

# Fracking and epistemic injustice: A feminist critique of knowledge formation

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## Abstract

The expansion of fracking, an intensive form of hydrocarbon extraction, has been met with increasing public hostility, spanning a diverse range of interests and political allegiances. However, to date, few authors have engaged with the role of gender and women activists. In this paper, I consider how gender and gendered ideas have been used as a resource to underpin fracking protests in the USA and UK. I find that a problematic gendered binary has emerged that undermined the veracity of anti-fracking protestors' opposition and aligns with modes of planning governance that valorize universal and objective forms of knowledge. Drawing upon a feminist epistemological stance, I turn to a planning dispute over noise levels in Lancashire, England, to explore the limits to current forms of knowledge production. I argue that specific actors, behaviours, and forms of knowledge become framed as gendered and unreliable in the sphere of technical decision making, diminishing our understanding of the complexities of human experience and subjectivity within spatial planning.

## Keywords

Fracking, feminism epistemic injustice, the politics of noise, planning

Women think differently to men on a whole range of issues – I am sure both men and women would agree with that statement . . . As a mother, I would do nothing to put my family, or any other family, in harm's way. As a scientist, I study the facts and know that many of the fears are irrational . . . Scientific language does not resonate with them [women]. They do not engage with it. What they do connect with is the impact they think science or technology will have on them and their family.

Averil MacDonald<sup>1</sup>

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My opening epigraph sets out the viewpoint of the scientist Averil MacDonald who was appointed chair of the industry lobbying body UK Onshore Oil and Gas in 2015. Her words exemplify a wider perception of public opposition to fracking. The assertion that public viewpoints from women on the matter are something that can be disregarded as irrational goes to the heart of questions of knowledge and objectivity, and how science is framed and utilised to support vastly different perspectives within planning disputes. To date, the intense public debate on fracking, which refers to a key part of the extraction of shale gas from deep subsurface rock, has revolved around disputed knowledge claims regarding the environmental, health, and social impacts on local communities (see Cotton, 2015; Sovacool et al., 2020). Supporters of the industry have deployed arguments that opposition is rooted in the non-rational world of emotions, with women so concerned with their caring roles that they are unable to engage with science in their everyday lives. Gendered discourses have in turn been used by anti-fracking campaigners to support their claims to know and care for local environments more deeply.

In this paper, I explore how essentialist ideas about gender have proliferated throughout the public debate on fracking. In the first section of the paper I outline how gendered opposition that draws on ideas about the relationship between nature and women have animated aspects of public protest. Secondly, I turn to a feminist epistemological critique that challenges a prevailing “rational versus irrational” knowledge binary underpinned by gendered stereotypes. In the final section I examine these gendered framings through the politics of noise. I look at the limitations of current governance approaches that seek universal measures through which to evaluate decisions. Specifically, I consider how the multi-layered nature of opposition to fracking reveals the continuing limitations of current conceptualisations of knowledge within environmental and planning decision-making. My argument draws upon interviews with people involved in the shale gas dispute, including advocates and protesters, in Pennsylvania, USA, and Lancashire England.<sup>2</sup> I focus in this paper on the interviews with women, although gender was not the primary focus of my research at the time of conducting fieldwork. The final part of the paper, focused on a specific dispute over noise, draws on the publicly available reports, from the planning inquiry, and noise reports, as well as watching the public inquiry via weblink and recorded sessions (9 February–11 March 2016).

Drawing on a feminist lens, I raise questions about how a binary distinction emerges between objective scientific decision-making and more subjective “emotional” forms of knowledge and dissent both shape and limit policy-making processes. Focusing upon a key area of dispute, noise, I examine how feminist epistemological approaches towards the subjective are crucial to understanding and analysing the complexities of shale gas development. Noise emerges as an important factor to consider questions of knowledge as the community could gain influence through engaging with technical assessment of sound. However, the sounds produced by fracking operations cannot be reduced to standardised levels of noise that are presumed to have similar and universal impacts on others.

Women have emerged as key actors in the anti-fracking movement but their activism has been subject to a backlash and underpins a key tenet of the dismissal of public concerns as irrational and outside the rational space of allegedly scientifically informed policy-making. Whilst the anti-fracking movement spans gender and political affiliations, a feminist epistemology provides crucial insights into the relegation of community forms of understanding that have long been critiqued in planning research (see Aitken, 2009; Rydin, 2007, 2020). A feminist critique challenges modes of policy-making that separate decisions from people and imagine a rational world where decision-making has equal impacts on different groups and all are equally able to participate in public debates. Public policy scholars have

emphasised the growing need to engage with the role of emotions in policy-making (Verhoeven and Duyvendak, 2016). However, expressions of emotion can act to re-essentialise gendered tropes (see for example Durnová and Hejzlarová, 2018). Jessica Pykett and colleagues point to the growing “emotionalised rhetoric” deployed in political debates but they further caution that “emotional resources and repertoires are of course in themselves linked to wider inequalities: who is able to muster and display appropriate emotions within encounters with the state ...” (Pykett et al., 2016: 9).

