Healthy Energy (US)

Physicians, Scientists and Engineers (PSE) for Healthy Energy is a multidisciplinary research and policy institute consisting of academics with expertise in health, engineering and earth sciences. Anthony Ingraffea, who has authored numerous academic articles on hydraulic fracturing, is one of the founding members. The institute generates, translates, and disseminates scientific research ‘to help identify reasonable, healthy, and sustainable energy options’, aiming to increase scientific transparency and provide understandable scientific information for policy makers, academics, grassroots and advocacy groups (PSE Healthy Energy, 2017). PSE Healthy Energy outputs include



publications, science summaries, presentations and a database of peer-reviewed science, all of which is ‘vetted’ before it is transmitted.

Pennsylvania State University Marcellus Educational Consortium (US)

The PennState Consortium’s mission is to use ‘timely and unbiased, evidence-based research and education, [...to] assist citizens, businesses, elected officials, and others to understand and respond to the challenges, opportunities, and issues related to Marcellus Shale natural gas development’ (PennState Extension, 2017). They aim to address ‘the informational and educational needs’ of Marcellus stakeholders through collaborations, educational programs, and web- and technology-based information portals.

Scholarly perception studies

There is a growing body of research exploring public perceptions of shale development (Thomas et al., 2017). Such research is relevant in a discussion of engagement activities because not only have such perceptions been shown to be a precursor to civic action (Theodori, 2013), but the very act of eliciting these perceptions is an engagement exercise in itself and should form the earliest stage of communications (Morgan et al., 2002; Pidgeon & Fischhoff, 2011; Stern & Fineberg, 1996). This research includes a limited amount of work looking *explicitly* at how members of the public engage with shale development (including voting behaviour, protest and landowner coalitions), and is discussed in section 2.3.5 below. Here we provide a brief summary of research into public perceptions per se of shale development in the US and Canada. More information can be found in M4Shale report 18.1 (Thomas et al., 2015) and an associated academic publication (Thomas et al., 2017b), in which 58 articles published between 2009 and 2015 pertaining to US/Canadian perceptions are reviewed. This review shows that scholarly engagement has taken many forms, and has tended to be more inclusive of individuals less directly affected by development than other types of engagement on account of employing survey approaches with wider (unaffected/upstream) populations, in addition to those studies that focus on directly affected populations.

Scholarly research into public perceptions of shale development in the US and Canada has increased steadily in recent years (Thomas et al., 2017b). Broadly, the literature shows mixed levels of awareness, tending towards higher awareness in areas experiencing shale development. Perceived benefits tend to be economic (e.g., job creation, boosts to local economies), while perceived risks tend to be environmental/social (e.g., impacts on water, traffic) (Thomas et al., 2017b). Views are mixed as to whether benefits of shale operations outweigh risks or vice versa, and levels of support and opposition differ across regions within the US and Canada. Views on regulation also vary spatially, but studies report widespread distrust of the parties responsible (particularly industry and government), stemming from perceived unfairness, heavy-handed corporate tactics, and a lack of transparency. A number of papers also point to ethical issues concerning risk/benefit distribution, procedural justice, trust in risk managers and risk governance, and impacts upon quality of life (Thomas et al., 2017b).



The review shows that scholarly engagement with North American publics has focused mainly on the US, with a particularly strong emphasis on the Marcellus shale area, a large play in the northeast of the country that has experienced some of the most intensive development (Thomas et al., 2017b). Research has been both qualitative and quantitative in nature, but with a strong focus on quantitative surveys. Notably, qualitative research has focused on interested and affected parties -such as landowners, farmers and local educators- while quantitative research has focused more on the general population, often using representative and/or national samples. The methods used and the samples employed have important implications for the types of discussions that emerge. In-depth qualitative research can raise issues that are overlooked in quantitative surveys and target demographic or interest groups (Thomas et al., 2017b), but cannot reach large samples like quantitative surveys can. Downstream research with interested and affected parties in regions already experiencing development is likely to highlight locally-based concerns such as impacts on traffic (e.g. Brasier et al., 2011) or the erosion of community bonds (Perry, 2012), while more representative samples - particularly those upstream of development- may discuss broader visions and values such as shale development's (in)compatibility with desired energy system change (Partridge et al., 2017). These are important distinctions, because while siting a technology within a particular community is typically met with more hostility than national polls would suggest, a community that has lived with a technology for some time may be more supportive than the wider population, albeit often with important reservations (Parkhill et al., 2010; Pidgeon & Demski, 2012).

Other aspects of study design, such as terminology (Evensen et al., 2014) can also have an impact on how the topic is perceived by participants and how results are interpreted. Finally, different approaches allow for varying levels of multi-way communication between the public and researchers. On-line surveys usually allow for limited exchange; the level of interaction during interviews depends on interview methodology and the interviewee/er relationship; while deliberative approaches are designed to maximise information exchange between facilitators and participants, allowing participants to learn and debate throughout the process (Icaro, 2014; Thomas et al., 2017a). On their own, public opinion surveys can provide 'a partial and unreflexive representation of 'the public'' (Chilvers et al., 2015) – recording attitudes at a fixed point in time, with participants (usually) unable to record challenges to the initial framing or understanding of their participation, and often unable to reflect contingency or uncertainty (see Chilvers et al., 2015).

Thomas et al. (2017b) suggest that 'future research should focus on nuanced inquiry, a range of methodologies and explore perceptions in varied social and geographical contexts' particularly where shale development is still at relatively early stages. They also suggest that considering the strong focus on quantitative surveys and qualitative interviews, future research using focus groups, deliberative workshops or ethnographic approaches could offer more insight into co-produced meanings and slow-thinking judgements, and would be expected to add further layers to current understandings of public perceptions of shale operations; while more longitudinal research could chart perceptions over time (Thomas et al., 2017b). Finally, Theodori (2013) suggests that



future research into public engagement per se should explore cooperative civic action (which promotes empowerment by creating links between community members) such as participating in public meetings and protests (Wakefield et al., 2006). As shown in the following section, there are many examples of such cooperative action taking place.

