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Technology Impacts, Justice, Place, and Worldviews: An Integrated Framework for Understanding Perceptions of and Attitudes towards Shale-Gas Fracking in English Host Communities

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TECHNOLOGY IMPACTS, JUSTICE, PLACE, AND WORLDVIEWS: AN INTEGRATED FRAMEWORK FOR UNDERSTANDING PERCEPTIONS OF AND ATTITUDES TOWARDS SHALE-GAS FRACKING IN ENGLISH HOST COMMUNITIES

by

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Copyright Statement

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Author's Declaration

At no time during the registration for the degree of Doctor of Philosophy has the author been registered for any other University award without prior agreement of the Doctoral College Quality Sub-Committee.

Work submitted for this research degree at the University of Plymouth has not formed part of any other degree either at the University of Plymouth or at another establishment.

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Technology Impacts, Justice, Place, and Worldviews: An Integrated Framework for Understanding Perceptions of and Attitudes towards Shale-Gas Fracking in English Host Communities

Magdalini Kechagia

Abstract

Despite growing national opposition, local resistance, and moratoriums in Scotland and Wales, successive UK governments have supported the use of fracking to exploit oil and gas from shale formations in England in response to declining North Sea reserves and concerns about geopolitical instabilities affecting energy security. Although scholars have examined technological, justice, and socio-psychological drivers of social attitudes to fracking in order to challenge 'Not-In-My-Back-Yard' explanations of perceptions and attitudes, existing studies have rarely examined these factors in an integrated way. The aim of this research is to investigate whether and how an integrated approach, combining insights from the factors identified above, can deepen understandings of host communities' attitudes to fracking as a contentious energy technology. The investigation centred on Preston New Road (Lancashire) and Kirby Misperton (North Yorkshire), two sites in England where planning permission for fracking had been granted at the time the investigation was conducted. The study used a mixed-methods approach, combining postal and online surveys with individual and group semi-structured interviews to achieve broad and deep understandings of the factors shaping of how residents of the two areas rationalised their attitudes towards fracking. The study found that residents often prioritised one reason for their views on fracking but, for most, attitudes were informed by a complex amalgam of: their underlying worldviews on nature-society-technology relationships; their perceptions of the risks and benefits of fracking technology; perceptions of justice in shale-gas governance (encompassing trust in governing bodies and other stakeholders and the distributive,

procedural and recognition dimensions of justice); and place-related factors, including spatial scale, location and distance, physical and social features of the area, and sense of place. These ideas were used to develop an integrated framework for understanding perceptions of shale-gas fracking as a way of deepening understanding of how attitudes to energy technologies are shaped, why responses are not cohesive between and within affected communities, and how different explanatory factors (or components thereof) are combined or prioritised differently by individuals. The thesis contributes theoretically, empirically, and methodically to the literature of public perceptions of shale-gas fracking by highlighting the value of seeing attitudinal influences relationally rather than regarding any single variable or set of variables as providing all-encompassing explanations for local attitudes towards new energy technologies. The flexibility of the proposed framework additionally has potential application in larger spatial scales and to other technological and social contexts which further enhance its contribution to the wider energy-siting literature.

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Introduction to Shale-Gas Fracking in the UK

1.1 What is Shale-Gas Fracking?

Recent years have seen significant interest in the development and roll-out of a range of technologies aimed at balancing the energy trilemma of security of supply, access and affordability, and decarbonisation (Bolton and Foxon, 2013; Heffron et al., 2015). Hydraulic fracturing, or 'fracking', is a prominent technology used for extracting unconventional[1] resources, such as shale gas, tight gas, coalbed methane, and heavy oil (EIA, 2013; PSAC, 2022). While the technology has previously been used for extracting conventional resources, technological innovations combining horizontal (or directional) drilling with high-volume fracking in the 1990s in the United States reduced extraction costs and made shale gas commercially viable within the US energy economy (Royal Society and Royal Academy of Engineering (RSRAE), 2012; Orr, 2013; Melikoglu, 2014; Task Force on Shale Gas (TFSG), 2015; Cotton, 2016;). US shale gas production increased from 1.6% of total US natural gas production in 2000 to 23.1% in 2010, leading to a decline in energy prices (TFSG, 2015; RSRAE, 2012).

Shale is formed of horizontal layers, making horizontal drilling more productive by minimising surface disturbance (King, 2016; Orr, 2013). Initially, a two-to-three kilometre vertical well is drilled; the drill is then steered horizontally along the shale layer for nearly two kilometres. After the well has been cased and cemented, fracking takes place along the horizontal section , moving from the end to the start of the section (TFSG, 2016; API, 2021). Each stage is approximately 30 metres long, with small perforations being made to the casing to enable the creation of fractures (or fissures) in

[1] The distinction between conventional and unconventional oil and gas is based on their permeability, their ability to flow through the pores of rock and into a wellbore (UKOOG, 2013).

the rock (TFSG, 2016). The fractures are made by injecting a high-pressure fluid– a mixture of water, proppant, and chemicals– a few hundred metres into the rock to enable gas to flow from the rock into the well (Figure 1.1) (RSRAE, 2012; TFSG, 2016). Proppant (usually sand) prevents the fractures from closing due to the weight of the overlying rocks, while other chemical additives can be used to improve efficiency (RSRAE, 2012; DECC, 2013; TFSG, 2016). Along with the gas, a portion of the fracking fluid flows back to the surface containing dissolved salts or naturally occurring radioactive materials (NORMs) picked up from contact with the shale (RSRAE, 2012; Hays et al., 2015; TFSG, 2016). Thus, fracking-flowback water is treated as wastewater according to local and national regulations (TFSG, 2016; RSRAE, 2012). High-volume fracking for unconventional resources requires more water, chemicals, and auxiliary infrastructure compared with fracking for conventional resources because it needs to overcome low rock permeability to produce a profitable resource (Cotton et al., 2014; TFSG, 2015; Hays et al., 2015).

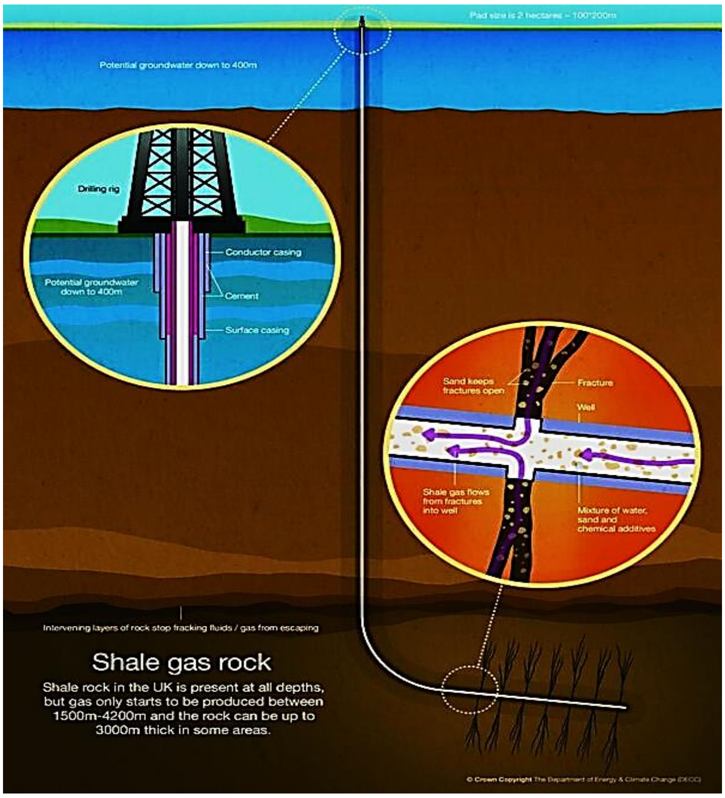

Figure 1.1 What is shale gas and fracking? (DECC, 2013, p.5)

The term fracking is used colloquially to refer to all the extraction stages[2] of unconventional energy resources, and thus encompasses considerations beyond the actual hydraulic fracturing process[3] (Evensen, 2016a; Short and Szolucha, 2019). It has also become a controversial technology, and has been associated with various negative socioeconomic, health, and environmental impacts (or risks), such as increased vehicle traffic, stress and anxiety, and landscape industrialisation (Theodori, 2009; Jacquet, 2014; Thomas et al., 2017a). The most cited environmental concerns are summarised in Textbox 1.1.

Textbox 1.1 Environmental risks of fracking
• Groundwater contamination from methane, heavy metals, and NORMs, caused by poor well construction or damage, and surface water contamination from inadequate wastewater storage or management. • Chemical additives used in the fracking fluid, which in some countries, such as the US, do not need to be disclosed for reasons of commercial confidentiality. • Excessive water use (ranging from 10,000-30,000 cubic metres of water per well), especially in water-stressed areas. • Seismic activity, usually caused by injecting wastewater into underground wells as a method of disposal. • Air pollution from emissions created during site (de)construction and shale production and distribution. • Fugitive methane emissions throughout the natural gas supply chain, which has a higher short-term global warming potential than carbon dioxide (CO_2). (Carbon Brief, 2012; IPCC, 2013; Hays et al., 2015; Melikoglu, 2014; Howarth et al., 2011; Hammond et al., 2015; Cotton, 2016; Thomas et al., 2017a)

[2] Oil and gas extraction is usually classified into four stages; 1) exploration, 2) appraisal (or 'moving into production'), 3) development and production, and, 4) decommissioning and restoration (DECC, 2013; 2015).

[3] Moving forwards, the thesis adopts the term 'fracking' to refer to 'shale-gas fracking' and the wider processes associated with the exploration of unconventional resources.

In contrast, moving away from other fossil fuels, energy independence and affordability, and financial and employment benefits for host communities have been portrayed as the main positive impacts of the technology (Thomas et al., 2017a; Sovacool, 2014). As the US shale boom accelerated, countries such as China, Australia, Denmark, Poland, and the United Kingdom considered their national unconventional reserves (RSRAE, 2012; Melikoglou, 2014; Cotton et al., 2014; Hays et al., 2015; Reap, 2015; LCPA, 2015; Cotton 2016).

1.2 UK Context of Fracking

The UK became a net-gas importer from 2004 as its North Sea reserves declined and successive governments considered extracting unconventional resources to promote energy security and reduce energy imports (Bolton and Foxon, 2013; DECC, 2013; Whitmarsh et al., 2015). As Figure 1.2 shows, there are considerable amounts of shale gas and oil in formations in the central-northern and south-eastern parts of the UK (EIA, 2013). According to the British Geological Survey (BGS), shale gas resources could range from 23.3– 64.6 trillion cubic metres (tcm), with a central estimate of 37.6 tcm in the Carboniferous Bowland–Hodder Shale in the North of England, one of the most promising shale areas (Andrews, 2013; EIA 2013).

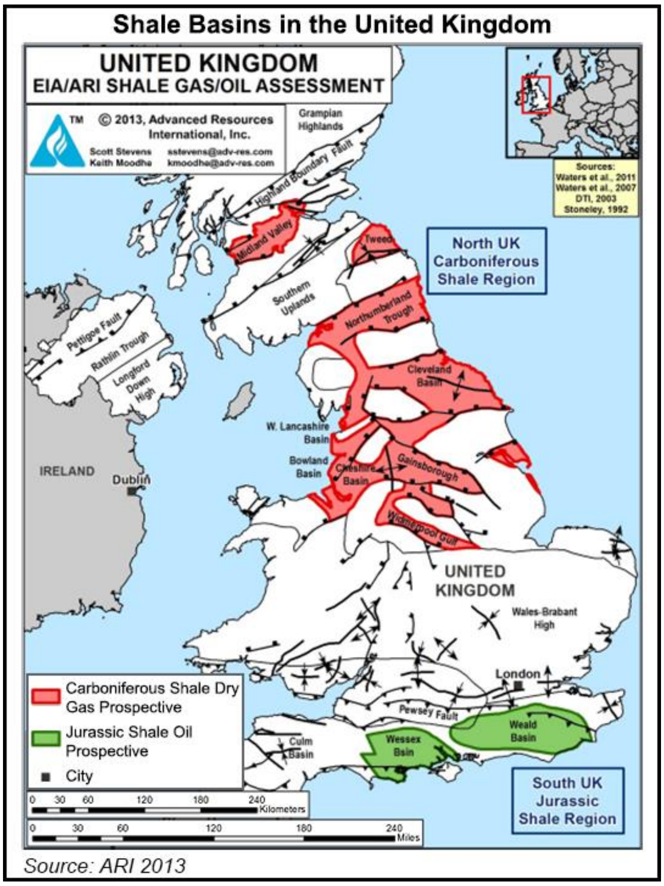

Figure 1.2 Shale gas and oil prospects in the UK. (ARI, 2003, cited in Fisher, 2015)

In August 2010, the UK moved forward with initial shale-gas exploration and the first well, Preese Hall-1, was drilled vertically by Cuadrilla Resources in the western Pennine Basin near Blackpool, Lancashire (EIA, 2013). In April and May 2011, two earthquakes of magnitude 2.3 and 1.5 were caused by fracking at Preese Hall-1 during fluid injection due to an adjacent fault (RSRAE, 2012; EIA, 2013). The UK Government suspended operations until the causes were identified and the environmental risks were better understood (EIA, 2013; RSRAE, 2012). People in the area reported the tremors, although the seismic activity was assessed as minor, similar to those caused by coal mining (RSRAE, 2012; TFSG, 2015a; EIA, 2013). After an 18-month suspension, in December 2012 the UK Government approved the resumption of fracking operations with stringent monitoring, following the RSRAE's (2012) conclusion that fracking "can be managed effectively in the UK as long as operational best practices [were] implemented and enforced through regulation" (p.4; EIA, 2013).

The decision triggered protests near prospective sites and attracted intense media attention, for example the 2013 Balcombe protests in West Sussex (Cotton et al., 2014; Bradshaw and Waite, 2017). Central government nevertheless continued to support going "all out for shale" in the words of the former PM David Cameron, and encouraged local councils to accept future shale developments by allowing them to keep 100% of business rates from fracking activities (Watt, 2014; Cotton et al., 2014). Scotland and Wales, however, imposed moratoria on fracking in 2015, but 63 out of 93 new PEDLs (Petroleum Exploration and Development Licences) issued during the 14th Onshore Round in 2015 involved shale exploration and testing in England (Flint, 2017; Hayhurst, 2015; UKOOG, 2015a; 2015b). These licences do not allow companies to start operations immediately but heralded a longer-term process of seeking approval from planning authorities and consents from the Environment Agency, Health, and Safety Executive (HSE), and Department of Business, Energy, and Industrial Strategy (BEIS)[4] [5] (DECC,

[4] These decisions fell previously with the Department of Energy and Climate Change (DECC), which merged into the new Department for Business, Energy, and Industrial Strategy in July 2016.

[5] After a PEDL is issued by the Oil and Gas Authority (OGA), DECC's Executive Agency since April 2015 gives operators exclusive rights to specific areas. The next steps involve gaining ensuring landowners' approval to access drilling sites during the exploration stage and getting permission from the Coal Authority in case the well encroaches on coal seams (DECC, 2014a; Crown, 2015). During this stage, an Environmental Risk Assessment is conducted by the operator to assess all risks that might arise during extraction (DECC, 2014b; TFSG, 2015a). The operator then seeks planning permission from the Minerals Planning Authority, normally the local county council (except for Scotland), which then decides if an Environmental Impact Assessment is needed (DECC, 2014a). If permission is granted, a permit may be needed from the Environmental Regulator (the Environment Agency, Natural Resources Wales, or Scottish Environment Protection Agency) (DECC, 2013; 2014a). Environmental permits may be required for groundwater activity, waste disposal and industrial air emissions (TFSG, 2015a). Operators must publicly disclose the chemical additives to be used for each well, their authorisation by the environmental regulator, and their hazard status (UKOOG, 2015c). The design and construction of the proposed well are then examined by an independent specialist and inspected by the HSE (DECC, 2014a). The operator must inform the environmental regulator of its intention to drill. (DECC, 2014a). Finally, DECC, after ensuring that there are no objections from the Environmental Regulator and HSE, and that the operator's plan includes minimising potential seismic activity, gives consent for drilling (DECC, 2014a). All steps described for the

2013). In addition, local financial schemes were designed by the UK Onshore Oil and Gas (UKOOG) industry charter for energy companies to provide host communities £100,000 in community benefits for each well site and 1% of revenues during the extraction stage (DECC, 2013; 2014c).

In May 2016, North Yorkshire County Council gave Third Energy planning permission for initial exploration at the Kirby Misperton site (KM), Ryedale. In October 2016, planning permission was also granted for the Preston New Road site (PNR), in Fylde, Lancashire, on behalf of the government by the Secretary of State for Communities, Sajid Javid. This decision-making process differed from that for KM, as Javid accepted Cuadrilla's appeal against rejection of its planning application by Lancashire County Council (LCC) based on unacceptable visual impact and noise, while local opponents saw this as government intervention in local affairs and a contravention of local democracy (Vaughan, 2015; 2016a; 2016b; Bradshaw and Waite, 2017). Javid postponed the decision for another site, Roseacre Woods (RW), which LCC also rejected, to allow the company to address road safety issues (Vaughan, 2016a).

At the time of writing, a moratorium was again imposed in England after multiple tremors occurred at PNR in October 2018 during the fracking process despite attempts by former PM Liz Truss to lift it during the 2022 energy crisis (Harvey and Goodier, 2022; Mathis, 2022). Operations at KM were suspended in 2018 due to financial issues, whereas Cuadrilla's appeal for fracking at RW was rejected in 2019.

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exploration stage must be repeated if the operator plans to drill more wells or move the site into the next stage of the process (DECC, 2014a; 2014c).

1.3 Research Rationale and Design

Fracking has become a controversial technology in the UK and other countries but debates on its development mirror more longstanding research and political debates on public opinion on new energy technologies. Focusing particularly on onshore wind developments but also other onshore and offshore technologies, research has charted significant public resistance to such projects on the grounds of their characteristics and impacts, institutional and governance issues, environmental views, and other reasons (Wolsink, 2000; van der Horst, 2007; West et al., 2010; Devine-Wright and Howes, 2010; Oltra et al. 2012; Devine-Wright, 2013; de Groot and Bailey, 2016). Scholars researching local resistance to energy developments argue that, alongside the moral justification for considering the views of host communities, understanding their attitudes has also instrumental rationales as opposition can lead to the interruption or abandonment of developments (Whitmarsh et al., 2015). Initially, such resistance was attributed to the Not-In-My-Back-Yard (NIMBY) phenomenon (Textbox 1.2).

Textbox 1.2 Defining NIMBYism
NIMBY is the motivation of residents who want to protect their turf. More formally, NIMBY refers to the protectionist attitudes of and oppositional tactics adopted by community groups facing an unwelcome development in their neighbourhood. [..] Residents usually concede that these "noxious" facilities are necessary, but not near their homes, hence the term "not in my back yard". (Dear, 1992, p. 288)

NIMBYism stressed the importance of spatial proximity and that the closer people lived to a new development, the more resistant or opposed they would be because of perceived inconveniences to their lives (Devine-Wright, 2011a; van der Horst, 2007, Boudet et al., 2016). However, the concept has been criticised for stereotyping and denigrating opponents by implying irrationality, ignorance, and selfishness behind their views (Freudenberg and Pastor, 1992; Devine-Wright, 2009a; 2009b; 2011a; Burningham, 2000; et al., 2006). Subsequent studies questioned these as rationales and explored explanations that sought to capture better the "contextual, social and psychological factors" that shape people's relationships with place and outlooks towards change-related disturbances to these connections (Devine-Wright, 2011a, p.67; 2013; Van der Horst, 2007; Wolsink, 2007a; Gross, 2007).

For example, scholars have stressed how technology's evaluations can shape but also differentiate people's attitudes towards a new energy technology in principle and specific local developments based on their proximity, experiences of positive and negative impacts, and the perceived appropriateness of siting (Wolsink, 2000; van der Horst, 2007; Haggett, 2011). Additionally, perceptions of technology impacts can also vary over time (e.g., between the construction and operation phases) (Bailey et al., 2011). The literature on sense of place, on the other hand, has emphasised residents' connection to their local areas and interpreted their energy attitudes as the result of change or disruption to their place attachment, identity, and/or dependence (Jorgensen and Stedman, 2001; 2006; Vorkinn and Rieses, 2001; Kyle et al., 2004; Devine-Wright, 2009b; Devine-Wright and Howes, 2010; Williams, 2014). Other scholars have explored other cognitive processes, examining how underlying values and broader beliefs or worldviews shape attitudes and beliefs about energy developments and environmental issues (Dunlap and Van Liere, 1978; et al., 1992; Thompson et al., 1990; Stern, 2000; et al., 1995; 1999; Leiserowitz, 2006; West et al., 2010; Hernes and Metzger, 2017). Planning processes and other social and institutional issues, such as public participation, trust, ownership, and accountability surrounding the fair governance of energy developments have also been explored as contributing to attitudes (Slovic, 1999; Bell et al., 2005; Gross, 2007; Walker et al., 2010; Oltra et al., 2012). These governance issues have been also captured within the environmental and energy justice literatures (Walker and Bulkeley, 2006; Gross 2007; Walker, 2009; McCauley et al., 2013).

Research in US, Australia, and Canada has noted differences in attitudes, worldviews, and perceptions of impacts and stakeholders involved in areas with proposed or established fracking developments (Theodori, 2009; 2013; Wynveen 2011; Brasier et al. 2011; Kriesky et al. 2013; Ladd, 2013; Lachapelle and Montpetit, 2014; Boudet et al., 2014; Evensen and Stedman, 2016), while a few studies have stressed the importance of place and people’s relationship with their areas as explanations for residents’ attitudes (Perry, 2012; Willow et al., 2014; Jacquet, 2014; Sangaramoorthy et al., 2016; Lai et al., 2017; Evensen and Stedman, 2017; 2018). Early UK surveys revealed growing opposition to fracking, noted concerns about environmental and health risks, and confirmed the value of integrating different social sciences approaches to explore multiple contributing factors to fracking attitudes (O’ Hara et al 2015; Andersson-Hudson et al., 2016; Whitmarsh et al., 2015). Qualitative research on this topic has been more limited but stressed issues of trustworthiness and justice (Cotton, 2013; 2016; et al., 2014; Williams et al., 2015), while some UK studies has suggested that people’s connection with the local area should be considered more comprehensively as a determinant of fracking attitudes in future studies (Whitmarsh et al., 2015; Cotton, 2016; et al., 2014). At the beginning of the research of this thesis, the views of English host communities to fracking developments were significantly under-researched, with the exception of two ethnographic studies examining local opposing views in Lancashire during and through the planning process (Beebeejaun, 2017; Short and Szolucha, 2019).

Overall, energy studies have considered some of aforementioned contributing factors simultaneously to better understand public attitudes to energy developments (Manzo and Perkins, 2006; McLachlan, 2009; West et al., 2010; Devine-Wright, 2013), but these multiple factors are rarely, if ever, considered together explicitly and in-depth. This study hypotheses that attitudes towards local energy developments incorporate an amalgam of perceived technology impacts, justice, sense of place, and worldviews. Recognising these gaps in the literature, the aim of this study is to understand the heterogeneity of perceptions of fracking in English host communities through an integrated approach. Fracking as a new energy technology in England, and with its "complicated and contested nature", constitutes a promising object of investigation to assess whether combing technology impacts, justice, sense of place, and worldviews can better explain the reasonings behind the attitudes of host communities (Sovacool, 2014, p.262).To achieve the study aim, four objectives will be addressed (Textbox 1.3):

Textbox 1.3 Research Objectives
1. To examine community attitudes towards fracking in Northern England (Lancashire & North Yorkshire) and understand how perceptions of impacts of the technology affect these attitudes. **2.** To understand how experiences and perceptions of justice and trust in the regulatory authorities and stakeholders involved in proposing, consenting, and resisting local developments affect attitudes towards fracking. **3.** To assess the ways in which residents' senses of place and worldviews contribute to the formation of attitudes towards and perceptions of fracking. **4.** To explore the ways in which impacts, justice in shale-gas governance, sense of place, worldviews, and attitudes towards fracking are connected, and to critically evaluate the potential of an integrated approach to deepen understandings of how individuals and local communities respond to controversial energy developments.

PNR and KM were selected as case studies, as both sites had planning permission in place for fracking operations during the design of the research. Both also fell under English planning rules and regulations and were at similar developmental stage, which facilitated investigation of perceptions from an integrated perspective. To increase the validity of research, quantitative and qualitative data-collection methods were both used to achieve methodological triangulation, combining surveys and in-depth semi-structured interviews, to achieve methodological triangulation.

Reflecting the questions and challenges the world faces about how to power a net-zero future by 2050, this study seeks to contribute through its integrated approach not only to the literature on public perceptions of fracking, but also to the broader energy-siting literature by extending its research outcomes to other novel energy technologies. Similarly, the study incorporated insights from the wider literatures on sense of place worldviews, and justice, while subsequently combining and contextualising them into case of fracking. At the beginning of this study, there was no qualitative research that explicitly explored multiple explanatory factors to fracking attitudes, there was no research that had explored the diversity of local perceptions in host communities, and there was no research that adopted a comparative case-study approach between areas with proposed and/or existing shale-gas developments. Therefore, besides its theoretical input, the study also makes empirical and methodological contributions to knowledge.

The remainder of the thesis is structured as follows. Chapter Two reviews the wider energy-siting literature focusing particularly “beyond NIMBYism” research to understand how local perceptions of energy developments are influenced by technology impacts, sense of place, worldviews, and justice and trust issues surrounding the governance of energy developments. Chapter Two further examines the social science of fracking in the UK and beyond before identifying research gaps. Chapter Three explains the methodology adopted, including its philosophical foundations, case-study strategy, data collection and analysis, and researcher-positionality and ethical considerations. Chapter Four presents the survey results and compares them with other available quantitative studies. Chapters Five and Six then discuss interviewees’ perceptions of impacts and justice on shale-gas governance. Chapter Seven brings together research findings to assess the importance of place and interviewees’ sense of place and worldviews, before assessing the integrated approach adopted in the study.

Finally, Chapter Eight concludes by summarising the study’s main findings, discussing its strengths and limitations, and suggesting future research directions.

Chapter Two
Understanding Public Perceptions of Energy Technologies

The previous chapter explained the rationale of the study, drawing on research on public acceptance of energy technologies to understand the basis of, and reasons for differences in, public responses (Section 1.3). It was argued that many scholars reject the oversimplicity and superficiality of Not-In-My-Back-Yard concept (NIMBYism) as an explanation for public concerns and that exploration of a broader range of factors is required to understand local attitudes (Devine-Wright, 2009b; 2011a; Wolsink, 2007a; 2007b; Van der Horst, 2007; Warren et al, 2005). The wider energy-siting literature has instead grouped people's attitudes towards technology developments into three broad explanatory categories: a) characteristics and impacts; b) psychological processes; and, c) broader social and institutional factors (Oltra et al., 2012, p. 229-30). Section 2.1 draws on these explanatory factors to describe researchers' attempts to go beyond NIMBYism (Oltra et al., 2012). Considering recent theoretical advances in different social disciplines (Whitmarsh et al., 2015), Section 2.1 expands on these explanatory factors, categorising them into:

1. Technology impacts
2. Socio-psychological processes, including varieties of sense of place, familiarity, and broader beliefs (worldviews)
3. Fair governance, incorporating different dimensions of justice and trust in stakeholders

While Section 2.1 presents each explanatory factors separately, it also identifies studies where they are intertwined. Section 2.2 then focusing on the literature examining attitudes towards fracking in the UK and other countries. Section 2.3 concludes by identifying research gaps and justifying the use of an integrated approach as a conceptual framework for this thesis.

2.1 Local Acceptance of Energy Technologies: Beyond NIMBYism

2.1.1 Technology Impacts

Bell et al. (2005) identified lack of “qualified support” as an explanation for local opposition (p. 460), where the technology characteristics and impacts of developments (e.g., size, scale, and effects on local flora and fauna) did not gain favourable evaluations (Haggett, 2011). For example, one of commonly cited reason for local opposition to wind turbines is their visual impacts (Wolsink, 2000; Warren et al., 2015; Oltra et al., 2012). Other technology impacts recognised as shaping energy attitudes are resource inputs needed, waste outputs, and industrialisation of, or compatibility with, the local environment (Oltra et al., 2012).

Technology impacts can also differentiate public attitudes towards an energy technology in principle and specific projects. While examining public attitudes towards proposed wind farms, Wolsink (2000) found instead of NIMBYism “anti-wind” and “anti-project” types of resistance (Van der Horst, 2007, p. 2706). The former, also known as Not-In-Anyone’s-Back-Yard, incorporated rejection of both the technology and local projects due to potential risks (ibid). However, anti-project sentiments arose from concerns about the negative technology impacts on landscape quality or concerns about the suitability of selected sites without rejecting the technology altogether (Wolsink, 2000; Van der Horst, 2007).

Research has also noted the contribution of residents’ proximity to energy developments and lived experiences of technology impacts. Examining public perceptions of wind energy in Scotland and Ireland, Warren et al. (2005) questioned the assumption that residents in closer proximity to windfarms would only hold only negative attitudes and instead identified an “inverse NIMBY syndrome”, where “those with windfarms in their ‘backyard’ strongly support[ed] the technology” p.853). However, Van der Horst (2007) separated residents’ negative attitudes towards proposed and existing windfarms and found that perceptions of risks varied based on their familiarity with the technology. He explained that residents near an existing windfarm were less opposed than those living further away, as they experienced and changed their negative perceptions over time. In contrast, people near proposed windfarms hold stronger negative opinions, as “the level of risk perception [was] related to the distance to the site” (p. 2707). Jacquet and Stedman (2014) similarly argued that perceptions of impacts during the early developmental phases were more negative despite there being no noticeable consequences because anticipation of potential risks was often worse than the realities. They also stressed individuals’ assessments of the severity and importance of technological impacts, stating that “subjective experience and interpretation of an event [were] potentially more important than the measurement of the more tangible outputs” (Jacquet and Stedman, 2014, p. 1294). Therefore, while experts can inform the public about possible effects of energy developments, evaluations of net technology impacts— the balance between perceived risks and benefits— is primarily subjective (Boudet et al., 2016).

The changes in perceptions of technology impacts during different developmental stages noted in the previous studies also highlighted their dynamic nature. Van der Horst (2007) recommended that researchers exploring alternative NIMBY explanations to local opposition to energy developments consider their current stage, while other scholars acknowledged temporal variations in perceived risks and benefits in relation to changes in attitudes. For example, Bailey et al. (2011) visualised the trajectory of public opinions towards wave energy in Cornwall as a W- shape curve: (i) at the beginning public support was high in principle where offshore technologies were perceived to be cost-effective and environmentally friendly with few risks, (ii) but reduced while the project was undergoing planning approval or negative technology impacts became noticeable during the construction phase, (iii) then, increased again when economic benefits appeared or disturbances to local life or landscapes began to reduce. In contrast to other U-shaped visualisations of attitudes towards other renewable developments over time (Wolsink, 1994; 2007), Bailey et al. (2011) saw (iv) a second decline possible, if new adverse impacts occurred, the old ones remained, or benefits were lower than expected; before, (v) public support could recover back to higher levels of support, again dependent on the management of impacts.

To summarise, perceptions and experiences of technology impacts contribute to attitudes while providing some alternative explanations of NIMBYism. However, academics have also highlighted the importance of socio-psychological and contextual factors in residents' subjective evaluations of technology impacts (Devine-Wright, 2011a; Oltra et al.2012; de Groot and Bailey, 2016). The next section focuses on people in local areas and their socio-psychological processes of interpreting environmental changes, such as the development of a new energy technology. Section 2.1.2 introduces the concept of sense of place, including place attachment, identity, and dependence, and explains how their disruption can affect local responses to energy technologies, before exploring the role of broader beliefs in attitude formation, focusing particularly on environmental worldviews.

2.1.2 Socio-Psychological Processes

2.1.2.1 Disruption to Sense of Place and Local Responses to Energy Technologies

Researchers have criticised NIMBYism for failing to consider deeper social-psychological explanations for relationships between people and places they find meaningful (Jacquet and Stedman, 2014). According to this perspective, places gain importance through the meanings, emotions and connections people develop from both its physical and social features, which in turn distinguish place from concepts such as site, space, landscape or environment (Relph, 1976; Tuan, 1974; 1977; 1980; Devine-Wright, 2009b; 2011a; Hidalgo and Hernández, 2001; Devine-Wright and Clayton, 2010; Easthorpe, 2004; Massey, 1995). The concept most commonly used to describe “the bonding of people to places” is place attachment (Low and Altman, 1992, p.2; Hernández et al., 2014):

> [The] experienced bonds, sometimes occurring without awareness, that are developed over time from the behavioral, affective and cognitive ties between individuals and/or groups and their sociophysical environment. These bonds provide a framework for both individual and communal aspects of identity and have both stabilizing and dynamic features. (Brown and Perkins, 1992, p. 284)

Place identity is a related place-centred construct, defined by Proshansky et al. (1983, p.59) as:

> A sub-structure of the self-identity of the person consisting of, broadly conceived, cognitions about the physical world in which the individual lives. These cognitions represent memories, ideas, feelings, attitudes, values, preferences, meanings, and conceptions of behavior and experience which relate to the variety and complexity of physical settings that define the day-to-day existence of every human being.

The relationship between these concepts is not definite. For example, Devine-Wright (2009b) saw place identity and place attachment as equal and related, but distinct, constructs. Other scholars have conceptualised place identity as a component of place attachment, as Scannell and Gifford (2010a, p.2) did in their “tripartite model of place attachment” (Figure 2.1), where they emphasised the three dimensions of place attachment: person, psychological processes, and place.

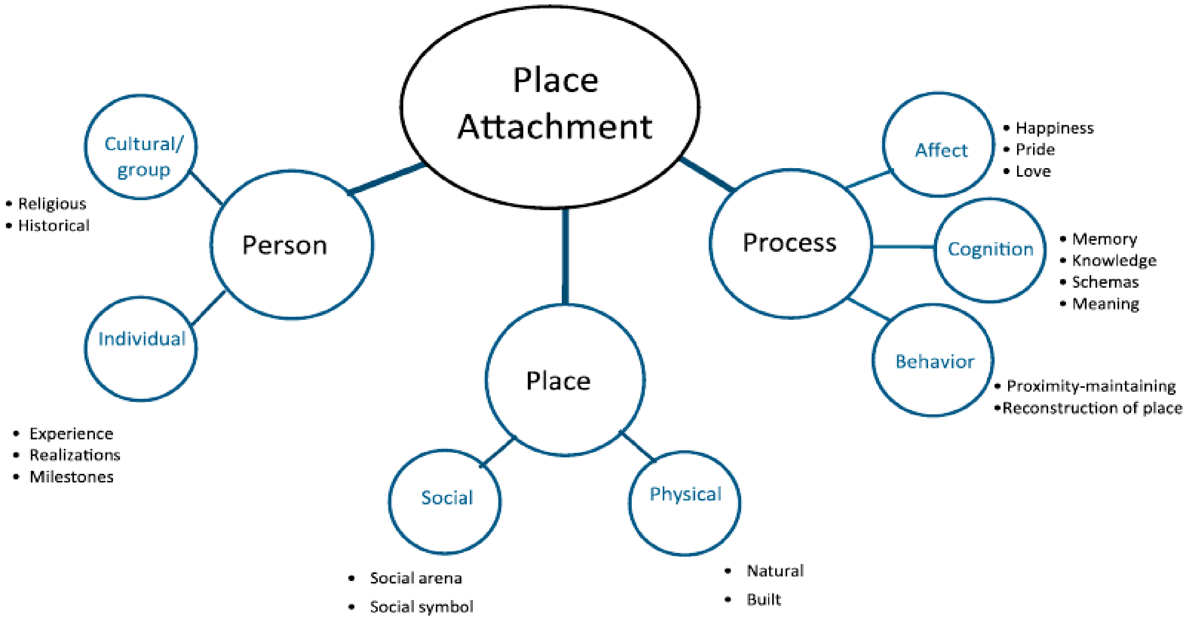

Figure 2.1 The tripartite model of place attachment (Scannell and Gifford, 2010a, p.2).

The person dimension focuses on the actor, either an individual or a group. An individual's bond to a place is suggested to stem from key experiences, personal memories and milestones, which contribute to creating place meanings independent from the physical features of the place through "experience-in-place" (Manzo, 2005, p. 74; Scannell and Gifford, 2010a). However, community place attachment is argued to derive from shared historical experiences, values and symbols passed between generations, linking the concept with cultural preservation and place protective actions.

The psychological dimension of place attachment encompasses its affective, cognitive, and behavioural sub-components and focuses on the processes through which people connect with places (Hernández et al, 2014). Emotions could range from happiness, love and pride to hatred, fear, and ambivalence (Manzo, 2005), while memory, knowledge, schemas, and meaning are included in the cognitive process. Such schemas can be described as "thematic and stylised" collections of information- including knowledge and beliefs about objects and one's self- through which people make sense of the world; these can be linked with notions of identity, familiarity, place dependence and distinctiveness (Proshansky et al., 1983, p.62; Scannell and Gifford, 2010a; Fullilove, 1996). The physical and social features of places incorporated into cognition through memory, values, beliefs, and preferences then become part of people's self-definition (Proshansky et al., 1983). The behaviour sub-component refers to people's actions in relation to a place, such as relocating to a new place with features similar to a previous one or attempting to stay close to a perceived special place.

Finally, the place dimension focuses on the object of attachment and its social or physical nature. For example, civil place attachment or nationalism reflects people's group attachment to, and identification with, a city or a country, while the physical features of places can provide people different amenities and resources, distinguishing built environments from natural ones (Scannell and Gifford, 2010b) . As such, physical place attachment can be associated with environmental identity, "the inclusion of nature into one's self-concept" (Scannell and Gifford, 2010a, p.5).

The concept and application of place attachment have broadened in recent decades across a variety of actors, situations, geographic scales, and emotions. Qualitative differences, emerging from different levels of consciousness and features of place, were recognised in an attempt to explain how and why place attachment occurs and varies between individuals and communities (Gustafson, 2014). For example, place attachment can be categorised into traditional and active attachment, where the former indicates an "unreflected rootedness and continuity" and the latter "a more reflected or ideological rootedness, possibly based on a conscious choice of where to live" (Gustafson, 2014, p.40; Lewicka, 2011b; Hummon, 1992). People showing traditional attachment are often suggested to be older and less educated, to hold more conservative values, to be limited in their social interactions and more tied to their closest social circles, and to become attached primarily from everyday interactions with their place compared to those who are more actively attached to meaningful places (Lewicka, 2014; 2011b; Gustafson, 2014). While place attachment often refers to residential affective bonds, it can be developed by people with high levels of mobility or be associated with highly recreational places, work, or sports activities (Lewicka, 2014; Gustafson, 2001; 2014). Length of residence nevertheless holds a moderate explanatory value for place attachment, especially the traditional type, as both memories and place attachment require a certain period of time to "living in a place" (Lewicka, 2014, p. 52; Gustafson, 2001; 2014).

Besides people's positive bonds to places, the place attachment literature has considered negative feelings arising during place separation or alienation (Relph, 1976; Manzo, 2005). For instance, Hummon (1992) recognised three types of non-attachment: alienation, place relativity, and placelessness. Gustafson (2014) further explained that alienation reflected negative attitudes to places, place relativity showed ambivalence and provisional acceptance of proposed change to places, and placelessness describes an indifference to places in general.

As people become attached to places through living, experiencing, and being engaged with their physical and social environments (Stedman et al., 2014; Lewicka, 2014), place attachment and other place-related constructs often intertwine. Despite the contribution of symbolic meanings to individuals' place identity, place can involve a ''functional connection based specifically on the individual physical connection to a setting" (Raymond et al, 2010, p.426; Lewicka, 2014; Williams, 2014; Williams and Vaske, 2003). This place dependence highlights people's reliance on certain features, resources, and experiences that make specific places distinctive and seen as preferable to alternatives (William and Roggenbuck, 1989; Williams, 2014; Jorgensen and Stedman, 2001; Mihaylov and Perkins, 2014). Some scholars perceived place dependence and place identity as core dimensions of place attachment that are essential in interpreting environmental disruptions, while others saw sense of place as a more overarching construct that incorporated all three concepts (Williams, 2014; Williams and Vaske, 2003; Kyle et al., 2004; Giuliani, 2003; Lewicka, 2011a; Mihaylov and Perkins, 2014; Jorgensen and Stedman, 2001; 2006). Sense of community, another closely related concept, was perceived to reflect both affective “social bondedness” with one’s place and a sense of “physical rootedness” similar to place dependence and identity (Perkins and Long, 2002, p.68). For Scannell and Gifford (2010a), sense of community focused on common interests, whereas community of place developed primarily within specific geographical areas.

Despite the profusion of place-based constructs, researchers agreed they acted as predictors of local resistance or opposition in various areas of study, including alternative energy resources, pro-environmental behaviour, and responses to catastrophes (Hernández et al, 2014; Manzo and Devine-Wright, 2014, p.4-5). Jacquet and Stedman (2014) argued that local opposition to land-use changes, such as new energy technologies can be explained by how perceived risks disrupted people’s social-psychological values, including their sense of place. Brown and Perkins (1992) introduced the concept of disruption to describe the impact of change on an individual or group. Similar to fluctuations in attitudes and perceptions of impacts over time (Section 2.1.1), they saw a temporality in people’s place-identity disruption before and after changes occurred, with people’s emotions ranging from shock or denial, to stress, acceptance or refusal (Devine-Wright, 2009b; Jacquet and Stedman, 2014).

One early study to include place attachment in examining local energy attitudes was by Vorkinn and Rieses (2001), who found that strong attachment to the natural area led to lower acceptance of a proposed hydropower project in a Norwegian rural community. In a comparative case study of local responses to offshore wind turbines in Wales, Devine-Wright and Howes (2010) found a negative relationship between place attachment and acceptance only in one of two Welsh towns examined where people held strong perceptions of the natural aspects of their place and the visual impacts of the development were perceived to industrialise the area. The authors attributed this difference to “a lack of fit” between people’s definition of their place and the proposed development (Devine-Wright, 2013, p.764).

However, studies have also identified public support when residents were familiar or identified positively with a local development, suggesting a Yes-In-My-Back-Yard syndrome (Boudet et al., 2016, Devine-Wright and Howes, 2010; Mihaylov and Perkins, 2014). For example, McLachlan (2009) researching public perceptions of wave energy in England, combined technological and place interpretations to explain local attitudes (Figure 2.2). She saw local support as possible when technology was perceived as pioneering and place was defined as a resource by residents or when the technology was seen to be compatible with nature in a place valued for its physical features. Devine-Wright (2011b; 2013, p.764) came to similar conclusions about a tidal energy project in Northern Ireland, concluding that ”strong attachment to a place [was] not inevitably linked to public objections, particularly in situations where a technology project [was] perceived to enhance rather than threaten a locality”.

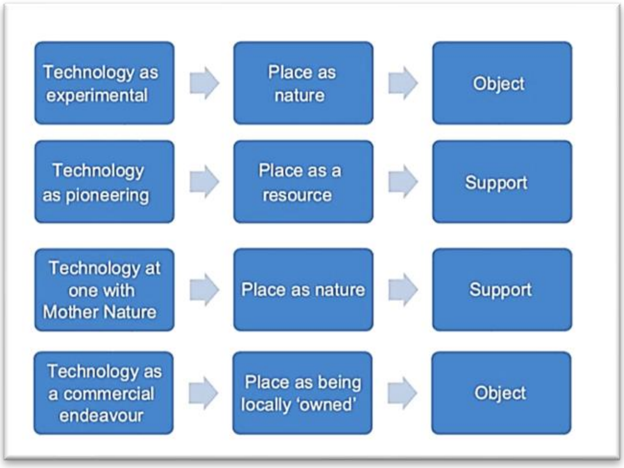

Figure 2.2 Examples of symbolic logics of opposition and support (McLachlan, 2009, p.7)

Venables et al. (2012), investigating attitudes towards nuclear power in England, found sense of place to mediate risk perceptions in closely-located communities and local support for new developments when already established power stations in their area had contributed positively to residents' sense of place. Conversely, they found current or previous employment in the nuclear industry to contribute negatively to local attitudes, despite previous research showing that "familiarity with technology or experience of technical occupations [were] associated with lower levels of perceived risk" (Venables et al., 2012, p.377). These findings led them to argue that attitudes towards new energy developments were depended on risk perceptions, but "valued aspects of the local area, [such as] peace and quiet, or the aesthetics of the local landscape" (ibid). Van der Horst (2007) noted that local communities in stigmatised places (e.g., ex-mining landscapes) were more likely to welcome "relatively green" technologies (p. 2705), whereas those with stronger senses of place identity stemming from rural surroundings tended to resist such developments. Therefore, besides lived experiences of technology impacts and natural features of place (Section 2.1.1), familiarity with energy developments was considered as contributing to attitudes and perceptions. However, as other scholars noted, previous or established developments in an area can only provide "ad-hoc explanations" for how they affected perceptions of new energy technologies (Whitmarsh et al., 2015; Oltra et. al., 2012, p.233).

Researching local attitudes towards a proposed power line in England, Devine-Wright (2013) found a negative relationship between active place attachment and local acceptance and no association for traditional attachment, while noting that actively attached people were more likely to take part in local protest groups by attending meetings or contributing financially to their cause (ibid; 2014). Therefore, he argued for the inclusion of varieties of place attachment in future research on local acceptance of energy developments. Discussing associations between NIMBYism and successful local protest groups, Van der Horst (2007) noted that organised opposition needed individual motivation, but individuals solely holding negative attitudes towards proposed developments were not inevitably inclined to protest or to achieve their desired outcome if they did. Manzo and Perkins (2006) similarly argued that attitudes towards disruption were based on people's place attachment, but people's responses "materialise[d] into action/opposition or acceptance/adaptation depending on perceptions of collective efficacy, the existing networks, participation practices, and social capital" (p.70). Devine-Wright (2014) concluded that both strong place attachment and empowered people were needed to contest place-change proposals.

However, other scholars pointed that, while place protective actions and civic engagement often suggested positive relationships between place attachment and pro-environmental behaviours, this was not inevitable and that geographical scales, local economic context, and environmental values should be considered (Carrus et al., 2005; 2014; Bonaiuto et al., 2002). For example, rejection of wind energy could be perceived either as an anti-environmental response on a global scale due to climate scepticism or a pro-environmental one on a local level due to landscape considerations (Carrus et al., 2014). Carrus et al. (2014) concluded that interpretation of a proposed change remained crucial, while clashes between economic and environmental values could complicate matters.

To conclude, this subsection has highlighted the importance of local context and people's sense of place as alternative explanations to pure NIMBYism and has showed that local responses often result from evaluations of an energy technology as a disruption or enhancement to one's place. However, underlying values and broader beliefs also emerge as potentially affecting sense of place, but also contribute to attitudes and responses towards new energy technologies. The next subsection expands on these broader socio-psychological concepts.

2.1.2.2 The Role of Broader Beliefs in Attitude Formation

Jacquet and Stedman (2014) argued that although perceptions of technology risks are subjective and varied, "the variation is far from random, and can vary systematically across segments of the population" (p. 1294). Research on risk perceptions agrees that risks are also culturally and socially constructed and that their interaction "with psychological, social, institutional and cultural processes […] can intensify or attenuate individual and social perception of risks" (Oltra et al., 2012, p.232; Dake, 1992; Jacquet, 2014; Kasperson et al., 1998; Pidgeon et al., 2003). Oltra et al. (2012) added that, while technology benefits may facilitate local acceptance, perceptions of benefits are "influenced by prior attitudes and cultural orientations as well as group membership" (p.231). Overall, while energy attitudes are based on weighting of the costs and benefits, perceptions of technology impacts are rooted in values and fundamental beliefs (Slimak and Dietz, 2006; Groot et al., 2013). Many researchers exploring public responses to environmental issues and energy technologies have focused on people's values, broader beliefs, worldviews, and their relationships with attitudes and behaviours, so clarifying their meanings is essential.

Values in social sciences are described as enduring beliefs or principles, which vary in importance, function as a guide in people's lives, and act as determinants of attitude and behaviour formation (Rokeach, 1973; Schwartz, 1992; Schultz and. Zelezny, 1999; Hernes and Metzger, 2017). Attitudes, however, are more flexible or vulnerable to change, and reflect positive or negative preferences and evaluations towards more specific situations, living beings, or objects (Fulton et al. 1996; Estévez et al., 2015; Dietz et al., 2005; Hernes and Metzger, 2017). Perceptions are often used interchangeably with attitudes in the literature, but instead of focusing on the affect and stance towards an outcome, they include a more cognitive dimension by emphasising the way something is understood (Hernes and Metzger, 2017). Scholars believe that personal values and broader beliefs influence risks perceptions (Slimak and Dietz, 2006; Estévez et al., 2015). Whitmarsh et al. (2015) described perceptions as a superior construct that incorporates both attitudes and risks perceptions towards proposed energy technologies or environmental changes. Similarly, Hernes and Metzger (2017) used the term perception to understand local communities' attitudes towards a biosphere reserve in Scotland but also included expectations of biosphere management and planning.

Stern et al (1995, p. 727) in their “Schematic Casual Model of Environmental Concern” clarified connections between these psychological concepts (Figure 2.3).

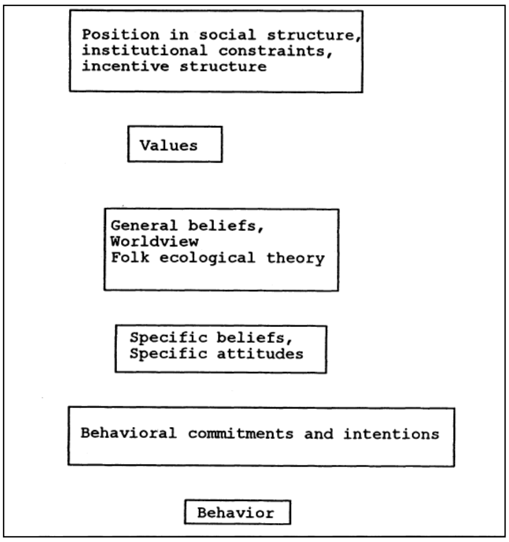

Figure 2.3. A schematic casual model of environmental concern (Stern et al., 1995, p. 727)

They conceptualised social structure at the top because it relates to early experiences in people's life that consequently shape the formation of values and general beliefs or worldviews. The authors argued that new information congruent with one's values and worldview filters has a higher possibility of influencing beliefs and attitudes. Values, preceding worldviews, are developed primarily during individuals' formative years within the family environment and were seen to be more resilient to change and more general than the subsequent constructs, "reflecting broad dispositions or orientations that seem nearly as basic as personality itself" (ibid, p.728). Worldviews are generalised beliefs developed later in life, are broader in scope entailing "social, cultural, and political attitudes toward the world", and are used to explain "how individuals and groups interpret[ed] the world in different, yet patterned ways' (Leiserowitz, 2006, p.49; Stern et al., 1995; Dietz et al., 2005). Finally, Stern et al. (1995) acknowledged the existence of a causation flow from top to bottom, but did not include causal arrows as they perceived that adjacent constructs may have stronger influence without rejecting some level of direct influence between more distant ones; and the authors believed feedbacks between constructs were possible.

Other social-psychological models use values and worldviews to comprehend specific beliefs and attitudes towards environmental issues while exploring people's rights over, and relationship with, the biophysical environment, such as the "Scale of Sustainability" (O'Riordan, 1981), the "New Environmental Paradigm" (Dunlap and Van Liere, 1978; et al., 1992), and the "Value-Belief-Norm (VBM) (Stern, 2000; et al., 1999) (see also, West et al., 2010; Hernes and Metzger, 2017; Lima and Castro, 2005; Schultz and Zelezny, 1999). However, West et al. (2010) perceived these models as unidimensional and believed that social and cultural considerations were essential in interpreting perceptions of environmental issues and energy technologies, while Estévez et al. (2015) argued for the need of risks perceptions to be explicit in theoretical frameworks. Overcoming this, both studies supported the use of cultural theory (CT) approach, a model in which risks perceptions are integrated with group and individual dimensions, social structure, and views on the human-nature relationship (Thompson et al., 1990; West et al., 2010; Oltedal et al., 2014; Estévez et al., 2015).

Originally deriving from Douglas's (1966) anthropological study of ritual defilement, CT was used to study technological and environmental dangers by Douglas and Wildavsky (1982), and then enriched by Thompson's "myths of nature" (1982)[6] that reflected different environmental worldviews. Since then, CT has been used to interpret issues such as water pollution, climate change, nuclear energy, and renewables by explaining individuals' varied perceptions through the lens of different worldviews (Thompson, 1998; et al., 1990; Langford, 2000; West et al., 2010; Wildavsky, 1987). For scholars using CT, worldviews encompassed people's cultural bias– cognitive "patterns of perceiving, justifying, reasoning, and feeling [that included] perceptions of time, space, nature,

[6] For a comprehensive overview of CT, see Rayner (1992) and Thompson et al. (1990).

human nature, justice, risk, blame, leadership, and governance" (Thompson et al., 1990; Douglas, 1978; Rippl, 2002; Verweij et al., 2011, p. 745). Thus, CT suggests that people's values attempt to maintain an existing form of social organisation and that people's fears or concerns are filtered and interpreted through their worldviews (Milton, 1996; Rayner, 1992). In contrast to the Psychometric Paradigm, which assumed risks are borne solely from individual interpretations and reactions to potential hazards, CT recognised the importance of social and cultural influence on people's risks perceptions and preferred ways of managing them (Rippl, 2002; Steg and Sievers, 2000).

CT is based on a grid-group typology[7]. Grid refers to the social rules regulating social interactions and individuals' behaviour whilst group represents the degree of social solidarity within sub-sets of society and its effect on the individual (Douglas, 1978; Milton, 1996; Oltedal et al., 2014). The grid dimension is high when people's actions were controlled, to a large extent, by authorities and low when individuals are freer to make their own choices, whereas the group dimension is high when people had a greater sense of collectivity and low when they are driven by self-interest rather than a group ethos (Milton, 1996). Based on the dynamics between these two dimensions, four worldviews emerged through which the world is perceived: hierarchists, fatalists, individualists, and egalitarians (Figure 2.4) (Douglas, 1970, 1978; Douglas and Wildavsky, 1982; Wildavsky, 1987; Rayner, 1992). Table 2.1 summarises the key characteristics of each worldview in relation to people's social roles, relations, fears, management preference of risks, trust, and perceptions of nature.

[7] Group (also known as collectivity/boundness responds to the question of identity 'who am I?', whereas the grid dimension (also known as stratification) answers the action question 'What shall I do?' (Wildavsky, 1987, p. 6; Milton, 1996; Oltedal et al., 2014; Verweij et al., 2011).

Table 2.1 Cultural theory's worldviews				
Worldview	**Grid- Group dimension**	**Characteristics**	**Social participation**	**Perceptions of Nature**
Hierarchist	High grid High group	Believe in the need for a well-defined system of rules; Freedom of action is highly controlled by authorities and actions reflect collective interests; Fear changes to status quo; Favour institutions and experts' knowledge.	Active in societal debates	Nature is tolerant; Natural resources are exploitable within certain limits; Relations with nature regulated by institutions; Willing to accept risks and new technologies that are justified by governmental authorities or experts who can establish them within proper boundaries.
Individualist	Low grid Low group	Prefer a 'market' form of organisation valuing individual initiative and following whichever development path offers the best financial prospects; Pursue own interests and personal gain; Fear restraint of their individual autonomy; Favour market liberalism; Politically placed to the right.	Active in societal debates	Nature is resilient to anthropogenic activities; Natural resources are abundant; Follow a trial-and-error approach presuming that nature will return to its original stable position after any disturbance; Technologies perceived as opportunities.
Egalitarian	Low grid High group	Pursue collective interests without activities being strictly regulated; Fear social inequalities and are sceptical towards institutions and experts; Favour political action for increasing social equality; Politically placed to the left.	Active in societal debates	Natural resources are depleting; Nature is fragile to anthropogenic activities; Sensitive to low probability-high consequence risks that can threaten people or even future generations; Supporters of the precautionary principle and sustainable approaches.

Table 2.1 Cultural theory's worldviews (continued)				
Worldview	**Grid- Group dimension**	**Characteristics**	**Social participation**	**Perceptions of Nature**
Fatalist	High grid Low group	Feel isolated in the face of an external world imposing arbitrary restrictions on them and that they have no control over situations; They are not withdrawn from society, but adopt a 'what will be, will be' attitude; Do not pursue collective interests and unable to pursue their own; Mostly unaware of risks; Fears are irrelevant as they have no say in decisions.	Inactive in societal debates; Perceived to represent the 'silent majority' and due to their passive stance, they usually excluded from the majority of cultural theory analyses.	Nature is capricious and unmanageable; They take advantage of whatever comes to their way.

Sources: Douglas, 1978; Thompson et al., 1990; Milton, 1996; Oltedal et al., 2014; Boudet et al., 2014 ; Rippl, 2002; Rayner, 1992 West, 2008; West et al., 2010; Weir, 2008; Adams, 1995; Steg and Sievers, 2000 Wildavsky, 1987.

Many studies have applied CT worldviews in quantitative surveys to predict people's policy preferences or risk attitudes (Dake, 1990; 1991; 1992; Wildavsky and Dake, 1990; Verweij et al., 2011; Rippl, 2002; Marris et al., 1996, 1998; Peters and Slovic, 1996), but these approaches have often led to criticisms of CT for disregarding changes in people's worldviews over time, not recognising shifts between worldviews within specific contexts, and stereotyping society into four categories (Rayner, 1992; Thompson et al., 1990; Boholm, 1996; West et al., 2010). These criticisms have been partly overcome by using qualitative methods, acknowledging worldviews as dynamic constructs[8], and conceiving them as ideal types to which participants' perceptions and arguments are allocated as representative discourses rather than precise descriptions. For example, West et al. (2010) explored renewable energy perceptions in England using CT as a beyond-NIMBYism heuristic device to provide a "snapshot of an often controversial debate" (p.5741). However, quantitative approaches remain useful, as in Meader et al.'s (2006) study of car-usage, costs, and benefits. The authors argued that CT helped to "distinguish between people or groups that, while on the surface appear[ed] to be similar, when viewed from the perspective of their cultural, environmental and economic worldview [were] somewhat different" (p.68). However, while their results concurred with other empirical findings and theoretical propositions presented by CT[9], they only found environmental and economic worldviews to be strong predictors of attitudes and not cultural ones, leading them to suggest that future studies should focus on the first two.

To conclude, this section has highlighted that broader beliefs or worldviews can shape diverse perceptions and subsequent attitudes towards energy technologies (Estévez et al., 2015) Therefore, perceptions of technology risks and benefits conditioned by these socio-psychological constructs can lead to support or opposition towards energy

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[8] Thompson (1982) argued that people's worldviews were relatively stable but after an accumulation of surprises and discrepancies of what was seen and what was expected in their real lives could turn to another rationality of perceiving and explaining the world (West, 2008). Worldviews perceived as dynamic constructs were associated with the mobile version of CT, which postulates that individuals could change worldviews throughout their lifetime and ascribe to different worldviews in different spheres of their life while exhibiting different cultural biases in different contexts and often adjusting the nature of their arguments when moving from one to another (Rayner, 1992; Marris et al., 1998; Langford, 2000; West, 2008).