By a feminist and gendered approach, my research focus is on women involved in the movement, and how a binary emerges relegating community objection to a long-standing gendered sets of ideas of irrationality and subjectivity. Yet fracking disputes are further constrained by the highly formal realm of spatial planning where permission must be sought for each specific shale gas well to developed and require objections to conform to a series of issues deemed relevant by central government. Planning as a spatial mode of governance has been subject to critique due to its limited ability to engage with the public in highly formal settings (Aitken, 2009). Furthermore, the challenges of multi-scalar forms of decision-making that may bypass the public at higher levels and where they may struggle to be heard at locally specific stages. (see Abbot, 2020; Owens, 2004; Rydin, 2020). “Spatial governance” refers to those systems of decision making that have spatial or environmental dimensions including, but not limited to, the formal state apparatus and the legislative framework for land use planning. Whilst planning ostensibly lies within the hands of the state, the operation of shale gas requires engagement with regulatory state actors, as well as industry actors monitoring, advising, and producing research data. Yet these non-traditional forms of governance raise questions of legitimacy and accountability (see Lau, 2014) There is considerable dispute between work focused on fracking disputes that argues that knowledge and information has little bearing on community beliefs about the industry (Evensen, 2017; Stedman et al., 2016). A second strand queries the notion of objective risk as well as the limited trust that public institutions hold, particularly when they are seen to be advocates for the technology (see Bradshaw and Waite, 2017; Goldstein, 2014; Williams et al., 2017; Zilliox and Smith, 2018).

Environmental concerns regarding air quality, water contamination, traffic impacts, noise levels, human and animal health, and wider social impacts of shale gas development have advanced particularly in the US context (see Davis and Fisk, 2017; Dunlop et al., 2021; Evensen and Stedman, 2017; Kinchy et al., 2014; Szolucha, 2021). There continues to be public distrust of the industry, as well as a series of studies examining the negative impacts for local residents living near shale gas sites or affected by the wider industry (Burbidge and Adams, 2020; Fry et al., 2015; Litovitz et al., 2013; Meng, 2015). The anti-fracking protests themselves have drawn increasing attention from scholars with studies have focused on motivations for opposition and the experiences of residents, adding to existing work on environmental activism (see Beebeejaun, 2019; Cotton and Charnley-Parry, 2018; Muncie, 2020).

The limitations of current public policy arenas to weave together scientific complexities into robust regulatory frameworks, arguably challenges the limits to current forms of governance and decision-making. Pathways to resolving these disputes have proved to be a thorny issue with no clear answers. The idea of frames through which discursive claims regarding the industry’s impacts and pathways to decision-making has been an important focus of attention in how to engage with the disputed and highly-charged terrain. The scholars Tamara Metze and Jennifer Dodge (2016) have explored the way in which ostensibly deliberative debates around fracking are shaped or framed by different actors seeking to frame the benefits or risks to fracking. Despite the intense differences between

perspectives that contribute to highly adversarial processes, Dodge (2015) suggests that ways of thinking have been advanced over time with debates pushing forward all actors' knowledge and perspectives. Yet the capacity of the state to reframe the nature of the debate acts to resituate the types of knowledge that might illuminate decisions. Tamara Metze traces the shifting boundaries that unfolded in the face of public controversy and strong opposition to fracking in the Netherlands. She notes that it moved from economic issues to one of environment risk before being transferred to the planning arena. The change of forum for debate presented a way of reasserting the topic as a technical debate rather than a political one that some formulation of national interest could guide (Metze, 2017).

Planning inquiries exemplify such an arena where evidence produced by communities is often considered to lack the scientific and objective credibility (see Aitken, 2009, 2010; Lee et al., 2018; Rydin et al., 2018). The environmental impact assessment processes (EIA) informs potential development of shale gas in the UK as is the case with many other countries. These assessments have become increasingly complex, spanning a range of distinctive scientific and technical fields arguably far beyond the knowledge and expertise of planners. For the planning system to operate it must be presumed that Environmental Impact Assessments provide "correct" forms of data. The legal scholar Jane Holder is critical of the undue influence that developers garner through the EIA process, given their ability to set the terms of reference for data collection. "The reliance in environmental assessments procedures upon scientific and expert opinion appears to offer objectivity in terms of prediction of likely effects and impacts" (Holder, 2004: 241). Ideas of objective certainty become important political currency, with even objectors questioning their own credibility within the highly formal and semi-legal processes of the planning inquiry. The energy researcher Mhairi Aitken elucidates how knowledge and science is represented within the public inquiry:

Prior inquiries may be construed to have socialised members of the public to accept that expert knowledge exists apart from—even as superior to—lay knowledge and that this alone is an appropriate basis for determining technical decisions (Aitken, 2010: 63).

Despite an acknowledgement that women are more likely to be opposed to fracking, the role of gender, particularly as a socially and politically constructed categorisation, has been largely overlooked in much research (for an example see Weible et al., 2016). Discussion of gender, when it does occur, reveals essentialist representations of gender exemplified in the epigraph. Furthermore, Rachel Howell's evaluation of public opposition notes how "Hypotheses to account for the gender differences that are often found in environmental risk perceptions include biological and social explanations (women are more vulnerable and are nurturers by nature or socialisation)..." (2018: 726). Exploring how gender intersects with the framing of opposition and shapes knowledge disputes remains an important yet underexplored arena.