2.3.5 Activism

Overview

Activism describes a process of campaigning to bring about change, and can take many forms. Here we consider individual action (e.g. voting), and collective action including that led by anti-fracking groups and landowner coalitions. Such engagement efforts can have very different aims, from obtaining the best deals on leasing land for shale development (e.g. Mistletoe Heights, NWPOA), to banning fracking within city limits (e.g. Denton Drilling Awareness Group). Our case studies achieved different levels of success, perhaps reflecting the extent to which their aims aligned with those of the shale development companies involved. We show that it is not only collective action that has exerted considerable influence in the US and Canada, both in support of and in opposition to development, but also individual actions (e.g. Gasland).

Individual action

Individuals who engage in protest or activism include those who oppose development, and those who support it. They can come from all walks of life. Stemming from in-depth conversations with grassroots anti-fracking activists, members of environmental non-profit organisations and community leaders, Willow (2014, p. 246) describes how many had not previously participated in environmental campaigns and did not identify themselves as environmentalists, but were ‘property-owners, parents, and professionals who felt personally threatened by what they observed taking place around them’. Types of engagement include attending meetings and rallies, placing signs on front lawns and voting (Sovacool, 2014; Theodori, 2013). Theodori et al. (2012) found that while most of the 800 Pennsylvania residents surveyed have not taken such actions, a total of 18% have attended a public meeting to get more information.

Theodori (2013) has explicitly explored engagement in individual civic actions (specifically, via contacting a local elected official/government agency to complain about a natural gas drilling/production issue, or voting for/against a political candidate because of their favourable position on shale development) in Tarrant County, Texas, and the relationship between this engagement and perceptions of the shale development impacts. He finds that individuals with more negative views of the social and environmental impacts of shale development are more likely to contact an elected official or government agency to complain about a natural gas drilling/development issue, and more likely to vote against a candidate due to their favourable opinion of it. This result is perhaps unsurprising, but does lend empirical support to the notion that perceptions influence civic action on shale development.



Gasland Film (US)

In some cases, individual efforts have had a significant impact on media and public framings of fracking. While the *Gasland* film has been promoted by anti-fracking campaigners worldwide, it was largely the vision of one man; the director Josh Fox. The film, released in 2010, attracted considerable media attention (Jaspal et al., 2014) and popularised ‘potent images of hazard’ including flaming water and tainted aquifers (Mazur, 2014, p. 207). It also contributed to anti-fracking mobilisations that in-turn affected the passage of local fracking moratoria (Vasi et al., 2015). The film won a prize at the Sundance Film Festival in 2010 and was nominated for Best Documentary Oscar in 2011 (Mazur, 2014). Its associated website is a hub for anti-fracking activity, including Twitter feeds, fact pages, maps and resources for taking action (Gasland, 2017).

On a side note, Hollywood has also ventured into the shale gas arena with Matt Damon’s 2012 film *Promised Land*, a story about a salesman (Damon) and his colleague who arrive in a small town to purchase drilling rights. What unfolds is a story of environmental activism and industry deception, labelled as ‘unforgivable’ by one commentator (Quinn, 2013) and receiving mixed reviews, but a ‘sociologically cogent picture of a rural town torn by controversy over the siting of a new technology’ nonetheless (Mazur, 2014, p. 207).

Anti-fracking groups

The anti-fracking movement in the US and Canada includes small grass roots groups, large international environmental groups, and high-profile celebrities. Their methods of engagement include protests, providing support for legal challenges, and disseminating information via social media. Anti-fracking activists have generated a strong internet presence, with many webpages and Facebook pages designed to inform citizens about the risks (Willow, 2014). Willow (2014) found that the anti-fracking-movement in Ohio takes its primary impetus from immediate environments and personal impacts rather than from a carbon emissions or climate change perspective, and that many of the activists were not against shale development altogether, recognising personal and national benefits of domestically produced affordable energy. Rather, they were opposing their lack of individual and local control and consent. Other organisations, such as Greenpeace, are against shale development altogether, arguing that it exacerbates climate change as well as generating more localised impacts such as contaminating water supplies (Greenpeace, 2017). Greenpeace has named fracking as one of its global warming issues and threats, with pages dedicated to information about the associated risks, and a focus on fracking as a threat to clean, renewable energy (Greenpeace, 2017).

In the US, there are a large number of groups that publically oppose fracking, from global environmental groups (e.g. Friends of the Earth, Greenpeace), through national specialist groups (e.g. Americans Against Fracking) to state-wide and more localised grassroots groups (e.g. Arizonans Against Fracking; Residents Against Fracking Tioga, New York). The ways in which these groups engage with the public and other stakeholders are varied. They include information dissemination, protest, political



lobbying and support for legal challenges. Americans Against Fracking for example is a national coalition to ban fracking, and acts as a hub for any organisation that supports a national ban on fracking (Americans Against Fracking, 2014). Earth Justice is the US's largest non-profit environmental law organisation, and provides free-of-charge legal support for environmental legal challenges. The organisation provided legal representation when an oil and gas company appealed against a ban in Dryden, New York, in 2014, a victory that sent a state-wide precedent upholding the rights of local communities to use municipal zoning powers to ban or limit fracking (Jordan-Bloch & Sutcliffe, 2014). In New York State, activist campaigns contributed to a state-wide moratorium on fracking (Kinniburgh, 2015). A number of high profile celebrities have also joined the anti-fracking movement in the US. Particularly notable are Mark Ruffalo (Navarro, 2011), and the New York-based Artists Against Fracking led by Yoko Ono and Sean Ono Lennon (Artists Against Fracking, 2017). A particularly effective artistic effort was Josh Fox's documentary film *Gasland*, as discussed above.