[9] Egalitarians are more strongly associated with pro-environmental attitudes showing higher concern for car use consequences and costs for the biosphere. In contrast, individualists are not concerned with environmental matters believing in market and technological solutions to solve them if needed, while hierarchists take a middle ground approach by recognising and weighting both the risks and benefits of car use accepting human intervention and exploitation of the environment up to a point.

developments (Slimak and Dietz, 2006; Estévez et al., 2015). Understanding the cognitive processes described in this section is important as they “may generate substantial and persistent biases and lead to attitudes that misinterpret the magnitude or severity of risks (Estévez et al., 2015, p.21). However, the literature showed that each worldview encompasses its own predispositions about potential risks and issues of trust, justice, and governance (Verweij et al., 2011). Thus, it becomes increasingly understandable why people’s responses towards energy technologies are complex and heterogeneous within a community. The next section focuses on the influence of issues of fairness, justice, and trust surrounding the governance of energy technologies.

2.1.3 Fair Governance

2.1.3.1 Public Participation and Trust

Sovacool and Cooper (2013) acknowledged that governmental institutions and operators were traditionally seen as the principal stakeholders involved in energy governance, but saw the concept as complex and multi-scalar, encompassing instead “three interrelated meanings” (p.8):

> First, governance can refer to the internal operation and management of the megaproject itself; how well it is built and maintained, and how efficiently or reliably delivers energy fuels or services. Second, governance can refer to the economics and politics of the system, the coalitions of interest involved in supporting or opposing a megaproject. Third, governance can refer to the interaction between the technology of a megaproject and the types of social organisation it creates— whether it produces competition or collaboration, whether it is controlling or democratic, whether access to it is open or closed.

Scholars have noted the importance of public participation, fairness and transparency in decision-making processes, and trust in the stakeholders involved governing developments (i.e., authorities, regulators, planners, developers, and action groups) – either as distinct explanatory factors or parts of a broader concept (Oltra et al., 2012;

Devine-Wright, 2005, 2013; Wolsink, 2007a; Gross, 2007). For example, Wolsink (2000) identified an "anti-process" type of resistance emerging during decision-making processes due to local negative impacts becoming more noticeable (e.g., construction risks) (van der Horst, 2007, p. 2706). In a study of waste facilities, Wolsink (2007a) concluded that "feelings about equity and fairness appear[ed] the determinants of 'backyard' motives, instead of selfishness" (p.1188). He explained that local residents resisting the siting of these facilities did not want to "shift the burden to others" (p.1203), but felt it was unfair to be the ones facing burdens imposed by decision-makers or third parties. Wolsink (2007a) also noted that perceptions of fairness were "strongly connected with perceived environmental risk, and also with strongly deviating core values about how society should take such decisions" (ibid). Bell et al. (2005) also noted that NIMBYism did not "reflect the complexity of human motives and their interaction with social and political institutions", and besides "self-interest" and "qualified support" explanations, they spoke of a "democratic deficit" (p. 460). The authors explained that a minority of people holding strong negative attitudes were potentially able to control or influence decisions and outcomes, resulting in non-democratic outcomes in permitting processes.

The structure of planning systems in many countries has been criticised for creating negative responses towards emerging technologies (Wosink, 2007a; 2007b; van der Host, 2007; Bell et al., 2005). In "decide-announce-defend" models of decision making– where developers first make decisions on the key aspects of developments, then announce and defend them to the public– people tended to be less supportive (Wolsink, 2000, p.62; 1996; Bell et al., 2005). These types of non-collaborative decision-making processes can trigger local opposition and lead to a "democratic deficit" (Bell et al., 2005,

p. 460; Haggett, 2011). Overall, studies advocate moving away from top-down and technocratic decision-making approaches and towards more open and collaborative processes that allow people to participate meaningfully in planning procedures and decisions affecting them (Wolsink, 2007a; 2007b; Bell et al., 2005; Devine-Wright, 2013).

Public participation in environmental decision-making and access to information and justice is a statutory right in many countries, including the UK, that derives from the Aarhus Convention (1998). However, public engagement was sometimes seen as “an end in itself”, with developers complying with statutory requirements while not fully engaging with communities or addressing concerns sufficiently (Haggett, 2011, p.16). The most popular conceptualisation of public engagement is Arnstein (1964)’s “Ladder of Citizen Participation” (Figure 2.4), which depicts a spectrum from non-participative information provision to consultation and total citizen control, reflecting people’s ability to influence processes and/or outcomes and the nature of communication between affected communities, planners, and developers (Arnstein, 1964; Haggett, 2011). Haggett (2011) noted that information provision, for instance leaflet distribution, advertising and exhibitions, involve a one-way flow of information and opinions, whereas consultation provide opportunities for dialogue, where planners and developers can address emerging issues and reasons for “qualified support” (Bell et al. 2005, p.460). Nevertheless, public engagement as consultation does not ensure people’s views would be taken into account. Thus, consultation processes that were perceived to be unfair could still lead to “democratic deficits”, which would then require more advanced engagement techniques to rectify.

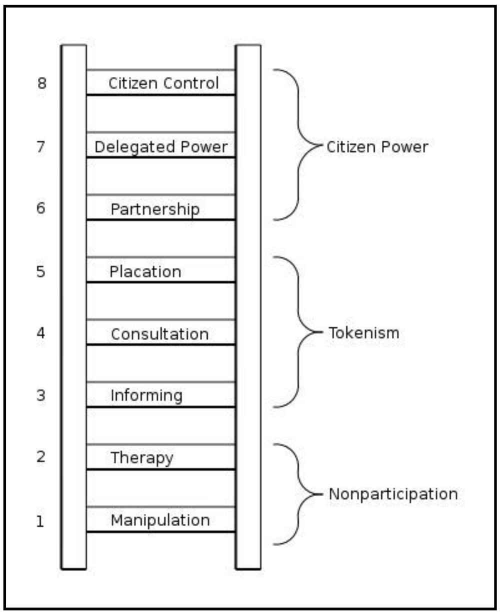

Figure 2.4 Ladder of citizen participation (adapted from Arnstein 1964, p.217)

Some studies within the sense of place literature have also recognised the significance of governance. For example, Bonaiuto et al. (2002) argued that negative responses can emerge from the undermining or exclusion of people's involvement in decision-making processes. Manzo and Perkins (2006) flagged that the place attachment literature overlooks people's connections with places in broader socio-political contexts, and in which planners function, while the community-planning literature focused more on public participation than people's bonds to place. Venables et al. (2010) found that, besides the positive contribution of established nuclear power developments to residents' sense of place, trust in government's regulations, industry, and local operator positively affect attitudes towards new facilities.

Devine-Wright (2014) noted, however, that socio-political factors were more evident within human geography studies of power inequality between local residents, developers, and decision-makers. Walker et al. (2010) stated that public engagement literature saw trust "both [as] a necessary characteristic and a potential outcome of cooperative behaviours" (p.2657). In their study of community renewable energy, they considered both interpersonal and social trust and found them significant components of successful energy facility siting. However, many studies on public responses to energy developments or environmental issues have considered previous research on risks analysis, management, and communication and stressed the importance of personal and institutional trust alongside assessment of potential hazards (Slovic, 1993; 1999; Poortinga and Pidgeon, 2003; Oltra et al., 2012; Cotton et al., 2014; Estévez et al., 2015; Whitmarsh et al., 2015). As Oltra et al. (2012) noted, "trust can be created in careful decision making processes, but it can be destroyed in an instant by processes perceived as unfair" (p.232). For example, when attempting to balance technology risks and socio-psychological disruptions and gain local acceptance, energy developers often provide host communities financial compensation in the form of payments or community shares (Oltra et al., 2012). However, these actions raise questions of trust, transparency, and fairness as they can be seen "as a way of bribing or buying off protestors or key decision-makers" (Cass et al, 2010 p.255).

Overall, research on local acceptance of energy developments argues that connecting national policies with the places where developments are proposed, considering local knowledge and opinions, and actively promoting local engagement can lead to: a) more successful developments and lower local opposition, b) fairer decisions and increased benefits for communities, and, c) (re)build trust in authorities and institutions (Hagett, 2011; Devine-Wright, 2011c; Walker and Cass, 2007; Warren and McFadyen, 2010).

2.1.3.2 Dimensions and Perceptions of Justice

In all cases where facility siting raised questions of sustainability, environmental justice is often a key factor in understanding local opposition (Wolsink, 2007a; Capek, 1993; Cowell and Owens, 1998). Clayton and Opotow (2003, p.300) defined justice as:

> An abstract systems of beliefs and standards prescribing appropriate relationships between people and their fates, [moderating] the relationship between individuals and societies to which they belong by encouraging people to regulate their own behaviour rather than be constrained by others, [and being operationalised] through law and legal procedures, as well as less formally in shared norms (e.g. reciprocity) and values (e.g. equality).

Environmental justice is perceived here as a mix of environmentalism and social justice– the fair distribution of social goods that can define the overall well-being of communities (Gross, 2007; Kuehn, 2000). The civil rights movement gave rise to the environmental justice movement in the US, which was concerned with contesting the unfair distribution of burdens and costs of polluting and hazardous waste facilities near mainly deprived black communities (Bulkeley and Walker, 2005; Walker and Bulkeley, 2006). Since then, environmental justice has evolved to address injustices and inequalities beyond race (i.e., social class, age, and gender) and moved beyond environmental risks to include access to, and the fair distribution of, resources and environmental benefits, such as green space, water, and energy (Walker and Bulkeley, 2006). Environmental justice has also expanded spatially to include maldistributions between and within countries/states, addressing international and global issues like climate change. Additionally, socio-temporal considerations about intra- and intergeneration inequalities connect environmental justice with sustainable development (Bulkeley and Walker, 2005; Walker and Bulkeley, 2006). Over recent decades, research on environmental justice has expanded globally, going beyond distributional concerns to identify processes that lead to unjust outcomes and decisions (Walker, 2009). Procedural justice has, thus, become another branch of environmental justice, focusing on decision-making processes and “rights of participation, access to information, and lack of bias on the part of the decision-maker” (Gross 2007, p.2729).

However, the contextual expansion of environmental justice to energy-related issues and climate change has given rise to more specialist concepts, such as energy and climate justice (Schlosberg and Collins, 2014; Fuller and McCauley, 2016). Energy justice aims “to provide all individuals, across all areas, with safe, affordable, and sustainable energy” (McCauley et al 2013, p.1). Thus, although energy justice has similar philosophical foundations to environmental justice, its emphasis lies on different elements of energy systems (e.g., energy production and the siting of infrastructures, fuel poverty, or ethical energy consumption) (Fuller and McCauley, 2016; Jenkins et al., 2016; Jenkins, 2018). The different foci of environmental and energy justice can lead to different interpretations about whether injustices occur (Bailey and Darkal, 2018), while, for some, energy justice is perceived as more easily applicable and successful due its narrower focus (Jenkins, 2018; Heffron and McCauley, 2017). Over the last decade, energy justice scholarship has proliferated, with the concept being applied in studies about the energy trilemma, systems, services, policy, activism, climate change, and community mobilisation (Jenkins; 2018; et al., 2016).

In his study of local opposition to a power line in England, Devine-Wright (2013) followed an integrated approach, considering not only varieties of place attachment but also “project-related constructs” (p.761), such as trust in the operator, perceptions of justice, and technology impacts. Although he acknowledged both the procedural and distributive dimensions of justice, his study focused only on the first. His findings showed that perceived negative impacts and perceptions of unfair planning and consultation processes were the strongest predictors of local opposition. Both procedural and distributive justice dimensions were significant in Gross‘s (2007) study of community perspectives on wind energy in Australia using a community fairness framework (Figure 2.5). Her key finding was that different community members, including those with “self-interest”, were “likely to be influenced by different aspects of justice, namely outcome fairness, outcome favourability and process fairness (p.2727). While acknowledging that justice and fairness can be used interchangeably in the literature, the author used the terms outcome fairness and outcome favourability to describe distributive justice whereas process fairness referred to procedural justice. Outcome favourability showed people’s predisposition towards a certain result, whereas outcome fairness was the perception of a fair outcome based on societal standards or common beliefs.

Group affected	Fairness perception influenced by	Primary reason
“Winners”	Outcome favourability (distributive justice)	Personal benefit from positive outcome/decision
“Losers”		Personal loss from positive outcome/decision
“Moral proponents”		Overriding belief in outcome
“Moral objectors”		Overriding belief in outcome
“Neutrals” no strong belief either way “Silent majority” who may or may not have an opinion	Outcome fairness (distributive justice)	Prefer outcome to be fair for everyone in community in order to maintain social well-being
Whole community where fair outcome desired for health of community	Process fairness (procedural justice)	A fair process is more likely to result in a fair outcome

Figure 2.5 Community fairness framework (Gross, 2007, p.2375)

Gross’s (2007) framework provided new understanding of the different motivations and reasonings within host communities and their interaction with different justice dimensions. She identified six social groups: (i) “winners”– people with personal gain from the outcome, (ii) “losers”– people with personal loss from the outcome, (iii) “moral proponents”– people with strong beliefs supporting the development, (iv) “moral objectors”– people with strong beliefs against the development, (v) “neutrals”– people with no strong beliefs, and, (vi) the “silent majority”– people who did not express an opinion (p.2735). Gross (2007) saw outcome bias among residents with personal interests or strong beliefs and argued that these four groups were more likely to be influenced by outcome favourability. However, "neutrals" and the "silent majority" were more likely to be influenced by outcome fairness as a way of preserving social well-being. The author found that process fairness was seen as important by the whole community and was perhaps the most important among all three fairness perceptions, as "a fair process [was] more likely to result in a fair outcome, particularly where it [was] unclear as to which outcome [was] best for the community" (p.2735).

However, bias in perceptions of process fairness was also noted in relation to prior attitudes and outcome legitimacy (Figure 2.6), with residents who supported developments being more likely to see processes and outcomes as just, and vice versa. Gross (2007, p. 2733) noticed that nobody with "neutral or negative initial attitude found the process fair", but some initial supporters of wind energy found the process unfair. The intermittent arrows in Figure 2.6 represent attitudinal changes, showing that perceptions of unfair processes could switch attitudes towards the development from positive or neutral to negative.

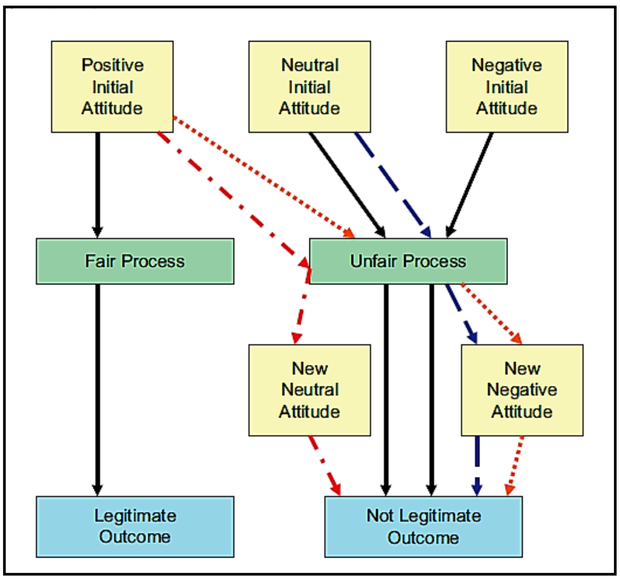

Figure 2.6 The relationship between attitude, perception of process and outcome legitimacy as reported by interviewees (Gross, 2007, p.2733)

Overall, Gross's (2007) study showed merit in including different dimensions of justice. Perceived inequality in outcome distribution created local divisions, while fair decision-making processes, including "appropriate participation, the ability of voices to be heard, adequate information, being treated with respect, and unbiased decision-making" were crucial in shaping final negative attitudes (p.2736). Alongside the procedural justice issues Gross considered, other scholars mentioned representation, use of technical information, and behaviour of the facilitator as determinants of process fairness (Smith and McDonough, 2001; Maguire and Lind, 2003). The importance of representation was associated with recognition, which for some researchers constitutes a third and distinct dimension of justice (Gross, 2007; Walker, 2009; Schlosberg, 2004).

Schlosberg (2004) urged for recognition of cultural identities in environmental justice. He perceived the latter as a threefold concept that included "equity in the distribution of environmental risk, recognition of the diversity of the participants and experiences in affected communities, and participation in the political processes which create[d] and manage[d] environmental policy" (p.517). Walker (2009) further described "justice as recognition in terms of the processes of disrespect, insult and degradation that devalue[d] some people and some place identities in comparison to others" (p.615). Moving beyond the distributional and procedural dimensions of environmental justice, Groves (2015) noted that lack of recognition of people's cultural identities, including place-based values, and potential disruptions to their place attachment by planners and developers constitutes a form of injustice.

More recently, recognition justice has been increasingly acknowledged within energy justice scholarship as forming the three core 'tenets' of energy justice together with distributional and procedural justice (McCauley et al., 2013, p.2; Walker and Day, 2012; Sovacool and Dworkin, 2015; Jenkins et al., 2016; Bailey and Darkal, 2018). For example, the special needs of elderly and disabled groups were only recently recognised in respect of fuel poverty issues in the UK (Walker and Day, 2012). Reviewing the concept of energy justice, Jenkins et al. (2016) emphasised that recognition justice extends beyond non-recognition to misrecognition- "a distortion of people's views that may appear demeaning or contemptible" (p.177). Building on Fraser (1999), Schlosberg (2003), and their own previous work (McCauley et al., 2013), Jenkins et al. (2016) described how developers, regulators and large environmental NGOs sometimes stereotyped local groups that opposed wind farms as NIMBYs and disregarded sincere feelings, values, and place-based concerns in ways that undermined future channels of communication.

Thus, justice as recognition brings out the importance of identity. Discussing the intersections of justice and identity, Clayton and Opotow (2003, p.298) argued that "contextualised" justice could provide deeper understandings by asking the question "what is fair for whom" and flagging the subjectivity behind issues of fairness, in contrast to early justice studies that treated justice as an abstract and impersonal concept to produce generalised models (Schlosberg, 2004). While different types of identity are implied within the justice literature, Clayton and Opotow (2003, p. 307) concluded that "only a recognition of the impact of identity on justice allows us to ask who counts- both individuals and groups- and how concern for their well-being will be reflected in specific individuals' preferences for procedures and outcomes". The link between justice and identity becomes more obvious when justice is perceived as a "human product":

> Each culture constructs its own norms by altering what was handled down to it. Individual and social groups vary not only in the way in which they define justice, but also to the degree which they prioritise it over alternative values such as expedience, practicality, or financial growth. The sense of justice as a mandate may motivate consistent behaviour, but it also inspires justifications, as individuals attempt to interpret their behaviour after the fact to make it appear consistent with the cultural consensus of what is just (ibid, p.300).

Therefore, identity and justice can have mutual implications; on the one hand, identity defines the reasons and priorities underpinning justice perceptions, while justice affects how people perceive others or oneself and justify actions to maintain personal identity (Clayton and Opotow, 2003). They added that group memberships, power differences in relationships and their perceived legitimacy could influence procedural justice perceptions (ibid). Additionally, they justified biases in fairness perceptions when someone was "directly affected" by explaining that distributive justice could be "affected by the aspects of the situation that are most salient, by the goals one have for the situation, and by a desire to benefit oneself or group" (ibid, p.302-303). However, Clayton and Opotow (2003) argued that individual, social [10] and environmental identities could coexist, while justice within environmental issues also entails moral considerations about future generations and nonhuman entities. Considering the intersection of justice and identity in these contexts, the authors urged that three characteristics of environmental conflicts be considered: (i) scale (of conflict and number/diversity of stakeholders involved), (ii) commons (shared resources and harms across different geographical levels), and (iii) knowledge (technical or experience-based) (ibid, p.306).

[10] Individual identity refers to one's self-assessment of characteristics and capabilities and one's role with others, while social identity derives from cultural characteristics and "a sense of belonging, attachment, or involvement with a group based on shared values, motivations, characteristics, or experiences" (Clayton and Opotow, 2003, p.299)

To summarise, Section 2.1 has explored scholars' explanations beyond NIMBYism within the wider energy-siting literature, while expanding on these often-distinct social sciences literatures to better capture the reasonings behind public attitudes (Whitmarsh et al., 2015). While technology impacts, socio-psychological processes, and fair governance were discussed separately, studies that combined them provided more in-depth understandings (e.g., McLachlan, 2009; West et al., 2010; Devine-Wright, 2013). However, most of studies only considered some of these explanatory factors. The next section now focuses on attitudes towards and perceptions of fracking. Based on the geographical focus and the emergence of the technology in the UK at the beginning of this study (Sections 1.2, 1.3, 3.2), Section 2.2 explores UK-based literature on the research topic. Then, it examines the broader literature on public perceptions of fracking in countries with longer industry history, focusing on explanatory factors described in Section 2.1, before identifying research gaps in Section 2.3.

2.2 Literature on Public Perceptions of Fracking

2.2.1 Public Perceptions of Fracking in the UK

This section presents a chronology of UK literature on perceptions of fracking. First, it reviews quantitative and qualitative studies that affected the thesis' design on both the conceptual and methodological levels, before discussing other significant research on fracking that emerged before data collection in early 2018 (Section 3.3) and which was considered in the subsequent analysis.

Early research on public perceptions of shale gas extraction took a quantitative approach. Researchers from the University of Nottingham conducted a series of national online surveys beginning in March 2012. Reporting findings from their September 2014 survey, Andersson-Hudson et al. (2016) noted that 43.11% of respondents supported shale-gas extraction in the UK, but women, income earners below £25,000/year, non-Conservative party supporters, and respondents who associated the technology with water contamination or earthquakes were less likely to do so. Discussing temporal attitudinal changes in their September 2015 survey, the authors saw support declining and opposition growing (ibid). Additionally, over the course of these surveys, the number of respondents correctly demonstrating knowledge of shale gas increased dramatically, leading the authors to believe that increased public familiarity with fracking led to the increased association of the technology with water contamination- "either by chemicals used in fracking fluids, or by methane escape as a result of the fracking process itself and/or poor well integrity" (O' Hara et al. 2015, p.6). After the 2011 fracking-induced tremors in Lancashire, the authors reported that association of the technology with earthquakes increased in 2012 and gradually declined over the following years. In 2015, although the majority of the public still believed in the potential economic benefits of fracking, perceptions of the technology as clean and cheap energy started to drop. As energy security was portrayed as a benefit of shale gas by government and industry, the authors later added an association question to the 2013 survey, which revealed a positive, but decreasing over time, relationship. The authors attributed the shift in perceptions to women who were taking a firmer stance based on increased concerns about technology's environmental impacts, while concluding that the government "must be prepared for significant levels of opposition from grass roots activists" if it continued to support the industry (ibid, p.14)

In August 2014, Whitmarsh et al. (2015) conducted a UK online survey of public perceptions of shale gas, focusing on three locations with different levels of experience of, and potential for, shale gas: a) Lancashire, where fracking had commenced, including the Preese Hall, Preston New Road, and Roseacre Wood sites; b) South Wales, where shale deposits had been identified but no exploration was underway; and, c) Mid/North Wales where no deposits existed. The authors explored factors predicting the technology's public acceptability and the impact of different information frames, while drawing on social science literatures of risk perceptions, attitude change, and place attachment and identity. Their results showed that prior knowledge did not polarise attitudes and additional information given to participants, irrespective of its environmental or economic context, led to more supportive attitudes (particularly for those with ambivalent views), while political affiliation and environmental values were the strongest predictors of shale-gas perceptions. Overall, shale gas was rated as the most unfavourable among energy resources, except nuclear energy. However, when respondents were asked whether widespread domestic extraction should be allowed, 31% agreed and 40% said they did not know. Participants' ambivalence was also noted in their response about whether the technology's risks outweighed its benefits (24.8%), closely followed by those who agreed with the statement. Concerns about water contamination and earthquakes were high among respondents. Acknowledging that trust in regulators can affect risk perceptions, the authors asked about respondents' confidence in current rules and regulations and the government's ability to regulate the industry; the majority expressed uncertainty or disagreement. Case-study comparisons revealed that Lancashire participants saw fracking as a more favourable, cleaner, cheaper, and less risky energy source. However, location was no longer a significant explanatory factor when other factors were considered; the authors attributed these to locational differences and, overall, positive attitudes to shale gas extraction were identified among males, Conservative voters, urban residents, those with greater climate scepticism, and those with less strong environmental identity. However, when grouping place-based (location, rurality, employment in the energy industry, length of residence, and place attachment) and attitudinal factors (political affiliation, climate scepticism, and environmental identity), the two aggregated parameters held equal levels of explanatory power in relation to the technology's favourability. Therefore, the authors saw merit in future studies considering all these predictor factors together and possibly adding more or exploring their interconnections to gain greater understanding of the public's heterogeneous perceptions of energy technologies. Contradicting their hypothesis, Whitmarsh et al. (2015) also found that higher place attachment was associated with more positive attitudes to fracking and recommended further qualitative research on this unexpected finding. In addition, the authors noted that even among participants who most disliked having shale deposits near them, almost half opposed fracking taking place anywhere. Based on these findings and in line with other beyond-NIMBYism studies, the authors concluded that the relationship between attitudes and location was complex, and called for more research on the importance of trust in government (TNS BMRB, 2014).

The Department of Business, Energy, and Industrial Strategy (BEIS)[11] also began a series of quarterly national surveys[12] in 2012 on various energy-related issues that included attitudes towards shale gas. Comparing five years of these data, Bradshaw and Waite (2017) noted that, similar to the Nottingham surveys, the Wave surveys showed increasing and significant opposition to shale gas alongside growing awareness, most notably after the 2013 Balcombe anti-fracking protests. The most cited reasons for

[11] The former Department of Energy and Climate Change (DECC).
[12] Known as Public Attitudes Tracker or Wave.

support were the need to utilise new energy resources, reduction of fossil fuel (coal, oil) dependency, reduction of dependency on other countries, cheaper energy bills, and local jobs and investment, while opponents were concerned about environmental damage, water contamination, earthquakes, uncertainty over the technology, and the safety of the process (Bradshaw and Waite, 2017). On a local level, Cuadrilla commissioned BritainThinks to survey, via telephone, Lancashire residents' attitudes to shale gas. BritainThinks (2012a) found that 44% of respondents supported fracking, while 23% were against and 35% were ambivalent or neutral. About half of the respondents answered an open question about its advantages and disadvantages, naming cheaper energy (23%) and job creation (11%) as the main benefits and earth tremors (32%) and water pollution (11%) as their main concerns. Just after the 2011 fracking moratorium was lifted, BritainThinks (2012b) conducted a follow-up survey and found that awareness had increased within two months. When BritainThinks (2012b) gave more information about regulatory and monitoring processes for seismic activity imposed on Cuadrilla, they reported an increase in support.

Qualitative studies emerged in 2014, when TNS BMRB was commissioned by the Office of Unconventional Gas and Oil/Sciencewise to "inform OUGO's public engagement policy, inform industry's development of a community benefit package, and help stakeholders (from both government and industry) to develop appropriate plans for local engagement." (p.1). Deliberative workshops took place in Winchester, Northampton, and Liverpool, three areas with different prospects and licence statuses for shale development. At the time, no area had shale gas developments which had been granted planning permission. Of the three areas, shale was only a viable option in Winchester and Liverpool and only in Liverpool was there a Petroleum Exploration and

Development Licence (PEDL). In all three cases, the majority of participants' initial attitudes were relatively neutral and their knowledge of its potential risks and benefits was low. Although the study sought to understand what the public would need from engagement about shale-gas exploration, TNS BMRB (2014) identified various reasonings underpinning local perceptions (Textbox 2.1).

Textbox 2.1 Reasonings underpinning local fracking perceptions in the UK
1) difficulties participants faced in balancing the need for shale-gas exploration with the priorities of energy affordability, sustainability, and security; 2) low awareness of risks, with the exception of a few participants who knew about 2011 Lancashire tremors and other negative impacts in the US; 3) the 'unknown' features of the technology led participants to rank the technology as high-risk and having less clear future outcomes; 4) confirmation bias among participants, with initial negative attitudes and greater receptivity to information on risks, benefits and regulation that aligned with their views; 5) reduced confidence in the objectivity of decision-making bodies and fears that important decisions were already taken as the government supported the industry by issuing new PEDLs; and, 6) the complexity of the technology generated questions about the public's overall capability to engage on processes and governance frameworks. (TNS BMRB, 2014)

Results on the financial benefits of fracking showed that a few participants saw community benefit packages as bribes; however, the idea that funds could be managed by a third party rather than being absorbed into general council funding was welcomed.

A number of participants also expressed concerns about job creation and how local jobs would be secured. Overall, participants found merit in information provided by credible, impartial, and trustworthy sources, such as academics, scientists, and regulatory bodies. The study highlighted that the independence of the bodies involved, the long-term accountability of operators, and the public's ability to have a say were key areas of concern that persisted despite regulations covering these issues. TNS BMRB (2014, p.40) concluded that public engagement on shale developments should "directly address existing public concerns, by clearly communicating the rationale for pursuing shale; who stands to benefit; and the extent of the public's ability to have a say in decisions", while making a case for developments that aligned with public energy priorities.

Similar findings were reported by Williams et al.'s (2015) qualitative research on UK public perceptions of fracking, where the trustworthiness of government and industry actors, inclusivity, and democratic decision-making processes were identified as important. The study consisted of six focus groups in three locations- Newcastle, Nottingham, and Lancashire (Chorley and Oldham)- involving lay and campaign participants with different characteristics regarding their relationships with the "earth" and "progress" (e.g., ex-miners/members of local industrial history societies) (ibid, p. 92). The authors reported that institutional framings followed "the deficit model of science communication" approach assuming public negativity was caused by lack of sufficient technological understanding, which could be then resolved by a one-way provision of accurate information on technological impacts" (ibid, p.91). These framings misaligned with participants' views, which showed strong scepticism towards fracking beyond objective risks and safety issues and a preference for more precautionary approaches by central government. Williams et al.'s (2015) study took place early in

2013, when the technology was relatively unknown in Northern England. The authors believed that public perceptions preceding the 2013 Balcombe protests contributed to the decreased public support noted in earlier quantitative surveys. However, they implied that mixing qualitative and quantitative methods could provide a better understanding of public attitudes towards fracking through the data triangulation. Finally, the authors called for more research on public understandings of fracking in relation to governance processes.

Cotton (2013) also urged shale-gas developers to avoid using the NIMBY label to describe local opposition and to consider social, cultural, and psychological factors more fully within their public engagement approaches, as "issues of place, trust, and fairness" were crucial in affecting public support towards other energy developments (p.6). He explained that procedural and distributive fairness were important for host communities and argued that developers needed to be honest and prioritise issues for discussion in a timely manner to build good relationships first and discuss compensation at the end to avoid perceptions of bribery. He noted that "the right" type of community benefits provided to communities could balance some distributive unfairness in some instances; however, place disruptions and changes to individuals' place identities could not easily be determined before projects were proposed; nor could they be monetarily valued (ibid, p.3). As a "one-size-fits-all approach to engagement [would] likely be counterproductive" (ibid, p.4), he concluded by providing various strategies for stakeholder groups with different personal values, energy interests, activism involvement, and proximity to potential sites.

Other early UK social science work on fracking in the UK focused on different framings and discourses of the technology found in policy documents and the media. For example, Hilson (2015) examined how framings of fracking differentiated between the anti-fracking movement and government/industry regarding local environmental and global climate impacts and the degree to which these concerns were considered within the English planning and regulatory system. Drawing on social representation theory, Jaspal and Nerlich (2014) also found contradictory representations of fracking in four newspapers, with left-leaning outlets portraying it as an environmental threat in line with their readers more environmentally conscious views. Similarly, Bomberg (2017) identified two contrasting coalitions built on perceptions of shale-gas either as an opportunity or as threat, in the analysis of newspapers, websites, and policy statements made by key stakeholders. The pro-shale coalition (oil and gas firms, industry networks, government supporters, experts, and media) framed the technology in terms of economic growth, energy security, reassurance about environmental risks, and as a "bridge" to a low-carbon future (ibid, p.80). In contrast, the anti-shale coalition (local residents, environmental and health NGOs, renewables firms, experts, MPs, media, celebrities) focused on environmental and health risks, discouragement of renewable energy investments by creating a fossil fuel "lock-in", and "bad governance" surrounding regulatory and development processes that lacked transparency, democracy, and citizen input (ibid, p.77). Bomberg (2017) concluded that opponents were more successful by stretching "the debate beyond economic or environmental concerns to include potent issues of local power and democracy", while supporters lacked "trustworthy messengers" (p.72).

Cotton and colleagues (2014) followed a similar discourse analysis, which also included interviews with key stakeholders, and identified three emergent "storylines" among contrasting coalitions in the shale-gas debate: cleanliness and dirt, energy transitions, and geographies of environmental justice (p.427) (Figure 2.7). Within the first storyline, the technology was compared with other energy sources, with proponents perceiving it as a cleaner option than coal. In contrast, opponents took a more precautionary approach, stressing scientific uncertainty, the technology's higher carbon dioxide output compared to renewables, and the additional release of methane emissions compared to other fuel sources (e.g., coal/nuclear). In addition, the authors reported that, since November 2012 and after the BGS report, concerns about seismic risks eased even within large environmental NGOs. Opposition instead shifted attention to climate impacts. However, members of Lancashire activist groups interviewed remained worried about the untested fracking process in the UK, excessive water usage, and water contamination by chemicals. Cotton et al. (2014, p.430) recognised that these unknown and invisible "underground" risks also had spatial and temporal dimensions among local interviewees by reflecting uncertainty about the range of possibly affected areas and the actualisation of negative impacts in the longer term. The authors also recognised the importance of trust relationships with energy companies, local government, and regulatory bodies, explaining that "[t]he sociocultural invisibility of fracking risks mean[t] that their interpretation and negotiation [were] mediated through" these trust relationships (p.431). However, risks mentioned included traffic, methane flaring, and visibility and light pollution from drilling equipment, were seen as "not just pollutants", but also the cause of industrialisation of residents' rural area that altered its place characteristics, and the way locals perceived themselves as rural people and were perceived by others outside their community (ibid). This led Cotton et al. (2014) to suggest future research to examine fracking's disruption to the place attachment and identity of host communities. This echoed Jaspal et al. (2014) who argued that shale developments posed “opportunities and threats to human identity as environmental and place identity values conflict[ed] with desire for the local economic development in poor post- industrial and rural communities” (ibid).

Overarching storyline	Principal values and worldviews	Contrasting discourse coalition memberships	Other actors involved in the storyline
Cleanliness and dirt	Cleanliness as an organising principle, defined relationally. Characterised by comparative assessment of environmental benefits and harms in relation to either coal/tar sands/nuclear or renewables. Social construction of cleanliness as relative reduction in carbon dioxide, and particulate ash in relation to coal. Social construction of dirt as an absolute increase in methane, and a relative increase in carbon dioxide in relation to renewables. Dirt storyline compounded by both the invisibility of fracking risks – toxicity, water contamination and the visibility of industrialising rural places	Shale exploration companies, energy consultants, academic environmental scientists and geophysicists, HM Treasury (cleanliness) Contrasted with: Environmental NGOs, Green Party, local and national activist organisations (dirt)	Environment Agency, DECC, DEFRA, HSE, BGS (regulation, scientific assessment and environmental protection) renewable energy companies, Fossil fuel companies (Shell, BP, etc.)
Energy transitions	Development of shale gas defined through temporal and spatial metaphors of transition: paths, roads, bridges and blockages. Discursive conflict between shale gas as a pragmatic position, “a stop-gap” as society shifts from reliance on fossil fuels to lower carbon alternatives, and the idealist positions of it as a “dangerous distraction” in the face of the threat of climate change. Economic viability is variably defined in relation to the United States experience – either as viable (it can provide domestic energy security and reduce domestic gas prices) or unviable (market gas prices have fallen).	Shale gas exploration companies, larger fossil fuel extraction companies, HM Treasury, Conservative Party within Coalition Government, David Cameron and George Osborne (transition) Contrasted with: Frack Off, No Dash for Gas, Greenpeace, Friends of the Earth, local activist organisations (blockage)	Energy consultants Banks and shale gas investment institutions Local councils
Geographies of environmental justice	Defined in relation to procedural and distributive fairness aspects across geographical scales Discursive conflict between supporters claiming transparent communication strategies and low environmental risks, versus actors concerned with inadequate community engagement, siting based upon arbitrary place valuation, and the peripheralisation of politically vulnerable communities in the North of England	HM Treasury, industry, Conservative party (central government), DECC, DEFRA Contrasted with: Conservative and Labour (local government and MPs in affected constituencies), Frack Off, local activist organisations	RSPB, Natural England Environment Agency County councils Councillors and constituents in affected areas

Figure 2.7 Storylines and associated discourse coalitions (Cotton et al. 2014, p. 435).

The second storyline concerned shale gas as a “bridge” or a “distraction” in energy transitions to a low carbon future (ibid, p.432). Although there was a consensus about the decline of North Sea reserves, supporters believed shale gas would enable the UK to meet its emissions reduction targets, whereas opponents saw it as an impediment to renewables. Mixed views were expressed about the economic viability of shale gas within this discourse and referred to the US either as a positive or negative example. Cotton et al.’s (2014) third storyline emphasised the importance of procedural and distributive environmental justice. They explained that when Cuadrilla started shale-gas exploration in Lancashire, they were not required to conduct an Environmental Impact

Assessment as the scale of the proposal fell just under the legal threshold; this possibly contributed to the proposal failing to acquire a social licence to operate (SLO) – “an ongoing status of local stakeholder approval [that] extends beyond what is considered to be normal business practice or courtesy to ensure a feeling of security” (p.433). One local activist perceived that public engagement had been insufficient, while the authors also discussed how financial benefits offered to local councils raised fairness and trust concerns. Distributive justice concerns focused on a “growing North-South divide” after shale-gas developments were portrayed as more suitable for the “desolate” North–a comment in the House of Lords by Lord Howell in August 2013 (p.434). The authors pointed out that these distributive injustices can emerge in areas of perceived low visual amenity or near economically marginalised areas, such as Blackpool in Lancashire, especially when technical criteria for site selection did not appear to exist within shale basins. The authors concluded that different evaluations of places and concerns over local environmental impacts could potentially create divisions within the anti-shale coalition (i.e., national NGOs and local activists) and called for more empirical research on perceptions of technology risks, environmental justice, and place-based values in affected communities.

Cotton (2016) discussed links between the procedural and distributive dimensions of environmental justice within an ethical framework used for policy evaluation of UK shale gas, while noting the emergence of the concept of energy justice. Here, the suitability and prioritisation of Northern areas with industrial histories or socio-economic marginalisation fell within recognition justice. Recognition injustices could also occur within communities if “vocally powerful minority activists and affluent residents with high stocks of social capital negotiate[d] a greater share of benefits and a smaller share of burdens” (p.14). Cotton (2016) argued that defining the notion of community through spatial proximity or stakeholders’ role involvement was problematic and often contributed to distributive injustices over financial benefits. Cotton (2016) suggested that this created a need for clearer benefit distribution mechanisms, better guidance on the format of payments (e.g., types of facilities to be built), and independent decision-making over expenditure. The author saw a paradox between governments’ planning policy approach to transfer control from the local to national level “over site-specific planning development for infrastructure plans deemed to be of national significance” with the Localism Act 2011 and promises to give increased decision-making to local communities (p.10). He also noted that in 2016 there was speculation that shale gas fracking would be included in the nationally significant infrastructure planning process based on a leaked government plan. Cotton (2016) identified further procedural injustices emerging from the passing of the Infrastructure Act 2015 and its “intention of accelerating development by ending excessive delays on projects that already [had] planning permission” (ibid). He added that, despite significant opposition in public consultations, trespass laws were altered within the Act to allow companies explore land below 300 meters depth for oil, gas, and geothermal energy without having to restore it[13]. In contrast, extra environmental protections were included, such as the consideration of cumulative impacts from multiple developments, independent well inspection, groundwater methane monitoring, and the approval of fracking chemicals by state regulators. The author foresaw that other procedural injustices could arise from the government’s support for fracking under the National Planning Policy Framework’s stipulation that “permitted planning must meet sustainable development goals” (p.11).

[13] For example, Cotton (2016) explained that there was no need for companies to acquire landowner’s consent for horizontal drilling and an ability to leave equipment or chemical substances in the ground

Considering public engagement required by operators, and similarly to Hilson (2015), Cotton noted that this was not mandatory under the UK Onshore Oil and Gas's community engagement charter during pre-application stage. Cotton (2016) further perceived that the participation practices within the charter were "more akin to information provision and limited site-related community feedback, which under Arnstein's (1969) participation framework would appear to suggest a tokenistic response to community empowerment in the decision process" (p.9).

These studies have all informed the thesis's conceptual and methodological development. However, before primary data collection began in early 2018 several further academic studies emerged. These followed a qualitative approach and included US-UK comparisons and/or focused on Lancashire– one of this thesis' case studies (Sections 1.3 and 3.2). As Bradshaw and Waite (2017) highlighted, in 2017, Preston New Road (PNR) turned into "ground zero" for the shale-gas conflict in England" (p.28). Thus, although these studies were published after the research was designed, they contributed to the subsequent analysis and discussion of the findings.

In October 2014, Thomas et al. (2017b) conducted deliberative workshops examining commonalities and differences in public perceptions of shale developments in the US (Los Angeles, Santa Barbara) and UK (London, Cardiff). In California, fracking had previously been used to access shallow conventional resources, whereas there were no developments near the UK cities selected. The majority of participants were ambivalent or undecided about fracking at the beginning of their workshop, and while their study provided balanced information on its risks and benefits, participants mainly focused on the negative impacts, believing they outweighed positive ones. At the end of the workshops, 40% of participants felt negatively about the technology. Concerns over water contamination, scepticism about economic or climate change benefits, and the feasibility of reduced energy prices were noted in both countries. The authors reported that UK participants described financial benefits as bribes and believed selling gas to Europe went against UK's energy security. Due to the case-study locations selected, the authors found a low prioritisation of localised risks among participants, and speculated that these risks or benefits (e.g., increased traffic or local jobs) would be more important to people in places where developments were underway as in some US areas (Thomas et al., 2017a;b). Despite differences between the two countries' energy histories, mineral ownership, and cultural values, the authors identified additional commonalities, including distrust towards national governments' ability to regulate the industry and energy companies' capabilities and underlying motives. In another paper from these workshops, Partridge et al. (2017) emphasised participants' shared views about the technology's incompatibility with their preferred long-term energy futures in terms of fossil fuel dependency, alternative technologies, and responsibility to future generations. These showed that people's "judgements of what counts as 'risk' and 'benefit' invariably [could] go beyond those included in formal assessments", while indicating that these underlying concerns should be included in early and open public engagement and before other perceptions of process inequity dominated discussions on local siting (Thomas et al., 2017b, p.7). However, the authors identified national differences that highlighted the importance of local context and concluded that the technology was both "a place-based and national issue" (ibid, p.11). For example, US participants drew on "place-based experiences", referring to the existing onshore oil and gas industry, while UK (Cardiff) participants referred to coal mining extraction since the onshore oil and gas extraction was "less common – and far less visible" (ibid, p.10).

Participants' perceptions of earthquakes induced by fracking differed, as high seismic activity in California amplified US participants' risk perceptions, though UK participants were concerned to some extent about seismicity due to "high population density, aging infrastructure and a poor history of emergency response" (p.10).

Whitton et al. (2017) came to similar conclusions when discussing differences between US and UK governance systems (e.g., land and minerals ownership and regulatory frameworks) and opportunities for public participation, while arguing that "effective governance [was] required to achieve any sense of energy justice in relation to shale gas projects" (p.19). On procedural justice, the authors saw contradictory moves by the UK government based on planning changes that favoured shale gas developments and its recognition of the need to engage and compensate affected communities through the Shale Wealth Fund (SWF) consultation. Although financial motives were considered for both communities and individual households in the SWF, the authors flagged distributive injustices for "geographically distant" communities, which could (or perceive themselves to) be impacted by shale gas developments, for example, those living near transportation routes used by the sector. Having found limited public influence on shale-gas decision making in both countries, the authors proposed a "community visioning" approach– a "multi-directional dialogue" between industry, government, and local communities, in which diverse viewpoints and values would be included to "co-develop plans to achieve an agreed vision" (p.20).

Beebeejaun (2017) also looked into the co-production of local knowledge in a comparison of US-UK regulatory frameworks. In the UK, she focused on Banks, a semi-rural community near Cuadrilla's-owned Becconsall[14] site in Lancashire, while attending meetings in 2012-2013 with a local anti-fracking group and talking informally and conducting semi-structured interviews with stakeholders from the industry, planning and regulatory bodies, and local anti-fracking groups in 2012-2015. In her early work, she mentioned that interviewees found it difficult to access information from Lancashire County Council (LCC) or local politicians and this "lack of perceived transparency set a context within which activism started to emerge, not least as an attempt to check the perceived pro-industry approach of the UK government" (p.425). According to one interviewee, most did not become "environmental campaigners from the start, [(…) but] wanted further information about the fracking process following Cuadrilla's planning applications" (p.426). She described how induced seismic tremors led to loss of trust towards Cuadrilla and questioning of the scientific knowledge provided by industry or government. However, regulation appeared to be "mediated through localized discourses" as the Lancashire tremors contributed to more research and the strengthening of industry regulation (p.428). The author criticised the planning process system for having a "narrow focus" and giving more "weight to the commercial operator's usage of technical and scientific information than to community viewpoints and experts" on issues like the stress and fears of negative impacts residents expressed while drawing on US experiences (p.426-7). Lancashire residents felt that the industry

[14] According to Cuadrilla's (2018) website: "Planning permission was granted by Lancashire County Council (LCC) for the Becconsall site in October 2010. Drilling of an exploration well began at the site in 2011, reaching a target depth of 10,500 feet. Following the completion of the well, the drilling rig was removed and the site secured. In March 2014 Cuadrilla applied to Lancashire County Council for planning permission to undertake measurement of the pressure of the gas in the shale rock at the well, to be followed by plugging of the wellbore with cement and restore the site to its original Greenfield status. Planning permission was granted by LCC on 1st May 2015. However, the planning consent contained a condition requiring Cuadrilla to place all pressure monitoring equipment on site by 31st May 2015. The equipment could not be secured and mobilised to site within that timeframe. Rather than seeking to vary the planning condition, Cuadrilla decided not to pursue the pressure testing, plugged the well and restored the site in accordance with the planning consent. Restoration of the site was completed in August 2018".

was “forced upon them” and disputed energy security arguments, believing that local councillors were pressured to accept Cuadrilla’s applications based on legal advice given (p.427). Beebeejaun (2017) concluded that the co-construction of knowledge between different interest groups did not occur as “community concerns spilled over into wider debates” that led to existing planning processes being seen as “an inadequate mechanism to assess the potential impacts of a British shale gas industry”, which, in turn, contributed to the anti-fracking movement (p.427-8).

Short and Szolucha (2019) echoed similar findings in a later Lancashire-based study. Szolucha followed an analogous methodological approach by living close to actual and potential sites for more than a year, attending meetings and events organised by anti-fracking groups, regulators, and planning authorities, and conducting semi-structured interviews. Her research also included testimonies from officials and local residents at the Development Control Committee (DCC)[15] and public inquiry during Cuadrilla’s appeal to explore PNR and RW sites. Short observed the planning hearings and conducted follow-up interviews with local campaigners, but also analysed the planning application documents and expert testimony. The authors reported that the communities involved experienced a collective trauma from both the prospect of fracking and the planning process and expressed feelings of powerlessness derived from central government influence, planning bias, and corporate lobbying. Based on analysis of the LCC Planning Officer’s report for DCC, they criticised the advice given to

[15] The committee consists of local politicians who decide upon planning applications in their area (Beebeejaun, 2017).

councillors to accept the planning applications as “at best, fundamentally flawed and inadequately researched, and, at worst, biased and disrespectful”[16] (p.270).

Short and Szolucha (2019) also identified technology objections to the application based on interviewees’ concerns about future increased HGV traffic and industrialisation, water pollution, air quality, site noise, and likelihood of localised earthquakes. Seismicity-related quotations also indicated their impact on trust towards Cuadrilla. In addition, they noted that interviewees distrusted the industry and government on the benefits of fracking and did not believe local developments were “justified on the grounds of enhancing national energy security” (p.268). Having found the UK anti-fracking movement to be well informed about the technology risks of fracking, the authors’ expectations that host communities would “cite the most well documented impacts as major causes of concern” were confirmed. They nevertheless highlighted that, besides anticipated impacts, “residents’ understanding of risk and experience of collective trauma [was] strongly affected by the social processes accompanying their struggle against fracking” (ibid). In their conclusion, Short and Szolucha (2019) reported that preparatory works at PNR were impeded by protesters “slow-walking” in front of trucks to delay operations and a police presence, and speculated that these “[would]

[16] Short and Szolucha (2019) explained that the Planning Officer dismissed arguments from academic studies and their own experts on health impacts, local geology, and Cuadrilla’s previous regulatory breaches at other sites. They also flagged that local councillors felt pressured to accept the PNR application based on comments made by a DCC councillor, who requested verbal legal advice to be published online, which resulted in the decision being postponed until after the weekend. Over that weekend, the authors reported that local anti-fracking groups and Friends of the Earth sent copies of alternative legal advice to LCC councillors, which were included in the following Monday’s hearing, reassuring councillors that they “were within their rights to reject the application if they felt there was sufficient evidence to do so – they were not bound by the advice of the Planning Officer or Council’s QC” (p.273). They also said that a few councillors requested to delay the decision until an un-redacted version of DEFRA’s report on ‘Shale Gas Rural Economy Impacts’ was available. Echoing fracking research from outside the UK that criticised governments’ close relationships with the industry, the authors questioned the full release of the DEFRA report just after LCC’s decision and Lord Browne’s dual role as a Cabinet Office member and the Chair of Cuadrilla.

have significant and long-lasting impacts on the local community, contributing to the collective trauma already experienced” (p.274).

Bradshaw and Waite (2017) also focused on the public inquiry and used “the social licence to operate (SLO) and the social, actuarial, and political risk and licensing (SAP) model to explore the national context and local specifics of the shale gas conflict in Lancashire” (p.29). The authors elaborated on similarities and differences in the decision-making processes for the PNR and RW applications for exploratory drilling and monitoring. They noted that, when minister Javid announced decisions on Cuadrilla’s appeals in October 2016, he agreed with the Planning Inspector about planning approval for exploring and monitoring PNR and monitoring RW, but went against the recommendation given and allowed Cuadrilla to address highway safety concerns for drilling at RW. Discussing the actuarial (legal) licence, they noted that, although Cuadrilla already had a PEDL licence and environmental permits, the fact that the final planning decision was made at the national level and against local sentiment undermined its legitimacy.

Regarding political licence (referring to political support), Bradshaw and Waite (2017) reported that Cuadrilla had some national political licence but this was contested locally by councillors and activists. However, on the local level they highlighted that the North & Western Chamber of Commerce (NWCOC) supported the developments in the public inquiry on the grounds of local economic opportunities. This led the authors to ask: “who constitute[d] and represent[ed] the community?” and “how representative” of the whole community was the local opposition that was evident during the public inquiry (p.33)? The authors mentioned that, beside opposition groups, 127 members of the public expressed objections during the public inquiry. While they identified similar reasons to Short and Szolucha's (2019) study, the authors noted that these reasons contributed to the "public's fear for the loss of the peace, tranquillity and the idyllic nature of the affected area of the Fylde coast" (p.33). They also noted mental health concerns among many residents who expressed "stress, anxiety and depression" due to the possibility of the development, but also mentioned fears about future physical health impacts (p.34). The authors also detected opponents' concerns about job losses in tourism and agriculture that the industry would not be able to counterbalance, reductions in house prices, and a lack of property insurance to cover damage from seismic incidents.

Bradshaw and Waite (2017) further explained that these positive and negative economic impacts brought out issues of distributional justice, which they saw as vital for an SLO. Drawing on the SLO literature, they described social legitimacy, credibility, trust, recognition of local culture, and communication with local stakeholders as key components of SLO as a "place- and project-dependent" construct (p.30). They reported that lack of SLO was frequently reported by activists but had no "legal standing" (p.34) and showed that the industry could continue without it. Bradshaw and Waite (2017) also explored the reasons for support given by 19 individuals during the public inquiry; these were local economic growth, job creation and national energy security through the exploitation of a "secure, sustainable and affordable energy resource" (p.33). Shale-gas supporters also pointed out how US and UK geology and regulations differed, referring to opponents' arguments about fracking experiences and information from North America. In their conclusion, Bradshaw and Waite (2017, p.34) found the SAP model useful but regarded it as unable to address "the complexity of scale" in national and local political support, while noting that ongoing anti-fracking protests at PNR came with increased in policing costs. Finally, they speculated that this political asymmetry and lack of SLO would occur at other UK sites, such as Kirby Misperton, where Third Energy was preparing to frack an existing vertical well and despite having a legal licence obtained at the local level against the wishes of most residents.

2.2.2 Public Perceptions of Fracking beyond the UK

Sovacool (2014, p.262) explained that the progression of shale-gas developments worldwide could vary significantly due to its controversy and complexity:

> Because every fracked site is unique, the particular array of costs and benefits will play out differently at each location, shaped by a multitude of factors including geology and the availability of injection disposal wells, type and location of technology, corporate governance, regulation related to waste discharges and transportation, natural gas prices, and social demographics.

This argument supports the geographical distinction in the way literature on public attitudes towards fracking is presented in this study, as research findings overseas are not necessarily applicable to the UK context (Luke and Evensen, 2018). However, research in countries with longer histories of unconventional resources exploitation indicates that looking at fracking host communities abroad at different developmental stages and with varied lived experiences and attitudes could help in interpreting UK local responses to fracking technology (Wynveen, 2011; Thomas et al, 2017a).

While academic interest in shale developments and fracking has been growing globally (e.g., China, Poland, Australia), most research has taken place in North America, where the industry has progressed to commercial levels (Bomberg, 2017; Evensen and Stedman, 2018). One of the first studies assessing community perceptions of shale gas developments was Theodori (2009), who examined whether perceptions of thirty issues were viewed as improving or deteriorating in two adjacent Texas counties on the Barnett Shale formation. The gas industry was more established in Wise County and less so in Johnson County. Theodori's survey showed that respondents perceived that social and environmental conditions were deteriorating while some economic or service-related conditions were improving (Figure 2.8). Increased truck traffic was the most negatively assessed impact, followed by freshwater requirements, whereas the availability of good jobs was the most positive impact reported in both counties. Furthermore, Theodori's (2009) research revealed longitudinal differences between the case studies; Wise County residents viewed water pollution more negatively, but regarded poverty, medical and health care services, quality of local schools, fire protection services, and the availability of good jobs more positively, whereas Johnson County residents showed greater concern about the deterioration of road conditions and population growth.

Perceived problematic issue	Overall mean	Values by county[a]	
		Wise Co.	Johnson Co.
Increased truck traffic	-0.73	-0.73 (193)	-0.73 (176)
Amount of freshwater used by gas producers	-0.56	-0.55 (191)	-0.56 (170)
High tax rates	-0.45	-0.48 (193)	-0.41 (184)
Depletion of aquifers	-0.44	-0.50 (187)	-0.38 (175)
Noise pollution	-0.42	-0.41 (204)	-0.44 (185)
Water pollution***	-0.39	-0.49 (197)	-0.27 (181)
Traffic accidents	-0.39	-0.42 (195)	-0.36 (177)
Loss of privacy	-0.38	-0.42 (193)	-0.32 (178)
Environmental quality	-0.36	-0.38 (191)	-0.35 (175)
Land use conflicts	-0.35	-0.38 (188)	-0.32 (175)
Conditions of roads and streets*	-0.33	-0.25 (203)	-0.42 (188)
Air pollution	-0.33	-0.30 (196)	-0.37 (182)
Odors/fumes from drilling equipment	-0.30	-0.25 (193)	-0.35 (175)
Light from gas drilling operations	-0.28	-0.24 (190)	-0.33 (174)
Population growth*	-0.26	-0.18 (188)	-0.35 (174)
Use of illegal drugs	-0.25	-0.29 (194)	-0.21 (181)
Crime	-0.20	-0.16 (193)	-0.25 (186)
Fire hazards	-0.20	-0.20 (192)	-0.20 (178)
Gas well explosions	-0.13	-0.10 (186)	-0.17 (170)
Respect for law and order	-0.12	-0.10 (200)	-0.14 (188)
Disagreements among local residents	-0.08	-0.08 (180)	-0.09 (178)
Absence of zoning regulations	-0.07	-0.05 (195)	-0.09 (184)
Effectiveness of county government	-0.04	-0.07 (197)	-0.01 (188)
Effectiveness of city government	-0.04	-0.03 (198)	-0.05 (186)
Poverty**	0.05	0.14 (194)	-0.04 (184)
Local police protection	0.08	0.12 (201)	0.03 (188)
Medical and health care services***	0.12	0.26 (201)	-0.02 (185)
Quality of local schools**	0.12	0.20 (201)	0.02 (186)
Fire protection services*	0.14	0.21 (192)	0.08 (179)
Availability of good jobs***	0.36	0.47 (195)	0.24 (188)

NOTES: [a] Mean values were adjusted for the covariate values; *p ≤ 0.05; **p ≤ 0.01; ***p ≤ 0.001.

Figure 2.8 Perceived problematic issues associated with shale-gas development (Theodori, 2009, p.107)

Similar findings emerged from later community studies in relation to impacts experienced and those anticipated in localities prior to the commencement of fracking operations (Wynveen, 2011; Brasier et al. 2011; Kriesky et al. 2013; Theodori 2013; Ladd, 2013). Other scholars did not allocate impacts into environmental, social, and economic categories, and instead distinguished them as perceived risks and benefits of the technology (Thomas et al., 2017a; Evensen and Stedman, 2017). Reviewing the North American literature between 2009-2015, Thomas et al. (2017a) summarised the most cited perceived risks and benefits, with water contamination emerging as the prominent environmental risks. The authors attributed this to climate change being seen as a more distant risk in the US, whereas community-focused studies reflected more immediate and local impacts. They nevertheless speculated that perceptions could differ in countries where climate change was seen as higher importance. Conversely, Thomas et al. (2017a) summarised the most cited benefits as job creation and local economic benefits, followed by poverty alleviation, energy independence, and improved local infrastructure and services.

Many scholars saw a positive association between positive socioeconomic benefits and support for shale developments, which was sometimes more evident where participants stood to benefit personally (e.g., landowners with leasing or drilling) (Theodori, 2012; Jacquet, 2012; Kriesky et al. 2013; Sangaramoorthy et al., 2016). However, there was no consensus over whether perceived risks outweighed benefits, with findings varying "across locations, communities, and various empirical methodologies" (Thomas et al., 2017a, p.3; Ladd, 2013). For example, studies examining attitudes towards shale gas in New York and Pennsylvania came to contrasting conclusions about New Yorkers' level of support, opposition, and ambivalence[17] (Stedman et al. 2011; Borick et al., 2014). It should be noted that not all public perception studies examined the views of lay residents. Many instead focused on the perceptions of key formal and informal stakeholders or locals with specific attributes (e.g., school administrators or landowners), whereas the views of the general public were mostly explored through surveys (Thomas et al., 2017a; Brasier et al. 2011; Schafft et al., 2013).