## **Gendered opposition**

Anti-fracking campaigns do not represent an explicitly feminist movement but women have become important actors in fighting the industry. My fieldwork in Lancashire and Pennsylvania revealed a network of local residents where women emerged as key figures in organising, with some having been recognised internationally for their environmental justice work. Significant individuals have emerged, such as the longstanding American,

activists, Sharon Wilson, also known as TXSharon, and Vera Scroggins, who have achieved international recognition.

These gendered dynamics have emerged within vastly different trajectories for the shale gas industry. The Anglo-Australian shale gas company Cuadrilla has only ever explored for shale gas and there has been no commercial production in Lancashire or elsewhere in the UK. However, Lancashire emerged as a location of widespread opposition from 2011 until the UK Government imposed a moratorium on fracking on 2 November 2019 (see Beebejaun, 2019). Pennsylvania, in contrast, has witnessed significant shale gas exploration from a series of operators, with tens of thousands of wells and a polarised debate given the financial benefits than can accrue to mineral rights holders (Jerolmack and Walker, 2018). Community groups have played a critical role in the environmental data monitoring process revealing the inadequacies of the existing regulatory regime (Jalbert et al., 2014; Kinchy, 2017). The women who joined these campaigns in both Lancashire and Pennsylvania often spoke of their prior lack of interest in environmental issues. However, for the women I interviewed as part of my fieldwork there was a strong sense of protecting their families' future, directly threatened by an asserted industrialisation of rural places. For example, one of the main members of a Lancashire anti-fracking groups argued "I would be negligent if I stood by and let this happen to my daughters and granddaughter".<sup>3</sup> Women formed significant parts of direct action as well as in organising and participating responses to planning consultations.

The local focus of the planning process to determine shale gas sites means that objection arguments must crystallise around the immediate changes or threats to individuals, families, and their local communities. Resident groups may organise submissions but scale of objection is measured by numbers of individual letters. Tens of thousands of people participated in this process. Whilst local activists are concerned with the multi-scalar impacts, planning's boundaries are often framed around local impacts distancing people from wider policy-making (see Owens, 2004). Community based local knowledge is considered by some to represent an alternative way of knowing. The geographer Karen Bickerstaff (2012) have argued that these local knowledge and histories reveal troubling deficiencies within planning. However, it is precisely because forms of local knowledge become distinguished from ideas of formal expertise, that they can be implicitly assumed to be less rigorous and potentially self-serving rather than the assumed rationality of scientific evidence. Yet a local lens had resonance with many women in the debate. Some anti-fracking campaigners have sought to make this argument a source of resistance, arguing that greater levels of concern for children and for the earth give them a privileged insight into the harms of unconventional hydrocarbon extraction. The rural regions within which many of these women lived in were seen as arenas in which nature should be protected against extractive industries and what was perceived to be forms of industrialisation and urbanisation.

Some strand of environment feminism or ecofeminist suggested that women were innately more connected to nature. For example, Julie Wassmer from "Mothers against Fracking" asserts:

Fracking is an attack on the environment and public health. It's a battle for clean air and water, the elements of life. And women understand that. It goes to the heart of women's role in society.<sup>4</sup>

However, such ecofeminist discourse has been criticised by some in the 1980s and 1990s for appropriating and simplifying the protests of Indigenous women as based on some innate relationship with nature, rather than emerging from specific socio-political contexts. Despite

this “ecofeminist intervention” is argued to be a mechanism “that can create a network, a space for debate, a mechanism not just for the intervention of feminism, environmentalism and anticolonial scholarship into policy-making . . .” (Sturgeon, 1999: 274). Nonetheless, the mobilisation of gender was effective at drawing much community and media attention. The Preston New Road site in Lancashire, the focus of the public inquiry in section three, drew upon gender to organise aspects of ongoing public protests. These included women’s days within a programme of direct action. Billed as a safer form of activism that was supported by the police, on these designated days women are encouraged to dress in white and engage in a silent protest. One of the women objector’s maintained that such forms of protest were about dignity in contrast to the “hot heads” who came along to the protests to make trouble. The women attending and supporting this day of protest raised specific concerns about women’s reproductive health, risk of miscarriages, and the health of young children (McHenry, 2017). Groups such as “Nanas against Fracking” came together from within different residents’ groups as specific mobilisers of activism against Cuadrilla’s development.

These actions led by women have questioned the assumptions at the heart of planning decisions and embraced gendered discourse to mobilise resistance. As Fitzgerald (2014: 36) notes, Wassmer’s tactic reframes a derogatory narrative into one rooted in gender and community:

Along with scientific facts, both pro-fracking and anti-fracking groups mobilize cultural symbols and identities—motherhood, environmentalism, family farming, family values, individualism, and patriotism among them—to persuade the public that their views on fracking can be trusted.

These frames of meaning have provided important tools of mobilisation for communities and had some power in attracting national and international media attention. Given that women still tend to have the primary caring roles within families, this has provided an important foundation for generating concerns (Power, 2020). Women in opposition have drawn upon narratives of family and domestic labour bringing them closer to the problem, as well as centralising women as nurturers and carers for nature, ostensibly in the face of a masculine and patriarchal extractive industry. These gendered presentations of knowledge and ways of knowing helped to support opposition and bring together women activists across the political spectrum, as well as to make international connections in a network of protest. At the same time, this framing lent itself to binary distinctions between gendered ways of thinking that emerge in the realm of scientific knowledge and its capacity to inform politics, policy, and planning decisions.