In New Brunswick, Canada, anti-fracking protestors in Rexton were particularly active in resisting development, where clashes between protestors' and police made headlines in 2013 (CBCnews, 2013). An indefinite moratorium was imposed in 2016, following publication of the New Brunswick Commission on Hydraulic Fracturing report (CBCnews, 2016) (New Brunswick Commission on Hydraulic Fracturing, 2016). Many of the smaller groups in both the US and Canada (e.g. Frack Free Illinois, Arizonans Against Fracking, Moncton Anti Fracking) use Facebook as a key engagement tool, posting events and links to articles.

Denton Drilling Awareness Group, Texas (US)

Denton Drilling Awareness Group (DAG) is a non-profit educational group 'dedicated to working towards a sustainable future' (Frack Free Denton, 2017). Their website describes their mission to 'promote the generation and use of renewable energy; education of the public about the health, safety and environmental impacts of hydraulic fracturing, and restoration of local regulatory authority over urban oil and gas production, including repeal of Texas House Bill 40' (Frack Free Denton, 2017). But in 2014, their aim was to ban fracking within the city limits, and that year, they led the successful Frack Free Denton campaign that saw Denton vote overwhelmingly to do just that, becoming the first town in Texas to ban hydraulic fracturing in their area (Maqbool, 2015). Environmental groups (and energy corporations) invested hundreds of thousands of dollars throughout the campaign for the ballot because in this energy-dominant state, this vote could set a precedent elsewhere (Rice, 2016). Indeed, the campaign for the fracking ban was the most expensive in Denton's history, and garnered support from national environmental groups (Rice, 2016). Opponents of the ban raised ten times more money (97% donated by oil and gas companies) than proponents, and so supporters resorted to 'informal tools of campaigning' ranging from canvassing to coffin races (Rice, 2016). Despite voters approving the ban 59% to 41% (Rice, 2016), the ban was overturned in May 2015, when the state of Texas passed a bill that 'in essence, prohibits bans on fracking' (Maqbool, 2015) by securing the state government's unilateral authority over oil and gas development (Rice, 2016). In June



2015, Denton formally repealed the ban, ‘insisting that the fight was far from over’ (Rice, 2016).

Council of Canadians

The Council of Canadians is ‘Canada’s leading social action organisation’ advocating for clean water, fair trade, green energy, public health care and ‘a vibrant democracy’ (Council of Canadians, 2017). They organise speakers, ‘days of action’, conferences and demonstrations, as well as produce research reports and fact sheets, ‘to ensure that governments know the kind of Canada we want’ (Council of Canadians, 2017). They state on their website that they oppose fracking ‘because of its high water use, its high carbon emissions, its impacts on human health, the disruption it causes to wildlife, and the danger it poses to groundwater and local drinking water’ and they are calling for a country-wide halt on operations. Their website includes information about the risks associated with hydraulic fracturing, as well as blog updates on fracking in Canada, and a ‘Fractivists Toolkit’ to help individuals and communities fight fracking, including sample resolution wording for asking elected representatives to place a moratorium or ban.

FracTracker (US)

The FracTracker Alliance ‘studies, maps, and communicates the risks of oil and gas development to protect our planet and support the renewable energy transformation’ (FracTracker Alliance, 2017). The Alliance encourages public contributions via e.g. digitising lease data, engaging in citizen science (e.g. counting trains, water monitoring), and sharing photographs and videos. They collect and present data, as well as offer mapping and analytical services for advocacy and research. They also work in communities, ‘collaborating with local stakeholders to document and learn more about the harms of extraction’ (FracTracker Alliance, 2017). Their tagline is ‘insights empowering action’. FracTracker began in 2010 as a website operating out of the University of Pittsburgh and focusing on data about extraction in the Marcellus Shale region, before becoming its own entity, the FracTracker Alliance, with offices across the US.

Landowner coalitions

Community-led activism is also proving successful in negotiating lease deals and lobbying for (responsible) gas drilling (Jacquet & Stedman, 2011; Liss, 2011). Jacquet and Stedman (2011) describe how landowner coalitions in New York State –comprising more than 20,000 landowners- engage in group activism to advocate for better lease and royalty rates with companies, as well as additional environmental protections and community benefits. The size and structure of the coalitions can vary widely, with the largest coalition in their study area comprising 5000 members. The authors describe how the coalitions afford considerable influence to landowners themselves, and that coalition group leaders are considering how to use this leverage to secure direct benefits to the wider community such as local investment and community development (Jacquet & Stedman, 2011). And while membership in the coalitions is reserved for landowners, the coalitions run outreach efforts with the wider community, including education seminars (Jacquet & Stedman, 2011). The authors describe a significant development as



being the creation of a state-wide umbrella group, which includes many of the coalition leaders, created to share leasing information and negotiation strategies.

Liss (2011) provides details of two particular landowner coalitions in Texas and Pennsylvania. In the case of Mistletoe Heights, Texas, the community appointed a committee of eight residents (including a petroleum engineer, attorneys, long-time residents) to negotiate a better deal for leases. They succeeded in attracting interest from another company, which provided competition, and significantly increased the bonuses secured for leasing. They also put the lease online so that other communities could follow suit (Liss, 2011). In a similar community coalition, Liss describes the Northern Wayne Property Owners' Alliance (NWPOA), which was set up to facilitate 'collective bargaining' by landowners faced with shale development companies interested in drilling on their land. Their engagement efforts included meetings (approx. 200 landowners), learning exercises including evening classes, appointment of district representatives, regular email and telephone updates, and the setting up of a dedicated website so that members could communicate with each other and stay informed. The website contained royalty calculators and lease offer trackers, for example. They hired a law firm, and liaised with geologists, Wall Street specialists, and energy companies, and looked at successful leases elsewhere. Liss describes how the lease created by the Alliance included special water treatment, limits to the density of well pads, and respect for seasonal industries such as summer camps. Two companies were interested in working with the Alliance, but had very different tactics. According to Liss (2011, p. 437), one company's 'hardball' tactics (including dishonesty and slander) alienated many of the landowners, despite making more generous immediate offers. A different company - offering less generous lump-sum payments but employing more amicable representatives who garnered more trust, and being the most forthcoming on environmental issues – was the one that the steering committee decided to make the deal with (Liss, 2011). About 85% of the Alliance's 1,300 members signed the deal.