[17] The studies agreed on the factors shaping Pennsylvanian residents' overall support and opposition, but Stedman's et al. (2011) study, conducted five years earlier, showed higher levels of ambivalence.

While variations occurred in public perceptions within the North American literature, many comparative case studies came to similar conclusions about the possible factors affecting attitudes and perceptions between locations. Besides the level of activity of the industry, researchers concluded that previous mineral extraction histories, the level of regulation, and ownership of mineral rights also had significant impacts on public perceptions while contrasting findings between and within US states and Canadian provinces (Evensen and Stedman, 2018; Lachapelle and Montpetit, 2014**;** Kriesky et al., 2013; Schafft et al., 2013; Brasier et al., 2011; Theodori, 2009; Sangaramoorthy et al., 2016). Brasier et al. (2011) explained that, while the level of industry activity and extractive histories were identified as factors within the 'boomtown' literature[18], their findings additionally showed that "[p]opulation size, proximity to population centers and transportation networks, and level of infrastructure development interact[ed] with" these factors "to create variability in a key informant's perception of the impacts" (p.24). Some scholars saw a positive association between areas with higher levels of industry activity and support for the technology. For example, Kriesky et al. (2013) found that residents of a Pennsylvanian county with intense drilling activity were less likely to see local shale development as an environmental and health threat and more likely to see economic opportunities. However, Schafft et al (2013) highlighted that the stage and intensity of local development was the most important predictor of perceived risks and benefits and noted that the same participants were "likely to see positive *and* negative potential [original emphasis]" (p.160), which then often resulted in ambivalence. Similarly, Thomas et al. (2017a) argued that, in general, attitudes to fracking technology were "rarely simply fixed entities, but […] [were] often conditional, ambivalent, labile,

[18] The term 'boomtown' was used to describe (usually rural) communities that experienced rapid growth due to energy developments.

and even seemingly contradictory for the same individual" (p.3). While this conceptualisation of attitudes and the degree of local activity connoted time as a contributed factor, Thomas et al. (2017a) added that new information and global developments could lead to different results in future public perceptions (e.g., increased seismicity due to waste reinjection and the contraction of the US shale industry in some areas due to decreases in gas prices).

Other differences between countries were highlighted in Lachapelle and Montpetit's (2014) study of Canadian and American perceptions of fracking, which showed that "political-cultural" characteristics also played a contributing role (p.17). The authors concluded that Canadians hold more egalitarian and less individualistic values, and were more likely to oppose the technology and pay attention to its risks and distributive inequalities. Moreover, the authors argued that egalitarians were less persuaded about the economic benefits of fracking and saw information provided environmental NGOs as the most credible source of information. They believed that, if experts argued that the risks were low, Canadians' risk perceptions could be adjusted to some extent but still not lead to future support. All four of cultural theory's worldviews[19] were a better predictor of attitudes in Canada. Canadians with individualist and hierarchical values were more likely to be supportive and less likely to be concerned with risks, whereas fatalists, in line with their "sense of powerlessness", showed some concern but no association with support was found (ibid, p.8). Finding no difference in perceptions and acceptance of fracking among Canadian residents closer to shale reserves, the authors

[19] Lachapelle and Montpetit (2014, p.8) used one sociocultural statement to examine each worldview: 'Individualism was (…) measured from a question on the importance of competition among individuals in society; egalitarianism from a question on the importance of the redistribution of wealth; hierarchy from a question on respect held for authority; and fatalism from a question measuring indifference regarding politics and the partisan makeup of government.

concluded that opposition in Quebec was “province-wide”, reflecting a NIABY attitude (ibid, p.10). Egalitarianism, being female and holding a political orientation were all strong determinants of attitudes and perceptions in both countries[20]. The explanatory power of egalitarianism aligns with Thomas et al.’s (2017a) conclusion that many participants in perceptions studies compared energy technologies and showed a preference towards renewables. However, some people saw shale gas as a better option than other fossil fuels, while others argued that coal mining brought more localised and long-lasting work opportunities (Thomas et al., 2017a).

Boudet et al. (2014), surveying US national attitudes, came to similar conclusions about the negative association of shale gas with egalitarian values, but found no effect of individualism.[21]**.** In contrast, McEvoy et al. (2017) found individualism to be the main worldview of landowners with experience of spills from US oil and gas operations during interviews; their support arose from perceptions of such risks to be low, nature to be resilient, and financial benefits to outweigh negative impacts. However, the authors found that some individualistic interviewees also expressed egalitarian and hierarchical views confirming that people are not necessarily fixed to singular worldviews.

Because of the dynamic nature of attitudes, Thomas et al. (2017a) saw research methodologies as a contributing factor, with variations being influenced by the methods chosen and the phrasing of questions. For instance, Evensen (2016) urged caution in using the term ‘fracking’ in attitudinal studies due to its often negative connotation and

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[20] Egalitarian values and gender (female) were associated positively with opposition and risks perceptions, whereas intention to vote for a political party in favour of fracking had the reverse effects (Lachapelle and Montpetit, 2014).

[21] Boudet et al. (2014) included three and five statements to examine egalitarian and individualistic worldviews, respectively, covering wealth distribution and preferred level of government interference in daily lives. The authors did not explore the other two remaining worldviews.

the inclusion of associated processes and impacts in its meaning that extended beyond the technique of releasing gas from unconventional reserves. In a previous US national survey, Evensen and colleagues compared the use of the term ‘fracking’ with ‘shale gas development’ and found that the latter was associated with more support and potential benefits (Evensen et al., 2014; Clarke et al., 2015). In contrast, Stoutenborough et al. (2016a;b) found no difference in attitudes between the wording ‘fracking’ and ‘hydraulic fracturing’ and argued that perhaps the negativity behind the concept had been overstated given that respondents within their ‘fracking’ subgroup were more familiar with the term. However, these studies agreed that ‘fracking’ was used more commonly in public discourses, media, and even research, reflecting the range of processes and stages of shale gas development, while different stakeholders or even countries could show a preference towards particular terms (Evensen, 2016a; Stoutenborough et al., 2016b). While Evensen (2016) noted that ‘shale gas’ was widely used by the UK government and media, Short and Szolucha (2019), in their Lancashire-based study, used ‘fracking’ to describe “the potential, or actualised, effects of *the entire* more-intensive unconventional extraction and production processes” (emphasis in original, p.265). Countering the view of Evensen et al. (2014, p. 130) that “one word can’t say it all”, Short and Szolucha (2019) concluded that:

> for potentially affected communities one word often [did] suffice simply because people’s lived experience of unconventional oil and gas [was] aboveground, and hence they experience[d] the impacts of the hydraulic fracturing technique’s associated, and necessary, infrastructure (p.265).

While distributional concerns were echoed in the North American literature on the uneven allocation of risks and benefits between residents, industry, and future generations, some studies also stressed the importance of procedural injustices related to lack of local control, power, and inclusivity (Thomas, et al., 2017a; Brasier et al., 2011; Wynveen 2011, Willow et al., 2014; Israel et al., 2015). Similar to North American studies about attitudes and perceptions of risks and benefits, Thomas et al. (2017a) noted that studies of perceptions of regulation, decision-making, and the institutions responsible for development again showed mixed results. Lack of trust also emerged as an important issue, especially towards the industry and government, "stemming from industry exposure, perceived unfairness, lack of information provision, and heavy handed corporate tactics, or bullying" (Thomas et al., 2017a, p.9). In contrast, trust of government environmental institutions and mistrust towards environmentalists were implied in Perry's (2012) ethnographic study, in which the majority of Pennsylvanian residents believed that State's 'Department of Environmental Protection would not [have] allow[ed] the gas development if it was really as bad as "those environmentalists and tree huggers claimed" (p.85). Furthermore, perceived bullying[22] was not attributed solely to energy companies, but also fellow residents and local politicians who disregarded residents' concerns (Perry 2012; 2013;). Trust towards experts also varied, with some participants seeing them as credible resources and some expressing scepticism about the integrity of scientific research, especially industry-sponsored studies (Theodori et al., 2012; Israel et al., 2012; Israel et al., 2015). Boudet et al. (2014, p.64) described trust as a strong predictor of attitudes towards new technologies by including "shared values, expertise and competence", while Jacquet (2014, p.8325) identified that studies of shale-developments had started to reveal strong correlations between "decreased trust in

[22] Perry et al. (2012, p.89) defined bullying as: "any act that is intended to harm, that takes place repeatedly, and that involves an imbalance of power between the aggressor and the target (…). It includes physical abuse, verbal abuse (e.g., threats, mocking, name-calling, or spreading of malicious rumors), and social isolation or exclusion in which a person is deliberately ignored".

governing bodies and officials [and] increased perception of risks, increased stress, and increased reportage of physical and mental health problems".

Brasier et al. (2011) argued for the need for longitudinal and comparative approaches to understand the individual and collective effects of energy technologies in boomtown communities. Similarly, Thomas et al. (2017a) found that attitudes towards shale developments were mostly associated with beliefs about impacts but causality was unclear. Evensen and Stedman (2017) noted that only a few studies had assumed, explicitly or implicitly, that people's beliefs about impacts affected their attitudes (e.g., Kriesky et al., 2013; Theodori 2009), but questioned the direction of this relationship for emerging and controversial issues. Their results rejected this assumption by showing that survey respondents assessed impacts based on their attitude. They concluded that a reverse or recursive relationship could exist instead. In addition, Evensen and Stedman (2017) argued that broader values and place attachment [23] were better explanations for attitude formation and should be included in future energy policy. Evensen and Stedman (2016) also found core values to be important on all US national, state, and local levels. However, they argued that "scale matter[ed]" as beliefs about technology impacts appeared to have a greater explanatory value in a local sample (ibid, p. 14). This aligns with many public perception studies that found higher levels of familiarity and awareness in affected communities or areas with high industry activity than in national representative samples (Boudet et al., 2014; Thomas et al., 2017a; Borick et al 2014; Theodori et al. 2012). However, assessing participants' knowledge of unconventional gas extraction and fracking could vary based on the level

[23] Evensen and Stedman (2017) used one statement for the environment, property rights, one's community, and political identification to assess these broader values.

of regional or national media coverage and the methodological approaches used by researchers, while its overall explanatory power for public support has remained questionable and less effective than trust and broader values (Thomas et al., 2017a; Whitmarsh et al., 2015; Stedman et al., 2016).

Drawing on the above, the significance of place becomes more apparent perhaps in comparative studies of host communities than in national samples, as people showed "particular place-based concerns about and interest in [fracking developments] as it relat[ed] to their way of life" (Evensen and Stedman, 2016; 2018, p.144). Evensen and Stedman (2018) further explained that rural communities "may care less about 'impacts,' *per se*" (ibid, p.143) and more about their subsequent effect of these impacts on their place and livelihood. The authors argued that, while public perception studies explored beliefs about technology impacts, only a small number explored reasons why these impacts were important to people. Those which did, however, revealed that "rapid industrialisation, increased intracommunity conflict, an influx of outsiders, and prominent changes in the landscape threaten[ed] place meanings and place attachment" (ibid, p.144; see also, Jacquet, 2014; Willow et al., 2014).

Jacquet (2014) explained how rapid industrialisation in relation to energy market volatility and ineffective governance could potentially cause "in-migration" and a subsequent overloading of local facilities and services (p.8322). He ascribed community conflict to attitude polarisation caused by community heterogeneity based on income, education, environmental attitudes, and the uneven distribution of costs and benefits, while noting the existence of contradictory information and distrust in institutions in these situations. Jacquet (2014) also acknowledged the risk probability of community stigma and social-psychological stresses deriving from perceived environmental contamination and media attention towards certain areas and disruptions to residents' place-identities. He explained that communities may have to deal not only with the possibility of negative impacts, but also the need to "internalize (…) changes to the social and economic character" of their area, which could then "disrupt cultural values and identities ranging from shared historical narratives to behavioral patterns [and] group affiliation" (p.8326). Finally, Jacquet (2014) suggested that people with stronger place attachments could regard place disruptions as more severe and could adopt oppositional 'place-protective' behaviours, while noting that research combining social−psychological disruptions with risk perception frameworks remained limited.

Hence, the literature on shale gas and unconventional gas developments outside the UK acknowledges the importance of sense of place and other place-related constructs as crucial factors in attitude formation. For example, Brasier et al. (2011) noted a strong attachment to land when discussing how interviewees envisioned the future of agriculture and the agrarian character of their area. Similarly, Willow et al. (2014, p.59) found that legacies of place and ways of life— "positive valuations placed on the ability to make a living from the local environment and/or pride in participating in a distinctive sense of place"— to be key themes shared among stakeholders interviewed. Recording rapid social and economic changes in a rural Pennsylvanian county over three years, Perry (2012) described how increased traffic, deteriorating road conditions, and changes to local traditional roadways were seen as the most important changes to residents' quality of life irrespective of their views on fracking, while water contamination and psychosocial impacts were also significant for some residents.

Exploring communities' lived experiences of the health impacts of fracking in West Virginia using a grounded theory approach, Sangaramoorthy et al. (2016) explored how residents framed their perspectives through "narratives about land, geography, and the history of place" (p.31). While "newcomer" residents moved to rural areas for their environment and peace, long-term residents also expressed feelings of loss and distress due to rapid changes to their land and sense of belonging (ibid). Perry (2012) found these feelings of uncertainty and loss even within the narratives of the "native" (p.82) landowners who supported the industry and saw these changes as necessary for "progress" (p.86) or as a reflection of their patriotism in ensuring domestic and affordable energy. Willow et al. (2014) even noticed anticipatory anxiety in communities with no experience of fracking, where opponents expressed concerns about the character of their place and showed feelings of either considering relocating elsewhere or disconnection from their home areas. However, Sangaramoorthy et al. (2016) noted that interviewees' reluctancy or inability to move away added to their stress, whereas some expressed nostalgia about past relationships, even with drilling companies that were considered part of their communities. They concluded that uncertainty over environmental and health impacts in combination with the rapid place transformation and large numbers of non-locals workers made fracking potentially more disruptive to residents' sense of place than previous extraction activities.

Evensen and Stedman (2018) pointed out that even fewer studies explored how perceived impacts affected people's relationship with their place in a positive way. One notable exemption was Lai et al. (2017)'s study of community residents' reactions to unconventional gas developments (UGD) in Australia based on 'Conservation of

Resources' and place attachment theories (Evensen and Stedman, 2018). Lai et al. (2017) argued that "when a loss to place attachment [was] perceived, negative emotions [were] also more likely" as "experienced or anticipated losses [were] more salient than experienced or anticipated gains in terms of associated effects on emotional outcomes" (p.496; 500). In their statistical analysis, they found that perceived negative impacts on personal and communal resources created negative emotions and undermined psychological well-being, and vice versa. However, this relationship was partly mediated by the impact of developments on people's place attachment. The authors noted that negative emotions also derived from the "negatively perceived impact of UGD on place attachment likely because the place-bound goals that [relied] on the continuity of person-place relationships […] [were] adversely affected due to the perception of deteriorating resources" (p.99). Conversely, no statistically significant relationship was found between perceived impact on place attachment and positive emotions.

However, Willow et al. (2014) found that interviewees' responses to UGD came from both different interpretations of their "ideal human–environment" relationship and sense of well-being by prioritising either human and environmental health or economic growth (p.63). While all interviewees considered the future of their place and livelihood, either positively or negatively, in relation to the technology and along with possible injustices, feelings of vulnerability and displacement derived solely from grassroots anti-fracking activists. Conversely, the prosperity brought to areas by fracking were considered only by government representatives, a few non-profit organisation members, and within industry public statements. Although government representatives believed in prosperity, they pointed out that retaining long-term benefits required appropriate regulation and investment in the area balancing out the potential risks of the technology. Adding to the complexity of attitude and perception formation, they concluded that responses to UGD extended beyond environmental issues to include preferences on social relationships and political structures. Evensen and Stedman (2018) similarly interpreted human well-being through Aristotle's notion of eudaimonia (human flourishing). They considered the pursuit of eudaimonia to be the reason why some technology impacts mattered in the formation of attitudes towards UGD. Supporters wanted to protect or promote human flourishing by retaining local services and population through year-round employment derived directly or indirectly from the shale industry to increase the vibrancy of communities and maintain the rural way of life by keeping farms in business. Conversely, opponents saw developments as threatening human flourishing while highlighting beauty, peace, and quiet as key place attributes. In addition, they believed that opponents were happy with the 'status quo' of their place or saw the technology as incompatible with their area.

Thus, the contribution of place to perceptions of unconventional extraction technologies via fracking becomes evident in more rural and often peripheral communities (Perry, 2012; Schafft and Biddle, 2015). Exploring youth perceptions in Pennsylvania, Schafft and Biddle (2015) explored how students referred to "the qualities of small town and rural lifestyles and their attachment to the local community describing, rurality as not simply a characteristic of local spaces, but of their personal identity" (p.78). Such areas in North-central Pennsylvania had experienced a youth population decline due to limited work opportunities but the majority of youth participants held negative or ambivalent perceptions about fracking technology despite high earning jobs becoming available in their communities. However, youth perceptions were largely positive in Southwest Pennsylvania, which were near large metropolitan areas and had a history of coal mining, where the shale industry was perceived as an “addition to the already diverse portfolio of industries and employment opportunities” (p.79). Researching levels of support for coal seam gas and the emergence of a social resistance movement in New South Wales, Australia, Luke (2017) interpreted similar findings as a prioritisation of different values, with supporters emphasising the economic benefits to their area. While opponents were worried about environmental consequences and their rural way of life, those whose “place identity strongly relate[d] to its natural and aesthetic landscape values” expressed deeper environmental values, reflecting humans’ rights over the environment and intergenerational equity (p.275). Luke (2017) acknowledged the role of place identity in shaping technology perceptions but noted that pre-existing values and social identity were important for social positioning on coal seam gas.

2.3 Summary and Reflections

This chapter has explored public attitudes to energy infrastructures, and in particular fracking, and the basis on which fracking host communities form their opinions. First, it reviewed the broad “beyond NIMBYism” energy-siting literature highlighting the importance of: a) technology perceptions, b) socio-psychological processes (sense of place and worldviews), and c) fair governance (justice and trust). What became evident from this was that these broad explanatory factors sometimes overlapped and provided more in-depth understandings of public energy attitudes. While some studies adopted an integrated approach (Devine-Wright, 2005; 2013; Whitmarsh et al., 2015), they did not explore fully the range of each factor or their interconnections. The chapter then focused on the literature on public perceptions of fracking within the UK and other countries and identified the same explanatory factors, which, again, were not considered thoroughly together and their relationships remained underexplored. This thesis addresses this research gap hypothesising that exploring public attitudes towards fracking in local communities through the lens of the interconnected effects and influences of technology impacts, sense of place and worldviews, and justice and trust in stakeholders would provide a more comprehensive understanding of their underlying reasonings.

Reviewing and geographically separating the public perceptions literature on fracking in Section 2.2, the chapter identified additional empirical, conceptual, and methodological gaps. First, research on fracking in North America and Australia often focused on regional or local areas with existing exploration or production sites, offered case-studies comparisons, and included a range of local views. Due to the early stage of shale industry in the UK, however, at the beginning of the study there was no comparative case studies based solely on areas with shale-gas potential or developments at a similar planning stage to assess differences and similarities in host communities' perceptions. Furthermore, UK research lacked a diversity of local perceptions, such as the views of affected residents with different proximity to proposed/approved fracking sites, with neutral or positive attitudes towards their local developments beyond the planning hearings, or with no participation in decision-making processes or local activist groups.

Second, the literature on public perceptions overseas placed a greater emphasis on the significance of people-place relationships and how broader beliefs shaped attitudes and perceptions. These studies explored why technology impacts mattered to, or differed between, communities and highlighted that lived experiences of fracking could generate positive emotions and outcomes for local areas despite raising concerns and disrupting residents' sense of place (Willow et al., 2014; Lachapelle and Montpetit, 2014; Sangaramoorthy et al., 2016; Lai et al., 2017; Evensen and Stedman, 2018). On the other hand, Thomas et al. (2017a), in their review of North American studies on fracking, called for more research on the role of worldviews as an influence on public perceptions of fracking and their interaction with locals' sense of place, while Jacquet (2014) argued that research combining risk perceptions and social−psychological disruptions remained limited. In contrast, while some UK-based studies have recognised the importance of place and examined some aspects of worldviews and sense of place, these socio-psychological constructs have not been explored in depth (Cotton, 2013; Whitmarsh et al., 2015). That said, while issues of public participation and trust in decision-making processes and stakeholders were echoed worldwide, the conceptualisation of these constructs as part of justice dimensions was most evident within the UK literature and recognition justice is only starting to gain attention (Thomas et al., 2017a; Cotton, et al., 2014; 2016).

Third, from a methodological perspective, quantitative research on public perceptions of fracking was more common and has considered multiple explanatory factors more extensively. However, qualitative studies have provided more in-depth understandings of the reasons for local support or opposition but have only started to emerge in England. Furthermore, studies in the UK and elsewhere agree that mixing qualitative and quantitative approaches could yield more insightful results about local perceptions (Thomas et al., 2017a; Williams et al., 2015). The thesis also addresses these secondary research gaps by conducting a comparative case study in communities with approved fracking sites in England, using a mixed-methods approach, exploring diverse their attitudes and perceptions, and considering interconnections between technology impacts, sense of place, worldviews, justice, and trust. (See also, Sections 3.2 and 3.3).

Drawing on the understanding of connections between these often-distinct social literatures and on the identification of research gaps (Whitmarsh et al., 2015), the thesis has conceptualised a theoretical integrated approach as a better way to understand the factors affection the formation of public attitudes towards fracking in English host communities (Figure 2.9).

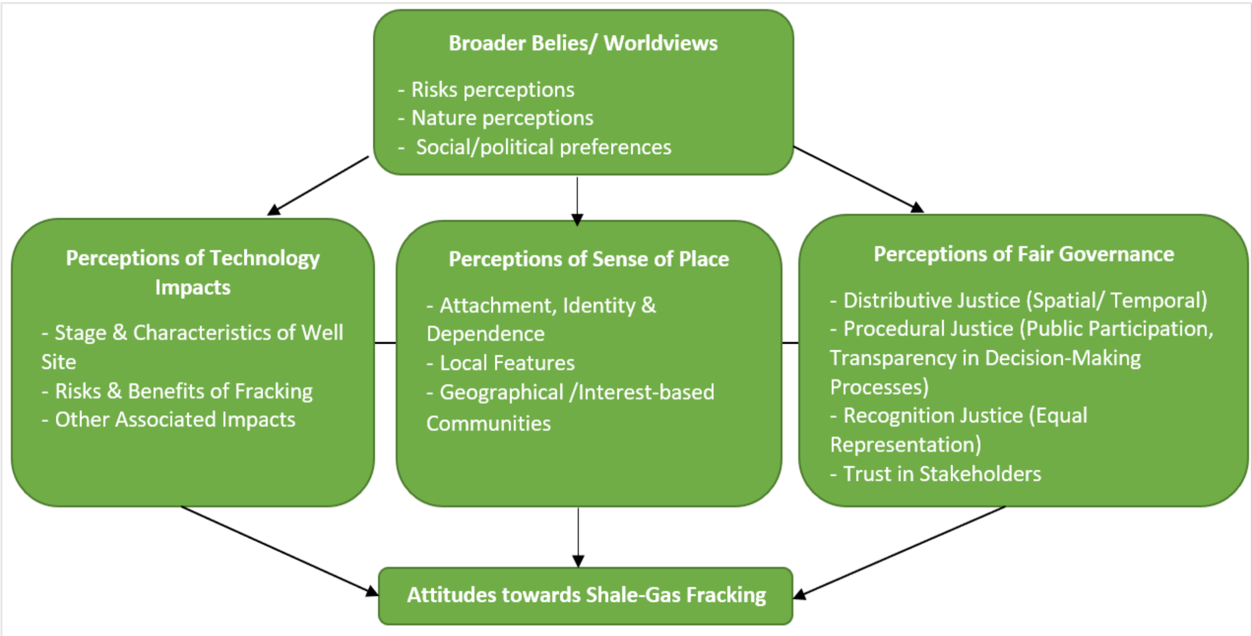

Figure 2.9 Exploring attitudes towards fracking through an integrated approach

From an analytical perspective, the thesis explores the perceived risks and benefits of shale-gas developments but also considers other potential or actual impacts beyond the actual fracking process, in particular, contextual socio-psychological factors related to people’s underlying worldviews and sense of place, and process-related factors shaping perceptions of trust and justice . The study also acknowledges the importance of the stage, characteristics, and requirements of each well site as potentially differentiating perceptions of technology impacts over time but also perceptions of distributive justice between areas and generations. Other aspects of fair governance encompassed are perceptions of procedural justice (i.e., level of public participation and transparency in decision-making processes) and the equal and just recognition of local host communities. Perceptions of different stakeholders involved in shale-gas governance (such as the government, local councils, environmental organisations, and anti-fracking groups) are also included, as scholars have previously noted the importance of trust as a factor of fracking-technology attitudes and impacts (Boudet et al., 2014; Jacquet, 2014). The integrated approach also considers sense of place, as disruption to place attachment and identity can determine the perceived suitability of local energy developments and interact with justice perceptions (Devine-Wright and Howes, 2010; Clayton and Opotow, 2003; Devine-Wright, 2013). As essential components of socio-psychological connections to place (Scannell and Gifford, 2010a), the research explores local features liked and disliked by Lancashire and North Yorkshire residents, and considers communities shaped not only by geography but also common interests (see also Section 3.2.2). Finally, the thesis acknowledges the influence of values and broader beliefs to the formation of more specific beliefs about perceptions of and attitudes towards fracking through the inclusion of cultural theory's worldview types and their varied perceptions of risks and nature and preferences on social relations and governance (Douglas, 1978; Thompson et al., 1990; Stern et al., 1995; Rippl, 2002; West et al., 2010; Oltedal et al., 2014; Estévez et al., 2015). Figure 2.9 illustrates some initial relations between worldviews, perceptions and attitudes identified through reviewing the energy literature as an initial to guide the reader, which will be explored in more detail during the course of the research.

To conclude, this chapter has explored key energy studies that have identified beyond NIMBY explanations for public perceptions of fracking in the UK and other countries. The review therefore provides the foundation for the research design and analysis of the thesis. However, after the beginning of data collection (in early 2018) and until the submission of the thesis, the fracking-related literature has expanded significantly. Most notably, Whitton and colleagues' (2018) book about the governance of shale gas developments in North America, Australia, and Europe included contributions from many of the scholars presented in this literature review. In addition, towards the end of data collection a NERC/ESRC fund was granted for interdisciplinary research on unconventional hydrocarbons in the UK that included examination of socio-economic impacts through separate projects on: a) public attitudes and community responses, b) social construction of unconventional gas extraction, and c) issues of framing and effective participation (UKUH, 2018). Due to space limitations and overlaps in their contributions, studies identified after the data collection were not included in this chapter but relevant outputs are discussed in the following chapters.

Chapter Three
Research Methodology

This chapter presents and justifies the research strategy and methods used to understand public perceptions of fracking in two English counties, Lancashire and North Yorkshire. Section 3.1 provides a theoretical justification for the research philosophy, strategy and methods used in the study. Section 3.2 provides background to the selected case studies. Section 3.3 describes the data collection process and methods. Section 3.4 presents the data analysis approaches used for quantitative and qualitative data. Section 3.5 summarises and reflects on the methodology and methods, including the positionality of the researcher.

3.1 Justification of research philosophy, methodology and methods

3.1.1 A Pragmatic approach

This study followed an interdisciplinary approach, with a predominant emphasis on human geography. The examination of place attachment and identity constructs usually falls under environmental psychology but also forms an important theme within human geography. The study of attitudes, values and worldviews is common in sociology and anthropology and psychology, while issues surrounding natural resources and environmental justice are significant in human geography, as is the overarching notion of place. Within contemporary human geography, reality is typically seen as socially constructed; while many values, beliefs and experiences are shared, differentiations appear when the world is viewed from different social, political, temporal, and spatial perspectives (Daniels et al., 2012). This is also the case with the environment and nature, whose meanings and representations are shaped by different cultures (ibid). Drawing on the literature on fracking (Section 2.2), communities near shale-gas developments hold varied opinions on the potential or actual negative and positive impacts of fracking based on their experiences; face disruptions to their place attachments and identities, and are concerned about distributional and procedural injustices. Thus, the geographical rootedness of the project is highlighted in the idea that attitudes towards and perceptions of shale gas fracking are formed in response to specific issues in specific places, rather than just as abstract constructs.

Designing a research project requires the choice and justification of three main stages: a) the research philosophy, b) the research strategy, and c) research methods (Creswell, 2009). Research philosophies refer to sets of beliefs and assumptions about how knowledge is developed and embraced by the researcher (Saunders et al., 2016; Creswell, 2009). Correspondingly, these philosophical worldviews influence the selection of research strategy, data collection, and analysis techniques and the assumptions made about ontology, epistemology, and axiology[24]. Figure 3.1 shows the five principal philosophies researchers adopt: positivism, critical realism, interpretivism, postmodernism, and pragmatism, and summarises their main assumptions and methodological characteristics:

[24] Ontology is concerned with assumptions about the nature of reality that shapes how prospective research objects are perceived and studied by researchers. Epistemology refers to assumptions about human knowledge that is considered acceptable, valid and legitimate knowledge, and how knowledge is communicated to others. Axiology concerns with the role of values and ethics and their significance within the research process from the perspective of both researchers and participants (Creswell, 2009; Burrell and Morgan 1979; Crotty, 1998).

Ontology	Epistemology	Axiology	Typical methods
		Positivism	
Real, external, Independent; One true reality (universalism); Granular (things); Ordered.	Scientific method; Observable and measurable facts; Law-like generalisations; Numbers; Causal explanation and prediction as contribution.	Value-free research; Researcher is detached, neutral and independent of what is researched; Researcher maintains objective stance.	Typically deductive, highly structured, large samples, measurement, typically quantitative methods of analysis, but a range of data can be analysed
		Critical Realism	
Stratified/layered (the empirical, the actual and the real); External, independent; Intransient; Objective structures; Causal mechanisms.	Epistemological Relativism; Knowledge historically situated and transient; Facts are social constructions; Historical causal explanation as contribution.	Value-laden research; Researcher acknowledges bias by world views, cultural experience and upbringing; Researcher tries to minimise bias and errors; Researcher is as objective as possible.	Retroductive, in-depth historically situated analysis of pre-existing structures and emerging agency; Range of methods and data types to fit subject matter.
		Interpretivism	
Complex, rich; Socially constructed through culture and language; Multiple meanings, interpretations, realities; Flux of processes, experiences, practices.	Theories and concepts too simplistic; Focus on narratives, stories, perceptions and interpretations; New understandings and worldviews as contribution.	Value-bound research; Researchers are part of what is researched, Subjective; Researcher interpretations key to contribution; Researcher reflexive.	Typically inductive; Small samples, in-depth investigations, qualitative methods of analysis, but a range of data can be interpreted.
		Postmodernism	
Nominal; Complex, rich; Socially constructed through power relations; Some meanings, interpretations, realities are dominated and silenced by others; Flux of processes, experiences, practices.	What counts as 'truth' and 'knowledge' is decided by dominant ideologies; Focus on absences, silences and oppressed/ repressed meanings, interpretations and voices; Exposure of power relations and challenge of dominant views as contribution	Value-constituted research; Researcher and research embedded in power relations; Some research narratives are repressed and silenced at the expense of others; Researcher radically reflexive.	Typically deconstructive – reading texts and realities against themselves; In-depth investigations of anomalies, silences and absences; Range of data types, typically qualitative methods of analysis.
		Pragmatism	
Complex, rich, external; 'Reality' is the practical consequences of ideas; Flux of processes, experiences and practices.	Practical meaning of knowledge in specific contexts; 'True' theories and knowledge are those that enable successful action; Focus on problems, practices and relevance; Problem solving and informed future practice as contribution.	Value-driven research; Research initiated and sustained by researcher's doubts and beliefs; Researcher reflexive.	Following research problem and research question; Range of methods: mixed, multiple, qualitative, quantitative, action research; Emphasis on practical solutions and outcomes.

Figure 3.1 Comparison of five research philosophies (Adapted table from Saunders et al., 2016, p.136-7)

Many aspects of contemporary human geography have adopted interpretivist or postmodern approaches, but the evolution and diversification of the discipline has resulted in geographical thought becoming more pluralistic (Castree et al., 2013). With pragmatism, researchers are not wedded to particular assumptions and choose different strategies and methods to address different types of research problem (Creswell, 2009). As this study has socio-psychological influences and addresses a certain research problem, its philosophical foundation rests upon pragmatism.

The starting points of inquiry were questions about people's attitudes towards, and perceptions of, shale gas fracking in English host communities, the underlying reasons shaping these views, and whether an integrated approach, incorporating perspectives on technology impacts, sense of place and broader beliefs, trust and justice, could provide more in-depth understandings of these issues. The study shared some characteristics with interpretivism, such as understanding different perceptions and worldviews and recognising the researcher's values and reflexivity, but it was primarily based upon pragmatism and uses a diversity of approaches and methods to achieve its objectives.

3.1.2 A Comparative Case-Study Strategy

As pragmatism is a problem-oriented approach that allows researchers to choose from different philosophical assumptions, it gives similar freedom in the selection of methodologies and data collection and analysis methods, to do "what works best" (Denscombe, 2014, p.147; Creswell, 2009). Thus, mixed research[25] and pragmatism are often co-associated (ibid; Saunders et al., 2016). This is achieved by using multiple

[25] Mixed research is alternatively referred to as mixed methodology, mixed methods, or multi-strategy research.

methodologies and/or methods (quantitative, qualitative, or both) and by recognising their respective advantages and disadvantages in exploring research problems (Denscombe, 2014). Table 3.1 presents the strengths, limitations, and methodologies of these two types of research.

Table 3.1 **Strengths, limitations & methodologies of quantitative & qualitative approaches**				
Research Type	**Description**	**Strengths**	**Limitations**	**Representative Methodologies**
Quantitative	Information in numerical form; Generates statistics; Normally involves a large number of participants with whom interaction is short	Draws conclusions for large numbers of people; Analyses data efficiently; Investigates relationships within data; Examines probable causes and effects; Control bias; Appeals to people's preference for numbers	Impersonal; Does not record the words of participants; Largely researcher driven	Surveys, Experiments
Qualitative	Explores attitudes, behaviours & experiences in-depth; Normally involves fewer participants with whom contact tends to last more	Provides detailed perspectives of a few people; Captures the voices of participants; Allows participants' experiences to be understood in context; Based on the views of the participants, not the researcher; Appeals to people's enjoyment of stories	Limited generalisability; Provides soft data; Studies few people; Highly subjective; Minimises researcher's expertise due to reliance on participants	Ethnography, Grounded Theory, Case study, Phenomenology, Action research, Narrative research

Source: (Dawson, 2009; Creswell, 2009)

This study adopted a predominantly qualitative research strategy, as it acknowledged the significance and diversity of local contexts and attempted to capture participants' views and experiences to gain deeper understandings of how technology impacts, socio-psychological processes, and fair governance interact to affect responses.

More specifically, a two-case study approach was considered the most appropriate methodology to explore the diversity of public attitudes to, and perceptions of, fracking on a local scale and to evaluate the usefulness of an integrated approach (Sections 1.3; 2.3). Case study research is bounded by time and activity that aims to understand the dynamics existing within a particular setting through in-depth exploration of events, relationships, experiences or processes (Denscombe, 2014; Creswell, 2009). Case study focuses on a specific "contemporary" phenomenon and considers its examination "within its real-world context" (Yin, 2014, p.16). Therefore, as UK shale gas developments were unfolding in specific places, examining the responses of particular host communities justified a case-study strategy. Other characteristics supporting the suitability of this strategy were its holistic approach to untangling complexities and that the phenomenon under investigation was not made by researchers, but existed before and after their involvement (Denscombe, 2014).

Denscombe (2014) also highlighted that, for a case study to qualify as such, it should be fairly self-contained with distinct boundaries. Yin (2014) nevertheless urged caution regarding spatial, temporal, and other concrete boundaries when designing case studies because the boundaries between a phenomenon and its context are not always clear-cut. Some cases are more concrete than others; for instance, when examining a specific group of organisations compared to the more abstract notions of community, neighbourhood, or relationships (Yin, 2014). Denscombe (2014) believed that a case-study strategy encouraged the use of mixed methods, even though qualitative methods are perhaps used more commonly. Accordingly, while this study uses a mixed-method approach, combining questionnaires and surveys (Sections 3.1.3, 3.3, and 3.4), this should not be confused with an out-and-out quantitative research strategy, as the study's emphasis on depth, and not breadth, characterised it as qualitative.

This links back to the limitations facing most qualitative strategies, such as the lack of scientific rigour and generalisability (Zainal, 2007; Crowe et al., 2011; Yin, 2014). One way of overcoming this within a case-study strategy is to have more than one case. While Baxter (2016) argued for the importance of depth and context of case studies compared to sample size, conclusions from a single case study can be criticised for being circumstantial. Multiple case studies are seen by some as more desirable for increasing the legitimacy of results and enabling analytical (theoretical) generalisation, or to aid transferability to explore theories and provide explanations of the phenomenon in question (Yin, 2014, Baxter, 2016; Lincoln and Guba, 2002). However, researchers should avoid going for a large sample size or amount of data if it jeopardises the quality of the research, and, instead, focus on having clear case-study justification and boundaries, using appropriate theoretical frameworks, having transparency throughout the research processes, following ethical guidelines, and allowing flexibility in data interpretation (Zainal, 2007; Crowe et al., 2011; Yin, 2014).

Drawing on the research gaps identified in the literature (Section 2.3), a multiple case-study approach was considered appropriate for exploring and comparing perceptions of fracking in different local areas where the industry was starting to progress. At the time of case study selection, two sites had planning permission for initial exploration and testing that both had a good chance of seeing fracking operations in the near future: Preston New Road site (PNR) in Lancashire and Kirby Misperton site (KM) in North Yorkshire. Thus, the research adopted a two-case study strategy based mainly on availability and potential comparability. However, there were variations in their decision-making processes (Sections 1.2; 3.2.2). Lancashire residents had longer experience of fracking processes, while North Yorkshire residents had greater familiarity with previous conventional extraction developments (ibid). Thus, these attributes made the selected case studies intrinsically interesting in terms of gaining insights on the genealogy of community perceptions of fracking despite their similar developmental stage of PNR and KM (Denscombe, 2014). Such spatial case studies conducted within the same timeframe are comparative or parallel case studies. Baxter (2016) explained that comparative case studies are common in human geography as they highlight the importance of place and its derived meanings as a determinant for differences in the phenomena studied. This comparative approach, it was felt, could "generate and modify concepts and theory so that they [could] explain commonalities across cases despite being embedded in different contexts" (Baxter, 2016, p. 141). Thus, having more than one case-study was essential to achieve the research aim and objectives and provide a level of theoretical generalisation, but more than two case-studies was thought to derail the research from the in-depth exploration of the research topic and lower the quality of the analysis. Baxter (2016) also argued that while some research phenomena, such as risk perceptions, are not necessarily place specific, comparative case studies can still provide a good foundation for interpreting findings.

This also links back to the position of theory development within the research. Considering how theory is generated is important as it can differentiate a case study approach from other approaches, such as ethnography or grounded theory, where theoretical propositions are usually not stated prior to data collection (Baxter, 2016; Yin, 2014). Generally, case studies can have a 'discovery-led' or 'theory-led' purpose with an inductive or deductive rationale, respectively (Denscombe, 2014). In practice, qualitative research often follows a cyclical flow or an abductive approach. Instead of a deductive approach that suggests a move from theory to empirical data, or an inductive approach that works in the opposite direction, abductive approaches move back and forth (Baxter, 2016; Suddaby, 2006; Saunders et al., 2016). This study embraced this abductive logic by exploring and comparing shale-gas responses in two case study areas while adopting an integrated approach to understanding the reasonings behind those responses. The study intentionally considered perceptions of technology impacts, justice, trust, sense of place, and worldviews, and tried to understand their interconnections and effects on attitudes towards fracking (Sections 1.3; 2.3). While the study acknowledged the significance of local context from the beginning, as it progressed, perceptions of place emerged as a contributing factor encompassing sense of place. Thus, the integrated approach was refined and formed a framework for understanding attitudes towards fracking through the interconnections of technology impacts, justice and trust, sense of place, and worldviews (Section 7.4).

3.1.3 Mixing Methods to Address Research Objectives

Following the pragmatic philosophy, the study adopted a mixed-method approach, using both quantitative and qualitative methods. Different logics and justifications exist for using multiple methods, depending on: (i) the use of quantitative and/or qualitative methods, (ii) whether extra weight is given to one method, and (iii) whether the methods are employed in parallel or sequence (Figure 3.2).

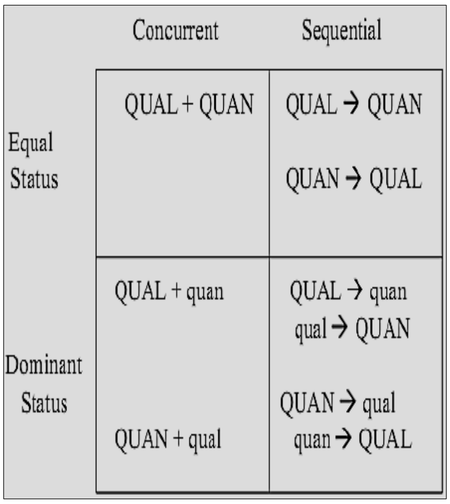

Figure 3.2 A matrix of mixed methods design (Johnson and Onwuegbuzie, 2004, p.22)

To address the research aim and objectives, the study began with a questionnaire survey followed by interviews within a sequential design. The rationale for mixing these methods was to generate both complementary (different but related) and further data (developed based on previous findings) (Denscombe, 2014). Table 3.2 presents the contribution of each data-collection method to achieving each research objective. Although some incidental and spontaneous observations were made during the research, these only indirectly contributed to the research objectives by shaping the design of the other methods.

***Table 3.2* Matching research objectives with methods**

Research Objectives	**Questionnaire Survey**	**Interviews**
To examine community attitudes towards fracking in Northern England (Lancashire & North Yorkshire) and understand how perceptions of technology impacts affect these attitudes.	✓	✓
To understand how experiences and perceptions of justice and trust in the regulatory authorities and stakeholders involved in proposing, consenting, and resisting local developments affect attitudes towards fracking.	✓	✓
To assess the ways in which residents' senses of place and worldviews contribute to the formation of attitudes towards and perceptions of fracking.	✓	✓
To explore the ways in which perceptions of impacts, justice on shale-gas governance, sense of place, worldviews, and attitudes towards fracking are connected, and to critically evaluate the potential of an integrated approach to deepen understandings of how individuals and local communities respond to controversial energy developments.		✓

Questionnaire surveys are a well-established method for exploring general trends in attitudes, opinions, and beliefs (Robson, 1993; Parfitt, 2013). They partly addressed the first three research objectives by providing an overview of respondents' attitudes towards and perceptions of fracking. Furthermore, the quantitative data obtained informed the direction of the research by highlighting important areas of discussion to be explored further in the interviews and contributing to the overall approach taken for analysing qualitative data. The qualitative interviews then enabled a deeper understanding of participants' viewpoints and experiences, the reasonings underpinning their perceptions, and the interconnections of the explanatory factors detected in the wide energy-siting literature (Dawson, 2009; Creswell, 2009). By incrementally moving towards a qualitative emphasis, its design reflected a sequential explanatory approach ('quan→QUAL') (Saunders, 2016; Creswell, 2009).

Research topics explored from more than two perspectives, using triangulation, can also augment validity. While triangulation initially emerged from researcher's attempts to combine quantitative and qualitative approaches to offset each other's limitations, nowadays it is accepted that it can occur in diverse ways[26] (Dawson, 2009; Denscombe, 2014). By combining questionnaires with interviews in this study, the lower granularity answers provided by questionnaires were counterbalanced by the deeper exploration provided by interviews, contributing to methodological triangulation. Furthermore, by

[26] For example, (a) methodological triangulation refers to the use of different or similar methods to examine the same issue by producing comparable or complementary data; (b) data triangulation increases the validity of results by focusing on different sources of information, either obtained by different informants (informant triangulation), collected at different times (time triangulation), or taken place in different social and geographical contexts (space triangulation); (c) investigator triangulation suggests the use of multiple researchers; and (d) and theory triangulation refers to the use of more than one theoretical position to analyse the data (Denscombe, 2014).

having two geographical case studies with different respondents, the study achieved informant and space triangulation.

3.2 Presentation of Case Studies

3.2.1 Geographical Boundaries and Demographic Characteristics of Case studies

Based on the research gaps identified within the UK literature on public perceptions of fracking (Sections 1.2; 2.3), two English cases studies were chosen in Lancashire and North Yorkshire because both had planning permission for exploring the shale-gas reserves using fracking (Figure 3.3). These two different–but adjacent– counties over Bowland shale provided a spatial boundary for the case studies (Yin, 2014). The epicentre of the Lancashire case study was PNR, while the focus of the North Yorkshire case study was the KM site. Following this sequence, this section further explores and presents the geographical and socio-demographic characteristics of each case study that contributed to understanding local contexts and designing the data-collection methods, before providing a comparative summary.

Figure 3.3 Fracking sites in in England in 2016. (Vaughan, 2016a)

The PNR is within Westby-with-Plumptons parish, in Fylde District, Lancashire (Figure 3.4), a mainly rural non-metropolitan district of 164km^2. Kirkham and Wesham are the nearest urban centres around 6km from the site. Part of Fylde covers the Lancashire coastline, including Lytham St. Anne's, a tourist resort near the Ribble Estuary, a National Nature Reserve. Blackpool and Preston are adjacent districts to Fylde with their city centres around 8 and 16km respectively from the site. Blackpool has been a well-known coastal destination since the Industrial Revolution.

Figure 3.4 Fylde District, Lancashire. Asterisk indicates the PNR location. (Google maps)

The KM site is within Kirby Misperton parish, adjacent to Habton and Barugh parishes and part of Ryedale District (Figure 3.5), the largest non-metropolitan district in North Yorkshire covering 1483 km^2. It is a mainly rural and agricultural area that incorporates part of the North York Moors National Park and Howardian Hills Area of Outstanding Natural Beauty. The site is between the towns of Malton and Pickering, which are 11 and 6 km away, respectively.

Figure 3.5 Ryedale District, North Yorkshire. Asterisk indicates the KM location (Google maps)

Based on the 2015 Indices of Deprivation, Fylde was ranked as the 218th most deprived area out of 326 districts and unitary authorities in England (Crown, 2015). In contrast, neighbouring Blackpool was the 4th most deprived district. Ryedale was ranked at 184th. In Fylde, 8.5% of households were classified as experiencing fuel poverty[27], noticeably lower than both the English average of 11.0% and the Lancashire average of 11.9%. However, fuel poverty in Ryedale was 13.3%, higher than the North Yorkshire average of 11.3% (Crown, 2017). Table 3.3 illustrates the main socio-demographic characteristics of the two districts and parishes.

[27] Determined by household income, household energy requirements, and fuel prices (Crown, 2018b)

Table 3.3 Geography and socio-demographic characteristics of case studies		
Focal point	**Preston New Road site**	**Kirby Misperton site**
A. Region	North West England	North East England
B. Ceremonial County	Lancashire	North Yorkshire
C. Planning Authority	Lancashire County Council (LCC)	North Yorkshire County Council (NYCC)
D. District[28]	Fylde	Ryedale
a) Area covered	16,568.86 ha (165.76 km^2)	150,659.41 ha (1504.78 km^2)
b) District population	78,200	53,500
c) Population density	4.72 persons/ha	0.36 persons/ha
d) Active population (16-64 y.o.)	44,800 (57.4% of district total)	31,100 (58.1% of district total)
- In employment	77.9%	83.5%
- NVQ4 and above	43.9%	36.8%
e) Political party in control/MP	Conservative/ Mark Menzies	Conservative/ Kevin Hollinrake
f) Main Industry Sectors (Excluding farm-based agriculture and self-employment)	1) Manufacturing (24.4%); 2) Professional, scientific and technical activities (14.6%); 3a) Wholesale and retail trade; repair of motor vehicles and motorcycles (11%); 3b) Accommodation and food service activities (11%)	1) Manufacturing (20.8%); 2) Wholesale and retail trade; repair of motor vehicles and motorcycles (14.6%); 3) Accommodation and food service activities (10.4%)
E. Civil Parish[29]	Westby-with-Plumptons	Kirby Misperton [Habton; Barugh]
a) Area covered	2,077.47 ha (20.77 km^2)	722.36 ha (7.23 km^2) [1,519.95 ha (15.20 km^2); 589.04 ha (5.88 km^2)]
b) Population	1,205	370 [321; 189]
c) Population density in hectares	0.58 persons/ha	0.51 [0.21; 0.32] persons/ha
d) Gender analogy	50% females; 50% males	50% females; 50% males
e) Average age (mean/median)	49.9/54	42.3/43 [42/43; 44.9/51]
f) Residents 16- 74 y/o **- Economic Active** **- Economically Inactive**	 -60.7% -39.3%	 - 66.2% [76.8%; 68.3%] - 33.8% [23.2%; 31.7%]
g) Education (Level 4 & Up)	22.2%	22.9 [27.7%; 37.2%]
h) Main Industry Sectors (Active Residents 16- 74 y/o)	1) Wholesale and retail trade, repair of motor vehicles and motorcycles (12.4%); 2) Accommodation and food service activities' (9.5%) 3) Manufacturing (9.2%)	1) Wholesale and retail trade, repair of motor vehicles and motorcycles (10.9%) 2) 'Accommodation and food service activities (10.3%) 3a) Manufacturing (9.2%) 3b) Human health and social work activities (9.2%) 3c) Construction (9.2%)

[28] Office for National Statistics (2017)- mid-2016 estimates
[29] Office for National Statistics (2011)- 2011 local census

Employment in Fylde is strongly influenced by British Aerospace (BAE) and Westinghouse Springfields- an established nuclear fuel manufacturing facility – and manufacturing jobs are proportionally higher than in other Lancashire districts (LCC, 2017). In contrast, the service sector had one of the lowest proportions of employment in Fylde, while the tourism and agriculture sectors were considered important (LCC, 2017). Except for 'Professional, scientific and technical activities', Fylde and Ryedale have a similar economic profile. The North York Moors, Howard Castle, and Flamingo Land Theme Park and Zoo are Ryedale's main tourist attractions, with the latter being situated within Kirby Misperton parish (NYCC, 2016).

The same industry sectors are important at the parish levels and were found in the same order for Kirby Misperton and Westby-with-Plumptons: a) 'wholesale and retail trade, repair of motor vehicles and motorcycles' b) 'accommodation and food service activities', and c) 'manufacturing'. However, in Kirby Misperton, 'human health and social work activities' and 'construction' were also ranked third. Both areas are rural or semi-rural, and according to 2011 local Census, 'agriculture, forestry, and fishing' accounted for 5.9% of employment in Westby-with-Plumptons, higher than Fylde's average of 1%, while in Kirby Misperton 6.5% of employment was in 'agriculture, forestry, and fishing', a little lower than Ryedale's average of 7.4%. For the North Yorkshire case study, local information for neighbouring parishes were included and, due to their close proximity to the KM site, were also included in the postal survey (Section 3.3.1). Although similar trends exist in Habton and Barugh parishes, 'agriculture, forestry, and fishing' industry appeared more significant (16% and 8.5%, respectively).

Both case studies had similar population densities and high average ages. Based on the 2011 census, in Westby-with-Plumptons the age distribution of older residents was: a)

21.1% (45-59 years) b) 11.3% (60-64) , c) 20.2% (65-74), and d) 12.8% (over 75). The age distribution in Kirby Misperton was: a) 18.9% (45-59), b) 5.9% (60- 64), c) 15.1% (65-74), and d) 6.5% over 75. Age trends for the Habton and Barugh parishes were similar but population density was lower than in Kirby Misperton. Table 3.3 also indicated the economic activity of residents aged 16-74 years in the two parishes. In line with the area's high mean age, the majority of those categorised as economically inactive were retired; 31.2% of residents were retired in Westby-with-Plumptons, 23.8% in Kirby Misperton, 14.5% in Habton, and 22.5% in Barugh.

3.2.2 Case-Studies Background on the Development of Shale-gas Fracking

As part of the review of the geographical and demographic characteristics of the areas around PNR and KM, important differences between the two case studies were identified, particularly concerning their planning applications processes and the development of the shale-gas industry in each area. These are further discussed to highlight the importance of the local context.

Cuadrilla Resources was established in 2007 and initially operated in the region of the Bowland Shale site but gained a degree of notoriety after the two fracking-related tremors at Preese Hall near Blackpool in 2011 that led to a UK moratorium; and 2013 protests over its oil exploration work in Balcombe West Sussex (Cotton et al., 2014; Bradshaw and Waite, 2017) (see also Section 1.2). In 2014, Cuadrilla Resources submitted four planning applications to drill, frack and test up to four wells at PNR and RW sites, construct a pipeline and connection to the gas-grid network, and to conduct associated monitoring works (LLC, 2019). Lancashire County Council (LLC) refused applications for shale exploration at PNR based on unacceptable impacts on the landscape and noise against the recommendation of the planning officer. LCC also rejected Cuadrilla’s RW exploration application based on traffic impacts. Cuadrilla appealed all four applications, including conditions on monitoring work around RW. In 2015, the Secretary of State of Communities and Local Government (SoS) Greg Clarke announced that he would determine the appeals due to their ‘more than local significance’ (Bradshaw and Waite, 2017, p.32). The beginning of this research project early in 2016 coincided with the public inquiry hearings for both PNR and RW. Taking over as SoS in October 2016, Sajid Javid accepted Cuadrilla’s appeals for PNR. He also accepted Cuadrilla’s monitoring work conditions at RW, postponed a decision on hydrocarbon exploration despite public inquiry inspector's recommendation, and reopened the public inquiry to allow more evidence on road-safety issues. In July 2018, days after the data collection, Cuadrilla was given the final Hydraulic Fracturing Consent[30] for PNR's—and the UK’s— first horizontal well. Multiple seismic tremors from fracking processes later that year led to a new moratorium in November 2019. Cuadrilla’s appeal for fracking at RW was also rejected in 2019 by the subsequent SoS, James Brokenshire.

In May 2016, North Yorkshire County Council gave permission for Third Energy’s 2015 planning application for fracking, testing, and producing gas from geological formations identified during 2013 drilling operations for KM8 well. The UK company acquired its onshore assets in North Yorkshire through the purchase of Viking UK Gas Limited and RGS Energy Services in 2011 and, along with KM, had another three gas fields within the

[30] Hydraulic Fracturing Consent was introduced in the Infrastructure Act 2015 as an additional step to the existing regulatory and permitting regime. It ensures a final check that all the necessary environmental and health and safety permits have been obtained and that BEIS is otherwise satisfied that it is appropriate to grant Hydraulic Fracturing Consent (Crown, 2018).

Vale of Pickering connected through a pipeline to Knapton Generating Station, which had provided power to North Yorkshire since 1995 (Third Energy, 2018). Part way through the data collection for this research (Section 3.3), Third Energy's financial situation came under scrutiny after it had applied for a Hydraulic Fracturing Consent; this led to the suspension of operations in March 2018 and the removal most of its equipment, including the rig. In April 2019, Third Energy sold its onshore gas business to York Energy, an American subsidiary firm of Alpha Energy, and more recently has shifted its focus from fossil fuels to sustainable energy (e.g., repurposing gas wells for geothermal energy).

Considering the similarities and differences of shale gas development in Lancashire and North Yorkshire, both case studies fell under English planning rules and regulations for allowing people to express their views on the planning applications. Despite many letters of objections received by local authorities, permissions were given for PNR and KM. Despite this, the processes for the two sites differed, as the final decision for PMR was made at the time by the SoS, while the county council made the planning decision for KM (see Figure z). During the design of this research project in 2016, PNR and KM were at a similar stage of development and there was a strong possibility of fracking operations beginning in the ensuing months, which further facilitated the investigation of perceptions from an integrated perspective. While the status of KM as a pre-existing conventional site with only a vertical well to be fracked and PNR's requirements for horizontal drilling and auxiliary infrastructure had been considered (NYCC, 2019), the suspension of KM operations part-way through data collection differentiated the two developments. It also highlighted that perceptions of Third Energy as a smaller and less financially stable company could also be a factor in community evaluations of the company, as could negative perceptions of Cuadrilla related to the 2011 seismic tremors events in Lancashire.

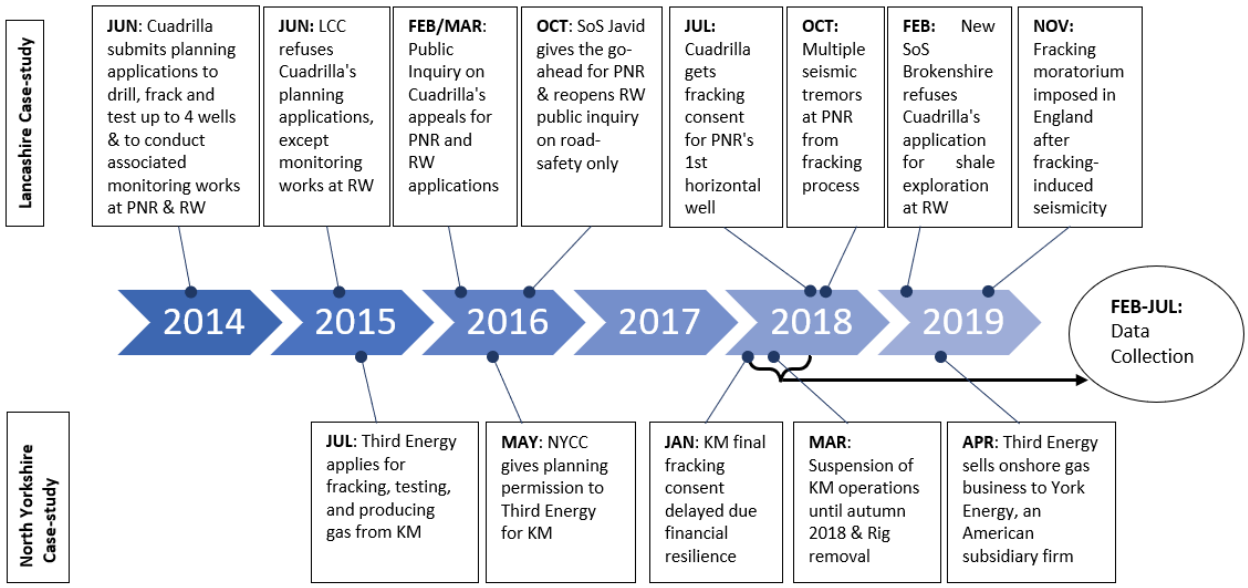

Figure ***3.6*** Timeline of Lancashire and North Yorkshire fracking-sites development and data collection

While no fracking occurred during the data collection period, PRN and KM were the only English sites with imminent shale-gas exploration at the time and had become major foci for the anti-fracking movement, both drawing national interest and attracting local and non-local protestors. After December 2016, protests increased significantly in both areas, and protester camps were organised less than a mile away from each site. This was observed during initial exploratory visits to the sites and surrounding areas. Acknowledging that community case studies have less concrete boundaries that makes them harder to define (Yin, 2014), and consistent with other studies on fracking perceptions (Luke, 2017), two types of communities were recognised; a “community of place”, including residents living close to shale-gas developments, and a “community of common interests and values”, consisting of people who lived further away but were socially engaged or interested in those developments, reflecting the observation that “social resistance movements frequently extend beyond geographical boundaries” (ibid, p.267). KM protesters saw the rig removal as a victory and then dismantled the nearby ”protection camp”, leaving only a few caravans near the site entrance to keep watch on developments (BBC, 2018). On the other hand, protests continued at PNR throughout the data collection period.