## **Gendered ways of knowing**

An attachment to the idea of objective knowledge predominates planning discourse. Too often planning has been critiqued for relegating other kinds of evidence to the realm of “subjective knowledge” and inadmissible to the deliberative process (Owens, 2004). The objective and rational is not derived from some knowable universal position but philosophically and politically based on the stance of men in power, excluding women and people of colour, and placing them as the reverse, the irrational and the subjective (Irigaray, 1985). Feminist critiques challenge assertions of objective knowledge illuminate the ways in which information and positions become aligned with particular subjectivities that are entangled with gendered binaries or poles (see Haraway, 1991). Only certain actors

are credited with knowledge and others find that their truth claims are relegated to a lesser position. Such conceptualisations are deeply damaging and have a long usage of exclusion of women and minorities from political, social, and economic power and agency. In this sense certain categories of people and knowledges frames, including the performative dimensions to scientific deliberation, produce systematic asymmetries and inequalities that are sustained through public participation in spatial planning.

Specific strands of feminist philosophy enable us to more fully interrogate assumptions about who holds knowledge and how that knowledge is represented. Donna Haraway argues for a critical rejection of scientific objectivity instead arguing for embodied objectivity. She calls for a recognition of how science has not developed as an innocent and neutral mechanism to develop knowledge of the world but is pivotal in “the exclusion and the exploitation” of women (1991: 8). Marshalling new epistemological resources through which to challenge the “objective” scientific realm, used as the basis for much policy-making has been the goal of many feminist philosophers (see, for example, Dotson, 2014; Fricker, 2007; Harding, 1995).

In a similar fashion the concept of “epistemic injustice” developed by Miranda Fricker (2007) draws on feminist thought and provides insights into how certain groups become constrained as “knowers”. She explores the linkages between the community as a social group and the knowledges they are presumed to hold. Epistemic injustice examines how credibility and thereby power accumulate and might emphasise differences. Epistemology is enmeshed in a framework of “social power”, linking together the political and ethical questions raised by current conceptualisations of knowledge claims. Her main concerns are groups who face severe epistemic injustices as part of wider systematic forms of inequality. Nonetheless it provides an important framework to more closely understand knowledge within planning systems and how the public are framed as knowers.

The marginalisation of the subjective in the search for an objective knowledge has at its heart, a longstanding marginalisation of women (Haraway, 1991, Irigaray, 1985). Standardised methodologies for data collection mask the complexities of understanding the multiplicity of experiences that exist for different people. But a paradox emerges from the embrace of essentialist ideas of womanhood centred on family and finding themselves in a closer relationship with nature by protesters. Donna Haraway’s pathbreaking work notes the problems that emerge from a feminist stance that re-embraces a binary siding women with nature and men with “rational” science:

“[F]eminists have sometimes affirmed the categories of nature and the body as sites of resistance to the dominations of history, but the affirmations have tended to obscure the categorical and overdetermined aspect of ‘nature’ or the ‘female body’ as an oppositional ideological resource” (1991: 134)

Thus, the positioning of women in the anti-fracking movement as holding understandings that were more aligned with the interests of nature was strategically cohesive and mobilising for them. However, it was also embraced by pro-shale interests. Their counter-arguments were also entangled with essentialising ideas about gender, outside the realm of rational decision-making, and scientific forms of knowledge that are rendered objective and able to intervene in nature in precise ways.

These tropes of “rationality” and “irrationality” can destabilise community concerns, particularly those seen as gendered. As the anthropologist Aya Hirata Kimura (2016) shows in her examination of mothers concerned with food contamination after the Fukushima disaster, women’s concerns were cast as outside the realm of “objective”

scientific evidence and marked by “irrational thinking”. The women activists’ scepticism about how scientific knowledge emerged and was used in public safety discourse rendered them as unscientific rather than seeking to engage with scientific knowledge differently. Their personal concerns were mocked and the women categorised as having “radiation brains” unable to process scientific knowledge. These mothers were subjected to a form of epistemic injustice that denied a broader consideration of Japanese food politics and conceptions of risk. In the same manner, anti-fracking concerns were recounted as “laughable” by some industry representatives and evidence of not only a perceived irrationality but an intellectual incapacity to engage with scientific knowledge.<sup>5</sup>

We are presented with a world where “facts” exist in a neutral arena leading us to a “correct” course of action. Such a conceptualisation obscures the more nuanced understanding of science as socially and politically constructed and its usage to justify policy-making and decisions (Keller, 2009). Kimura reminds us that tactics which “shame” women have long been drawn upon to neutralise public scrutiny. “Such sanctioning of women echoes through the history of women’s environmental activism” (Kimura, 2016: 35). The media focused heavily on women’s greater opposition to fracking, presenting the case against as “irrational”, ill-informed, or even “neurotic”. Women whose forms of resistance have acted as proxies for the entire community become placed outside of rational knowledge altogether, their emotional worries blinding them to the scientific “truth”, their domestic concerns rendering them unable to see the larger picture that according to Averil MacDonald is readily available to men. The claim that “Women think differently” is situated within a discourse that marks it as inferior or peripheral when it comes to decision-making on energy policy.