2.4 Discussion

Our review shows that engagement with shale development has been carried out in various forms in the US and Canada. Those running engagement processes include individual companies, consortia and alliances, consultants, government agencies, academic institutions and scholars, individuals, community groups and anti-fracking movements. As such, participants include industry, landowners, members of the public, environmental organisations and regulators.

With regards to the methods of engagement used, North et al. (2014 p. 8393) state that most participation 'is limited to public listening sessions, public hearings, and written public comments, rather than dialogue'. On the contrary, we find that while public meetings are certainly popular forms of engagement, particular methods appear to be chosen depending on the type of engagement, who participates and the aims of the exercise (and thus is dependent upon how we define 'engagement'). For example, while



government assessments often favour public meetings, web-based fora are important for industry-led community liaison projects and citizen-science such as USGS's 'Did You Feel It?' and FracTracker's citizen train counting. Scholarly participation efforts on the other hand use a wide range of methodologies, including quantitative surveys, qualitative interviews, and occasionally deliberative fora. The level of multiway communication varies accordingly. While deliberative methods encourage a good deal of discussion between participants and facilitators, surveys allow mainly one-way flow from participants to surveyor, and industry podcasts and the like provide one-way flow in the opposite direction. Although such one-way information provision is far-from-ideal engagement (Fischhoff, 1995), in some cases it is an improvement for a traditionally secretive industry.

One of Rowe and Frewer's (2000) criteria for effective participation is that it should be carried out as early as possible. We find that engagement efforts tend to have predefined aims such as scoping potential impacts, reviewing existing legislation, and providing information; and that the stage of engagement is linked to these aims. For example: early engagement might be used to scope the risks from shale development (as in a SIA); complaint hotlines might be used in the post-development stages to hear concerns; citizen science projects (e.g. USGS 'Did You Feel It?') may be used to monitor impacts as they occur; and anti-fracking media (e.g. the Gasland film) may draw upon the experiences of impacted areas to engage people in regions not yet affected. Despite this range, we concur with North et al. (2014) in noting that not enough engagement happens at the very earliest stages of development. Notwithstanding some notable exceptions (e.g. a number of Canadian governmental assessments: Alberta, Quebec, Nova Scotia, New Brunswick; and numerous anti-fracking movements) engagement efforts have tended to occur later in the siting and development process. Furthermore, and importantly, the majority of studies neglect to ask the most fundamental of questions -whether shale development should occur at all. Instead, questions focus on where development should occur, how negative impacts should be minimised and benefits maximised, and what regulations should be in place. Rather than public and stakeholder perspectives being taken into account when deciding whether or where to allow shale development, participation by industry generally forms part of routinised regulatory procedures (North et al., 2014).

Rowe and Frewer (2000) suggest that participants should be broadly representative of the affected population. This criterion was rarely met in the examples that we reviewed, simply because the types of methods used (e.g. information campaigns on websites, complaint hotlines, public meetings) appeal to interested individuals. More representative surveys have been carried out in the US and Canada by scholars interested in these issues (e.g. Baldassare et al., 2014; Boudet et al., 2014; Lachapelle & Montpetit, 2014), but as discussed in section 2.3.4, the depth at which such surveys can explore individual concerns is limited. The notion that the only legitimate participants are representative (and 'invited') is contested in risk perception research. Both invited and uninvited publics can have legitimate roles to play in risk engagement and decision-making. Not least, those with a stake in a development may have specialist or local knowledge, be most likely to be affected, be more likely to oppose/support a project, or



voice concerns that are not necessarily included in formal risk assessments (Pidgeon, 1998). While invited publics may be expected to more closely represent the views of the ‘average citizen’, uninvited publics can challenge the normative assumptions and framings that accompany ‘invited’ participation (Wynne, 2007). Designers of engagement practices might reflect on whether the aim is to engage a ‘mini-public’ of average citizens, or more interested proponents/opponents who may have a more direct stake in the issue (see Pidgeon et al., 2017; Felt and Fochler 2010 for a discussion).

The information that we reviewed (reports, papers, company websites etc.) does not tend to provide sufficient detail to be able to state whether engagement processes are independent and unbiased. However, whether they are likely to be *viewed* as such can be surmised to an extent by who ran the process (Thomas et al., 2017b). For example, if an engagement exercise was run by industry or anti-fracking groups, it is unlikely to be *viewed* as independent; whereas if it is run by university researchers or community members it is more likely to be *viewed* as unbiased (note that this does not mean that it necessarily was(not) independent and unbiased). The Nova Scotia report takes measures to increase independence and reduce bias, including inviting stakeholders to comment on the skill sets to be incorporated into the selection process for expert panelists, and recommending panelists. Contrast this with the Marcellus Shale Advisory Commission who received complaints as to the composition of the commission, perceived to have too many members of the natural gas industry and of the Governor’s Administration.

Again, without access to the engagement processes themselves, or at least formal evaluations of them (e.g. Icaro, 2014), it is difficult to gauge factors such as transparency, access to appropriate resources, how clearly the nature and scope of the task were defined, and the cost-effectiveness of the process (Rowe & Frewer, 2000). As discussed in section 2.3.3, the Nova Scotia report is also notable for its transparency and clarity of process. For example, stakeholders were issued with updates on the review process and the panel maintained a public record of all formal submissions, published the minutes from meetings and their criteria for appointing members of the advisory group. Other engagement efforts were less forthcoming with such details. With regards to engagement materials, while some scholarly efforts (e.g. Partridge et al., 2017) make available their protocols and workshop resources, the provision of detailed materials is still quite unusual.