Further stressing the spatiotemporal nature of the research topic and case-study approaches, Textbox 3.1 and 3.2 present prior and “at-the-time” events from which participants drew their perceptions of impacts and justice and which were not necessarily planning-related.

	Textbox 3.1 **Key Events in Impacts & Justice Perceptions in Lancashire**
PNR	**APR 2014** - Community Liaison Group (CLG) is established
	JUN 2014 - Cuadrilla submits planning applications to drill, frack and test up to 4 wells & to conduct associated monitoring works
	JUN 2015 - LCC rejects Cuadrilla's planning applications despite planning officer's recommendation
	SEP 2015 - Cuadrilla appeals LCC's decisions and CLG stops
	FEB/MAR 2016 - Public Inquiry for PNR and RW appeals
	OCT 2016- SoS Javid accepts Cuadrilla's appeal and gives planning permission to PNR
	JAN 2017 - Construction works start and new & more extended CLG is set up
	JUL 2017 - Big anti-fracking lock-on protest at PNR
	JUN 2018 - Cuadrilla granted temporary injunction on protests; Mass protest rally event; Possible hosepipe ban in Lancashire due to heatwave
RW	**APR 2014** - Community Liaison Group (CLG) is established
	JUN 2014 - Cuadrilla submits planning applications to drill, frack and test up to 4 exploration wells & to conduct associated monitoring works
	JUN 2015 - LCC refuses Cuadrilla's planning permission for hydrocarbon exploration but consents monitoring works
	SEP 2015 - Cuadrilla appeals LCC's decision for hydrocarbon exploration and some conditions on monitoring; CLG stops
	FEB/MAR 2016 Public Inquiry for PNR and RW appeals
	OCT 2016 - SoS Javid accepts Cuadrilla's appeal on monitoring work conditions, but postpones decision on hydrocarbon exploration despite public inquiry inspector's recommendation, and reopens public inquiry to allow more evidence on road-safety issues
	NOV 2016 - The decision to reopen the public inquiry is legally challenged
	APR 2017 - Legal challenge refused for court hearing
	NOV 2017 - Cuadrilla proposed traffic management plan with alternative routes
	JAN 2018 - LCC reject new traffic management plan
	APR 2018 - New SoS, James Brokenshire, to decide on Cuadrilla's RW appeal
	***** Highlighted dates occurred within the data collection period

Textbox 3.2 **Key Events in Impacts & Justice Perceptions in North Yorkshire**	
KM	**JUL 2015** - Third Energy applies for fracking, testing, and producing gas from previously identified geological formations during 2013 drilling operation of KM8 well & plans to establish a KM CLG
	SEP 2015 - Thirsk and Malton MP visits fracking areas in Pennsylvania US
	MAR 2016 - Ryedale District Council votes against fracking exploration
	MAY 2016 - Public hearings/ NYCC gives planning permission to Third Energy at KM8
	DEC 2016 - Court rejects Friends of the Earth and Frack Free Ryedale legal challenge of KM permission based on climate change concerns
	DEC 2016 - KM protesters camp is established
	OCT 2017 - Complaints about strong smell from KM ; Protesters block road with wooden towers to prevent access to Kirby Misperton site.
	JAN 2018 - Government delays decision on KM final fracking consent upon financial compliance/resilience
	FEB 2018 - Third Energy starts removing equipment/ Rig get stuck on listed bridge
	MAR 2018 - Public debate on safety of UK regulations in Pickering between Thirsk and Malton MP, Kevin Hollinrake, and oil and gas industry engineer, Mike Hill.
	MAR 2018 - Suspension of KM operations & CLG possibly until autumn 2018
***** Highlighted dates occurred within the data collection period	

3.3 Data Collection

As previously described, a mixed-method approach of questionnaires and interviews was used to address the research objectives (Section 3.1.3). Quantitative approaches are usually preferred when there is limited access to the research population (Hancock and Algozzine, 2011). Therefore, besides gaining a broad understanding of participants' responses, questionnaires helped to interact with host communities and identify potential interview participants. While designing the questionnaire, an initial visit was made to both case study areas to explore the areas and decide on sampling and distribution techniques. Observations made at the time about the nearby protest camps and the scattered nature of settlement in the surrounding hamlets and parishes prompted a decision to use both online and postal questionnaires as a way of addressing the complexity of the notion of community by recognising people living beyond the immediate proximity to the shale-gas developments who could be affected by potential or actual impacts, be involved in decision-making processes or protest activities, or be interested in this type of energy infrastructure in these areas (Cotton, 2016). This approach also aligned with the idea that sense of place can exist beyond strictly residential bonds and should consider people with other forms of tie with the case-study areas (e.g., family ties) or with 'mobile' place attachment (e.g., tourists, protesters, commuters) (Section 2.1.2.1).

Data collection started in February 2018 and lasted five months. The online questionnaire was conducted first, followed shortly afterwards by the postal one due to additional preparatory time needed for the latter questionnaire to be sent to local residents. Individual or group (two-three participant) semi-structured interviews were then conducted in two rounds in each case study, with short gaps in-between to schedule interview dates and recruit additional participants. Approximately a week was spent in each case study each time.

3.3.1 Process, Sampling, and Distribution Techniques of Questionnaire Surveys

During the research design, it became evident that there were many 'groups' on social media platforms supporting, opposing, or debating fracking and that many people who lived locally, regionally, or even nationally were members of those groups. Second, large amounts of information exchange were taking place online and the topic appeared more sensitive and polarised than initially thought. Consequently, a self-administered questionnaire survey was used to allow respondents to express their views freely and anonymously without feeling intimidated while minimising participant or interviewer bias[31,32] (Saunders, 2016; Parfitt, 2005).

Exploratory samples were employed to maintain a qualitative emphasis in analysis of factors that could influence people's beliefs on fracking in the case-study areas (Hancock and Algozzine, 2011). Exploratory samples are considered suitable for small-scale research projects aiming to "generate insights and information" instead of the generalisation offered by larger, more representative surveys (Denscombe, 2014, p.33; Dawson, 2009). Acquiring a precise cross-section of the population was not necessary, therefore, as exploratory samples are "more likely to include interesting, extreme and unusual examples that can illuminate the thing being studied" (ibid). Demographic characteristics obtained in the questionnaires and compared with the local census data could, nevertheless, provide a reference point to assess possible sample bias. Probability or non-probability sampling is used to select survey populations. Non-probability sampling[33] was chosen for this study as it 'involve[d] an element of discretion or choice on the part of the researcher at some point in the selection process" (Denscombe, 2014, p.33). Purposive sampling was also adopted to achieve desired criteria (Dawson, 2009) – people from Lancashire or North Yorkshire with an interest in, or connection with, the areas and/or shale-gas developments.

The online questionnaire survey enabled the research to capture people's opinions on shale gas developments in the two areas without distance or residency restricting their

[31] Participant bias is "[a]ny factor which induces a false response. For example, conducting an interview in an open space may lead participants to provide falsely positive answers where they fear they are being overheard, rather than retaining their anonymity" (Saunders, 2016, p. 203).

[32] Interviewer bias refers to participants being "influenced by the presence, personality and intonation of an interviewer" (Parfitt, 2005, p.103).

[33] In contrast, probability sampling uses the random selection of participants to achieve a more representative sample (Denscombe, 2014).

participation, using SurveyMonkey. An invitation to people fulfilling the selection criteria, some introductory information about the study, and a hyperlink to the web-based questionnaire were emailed or posted on Facebook and Twitter, contacting fracking- and non-fracking-related community groups. A more detailed information letter was provided at the beginning of the questionnaire (similar to the one accompanying the postal questionnaire, see Appendix I) and all ethical procedures and standards were followed to ensure participants' anonymity while informing them about their right to withdraw. To protect participants from identification, collection of their IP addresses was disabled. Only participants who wanted to be contacted opted to leave email or telephone details.

The online survey was available from early February 2018 to June 2018, with bimonthly reminders sent. Because of the nature of online questionnaires, the sample size could not be determined in advance, so a response rate could not be calculated. However, the survey remained open for a few months following a cumulative approach until data saturation occurred and received responses from 149 participants.

The online questionnaire provided a general sense of communities' views on fracking within a wider geographical area in a timely- and cost-effective manner (Denscombe, 2014). Recruiting participants through social media networks provided "access to a vast audience of people", who hold "a shared interest or a shared identity" related to the topic under investigation; "a ready-made research population", as Denscombe (2014, p.19) described. However, the benefits of internet access can be a limitation, reflecting some non-response bias[34] through non-contact. Denscombe (2014) also noted that,

[34] Non-response bias "occurs when there is a pattern to the responses in which it becomes clear that those who have not completed the survey tend to be different from those who have" (Denscombe, 2014, p.27).

while response rates or data from online surveys do not differ much from other traditional methods and the majority of population in developed countries have internet access, characteristics such as social class and age should not be overlooked.

Following the online survey, postal questionnaires were sent to households up to approximately 2 km from the PNR and KM, following the natural town planning and geography of the areas (Figures 3.6 and 3.7). Researching residents' views in close proximity to the shale-gas developments was important as even with the imminent prospect of fracking, people in nearby communities could have faced more potential or actual (positive or negative) impacts, for example, disruption from infrastructure preparations or offers of financial compensation from the energy companies.

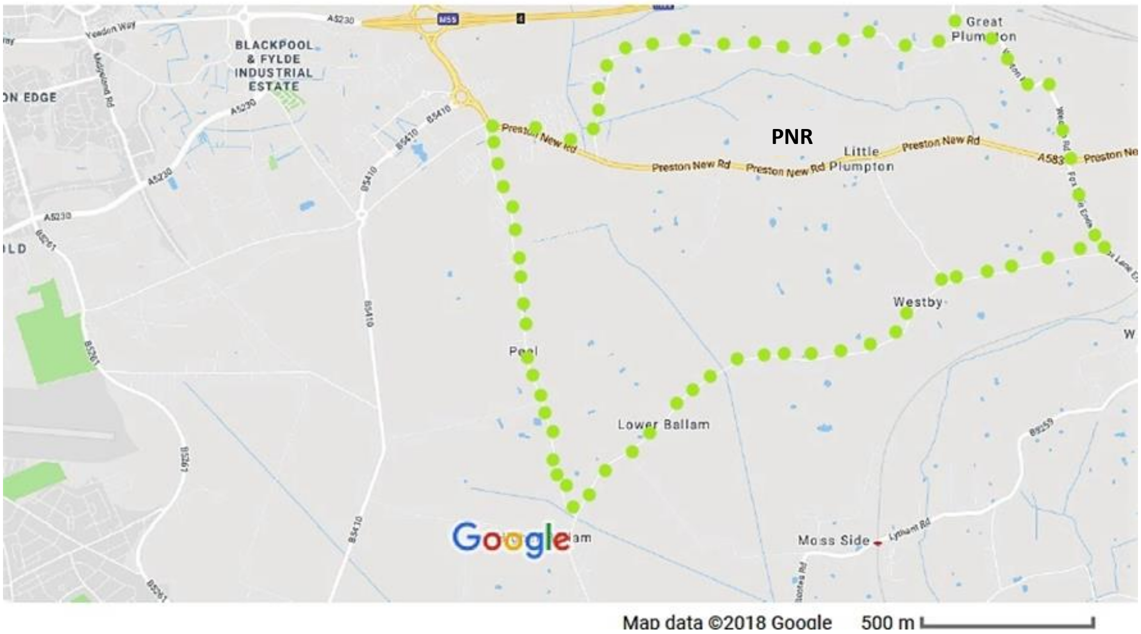

Figure 3.7 Area covered around Preston New Road site (Google maps)

This type of bias occurs either through refusal, when the design of the survey itself discourages certain participants from taking part, or through non-contact– as in the case of internet surveys, in which certain participants are systematically excluded (ibid).

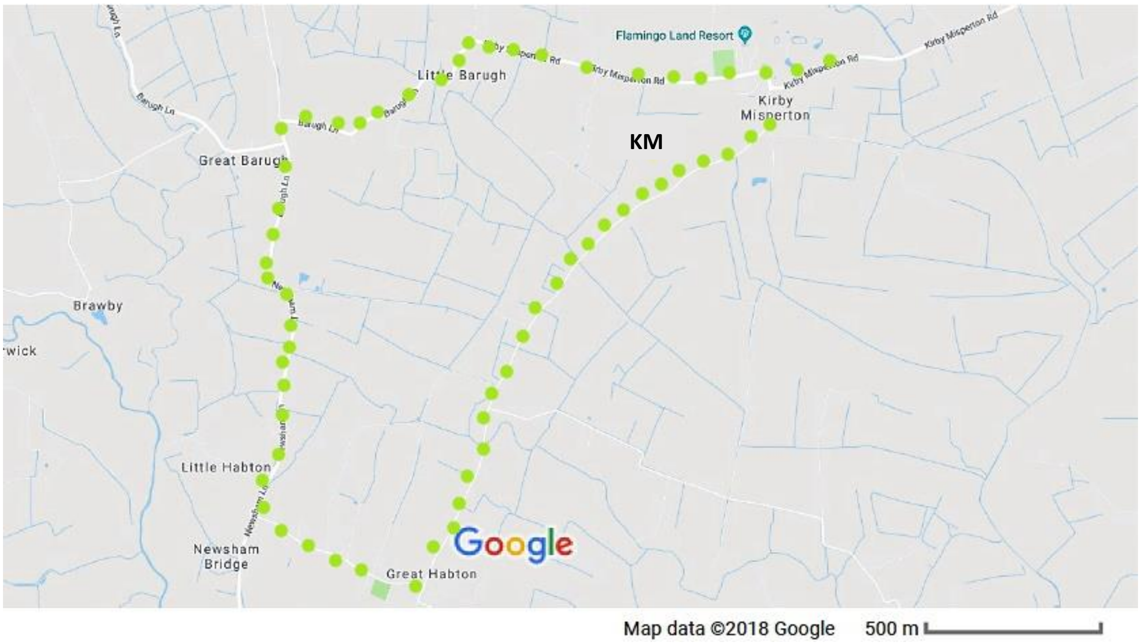

Figure 3.8 Area covered around Kirby Misperton site (Google maps)

Household addresses were identified though map research and the postal service website. This survey was launched in late February 2018 and lasted two months. To increase the response rate, a free-post envelope was provided, while a follow-up reminder and another copy of the questionnaire were sent three weeks after the initial date (Parfitt, 2005). Because of the small number of households in these communities, questionnaires were sent to all addresses without applying a systematic sampling technique. The survey was delivered to 143 and 142 households around PNR and KM, respectively[35]. In both areas, the number of returned and completed questionnaires were similar, yielding a joint response rate of 21.75%; however, PNR response rate was slightly higher (24.47% compared to 19.01% in KM).

Self-administered questionnaires could also have been distributed through a 'drop-and-collect' system and this was considered as a way of increasing the response rate (Dawson, 2009; Parfitt, 2005). However, due to the rurality and limited transportation

[35] Two PNR questionnaires were returned as inaccessible/ non-existent, so were not included in the response rate calculation.

in the areas, this may have created non-contact bias, particularly since households could only be visited during working hours (Denscombe, 2014). Again, the sensitivity of the topic influenced the distribution of the questionnaire survey. It was assumed that, because of the size of local communities, residents would want to protect their anonymity and/or might insist on knowing researcher's stance on the issue before completing the questionnaire. Therefore, the postal questionnaire was preferred.

Besides mode of distribution, response rates can vary for other reasons, such as the survey audience, interest in the topic, survey design, the value of participants' contribution, and other incentives. Internal surveys can have higher rates than external ones[36], i.e., 30-40% versus 10-15%, (Fryrear, 2015). Because the researcher had no prior connection with the case study areas, the host communities were treated as external audiences. Although people with potential interest in or awareness of the topic were approached and encouraged to voice their views, no financial incentive was given, in line with the university's ethical guidelines.

Denscombe (2014) argued that there is no standard acceptable response rate and instead recommends comparisons with similar surveys. At the time, no other postal surveys where known to have taken place in either area[37], so research fatigue was not

[36] For example, a company surveying its employers (internal) and customers (external) (Fryrear, 2015).

[37] During the interviews, it became known that other interested parties or students had been in the areas focusing on fracking activism and the economic impacts of fracking. One Lancashire interviewee mentioned that she had received a similar postal survey a year earlier. Later on, while attending a panel discussion at RGS-IBG Annual International Conference 2018 on 'Fracking and Shale Gas: The evolving landscape', hosted by a team involved in a NERC/ESRC project on social research on fracking developments (see Section 2.3), it became clear that the postal survey had been conducted as part of a student's dissertation. Their results showed similar trends in attitudes near PNR site, although the geographical coverage was broader. Findings from this study and other qualitative work on communities were published in 2020 but only reported stresses experienced by residents (Aryee et al., 2020**)**. The authors mentioned that their survey was sent to 1136 addresses and yield 198 responses (i.e., a lower response rate), while visual representation showed that the majority of responses received came from outside the geographical coverage of this research (ibid).

considered to affect response rates. Compared with other UK community studies on energy technologies, such as Bailey et al.'s (2011) study of wave energy in Cornwall, which achieved a joint response rate of 16.8%, this study's 21.75% was considered satisfactory. However, the response rate was lower than with North American surveys on shale development. Theodori (2009; 2012), and colleagues (2012) achieved response rates of 39%, 34%, and 23%, whereas Jacquet (2012)/Jacquet and Stedman (2013) achieved 58.7%. These differences may have arisen because the study had: a smaller sample size, fewer follow-up reminders, a sole focus on shale-gas, and a research population with less experience of positive and negative impacts compared to some US communities. Overall, differences in types and development stages of energy technologies, and cultural and geographical contexts, make comparisons difficult (Bailey et al., 2011; Devine-Wright, 2008).

The drawback of excluding elderly people with no internet access from the online survey was partly offset by including all nearby residents in the postal survey. Postal and online surveys can, nevertheless, have some bias against people who are illiterate or have eyesight issues (Parfitt, 2005). However, based on the response rate, no significant non-response bias was believed to have occurred. Questions about the silent majority nevertheless still exist and are discussed in Section 3.5. Overall, both surveys offered simple, efficient, and inexpensive ways to allow participants to express their views at their own pace and without the researcher's presence distorting responses (Denscombe, 2014; Parfitt, 2005). Conversely, their views may have been influenced by other people during completion (Parfitt, 2005). Due to their quantitative nature, surveys lack the depth of qualitative methods, but they can still incorporate open-ended questions.

3.3.2. Content of Questionnaire Surveys

As the researcher did not administer the questionnaires personally, its design was especially important. Self-completion questionnaires require questions to be kept simple and have straightforward instructions (Parfitt, 2005). The questionnaire was piloted with friends and colleagues to test this, and adjustments were made to some questions. Unfortunately, due to funding and distance from the study areas, questionnaires could not be pre-tested with local residents. To increase the completion rate and avoid questionnaire fatigue (Denscombe, 2014), the questionnaire was kept short with an estimated 15-20 minutes for completion. . Reflecting the research aim and objectives and literature review gaps, the layout of the survey (see Appendix II) was divided into five sections. Table 3.4 summarises these, then explanations and the sources used to construct each section are provided.

Table 3.4 **Layout of questionnaire survey**

Section	**Relevant Literature**
A. Opinions on local area and community	Sense of Place
B. Opinions on energy issues and technologies	Energy issues and technologies
C. Opinions on shale-gas fracking	Shale-gas fracking (attitudes, impacts, and trust in stakeholders); NIBMYism; Environmental/Energy Justice
D. Opinions on environment	Cultural theory's environmental worldviews
E. Demographic characteristics	Research methods

Section A first enquired about participants' relationship with the selected case-study areas , then drew primarily on the sense of place literature to explore their agreement with various types of place attachment (i.e., traditional/ active and physical/social), non-attachment, identity, dependence, and community cohesion (i.e., Jorgensen and Stedman, 2001; Lewicka, 2005; Devine-Wright, 2013; Scannell and Gifford, 2010; West, 2008). Open questions then provided further insights into participants' social engagement (including any involvement in environmental/ anti-fracking groups), and perceptions of the most positive and negative features of their local areas to comprehend what residents valued or possibly wanted to change in their areas (de Groot and Bailey, 2016; McLachlan, 2009; Devine-Wright, 2013). Section B asked general questions about participants' agreement with different energy technologies and technological-environmental considerations (de Groot, 2015; and Bailey, 2016). Section C then focused on shale-gas fracking by considering participants' level of knowledge, acceptance (both in principle and in their local area), and distance from their nearby site, in line with alternative explanations to NIMBYism (Whitmarsh et al., 2015; Wolsink, 2000; van der Horst, 2007). Based on the literatures of public perceptions of energy technologies and fracking and environmental/energy justice (West, 2008; Gross, 2009; Theodori, 2009; Whitmarsh et al., 2015; Cotton, et al., 2014; 2016), the remaining section delved into participants' views on possible positive and negative impacts resulting from fracking activities impacts, reasons for opposing or supporting local developments, and perceptions of justice in shale-gas governance (including trust in different stakeholders). Section D drew on cultural theory studies to explore participants' environmental worldviews (i.e., Meader, 2002; et al., 2006; Marris et al., 1998; Thompson et al., 1990; Adams, 1995; Steg, 1998), before the survey concluded by asking information about their personal characteristics. Through this structure and foci, the survey aimed not only to gain an overview of participants' attitudes towards fracking but also their views on technology impacts, sense of place, justice and trust, and worldviews as a way to better understand the underlying reasonings underpinning their attitudes towards fracking in order to build towards the integrated approach adopted in the study (Section 2.3).

Considering the success of self-completion questionnaires, the number of open-ended questions included was kept low to avoid discouraging participants from completing the survey on the grounds that it required excessive effort (Parfitt, 2005; Denscombe, 2014), and most closed questions used a Likert scale format . Examples of each type of question are presented in Table 3.5.

Table 3.5 **Example of survey questions**

Question Type	**Description**	**Example**
Closed question	Likert scale	To what extent do you agree/disagree that shale-gas extraction and fracking in your area is a good idea
	Multiple choice	How far is your home from the nearest shale-gas fracking site?
Open-ended question	Text box	What do you think are the most positive or negative features about your local area and community? Please provide up to 3 features for each
	Follow-up question with text box	Please explain the main reasons for your answer

Closed questions are predetermined by the researcher's ideas, so restrict participants by giving them only pre-selected answers to choose from. Therefore, the inclusion of open-ended questions was necessary to reduce research bias[38], and allow respondents to share their feelings on the topic (Denscombe, 2014). Care was also taken to avoid leading or loaded questions because of possible polarisation over fracking. For example, the question regarding the potential impacts of fracking alternated between risks and benefits statements.

Because of differences in the distribution mode and participants, some slight differentiations were included in the online and postal questionnaire. First, because

[38] Researcher bias is "[a]ny factor which induces bias in the researcher's recording of responses. For example, a researcher may allow her or his own subjective view or disposition to get in the way of fairly and accurately recording and interpreting participants' responses" (Saunders, 2016, p.203).

online participants were not necessarily residents, a ‘non-applicable’ answer was added to some place-related statements. Second, as the postal questionnaires were sent to specific locations, the first question about participants living in North Yorkshire or Lancashire was simplified. Nevertheless, in both cases, people who were not residents but were ‘interested in, or had ties with, the area and/or community’ had the option of explaining their connections. Additionally, inquiring about participants’ distance from the nearest fracking site provided insights into their individual situations.

3.3.3 Development of Semi-structured Interviews and Recruitment of Participants

Qualitative interviews provided a way of gaining rich and personalised data that deepened understandings of the first three research objectives while addressing the fourth one (Section 3.1.3) (Hancock and Algozzine, 2011). In contrast to structured interviews that resemble “interviewer-completed questionnaires”, unstructured or semi-structured interviews are preferable when the research explores the reasons for participants’ attitudes and opinions (Saunders, 2016, p.391). Such interviews are aligned with a subjective interviewing approach through which data are:

> socially constructed; co-produced, on the one hand, by the views and interpretations of the participant and, on the other hand, by the interviewer, who asks questions, responds to the participant’s views and interprets the resulting data during data analysis (Saunders, 2016, p.390).

Semi-structured interviews were chosen as well-suited to qualitative methodologies (and especially case studies) and adaptable to “a mixed methods design to explore, explain or validate themes that have emerged from the use of a questionnaire” ((Hancock and Algozzine, 2011; Dawson, 2009; Saunders, 2016, p.393). The main difference from unstructured interviews is that semi-structured interviews include predetermined questions or topics (Saunders, 2016) and so encourage interviewees to voice their opinions freely while facilitating comparison of the interview data to establish patterns (Hancock and Algozzine, 2011; Dawson, 2009). In line with the study's objectives and theoretical framework, perceptions of technology, place, and justice were the three main discussion topics and an interview guide (Appendix III) was created "to ensure continuity" (Dawson, 2009, p.53; Dunn, 2016). While indicative questions were drafted for each theme, due to the flexibility provided by semi-structured interviews, their use, sequence, and wording varied depending on individual experiences and attitudes (Hancock and Algozzine, 2011; Saunders, 2016). Moreover, semi-structured interviews gave flexibility for the researcher to probe areas of interest with each interviewee by asking follow-up questions (ibid).

This type of interview also welcomes the use of prompts (Saunders, 2016). Photos are a useful tool to bridge gaps between the researcher and the researched community and to "elicit dialogue during an interview" (Torre and Murphy, 2015, p.1). In this study, the researcher took pictures in both areas during initial visits and showed them to participants to stimulate discussion, return to a previous theme, or to move on to the next one (Clark-IbáÑez, 2004; Richard and Lahman, 2015). Photo elicitation also contributed to building rapport with interviewees by showing the researcher's awareness of local fracking developments. In both case studies, photographs was chosen to illustrate local anti-fracking signs, the respective rigs, and protesters and police near the sites (see Appendix IV). The researcher assumed that interviewees would be familiar with these "context-specific" images and their interpretation would shed light on their attitudes towards fracking and local disruption (Richard and Lahman, 2015, p.6).

At the end of the questionnaire, participants had the option to provide contact details if they wanted to discuss their views further individually or within a small group.

Respondents were screened for their distance from a shale-gas development, and those living up to 16 km were included in the interviews. This sampling technique is often used with semi-structured interviews, whereby participants “represent those who are critical” to a specific situation (Saunders, 2016, p.417). These participants constituted the initial interview participants mainly during the first round of interviews. Snowballing, a further purposive sampling technique, was used to find additional interviewees until data saturation occurred (Dawson, 2009). Besides distance, the study sought to include different attitudes towards fracking in each area in order to understand heterogeneous views. Questionnaire participants with pro-fracking views were less keen to leave contact details and less responsive to participating further. Thus, the two recruiting approaches were both significant, first, because they enabled access to local residents, and, second, because they incorporated diverse attitudes and perceptions.

Most interviews were conducted on a one-to-one basis. As shale-gas developments constitute a community issue in these localities, focus groups were initially considered as a useful way of probing participants’ underlying reasons based on “group dynamics” (Denscombe, 2014, p.189; Morgan, 2006). The advantages of group interviews include the high number and range of participants per interview, their ability to ask questions or comment on others’ ideas, and discussion of issues they might have overlooked individually (Dawson, 2009). However, focus groups were rejected for two reasons. Similar to ‘drop-and-collect’ questionnaires, the sensitivity of the topic and the size of nearby communities may have made some residents reluctant to meet or express their views with others who they did not know or realised they did know, compromising their anonymity. Therefore, forming and conducting focus groups would have been challenging and potentially inconsistent with the study’s objectives. Additionally, compared to other group interviews, focus groups place attention both on topics and interactions between participants, while the researcher takes a less dominant moderator role (Denscombe, 2014). As the study aimed to gain in-depth understandings of the reasons underlying each participant's views, focus groups and large group interviews were unsuitable (Denscombe, 2014). However, recognising the potential benefits of group interviews, interviewees were encouraged to bring a spouse, friend, or neighbour if they wished. The majority of interviewees preferred to meet individually. 26 interviews were conducted, of which only five were group ones with a maximum of three participants. The number of interviews was kept similar between the case studies, leading to 12 and 14 interviews in Lancashire and North Yorkshire, respectively. In total, 34 people were interviewed. However, because more group interviews took place in North Yorkshire, the total number of interviewees in each location differed by six participants.

Group and individual interviews were conducted in the same way (Denscombe, 2014). Even though there was interaction among participants, the researcher ensured the main themes were covered and everybody had opportunities to voice their views. Nevertheless, contributions varied depending on people's character and personal experiences. By choosing to bring along others, group interviewees were acquainted with each other and arguably felt more comfortable expressing their beliefs (Dawson, 2009). Furthermore, it was assumed that their views on the topic would not differ significantly, which aided exploration of their underlying reasons. Variations in views could still have existed, so participants were asked at the beginning of each group interview to be respectful of each other's ideas.

Except for one telephone interview, all interviews were conducted face-to-face using an "informal conversational approach" (Saunders, 2016, p.399). Personal contact was preferred as "data can be checked for accuracy and relevance" during data collection (Denscombe, 2014, p.202), while trust issues towards the researcher or concerns about the use of data could be overcome (Saunders, 2016). All participants were made familiar with the project and were encouraged to ask questions before their interview began. The information and consent form used can be found in Appendix V. All interviews were audio-recorded, with the exception of the telephone interview, for which notes were taken.

Careful consideration was given to the timings and location of interviews. Potential interviewees were able to choose a time of their preference and interviews occurred on both weekdays and weekends from early morning to the evening. Depending on group size, an estimate of 1-1.5 hours was given to interviewees. Except for the telephone interview, which was shorter, interviews were very detailed, lasting from 40 minutes to two hours. Most interviews were conducted at cafés of the researcher's choice to ensure comfortable and relatively quiet spaces. All locations were accessible by different modes of transportation and were usually known by the participants. Two interviews were partially conducted while driving near the gas sites at the interviewees' suggestion. Additionally, one interview took place at an interviewee's home and another one at the PNR protesters' camp at the interviewee's request.

Steps were also taken to minimise interviewer and response bias. For example, the researcher adopted a neutral and non-judgemental stance on the topic, listened to participants attentively, and was sensitive to their feelings (Saunders, 2016; Denscombe, 2014). Although the interviews ran smoothly, interviewees' perceptions of the researcher could have persisted. As Denscombe (2014, p.190) highlighted “our sex, our age, our ethnic origin, our accent, even our occupational status, all are aspects of our ‘self’ which, for practical purposes, cannot be changed”. Overall, interviews were a valuable tool for gaining in-depth understandings of residents’ attitudes and perceptions and Their flexibility provided deep insights into participants priorities, allowing them “to expand their ideas, explain their views and identify what they regard[ed] as the crucial factors” (ibid, p.202).

3.4 Data Analysis

Depending on methodology chosen, data analysis enables description, explanation, and/or interpretation of the research phenomenon in question (Denscombe, 2014). This study goes beyond descriptions of who said what, but uses this as a basis to understand patterns and interconnections with ideas in the literature on public perceptions of energy technologies. The qualitative emphasis of the study leant closer to interpretation as it aimed to provide a deeper understanding while acknowledging the local context within which the data have been acquired and the researcher’s involvement in their production (Denscombe, 2014). Quantitative and qualitative analyses were both required to accommodate the mixed methods employed. Figure 3.9 presents the five stages of analysis for different data types: preparation, exploration, analysis, presentation, and validation. Section 3.4.1 describes the analysis of the closed survey questions, while the analysis of open-ended questions and interviews are discussed in Section 3.4.2.

Five stages of data analysis		
	Quantitative data	**Qualitative data**
1. Data preparation	Coding (which normally takes place before data collection); Categorizing the data; Checking the numbers	Cataloguing the text or visual data; Transcribing the text; Preparation of data and loading to software (if applicable)
2. Initial exploration of the data	Look for obvious trends or correlations	Look for obvious recurrent themes or issues Add notes to the data. Write memos to capture ideas
3. Analysis of the data	Use of statistical tests (e.g. descriptive statistics, factor analysis, cluster analysis); Link to research questions or hypotheses	Code the data; Group the codes into categories or themes; Comparison of categories and themes; Look for concepts (or fewer, more abstract categories) that encapsulate the categories
4. Presentation and display of the data	Tables; Figures; Written interpretation of the statistical findings	Written interpretation of the findings; Illustration of points by quotes and pictures; Use of visual models, figures, and tables
5. Validation of the data	External benchmarks Internal consistency; Comparison with alternative explanations	Data and method triangulation; Member validation; Comparison with alternative explanations

Figure 3.9 Five Stages of Data Analysis (Adapted from Denscombe, 2014, p.247-248)

3.4.1 Quantitative Analysis

Following data collection, questionnaire data were transferred to the SPSS statistical software package. Three files were then created containing: the online results, postal results, and the data merged into a joint survey. This aided understanding of the data and gave flexibility to the discussions in the following chapters. For example, while reviewing online answers, some Lancashire participants who said they lived about a mile away from the nearest fracking site referred to the proposed and under appeal RW site. Although this added difficulty to the data analysis, it highlighted the importance of place and local context.

While preparing the data, two issues were noted. A technical format problem found in one question within the online survey led to its removal. Although this was detected during data collection, fixing it halfway through would have created bias against some early respondents. Another error was accidently cutting off one environmental worldview statement during editing. Unfortunately, neither mistake was detected during piloting; however, their effect was negligible. Beginning the data analysis, each survey question or statement represented a different variable and each answer was ascribed a code (number) to facilitate analysis.

Quantitative data are normally divided into numerical or categorical data. All data deriving from the closed questions were categorical. Although there were some nominal data (e.g., gender, age groupings), the majority was ordinal. For example, respondents rated their level of agreement in Likert-scale questions to give more precise indications of the relative position of each response than can be obtained from nominal data. The codes assigned in this case ranged from '2' ('Strongly Agree') to '-2' ('Strongly Disagree'), while '0' was given to 'Neither Agree or Disagree' to reflect neutral stances.

The purposive sampling technique and data types used to some extent limited the statistical tests that could be used. Although, arithmetically, mode or median are more appropriate measures of central tendency for ordinal data, for univariate analysis only, these were treated as numerical interval and continuous (Saunders, 2016; Denscombe, 2014). Thus, for these statements, means and standard deviations were calculated to indicate the balance of views among participants. This approach is often used in social studies when ordinal data "have similar size gaps between data values" (Saunders, 2016, p.500; Denscombe, 2014). In addition, one sample t-tests were used to examine whether each variable differed significantly from the neutral viewpoint '0', as this approach is considered to be relatively "robust to non-normal distribution" (Bailey, 2000, p.198). Chi-square tests were used to compare nominal variables (e.g., gender, employment) between case studies. However, as the majority of statement questions were ordinal, Mann-Whitney tests were used to compare the distribution of responses between case-study residents and residents with contrasting attitudes towards fracking, while Spearman correlation (a recommended test for assessing correlations on non-normally distributed and ordinal data) was used to examine the strength and direction of associations.

3.4.2 Qualitative Analysis

Qualitative data were produced from both the interviews and open-ended questionnaire questions. Initial qualitative analysis took place before interviews took place by reading participants' answers to the survey to gain an overall impression of viewpoints. Exploring these responses uncovered areas or issues whose existence or importance could otherwise have been overlooked. As many interviewees had completed the postal or the online questionnaire, the researcher usually knew their attitudes towards fracking in advance and could probe the reasons for their views.

All interviews were transcribed by the researcher using verbatim transcription to capture interviewees' perceptions of certain issues, while notes additional were included to capture interviewees' tone and emotions (e.g., laughing, crying or being sarcastic). Transcribing thus converts data into a more comprehensible form for analysis and minimises researcher bias by avoiding cherry-picking of the data (Denscombe, 2014; Saunders, 2016). Transcribing also enhances the researcher's familiarity and engagement with the data as "a preliminary form of analysis" (Dunn, 2016, p.170). Following transcription, self-memos were kept to record thoughts and ideas since "writing is an integral part of analysis, not something that takes place at the end" (Braun and Clarke, 2006, p.15; Saunders, 2016).

The next step entailed importing all transcripts and answers to open questions into the NVivo qualitative software programme. Coding qualitative data enables the researcher to deduct, organise, and explore large amounts of data by converting them into more manageable chunks (Cope 2016). By labelling words, phrases, or sentences (units of data) within responses (data item), the researcher produces codes that summarise or symbolise the meaning of the data (Braun and Clarke, 2006; Saunders, 2016) to create an accessible base for the researcher to refer to when building the analysis (Saunders, 2016).

In this study, thematic analysis was the most suitable method for identifying, analysing, and reporting patterns (themes) within the data (Braun and Clarke, 2006; Saunders, 2016). Amalgamation of similar codes can also lead to sub-categories, which further create overarching categories or themes that reflect significant meanings in the data with respect to the research objectives (Braun and Clarke, 2006). Thematic analysis is a systematic and flexible analytical tool that is neither restricted to a specific research philosophy nor limited to deductive or inductive approaches (Braun and Clarke, 2006; Saunders, 2016). Hence, it fits well with the study's philosophy and approach (Section 3.1.2) and enabled initial theory-driven enabled the production of themes relating to the research objectives and questions, followed by a bottom-up approach through which the data were explored further beyond pre-existing ideas to complement or modify the themes (ibid). Thus, this analytical approach "involve[d] a constant moving back and forward between the entire data set, the coded extracts of data (…) and the analysis of the data [being produced]" (Braun and Clarke, 2006, p.86). Figure 3.10 summarises the recursive phases of thematic analysis.

Phases of thematic analysis	
Phase	**Description of the Process**
1. Familiarizing yourself with your data	Transcribing data (if necessary), reading and re-reading, noting down initial ideas
2. Generating initial codes	Coding interesting features in a systematic fashion across the entire data set, collating data relevant to each code.
3. Searching for themes	Collating codes into potential themes, gathering data relevant to each potential theme
4. Reviewing themes	Checking if the themes work in relation to the coded extracts (Level 1) and the wider data set (Level 2), generating a thematic 'map' of the analysis
5. Defining and naming themes	Ongoing analysis to refine each theme, and the overall story the analysis tells, generating clear definitions and names for each theme
6. Producing the report	Selection of vivid, compelling extract examples, final analysis of selected extracts, relating the analysis back to the research question and literature, producing a scholarly report of the analysis.

Figure 3.10 Phases of thematic analysis (Braun and Clarke, 2006, p. 87)

Thematic analysis was applied to both interview transcripts and survey answers. However, within the latter, two modifications took place. First, each open question was coded and analysed separately. Second, where appropriate, some results were also quantified. Although quantification is not the goal of thematic analysis, it can still be applied to identify recurring themes (Boyatzis, 1998; Braun and Clarke, 2006). While this resembles a content analysis approach, which also looks for patterns or themes in the data, the two approaches should not be equated. Content analysis was rejected due to the need to develop initial codes in advance of the analysis (and sometimes even before data collection, for example in observation studies) and prohibition of modifying these at a later stage (Dunn, 2016; Saunders, 2016). Additionally, it is perceived as a quantitative technique through which themes emerge in a more objective way by tallying words and phrases to determine their significance (Vaismoradi et al., 2013; Saunders, 2016; Cope, 2016). In contrast, thematic analysis highlights the judgment of the researcher in defining what is important in the development of themes in relation to the research objectives and, thus, the researcher plays a more active role in their production (Saunders, 2016; Braun and Clarke, 2006). As the researcher is "the instrument" for analysis rather than a predetermined codebook, no external validation is required for theme development (Neuendorf, 2019, p.219). The key themes are discussed in the following chapters, illustrating points through the use of participants' quotes.

3.5 Summary and Reflections on Research Ethics

To summarise, the study took an interdisciplinary approach with human geography at its fore to explore local attitudes towards and perceptions of fracking. To untangle social acceptance of this emerging energy technology in the UK, the study used a comparative two-case study that enabled integrated analysis of the effects of technology impacts, sense of place, worldviews, and justice on perceptions of fracking. Looking at the regional and local context, the differences and commonalities between the PNR and KM allowed the research to assess these factors in an integrated way and use these theoretical propositions to guide the design of data collection and analysis. The survey was distributed online and by post to capture the views of people living within and beyond immediate proximity of the two sites. Semi-structured interviews, meanwhile, enabled residents to share their experiences and views more freely, and to stress issues that were important to them regarding shale gas development in their area. Quantitative data were analysed statistically using SPSS, whereas qualitative data were coded and explored using a thematic analysis approach.

With pragmatism in its foundation, a mixed-method approach was suitable to address the research aim and objectives. Triangulation was used to counter the individual limitations of quantitative and qualitative approaches; more specifically, the broad but shallow nature of surveys was offset by the in-depth exploration of views through interviews. Conversely, questionnaires added greater generalisability to a predominantly qualitative study. The researcher's values, influence, personal conduct, and interpretation all needed to be considered to ensure a rigorous study. Detailed attention was therefore given during all research phases to minimising bias, and especially while conducting and analysing the interviews where research involvement was greater.

In previous sections, references were made to research ethics and the subjectivity of the study. Subjectivity should not be viewed as a drawback as, in social studies, value-driven research initiated by the researcher's questions about a topic reflects the axiological assumptions of pragmatism (Saunders, 2016). Nevertheless, the researcher must remain critically reflective and acknowledge their positionality in its reporting (Dowling, 2016). This was achieved by thinking through the researcher's obligations towards everyone involved in the project beyond and after ethical approval was received (Saunders, 2016). A research journal was also kept of fieldwork notes and thoughts about the research process and researcher's role (Dowling, 2016). All ethical considerations related to participants' privacy, avoiding harm, confidentiality, anonymity, informed consent, and right to withdraw were included in the project design (Denscombe, 2014) and special attention was given to the online survey by disabling the collection of IP addresses. Moreover, quotations used in the analysis only indicate interviewees' location, since providing personal attributes could lead to identification for those living in small communities (Saunders, 2016). However, the diversity of their roles and involvement provided interesting insights and so some generalised information will be provided to help understand viewpoints. When some participants became emotional during interviews, the interview was paused to allow them to regather themselves and continue if they wished.

However, the sensitivity of the research topic and some distrust towards the researcher became apparent from an early stage. Many questionnaire and interview participants wanted information on how the project was funded, echoing concerns from North American studies (Israel et al., 2015). Some anti-fracking participants wanting to confirm that the project was not financed by a gas company or the government. Similar scepticism is also expressed in the term 'frackademics' that was noted on internet sites and social media (Northup, 2012), referring to scholars who supported the work of shale-gas companies. All questions were treated with openness, honesty, and respect. However, participants with more pro-fracking views were more reluctant to give their contact details for interviews. Among those who supported fracking, the majority did not reply to invitations for follow-up interviews, so snowballing was employed to ensure a variety of views was captured. Additionally, some interviewees reported experiencing bullying for their pro-fracking views and wanted additional details on the discussion topics and questions to be covered during the interview.

While the postal survey received a good response rate, it does leave questions about the silent majority. There was a strong anti-fracking sentiment in both areas, so it is possible that people who did not participate were not necessarily uninterested or unaware of the topic, but may have been reluctant to share their views with a stranger for fear of identification. One example of this was where a participant ripped off the questionnaire identification code to prevent their opinions being matched to their address. In another incident, in one of the four questionnaires returned empty[39], the

[39] These were not taken into account in the response rate.

respondent suggested the researcher visit the local area instead, indicating that some people might have been dissuaded from participating by the impersonal nature of the surveys.

Furthermore, it became known during the interviews that residents in close proximity had received information by mail from Cuadrilla and Third Energy. Thus, although significant research fatigue was not detected, the extended protests may have left some people feeling drained. Overall, the two methods helped to include people with different preferences towards the involvement of the researcher on a sensitive topic but even though attempts were made to limit participation bias via research design, self-selection of participants is to some extent unavoidable.

It is also important to think about power relations with interviewees. All the interviewees appeared to have moderate-to-high knowledge of fracking and the overall dynamic felt symmetrical (Dowling, 2016). While attempting to recruit additional participants, some respondents mentioned that people might find it difficult to discuss or articulate arguments about a complex technology with someone they perceived to be expert on the topic. Based on the conversation-style interviews, in which there was no assessment of knowledge and only sharing of personal views and experiences, recommendations were made and additional participants were recruited through snowballing. Preconceptions of the researcher as an expert could, nevertheless, have persisted. Such perceptions, similar to the researcher's personal attributes and other features that form one's 'self', cannot be removed (Denscombe, 2014). Nonetheless, reflection on those characteristics is crucial when collecting and analysing of data entails a high degree of subjectivity.

I adopted a neutral stance throughout all aspects of the research to give priority to listening to participants with diverse views. My interdisciplinary education background in sustainability, environmental management, and business enabled me to understand arguments for and against shale-gas developments without being judgemental towards either side. My relative outsider status also facilitated this, as I grew up in Greece and have lived in the South West of England in recent years. Researching these communities was the first time I had been to the North of England, and I was able to able to research more 'objectively' and without personal agendas. Dowling (2016) argues that "you are never simply an insider or outsider' (p.40), but I did feel connections with my interviewees based on our common interest in the development of fracking. My aspiration was that I would be seen as someone they could express their views and concerns to without fear of criticism, as I was not a member of their community. Although, as an outsider, accessing local communities and establishing rapport is challenging, because of the sensitivity of the issue, it proved beneficial for this study.

Finally, thinking how this research has influenced participants' lives or opinions, two things come to mind. First, while many questionnaire participants already had concerns about these developments, asking them to state their level of agreement or disagreement acted for some as a prompt to reflect and take a stance on this issue. Second, a lot of information exchange took place. Many interviewees from one case study wanted to learn more about the other shale-gas site. On the other hand, I learned a great deal about the local context and place-based issues regarding these and other developments from talking with knowledgeable residents.

Chapter Four
Survey Results– Attitudes towards and Perceptions of Fracking

This chapter presents the results of the survey in the two selected case-study areas to provide an overview of participants' perspectives on energy technologies, fracking, justice, sense of place, and worldviews. Where relevant, comparisons are made between: (i) Lancashire and North Yorkshire residents and (ii) residents with positive and negative attitudes towards fracking in order to explore the diversity of views on specific issues. Except for place-focused questions, results are usually shown first for all participants before focusing on residents' views. The fact that the majority of respondents were residents (Figure 4.1) allowed the online and postal surveys to be analysed together to increase the generalisability of the findings. The joint survey yielded 211 responses[40].

Section 4.1 describes participants' relationships with the case-study areas and demographic characteristics. Section 4.2 then presents responses to energy issues and technologies, before focusing on attitudes towards unconventional oil and gas developments in general, and fracking in the two areas. Section 4.3 explores positive and negative perceptions of the impacts of fracking and other possible reasons affecting participants' attitudes towards these developments. Section 4.4 examines participants' perceptions of justice and trust in stakeholders involved in the governance of shale-gas developments. Section 4.5 describes participants' views on, and relationship with, their areas and the environment, and is followed by evaluation of whether shale-gas developments had disrupted participants' daily lives or areas. Section 4.6 synthesises

[40] For individual response rates, see Section 3.3.1

and discusses the surveys' findings before examining interviewees' perceptions of fracking in the following chapters.

4.1 Participant Characteristics

4.1.1 Residents and Non-Residents' Connections with the Case-Study Areas

The survey began by asking participants if they lived in Lancashire or North Yorkshire. Figure 4.1 shows that 88.1% of respondents were residents, 46.7% living in Lancashire and 41.4% living in North Yorkshire. This was expected because the postal survey was sent to home addresses around the shale-gas sites. However, the fact that 124 online participants were also residents enabled the surveys to be analysed together. 5.2% and 6.7% of participants were not residents but had an interest in, or ties with, the areas or communities in Lancashire or North Yorkshire. A Mann-Whitney test showed that there was no significant difference in the distribution of residents and non-residents between the case studies (U=5,712, P=0.4, a=0.5).

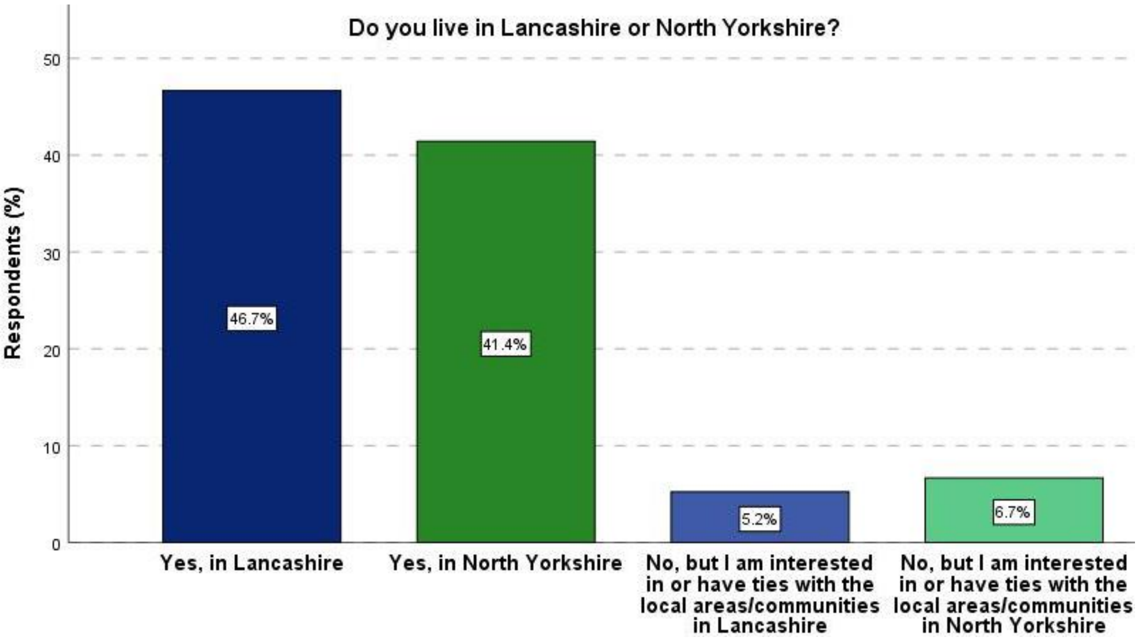

Figure 4.1 Residents and non-residents in Lancashire and North Yorkshire (n=210)

Non-residents were asked to elaborate on their response. 23 out of 25 participants responded, with 10 referring to the Lancashire and 13 to the North Yorkshire case study.

Analysis of this question using NVivo (Table 4.1) shows that non-residents had personal connections with the area and/or interests in fracking. Many had family in the areas and were former residents, while some mentioned having longstanding friends, working in the areas, and liking to visit or explore. Participants expressing an interest in shale-gas developments often provided a geographical reference, whereas others perceived it as a significant issue beyond the geographical locality:

> Leeds, my nearest city, will be used in trying to process some of the waste poison that comes from fracking (*Respondent_6795058686*).
>
> This is not a local issue. It is a national one. Damaging the land/water affects us all. This is not just an issue for NIMBYs (*Respondent_6674653919*).

Table 4.1 Non-residents relation with case study areas

Explanation		**% of non-residents**		
Personal Connection		**Lancashire (n=10)**	**North Yorkshire (n=13)**	**Total (n=23)**
	Family in area	30	30.8	30.4
	Former resident	30	15.4	21.7
	Friends in area	10	15.4	13.0
	Visitor/Explorer	10	15.4	13.0
	Work	0.0	15.4	8.7
Interest in Fracking				
	Geographic proximity	40	15.4	26.1
	Beyond proximity	20	7.7	13.0

Residents were then asked about how long they had lived in the areas (Figure 4.2). While over half of residents in each area had lived there for more than 20 years, their distribution differed across the two areas (U=3,123, P=0.003, a=0.5), mainly because 16.6% more North Yorkshire residents had lived there 11-20 years and 22.4% more Lancashire residents had lived there for 21-49 years.

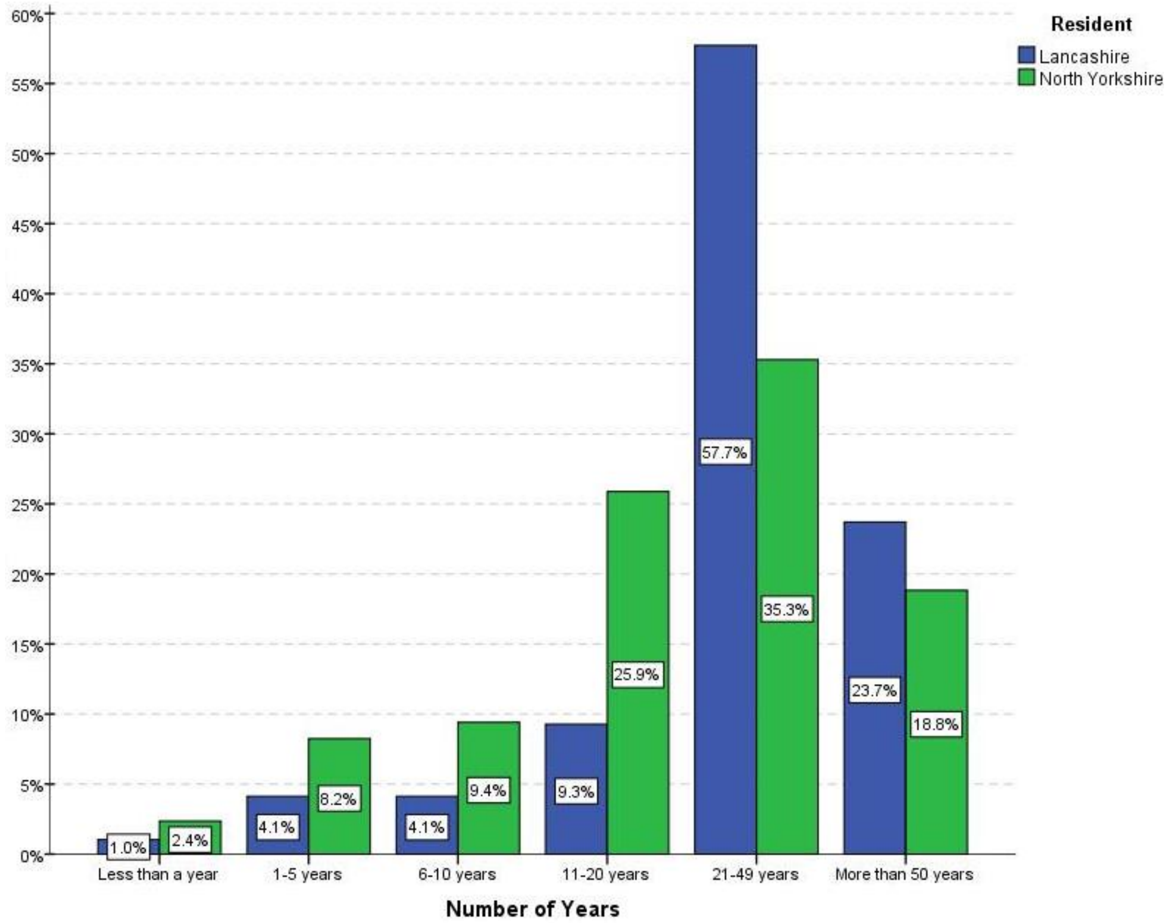

Figure 4.2 Residents' number of years living in their area (n=182)

Participants were further asked to specify their distance from the nearest shale-gas site. Of 179 respondents who lived in the two counties, the majority lived within 10 miles, 86.3% in Lancashire and 72.6% in North Yorkshire (Figure 4.3). Comparison of case-study residents nevertheless revealed a significant difference in their distance distribution ((U=4,759.5, P=0.022, a=0.5), mostly due to differences between participants living 2-3 miles and beyond 15 miles from sites. Further analysis showed that only 11.9% of North Yorkshire residents lived 2-3 miles away from a site compared to 28.4% of Lancashire residents, whereas an additional 10.5% of North Yorkshire residents lived beyond 15 miles away. The modal living distance is also evident in Figure 4.3– most residents lived a mile away in Lancashire and 4-10 miles in North Yorkshire. As postal surveys were only sent to people living up to 3 miles from fracking sites, i.e., only the first two distance groups, these differences are ascribed mainly to online participants. Ryedale (Yorkshire) is approximately nine times larger than Fylde (Lancashire) and the two areas have different population densities and settlement patterns (Section 3.2.2).

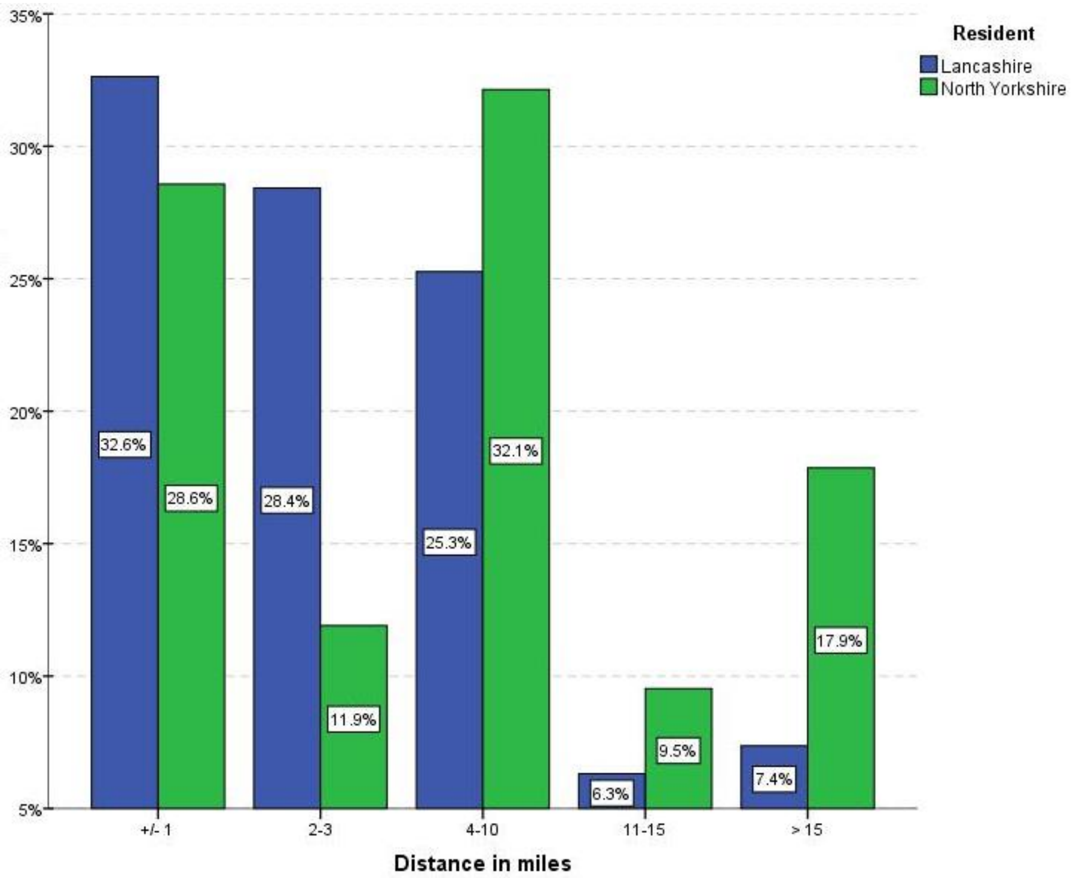

Figure 4.3 Residents' distance from the nearest fracking site (n=179)

4.1.2 Demographic Characteristics of Participants

Figures 4.4-4.7 illustrate the distribution of age, gender, employment, and educational status of survey respondents.