The emerging public interest and opposition to proposed shale gas development in Lancashire became framed as a community holding back energy policy due to unfounded fears and lack of scientific knowledge. It is widely accepted that the technological dimensions of fracking are complex and evolving. Fear of earthquakes was heavily disputed during early stages of community opposition in Lancashire given the limited and disputed evidence from the US. During my attendance at professional shale gas conferences and public events, I heard repeated on multiple occasions that any seismic activity would have less impact than a heavy goods vehicle driving by a house. These parallels were drawn precisely to show that any fears were irrational and due to an ignorance about scientific evidence. Community concerns about earthquakes had been dismissed for many years as evidence of over-anxiety or even stupidity within the industry and in public discussion. Yet the reason for the current moratorium is precisely because recent exploratory attempts by Cuadrilla in Lancashire have breached Governmental thresholds for seismic activity. The previous outright dismissal of concerns reinforces the notion of rationality within the shale gas industry positioned against the irrationality of the public. A gendered binary has animated ideas of the objective and non-objective realms of knowledge within scientific discourse yet little attention was paid to the previous discrediting of community concerns when the Government determined that seismic activity was a stumbling block to future shale gas extraction. Opposition seemingly bifurcates the rational world of science from a space where women’s gendered concerns are based on emotion, denying them the capacity to act on “facts”, as part of a well-worn trope that forms the basis for women’s exclusion from politics over different places and times.

The increased usage of social media and the ability for citizens to produce and distribute material has been a key dimension to anti-fracking mobilisation (see Jaspal and Nerlich, 2014). The early absence of data about fracking meant that communities started to look for or produce other evidence, including those on social media. Video evidence such



as the filming of the noise of trucks or flaring and venting of gas, have provided a material dimension missing from earlier periods of environmental action, not least because of their global reach.

Video evidence revealed numerous personal accounts concerning details about environmental harms, water contamination, health impacts to humans and animals, social impacts, and specific local changes including increasing industrialisation, traffic, noise, and local emissions concerns. These personal testimonies have been striking in their influence on the shale gas debate.

The centrality of the individual as “sensor” rather than the search for some forms of objective measurement is central to a feminist critique and epistemology. It is often lived experience that guides community understanding of the impacts of the industry and places the disregarding of activists’ knowledge as part of a pro-shale political framework:

It’s a contamination of our air, water, and our democracy. We are all volunteer grassroots organizations. The impacts [in South-Western Pennsylvania] are so big, so unbelievable, that I understand why people think we are making it up. It is so bad, so in your face, criminally unconstitutional, so in your face corrupt. I don’t want to be labelled an environmentalist. They label you right away . . . I consider myself a concerned citizen.<sup>6</sup>

Individual testimony has received limited weight where communities live with the impacts of shale gas extraction. This “testimonial scepticism” is intimately tied to the nature of personal accounts regarding the impacts of fracking primarily given by women. There is a long history of the gendered problems of medical symptoms. In an array of medical arenas, women’s concerns have been presumed to be psychological (see Koerber, 2018 for a discussion). In the environmental field, many individuals have found that their illnesses are not considered linked to possible pollution. Interviewees living near to shale gas sites in Pennsylvania were active in compiling medical issues and also providing monitoring equipment (see also Kinchy, 2019). But they faced problems in seeking to be heard: “They [health care providers] are saying you have a symptom of a seasonal allergy and they are not taking time to talk about environmental exposure”.<sup>7</sup>

The rapid expansion of the fracking industry in the USA meant that much of the data was generated by individuals and community groups. The diverse range of impacts of the industry and the significant changes experienced in rural areas could not be captured by state-led practices of environmental monitoring. The data generated by communities illustrates feminist epistemological insights into the limitations to existing understandings of “objectivity” in environmental discourse and the various strategies used to marginalise local knowledge. The question of decision making in turn raises a series of issues concerning the precise roles of a diversity of actors including planning officers, environmental consultants, corporate lawyers, community organisations, and many other participants in contested dimensions to environmental discourse. Research on community objections continues to show that the public play a vital role in shaping knowledge and debate in complex technical fields (see Metze, 2017). Yet the planning process continues to valorise scientific knowledge as objective, neutral or expert-led despite feminist critiques, including within the natural sciences.

## **The politics of noise**

A feminist critique opens up the space to examine the ongoing limitations to how some forms of knowledge are discredited within the planning arena. The dichotomy between the

emotional and irrational and the unemotional and objective runs through the planning inquiry process in the framing of knowledge even though not all objectors were women (see Aitken, 2009). I now turn to the evaluation of an increase in night-time noise in a largely rural area. I suggest that the treatment of evidence of the impact of noise within the planning process reveals the limited understandings of noise based on a notion of objective data for the measurement and regulation of sound.