A final criteria outlined by Rowe and Frewer (2000) is that the output of the procedure should have a genuine impact on policy and be seen to do so. It is difficult (if not impossible) to trace how particular engagement exercises may influence public policy, and compared to process evaluation, outcome evaluation is more difficult to achieve (Bickerstaff et al., 2010). Unfortunately ‘there is no guarantee that political decisions will follow the logic of processes [...] however well designed and executed’ (Wheeler et al., 2015, p. 306). A public engagement can be exemplary, and yield excellent results, but this does not mean that the ‘correct’ or ‘appropriate’ corresponding decisions will be made (ibid). Indeed, without reading each individual public contribution and analysing the nature of any deliberations (e.g. if the facilitation was fair, appropriate and effective), it is not possible to say whether the end results reflect the wishes of the



public. For example, with telephone complaint hotlines, little is known about how often or how effectively complaints are actually addressed (North et al., 2014). As described in section 2.3.5, in Denton, Texas, the public engagement effort was successful in securing a ban, but the ban was subsequently overturned. Oil and gas companies have filed various lawsuits objecting to democratically implemented fracking bans such as this, and US Government regulation is only adjusting modestly to public concerns about the technology; leading Barvosa (2015, p. 497) to suggest that the ‘incorporation of public perspectives into science and technology governance is clearly still limited’.



3 DESIGNING ENGAGEMENT STRATEGIES

In this section, we draw upon the findings from our review and insights from the literature to make recommendations for engagement strategies. We propose the following guidelines, described in more detail below:

- Invest time and resources
- Clarify goals
- Consider who participates (and how)
- Begin participation early
- Select and adapt appropriate methods
- Facilitate multi-way communication and deliberation
- Ensure openness and transparency
- Act upon results and provide feedback

The above guidance lends itself particularly to those wishing to engage the public. We therefore conclude this section with insights for communities engaging with industry.

3.1 Invest time and resources

‘One cannot expect to quiet a raging controversy with a few hastily prepared messages’ (Fischhoff, 1995, p. 144). Indeed, poorly executed dialogue and communication processes can escalate concerns and make matters worse rather than better (Pidgeon & Demski, 2012, p. 41). When participants in the United Kingdom’s TNS BMRB engagement initiative⁴ were asked to design their own engagement process, albeit constrained by existing regulatory structures, one attribute was that the relevant bodies should be proactive in taking the lead on engagement, rather than waiting to be asked (TNS-BMRB, 2014). The key lesson here is for engagement not to be carried out as an afterthought, but instead form a key aspect of potential development, with adequate time and resources invested in it. In the case of industry engagement, Potterf et al. (2014) recommend that individual companies or groups of companies create long-term staff positions dedicated to community liaison.

Evidence suggests that time be invested in thinking and reflecting upon the practice of engagement. Chilvers et al. (2015) argue that there is a need for approaches to energy participation that take account of the diverse, complex and continually emerging ways in which people engage with energy issues, and that a participatory practice should be recognised as being shaped by, and in turn shaping, the object (fracking), models (participatory practice/method) and subjects (public participants). Doing engagement ‘properly’ includes being aware of the ways in which these factors might shape the process, and being open to changes in any of them throughout. It also includes being sensitive to any prior assumptions and framings, including the ways in which the

⁴ Three public dialogues were held with diverse participants, designed to advise the UK’s Office of Unconventional Gas and Oil’s public engagement policy, inform industry’s development of a community benefits package, and help stakeholders develop plans for local engagement.



cultural norms of the organising institution frame the dialogue (Bickerstaff et al., 2010), assumptions about who is participating (Cotton, 2013), how they participate (Felt & Fochler, 2010), and assumptions made when analysing data from an engagement exercise.

3.2 Clarify goals

Methods cannot be chosen effectively or successes measured without setting goals. The National Academies of Sciences (2017) state that the most effective communications approach will depend on the communicator's goal, which can include: increasing knowledge and understanding of a science-related issue; influencing opinions, behaviour and policy preferences; and engaging with diverse groups in order that their perspectives can be considered in seeking solutions. It is also suggested that the goal of an engagement exercise be defined and made public (Chess & Purcell, 1999), and criteria by which to evaluate the process set out (Rowe et al., 2005). For example, will successful participation lead to citizen support for (or refusal of) a shale development proposal? Will it lead to citizens shaping hydraulic fracturing policy? As well as setting the clear objectives of an engagement exercise, the IOGP recommend that organisers of Stakeholder Engagement Plans for a SIA should outline factors such as the methods and frequency of stakeholder consultation, and how their views will be documented, analysed and acted upon (IOGP, 2017).

3.3 Consider who participates (and how)

There is never one single public attitude or belief about 'risk': instead, multiple publics hold differing worldviews, knowledges and experiences concerning the technology in question and its impacts upon them (Pidgeon et al., 1992). Conveners might therefore consider who participates in an engagement exercise: from the 'type' of participant (e.g. regulator, landowner, lay public) through how large the sample should be, to how local/national context might shape their responses.

The first task might be to define the 'community' of interest. This may not be straightforward, and as Cotton (2017) suggests, injustices may occur when a community is defined by spatial proximity (e.g. those closest to a well), or by role involvement (e.g. members of social movements). Organisers might ask whether the aim is to engage a 'mini-public' of average citizens, or more interested proponents/opponents ('uninvited' publics) who may have a more direct stake in the issue (see Pidgeon et al., 2017 for a discussion). Should participation garner the deep engagement of a small sample, or a lighter touch engagement with a large population? Is the aim to elicit the views of those who are most likely to protest, or the views of those whose voice has not yet been heard (Rowe et al., 2005)? Or are there key stakeholders who can act as go-betweens with the wider community? For example, Potterf et al. (2014) recommend that industries proactively seek information from diverse types of community leaders as well as the general public: for example, Church officials and social service providers who are particularly well positioned to understand the experiences of the potentially most affected individuals (e.g. low income, elderly). Similarly, IOGP (2017) suggests that



NGO stakeholders may offer potential opportunities for helping to identify, evaluate and address social issues.