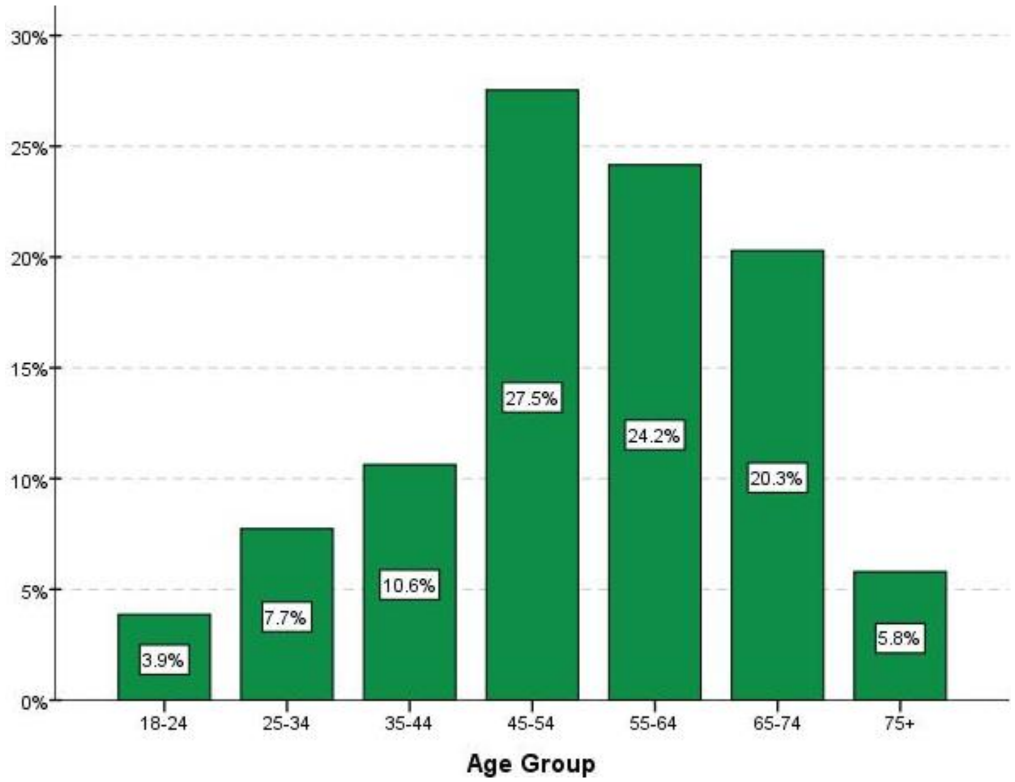

Figure 4.4 Age distribution of survey respondents (n=207)

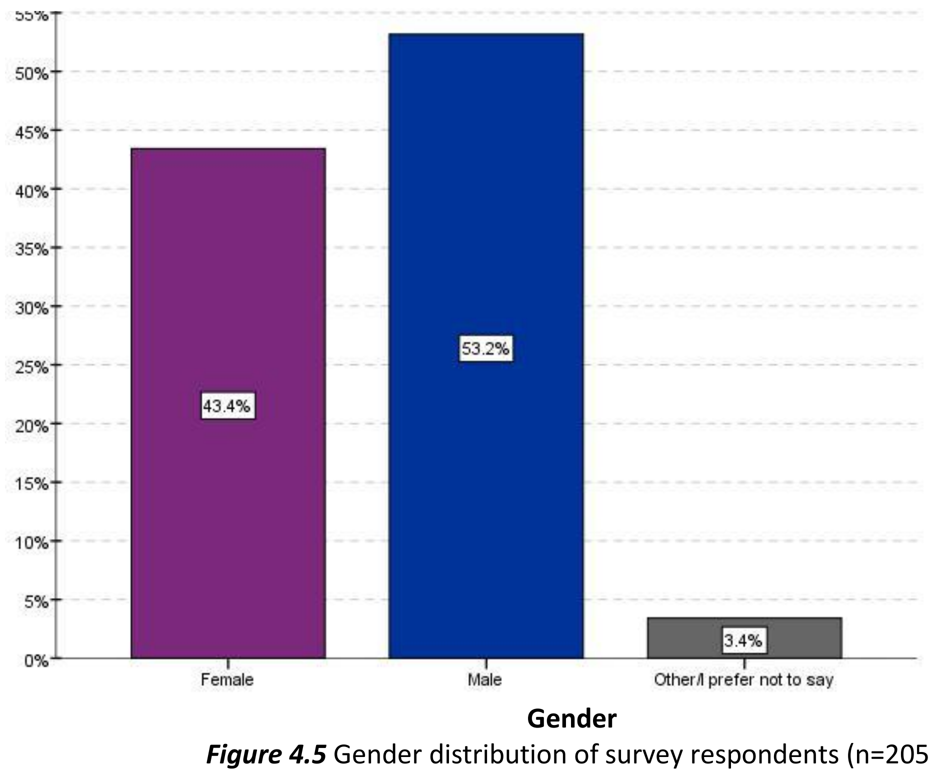

Figure 4.5 Gender distribution of survey respondents (n=205)

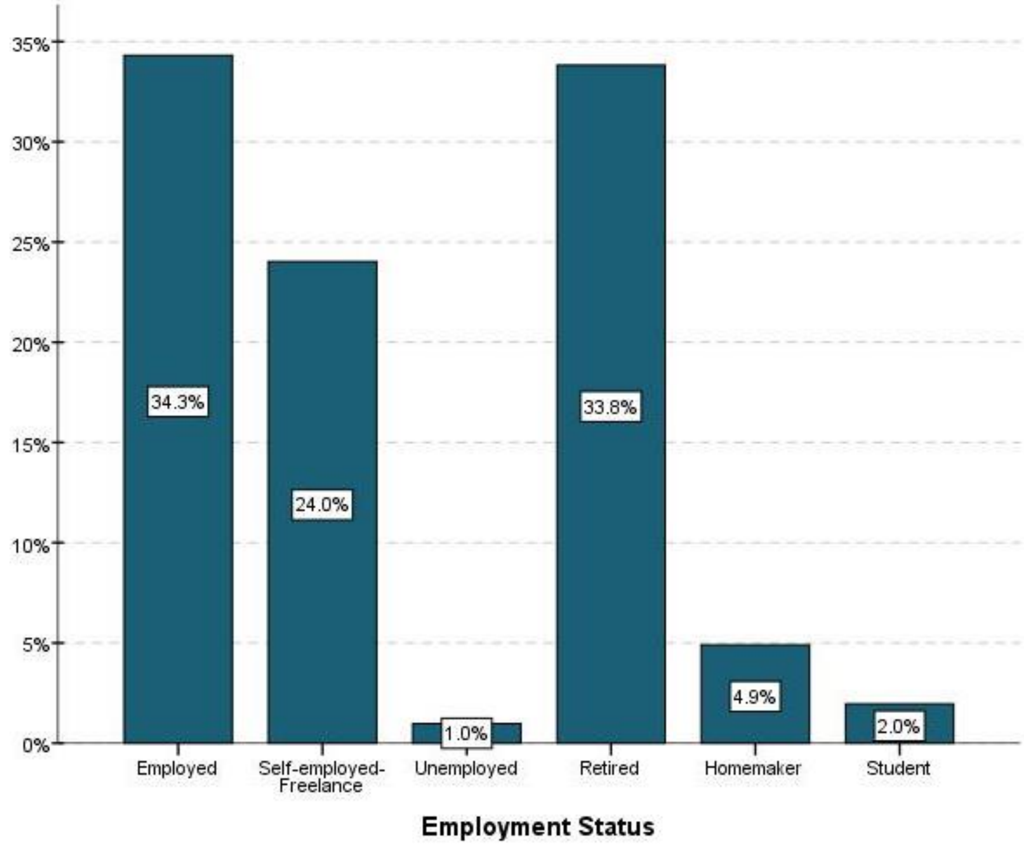

Figure 4.6 Employment-status distribution of survey respondents (n=206)

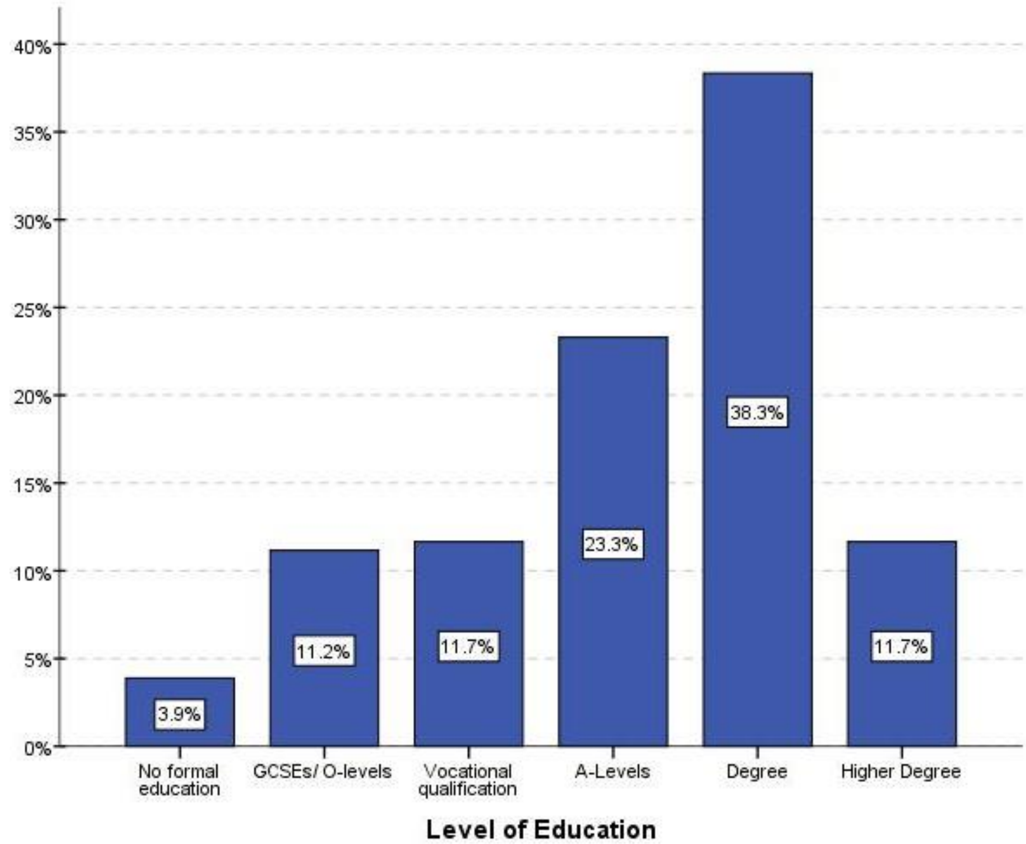

Figure 4.7 Level of education distribution of survey respondents (n=204)

The majority of respondents (77.8%) were 45 years old or older and males exceeded females by 9.8%. Most respondents were employees or self-employed/freelancers (58.3%), compared to 33.8% who were retired. Homemakers, students, and unemployed respondents accounted for 7.9% of the sample. Respondents generally appeared to have high levels of educational achievement, with half having a degree or higher degree (NVQ4 equivalent and above). Further comparisons between the demographics of residents in the case-study areas using local statistics helped to determine to what extent residents who participated in the study were representative of their areas. Figures 4.8-4.11 compare the age, gender, employment status, and education level distribution of Lancashire and North Yorkshire residents.

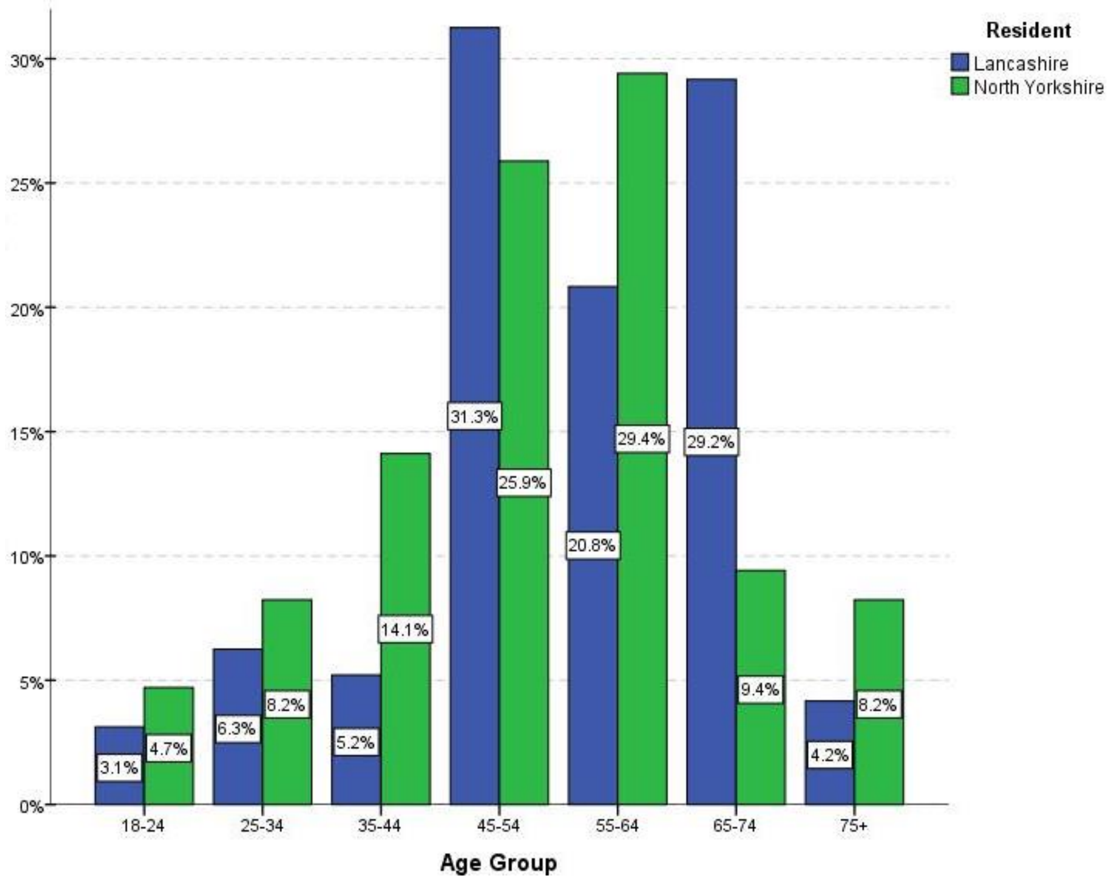

Figure 4.8 Age distribution of Lancashire and North Yorkshire residents (n=181)

Comparisons between the case studies found no significant age differences between Lancashire and Yorkshire residents (U=3,456, P=0.69, a=0.5). Figure 4.8 shows that the majority of residents in each area were over 45 years old (Lancashire median 55-64 years, North Yorkshire median 45-54). Comparison with other local surveys were only available for Lancashire. Aryee et al.'s (2020) findings from a postal survey around PNR, conducted a year earlier covering a slightly larger area, revealed the same median age group. 51.4% of residents lived up to 3 miles away from a fracking site, so parish statistics were the most appropriate scale for further comparisons, in which the local population appeared marginally younger (Section 3.2.2). However, the survey took place seven years after the 2011 census, so small age differences may be explained by this time gap.

To allow gender comparisons between the case studies, respondents who answered 'other/prefer not to say' were not included. A Chi-square test showed a significant[41] difference in the distribution of female and male residents in the two areas (x2= 4.248, df=1, P=0.039). 52.4% of North Yorkshire residents were females compared to 37.9% in Lancashire (Figure 4.9). In contrast, the percentage of males was 24.4% higher in Lancashire. In both parishes, the male-female ratio was 50/50 in local statistics, so the results are slightly skewed towards females in North Yorkshire, and moderately skewed towards males in Lancashire. The latter contrasted with Aryee et al.'s (2020) skewed sample of females found in the Lancashire area (59.9%).

[41] Unless otherwise stated, the confidence level is 95% (a=0.05) for all statistical tests.

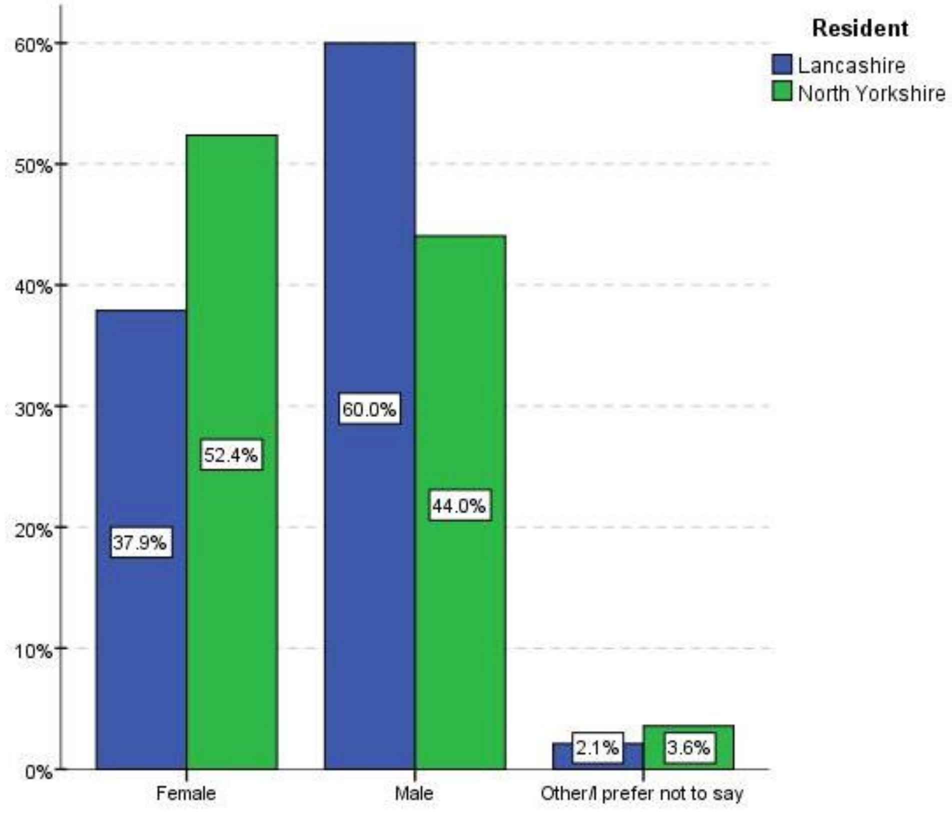

Figure 4.9 Gender distribution of Lancashire and North Yorkshire residents (n=179)

Figure 4.10 shows six employment-status categories for residents, with many being employed, self-employed or retired. To allow further comparisons, the unemployed, homemaker and student categories were combined, as were respondents in all types of employment. A chi-square test indicated a significant difference in employment status between the areas (x^2=7.582, df=2, P=0.023) based on the high percentage of employed residents in North Yorkshire, which exceeded Lancashire residents by 12.4%. No-one was unemployed in North Yorkshire, whereas the percentage of retired participants in Lancashire was 1.5 times higher, reflecting their slightly higher age profile.

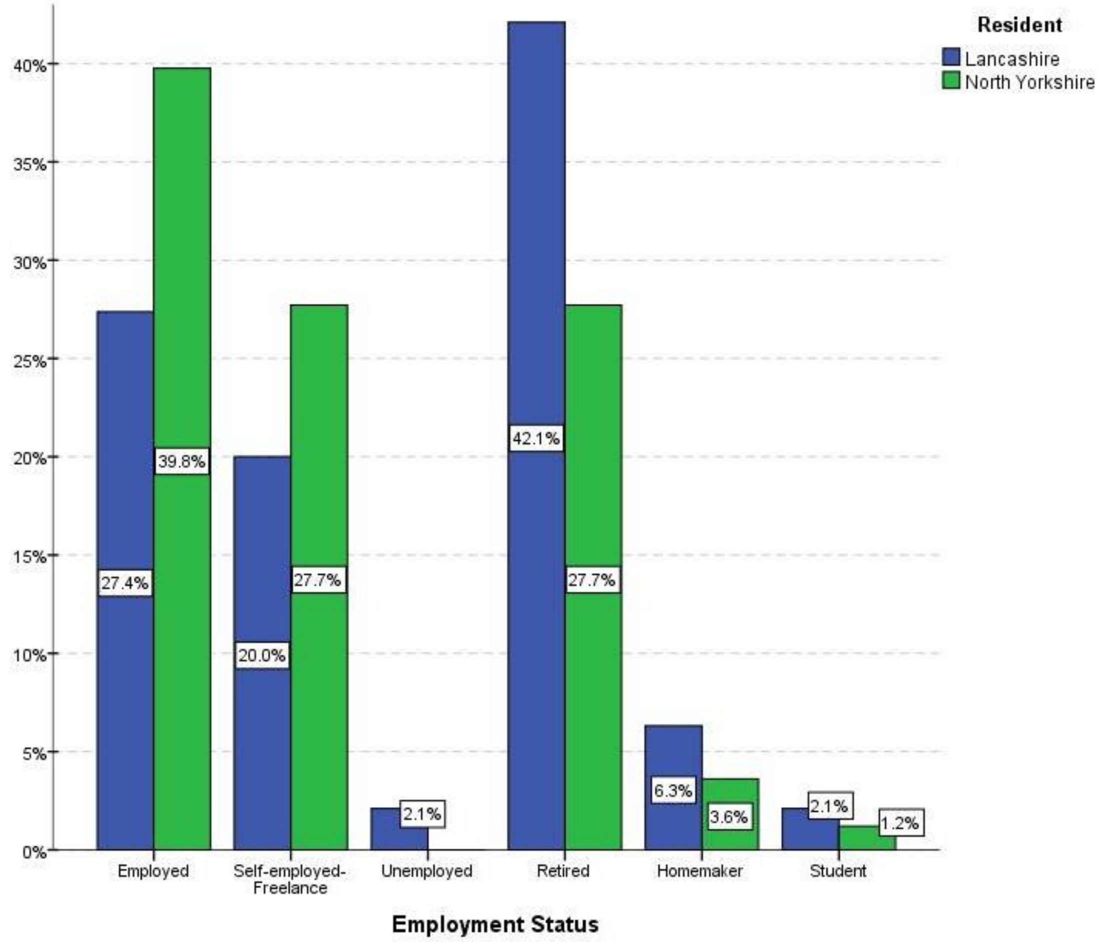

Figure 4.10 Employment status distribution of Lancashire and North Yorkshire residents (n=178)

Overall, 49.5% of the Lancashire residents were economically active[42], while 50.5% fell into economically inactive categories. Compared to parish statistics (Section 3.2.2), the Lancashire sample was not representative as the 42.1% of retired respondents skewed the results. Among North Yorkshire residents, 67.5% were economically active and 32.5% were economically inactive, close to local statistics (especially for Kirby Misperton and Barugh). Again, these results seemed reasonable based on the lower average age of North Yorkshire residents in 2011 and the age gap between these data and the surveys.

[42] Economically active are considered employed, self-employed, and unemployed people.

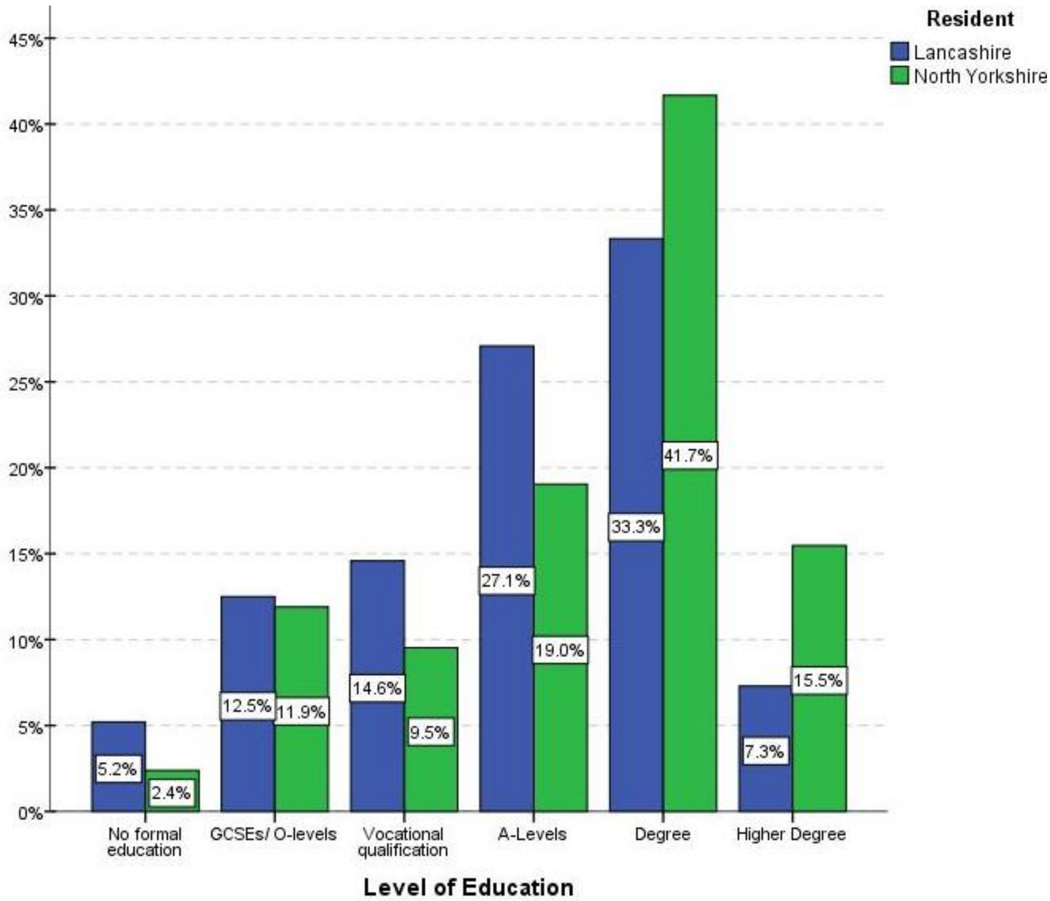

Figure 4.11 Level of education distribution of Lancashire and North Yorkshire residents (n=180)

Figure 4.11 shows presents the level of education levels in both areas. A Mann-Whitney test indicated a significant difference in the educational attainment of Lancashire and North Yorkshire residents (U=4,768.5, P=0.029, a=0.5). The majority of participants (57.2%) who lived in North Yorkshire were educated to a higher level[43], whereas at 59.4%, the Lancashire figures were higher for each category up to and including A-levels (Figure 4.11). Compared to parish statistics, respondents in both areas had higher levels of educational achievement. However, compared to district-level statistics, Lancashire results were similar to Fylde statistics but North Yorkshire figures remained significantly higher (Section 3.2.2). The study concurred with Aryee et al. (2020) who found 51.7% of their Lancashire participants to have a higher educational level[44] than the average,

[43] Degree and Higher Degree is equivalent to Level 4.
[44] Most Aryee et al. (2020)'s participants were educated to a university degree– a little higher than in this study.

perhaps reflecting the challenges of understanding or expressing an opinion on a complex energy technology.

4.2 Perceptions of Energy Technologies

4.2.1 Energy and Technology Perspectives

Survey participants were asked to rate their opinions on various statements relating to their views on energy issues and perceptions of different energy technologies (Figure 4.12[45] and 4.13[46]). One sample t-tests revealed that the mean scores of respondents' views on these statements varied significantly from a neutral position, except for nuclear energy (Table 4.2). The majority of participants had concerns about climate change and the environment and favoured environmentally orientated energy choices.

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[45] The responses indicated that the majority of respondents disagreed with the statements: 'people should use as much energy as they want' (x=-0.61, n=207); 'weather patterns change naturally, and people should stop worrying about climate change' (x=-0.90, n=210); and, 'concern about the environment restricts technological innovations too much (x=-0.76, n=211) However, respondents generally agreed that: 'environmental and energy decisions should be more informed by public participation' (x=1, n=210); 'investing in renewable energy to reduce climate change' (x=1.42, n=211); 'industry left to itself will harm the environment' (x=1.10, n=210); 'national energy choices should also take into account environmental factors besides economic and social ones' (x=1.41, n=210); and, 'the country should invest more in environmental-friendly energy technologies even if it costs more' (x=1.22, n=210).

[46] Participants strongly agreed with the UK investing in renewables (x=1.63, n=209, $P<0.001$), disagreed with focusing on fossil fuels (x=-0.75, n=206, $P<0.001$), and appeared neutral towards nuclear energy (x=-0.04, n=206, $P=0.682$).

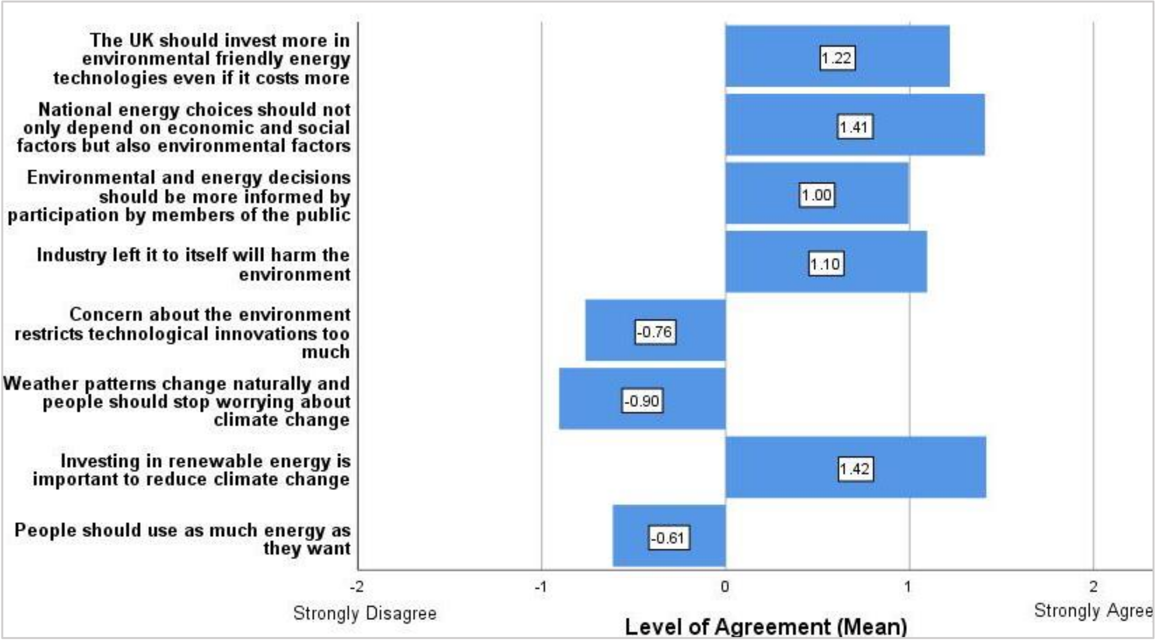

Figure 4.12 Respondents' energy-related views

Table 4.2 **One-sample t-tests for energy-related statements and energy choices**				
Variables	**Mean**	**T-test**	**Df**	**P-value**
People should use as much energy as they want	-0.61	-7.504	206	<0.001
Investing in renewable energy is important to reduce climate change	1.42	22.659	210	<0.001
Weather patterns change naturally and people should stop worrying about climate change	-0.9	-11.326	209	<0.001
Concern about the environment restricts technological innovations too much	-0.76	-9.736	210	<0.001
Industry left it to itself will harm the environment	1.1	14.394	209	<0.001
Environmental and energy decisions should be more informed by participation by members of the public	1	12.857	209	<0.001
National energy choices should not only depend on economic and social factors but also environmental factors	1.41	24.374	209	<0.001
The UK should invest more in environmental-friendly energy technologies even if it costs more	1.22	15.431	209	<0.001
Nuclear energy	-0.04	-0.411	205	0.682
Fossil fuel energy	-0.75	-8.087	205	<0.001
Renewable energy	1.63	31.923	208	<0.001

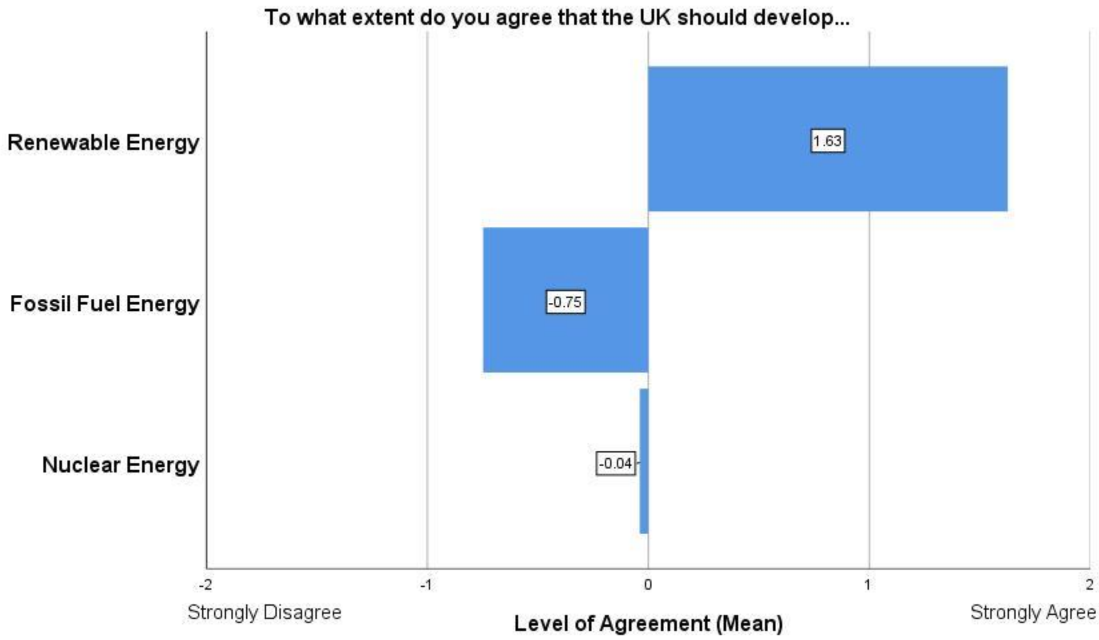

Figure 4.13 Respondents' views on renewable, fossil-fuel & nuclear energy

Figures 4.14, 4.15, and 4.16 provide further detail on the level of agreement/disagreement with renewable, fossil fuel and nuclear energy between case-study residents.

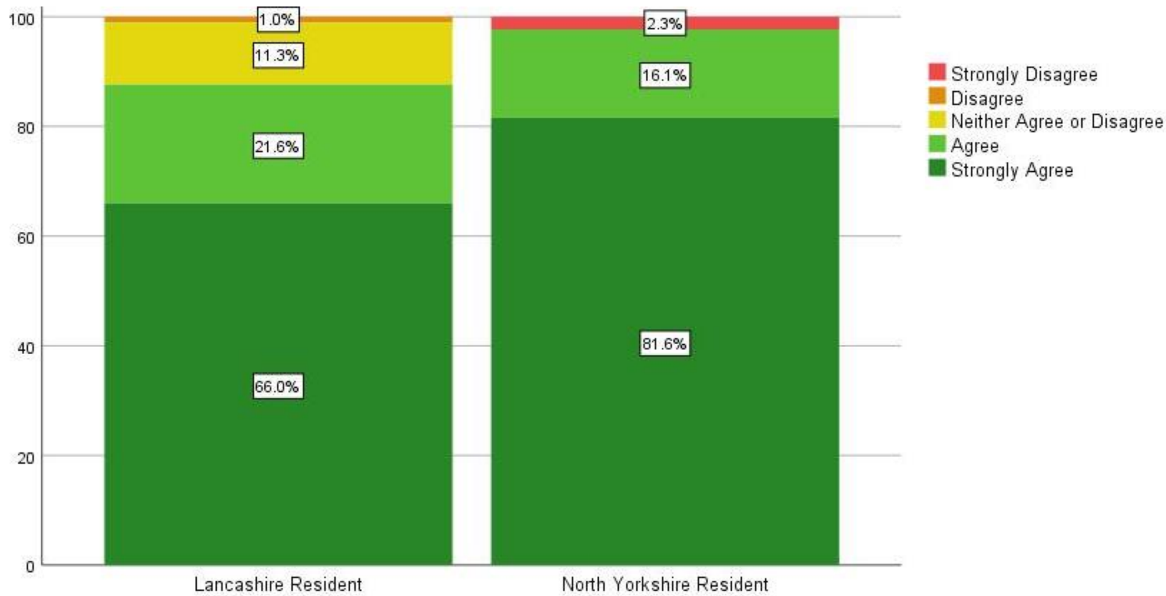

Figure 4.14 Residents agreement/disagreement with renewable energy (n=184)

Most Lancashire and North Yorkshire residents favoured renewable energy, exceeding 80% in both cases. However, a Mann-Whitney test showed a significant difference in responses (U=4,930, P=0.011), mainly because 11.3% of Lancashire residents expressed neutral attitudes, whereas nobody in North Yorkshire was neutral and 2.3% strongly disagreed with renewable energy. The 15.6% difference between residents who strongly agreed is notable but contributed less to the test outcome.

Figure 4.15 presents residents' attitudes towards nuclear energy. Comparison between case studies again found a significant difference (U=3,368.5, P=0.04, a=0.5). 50.5% of Lancashire residents were positive towards nuclear compared to 29.1% of North Yorkshire residents. Another contributing category to the test outcome was the difference between people with neutral attitudes, which was 16.4% higher in North Yorkshire. Negative attitudes in both case studies were similar, 36.1% in Lancashire and 41.6% in North Yorkshire.

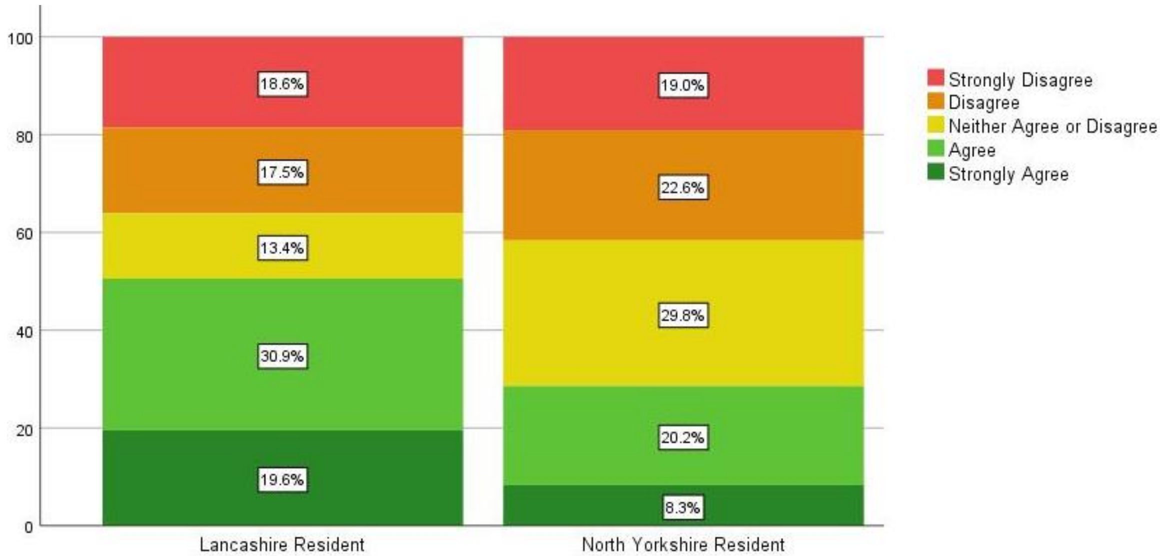

Figure 4.15 Residents agreement/disagreement with nuclear energy (n=181)

Figure 4.16 shows residents' attitudes towards fossil fuels. A Mann-Whitney test showed no significant difference in responses (U=3,457, P=0.064). In both cases, over 50% of residents felt negatively towards fossil fuels, 58.4% in Lancashire and 70.6% in North Yorkshire. While the proportion of respondents with neutral attitudes was similar; 16.4% more people supported fossil fuels in Lancashire.

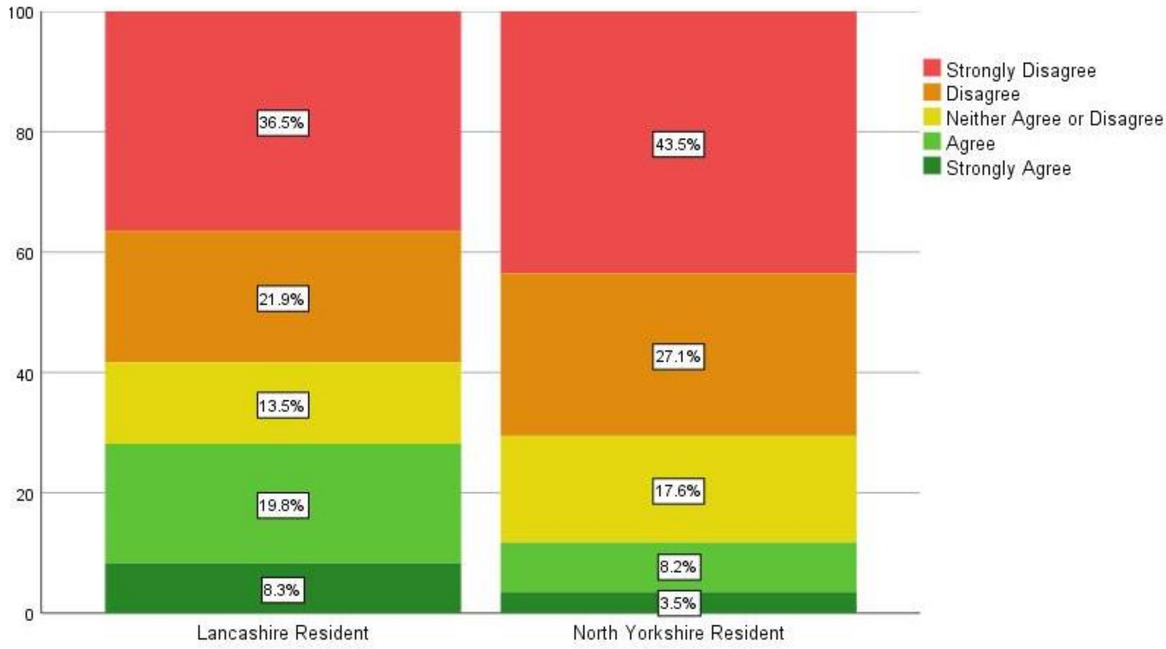

Figure 4.16 Residents agreement/disagreement with fossil-fuel energy (n=181)

As the survey did not examine attitudes to individual technologies, these results were not directly comparable with other studies; nonetheless, the overall high favourability of renewables, dislike of fossil fuels, and mixed feelings about nuclear reflected the findings of O'Hara et al. (2015) and Whitmarsh et al. (2015).

4.2.2 Attitudes to Unconventional Resources and Fracking in Local Areas

Participants were first asked their views on the extraction of unconventional resources in general, followed by their opinions on shale-gas fracking in the area (Figure 4.17). Participants generally disagreed with extracting unconventional resources (x=-0.78, n=207) and fracking in the area (x=-0.91, n=206). Table 4.3 shows that the mean scores for these questions varied significantly (P<0.001) from a neutral viewpoint.

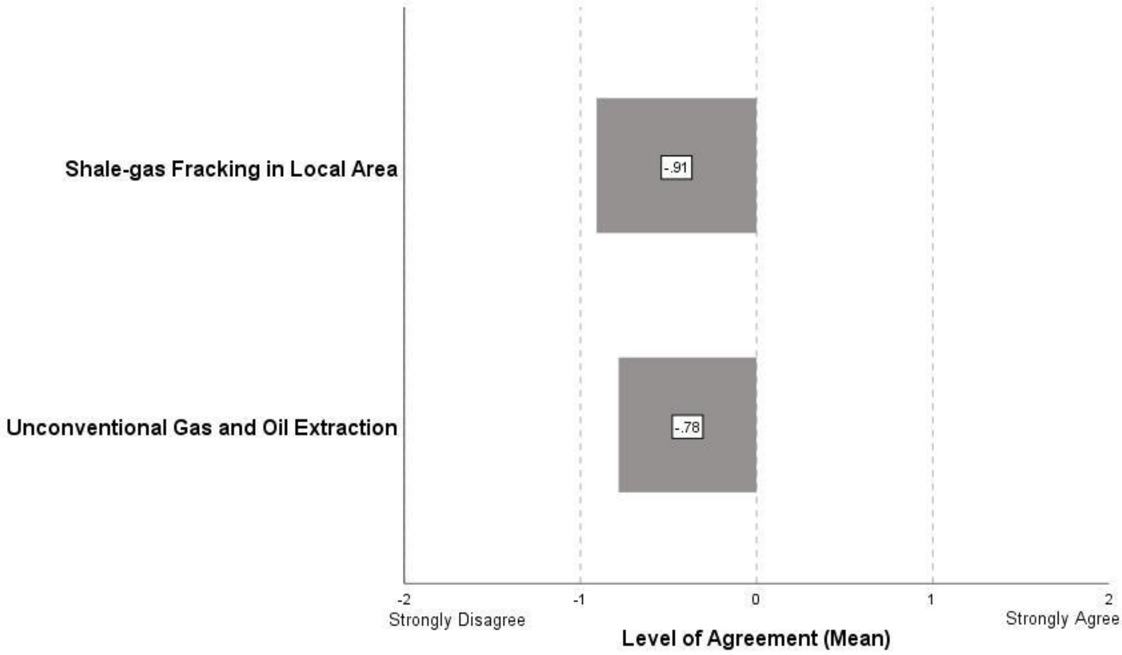

Figure 4.17 Respondents' agreement with unconventional resources and fracking in local area

Table 4.3 Mean scores and T-test results for unconventional resources and fracking		
	Unconventional Oil and Gas Extraction	**Fracking in Local Area**
Mean	-.78	-.91
Sample Size (n)	207	206
Standard Deviation	1.63	1.60
T-test statistic	-6.921	-8.124
P-Value	<0.001	<0.001

Further analysis confirmed that the difference between the two mean scores was not significant (t=0.818, df=411, P=0.414, a=0.5). Residents' attitudes towards unconventional oil and gas (UOG) extraction and fracking in local areas were both skewed towards strongly negative attitudes, suggesting a Not-In-Anyone's-Back-Yard stance (Wolsink, 2000; van der Horst, 2007), similar to other fracking communities abroad where opposition was recorded (Lachapelle and Montpetit, 2014) (Figures 4.18 and 4.19).

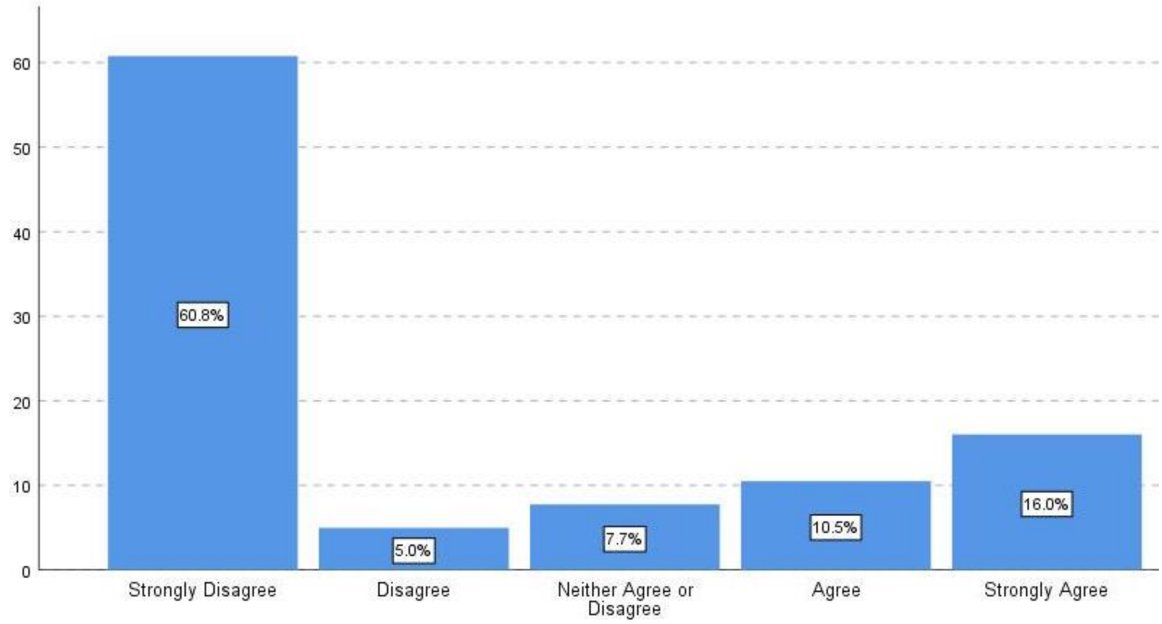

Figure 4.18 Residents' attitude towards unconventional oil and gas extraction (n=181)

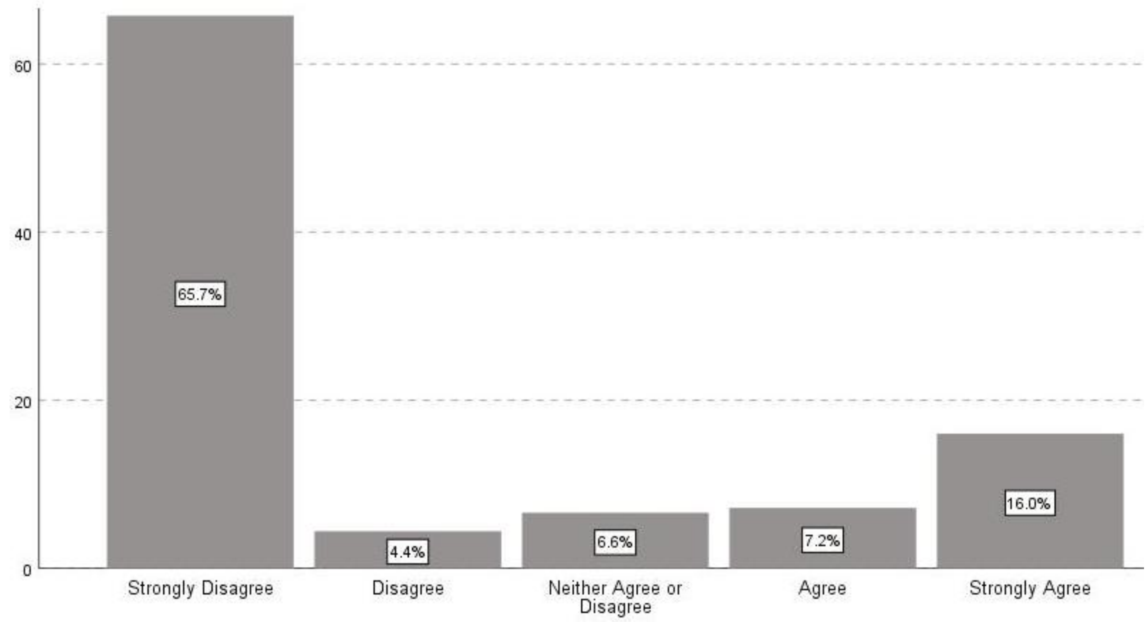

Figure 4.19 Residents' attitude towards fracking in their local area (n=181)

Overall, the majority of residents who agreed, disagreed or were ambivalent about UOG extraction in general had the same attitude about local shale-gas projects, judging from a strong positive correlation between responses to the two questions (r_s= 0.942, P<0.001, a=0.01, n=179) (Figure 4.20). However, 66.7% of residents expressed stronger negative feelings towards local developments. All residents who strongly agreed with UOG also expressed positive views about local projects, suggesting some Yes-In-My-Back-Yard views; however, 13.8% showed weaker agreement. These responses indicated that, despite their oppositional or supportive attitude towards fracking in principle and towards local developments (Wolsink, 2000), residents had some concerns about development of fracking technology locally. Perceptions of the suitability of relevant technologies in particular local places may also explain the responses of residents with ambivalent views on UOG and negative attitudes towards local developments (42.9%) or agreement with UOG and neutral attitudes towards local developments (26.3%). Contrasting views were mainly identified for residents who agreed with, or were ambivalent towards, UOG. While the majority who agreed with UOG also supported fracking locally (63.2%), 10.6% opposed it. This type of resistance reflects the self-interests associated with NIMBYism, but it constituted only 1.2% of residents who participated in the survey.

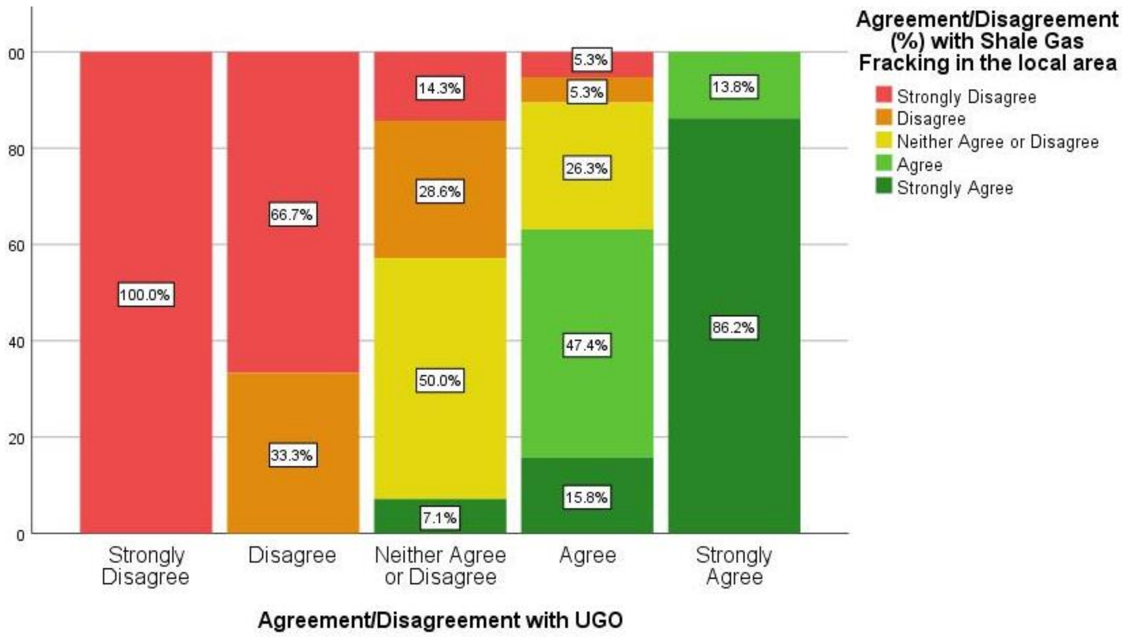

Figure 4.20 Residents' attitude towards fracking in the local area (%) ranked by attitude towards UOG extraction in general (n=181)

A further comparison between residents' views on local fracking using Mann-Whitney testing found a significant difference in attitudes between the areas (U= 2,984.5, P=.00, a=0.5, n=181). While Figure 4.21 highlights the strong polarisation of residents' attitudes, 21.67% more people in Lancashire strongly supported local fracking and 23.17% more North Yorkshire residents strongly opposed. These findings were confirmed by a weak association (rs= -0.276, P<0.001, a=0.01, n=181).

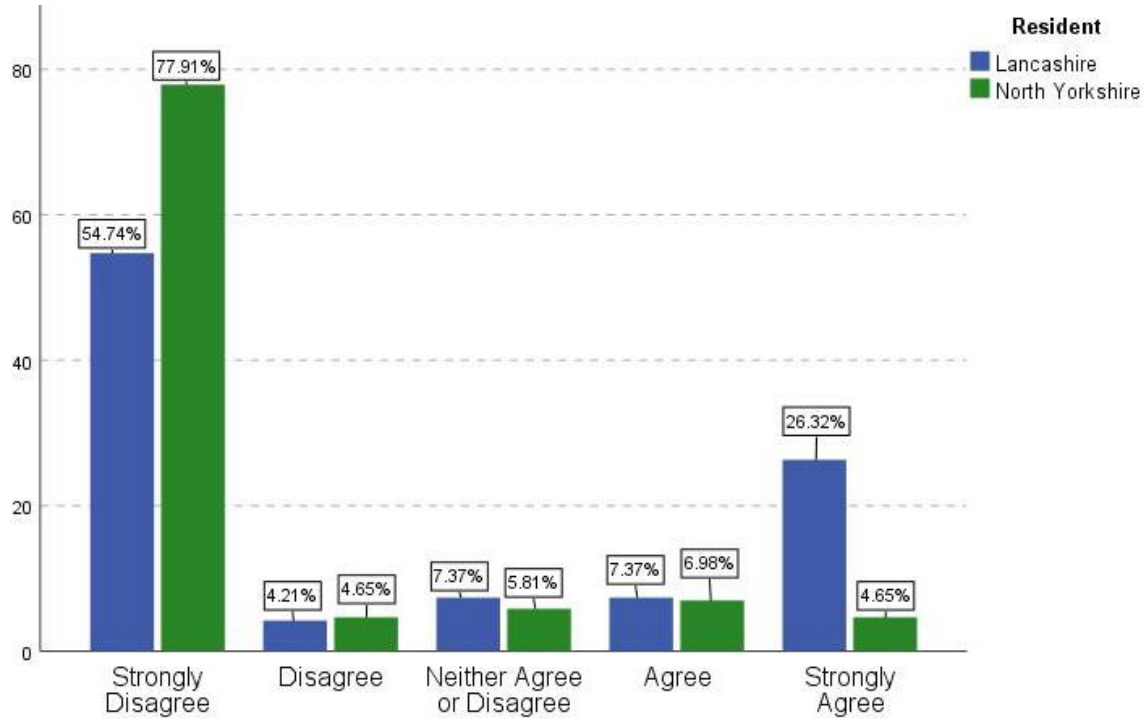

Figure 4.21 Residents' attitude towards fracking per case study (n=181)

Drawing on recent literature on concerns about the terminology used to examine attitudes towards fracking (Evensen et al., 2014; Clarke et al., 2015; Stoutenborough et al., 2016a; 2016b), reflections were made about whether more negative attitudes at the local level might have derived from including the wording 'fracking' only in the question or participants' unfamiliarity with the term 'unconventional resources'. Based on the design of the first question to include shale gas as an example of an unconventional resource (Appendix II), contrasting scholarly opinions on the negative connotation of the term 'fracking' (ibid), and the high level of knowledge found among respondents (see Figure 4.22), it is unlikely the terminology used influenced the results.

In common with other studies (Andersson-Hudson et al., 2016, Stedman et al., 2016; Bradshaw and Waite, 2017), the research found high awareness of fracking among UK participants; 91.2% of respondents had some or a lot of knowledge of fracking and 8.7% stated they had a little.