A public inquiry took place in Lancashire in 2016 to investigate the local state's decision to refuse planning permission for two exploratory shale gas drilling sites. Planning applications had initially been submitted in June 2014 for two sites in the Fylde, one at Preston New Road, and the other at Roseacre Wood, along with seismic monitoring surveys. Despite receiving a licence for shale gas operations in the region by the UK government Cuadrilla had been refused planning permission for these two sites by Lancashire County Council in 2015 against the advice of the local planning officer (Beebeejaun, 2017). The local councillors had determined that noise levels, visual impact, rural industrialisation, and increased traffic were sufficient reasons to refuse permission. Cuadrilla won their legal right of appeal against the decision, and in 2016 a public inquiry was convened by the Planning Inspectorate, which is the national independent agency that oversees appeals.<sup>8</sup>

The nature of the fracking process means that there is an intermittent drilling process lasting around 14 months and night-time noise was a concern for local residents at the Preston New Road site (MacKay, 2016: 86). The Public Inquiry's attention to noise revealed the dispute between the collection of data and the acceptable thresholds for noise generated by night-time fracking activity in a rural area. The absolute decibel (dBa) level was used to determine acceptable noise levels. Cuadrilla had proposed levels of 42 dBa but Lancashire County Council proposed levels of 35 dBa in the Inquiry, with the resident's group representative suggesting an even lower level of 30 dBa. The debate focused on the veracity of the data produced by different groups. However, the production of data was underpinned by the consensus that noise was a phenomenon that could be measured and discussed on the basis of instrumentation.

Whilst decibel measures may provide a seemingly universal frame of reference, this process has been criticised within both planning and sound studies for failing to engage with the causal impacts of noise on health (see Corburn, 2009). As the legal scholar Michael Mopas (2019) notes, it is the development of noise measurement devices that have transformed our understanding of noise moving it a subjective experience to something that can be captured accurately using machines. Noise, as opposed to sound, often carries a sense of undesirability. It is complex and embodied: for a noise to exist there must be a hearer to experience it as nuisance. Noise has been a public concern since at least the early modern period, as evidenced by a range of by-laws dating back to the thirteenth century in England (Schafer, 1993[1976]).

The planning scholar Jason Corburn (2009: 69) notes that planning processes have tended to work towards a process of codification using decibel levels and that "If the background measures of noise and the predicted increase meet the threshold, an environmental review would likely rule that there is no significant impact" (see also Dobruszkes and Efthymiou, 2020; Liboiron et al., 2018). However, it is only possible to understand the differentiated impacts of noise on different people and environments through an engagement with noise as a subjective experience.

The challenge for feminist epistemologies is to open up the differential impacts that noise has on different people and in different circumstances. As the feminist sound scholar Marie Thompson (2017: 18) notes "To describe noise as unwanted sound requires a listener to hear it as such. Sound become noise when they are heard in a particular way – it is a value

ascribed in relation to perception. The task of constituting noise thus lies with the listener". The veracity of community objections to fracking hinged on the idea that the noise generated below a threshold level would cause minimal disturbance. Noise would be audible but at a level that would not disturb nearby residents especially when they were sleeping. However, the desire for a lower level of noise than in Cuadrilla's proposal was heavily disputed in the media. Cuadrilla's chief executive asserted that the area would be as quiet as a library with one media report comparing the sound to the "hum of a fridge" to emphasise that the objectors demands were unreasonable.<sup>9</sup>

However, the audibility of noise and its meanings are not part of a universal experience. The legal scholar Michael Mopas suggests in his study of wind turbines that "Noise is not a distinct ontological category of sound that can be objectively defined and measured, but an epistemological phenomenon." (2019: 322). Yet it is precisely this separation between sound generation and the impact upon the hearer that is reinforced through forms of environmental regulation. These forms of standardised measurement laid the basis for debates about the noise impacts on local residents and were based on the principle of finding an acceptable level of sound. Implicit within the planning process was an understanding that an acceptable threshold could be achieved, thus reducing human subjects to subjective hearers of noise, and implicitly less reliable than measuring equipment. Individual concerns or fears are recast as irrational. The assumption that there are universal standards to levels of night-time noise leads to a view that being disturbed at lower levels is unreasonable or irrational.

A series of three studies were carried out on night-time noise. The original monitoring by Arup Consultants submitted as part of the EIA took place at two locations between 3.10 a.m. and 4.40 a.m. on 22 November 2013. The noise levels ranged from 31.9 dBA to 40.3 dBA (L90<sup>10</sup>) with the observations noting that most noise was distant traffic, cars driving directly along the road, occasional dog barks, and bird song. Lancashire County Council subsequently commissioned a report from Jacobs, another planning consultant, who took observations for three hours between 12 midnight and 3 a.m. on 21 November 2014 and found higher noise levels with background road noise being the most significant disturbance. A final study had been undertaken by MAS Consultants, an acoustic specialist, on behalf of Preston New Road Action Group, a local residents group, over September and October 2015.<sup>11</sup> The Planning Inspector, Wendy MacKay determined that Arup's study for Cuadrilla was inadequate due to the short time period of monitoring baseline noise and that they had provided insufficient information about data modelling.