Morgan et al. (2002) recommend that communicators explore what participants already know and perceive of the issues before further engagement commences. This strategic listening (Pidgeon & Fischhoff, 2011, p. 35) is important because ‘there is no way to know what information people need without doing research that begins by listening to them.’ From a media and public relations perspective, Jones et al. (2013) cite pro-business consultants *Control Risks* in suggesting that knowing the audience should involve gaining a better understanding of the goals, structure, methods and trajectory of the anti-fracking movement. Logically, opponents of shale development might equally benefit from understanding the goals, structure, methods and trajectory of shale development companies and the PR companies that they employ.

It is also important to recognise that views are changeable: an individual may simultaneously hold conditional, ambivalent and sometimes contradictory views about a given technology (Henwood & Pidgeon, 2014). Furthermore, the importance of *context* means that a ‘one size fits all’ approach is not appropriate (Thomas et al., 2017a). Communicators may wish to seek to understand the local and national context in which participation occurs, and be sensitive to cultural and social differences, differences in gender, values and so on. This includes how publics view their locales, and understand place attachments and sense of identity (Pidgeon & Demski, 2012). Some of the documents that we reviewed accordingly stressed the importance of local knowledge in designing and carrying out engagement exercises (IOGP, 2017; Potterf et al., 2014).

Finally, those designing engagement exercises might not only consider who participates, but how they participate. Any participation exercise will be complicated by the ways in which public roles are framed by the very settings in which public engagement occurs, and in turn the ways in which the participants themselves transform these roles and identities, and construct themselves in relation to wider publics (Felt & Fochler, 2010). In other words, how engagement *makes* and is *made by* those who participate in it (Michael, 2009).

3.4 Begin participation early

Evidence suggests that participation should begin early (Chess & Purcell, 1999; Ruckelshaus, 1983) and continue throughout the development process (IOGP, 2017; TNS-BMRB, 2014). The importance of upstream engagement -whereby public perceptions are taken into account from the earliest stages in technological development- has been recognised for two decades (Royal Commission on Environmental Pollution, 1998; Stern & Fineberg, 1996; Wilsdon & Willis, 2004). Such engagement can facilitate debate of future trajectories and a full range of choices, raise potential concerns early, and allow key decisions to be influenced before technologies become locked-in or established (Pidgeon & Rogers-Hayden, 2007; Stirling, 2007).



Shale development has been described as a ‘liminal’ case for deliberation, established in some locations and unfamiliar in others (Partridge et al., 2017). While ‘upstream’ engagement refers to engagement in the early stages of technology *development* rather than the *siting* of a particular project, in both cases early engagement can highlight concerns and preferences. Organisers may also wish to reflect on how the timing of an engagement might influence participants’ conceptualisation of the process and their role in it (Felt & Fochler, 2010). For example, in the later stages of development participants may more readily relate the development to how they would themselves be affected (Felt & Fochler, 2010).

3.5 Select and adapt appropriate methods

As illustrated in Table 1, a multitude of methods exist to engage the public and other stakeholders with shale development. There is no silver bullet, and different modes may be appropriate for different purposes and for different people (Chess & Purcell, 1999; Rowe & Frewer, 2000). For example, drop-in centres and town hall meetings may be effective modes for engaging ‘neighbours’, while early, upstream engagement and moderated online discussion forums may be more effective for activists (Cotton, 2013). The most appropriate method will depend on the context of the issue, the desired outcome, the stage of development, and the participants. When asked, participants in the TNS BMRB initiative favoured a variety of approaches at varying stages of development, ranging from televised panel discussions to engage with the national debate, through residents’ community panels to door-knocking by operators (TNS-BMRB, 2014).

As discussed in section 2.3.4, the chosen methods have important implications for the nature and depth of discussions that emerge. For example, when aiming to elicit informed rather than uninformed preferences (Corner & Pidgeon, 2012), lengthier deliberation sessions that facilitate two-way communication may be more appropriate than a traditional survey (e.g. Thomas et al., 2017a; Williams et al., 2015). It is important to note however, that *how* the method is used can be more important than *which* method is used. Organisers might therefore consider modifying traditional methods or using a combination of different techniques (Chess & Purcell, 1999; Rowe & Frewer, 2000).

Regardless of the chosen method, materials should be carefully calibrated to provide sufficient balanced information and allow enough time and resources for piloting (Satterfield et al., 2012). Evidence suggests that those designing an engagement exercise should be sensitive to assumptions, and consider how the mode and materials might frame the issue (Corner & Pidgeon, 2015). For example, it might be desirable to carefully consider, pilot and adapt wording, recognising for instance that some terms have negative connotations (e.g. fracking) whilst others have positive ones (new technology/development) (Evensen et al., 2014; Pidgeon et al., 2009). It might be appropriate to follow a methodology that ‘unframes’ the issues (Bellamy & Lezaun, 2015) or allows the public to some extent frame the issues themselves (Rowe et al., 2005; TNS-BMRB, 2014).



3.6 Facilitate multi-way communication and deliberation

It has been suggested that engagement should be an iterative process of analysis and deliberation, ensuring multi-way dialogue between various stakeholders and stakeholder groups (Fischhoff, 1995; Stern & Fineberg, 1996; Webler, 1995; Whitton et al., 2017). Furthermore, it has been argued that having the opportunity to deliberate –i.e. dedicate long and careful thought to the issue- is central to responsible participatory democracy (Dryzek, 2009), not only for decision making and scientific governance, but also in fostering political efficacy, increasing political ‘sophistication’ and providing other personal benefits to participants (Carpini et al., 2004; Gastil & Dillard, 1999; Selin et al., 2016).