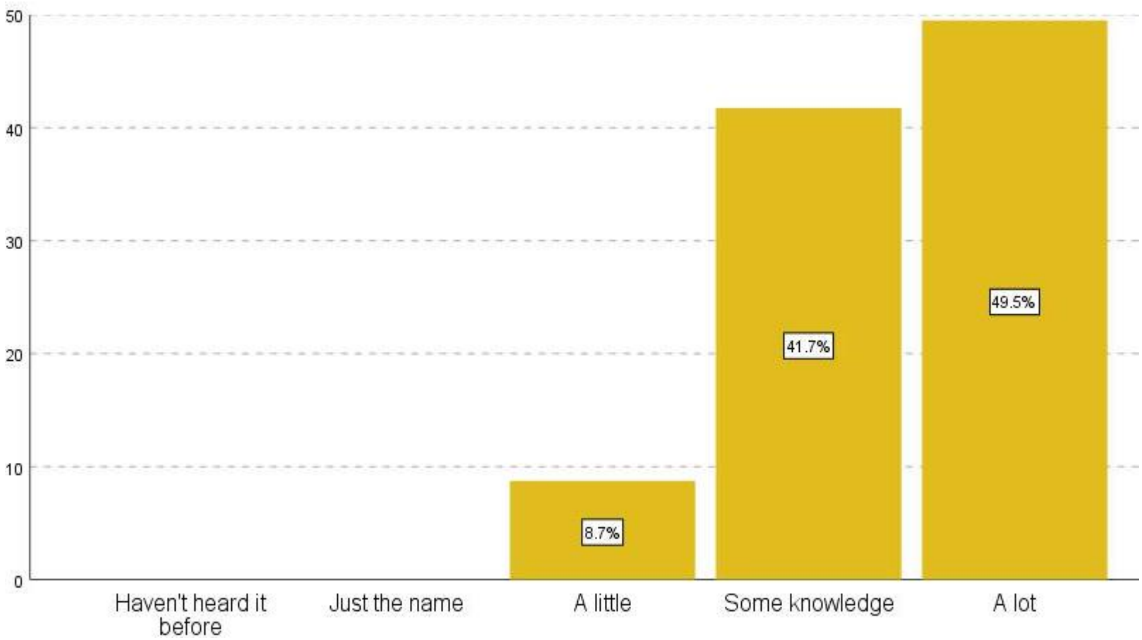

Figure 4.22 Respondents' knowledge of fracking (n=206)

However, participants claimed to be more knowledgeable compared to previous surveys in Lancashire, with no one claiming to know nothing about fracking or only have heard it by name, unlike nearly 25% of other surveys' participants (BritainThinks2012b; Whitmarsh et al., 2015). This was not entirely surprising given the time gap between surveys and the progression of local shale developments in Lancashire and North Yorkshire. However, the question was self-assessed and no additional information was provided to capture changes in attitudes (Whitmarsh et al., 2015; Stedman et al., 2016, 2016; Choma et al., 2016; BritainThinks, 2012b).

A Mann-Whitney test found no difference in the distribution of responses between Lancashire and North Yorkshire residents (U=3,517.5, P=0.74, n=181). Interestingly, the more knowledgeable residents claimed to be, the stronger their attitudes became in supporting or opposing fracking (Figure 4.23).

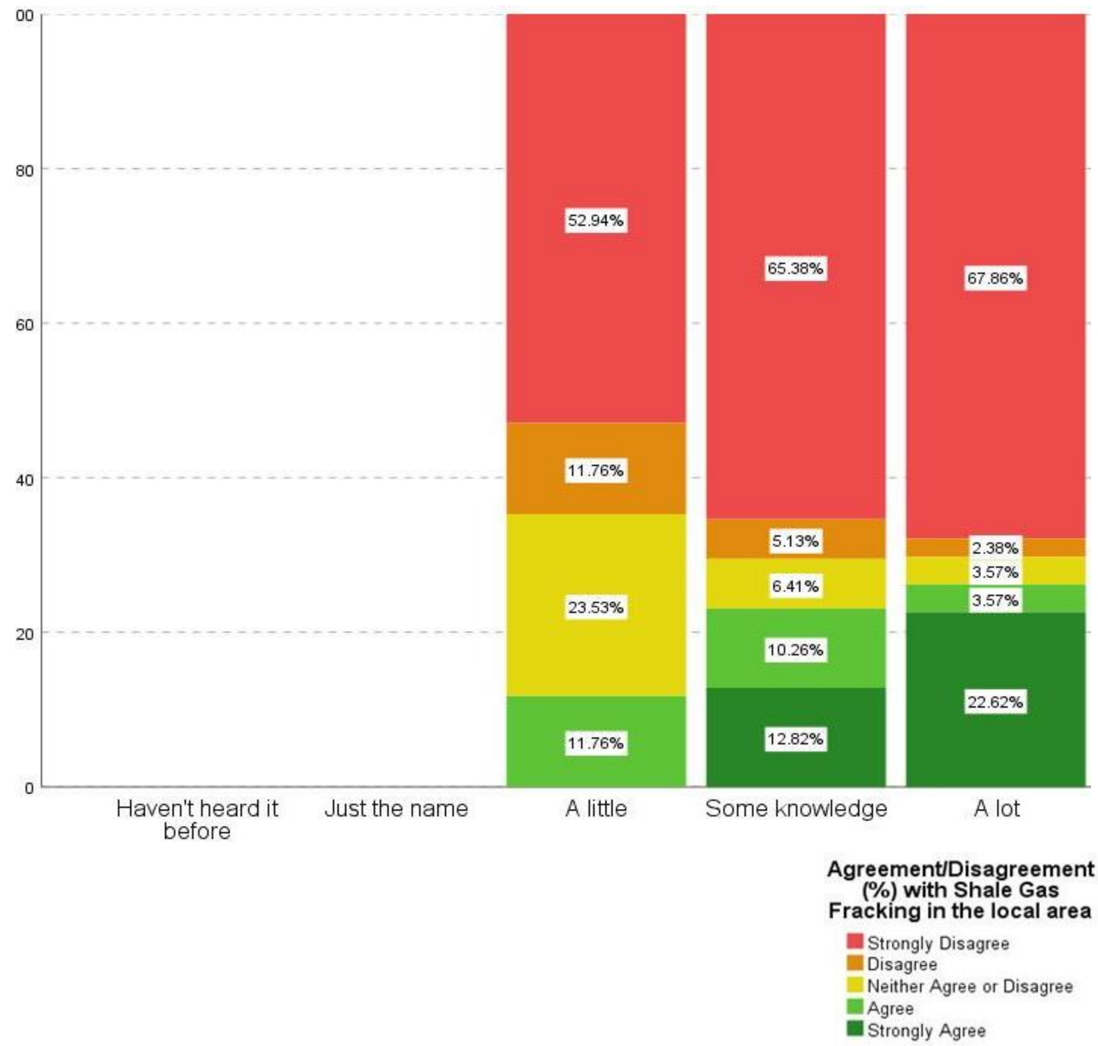

Figure 4.23 Residents' attitude towards fracking ranked by knowledge (n=179)

However, while the association between knowledge and support of fracking remains controversial within the literature (Boudet et al., 2014; Whitmarsh et al., 2015; Stedman et al., 2016), this study found that knowledge did not affect attitudes (r_S= 0.058, P=0.46, n=167). Further analysis also showed that residents' high educational level did not affect their familiarity with fracking technology (r_S= 0.011, P=0.884, n=176).

The research further assessed the association between gender and attitudes towards fracking and concurred with the literature that women usually hold more pro-environmental views and oppose fracking (Andersson-Hudson et al., 2016; Boudet et al., 2014), including Whitmarsh et al. (2015) who found higher support for fracking among males in Lancashire. A Spearman correlation test showed a weak but highly significant statistical association (r_s= 0.288, $P<0.001$, $n=163$).

4.3 Perceptions of Fracking

4.3.1 Beliefs about Impacts associated with Fracking

Drawing on the fracking literature (Section 2.2), the survey asked participants to state their agreement with possible or actual impacts associated with fracking (Figure 4.24). One-sample t-tests showed that all variables varied significantly from the neutral viewpoint (P<0.001), especially 'increased vehicle traffic' (x=1.25, n=208), 'property devaluation' (x=0.96, n=209), and 'industrialisation of the landscape' (x=0.95, n=210). Participants agreed with the risks and disagreed with the benefits provided (Table 4.4).

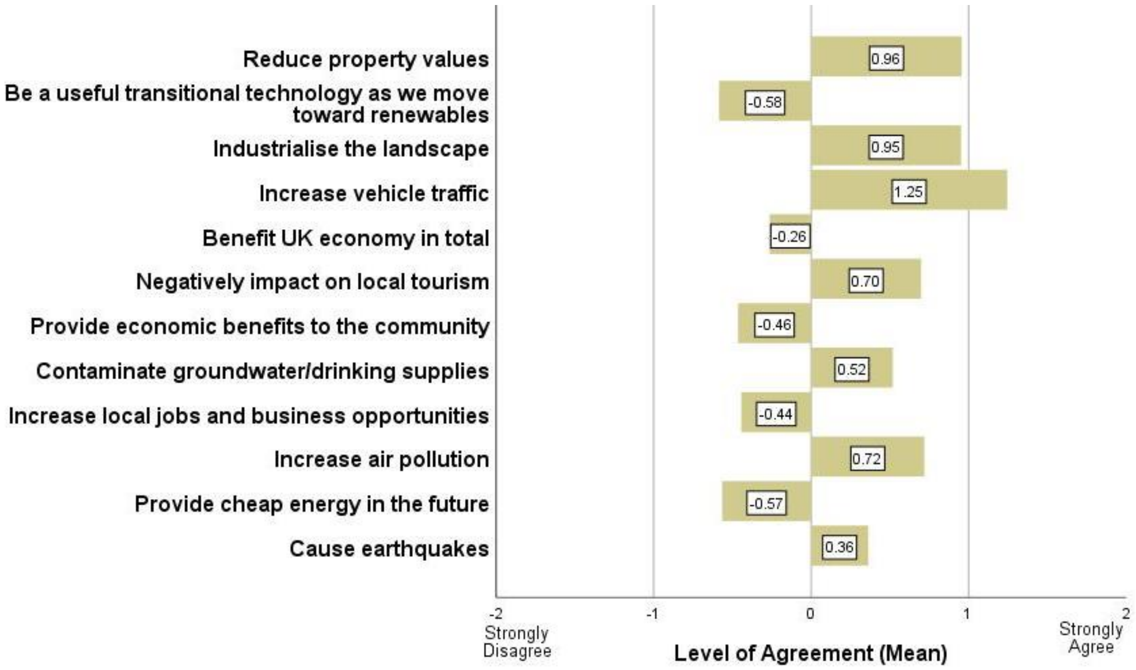

Figure 4.24 Respondents' agreement with fracking impacts

Table 4.4 **One-sample t-tests– Fracking impacts**				
Impact	**Mean**	**T-test**	**Df**	**P-value**
i) Cause earthquakes	0.36	4.083	206	<0.001
ii) Provide cheap energy in the future	-0.57	-5.859	206	<0.001
iii) Increase air pollution	0.72	7.509	209	<0.001
iv) Increase local jobs and business opportunities	-0.44	-4.663	209	<0.001
v) Contaminate groundwater/drinking supplies	0.52	4.89	209	<0.001
vi) Provide economic benefits to the community	-0.46	-4.512	208	0.011
vii) Negatively impact on local tourism	0.70	6.475	208	<0.001
viii) Benefit UK economy in total	-0.26	-2.551	204	<0.001
ix) Increase vehicle traffic	1.25	17.168	207	<0.001
x) Industrialise the landscape	0.95	9.788	209	<0.001
xi) Be a useful transitional technology toward renewables	-0.58	-5.701	206	<0.001
xii) Reduce property values	0.96	10.069	208	<0.001

In order to allow further comparison of residents' attitudes, the small number of respondents with neutral attitudes towards fracking in their areas were excluded and other variable categories were merged into: a) strongly disagree/disagree, and b) strongly agree/agree responses. Table 4.5 shows that residents' overall mean scores (X_R) were close to the mean scores for all participants, yet greater deviation appeared in the mean scores between: (a) residents with positive (X_+) and negative (X_-) attitudes, and (b) Lancashire (X_L) and North Yorkshire (X_{NY}) residents.

Table 4.5 **Descriptive statistics– Residents' agreement with fracking impacts**

Impact	**All Residents**			**Residents/ Attitude**		**Residents/ Case study**	
	X_R	Std_R	N_R	X_+	X_-	X_L	X_{NY}
i) Cause earthquakes	0.40	1.28	181	-1.26	1.01	0.26	0.56
ii) Provide cheap energy in the future	-0.59	1.37	182	1.14	-1.34	-0.31	-0.90
iii) Increase air pollution	0.73	1.38	184	-1.07	1.4	0.42	1.07
iv) Increase local jobs and business opportunities	-0.51	1.36	184	1.36	-1.21	-0.27	-0.78
v) Contaminate groundwater/drinking supplies	0.58	1.51	184	-1.55	1.36	0.33	0.85
vi) Provide economic benefits to the community	-0.54	1.47	183	1.52	-1.33	-0.18	-0.94
vii) Negatively impact on local tourism	0.74	1.54	183	-1.31	1.51	0.41	1.11
viii) Benefit UK economy in total	-0.3	1.46	179	1.57	-1.03	0.07	-0.71
ix) Increase vehicle traffic	1.27	1.03	182	0.1	1.73	1.08	1.48
x) Industrialise the landscape	1.03	1.36	184	-0.88	1.75	0.81	1.26
xi) Be a useful transitional technology toward renewables	-0.64	1.42	182	1.17	-1.38	-0.39	-0.91
xii) Reduce property values	1.02	1.36	183	-1.00	1.71	0.76	1.31

Figure 4.25 shows residents' responses to impacts based on overall positive or negative attitudes towards fracking in their area.

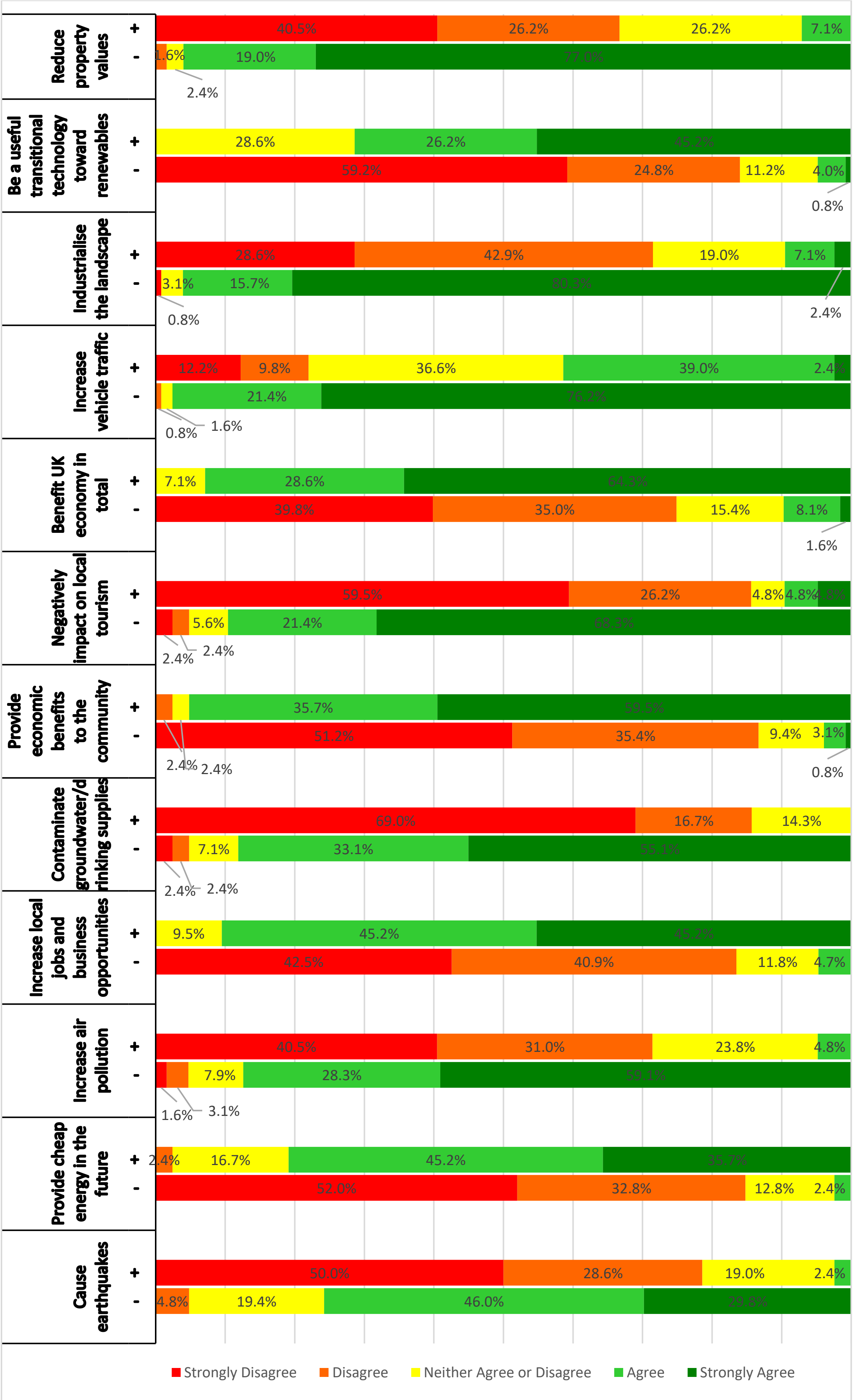
Reduce property values
+
40.5%
26.2%
26.2%
7.1%
-
1.6%
19.0%
77.0%
2.4%
Be a useful transitional technology toward renewables
+
28.6%
26.2%
45.2%
-
59.2%
24.8%
11.2%
4.0%
0.8%
Industrialise the landscape
+
28.6%
42.9%
19.0%
7.1%
-
3.1%
15.7%
80.3%
0.8%
2.4%
Increase vehicle traffic
+
12.2%
9.8%
36.6%
39.0%
2.4%
-
21.4%
76.2%
0.8%
1.6%
Benefit UK economy in total
+
7.1%
28.6%
64.3%
-
39.8%
35.0%
15.4%
8.1%
1.6%
Negatively impact on local tourism
+
59.5%
26.2%
4.8%
4.8%
4.8%
-
5.6%
21.4%
68.3%
2.4%
2.4%
Provide economic benefits to the community
+
35.7%
59.5%
-
51.2%
35.4%
9.4%
3.1%
2.4%
2.4%
0.8%
Contaminate groundwater/drinking supplies
+
69.0%
16.7%
14.3%
-
7.1%
33.1%
55.1%
2.4%
2.4%
Increase local jobs and business opportunities
+
9.5%
45.2%
45.2%
-
42.5%
40.9%
11.8%
4.7%
Increase air pollution
+
40.5%
31.0%
23.8%
4.8%
-
7.9%
28.3%
59.1%
1.6%
3.1%
Provide cheap energy in the future
+
2.4%
16.7%
45.2%
35.7%
-
52.0%
32.8%
12.8%
2.4%
Cause earthquakes
+
50.0%
28.6%
19.0%
2.4%
-
4.8%
19.4%
46.0%
29.8%
Strongly Disagree
Disagree
Neither Agree or Disagree
Agree
Strongly Agree

Figure 4.25 Fracking impacts by residents' attitudes

Residents opposing fracking in their areas agreed with all the negative impacts, whereas residents in support agreed with all its associated benefits, confirmed using Mann-Whitney tests (Table 4.6). As with all survey participants, residents opposing fracking were mostly concerned with the same potential or actual risks: 97.6% agreed or strongly agreed that the development would 'increase vehicle traffic', followed by 96% who felt it would lead to industrialisation and property devaluation. Consistent with other UK quantitative surveys, local opponents were concerned about water contamination (88.2%) and seismic tremors (75.8%) (BritainThinks2012a; Whitmarsh et al., 2015; Andersson-Hudson et al., 2016; Bradshaw and Waite, 2017). Opponents saw earth tremors as less threatening than other impacts, reflecting the gradual decline in perceptions of risks noted by other UK studies since the 2011 seismic events (Andersson-Hudson et al., 2016; O' Hara et al., 2015).

Conversely, residents supporting fracking agreed or strongly agreed that it would provide economic benefits locally (95.2%) and nationally (92.9%) and increase local jobs and business opportunities (90.4%). These socioeconomic benefits ranked higher among residents supporting developments than gaining cheaper energy (80.9%) or using fracking as a transitional technology (71.4%), echoing Andersson-Hudson et al.'s (2016) survey, where UK participants who believed in the benefits of fracking in general but less that it would provide cheaper energy. However, 41.4% of residents with positive attitudes agreed with increased traffic, in common with North American studies that identified it as a key negative impact experienced in areas with established developments (Theodori, 2009; Perry, 2012; Thomas et al., 2017a).

Table 4.6 **Mann-Whitney tests– Fracking impacts between residents with positive and negative attitudes**			
Impact	**n**	**Mann-Whitney U**	**P-Value**
i) Cause earthquakes	166	238.5	<0.001
ii) Provide cheap energy in the future	167	5,105	<0.001
iii) Increase air pollution	169	247	<0.001
iv) Increase local jobs and business opportunities	169	5,223	<0.001
v) Contaminate groundwater/drinking supplies	169	138	<0.001
vi) Provide economic benefits	169	5,226	<0.001
vii) Negatively impact on local tourism	168	325	<0.001
viii) Benefit UK economy in total	165	4,990.50	<0.001
ix) Increase vehicle traffic	167	374	<0.001
x) Industrialise the landscape	169	169	<0.001
xi) Be a useful transitional technology toward	167	5,046	<0.001
xii) Reduce property values	168	100.5	<0.001

Opinions on these impacts also varied between Lancashire and North Yorkshire residents (Figure 4.26).

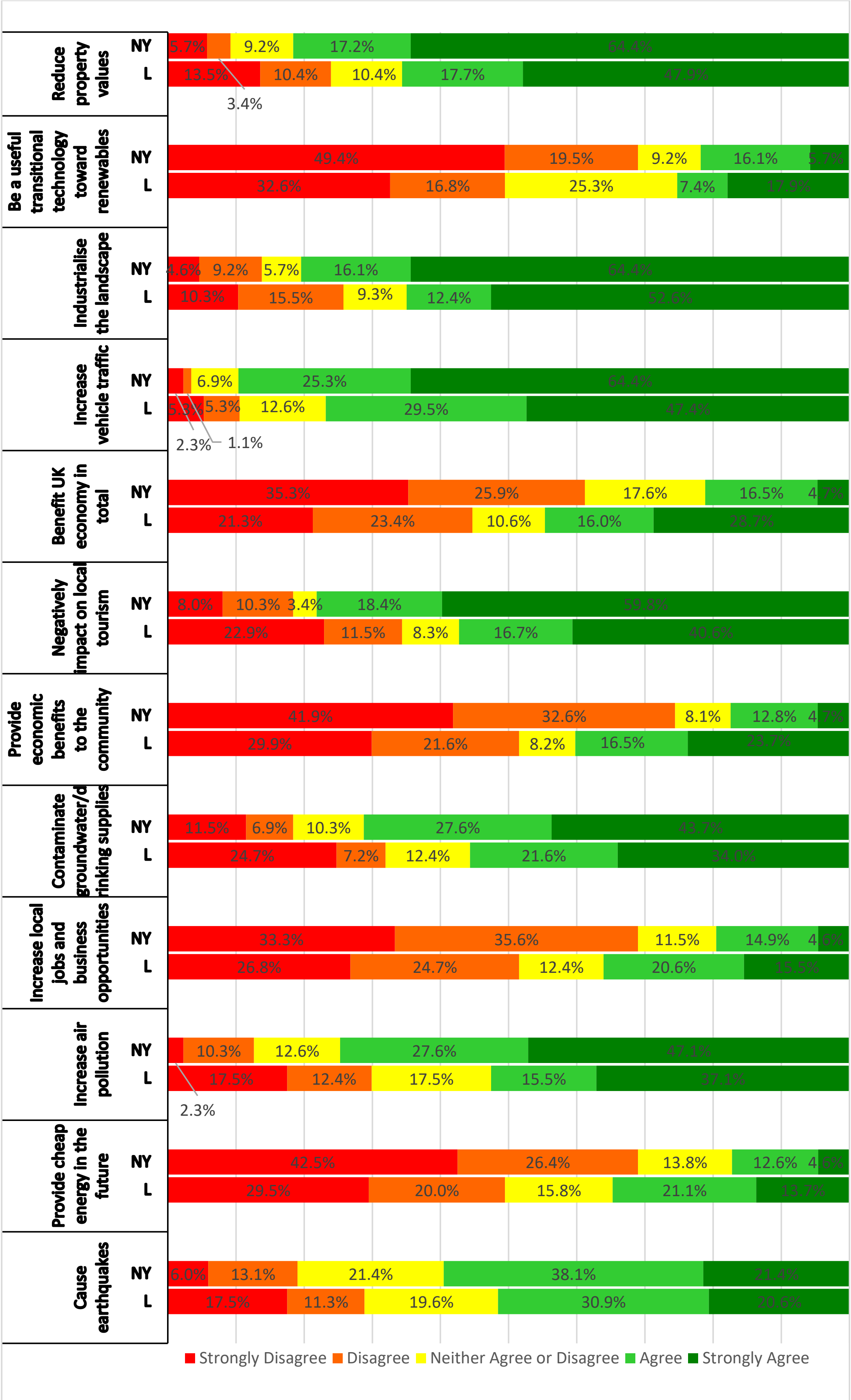

Figure 4.26 Fracking impacts by residents' area

Overall, residents' views on impacts reflected attitudes previously detected in the two areas, with some North Yorkshire residents agreeing more with the negative impacts of fracking and some Lancashire residents agreeing more with the positive impacts. Mann-Whitney tests (Table 4.7) confirmed a significant difference in responses between North Yorkshire and Lancashire residents for all impacts except for earthquakes (P=0.195). The percentage of North Yorkshire residents strongly disagreeing that fracking would 'provide cheap energy' was 13% higher, while 17.6% more Lancashire residents foresaw that outcome. 12.1% more North Yorkshire residents agreed that the technology would 'increase air pollution', whereas 15.2% more Lancashire residents strongly disagreed. Some Lancashire residents saw an 'increase of local jobs and business opportunities' as a very likely positive outcome (10.9% more strongly agreed), while 10.9% more North Yorkshire residents disagreed. A greater percentage of Lancashire residents (13.2%) strongly disagreed that fracking could cause water contamination'. 23% more North Yorkshire residents questioned 'the provision of economic benefits to the community', while 19% more Lancashire residents agreed with the proposition. 19.2% more North Yorkshire residents thought that 'local tourism could be affected negatively' but 14.9% more Lancashire residents strongly disagreed and an additional 4.9% were ambivalent. Lancashire residents who strongly agreed that shale gas would 'benefit the UK economy' exceeded North Yorkshire residents by 24%; in contrast, 14% more North Yorkshire residents strongly disputed this. 17% more North Yorkshire residents strongly agreed that fracking would generate 'increased vehicle traffic', while an additional 4.2% of Lancashire residents disagreed. The percentage of Lancashire residents who strongly disagreed with 'industrialisation' was greater by 5.7%. 12.2% more Lancashire residents strongly believed that fracking was a transitional technology, while the proportion who neither agreed nor disagreed was higher by 16.1%; conversely, 16.8% and 8.7% more North Yorkshire residents strongly disagreed and agreed with this. Some Lancashire residents did not fear of property devaluation (7.8% additionally strongly disagreed and 7.1% disagreed), while 16.5% more North Yorkshire residents strongly agreed with this negative impact.

Table 4.7 **Mann-Whitney tests– Fracking impacts between North Yorkshire and Lancashire residents**

Impact	n	Mann-Whitney U	P-Value
i) Cause earthquakes	181	4,515	0.195
ii) Provide cheap energy in the future	182	3,180.5	0.006
iii) Increase air pollution	184	5,159.5	0.006
iv) Increase local jobs and business opportunities	184	3,409	0.02
v) Contaminate groundwater/drinking supplies	184	4,961	0.032
vi) Provide economic benefits to the community	183	3,074	0.001
vii) Negatively impact on local tourism	183	5,194.5	0.002
viii) Benefit UK economy in total	179	2,842	0.001
ix) Increase vehicle traffic	182	4,960.5	0.009
x) Industrialise the landscape	184	4,871.5	0.043
xi) Be a useful transitional technology toward	182	3,277	0.012
xii) Reduce property values	183	5,021	0.009

To visualise the importance of risks and benefits for each area, all impacts were ranked based on overall agreement. Table 4.8 shows that the ranking of negative impacts was almost identical for both case studies. However, rankings differed more between the case studies on positive impacts, most notably about fracking's usefulness as a transitional technology; this ranked highest for North Yorkshire residents but lowest for Lancashire residents. The low ranking of tremors in both areas highlighted the temporality of the research since more seismic activity occurred after the study. Additionally, 'the provision of economic benefits to the local economy' was ranked second in Lancashire but fourth in North Yorkshire, whereas the 'benefit to the UK economy' ranked high in both areas.

Table 4.8 **Impacts ranking by case study**			
Ranking of Negative Impacts		**Ranking of Positive Impacts**	
North Yorkshire	**Lancashire**	**North Yorkshire**	**Lancashire**
1. Increase vehicle traffic	**1.** Increase vehicle traffic	**1.** Be a useful transitional technology toward renewables	**1.** Benefit UK economy in total
2. Reduce property values	**2.** Reduce property values	**2.** Benefit UK economy in total	**2.** Provide economic benefits to the community
3. Industrialise the landscape	**3.** Industrialise the landscape	**3.** Increase local jobs and business opportunities	**3.** Increase local jobs and business opportunities
4. Negatively impact on local tourism	**4.** Negatively impact on local tourism	**4.** Provide economic benefits to the community	**4.** Provide cheap energy in the future
5. Increase air pollution	**5.** Contaminate groundwater/drinking supplies	**5.** Provide cheap energy in the future	**5.** Be a useful transitional technology toward renewables
6. Contaminate groundwater/drinking supplies	**6.** Increase air pollution		
7. Cause earthquakes	**7.** Cause earthquakes		

Spearman correlation tests were conducted to assess the association of impacts with residents’ attitudes and case-study location. Table 4.9 reveals strong significant correlations between all impact variables and residents’ attitudes towards fracking. However, significant but weak correlations with case-study residents were detected for impacts (ii-xii). Negative correlation confirmed that residents supporting fracking were more likely to disagree that fracking produced negative impacts and Lancashire residents were more likely to agree that it produced positive impacts.

Table 4.9 **Spearman correlation– Fracking impacts with residents' attitude and case-study**						
	Attitude			**Case study**		
Impact	**n**	**r_s**	**P-Value**	**n**	**r_s**	**P-Value**
i) Cause earthquakes	166	-.707**	<0.001	181	0.097	0.196
ii) Provide cheap energy in the future	167	.740**	<0.001	182	-.206**	0.005
iii) Increase air pollution	169	-.717**	<0.001	184	.202**	0.006
iv) Increase local jobs and business opportunities	169	.743**	<0.001	184	-.172*	0.02
v) Contaminate groundwater/drinking supplies	169	-.746**	<0.001	184	.158*	0.032
vi) Provide economic benefits to the community to the community	169	.750**	<0.001	183	-.236**	0.001
vii) Negatively impact on local tourism	168	-.715**	<0.001	183	.227**	0.002
viii) Benefit UK economy in total	165	.723**	<0.001	179	-.256**	0.001
ix) Increase vehicle traffic	167	-.719**	<0.001	182	.193**	0.009
x) Industrialise the landscape	169	-.799**	<0.001	184	.150*	0.043
xi) Be a useful transitional technology toward renewables	167	.730**	<0.001	182	-.187*	0.012
xii) Reduce property values	168	-.806**	<0.001	183	.193**	0.009
* Correlation is significant at the 0.05 level (2-tailed) ** Correlation is significant at the 0.01 level (2-tailed)						

4.3.2 Reasons Affecting Attitudes towards Fracking

Participants were next asked to rate five possible factors shaping their attitudes. Following the overall negativity expressed towards fracking, all reasons differed significantly from the neutral viewpoint (P<0.001) and were associated negatively (Figure 4.27[47]) (Table 4.10).

[47] 'Social effects on nearby communities' ranked first (x=-0.80, n=205), followed by 'the level of trust towards decision-making processes and institutions involved' (x=-0.76, n=206), 'environmental effects' (x=-0.74, n=207), 'appropriateness of the site in question' (x=-0.63, n=205) and, finally, their 'personal connection with the area' (x=0.49, n= 203).

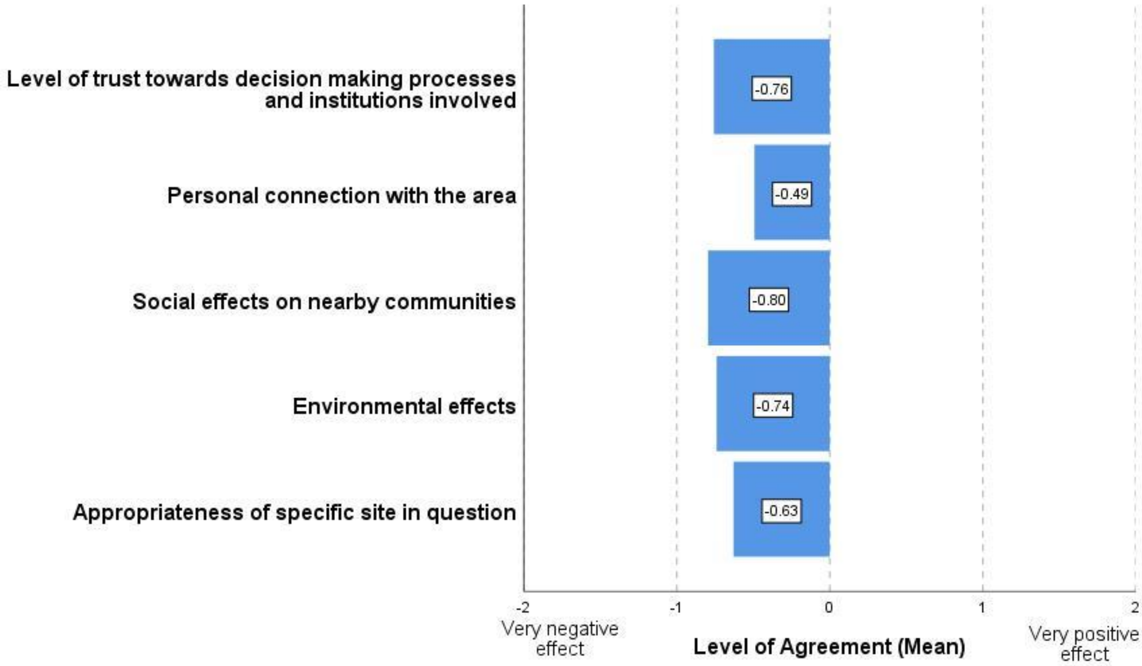

Figure 4.27 Respondents' agreement with reasons affecting their attitudes towards fracking

Table 4.10 **One-sample t-tests– Reasons affecting attitudes towards fracking**				
Reason	**Mean**	**T-test**	**Df**	**P-value**
i) Appropriateness of site in question	-0.63	-6.568	204	<0.001
ii) Environmental effects	-0.74	-7.148	206	<0.001
iii) Social effects on nearby communities	-0.8	-8.53	204	<0.001
iv) Personal connection with the area	-0.49	-5.436	202	<0.001
v) Level of trust towards decision making processes and institutions involved	-0.76	-7.06	205	<0.001

Table 4.11 demonstrates that residents' overall mean scores (X_R) were close to the mean scores for all participants. Nevertheless, a larger contrast appears in the mean scores between residents with positive (X_+) and negative (X_-) attitudes. All five reasons had a positive effect on residents with positive attitudes and vice versa. Conversely, all reasons had an overall negative effect on residents' attitudes when ranked by their case study, yet mean scores for Lancashire residents (X_L) were above X_R and mean scores for North Yorkshire residents (X_{NY}) were below X_R.

Table 4.11 **Descriptive statistics– Reasons for residents' attitudes towards fracking**							
	All Residents			**Residents/ Attitude**		**Residents/ Case study**	
Reason	**X_R**	**Std_R**	**N_R**	**X_+**	**X_-**	**X_L**	**X_{NY}**
i) Appropriateness of site in question	-0.68	1.38	180	0.93	-1.27	-0.53	-0.85
ii) Environmental effects	-0.74	1.49	181	0.73	-1.30	-0.51	-1.00
iii) Social effects on nearby communities	-0.85	1.31	179	0.20	-1.27	-0.63	-1.09
iv) Personal connection with the area	-0.55	1.29	177	0.59	-0.97	-0.43	-0.69
v) Level of trust towards decision making processes and institutions involved	-0.79	1.55	180	1.10	-1.49	-0.48	-1.14

Figure 4.28 further illustrates residents' responses to these reasons ranked by positive and negative attitudes, followed by Table 4.12 presenting Mann-Whitney test results confirming that responses varied significantly (P<0.001).

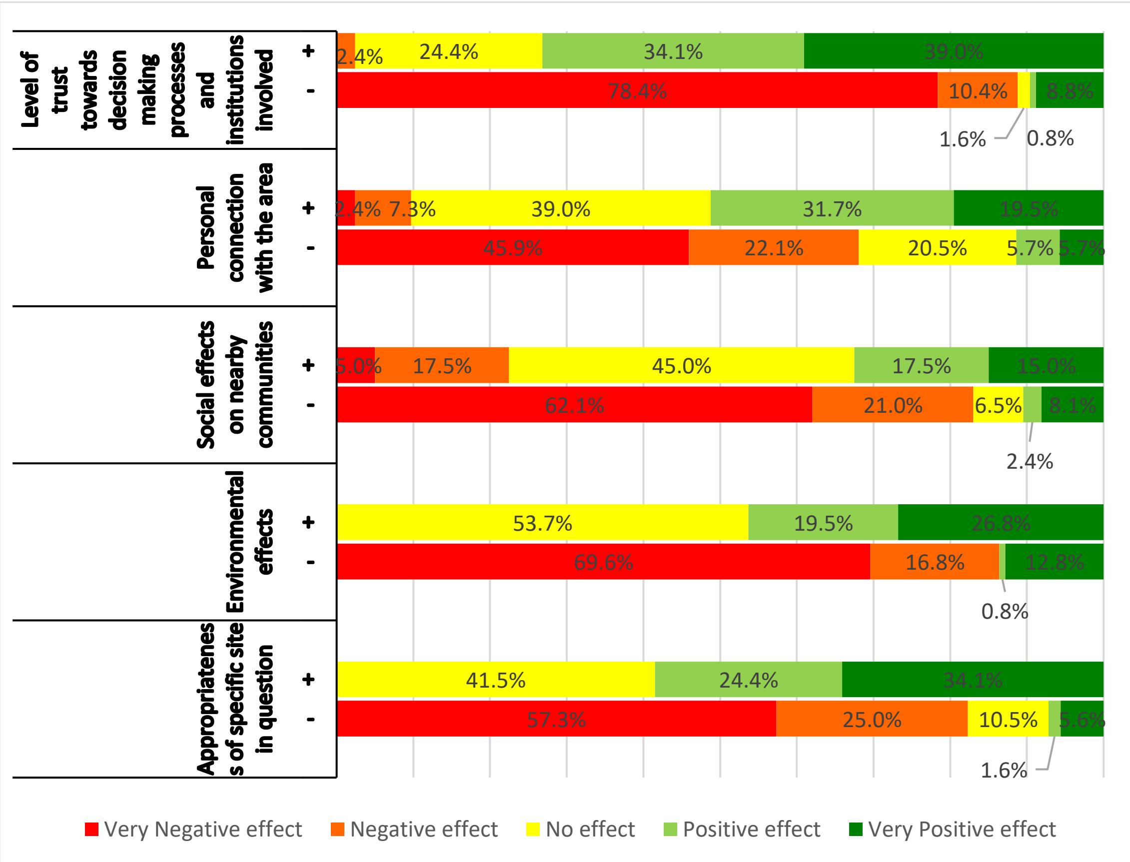

Figure 4.28 Reasons for residents' attitudes towards fracking by attitude

Table 4.12 **Mann-Whitney tests– Reasons between residents with positive and negative attitudes towards fracking**			
Reason	**n**	**Mann-Whitney U**	**P-Value**
i) Appropriateness of the site	165	4,691.5	<0.001
ii) Environmental effects	166	4,531	<0.001
iii) Social effects on nearby communities	164	4,134.5	<0.001
iv) Personal connection with their area	163	4,162	<0.001
v) Level of trust towards decision-making processes and institutions involved	166	4,725.5	<0.001

The majority of residents opposing fracking, in descending order, believed that their attitudes were shaped negatively by their 'trust towards decision-making processes and institutions' (88.8%), 'environmental effects' (86.4%), 'social effects on communities' (83.1%), 'the appropriateness of the site' (82.3%), and 'personal connection with their area' (68%). As opponents' views on appropriateness of local sites aligned with their fracking attitudes, the study did not detect 'anti-project' resistance as an alternative NIMBY explanation (Wolsink, 2000). In contrast, most residents supporting fracking found these reasons to have a positive or no effect on their attitudes. For those who saw these factors positively, their importance was assessed similarly, except for their 'personal connection with their area' (51.2%), which ranked third. However, a greater proportion of residents opposing (20.5%) and supporting (39%) fracking considered this to factor to have no bearing on their attitudes.

Figure 4.29 shows Lancashire and North Yorkshire residents' responses to these contributing reasons. Mann-Whitney tests (Table 4.13) showed no significant difference in residents' responses to the 'appropriateness of the site' and their 'personal connection with their area'.

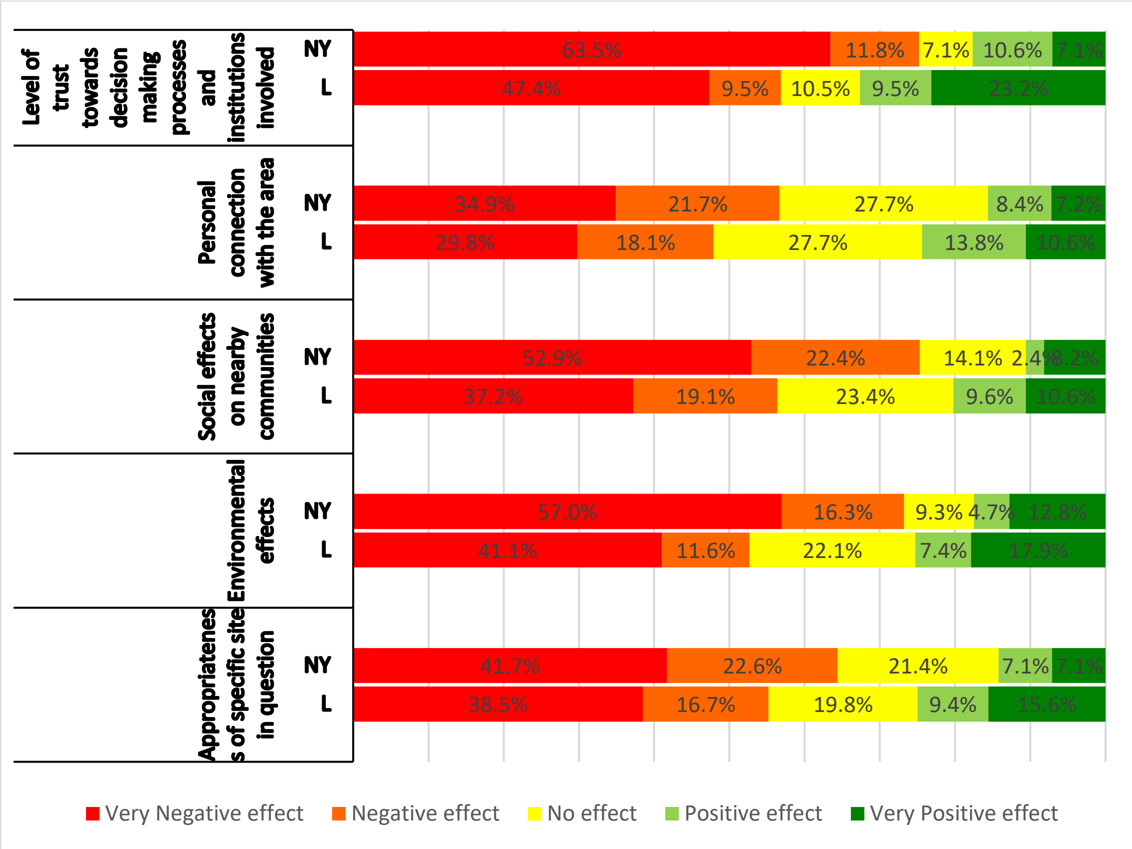

Figure 4.29 Reasons for residents' attitudes towards fracking by case study

Table 4.13 **Mann-Whitney tests– Reasons for residents' attitudes towards fracking between North Yorkshire and Lancashire case studies**			
Reason	**n**	**Mann-Whitney U**	**P-Value**
i) Appropriateness of the site	180	3,617.5	0.215
ii) Environmental effects	181	3,312	0.019
iii) Social effects on nearby communities	179	3,173.5	0.012
iv) Personal connection with their area	177	3,473.5	0.194
v) Level of trust towards decision-making processes and institutions involved	182	3,184.5	0.007

However, 15.9% and 15.7% more North Yorkshire residents believed environmental and social effects had a very negative effect on their attitude, while 12.8% and 9.3% more Lancashire residents found these to have no impact. The percentage of North Yorkshire residents who believed trust towards decision-making processes and institutions had a very negative effect on their views was greater by 16.1%, while 16.1% more Lancashire residents said this had a very positive effect.

Table 4.14 shows significant correlations between all reason variables and residents' attitudes towards fracking, with the first four being moderate and trust in decision-making processes and institutions being strong. The positive correlations confirm that residents opposing fracking were more likely to rate the effect of these reasons negatively. Weak negative correlations appeared between case-study location and 'trust towards decision-making processes and institutions' and environmental and social effects, with the former factor being of high statistical significance. This indicated that Lancashire residents were more likely to see these reasons having a positive effect on their attitudes.

Table 4.14 **Spearman Correlation– Reasons towards fracking with residents' attitude and case study**

	Attitude			**Case study**		
Reason	**n**	**r_s**	**P-Value**	**N**	**r_s**	**P-Value**
i) Appropriateness of the site	165	.665**	<0.001	180	-0.093	0.216
ii) Environmental effects	166	.623**	<0.001	181	-.175*	0.018
iii) Social effects on nearby communities	164	.530**	<0.001	179	-.188*	0.012
iv) Personal connection with their area	163	.517**	<0.001	177	-0.098	0.195
v) Level of trust towards decision-making processes and institutions involved	166	.710**	<0.001	180	-.201**	0.007

* Correlation is significant at the 0.05 level (2-tailed)
** Correlation is significant at the 0.01 level (2-tailed)

4.4 Perceptions of Justice in Shale-Gas Governance

4.4.1 Trust in Stakeholders

Figure 4.30[48] shows participants' trust in stakeholders involved in shale-gas governance. One-sample t-tests showed that most responses varied significantly from neutral viewpoints (P<0.001), except for trust towards other residents (P=0.102), and large (P=0.646) and local (P=0.326) environmental groups (Table 4.15).

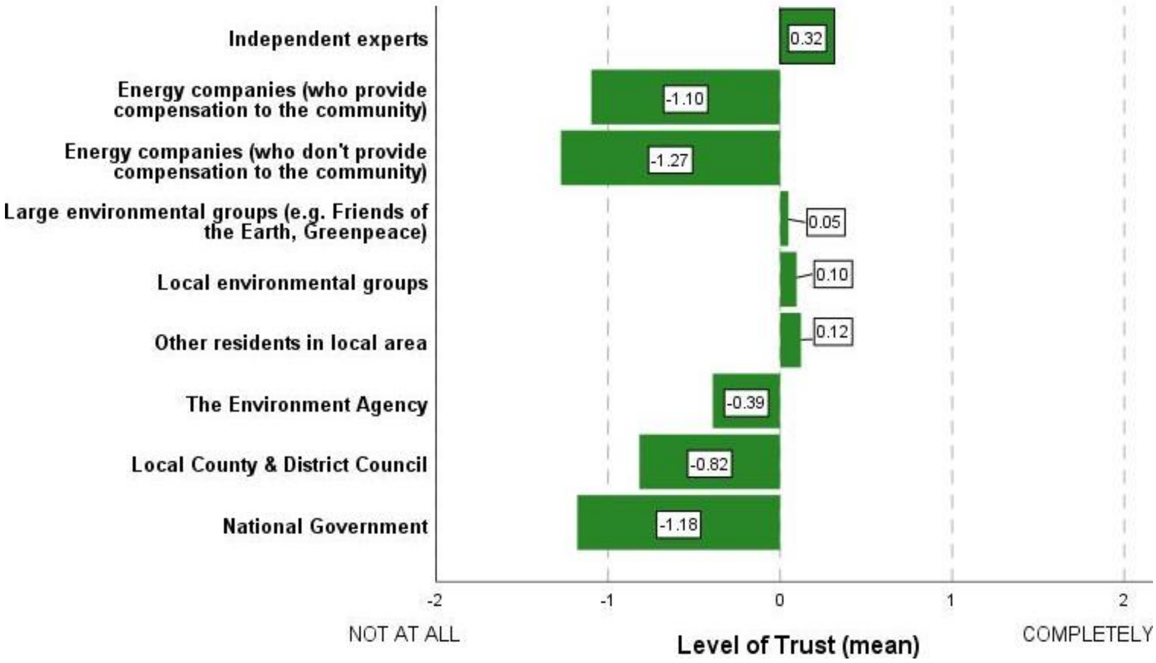

Figure 4.30 Participants' trust in stakeholders governing fracking

[48] Participants showed strong distrust towards the national government (x=-1.18, n=207), energy companies that did not provide compensation payments (x=-1.27, n=205), and those that did (x=-1.10, n=207). The latter statements were included to see whether compensating host communities affected trust towards energy companies. Although providing compensation led to a slight increase in trust, there was no statistically significant difference between mean scores (t= 1.473, df= 407, P=0.141). Participants also mistrusted their county and district councils (x=-0.82, n=208), and, to a lesser extent, the Environment Agency (x=-0.39, n=207). Participants trusted independent experts the most (x=0.32, n=206), whereas neutral levels of trust existed towards other residents (x=0.12, n=206), local environmental groups (x=0.10, n=208) and large environmental groups (x=0.05, n=209).

Table 4.15 **One-sample t-tests– Trust in various stakeholders**				
Stakeholders	**Mean**	**T-test**	**Df**	**P-value**
i) National Government	-1.18	-13.232	206	<0.001
ii) Local County & District Council	-0.82	-10.746	207	<0.001
iii) The Environment Agency	-0.39	-4.374	206	<0.001
iv) Other residents in local area	0.12	1.645	205	0.102
v) Local environmental groups	0.10	0.985	207	0.326
vi) Large environmental groups (e.g. Friends of the Earth)	0.05	0.46	208	0.646
vii) Energy companies (that don't provide compensation to the community)	-1.27	-16.314	204	<0.001
viii) Energy companies (that provide compensation to the community)	-1.10	-12.902	206	<0.001
ix) Independent experts	0.32	4.387	205	<0.001

Table 4.16 shows that residents' responses followed the same ranking with minor mean score differences (X_R). Mean scores for Lancashire residents (X_L) were lower than X_R scores while displaying slight distrust towards environmental groups. However, mean scores for North Yorkshire residents (X_{NY}) were higher than X_R scores in absolute values, showing more trust towards environmental groups and independent experts and more distrust towards government bodies and energy companies. Figure 4.31 shows opponents and supporters' trust in different stakeholders.

Table 4.16 **Descriptive statistics–Residents' trust in stakeholders governing fracking**							
Stakeholders	**All Residents**			**Residents/ Attitude**		**Residents/ Case study**	
	X_R	Std_R	N_R	X_+	X_-	X_L	X_{NY}
i) National Government	-1.20	1.27	181	0.57	-1.88	-1.01	-1.42
ii) Local County & District Council	-0.83	1.10	182	-0.38	-1.03	-0.49	-1.21
iii) The Environment Agency	-0.42	1.26	181	0.95	-0.86	-0.24	-0.62
iv) Other residents in local area	0.15	1.07	180	-0.41	0.39	0.08	0.23
v) Local environmental groups	0.14	1.38	182	-1.26	0.7	-0.17	0.49
vi) Large environmental groups (e.g. Friends of the Earth)	0.07	1.49	183	-1.83	0.78	-0.26	0.43
vii) Energy companies (that don't provide compensation to the community)	-1.28	1.12	179	0.07	-1.8	-1.02	-1.56
viii) Energy companies (that provide compensation to the community)	-1.09	1.24	181	0.57	-1.66	-0.83	-1.38
ix) Independent experts	0.29	1.03	180	0.48	0.19	0.24	0.34

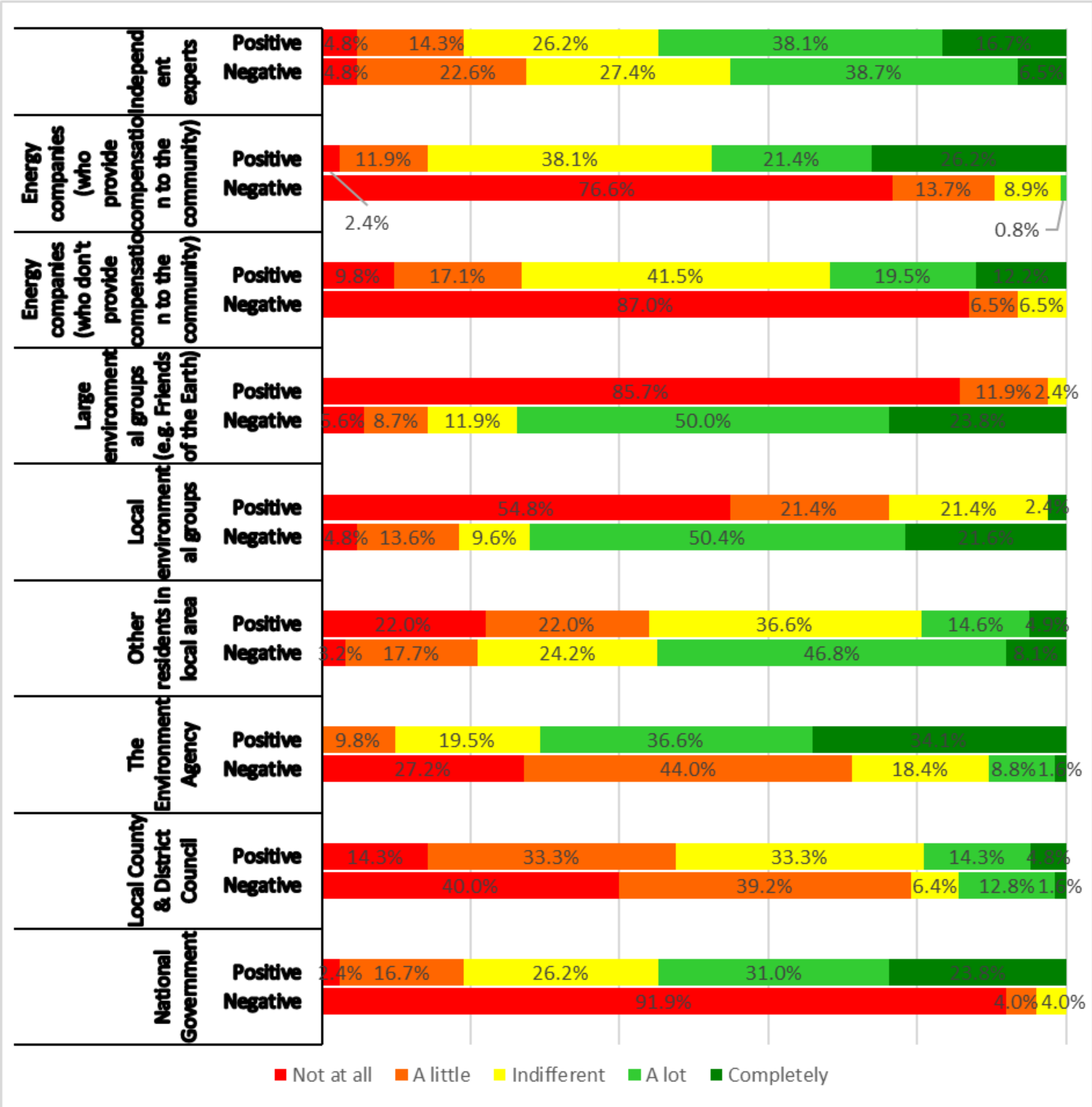

Figure 4.31 Residents' trust in stakeholders governing fracking by attitude

Mann-Whitney tests (Table 4.17) confirmed significant differences in opponents and supporters' responses, except for trust towards independent experts, which was high in both groups (see also TNS BMRB, 2014). Concurring with the literature on perceptions of fracking (Jacquet, 2014; TNS BMRB, 2014; Thomas et al., 2017a; 2017b; Williams et al., 2015), opponents expressed greater mistrust of the national government (95.9%), the local and district councils (79.2%), the Environment Agency (71.2%), and energy companies that did and did not provide compensation (90.3%/93.5%). However, supporters showed higher trust in the national government (53.8%), Environment Agency (70.7%), and energy companies (31.7%/47.6%) but did not trust local and large environmental groups (76.2% & 97.6%) and other local residents (44%). Some also showed some distrust towards local and district councils, perhaps indicating a disapproval of Lancashire Council's decision to reject Cuadrilla's initial planning application. (28%).[49]

Table 4.17 **Mann-Whitney tests– Trust in stakeholders governing fracking between residents with positive and negative attitudes**

Stakeholders	n	Mann-Whitney U	P-Value
i) National Government	166	5,061	<0.001
ii) Local County & District Council	167	3,573	<0.001
iii) The Environment Agency	166	4,548.5	<0.001
iv) Other residents in local area	165	1,516	<0.001
v) Local environmental groups	167	572	<0.001
vi) Large environmental groups (e.g. Friends of the Earth)	168	214	<0.001
vii) Energy companies (that do not provide compensation)	164	4,613	<0.001
viii) Energy companies (that provide compensation to the) community	166	4,920.5	<0.001
ix) Independent experts	166	2,999	0.125

Figure 4.32 presents case-study residents' trust in stakeholders governing fracking.

[49] Other distribution differences resulted from residents who held positive attitudes towards fracking but expressed indifferent views towards local and district councils (33.3%), other local residents (36.6%), and energy companies with or without compensation (38.1%/41.5%).