The Arup study illustrates the disembodied nature of noise and sound within planning referring to sound recording equipment and the location of properties but makes no mention of people. In contrast, the MAS Environmental report, referred extensively to the importance of understanding sound within its context. They contested the proposed night-time noise limits as more appropriate to an industrialised area rather than one that was currently a quiet rural location. "the application of the maximum permitted level 42 dBA LAeq, which should only be considered acceptable in worst cases where there are high levels of masking noise" (MAS Environmental Ltd, 2015: 21). The limitations of the planning framework could be seen in the problems in attempting to understand noise as a phenomenon unrelated from people (and animals), in this case the people affected by the noise of exploratory shale gas exploration.

As the geographer Michael Flitner notes in his study of airplane noise (2014: 186) reveals:

Noise has a physical, technically measurable side. Its negative health effects are directly related to the exposure to certain sound pressures. Yet the disturbing and annoying properties of noise are not just a matter of physics. Noise comes with meanings.

In particular, Flitner highlights differences in “noise sensitivity” between densely urban or suburban and semi-rural areas. These processes and assessments provided a route for public objectors to engage with the planning inquiry through commissioning their own evidence which they hoped would challenge the veracity of Cuadrilla’s evidence. Within the public inquiry, many residents used the opportunity to give a five-minute statement on their objections on a number of issues. Many attempted to split their representations between their own embodied experiences and that of critiquing Cuadrilla’s technical data. These individually rooted expressions are permitted dimensions within a public inquiry but often considered to form an emotive and unverifiable account (Aitken, 2009). Public participants presented alternative framings regarding the peaceful nature of the rural area and the choices people had made to settle here. Many spoke of moving to the region not only to enjoy the quiet but because of their particular needs, including one family having a child with autism unable to deal with loud and persistent noise levels. Others spoke of moving to a quiet rural area in their retirement years, connecting a move away from the noise of a more urban area to the imaginative realm of the rural. Others said they simply were unable to ignore the noise generated because it was due to the shale gas process. Yet these forms of testimony were linked to the ongoing framing of community resistance as unreasonable and selfish.

The County Council provided an acoustic expert, Dr Andrew McKenzie to give evidence on the impacts of noise. During the cross-examination by Cuadrilla’s barrister, Nathalie Lieven Andrew McKenzie’s evidence foregrounded the subjectivities of noise and their health impacts:

So it’s not the noise levels we are talking about, it’s the effect on people. We know in these circumstances because of the nature of development people will complain, people will get stressed about it, it will cause perceived effects on quality of life and in fact at night on their ability to sleep, which will have knock on effects itself. So these are the adverse effects that have to be balanced . . .

Here McKenzie emphasises that noise becomes an issue because it has particular physiological and psychological consequences, particularly as residents have been concerned about shale gas for many years. Yet Lieven countered that the issue was not a breach of regulation:

If it’s audible people are likely to complain. That’s going to be a consequence of the level of opposition to development . . . But the level of complaint may have some relationship to the noise but may also be associated with a number of other factors to do with the development that actually have nothing to do with the noise.<sup>12</sup>

The difficulties in pursuing a more nuanced argument around noise are highly constrained by the narrow acoustic engineering debates integral to planning policy. However, this dialogue brings into focus Cuadrilla’s claim that noise provided only a trigger to complain rather than having any real impacts on local residents. Such an interpretation is underpinned by the limited technical focus on sound as a measurable entity that does no harm if regulated rather than having multi-dimension impacts on people. Fracking noise would continuously remind residents of the loss of a rural home and the emergence of an industrial landscape.

The Planning Inspector’s report determined the noise report commissioned by Preston New Road Action Group was provided the most reliable technical data due to the greater number of observations recorded (McKay, 2016). Here, the community’s employment of an expert enabled them to render their objections as legible under the planning framework.

Nonetheless, other dimensions of the noise dispute remained obscured the Inquiry and the subjectivity of noise was engaged with to differing ends. The Inspector's report acknowledged some of the complexities of evaluating noise and placed several conditions to be met by the developer including that they monitor sound levels and mitigate if exceeded. The Inspector wrote extensively about noise in her final report considering the complex and contested nature of noise and the proposed impacts, problems of measurement and locational factors. Yet she was limited by the current regulatory framework and determined that 35 dB "is likely to represent the lowest point at which observed adverse effects... would occur" (2016: para 12.252).

The complex manifestations and experiences of sound move beyond planning's realm of understanding and modes of regulation. Noise is measurable, to be sure, as a physical entity but the experience of the listener is critical and their experience varies producing physiological and psychological experiences. The material realities of hearing evade the objective and subjective binary. Sound studies which include feminist insights into "objective methodologies" encompass questions of sound and noise and question current approaches. Decibels measure energy and sound intensity but the notion that an objective measurement process is possible is predicated on the false claims of a universal human experience (see Corburn, 2009). Such processes remove the individual human or at best frame them as a standardised entity in ways that have been long disputed by feminist and race scholars.