Pidgeon et al. (2017) argue that as long as they are open to free discussion and not constrained by strong framings, deliberative fora should allow values to emerge quite freely. Alternatively, conveners may wish to actively explore value questions such as issues of equity, trust and power, or how shale development fits within wider preferences (Dietz, 2013; Thomas et al., 2017a; Wheeler et al., 2015). Such questions may be particularly relevant in controversial issues such as shale development, where politics, culture and worldviews have been shown to be important in shaping perceptions (see Thomas et al., 2017b). Indeed, opposition to developments tends to stem from a lot more than ‘not in my back yard’ sentiments, rather reflecting broader questions of fairness, place identity and wider contexts of energy preferences and values (Cotton, 2013; Demski et al., 2015; Devine-Wright, 2009).

3.7 Ensure openness and transparency

An open and transparent engagement exercise would adequately publicise forums and results, and be truthful and unbiased during the engagement process. Firstly, where participants are openly invited to attend an engagement event, it is suggested that the event be effectively publicised (Chess & Purcell, 1999), else risk excluding potential participants and exacerbating self-selection biases. This includes where engagement consists of information provision only: as Potterf et al. (2014) discovered, information provided by industry to community leaders does not necessarily get passed on to other stakeholders or the wider public.

Untruthful engagement practices risk alienating the public and (further) reducing levels of trust. For example, if designing an event to disseminate information, it is suggested that organisers do not promise to listen to feedback if there is no mechanism for doing so (Cotton, 2013). This is particularly important in an arena where the public perceives a lack of transparency and harbours a mistrust of industry and government (Thomas et al., 2017b). Potterf et al. (2014) stress the need for unbiased, research based information, or acknowledgment that this is lacking. Communicators should be clear about what is known and not known, what the public can influence and what they cannot (TNS-BMRB, 2014). Participants will likely demand ‘confirmed facts’ and statistics (Thomas et al., 2017a; TNS-BMRB, 2014); but uncertainties should be



explicitly acknowledged where they exist (Pidgeon & Fischhoff, 2011; Ruckelshaus, 1983).

Evidence suggests that engagement efforts should also be ‘real’: Potterf et al. (2014) noted that local leaders were particularly annoyed when they perceived communication efforts as simply for ‘public relations’ purposes, or as token gestures. In a similar vein, engagement campaigns may be most successful when they use trusted communicators. For participants in TNS-BMRB engagement initiative, the most trusted messengers were those that were perceived as being most likely to have a clear understanding of the issues and to be honest about them; non-biased experts including academics, scientists and regulatory bodies (TNS-BMRB, 2014). Liss (2011) also stresses the importance of amicable industry negotiators who garner trust amongst the affected community.

Rowe and Frewer (2000) stipulate that engagement campaigns should be conducted in an independent and unbiased way, and that managers and facilitators should be independent and seen to be independent. This ranges from the make-up of expert panels to the ways in which a participatory workshop is facilitated. For example, as mentioned earlier, many public submissions to the Marcellus Shale Advisory Commission expressed dissatisfaction with the composition of the Commission, which was perceived to have too many members of the natural gas industry and of the Governor’s Administration (Governor’s Marcellus Shale Advisory Commission, 2011); which puts the credibility of the exercise at risk. Contrast this with the Nova Scotia Independent review panel on Hydraulic Fracturing, where participants were invited to recommend candidates for the expert panel (Atherton et al., 2014).

3.8 Act upon results and provide feedback

An open and transparent engagement campaign would also make a commitment to following recommendations that emerge. Responsible innovation requires developers to respond accordingly and rapidly to public input, even if it is not what they were hoping for (Potterf et al., 2014; Stilgoe et al., 2013), and maintaining a social license to operate requires companies to continue to engage with the community throughout the duration of a project. Engagement exercises should be seen to have a clear impact, which might even include moratoria or amendments to legislation (Governor’s Marcellus Shale Advisory Commission, 2011). Similarly, it may be desirable to make publically accessible monitoring and oversight of shale developments as they occur, for example through postal and web portal updates (FracFocus, 2017b; TNS-BMRB, 2014).

Outcomes may be evaluated using a variety of tools, including empirical surveys, interviews or deliberations. However, measuring the impacts of engagement activities on policy development is notoriously difficult (Bickerstaff et al., 2010) and is often neglected (Kurath & Gisler, 2009). Measurement can be problematic because of difficulties in identifying an end-point to the engagement exercise (Rowe et al., 2005), and because any effects may be due to other variables such as the social context of particular activities, the nature of the problem, or simultaneous events like local elections (Chess & Purcell, 1999). As discussed in section 2.1, this is complicated by



the subjectivity in deciding the criteria by which an engagement exercise is deemed successful. Furthermore, the impacts of an engagement exercise can of course only be measured if there is knowledge of baseline beliefs and attitudes, thus there is an argument for carrying out ‘social’ baseline monitoring alongside more technical monitoring of earthquakes and methane concentrations, for example. This could be carried out as part of the ‘strategic listening’ described in 3.3.

While evaluating outputs may be problematic, evaluating engagement *processes* tends to be more straightforward. This evaluation may be carried out by the agency leading the engagement exercise, or ideally an independent external party or the participants themselves (Icaro, 2014; Rowe et al., 2008). Methods could include event observation, questionnaires, discussions with participants, and interviews with stakeholders (Icaro, 2014; Rowe et al., 2005; Rowe et al., 2008). Such an evaluation could explore various criteria, including perceived neutrality and bias, clarity of outcomes, effectiveness of facilitation, and so on.

3.9 Guidance for communities engaging with industry

Thus far we have focused on engagement where members of the public are the participants rather than the conveners. However, many of the same guidelines would apply to engagement led by members of the public, from investing time and resources and ‘knowing’ the participants, to beginning participation early and using appropriate engagement methods. Likewise, many of the insights offered by pro-development stakeholders also apply to opponents. For example, from a pro-development perspective, Jones et al. (2013) argue that PR companies should identify key issues, pursue a coordinated strategy, consider a variety of traditional and social media outlets, have the expertise to access technical and regulatory information rapidly, and ‘should work together to counter environmental and community concerns’ (p.390). Members of the public seeking to engage with industry stakeholders might equally benefit from the strategies that Jones and colleagues recommend.