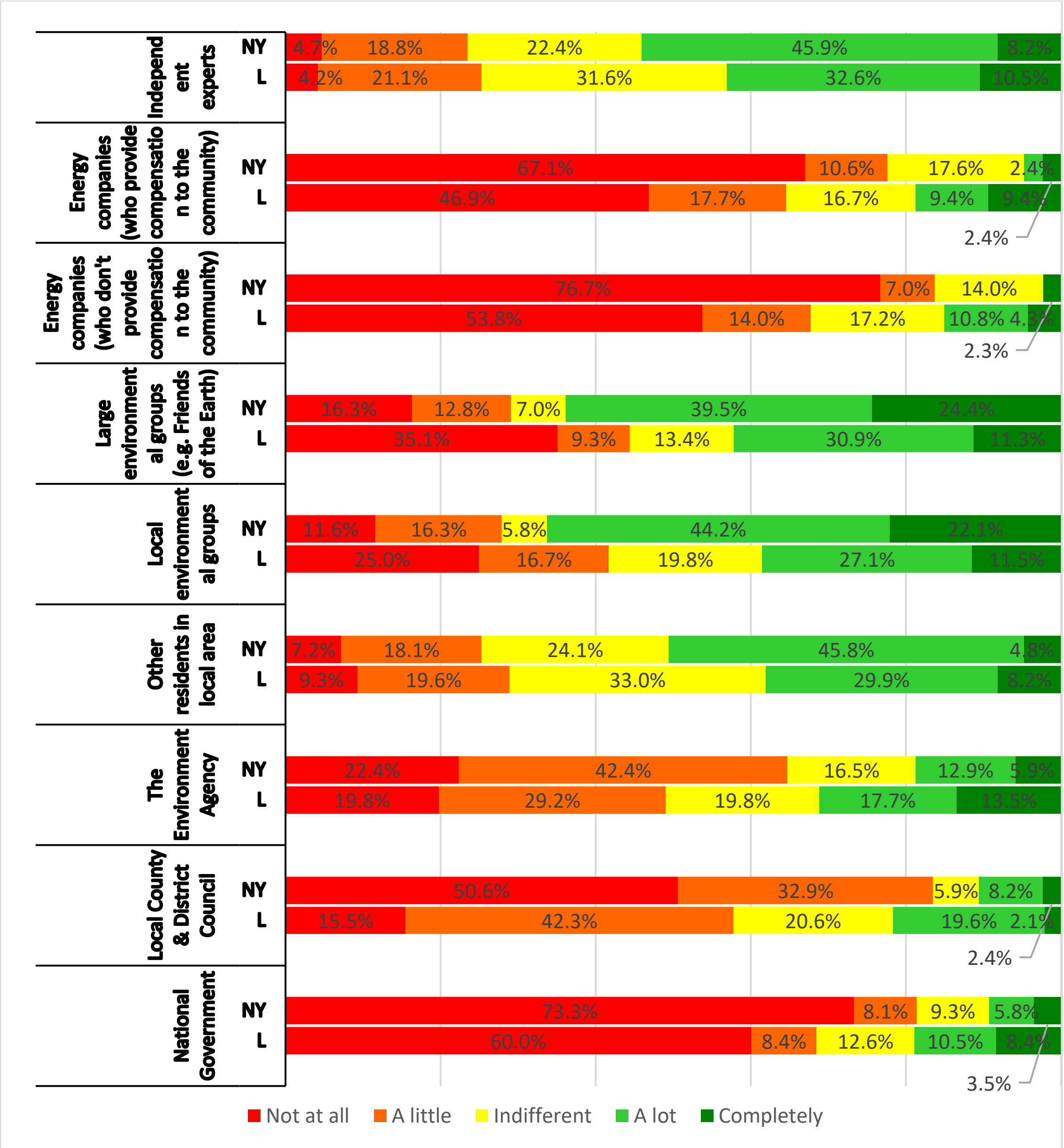

Figure 4.32 Residents' trust in stakeholders governing fracking by case study

Mann-Whitney tests (Table 4.18) found significant differences in trust between the case studies possibly due to more Lancashire residents supporting fracking and more North Yorkshire residents opposing it. For example, Lancashire residents were more trusting towards national government (9.6%) and local/ district councils (11.4%), while more did not trust local/ national environmental groups (13.4%/18.8%) or were indifferent (14%/14.7%). Other significant differences were found for statements about energy companies, where Lancashire residents expressed more trust in companies regardless of whether they provided compensation. The proportion of Lancashire residents who expressed trust in companies that did not provide compensation was greater by 10.8% and no North Yorkshire resident shared this view. Overall trust in companies that offered compensation was higher for Lancashire residents by 14%. 20.2% more North Yorkshire residents said they did not trust companies that provide compensation, while their mistrust was greater by 22.9% towards companies that did.

Table 4.18 **Mann-Whitney tests– Trust in stakeholders governing fracking between Lancashire and North Yorkshire residents**

Stakeholders	n	Mann-Whitney U	P-Value
i) National Government	181	3,473.5	0.39
ii) Local County & District Council	182	2,437	<0.001
iii) The Environment Agency	181	3,426	0.055
iv) Other residents in local area	180	4,387.5	0.278
v) Local environmental groups	182	5,271	0.001
vi) Large environmental groups (e.g. Friends of the Earth)	183	5,294	0.001
vii) Energy companies (that don't provide	179	3,023	0.001
viii) Energy companies (that provide compensation to the community)	181	3,162	0.004
ix) Independent experts	180	4,313.5	0.408

Spearman correlation tests showed significant correlations between attitudes towards fracking and trust in stakeholders, except for independent experts (Table 4.19). These were strong for national government, large environmental groups, and energy companies; moderate for the EA, local residents and environmental groups; and weak for local government. Positive and negative correlations indicated that fracking supporters were more likely to trust national and local governments, the EA, and energy companies, and more likely to distrust environmental groups and other local residents. Weak correlations were found between case-study location and residents' trust in national and local governments, environmental groups, and energy companies. Negative correlations showed that North Yorkshire residents were more likely to distrust national and local governments, and energy companies, while positive results showed that Lancashire residents trusted local and large environmental groups less, and vice versa.

Table 4.19 **Spearman correlation–Trust in stakeholders governing fracking with residents' attitude and case study**

	Attitude			Case study		
Stakeholders	**n**	**r_s**	**P-Value**	**n**	**r_s**	**P-Value**
i) National Government	166	0.871**	<0.001	181	-0.154*	0.038
ii) Local County & District Council	167	0.285**	<0.001	182	-0.371**	<0.001
iii) The Environment Agency	166	0.599**	<0.001	181	-0.143	0.055
iv) Other residents in local area	165	-0.316**	<0.001	180	0.081	0.279
v) Local environmental groups	167	-0.609**	<0.001	182	0.247**	0.001
vi) Large environmental groups (e.g. Friends of the Earth)	168	-0.717**	<0.001	183	0.241**	0.001
vii) Energy companies (that do not provide compensation)	164	0.751**	<0.001	179	-0.248**	0.001
viii) Energy companies (that provide compensation to the) community	166	0.749**	<0.001	181	-0.216**	0.004
ix) Independent experts	166	0.12	0.125	180	0.062	0.409

* Correlation is significant at the 0.05 level; ** Correlation is significant at the 0.01 level. (2-tailed)

4.4.2 Perceptions of Justice

The next question explored participants' agreement with statements concerning distributive and procedural justice (Figure 4.33[50]). One-sample t-tests showed that each statement varied significantly from a neutral viewpoint (Table 4.20), except for statements that the 'energy company has engaged in discussions with the local community', and that 'a few people in the community would benefit from the development'.

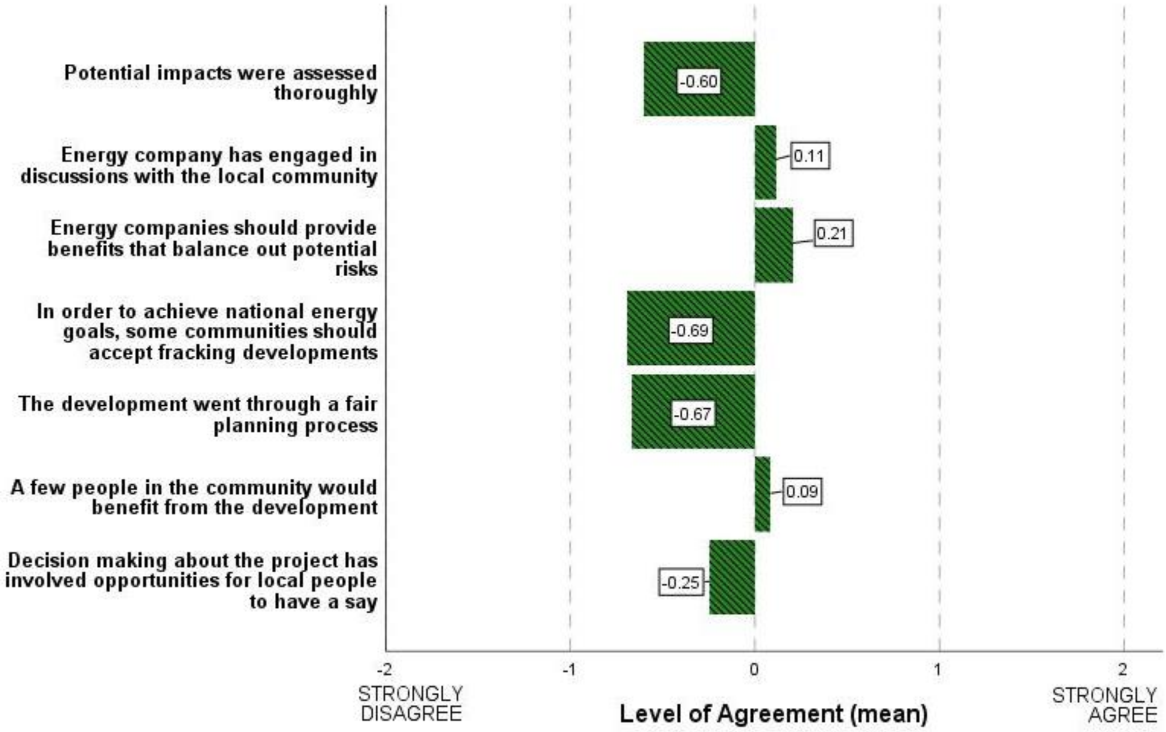

Figure 4.33 Respondents' agreement with justice-related statements

[50] The statement with the greatest positive agreement was that 'energy companies should provide benefits that balance out the potential risks' (x=0.21, n=205). Participants strongly disagreed that: 'to achieve national energy goals some communities should accept fracking developments' (x=0.69, n=209); 'the development went through a fair planning process' (x=-0.67, n=210); and, 'potential impacts were assessed thoroughly' (x=-0.60, n=210). They also disagreed 'that decision making about the project has involved opportunities for local people to have a say' (x=-0.25, n=208).

Table 4.20 **One-sample t-tests– Justice-related statements**				
Justice-related Statement	**Mean**	**T-test**	**df**	**P-value**
i) Decision making about the project has involved opportunities for local people to have a say	-0.25	-2.687	207	0.008
ii) A few people in the community would benefit from the development	0.09	1.009	209	0.314
iii) The development went through a fair planning process	-0.67	-6.684	209	<0.001
iv) In order to achieve national energy goals, some communities should accept fracking developments	-0.69	-6.269	208	<0.001
v) Energy companies should provide benefits that balance out potential risks	0.21	2.286	204	0.023
vi) Energy company has engaged in discussions with the local community	0.11	1.236	208	0.218
vii) Potential impacts were assessed thoroughly	-0.60	-5.688	209	<0.001

Resident's overall agreement with the fairness-related statements (X_R) again followed similar trends with minor mean score differences indicating slightly greater disagreement (Table 4.21). Contrary to the mean scores for residents with negative attitudes (x_-), mean scores for residents with positive attitudes (x_+) showed agreement with all justice-related statements. Differences in the mean scores between Lancashire (X_L) and North Yorkshire (X_{NY}) residents indicated that the former disagreed less with statements on procedural and distributive justice and agreed more with statements about energy companies' behaviour and people benefiting from the development.

Table 4.21 **Descriptive statistics– Residents' justice-related statements**							
Justice-related Statement	**All Residents**			**Residents/ Attitude**		**Residents/ Case study**	
	X_R	**Std_R**	**N_R**	**X_+**	**X_-**	**X_L**	**X_{NY}**
i) Decision making about the project has involved opportunities for local people to have a say	-0.31	1.32	182	0.81	-0.82	-0.01	-0.65
ii) A few people in the community would benefit from the development	0.09	1.25	184	0.17	-0.01	0.18	-0.02
iii) The development went through a fair planning process	-0.73	1.44	184	1.29	-1.48	-0.51	-0.98
iv) In order to achieve national energy goals, some communities should accept fracking developments	-0.7	1.58	183	1.57	-1.57	-0.35	-1.1
v) Energy companies should provide benefits that balance out potential risks	0.17	1.32	180	1.02	-0.16	0.37	-0.07
vi) Energy company has engaged in discussions with the local community	0.13	1.33	183	1.50	-0.44	0.31	-0.08
vii) Potential impacts were assessed thoroughly	-0.66	1.52	184	1.5	-1.51	-0.30	-1.08

Figure 4.34 shows residents' responses to justice-related statements grouped by positive and negative attitude towards fracking.

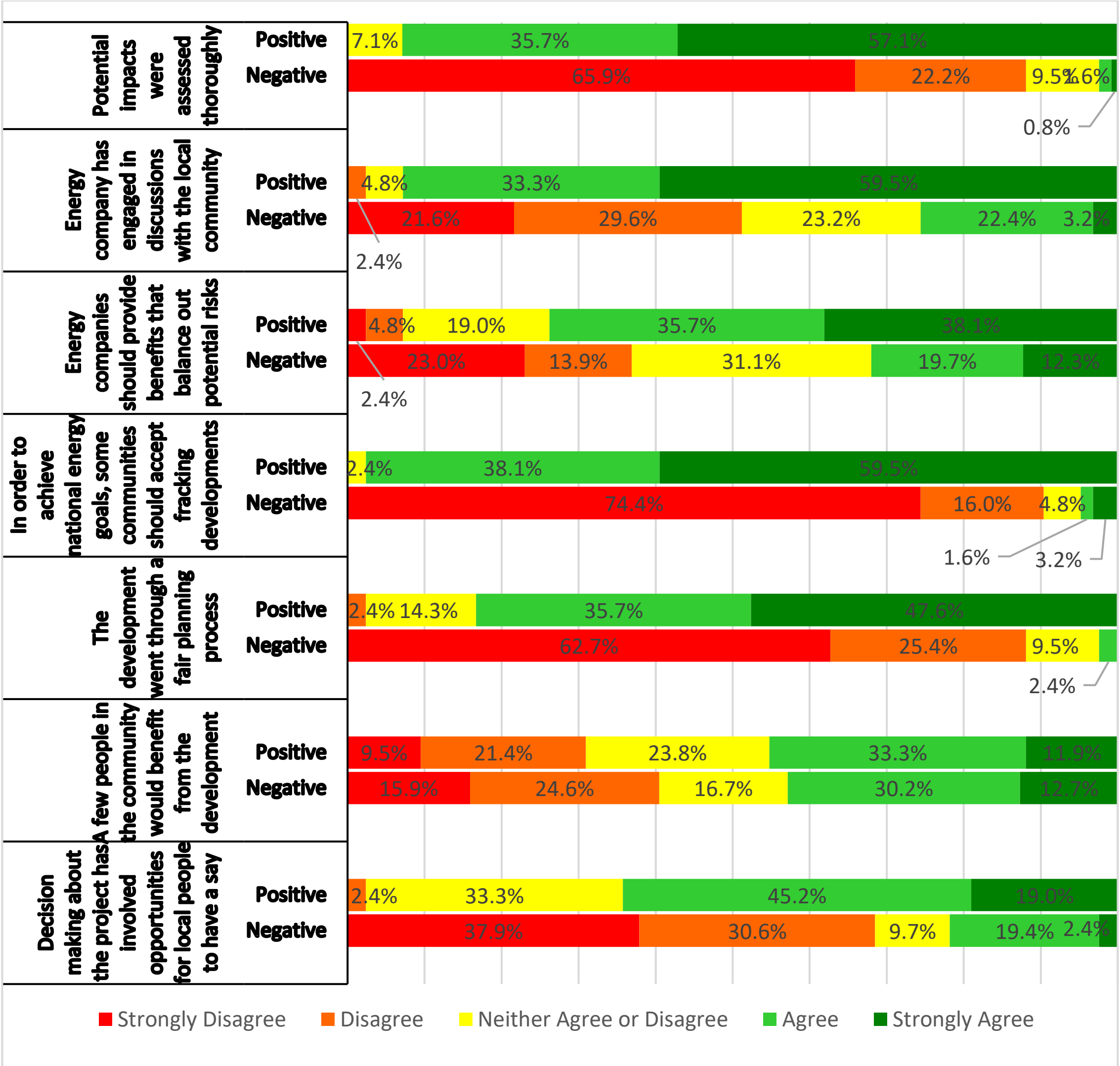

Figure 4.34 Justice-related statements by residents' attitude

Mann-Whitney tests confirmed significant differences in responses to all justice-related statements between opponents and supporters, except for 'a few people in the community would benefit from the development', highlighting polarised opinions (Table 4.22). Overall, residents opposing/supporting fracking disagreed/agreed that: locals had a say in decision-making (68.5%/64.2%); there was a fair planning process (88.1%/83.3%); communities should accept fracking to achieve national energy goals (90.4%/97.6%); 'energy companies should provide benefits that balance out potential risks' (36.9%/73.8%); 'energy company has engaged in discussions with the local community' (51.2%/92.8%); and, 'potential impacts were assessed thoroughly' (88.1%/92.8%).

Reflecting on opponents' ambivalence that local people had a say in decision-making process, energy companies' engagement with communities, and industry balancing risks with benefits, it is possible that some saw the opportunities for participation in decision-making processes as inadequate but recognised they were engaged to some extent (Haggett, 2011; Cotton, 2013; Cotton et al., 2014). Opponents' views suggested a desire for greater distributive justice, while their higher disagreement with the provision of benefits perhaps indicated that financial benefits were perceived as bribery or could not outweigh the risks of fracking (Cass et al., 2010; Cotton, 2012; TNS BMRB, 2014; Cotton et al., 2014; Whitmarsh et al., 2015). Mixed and similar distributed responses about a few people in the community benefitting from the development could perhaps be attributed to ambiguity in this statement, with residents interpreting it that either some local benefits would accrue or that only a few residents would benefit.

Table 4.22 **Mann-Whitney tests– Justice-related statements between residents with positive and negative attitudes towards fracking**

Justice-related Statement	n	Mann-Whitney U	P-Value
i) Decision making about the project has involved opportunities for local people to have a say	166	4,391	<0.001
ii) A few people in the community would benefit from the development	168	2,838.5	0.468
iii) The development went through a fair planning process	168	5,184.5	<0.001
iv) In order to achieve national energy goals, some communities should accept fracking developments	167	5,111	<0.001
v) Energy companies should provide benefits that balance out potential risks	164	3,856	<0.001
vi) Energy company has engaged in discussions with the local community	167	4,775.5	<0.001
vii) Potential impacts were assessed thoroughly	168	5,223	<0.001

Figure 4.35 further demonstrates North Yorkshire and Lancashire residents' responses to these justice-related statements.

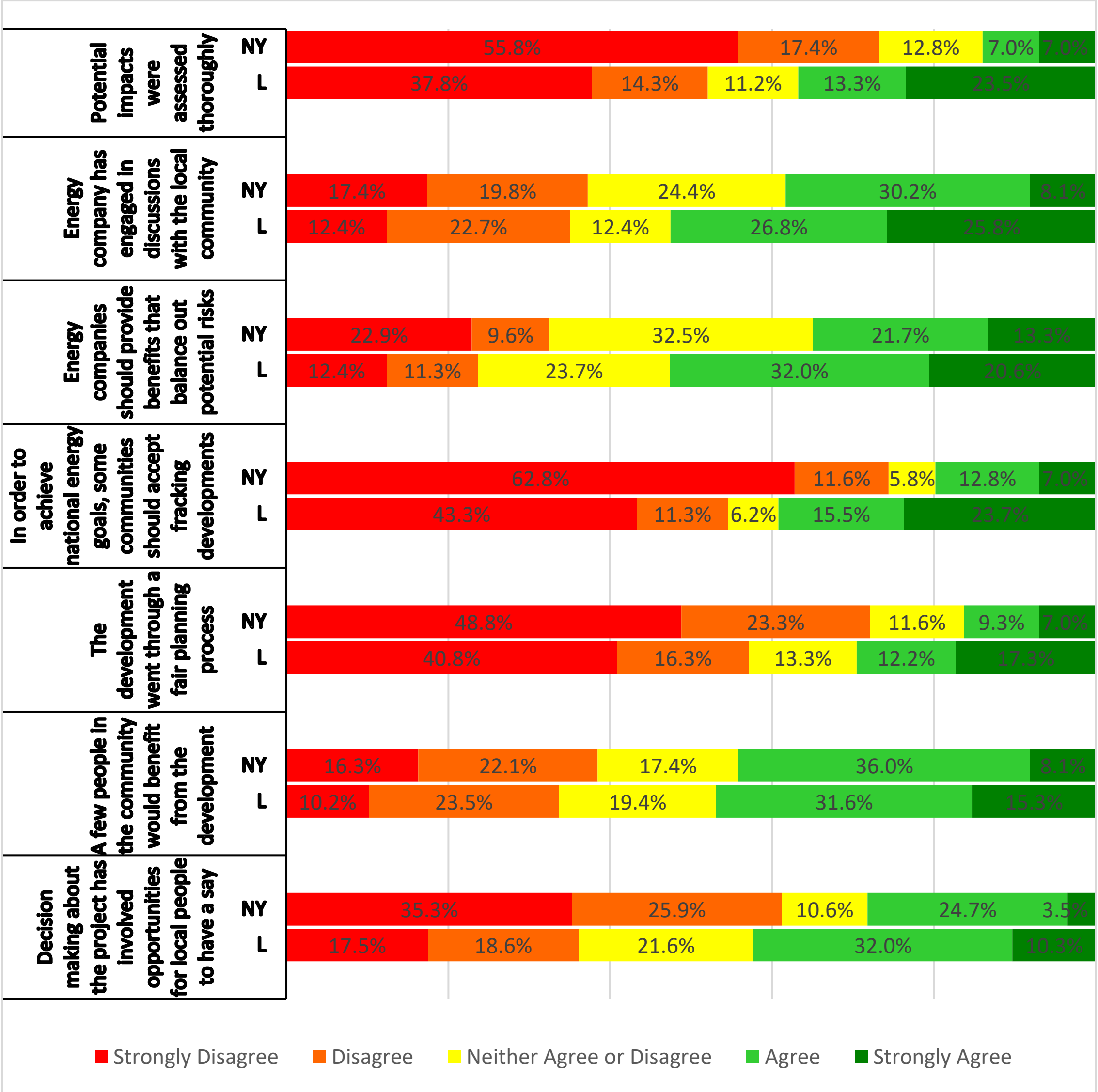

Figure 4.35 Justice-related statements by residents' case study

Mann-Whitney tests (Table 4.23) revealed that more North Yorkshire residents were generally negative more participants about locals having a say (17.8%); accepting fracking to achieve national energy goals (19.5%); that 'energy companies should provide benefits that balance out potential risks' (10.5%); and, that 'impacts were assessed thoroughly' (18%). Additionally, 12% more North Yorkshire residents said they neither agreed nor disagreed that 'the energy company had engaged with the local community'. Conversely, more Lancashire residents agreed or were indifferent to these statements.

Table 4.23 **Mann-Whitney tests– Justice-related statements between Lancashire and North Yorkshire residents**			
Justice-related Statement	**n**	**Mann-Whitney U**	**P-Value**
i) Decision making about the project has involved opportunities for local people to have a say	182	3,014	0.001
ii) A few people in the community would benefit from the development	182	3,842	0.287
iii) The development went through a fair planning process	184	3,562	0.056
iv) In order to achieve national energy goals, some communities should accept fracking developments	183	3,133.5	0.002
v) Energy companies should provide benefits that balance out potential risks	180	3,249.5	0.022
vi) Energy company has engaged in discussions with the local community	183	3,446.5	0.038
vii) Potential impacts were assessed thoroughly	184	3,099.5	0.001

Statistically significant positive correlations were found between residents' attitude towards fracking and all justice-related statements, except for 'a few people in the community would benefit', confirming that residents opposing fracking were less likely to disagree (Table 4.24). These were stronger for 'fair planning process', accepting fracking 'to achieve national energy goals, and energy company's engagement with the local community; and moderate for locals 'having a say', companies 'balancing out potential risks', and 'impacts were assessed thoroughly'. However, weak negative correlations between residents' location and justice-related statements indicated that North Yorkshire residents were more likely to disagree with locals having a say, accepting fracking 'to achieve national energy goals', companies 'balancing out potential risks', and energy companies' engagement with the local community.

Table 4.24 **Spearman correlation– Justice-related statements with residents' attitude and case study**						
	Attitude			**Case study**		
Justice-related Statement	**n**	**r_s**	**P-Value**	**n**	**r_s**	**P-Value**
i) Decision making about the project has involved opportunities for local people to have a say	178	0.532**	<0.001	182	-0.239**	0.001
ii) A few people in the community would benefit from the development	180	0.056	0.47	184	-0.079	0.288
iii) The development went through a fair planning process	180	0.765**	<0.001	184	-0.141	0.056
iv) In order to achieve national energy goals, some communities should accept fracking developments	179	0.786**	<0.001	183	-0.234**	0.001
v) Energy companies should provide benefits that balance out potential risks	176	0.392**	<0.001	180	-0.171*	0.022
vi) Energy company has engaged in discussions with the local community	179	0.630**	<0.001	183	-0.154*	0.038
vii) Potential impacts were assessed thoroughly	180	0.783**	<0.001	184	-0.242**	0.001
* Correlation is significant at the 0.05 level (2-tailed) ** Correlation is significant at the 0.01 level (2-tailed)						

4.5 Perceptions of Place, Environment and Fracking

4.5.1 Perceptions of Place and Disruption

Participants were asked whether they were members of environmental, political, community or other groups to explore their social engagement with the area and identify any membership of anti-fracking groups. 42 Lancashire and 40 North Yorkshire residents said they were members of groups, such as local parishes, churches, sports clubs, or farming unions (Table 4.25). 9% more North Yorkshire residents mentioned anti-fracking connections and 5% reported being members of an anti-protest group compared with none in Lancashire. Political affiliation (e.g., the Labour or Green parties) was 8.7% higher in Lancashire. Residents supported larger environmental groups (e.g., Friends of the Earth and RSPB) in both areas, but were more likely to engage with local and county-level anti-fracking groups. Nevertheless, activism was only reported by 15.6% of residents who completed the surveys, suggesting that any participation bias was unlikely and that the negative attitudes found in the areas are indicative of people living in those counties, rather than just those actively opposing the technology.

Table 4.25 Residents' group membership in case-study areas

Type of group		**% of Residents**	
	Total (n=82)	**Lancashire (n=42)**	**North Yorkshire (n=40)**
Community	43.9	38.1	50
Anti-fracking	35.4	31.0	40
Environmental	24.4	28.6	20
Political	22.0	26.2	17.5
International humanitarian	3.7	7.1	0
Anti-protesters	2.4	0	5

The survey asked participants to describe up to three of the most positive and three most negative features of their areas or communities. 96.8% volunteered positive features, which were merged into six key features (Table 4.26)[51].

Table 4.26 Residents' Perceptions of positive features of the local area			
Positive features	**% of Residents**		
	Total (n=158)	**Lancashire (n=85)**	**North Yorkshire (n=73)**
1. Rurality and Natural Beauty	75.3	76.5	74.0
2. Way of Life	59.5	56.5	63.0
Sense of community & belonging	31.7	23.5	41.1
Quality & Local Values	29.1	35.3	21.9
Peace & Quiet	10.1	10.6	9.6
3. Accessibility & Amenities	26.0	29.4	21.9
4. Safety & Low Crime Rate	8.2	4.7	12.3
5. Local Sectors	5.7	7.1	4.1
Farming	3.2	3.5	2.7
Tourism	3.2	4.7	1.4
6. History and culture	5.1	4.7	5.5
Total (unique)	96.8	94.1	100

Many residents liked both the physical and social features of their areas. The top three positive features were 'rurality and natural beauty' (75.3%), 'way of life' (59.5%), and 'accessibility & amenities' (26%), ranked the same in both areas. All residents talked about the rural character of their areas, the openness of the countryside, the beauty of the landscape, wildlife, and clean air. One minor difference was that some Lancashire residents described their area as "semi-rural" (*Respondent_6794098285*) and highlighted the beauty of the nearby coast.

'Way of life' consisted of three sub-features, the first two of which were ranked in reverse order between the case studies; 41.1% of North Yorkshire residents described 'sense of community & belonging' as of high importance; Lancashire residents

[51] Codes with more than three answers were included.

emphasised ‘quality & local values’ and the importance of traditional and family values (35.3%). Local ‘peace & quiet’ was equally valued. Residents appreciated their proximity to town/cities and amenities, though some Lancashire residents also highlighted the accessibility of motorways and transport links (*Respondent_6673013443*), and some North Yorkshire residents mentioned walking routes (*NY130*). Some residents also appreciated their area’s ‘safety & low crime rate’, ‘history and culture’, and local economic sectors such as farming and tourism.

Table 4.27 shows that proportionately fewer residents described negative features of their areas. Eight deprivation issues were merged and ranked as the most negative overall feature (38.6%). Individually, however, fracking, (ranked in second place overall) was the most adverse aspect in both areas (20% in Lancashire and 23.3% in North Yorkshire), indicating that the technology had already affected residents’ perceptions of their areas. Variations were noted in ‘deprivation’ sub-features; while ‘limited local facilities’ and ‘limited public transport’ were the highest among deprivation issues in both areas. These figures were slightly higher in North Yorkshire (by 5.7% and 3.5%). Lancashire residents emphasised their area’s ‘poverty & economic decline’ (9.4%), ‘lack of work opportunities’ (7.1%), and ‘alcohol & drugs-use’ problem (4.7%), whereas North Yorkshire participants complained more about ‘poor broadband’ and ‘house affordability & homelessness’ (8.7% each).

Table 4.27 Residents' Perceptions of negative features of the local area			
Negative features	**% of Residents**		
	Total (n=158)	**Lancashire (n=85)**	**North Yorkshire (n=73)**
1. Deprivation	38.6	38.8	38.4
Limited Local Facilities	12.0	9.4	15.1
Limited Public Transport	10.8	9.4	12.3
Poverty & Economic Decline	7.0	9.4	4.1
Poor broadband	6.3	4.7	8.2
House Affordability & Homelessness	5.7	3.5	8.2
Lack of Investment & Funding	5.1	5.9	4.1
Lack of Work Opportunities	5.1	7.1	2.7
Alcohol & Drugs Use	3.2	4.7	1.4
2. Fracking	21.5	20.0	23.3
3. Local Mind-set and Behaviour	13.3	8.2	19.2
Insularity	7.0	5.9	8.2
Lack of Environmental Awareness/Protection	3.8	2.4	5.5
Lack of Diversity	3.2	0.0	6.9
4. Traffic	12.7	14.1	11.0
5. Politics	11.4	8.2	15.1
Conservatives	6.3	2.4	11.0
Councils	3.2	3.5	2.7
Inadequacy	1.9	2.4	1.4
6. Road Condition	11.4	8.2	15.1
7. Urbanisation	8.9	11.8	5.5
8. Rural Isolation	7.6	5.9	9.6
9. Fracking Protesters	5.7	8.2	2.7
10. Landscape	2.5	3.5	1.4
Total (unique)	85.4	84.7	86.3

The ranking of other features differed between the two areas. 'Local mind-set and behaviour' came third overall (13.3%) and for North Yorkshire residents (19.2%), for whom all three sub-features were more important: 'insularity' (8.2%), 'lack of environmental awareness & protection' (5.5%), and 'lack of diversity' (6.9%). For Lancashire residents, 'traffic' was the third listed negative feature (14.1%) with some mentioning increases in heavy goods vehicles, whereas, for North Yorkshire residents, poor 'road conditions' and maintenance preceded traffic issues. Finally, 'fracking protesters' were mentioned as negative features in both areas, but by 6% more Lancashire residents.

Figure 4.36[52] shows participants' responses to 18 statements on their sense of place[53]. Most had positive bonds with their areas and agreed with positive place statements and disagreed with negative ones. One-sample t-tests showed that all responses varied significantly from the neutral point, except for participants being tied to the area by employment (Table 4.28).

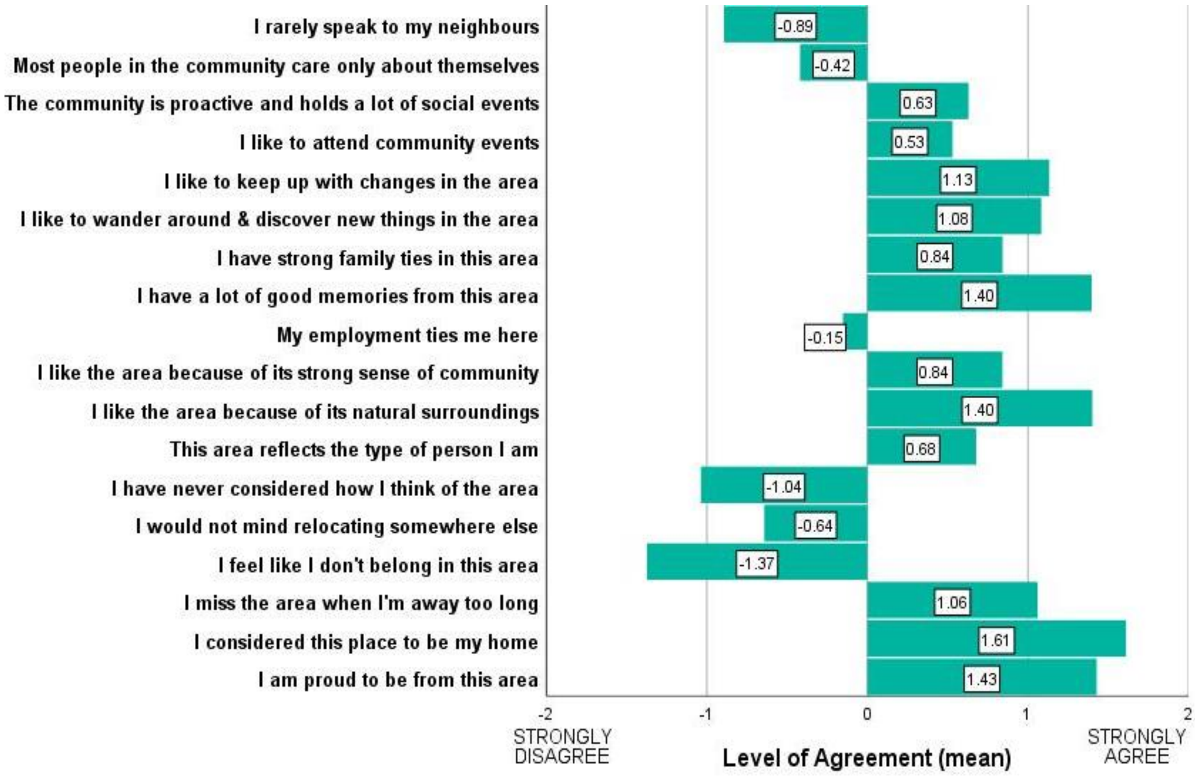

Figure 4.36 Respondents' agreement with place-related statements

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[52] The statements with the strongest agreement were participants: 'considering the area to be their home' (x=1.61, n=203); 'being proud to be from the area' (x=1.43, n=201); 'liking it because of its natural surroundings' (x=1.40, n= 207); 'having a lot of good memories' (x=1.40, n=204); 'liking to keep up with changes in the area' (x=1.13, n=204); 'liking to wander around and discover new things in the area' (x=1.08, n=205); and, 'missing the area when they were away for a long time' (x=1.06, n=199). These were followed by 'having strong family ties in the area' (x=0.84, n=207); 'liking the area because of its strong sense of community' (x=0.84, n=196); 'the area reflecting the type of person they were' (x=0.68, n=202); 'community being proactive and holding social events' (x=0.63, n=203); and, 'liking to attend community events' (x=0.53, n=200). The statements with the strongest disagreement concerned participants 'feeling they do not belong in their area' (x=-1.37, n=198) and 'never considering how they think of their area' (x=-1.04, n=191). These were followed by 'rarely talking to their neighbours' (x=-0.89, n=196); 'not minding relocating elsewhere' (x=-0.64, n=201); 'most people in the community only caring about themselves' (x=-0.42, n=205), and 'employment tying them to the area' (x=-0.15, n=178).

[53] For respondents with no connection with these areas a 'Not Applicable' (N/A) response was included and these answers were not included in the analysis.

Table 4.28 **One-sample t-tests– Place-related statements**				
Place-related Statement	**Mean**	**T-test**	**Df**	**P-value**
i) I am proud to be from this area	1.43	26.673	200	<0.001
ii) I consider this place to be my home	1.61	33.961	202	<0.001
iii) I miss the area when I'm away too long	1.06	16.573	198	<0.001
iv) I feel like I don't belong in this area	-1.37	-20.316	197	<0.001
v) I would not mind relocating somewhere else	-0.64	-7.502	200	<0.001
vi) I have never considered how I think of the area	-1.04	-15.386	190	0.011
vii) This area reflects the type of person I am	0.68	9.52	201	<0.001
viii) I like the area because of its natural surroundings	1.4	26.44	206	<0.001
ix) I like the area because of its strong sense of community	0.84	12.407	206	<0.001
x) My employment ties me here	-0.15	-1.542	177	0.125
xi) I have a lot of good memories from this area	1.4	27.004	203	<0.001
xii) I have strong family ties in this area	0.84	9.5	195	<0.001
xiii) I like to wonder around & discover new things in the area	1.08	18.229	204	<0.001
xiv) I like to keep up with changes in the area	1.13	20.912	203	<0.001
xv) I like to attend community events	0.53	7.518	199	<0.001
xvi) The community is proactive and holds a lot of social events	0.63	10.246	202	<0.001
xvii) Most people in the community care only about themselves	-0.42	-5.811	204	<0.001
xviii) I rarely speak to my neighbours	-0.89	-11.911	195	<0.001

The personal connection of non-residents with the local areas (e.g., family ties, former resident, tourist) supported arguments that positive feelings towards places are not necessarily restricted to residential bonds but were also exhibited by other people with interests in its features (Lewicka, 2014; Gustafson, 2001; 2014). Table 4.29 shows only minor differences in mean scores (X_R) that indicate slightly stronger bonds with their areas. Mean scores for residents with positive (X_+) and negative attitudes (X_-) to fracking varied less (Figure 4.37). However, mean scores among North Yorkshire residents (X_{NY}) were higher than for Lancashire residents (X_L) in absolute values, suggesting possible stronger sentiments about the area.

Table 4.29 **Descriptive statistics– Residents' place-related statements**							
Place-related Statement	All Residents			Residents/ Attitude		Residents/ Case study	
	X_R	Std_R	N_R	X_+	X_-	X_L	X_{NY}
i) I am proud to be from this area	1.45	0.75	183	1.55	1.42	1.44	1.47
ii) I consider this place to be my home	1.68	0.56	185	1.62	1.68	1.63	1.74
iii) I miss the area when I'm away too long	1.08	0.91	177	0.82	1.18	0.93	1.26
iv) I feel like I don't belong in this area	-1.41	0.95	178	-1.40	-1.42	-1.33	-1.50
v) I would not mind relocating somewhere else	-0.66	1.21	182	-0.65	-0.65	-0.49	-0.85
vi) I have never considered how I think of the area	-1.08	0.92	173	-0.82	-1.17	-0.95	-1.24
vii) This area reflects the type of person I am	0.69	1.02	181	0.61	0.69	0.48	0.92
viii) I like the area because of its natural surroundings	1.43	0.77	183	1.12	1.56	1.20	1.68
ix) I like the area because of its strong sense of community	0.84	1.01	184	0.64	0.93	0.69	1.00
x) My employment ties me here	-0.14	1.32	164	0.20	-0.33	-0.28	0.01
xi) I have a lot of good memories from this area	1.40	0.75	184	1.36	1.44	1.33	1.49
xii) I have strong family ties in this area	0.83	1.26	176	0.78	0.83	0.77	0.89
xiii) I like to wonder around & discover new things in the area	1.08	0.88	182	0.79	1.19	0.89	1.29
xiv) I like to keep up with changes in the area	1.13	0.79	182	1.17	1.11	1.08	1.19
xv) I like to attend community events	0.56	1.00	179	0.17	0.70	0.43	0.70
xvi) The community is proactive and holds a lot of social events	0.60	0.88	182	0.51	0.65	0.47	0.75
xvii) Most people in the community care only about themselves	-0.40	1.04	182	-0.07	-0.52	-0.22	-0.60
xviii) I rarely speak to my neighbours	-0.93	1.05	178	-0.62	-1.02	-0.78	-1.10

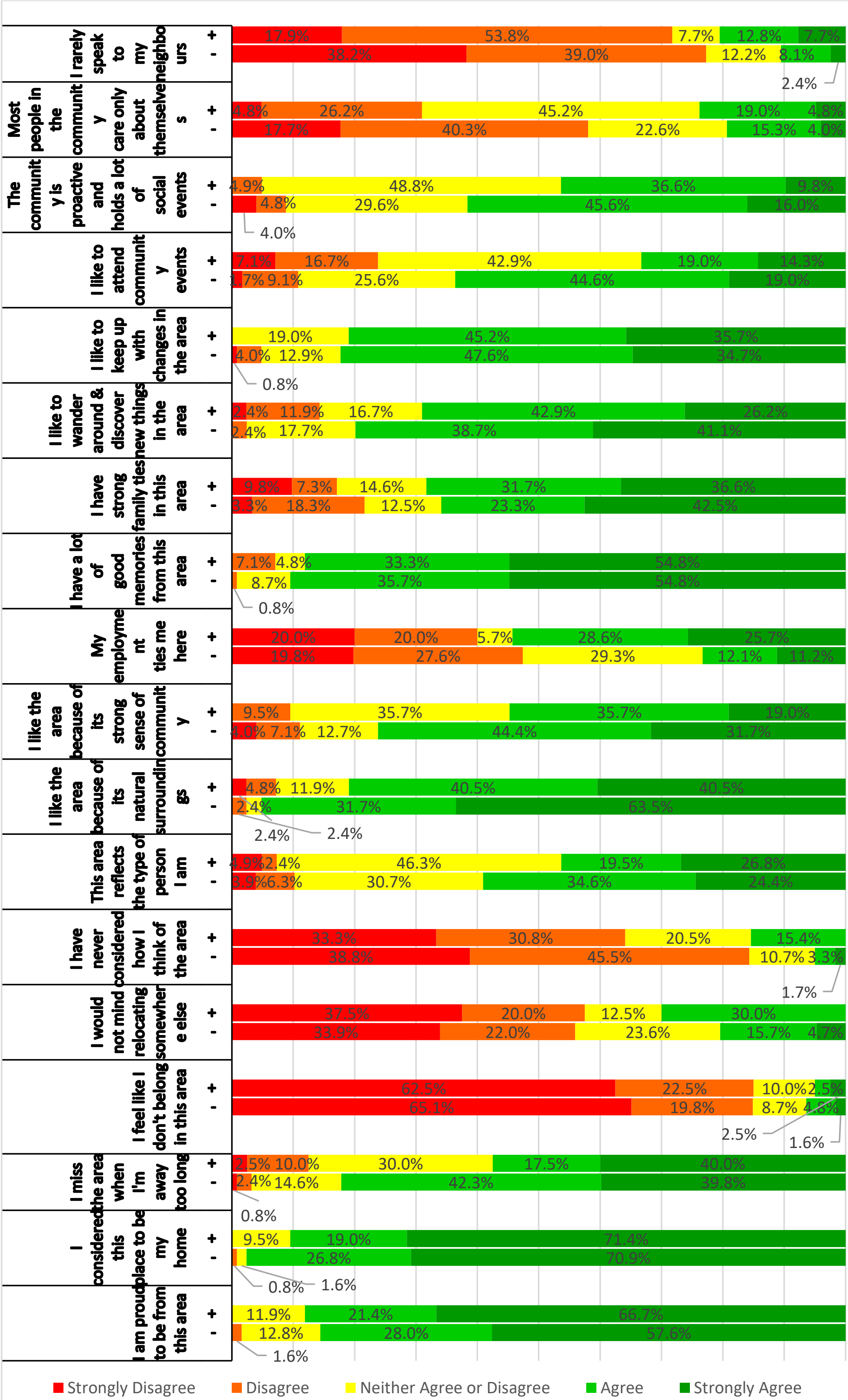

Figure 4.37 Place-related statements by residents' attitude to fracking

Differences in the distribution of residents' responses according to their attitude were detected only for liking area's 'natural surroundings', 'sense of community', 'to discover new things' and 'to attend community events', stating that they 'rarely speak to neighbours' and 'most people care only about themselves' (Table 4.30).

Table 4.30 Mann-Whitney tests– Place-statements between residents with positive and negative attitudes towards fracking			
Place-related Statement	**n**	**Mann-Whitney U**	**P-Value**
i) I am proud to be from this area	167	2,861.5	0.319
ii) I consider this place to be my home	169	2,628	0.858
iii) I miss the area when I'm away too long	163	0,078.5	0.117
iv) I feel like I don't belong in this area	166	2,571.5	0.819
v) I would not mind relocating somewhere else	167	2,540.5	0.998
vi) I have never considered how I think of the area	160	2,769.5	0.081
vii) This area reflects the type of person I am	168	2,450	0.553
viii) I like the area because of its natural surroundings	168	1,925.5	0.003
ix) I like the area because of its strong sense of community	168	2,086	0.03
x) My employment ties me here	151	2,443	0.062
xi) I have a lot of good memories from this area	168	2,602	0.856
xii) I have strong family ties in this area	161	2,386.5	0.765
xiii) I like to wander around & discover new things in the area	166	2,071	0.035
xv) I like to keep up with changes in the area	166	2,628	0.923
xvi) I like to attend community events	163	1,793.5	0.003
xvii) The community is proactive and holds a lot of social events	166	0,213.5	0.162
xviii) Most people in the community care only about themselves	166	3,292	0.008
xix) I rarely speak to my neighbours	162	2,902.5	0.036

23% more opponents strongly agreed with the appeal of 'natural surroundings', while supporters were more ambivalent (9.5%) or strongly disagreed (2.4%). Opponents showed stronger active attachments, with 14.9% more likely to agree strongly they 'liked to wander and discover new things in the area', while supporters were 11.9% more likely to disagree. Differences were also noted in residents' perceptions of their area's sense of community; more supporters were ambivalent about or disagreed with liking 'the area because of its strong sense of community' (23%/4%) and 'community events' (17.3%/13%), where 12.7% and 14.9% more opponents strongly agreed; 27% more opponents disagreed that 'most people in the community cared only about themselves' and 20.3% more strongly disagreed with 'rarely talking to their neighbours', while 5.3% more opponents strongly agreed with this statement.

However, the majority of residents had an overall positive relationship with their areas irrespective of their attitudes towards fracking, contrary to Whitmarsh et al.'s (2015) findings that only supporters had higher place attachment. However, the authors concluded this from aggregating 12 statements about general, physical, and social elements of place attachment[54] without exploring individual components of place attachment (Whitmarsh et al., 2015; Devine-Wright, 2013). Since 68.7% of residents (n=182) had lived in their areas for over 20 years, length of residence was compared with place-related statements. Results revealed a positive correlation between the high number of years of living in an area and residents feeling proud, considering it their home, and having good memories and strong family ties[55]. Thus, length of residence helped to explain place attachment and confirmed that the majority of residents had traditional attachments to their areas (Lewicka, 2014; Gustafson, 2001; 2014). These findings also hinted that residents' psychological connection to place was partly subconscious, possibly explaining why only half of residents stated that this reason shaped their fracking attitudes (Lewicka, 2014; Gustafson, 2001; 2014). However, opponents reported stronger environmental identities, favoured the natural

[54] Individual place-related statements were not reported by Whitmarsh et al. (2015).
[55] 'I am proud to be from this area' (r_s=0.253, P=0.001, n=180); 'I considered this place to be my home' (r_s=0.165, P=0.026, n=182); 'I have a lot of good memories from this area' (r_s=0.204, P=0.006, n=181); 'I have strong family ties in this area' (r_s=0.292, P<0.001, n=173).

surroundings, and exhibited more active attachment to area's physical and social features echoing studies on other energy technologies (Scannell and Gifford, 2010; Devine-Wright and Howes, 2010; Devine-Wright, 2013).

Figure 4.38 shows residents' views on place-related statements grouped by case-study location.

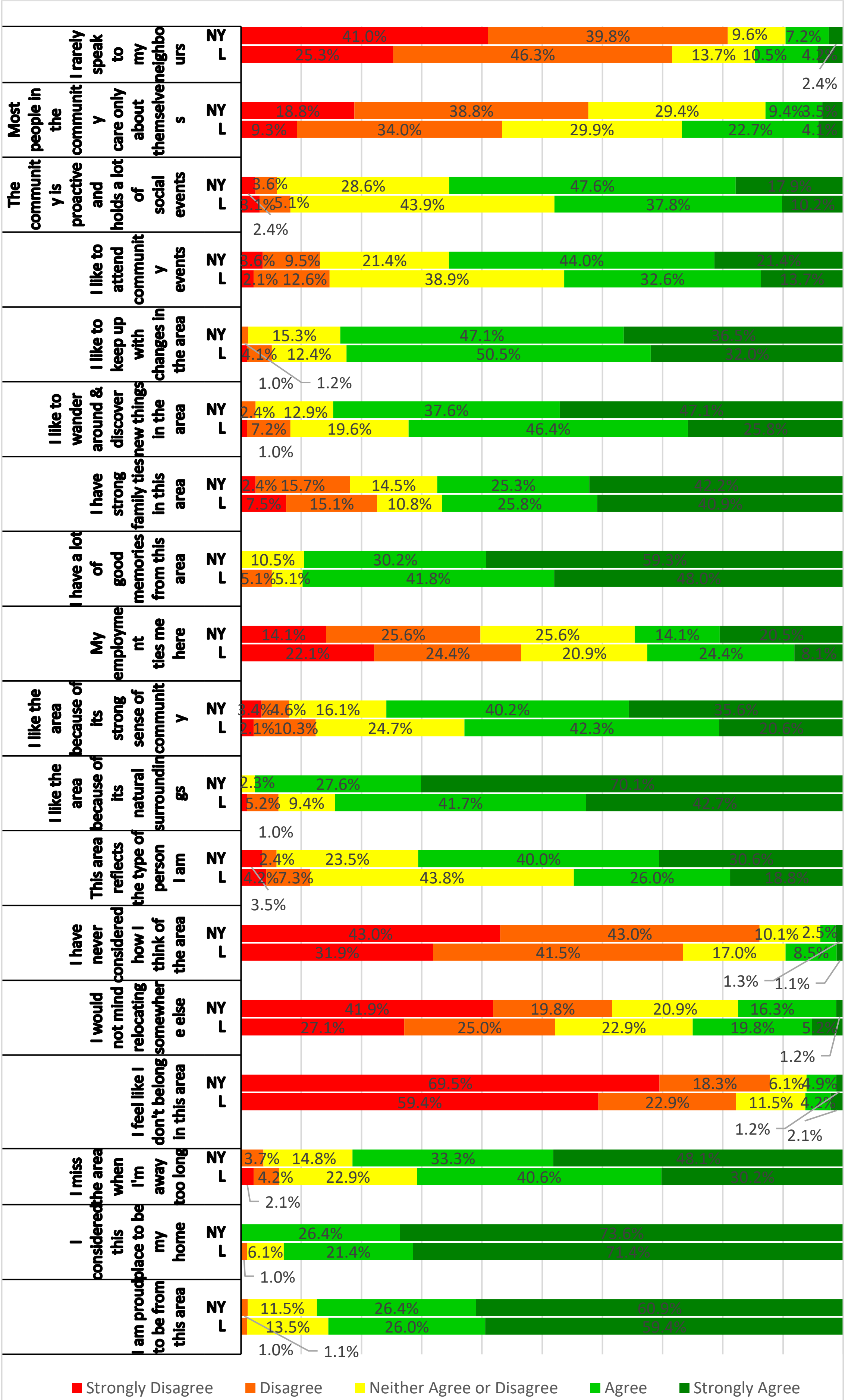
I rarely speak to my neighbours
Most people in the community care only about themselves
The community is proactive and holds a lot of social events
I like to attend community events
I like to keep up with changes in the area
I like to wander around & discover new things in the area
I have strong family ties in this area
I have a lot of good memories from this area
My employment ties me here
I like the area because of its strong sense of community
I like the area because of its natural surroundings
This area reflects the type of person I am
I have never considered how I think of the area
I would not mind relocating somewhere else
I feel like I don't belong in this area
I miss the area when I'm away too long
I consider this place to be my home
I am proud to be from this area
NY
L
Strongly Disagree
Disagree
Neither Agree or Disagree
Agree
Strongly Agree

Figure 4.38 Place-related statements by residents' case study

Mann-Whitney tests (Table 4.31) confirmed significant differences in residents' responses to place-related statements that generally arose from stronger positive and reflective senses of place in North Yorkshire and more mixed sentiments in Lancashire. North Yorkshire residents showed a greater place identity, appreciation for physical features, and social involvement that indicated more active attachments, possibly due to local geographical features and conscious decisions to live there (Lewicka, 2011b; Hummon, 1992; Gustafson, 2014; Schafft and Biddle, 2015; Luke, 2017). Some Lancashire residents also exhibited alienation and placelessness (ibid), possibly reflecting the deprivation issues of the area. For example, 25.8% more North Yorkshire residents believed that the area 'reflected their personality', while 20.3% and 4.9% more Lancashire residents disagreed or were ambivalent. More Lancashire residents who disagreed, or were ambivalent about liking local 'natural surroundings' by 5.2%, and 7.1%. Conversely, no North Yorkshire residents expressed disagreement, while 70.1% strongly agreed. 21.3% more North Yorkshire residents liked to 'discover new things in their area', while higher proportions of Lancashire residents disagreed with or were ambivalent about this (4.8%/6.7%). More Lancashire residents expressed greater ambivalence about liking the area's 'strong sense of community' and 'attending community events' (8.6%/17.5%), while North Yorkshire residents showed greater agreement (15%/19.1). Finally, residents' dependence on the area because of work was generally low in both areas, possibly due to their high age profile (Raymond et al, 2010; Lewicka, 2014; Williams, 2014; Williams and Vaske, 2003).

Table 4.31 Mann-Whitney tests– Place-related statements between Lancashire and North Yorkshire residents			
Place-related Statement	**n**	**Mann-Whitney U**	**P-Value**
i) I am proud to be from this area	183	4,262.5	0.782
ii) I consider this place to be my home	185	4,434.5	0.545
iii) I miss the area when I'm away too long	177	4,677	0.013
iv) I feel like I don't belong in this area	178	3,530	0.165
v) I would not mind relocating somewhere else	182	3,446.5	0.047
vi) I have never considered how I think of the area	173	3,080.5	0.039
vii) This area reflects the type of person I am	181	5,150	0.001
viii) I like the area because of its natural surroundings	183	5,466.5	<0.001
ix) I like the area because of its strong sense of community	184	5,041.5	0.016
x) My employment ties me here	164	3,748	0.184
xi) I have a lot of good memories from this area	184	4,660	0.167
xii) I have strong family ties in this area	176	3,994	0.675
xiii) I like to wander around & discover new things in the area	182	5,165.5	0.002
xiv) I like to keep up with changes in the area	182	4,332.5	0.518
xv) I like to attend community events	179	4,705.5	0.03
xvi) The community is proactive and holds a lot of social events	182	4,902.5	0.017
xvii) Most people in the community care only about themselves	182	3,267	0.012
xviii) I rarely speak to my neighbours	178	3,224	0.026

Table 4.32 shows statistically weak correlations between residents' attitudes towards fracking and statements about natural surroundings; sense of community; discovering the area; attending community events; people caring only about themselves; and rarely speaking to neighbours. However, beliefs about natural surroundings, community events and not caring for other community members were highly significant and positive, suggesting that supporters were more likely to think their areas lacked these social features. The results confirmed more relationships between case-study residents and place-related statements. Associations were weak for statements about missing the area; relocating elsewhere; having considered the area; reflecting their personality; liking the area for its natural surroundings and sense of community; discovering the area; attending community events; having social events; caring only about themselves;

and rarely speaking to neighbours. However, statements about place identity, active attachment, and appreciation of physical features were statistically significant and showed greater agreement by North Yorkshire residents. Here, negative correlations for case-study residents' responses indicated that Lancashire residents were more likely to agree with statements about non-attachment (relocating elsewhere, having considered the area) and lack of social relations (people caring only about themselves, rarely speaking to neighbours).

Table 4.32 **Spearman correlation– Place-related statements with residents' attitude and case study**

	Attitude			Case Study		
Place-related Statement	**N**	**r_s**	**P-Value**	**n**	**r_s**	**P-Value**
i) I am proud to be from this area	167	0.077	0.32	183	0.021	0.783
ii) I consider this place my home	169	-0.014	0.858	185	0.045	0.546
iii) I miss the area when I'm away too long	163	-0.123	0.118	177	.186*	0.013
iv) I feel like I don't belong in this area	166	0.018	0.82	178	-0.104	0.165
v) I would not mind relocating somewhere else	167	0	0.998	182	-0.148*	0.046
vi) I have never considered how I think of the area	160	0.138	0.081	173	-0.157*	0.039
vii) This area reflects the type of person I am	168	-0.046	0.555	181	0.238**	0.001
viii) I like the area because of its natural surroundings	168	-0.232**	0.003	183	0.302**	<0.001
ix) I like the area because of its strong sense of community	168	-0.168*	0.03	184	0.178*	0.016
x) My employment ties me here	151	0.152	0.062	164	0.104	0.185
xi) I have a lot of good memories from this area	168	-0.014	0.857	184	0.102	0.167
xii) I have strong family ties in this area	161	-0.024	0.766	176	0.032	0.677
xiii) I like to wander around & discover new things in the area	166	-0.164*	0.034	182	0.234**	0.001
xiv) I like to keep up with changes in the area	166	0.008	0.923	182	0.048	0.52
xv) I like to attend community events	163	-0.233**	0.003	179	0.163*	0.03
xvi) The community is proactive and holds a lot of social events	166	-0.109	0.163	182	0.177*	0.017
xvii) Most people in the community care only about themselves	166	0.207**	0.007	182	-0.187*	0.011

xviii) I rarely speak to my neighbours	162	0.166*	0.035	178	-0.168*	0.025
* Correlation is significant at the 0.05 level ** Correlation is significant at the 0.01 level. (2-tailed)						

After enquiring about attitudes towards fracking, participants were asked whether and how they thought fracking affected or would affect their area or lives. Figure 4.39 shows that a majority believed fracking had a negative overall impact.