Whilst a debate ensued regarding the differential audibility to hearers, such distinctions were considered the result of an emotional opposition to fracking. However, the embodied and affective dimensions to the experience of noise highlight the limits to simplistic conceptions of the role of knowledge in technical decision making for spatial planning. More tellingly, feminist engagement with sound and noise further disrupt the ways in which assumptions have been made. The feminist scholar Nina Sun Eidsheim whilst engaging with the racial and gendered dynamics of voice, makes important arguments regarding the relationship between sound and listener: "Because listening is never neutral, but rather always actively produces meaning, it is a political act. Through listening we, name and define" (2019: 24). Her argument continues that there is no essential and knowable quality to measure but rather that sound is only a phenomenon that is co-constituted with a listener. The personal testimony given by residents that noise generated from fracking is objectionable provides a form of emotional evidence that is often discounted in planning but one which a feminist critique epistemology recognises within a wider turn to challenging the historical and political masculine subjectivity that masquerades as objectivity (Haraway, 1991).

## Conclusions

The role of women's organisation within shale gas opposition has emerged as an important, yet often overlooked, dimension of research. Whilst gendered discourses have been powerful in mobilising activists and forms of protest, there are contradictions in how these positions have been challenged. The spatial governance of fracking has opened up conceptual and political space to consider a host of scientific environmental and health issues as well as climate change and energy production, questions tied to multi-scalar environmental questions. Whilst objectors attempted, with some success, in relation to noise, to dispute the veracity of the technical data, the recourse to problematic knowledge claims was not destabilised within the confines of planning discourse.

It is clear that attempts to rely on "scientific" data and exclude embodied experiential forms of evidence cannot offer a better or more replicable set of recommendations for decision-making. Such perspectives ignore significant feminist critiques of knowledge at

the same time as recentring problematic gender binaries. The alleged irrationality of public forms of opposition pits the myth of objective expertise easily distinguished from the emotional and unsteady perspectives of protestors. However, technical forms of knowledge can only partially answer questions regarding noise and its regulation. The challenge for spatial governance is to find processes that are attentive to human subjectivities as part of a spectrum of knowledge production. How can the lived experience of noise be brought back into planning? Work on urban soundscapes highlight a series of important dimensions for planning. Jieling Xiao and her colleagues work contest the narrow focus on noise and argue for a planning process that explores the richer acoustic soundscapes that move away from nuisance towards well-being:

[H]uman perceptions of sounds vary through individual preferences, past experiences, physiological issues, memories and contexts. Therefore, these considerations need to be included in urban planning practices to effectively manage the acoustic environment (Xiao et al., 2018: 678)

They propose proactive measures that collectively engage key stakeholders including residents as users in a process whereby “human perception is centralised” in soundscape planning. New approaches such as those proposed by Xiao push at current forms of spatial regulatory governance that have neglected the diversity of human experience. Feminist epistemologies invite us to look differently at how subjective and embodied positionalities create space to address power in decision-making engaging with a spectrum of perceptions and concerns. Such a process must challenge the competence of existing regulatory regimes that necessitate communities gaining technical competence in acoustic data collection or having the funds to pay for consultancy. Such data may provide important contextual information but the supremacy of technical measurements of sound over human experience points to the deficiencies of planning practices. The findings of my study question the basis for assumptions regarding the clear divide between scientific and non-scientific forms of knowledge. The rendering of the concerns of communities as an emotional over-reaction, based on fear or a lack of understanding is bounded by an essentialising binary of rational and irrational knowledge. The illusion of technical and objective form of spatial decision-making has been fundamentally challenged by the scope and the intensity of anti-fracking activists.

The movement towards a planning epistemology that is sensitive to feminist critiques of knowledge raises a series of significant challenges. In this paper I have explored some of the ways that certain types of knowledge become gendered and unevenly valorised within planning discourse. The current epistemological power dynamic works systematically against the credence given to community drawing on gendered binaries. The planning system, as it stands, lacks sufficient engagement with the degree to which all knowledge claims are not only socially and geographically situated. The feminist challenge urges us to understand the embodied subjectivities that emerge in the face of *all* knowledge claims.

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## Notes

1. (2015) professor of public understanding of science, and chairs of UK Onshore Oil and Gas
2. I undertook 15 interviews in Pennsylvania and 17 in Lancashire
3. Interview with women's organiser, Lancashire, 28 February 2017
4. Quoted in Vidal, J., 'Women lead the call to arms as anti-fracking fight intensifies.' *The Observer*, 29 May 2016.
5. Shale Gas Summit 2014 London, UK. Throughout the event numerous comments were made regarding public opposition. The dinner event has been enlightening, particularly "anecdotes" in an after dinner speech. He mentions speaking to a woman and telling her about peer-reviewed articles that support shale gas, and the 'woman's response was "What's it got to do with the House of Lords?" after which followed much laughter [fieldnotes].
6. Interview with woman anti-fracking campaigner, 29 July 2014, Pittsburgh, PA
7. Interview with woman community worker, 31 October 2014. Pittsburgh, PA
8. Since that time, a moratorium was imposed on fracking in England in November 2019, bringing the country in line with the rest of the UK.
9. Cuadrilla fracking plans: Noise as 'quiet as a library' deemed unacceptable. *The Telegraph*, 21 January 2015.
10. L90 is the maximum decibel level over 90% of the observation period.
11. Decibels measure the intensity of sound on a scale. It is important to note that the scale rises exponentially so a difference between 50 and 70 db is a 100 times greater but would sound around four times as loud. However, the scale does not measure frequency.
12. 23 February 2016, Public Inquiry, Blackpool UK.

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