While there is far less peer-reviewed literature providing explicit recommendations for communities wishing to engage with industry, Liss (2011) offers important insights from her analyses of landowner negotiations; and further guidelines can be found in grey-literature such as activist toolkits. While pointing out that every situation is unique (note that in Canada for example, the Crown owns many of the resource rights), Liss (2011) outlines the following lessons that could be applied to landowners involved in negotiating extractive deals. She suggests that several companies should be involved so that landowners get the most money for leases (ibid). Next, collective bargaining (alliances) work by creating leverage and providing a means to split costs e.g. legal fees. She states that it is important to build intergroup trust (e.g. select leaders with reputations for integrity) and keep members informed; and to not rely on companies for information – landowners reduce ‘power asymmetries’ when they educate themselves. Finally, she notes that insisting on addressing environmental concerns should not necessarily be a deal-breaker, but aside from this that landowners should not expect all of their ‘minor concerns’ to be accommodated.



A number of resources provide guidance for those wishing to prevent shale development rather than maximise gains from it. The Council of Canadians' *Fractivist Toolkit* is a detailed 55-page document providing advice on how to 'take action to protect water and stop fracking' (Council of Canadians, 2013), including how to build a coalition and encourage community participation, how to engage via social media, and how to lobby for a bylaw or resolution. The report goes into significant detail, outlining for example how Neighbourhood Watch members can be enlisted to help with surveillance work, and how to debunk particular 'industry myths' (p.46). The report includes insights from case-studies of successful campaigns (e.g. France, Quebec, New York), such as the significance of 'spontaneous and passionate protests', a strong sense of community, and targeting individual high-ranking politicians (Council of Canadians, 2013, p. 38). The report also links to blog posts written by one of the organisers of a Quebec anti-fracking movement, which share some of the 'strategic insights and tactical ideas' for engaging in nonviolent resistance (Duhamel, 2013a). These include the importance of preparation and training in Nonviolent Direct Action and Civil Disobedience, detailed planning, and choosing a frame that does not exclude swathes of the public (Duhamel, 2013b).

Focusing more on the legal aspects of shale development, Earth Justice is a non-profit environmental law organisation based in the US, which lists fracking as one of its headline advocacy campaigns. In addition to featuring details of successful campaigns, their website (Earth Justice, 2017) includes resources such as a discussion by legal experts about the options available to Californian communities for using municipal zoning to limit or ban fracking, and advice on how to write effective action letters. In addition to providing material support for citizen groups seeking to take legal action (as in the case of Earth Justice), NGOs can act as intermediaries, able to engage with industry and government on behalf of citizens. Examples include entering into alliances (see 3.2.2) and lobbying government.



4 CONCLUSIONS

Engaging the public and other stakeholders with shale development is not easy, due to many factors including inequitable impacts, scientific uncertainty and mistrust of industry and government. Despite these obstacles, a multitude of engagement projects are occurring in the US and Canada.

Public engagement by industry has largely focused on one-way information provision and public hearings (see also North et al., 2014, Whitton et al., 2017), perhaps reflecting an information deficit approach that assumes providing more information will lead to acceptance. Risk communication experts (Fischhoff, 1995; McComas, 2006; Pidgeon et al., 1992) and PR commentators alike (Minty, 2016) have recognised that providing more information alone is not an effective form of engagement. Having said this, our review shows that one-way information by industry stakeholders is only one of the many types of engagement occurring around shale development in North America. Indeed, engagement is also being carried out by government agencies, scholars, individuals, grass-roots and community groups, and is using a variety of different methods – ranging from barbeque events to in-depth academic research - reflecting similar observations in relation to engagement with energy issues more broadly in the UK (Pallett et al., 2017).

Despite burgeoning engagement activity in the US and Canada, much of it is not occurring at the earliest stages of development, and at times seems something of an afterthought, secondary to the physical aspects of development. We also find that engagement activities rarely ask the most fundamental question, whether shale development should proceed at all; and instead commonly focus on questions of impact minimisation, regulation and gaining support. Furthermore, most of the engagement activities that we reviewed tended to elicit the responses of interested and affected parties, particularly local communities, with much less attention to the views of the wider public. While it is essential to engage individuals in the immediate area, in the case of shale gas/oil development -with potential local, national and global ramifications (e.g. impacts on energy security and climate change)- it is also important to engage more widely (Partridge et al., 2017).

It is very difficult to gauge the success of individual engagement efforts. Some, such as the Marcellus Shale Advisory Commission, had a clear impact on policy (Whitton et al., 2017) while some, such as the film *Gasland*, attracted considerable media attention. Others were successful in leading to fracking bans, but were subsequently undermined by powerful industry interests. Indeed, as discussed in section 2.4, carrying out exceptional public engagement does not mean that the ‘correct’ or ‘appropriate’ corresponding decisions will be made. Therefore, alongside well-designed and executed engagement, there must be an unwavering commitment from decision makers to follow truthfully the recommendations that emerge from these exercises.

In conclusion, while there is extensive engagement occurring among various parties in the US and Canada, there is still much room for improvement. The benefits of



engagement are broad, and too important to constitute an afterthought or an ‘add on’ activity. From our review of case studies and the literature, we recommend that the goals of an engagement exercise be clarified at the outset, and that sufficient time and resources are invested to enable projects to be carried out thoughtfully and thoroughly. Evidence suggests that engagement should begin at the earliest stages of development, and consideration be given to who participates and how they participate. Methods might be selected and adapted according to the specific circumstances, participants, and goals of the engagement; and may facilitate multi-way communication and deliberation. The literature also suggests that openness and transparency be maintained throughout, with a strong commitment to following recommendations that emerge.

While these guidelines are broadly applicable to the European experience, there are of course important differences between North American and European shale development. Not least, different levels of economic benefit (local vs national) as well as differences in mineral rights ownership, geology, population distribution, and regulatory contexts may all impact perceptions and engagement strategies. We therefore reiterate the importance of considering context when designing and interpreting engagement campaigns.



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