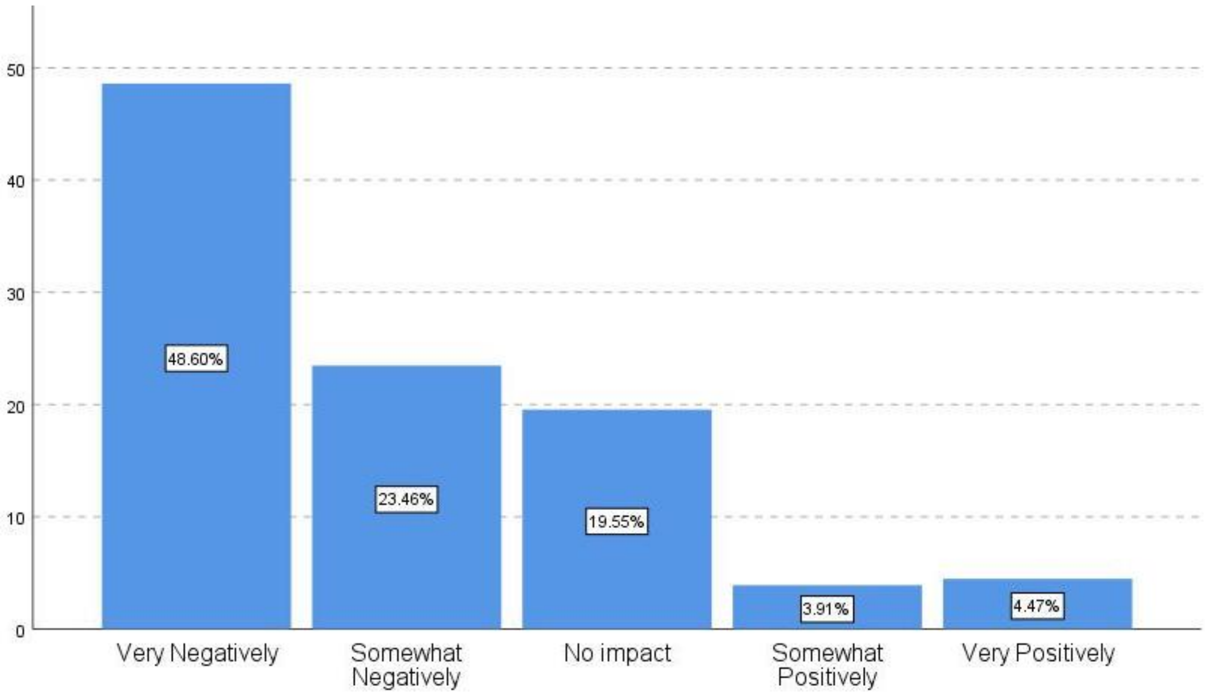

Figure 4.39 Residents' views on fracking impact on local area or daily life (n=179)

The survey asked participants to justify their responses (Table 4.33). Explanations about the negative impacts of fracking on the area or daily life ranged from concerns about fracking technology to impacts on sense of place and governance. Residents who saw a positive impact referred to the perceived benefits of the technology, but noted the disruption caused by protesters. Those who perceived no impact arising from fracking attributed this to the early stage of the developments or their distance from the sites and used a mixture of justifications. More Lancashire residents explained why they believed fracking had no impact, while more North Yorkshire residents explained why it had negative effects.

Table 4.33 Residents' Explanations about fracking impact on local area or daily life			
Fracking Impact	**% of Residents**		
Positive	**Total (n=150)**	**Lancashire (n=80)**	**North Yorkshire (n=70)**
Economy Boost	3.3	6.3	0.0
Disruption by Protesters	1.3	1.3	1.4
Need for Energy	1.3	1.3	1.4
Place Recognition	1.3	2.5	0.0
Total (unique)	8.0	8.8	7.1
None			
None (yet)/Not Directly	10.7	12.5	8.6
Disruption by Protesters	6.7	10.0	2.9
Economic Boost	2.0	3.8	0.0
Need for Energy	2.0	3.8	0.0
Environmental Concerns	2.0	2.5	1.4
Local Costs	1.3	1.3	1.4
Total (unique)	18.7	25.0	11.4
Negative			
Disruption of Way of Life	19.3	15.0	24.3
Increased Traffic	16.7	12.5	21.4
General Environmental Concerns	13.3	6.3	21.4
Community Division	12.7	8.8	17.1
Disruption by Protesters	12.0	16.3	7.1
Distrust in Government & Politicians	12.0	6.3	18.6
Industrialisation	12.0	12.5	11.4
Police Conduct	10.7	8.8	12.9
Property Devaluation	10.7	11.3	10.0
Undemocratic Decision	10.0	11.3	8.6
Water Contamination	10.0	10.0	10.0
Energy Companies Behaviour	7.3	6.3	8.6
Unsustainable Technology	7.3	2.5	12.9
Air Pollution	6.0	5.0	7.1
Tourism	6.0	2.5	10.0
Agriculture/Land pollution	4.7	3.8	5.7
Unsuitable Infrastructure	4.7	1.3	8.6
Unsafe Method	4.0	2.5	5.7
Physical Health Impacts	3.3	0.0	7.1
Noise Pollution	3.3	5.0	1.4
Regulators Incapability	3.3	1.3	5.7
Earthquakes	2.7	3.8	1.4
Scale of Industry	2.7	2.5	2.9
Light Pollution	2.0	1.3	2.9
Lack of Economic Benefits	2.0	0.0	4.3
Place Despoliation	2.0	3.8	0.0
Other Developments	1.3	2.5	0.0
Fracking Waste	1.3	0.0	2.9

Total (unique)	73.3	65.0	82.9

Residents who argued for the 'need for energy' emphasised the potential for personal use or fracking as a transitional fuel:

> I believe we require shale gas, along with other non-conventional energy sources to provide a much-needed transition away from carbon intensive fuels. The evidence of human induced climate change is profound and provable. To reduce these effects, I strongly believe that an energy revolution is required, so as to provide alternative forms of energy. Fracking… although not the best option, is an excellent interim. (*Respondent_6795594316*)

However, only Lancashire residents emphasised 'boost to economy and 'place recognition' as justifications for their perceptions of the impacts of fracking on the area (6.3% and 2.5%):

> Shale gas has put Lancashire on the map, encouraged local policy and decision-makers to think about Lancashire with more of a growth mindset and brought businesses together that may not otherwise have connected. (*Respondent_6720116790*)

Most residents who perceived fracking as having no impact on their area or lives explained that it was "difficult to assess" impacts since fracking had not started yet (*Respondent_6688258011*) or they were not living "near enough to the site for this to have had a direct impact on me at this time" (*Respondent_6688187468*). Some expressed future environmental concerns, however, that "could affect a wider geography than the fracking site" (*Respondent_6688187468*). Those in Lancashire also echoed the need for energy and the potential economic boost to the area, while both case-study residents mentioned the disruption by protesters and increased 'local costs' due to their activities:

> Although the site is in view from my window, it causes no disturbance or problems. However, the antifracking protestors are annoying. (*LN70*)

> The only problem the community has had is from the anti-social transient protesters, costing police and higher tax bills, the disrespectful way they have treated the local community and authorities, yet (*Respondent_6902093032*).

The most common reason residents gave for the perceived negative impacts of fracking on the areas was the disruption to their "way of life', including increased stress and worry. This was evident in both areas but was ranked highest in North Yorkshire (24.3%) and second in Lancashire (15%) after disruption by protesters (16.3%). Some North Yorkshire residents discussed the "restricted use of rural areas and footpaths for dog walking [and] disruption to daily life from interaction between national protestors and police" (NY133), and a higher percentage (8.3% more) saw 'community divisions':

> It has caused bitterness among families and the community. Protestors have caused disruption to road users. (*LN79*)

> Our community is now divided into three camps. Anti-fracking protestors, people against fracking but also against protestors and pro-frackers. Friends and families are divided and it has become a topic to be avoided in general conversation. (*Respondent_6681066527*)

A majority of residents who felt negatively affected mentioned 'increased traffic' (16.7%), often referring to HGVs (second overall and 8.9% more among North Yorkshire residents). However, some mentioned increased traffic caused by protesters blocking site travel as part of the overall 'disruption by protesters'. Many residents expressed general local or global environmental concerns, while some referred to specific environmental risks (Section 4.4.1), such as fracking-fluid waste management and noise and light pollution. Alongside 'industrialisation' of the area, 3.8% of Lancashire residents expressed disappointment about the overall 'place despoliation', which was often discussed in relation to 'other developments' (nuclear and gas storage facilities) in the area and how fracking could affect these (2.5%):

> Lancashire has had more than its fair share of despoliation 'for the good of the national economy' in the past. (*Respondent_6797310978*)

> I live a few miles away but gas storage is planned here in unstable ground and the tremors could be a danger. Also there could be a gas-powered power station across the estuary in Thornton. (*Respondent_6901961562*)

7.1% of North Yorkshire residents additionally expressed concerns about 'physical health impacts' from environmental risks, while some saw fracking as a generally 'unsafe method' (4%) and aired concerns about the 'scale of the industry' (2.7%) as more sites were on the horizon:

> I live in a Petroleum Exploration and Development Licence area in North Yorkshire, which means that unless there is a change of mind at some stage there is likely to be fracking under or near my home (*Respondent_6682097158*).

> I'm far enough away so can't see smell hear or be inconvenienced on a daily basis but PNR is just the start and I don't think it should happen anywhere (*Respondent_6794098285*).

Finally, justice and trust were noted in both case-study areas. However, distrust in the government and politicians, both local and central, was higher in North Yorkshire (18.6%) and issues of democracy and house devaluation were mentioned more frequently in Lancashire (11.3% for each). Aside from dissatisfaction with energy companies, some residents complained about the conduct of the police (10.7%) and questioned whether regulators would monitor energy companies properly (3.3%):

> There are correlations between fracked areas and earthquakes on record and track records of private enterprise and H&S compliance are not good, ranging from the nineteenth century Titanic to last year Grenfell. It is a disaster waiting to happen (*Respondent_6796532739*).

4.5.2 Environmental Worldviews

Drawing on the role of broader beliefs in the formation of energy attitudes (Section 2.1.2.2), participants were asked to rate their agreement with various environmental worldview statements at the end of the survey. Overall, participants responded positively to egalitarian and hierarchical statements and negatively to individualistic and fatalistic statements (Figure 4.40)[56]. Except for having 'little control over environmental risk', all responses varied significantly from the neutral point (Table 4.34).

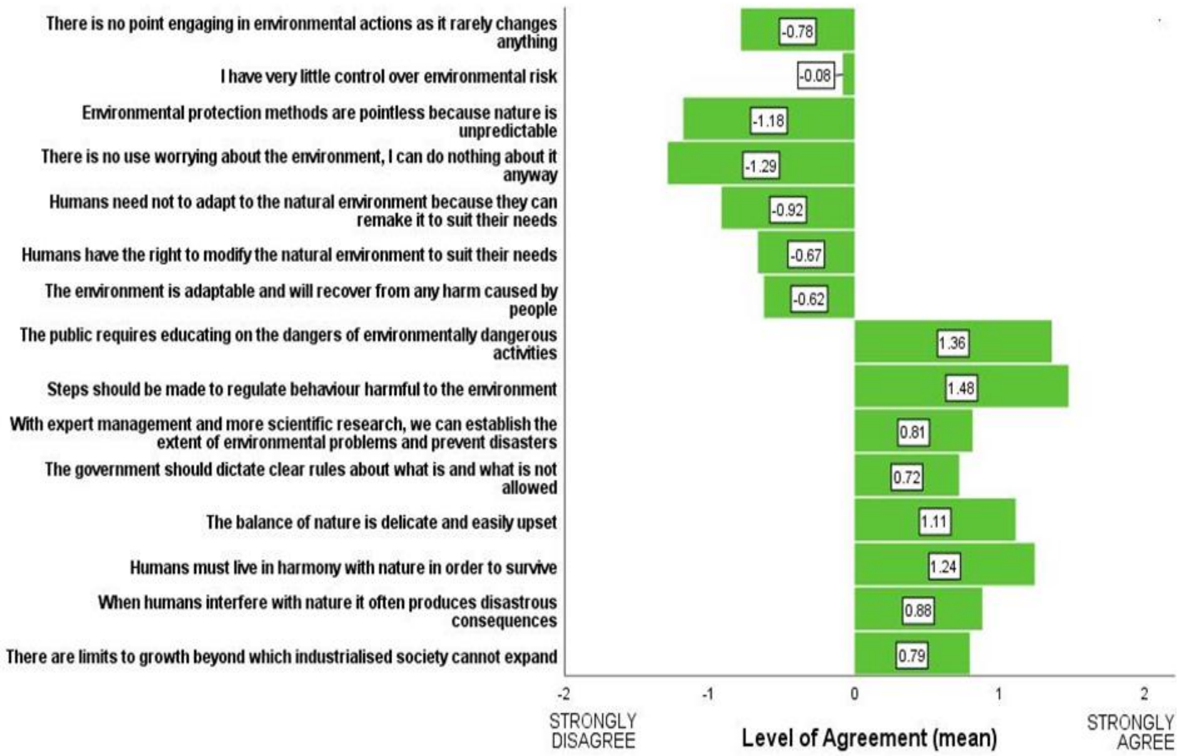

Figure 4.40 Respondents' agreement with environmental worldview statements

[56] Respondents agreed that: 'there are limits to growth beyond which industrialised society cannot expand' (x=0.79, n=203); 'when humans interfere with nature it often produces disastrous consequences' (x=0.88, n=209); 'humans must live in harmony with nature in order to survive' (x=1.24, n=207); 'the balance of nature is delicate and easily upset' (x=1.11, n=208); 'the government should dictate clear rules about what is and what is not allowed' (x=0.72, n=208); 'with expert management and more scientific research, we can establish the extent of environmental problems and prevent disasters' (x=0.81, n=205); 'steps should be made to regulate behaviour harmful to the environment' (x=1.48, n=208); and, 'the public requires educating on the dangers of environmentally dangerous activities' (x=1.36, n=209). Conversely, respondents disagreed that: 'the environment is adaptable and will recover from any harm caused by people' (x=-0.62, n=208); 'humans have the right to modify the natural environment to suit their needs' (x=-0.67,n=208); 'humans need not to adapt to the natural environment because they can remake it to suit their needs' (x=-0.92, n=208); 'there is no use worrying about the environment, I can do nothing about it anyway' (x=-1.29, n=208); 'environmental protection methods are pointless because nature is unpredictable' (x=-1.18, n=209); 'they have very little control over environmental risk' (x=-0.08, n=208); and, 'there is no point engaging in environmental actions as it rarely changes anything' (x=-0.78, n=208).

Table 4.34 **One-Sample t-tests– Environmental worldview statements**					
Environmental Statements per Worldview		**Mean**	**T-test**	**Df**	**P-value**
Egalitarianism	**i)** There are limits to growth beyond which industrialised society cannot expand	0.79	10.845	202	<0.001
	ii) When humans interfere with nature it often produces disastrous consequences	0.88	11.472	208	<0.001
	iii) Humans must live in harmony with nature in order to survive	1.24	19.329	206	<0.001
	iv) The balance of nature is delicate and easily upset	1.11	15.885	207	<0.001
Hierarchism	**v)** The government should dictate clear rules about what is and what is not allowed	0.72	8.24	207	<0.001
	vi) With expert management and more scientific research, we can establish the extent of environmental problems and prevent disasters	0.81	10.822	204	<0.001
	vii) Steps should be made to regulate behaviour harmful to the environment	1.48	27.972	207	<0.001
	viii) The public requires educating on the dangers of environmentally dangerous activities	1.36	22.824	208	<0.001
Individualism	**ix)** The environment is adaptable and will recover from any harm caused by people	-0.62	-7.796	207	<0.001
	x) Humans have the right to modify the natural environment to suit their needs	-0.67	-7.926	207	<0.001
	xi) Humans need not to adapt to the natural environment because they can remake it to suit their needs	-0.92	-11.918	207	<0.001
Fatalism	**xii)** There is no use worrying about the environment, I can do nothing about it anyway	-1.29	-19.889	207	<0.001
	xiii) Environmental protection methods are pointless because nature is unpredictable	-1.18	-17.733	208	<0.001
	xiv) I have very little control over environmental risk	-0.08	-0.946	207	0.345
	xv) There is no point engaging in environmental actions as it rarely changes anything	-0.78	-9.072	207	<0.001

Table 4.35 demonstrates that residents' mean scores (X_R) were similar to the mean scores for all participants. Mean scores for residents opposing (X_-) and supporting (X_+) fracking varied, often in an opposite direction to X_R scores. However, mean scores for Lancashire (X_L) and North Yorkshire (X_{NY}) residents followed the same direction as X_R, while North Yorkshire residents agreed overall more with egalitarian and hierarchical statements and disagreed more with individualistic and fatalistic ones (all $|X_{NY}|>|X_R|$). Figure 4.41 shows residents' environmental worldviews based on their attitudes towards fracking.

	Table 4.35 **Descriptive statistics– Residents' environmental worldview statements**							
	Environmental Statements per Worldview	**All Residents**			**Residents/ Attitude**		**Residents/ Case study**	
		X_R	**Std_R**	**N_R**	**X_+**	**X_-**	**X_L**	**X_{NY}**
Egalitarianism	**i)** There are limits to growth beyond which industrialised society cannot expand	0.79	1.01	177	0.34	0.92	0.67	0.91
	ii) When humans interfere with nature it often produces disastrous consequences	0.89	1.09	183	-0.36	1.35	0.73	1.07
	iii) Humans must live in harmony with nature in order to survive	1.30	0.85	181	0.48	1.60	1.17	1.45
	iv) The balance of nature is delicate and easily upset	1.14	0.99	182	0.17	1.48	1.01	1.29
Hierarchism	**v)** The government should dictate clear rules about what is and what is not allowed	0.69	1.32	182	0.83	0.61	0.57	0.81
	vi) With expert management and more scientific research, we can establish the extent of environmental problems and prevent disasters	0.85	1.03	179	0.98	0.83	0.81	0.89
	vii) Steps should be made to regulate behaviour harmful to the environment	1.47	0.77	182	0.83	1.69	1.34	1.62
	viii) The public requires educating on the dangers of environmentally dangerous activities	1.36	0.85	183	0.62	1.65	1.24	1.5
Individualism	**ix)** The environment is adaptable and will recover from any harm caused by people	-0.68	1.15	182	0.45	-1.1	-0.43	-0.95
	x) Humans have the right to modify the natural environment to suit their needs	-0.74	1.20	182	0.45	-1.16	-0.54	-0.98
	xi) Humans need not to adapt to the natural environment because they can remake it to suit their needs	-0.97	1.11	182	0.02	-1.34	-0.83	-1.12
Fatalism	**xii)** There is no use worrying about the environment, I can do nothing about it anyway	-1.26	0.96	182	-0.67	-1.56	-1.17	-1.37
	xiii) Environmental protection methods are pointless because nature is unpredictable	-1.16	0.97	183	-0.5	-1.42	-1.02	-1.31
	xiv) I have very little control over environmental risk	-0.04	1.25	182	-0.21	-0.02	0.03	-0.12
	xv) There is no point engaging in environmental actions as it rarely changes anything	-0.75	1.26	182	0.02	-1.11	-0.54	-0.98

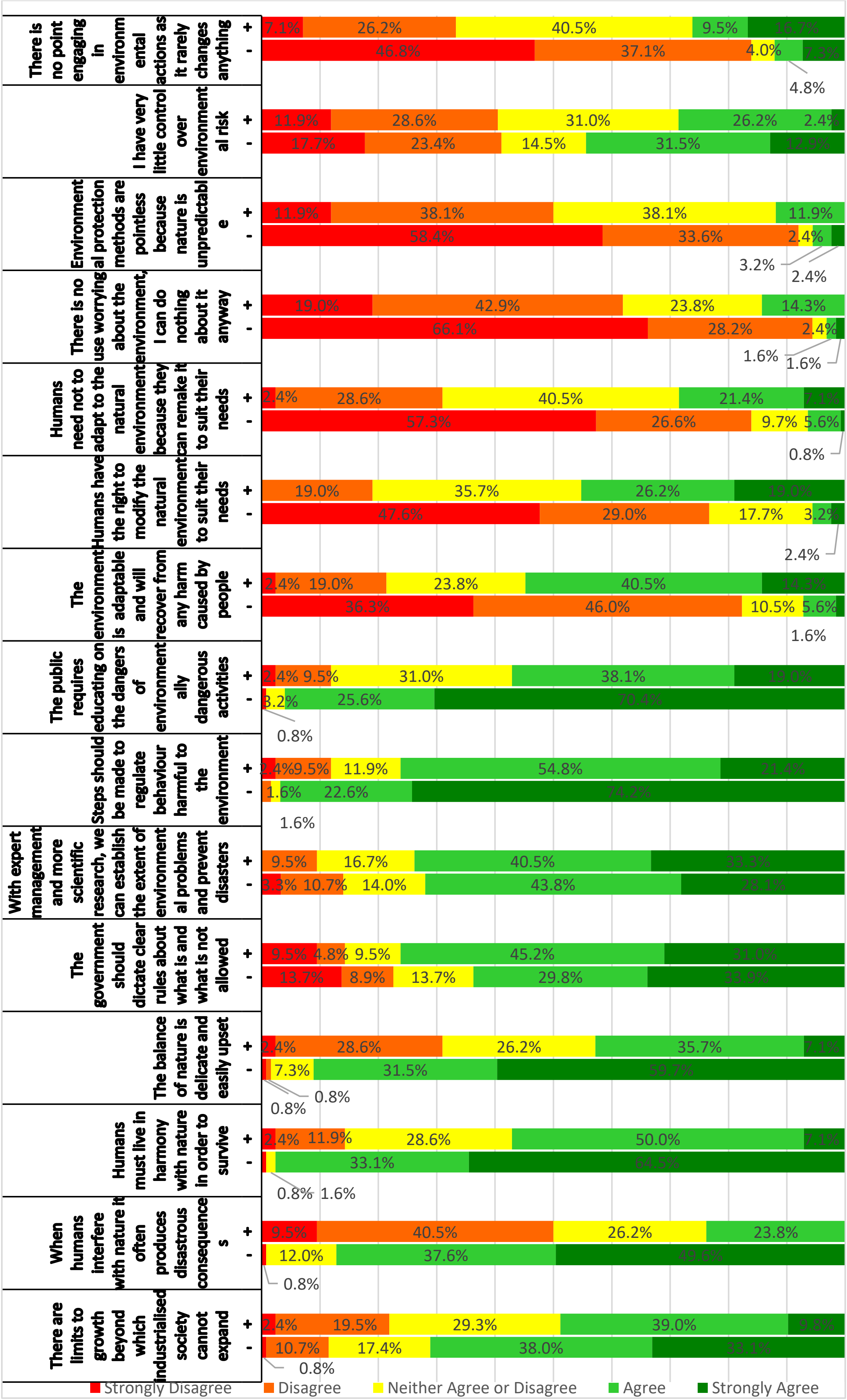

Figure 4.41 Residents' environmental worldviews by attitude

Mann-Whitney tests showed differences in opponents and supporters' responses to four environmental worldviews, except for 'the government dictating clear rules' and faith in 'expert management and more scientific research' that both groups generally agreed (Table 4.36). Again, the distribution of residents' responses to having 'control over environmental risk' did not differ significantly; however, a greater range of views existed in both groups, with many agreeing, disagreeing or being ambivalent with the other statements.

	Table 4.36 **Mann-Whitney tests– Environmental worldviews between residents with positive and negative attitudes towards fracking**			
	Environmental Statements per Worldview	**n**	**Mann-Whitney U**	**P-Value**
Egalitarianism	**i)** There are limits to growth beyond which industrialised society cannot expand	162	1,686.5	0.001
	ii) When humans interfere with nature it often produces disastrous consequences	167	507.5	<0.001
	iii) Humans must live in harmony with nature in order to survive	166	775	<0.001
	iv) The balance of nature is delicate and easily upset	166	808.5	<0.001
Hierarchism	**v)** The government should dictate clear rules about what is and what is not allowed	166	2,770.5	0.519
	vi) With expert management and more scientific research, we can establish the extent of environmental problems and prevent disasters	163	2,705	0.510
	vii) Steps should be made to regulate behaviour harmful to the environment	166	1,135	<0.001
	viii) The public requires educating on the dangers of environmentally dangerous activities	167	1,027.5	<0.001
Individualism	**ix)** The environment is adaptable and will recover from any harm caused by people	166	4,448	<0.001
	x) Humans have the right to modify the natural environment to suit their needs	166	4,495	<0.001
	xi) Humans need not to adapt to the natural environment because they can remake it to suit their needs	166	4,401.5	<0.001

Table 4.36 **Mann-Whitney tests– Environmental worldviews between residents with positive and negative attitudes towards fracking (continued)**				
	Environmental Statements per Worldview	**n**	**Mann-Whitney U**	**P-Value**
Fatalism	**xii)** There is no use worrying about the environment, I can do nothing about it anyway	166	4,030	<0.001
	xiii) Environmental protection methods are pointless because nature is unpredictable	167	4,150.5	<0.001
	xiv) I have very little control over environmental risk	166	2,362.5	0.356
	xv) There is no point engaging in environmental actions as it rarely changes anything	166	4,073	<0.001

Responses to all egalitarian worldview statements differed significantly, with more opponents agreeing and more supporters disagreeing or being ambivalent. For instance, 23.3%, 63.4%, 40.5%, and 52.6%. more opponents strongly agreed respectively that 'there are limits to growth', humans' interference could 'produces disastrous consequences', 'humans must live in harmony with nature, and its 'the balance is easily upset'.

Both groups again expressed agreement with the remaining hierarchical statements that 'steps should be made to regulate behaviour harmful to the environment' and 'the public requires educating on the dangers of environmentally dangerous activities'. However, the distribution of responses differed significantly due to 52.8% and 51.4% more opponents strongly agreeing, while more supporters only agreed by 32.2% and 12.5% with these statements.

Responses to all individualistic worldview statements differed significantly, with supporters showing agreement or ambivalence and opponents showing strong disagreement. For example, 47.6%, 39.6%, and 22.1% more supporters agreed 'the environment is adaptable', 'humans have the right to modify', and 'they can remake it to suit their needs'.

Finally, opponents showed stronger disagreement and supporters were more ambivalent with the remaining fatalistic statements that ‘there is no use worrying about the environment’, ‘environmental protection methods being pointless’, and ‘there is no point engaging in environmental actions’ (an additional 47.1%, 46.5%, and 39.7% versus an additional 21.4%, 35.7%, and 36.5%).

Figure 4.42 shows the range of Lancashire and North Yorkshire residents’ responses to these environmental worldviews.

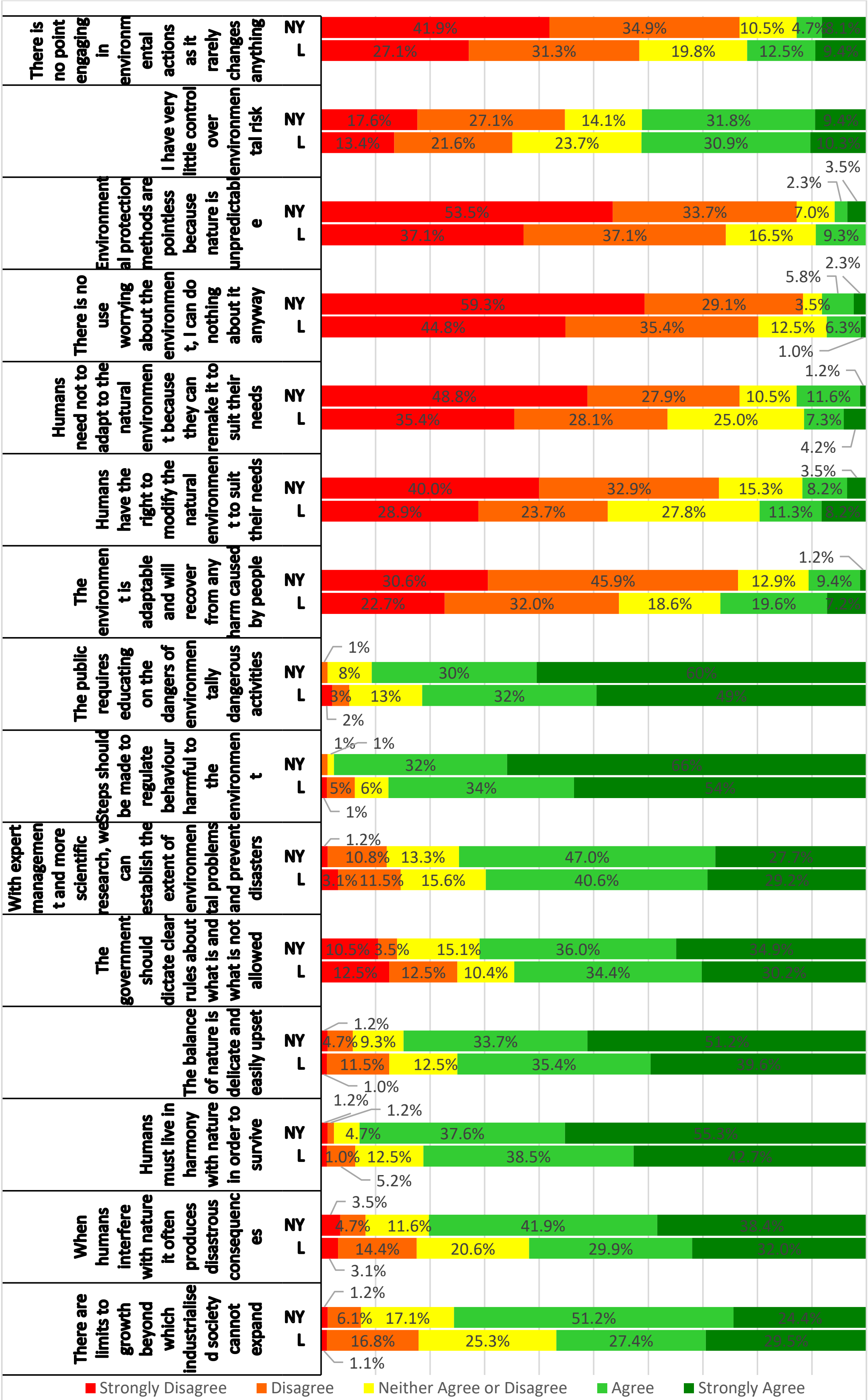

Figure 4.42 Residents' environmental worldviews by case study

Mann-Whitney tests (Table 4.37) confirmed that more Lancashire residents disagreed or were ambivalent about humans' interference with nature' (9.7%/ 6%), 'humans must live in harmony with nature' (4%/7%), and 'steps should be made to regulate behaviour harmful to the environment (5% and 6%). More North Yorkshire residents disagreed with 'the environment being adaptable' and (13.9%) and 'humans having the right to modify it (20.3%), while more Lancashire responses agreed (16.2%) and were ambivalent (12.5%), respectively. Similarly, greater agreement and uncertainty were evident in Lancashire responses to fatalistic statements that 'environmental protection methods are pointless' and 'there is no point engaging in environmental actions (by 7%/9.5% and 7.8%/9.3%), while 16.4% and 14.8% more North Yorkshire residents strongly disagreed with these statements.

	Table 4.37 **Mann-Whitney tests– Environmental worldviews between Lancashire and North Yorkshire residents**			
	Environmental Statements per Worldview	**n**	**Mann-Whitney U**	**P-Value**
Egalitarianism	**i)** There are limits to growth beyond which industrialised society cannot expand	177	4,339.5	0.171
	ii) When humans interfere with nature it often produces disastrous consequences	183	4,858	0.044
	iii) Humans must live in harmony with nature in order to survive	181	4,768.5	0.032
	iv) The balance of nature is delicate and easily upset	182	4,747.5	0.061
Hierarchism	**v)** The government should dictate clear rules about what is and what is not allowed	182	4,495.5	0.28
	vi) With expert management and more scientific research, we can establish the extent of environmental problems and prevent disasters	179	4,092	0.74
	vii) Steps should be made to regulate behaviour harmful to the environment	182	4,758	0.039
	viii) The public requires educating on the dangers of environmentally dangerous activities	183	4,751	0.071
Individualism	**ix)** The environment is adaptable and will recover from any harm caused by people	182	3,168	0.005
	x) Humans have the right to modify the natural environment to suit their needs	182	3,284	0.014
	xi) Humans need not to adapt to the natural environment because they can remake it to suit their needs	181	3,490	0.058

Table 4.37 **Mann-Whitney tests– Environmental worldviews between Lancashire and North Yorkshire residents (continued)**				
	Environmental Statements per Worldview	**n**	**Mann-Whitney U**	**P-Value**
Fatalism	**xii)** There is no use worrying about the environment, I can do nothing about it anyway	182	3,496.5	0.05
	xiii) Environmental protection methods are pointless because nature is unpredictable	183	3,350	0.013
	xiv) I have very little control over environmental risk	182	3,864	0.453
	xv) There is no point engaging in environmental actions as it rarely changes anything	182	3,252	0.01

Spearman correlation tests confirmed associations between the same environmental worldview statements and residents' attitudes towards fracking and case-study location (Table 4.38). Negative correlations suggest that opponents were more likely to agree with all egalitarian statements, and some hierarchical statements (regulating behaviour harmful and the public requiring education), while positive correlations indicate that supporters agreed more with all individualistic and fatalistic statements, except for having 'control over environmental risk', for which no correlation was found. All trends were statistically significant and most showed moderate associations, except for 'humans' interference with nature', which was strong. Opponents' stronger egalitarian values aligned with previous North American studies, although comparison of individual statements was impossible due to different question wording and emphasis (Section 2.2.2) (Boudet et al., 2014; Lachapelle and Montpetit, 2014). However, supporters' stronger individualistic values agreed only with Lachapelle and Montpetit's (2014) results in their Canadian case study, while the explanatory power of hierarchism and fatalism remained less indicative of clear support or opposition to fracking.

Reflecting case-study residents' attitudes, negative correlations also suggested that North Yorkshire residents were less fatalistic and individualistic. All associations found weak, but worldview statements about 'the environment being adaptable' and 'there is no point engaging in environmental actions' were of higher statistical significance.

Table 4.38 **Spearman correlation– Environmental worldviews with residents' attitude and case study**							
Environmental Statements per Worldview		**Attitude**			**Case study**		
		n	**r_s**	**P-Value**	**n**	**r_s**	**P-Value**
Egalitarianism	**i)** There are limits to growth beyond which industrialised society cannot expand	162	-.252**	0.001	177	0.103	0.172
	ii) When humans interfere with nature it often produces disastrous consequences	167	-.638**	<0.001	183	.150*	0.043
	iii) Humans must live in harmony with nature in order to survive	166	-.583**	<0.001	181	.160*	0.031
	iv) The balance of nature is delicate and easily upset	166	-.559**	<0.001	182	0.14	0.06
Hierarchism	**v)** The government should dictate clear rules about what is and what is not allowed	166	0.05	0.521	182	0.08	0.281
	vi) With expert management and more scientific research, we can establish the extent of environmental problems and prevent disasters	163	0.052	0.511	179	0.025	0.742
	vii) Steps should be made to regulate behaviour harmful to the environment	166	-.492**	<0.001	182	.153*	0.039
	viii) The public requires educating on the dangers of environmentally dangerous activities	167	-.516**	<0.001	183	0.134	0.071
Individualism	**ix)** The environment is adaptable and will recover from any harm caused by people	166	.558**	<0.001	182	-.209**	0.005
	x) Humans have the right to modify the natural environment to suit their needs	166	.569**	<0.001	182	-.183*	0.014
	xi) Humans need not to adapt to the natural environment because they can remake it to suit their needs	166	.550**	<0.001	182	-0.141	0.058
Fatalism	**xii)** There is no use worrying about the environment, I can do nothing about it anyway	166	.459**	<0.001	182	-0.145	0.05
	xiii) Environmental protection methods are pointless because nature is unpredictable	167	.472**	<0.001	183	-.183*	0.013
	xiv) I have very little control over environmental risk	166	-0.072	0.358	182	-0.056	0.454
	xv) There is no point engaging in environmental actions as it rarely changes anything	166	.446**	<0.001	182	-.191**	0.01
	* Correlation is significant at the 0.05 level (2-tailed) ** Correlation is significant at the 0.01 level (2-tailed)						

Based on the strong egalitarian views of fracking opponents, further inferential analysis was conducted between residents' attitudes and responses to energy-related statements and views on energy preferences explored in Section 4.2.1. These revealed a number of significant correlations[57]. Support for fracking was positively associated with the UK developing fossil fuels (r_s=.646, P<0.001, n=166) and negatively with renewables (r_s=-0.389, P<0.001, n=168). A positive moderate association was also found between those supporting fracking and nuclear energy (r_s=-0.431, P<0.001, n=165). The higher number of Lancashire residents supporting nuclear energy and the higher number of North Yorkshire residents supporting renewable energy explained the correlation between these energy sources and case-study areas, though their associations were quite weak (r_s=-0.153, P=0.04, n=181; r_s=0.188, P=0.01, n=184).

4.6 Summary and Reflections

This chapter partially addressed the first three research objectives by examining survey respondents' attitudes towards fracking in Lancashire and North Yorkshire and how these linked to perceptions of impacts, justice, trust, sense of place, and environmental worldviews. Echoing UK national surveys, the study found high local resistance to fracking in both case studies (70.1%) (Bradshaw and Waite, 2017). However, local support was 22.1% greater in Lancashire, possibly as a result of the greater portion of males respondents in this area (Whitmarsh et al., 2015). Only a small minority of

[57] 'People should use as much energy as they want' (r_s=0.351, P<0.001, n=166); 'Investing in renewable energy is important to reduce climate change'(rs=-0.472, P<0.001, n=169); 'Weather patterns change naturally and people should stop worrying about climate change' (r_s=0.491, P<0.001, n=169); 'Concern about the environment restricts technological innovations too much'(r_s=.584, P<0.001, n=165); 'Industry left it to itself will harm the environment'(r_s=-0.581, P<0.001, n=168); 'Environmental and energy decisions should be more informed by participation by members of the public'(r_s=-0.554, P<0.001, n=168); 'National energy choices should not only depend on economic and social factors but also environmental factors'(r_s=-0.619, P<0.001, n=168); 'The UK should invest more in environmental friendly energy technologies even if it costs more'(r_s=0-.614, P<0.001, n=168).

residents' attitudes (1.2%) arguably fitted the typical NIMBY profile of supporting such a technology in principle but opposing it on a local scale and, instead, most residents expressed Not-In-Anyone's-Back-Yard attitudes (Wolsink, 2000; van der Horst, 2007). Overall, the survey showed that technology impacts, justice and trust in stakeholders, and place-based reasons (site appropriateness, local features, and place connections) provided better explanations for residents' attitudes than NIMBYism arguments (Wolsink, 2007; Cotton, 2013; 2016; Cotton et al., 2014; Boudet et al., 2014; Jacquet, 2014; Williams et al., 2015; Bomberg, 2017; Thomas et al., 2017b).

The majority of fracking opponents were concerned about the negative environmental and socioeconomic impacts of fracking, especially the more immediate or actual ones (local traffic, industrialisation, and property devaluation). 51.4% of residents lived within three miles from a shale-gas site, so the findings reinforce Thomas et al.'s (2017) expectations that residents in UK areas where shale gas developments were proposed or had begun prioritised localised risks. Except for noise and light pollution, open question results revealed environmental concerns than over and above those cited in planning procedures, such as impacts on local agriculture/land, the treatment of waste from the fracking process, and the future scale of the industry (Bradshaw and Waite, 2017; Short and Szolucha, 2019). Furthermore, respondents also emphasised stress and worry as disruptions to their way of life, while some, especially in North Yorkshire, expressed concerns about future health risks, community division, and the inability of local infrastructure to accommodate the industry.

In contrast, the majority of fracking supporters foresaw local and national economic benefits but were less convinced that shale gas would provide cheaper energy or facilitate the transition towards renewables. In common with Bradshaw and Waite

(2017), those who saw fracking as having a positive or no impact on the areas or their lives stressed the technology's short-term contribution to ensuring the UK's energy supplies, facilitating a transition from other fossil fuels, and reducing energy imports. However, both groups associated fracking with increased traffic. While this could have been because supporters saw traffic as acceptable in the context of the aforementioned benefits, open questions indicated concern about the disruption caused by protesters.

The survey results showed that divergence of responses was not only evident in perceptions of impacts between supporters and opponents of fracking but also issues of justice and trust in stakeholders involved in shale-gas governance. For example, opponents were more likely to identify procedural and distributive injustices, distrust the national government, local councils, the Environment Agency and energy companies, and trust environmental groups and other locals. Overall, while some differences were detected between the case studies over residents' perceptions of technology impacts, justice, and trust, these were attributed to the stronger opposition to fracking identified in North Yorkshire.

Conversely, case-study location appeared more important than residents' attitudes in relation to sense of place. This was because both opponents and supporters mainly exhibited strong positive place bonds with their areas due to their length of residence, although local geographical and demographic features affected some residents' decision to locate to these areas and differentiated other dimensions of their sense of place, such as their active attachments, place identities, feelings of alienation/placelessness, and sense of community (Gustafson, 2014; Lewicka, 2011b; Hummon, 1992). Exploring what local features residents valued and wanted to change in their areas provided an understanding of why place-based technology impacts were often prioritised and why some saw fracking as a threat and others saw it as an opportunity (McLachlan, 2009; Devine-Wright, 2013; Kriesky et al. 2013; Jaspal et al., 2014; Bomberg, 2017; Evensen and Stedman, 2016; 2018; Thomas et al., 2017b). For example, residents' appreciation of rurality, community, local values, and peace and quiet explained why many felt fracking affected them negatively (see Schafft and Biddle, 2015; Evensen and Stedman, 2018). While more North Yorkshire residents described sense of community as significant when justifying why fracking caused community divisions and criticised the ability of roads to accommodate additional HGV traffic, more Lancashire residents supported for fracking for bringing economic opportunities that might alleviate local deprivation.

Regardless of residents' attitudes towards fracking, many felt the developments had or would have a negative effect on their areas due to the general disruption to their way of life, disturbance by protesters, potential and actual technology impacts, and altered trust relationships with elected authorities and other stakeholders, including the police. Thus, the survey showed that fracking affected many residents' lives and places beyond the impacts normally recognised as legitimate concerns during planning processes (Evensen and Stedman, 2018; Thomas et al., 2017b; Bradshaw and Waite, 2017). The survey found that all the factors explored contributed, to some extent, to residents' attitudes towards fracking (appropriateness of specific site in question, environmental effects, social effects on nearby communities, personal connection with the area, and level of trust towards decision-making processes and institutions involved), further reinforcing the merits of the integrated approach adopted in the study. While the framing of the survey questions specified a direction in the relationship of these factors and attitudes, residents' polarised perceptions of impacts, trust, and justice indicated that confirmation bias was possible and recursive relationships exist between these factors (Gross, 2007; TNS BMRB, 2014; Evensen and Stedman, 2017).

The possibility of confirmation bias was also supported by residents' broader energy beliefs and environmental worldviews. For instance, supporters' support for nuclear energy suggested that these residents held different risk perceptions to opponents and saw these energy technologies as less hazardous. While both opponents and supporters shared some hierarchical worldviews, their polarised responses to individualistic and egalitarian statements showed that supporters had greater faith in human's capability to manage nature and gave greater priority to technological and economic development (Willow et al., 2014).

In conclusion, analysis of the survey data provided a wide range of insights into Lancashire and North Yorkshire residents' attitudes towards fracking and identified multiple factors affecting their attitudes. To explore these variations and how each category of variable affected viewpoints further, the next chapter explores interviewees' perceptions of fracking technology and its impacts.

Chapter Five
Perceptions of Positive and Negative Impacts of Fracking

The aim of this chapter is to shed more light into the survey results and address the first research objective by examining interviewees' qualitative perceptions of impacts of fracking in order to provide more in-depth understandings of the factors shaping opinions and differences in viewpoints in the two case-study locations. 26 one-to-one or group interviews were conducted with 34 participants across the two areas, 12 in Lancashire with 14 residents and 14 in North Yorkshire with 20 residents. Again, the majority of interviewees (79.4%) held generally negative attitudes towards their local shale-gas developments and all interviewees appeared knowledgeable about the technology, usually using the term 'fracking' to refer to all shale-gas extraction processes. Therefore, the discussion chapters continue to adopt this simplified term throughout. Due to the recruiting methods used (Section 3.3), demographic characteristics such as education level and age were not available. However, the majority of participants were over 45 years old and 64.7% were males and 35.3% were females. 53% of interviewees lived up to three miles from a fracking site (with most approximately a mile away), whereas the remaining 47% of interviewees lived 4-10 miles away. The intention was again not to achieve a representative sample of interview participants but, rather, to obtain deeper illustrative insights on the diverse reasonings underpinning residents' attitudes towards fracking. While interviews did not enquire about participants' type of occupation, it is notable that two supporters had experience working for or with the oil and gas industry, and one supporter and one opponent in North Yorkshire was involved in tourism industry. The majority of interviewees in both case studies became involved to some extent with their local fracking developments by putting anti-fracking signs up at their homes, submitting public consultations, speaking at public hearings or inquiries, participating in community liaison groups, taking provisions to protesters, donating money to camps, attending meetings and demonstrations, and/or becoming members of anti- or pro-fracking organisations. Furthermore, one North Yorkshire and two Lancashire interviewees were also local representatives.

During the recruitment of interviewees, some online Lancashire respondents referred to Roseacre Wood site (RW) as the nearest fracking site instead of Preston New Road site (PNR). This highlighted the importance of both sites in Lancashire, even though RW's planning approval was still pending and there was no development at the time. Lancashire interviewees therefore included residents living near both Fylde area sites to allow better understanding of local perceptions. The Kirby Misperton site (KM) had been suspended due to suspected financial issues at the time the interviews began, creating a further point of differentiation between the two case studies.

Overall, interviewees' views on the positive and negative impacts of fracking were similar to those identified in the survey (Section 4.3.1) but were coded and merged into themes to aid analysis of contrasting attitudes. Following Thomas et al. (2017a) and Evensen and Stedman (2017), the chapter considers perceived technology risks and benefits, with further subthemes echoing other scholars' categorisations (Theodori, 2009; 2013; Wynveen, 2011; Kriesky et al., 2013; Ladd, 2013). Section 5.1 accordingly explores perceived environmental, health and socioeconomic risks, whereas Section 5.2 discusses the need for gas and economic benefits of fracking. Table 5.1 provides a synopsis of the impacts considered by residents with contrasting attitudes towards fracking within each case-study location that facilitated the generation of the themes and subthemes. However, reflecting the qualitative nature of the date, the number of interviewees mentioning an issue should not be interpreted as corresponding to the perceived level of importance of each technology risk and benefit or that each interviewee who mentioned particular risks or benefits attached the same importance to them. They merely provide a general sense of the issues mentioned more or less frequently by opponents and supporters. Building on survey results about opinions on fracking impacts (Section 4.3.1), interviewees' perceptions of risks and benefits are portrayed through their contrasting attitudes towards fracking, but case-study variations are highlighted where relevant[58].

[58] Each interviewee's quotation is followed by its unique coding number. Those starting with LN refer to Lancashire and those with NY to North Yorkshire interviewees.

Table 5.1 Key themes in residents' perceptions of fracking impacts								
	Theme	**Sub-theme**	**Description**	**Number of Interviewees**				
				Total	**-**	**+**	**LN**	**NY**
Negative Impacts	Environmental risks	Waste treatment & management	Management of fracking-flowback water and infrastructure needed to manage fracking waste	17	14	3	8	9
		Seismic tremors	Earth tremors occurring during fracking and waste reinjection; Geological faults and safety provided by seismic monitoring equipment	22	18	4	12	10
		Water contamination & other water-related concerns	Contamination of aquifer from chemicals used in fracking or gas escaping during the overall extraction process; Water amount required in fracking process and prioritisation in case of drought emergency	18	15	3	6	12
		Air pollution	Increased methane emissions in the atmosphere and general pollution from increased vehicles movements	22	17	5	8	14
	Health risks	Physical	Physical health risks from chemicals in fracking process and other environmental risks	13	8	5	5	8
		Mental	Stress and worry from local fracking developments	19	14	5	8	11
	Socioeconomic risks	Traffic & road-related concerns	Increased traffic due to HGVs numbers and protests; Traffic management plans and suitability of transportation routes; Deterioration of roads and road safety	33	26	7	13	20
		House devaluation	Decrease in house prices and home insurance problems	16	14	2	7	9
		Industrialisation of local area	Visual impacts on rural or semirural areas	19	12	7	8	11
		Local tourism & agriculture	Economic impact on local industry sectors	17	13	4	5	12
Positive Impacts	Need for gas	Energy security	Geopolitical insecurity of energy supplies to cover UK energy demand	27	21	6	9	18
		Affordability	Cheaper energy bills	9	8	1	7	2
		Environmental Sustainability	Shale-gas as a transitional fuel or contributor to climate change and impediment to renewables development	28	24	4	11	17
	Economic benefits	Job creation	Job opportunities directly or indirectly created by shale industry	29	22	7	11	18
		Community benefits	Community funds, direct reimbursement payments, and new local facilities	24	17	7	10	14
		Financial national gains	Tax revenue and contributions	2	0	2	2	0
	Total number of interviewees per attitude/location				**27**	**7**	**14**	**20**

5.1 Perceptions of Negative Impacts of Fracking

5.1.1 Environmental Risks

Various environmental risks caused by fracking were discussed with interviewees, including waste treatment and management, seismic tremors, water contamination and other water-related issues, and air pollution. The first three were often discussed together due to what interviewees saw as the domino effect caused by the re-injection of fracking fluid as a disposal waste method. The viewpoints of opponents of fracking are presented first, followed by the counterarguments by supporters.

The management of waste fracking fluid troubled the majority of interviewees who held negative attitudes towards fracking and echoed concerns noted in survey responses. This impact was usually discussed alongside other negative impacts but was perceived to be a high-priority concern. Opponents worried about uncertainties surrounding the waste management process and the limited information provided, especially given the potential number of developments. These interviewees were especially worried about the absence of infrastructure to deal with wastewater and the number of trucks required to transfer it to treatment centres through "little country lanes" (*LN09*):

> So, it [flowback water] needs analysis, then it needs transportation again. Where is it you transported to? Because there is no infrastructure for treating it. As far as I am aware there are only four sites in the whole country which is enough to treat the waste from four sites without doing anything else. *(NY08)*

Some participants who saw this method as "expensive" and "barely commercial" speculated that energy companies would put "extreme pressure to get reinjection" allowed since it was "still not banned" in the UK (*NY08*), and, thus, "radioactive waste" would be buried on site in the future (*NY13*). This environmental impact prompted some opponents of fracking to draw comparisons with nuclear energy: "in some ways [they had] the similar problem, in that they store[d] radioactive waste that no one quite [knew] what to do with it” (*NY04*). The importance of managing waste fracking fluid has rarely been mentioned in previous UK research, with the exception of Beebeejaun (2017), who mentioned general concerns about waste from Preese Hall site being dumped into the Manchester Ship Canal. However, Thomas et al. (2017a) also speculated that attitudes towards fracking could become more negative due to increasing evidence that reinjecting flowback water into boreholes may cause seismicity.

Many interviewees associated fracking with seismic tremors, referring to incidents in the US, and the 2011 events in Lancashire. The fact that early fracking activities in England had unexpectedly cause earth tremors did not “fill” several residents with “confidence” (*NY06*) and created an expectation within local communities that fracking could be banned if another significant tremor occurred. As with the survey findings, seismic events were not seen by interviewees as the most worrying impact, and some saw the possibility as of very low importance or magnitude. Residents who were concerned about seismicity, however, mainly focused on tremors occurring during waste reinjection rather than actual fracking. Beebeejaun (2017) and Short and Szolucha (2019) similarly identified that Lancashire residents saw seismicity as a notable concern that potentially undermined trust in the industry capability and raised fears of water contamination.

Several opponents appreciated the presence of seismic monitoring equipment with traffic-light systems to provide safety warnings. However, some feared that nearby geological faults might be affected if tremors occurred and felt that this approach unreliable and insufficiently preventive to satisfy the “precautionary principle” (*NY06*) (see Cotton et al., 2014). These concerns echoed a report published by Professor Peter

Styles around the time of the interviews, which was mentioned by some opponents (Keele University, 2018; Hayhurst, 2018). The “fractured geology” (*NY08*) of the areas and novelty of fracking technology added to those concerns and led some interviewees to complain about geological faults not having been taking into “planning consideration” (*LN04*).

As with the survey, Lancashire interviewees who opposed fracking did not appear more concerned than North Yorkshire opponents about the possibility of tremors despite the area’s previous history. However, a few worried about the potential for seismic tremors to impact on two other local energy developments, Westinghouse Springfields nuclear-fuel manufacturing facility and a gas storage facility approximately ten miles North of PNR, near Preesall:

> [T]he nuclear industry has said that because of the likelihood of earth tremors there should be no fracking within 50 kilometres of a nuclear reactor. Well, there is a nuclear establishment, Westinghouse, five miles from where Preston New Road is. (*LN10*)

> People don’t think the land where the gas is stored is stable anyway, so, they were against the gas storage anyway, and then the proximity of fracking is an added thing. […] Generally, in the area I come from, people are more worried about gas storage than fracking; but people are also worried about fracking because of the relation between the two and also how the decision was taken. (*LN07*)

Reflecting previous UK findings, water contamination was seen as a technology risk that opponents felt could result from the chemicals used in fracking or gas escaping during the process (O’ Hara et al., 2015; Bradshaw and Waite, 2017). Echoing Thomas et al. (2017b) some opponents saw water contamination as the worst possible risk because it was potentially irreversible. They argued that “you can have as many whatever gold standards as you want and it can still go wrong; you can’t put the genie back into the bottle” (NY01). Drawing on information on fracking impacts in other countries, several interviewees foresaw the possibility of water contamination from deteriorating infrastructure or tremor damage after waste reinjection. Reflecting residents' worries that underground risks could extend spatially and temporally (Cotton et al., 2014), two interviewees discussed these geological uncertainties:

> But when he [Professor from Cornell University] says that the gas can migrate 14km, my instant thought was that if it can migrate 14km, it can migrate 14km again *(NY06)*.
>
> And, it could take 10 years or 100 years, but once it found that pathway then where does it end? And then, where do you get the water from? *(NY08)*

Some interviewees pointed out that the process would take place away from local aquifers but still emphasised the severity of this technology risk if farmland became contaminated. One North Yorkshire interviewee explained that local farmers had "boreholes" but only used the "water for cattle" (*NY16*).

Highlighting the usefulness of a mix-methods approach, the interviews revealed water-related fears about beyond contamination that often went unnoticed in previous quantitative research (Evensen, 2016; Thomas et al., 2017a). Some opponents described fracking as a water-intensive process that required "millions of gallons" each time (*NY08*). They described the technology as "not sustainable" for the water cycle or drinking supplies, while uncertainty about water-related impacts prompted them to consider "buy[ing] their own monitors and monitor[ing] the water themselves" (*LN12*). Water usage concerned many opponents, especially in relation to potential shortages or emergencies:

> If they need that much water to put down on a well, where does that leave us, residents? (*LN13*)
>
> Because you know there is a question who gets the water first, is it domestic emergency presumably, agriculture, industry excluding fracking, and then the fracking industry? (*NY08*)

Concerns about water usage, availability, and prioritisation became more prominent in Lancashire after warnings of a hosepipe ban were issued during the second round of interviews, highlighting how events can differentiate local perceptions over time (Denscombe, 2014). Some Lancashire interviewees claimed that possible upcoming water restrictions raised awareness of the water required by the fracking process and created more local opposition:

> We, as locals, are getting texts and emails telling us to put breaks on toilets and to take showers instead of baths and to not hose the gardens the same time Cuadrilla are coming up to a frack. (…) A lot of people who have not really thought about it are going all of the sudden 'how come I'm paying £500 per year and they want me to stop getting the bath but yet they are wasting how many millions of gallons? *(LN11)*

Air pollution was also seen as an important negative impact, although it was usually only mentioned briefly by opponents alongside other environmental risks. Echoing reasons for opposition given during the planning process in Lancashire (Bradshaw and Waite, 2017), air pollution was regarded as both a current and future risk caused directly or indirectly by the fracking process. For example, some participants were concerned about air pollution caused by to increased vehicles movements, while others emphasised how increased methane emissions went against UK's climate change goals:

> Pollution from the number of vehicles that were coming through [Kirby Misperton] showed on the data that was coming through, the fugitive emissions. *(NY14)*

> One of the biggest reasons that global warming is on the spike the last 10 years, they've looked at it and it's because of methane and excess methane being released into the atmosphere. As you probably know, methane is 84 times more potent as greenhouse gas than CO_2; it doesn't last that long, it's half-life, it is about 20 years as supposed to CO_2 which I think it's 100 years. But for that first 20 years it has a huge effect; the reason we have got this huge spike now is shown to be because of fugitive methane from America and Australia. *(LN10)*

One interviewee elaborated on the ways methane could escape and highlighted the importance of controlling gas leaks if the technology was to "replace coal burning" and create "a bridge to renewables" (*NY08*). While some participants expressed worries about flaring– the process of burning excess gas at the site– the same interviewee and local representative in North Yorkshire lobbied during the recent Waste and Mineral Joint Plan Examination hearings for “green completion”– where gas is collected and used instead of being flared (*NY08*). Many Lancashire participants expressed safety concerns about uncontrolled gas releases, which coincided with protestors requesting an emergency evacuation plan for PNR. Incidents and memories of gas smells in the case-study areas were also shared during the interviews. One Lancashire interviewee remembered “a smell in the air that wasn’t agricultural, it was something gassy” when driving past the “original test drilling site [Preese Hall] a few years ago (*LN02*). A group of North Yorkshire participants wondered whether fracking had already occurred secretly based on “a very bad smell that came across the village from the [KM] site [during] chemical cleaning [of] pipes” (*NY12*), whereas another local resident did not worry about gas leaks due to industry’s good record in “respond[ing] immediately” to concerns (*NY09*).

In contrast to the survey results and previous Lancashire findings (Bradshaw and Waite, 2017; Short and Szolucha, 2019), interviewees did not report or appear worried about noise pollution. This could have been due to the fact that the KM and RW sites were not undergoing development at the time of the interviews and PNR was reaching the end of its construction stage.

However, supporters seemed less concerned about these environmental risks and argued that they were misconceptions about incidents abroad that were often fuelled by environmental NGOs and local anti-fracking protester scaremongering. They believed that the fracking process was safely away from the aquifer and emphasised that proper infrastructure and waste management would prevent gas leaks and water contamination:

> I think the water contamination thing is a misrepresentation of the US argument, where they are taking about surface water contamination, where the water is stored in open pits; whereas in the UK is very differently, double-sealed containers for waste treatment and disposal. *(LN08)*

Generally, supporters did not elaborate on waste issues, except for one interviewee who was previously involved in the development of the waste management process for fracking fluid; they described how "straight-forward" it was and how it resembled systems used for nuclear and other waste "in dozen treatment facilities around in the UK" (*LN14*). The interviewee also discussed the reversibility and reuse of most water within the fracking process, while pointing out the negative connotations surrounding radioactive waste:

> And it was very important to us as a business and Cuadrilla at the time that there was some way of taking the material and basically cleaning it up sufficiently it can be put back into the environment; so we could say with certainty this stuff is not beyond redemption (…) And there is no broader understanding of the naturally reoccurring material in the environment (…) it's in you, in me, it's in this table, it's in the bricks of this building is made of; you know those are full of potassium 40 because it's naturally present in clay. So, people don't normally know that thing, and I think it's very easy to fall into the trap of hearing about this waste and it's got radioactive material in it and assuming the worst. *(LN14)*

Regarding seismic tremors, some North Yorkshire interviewees counterargued that these "problems (…) smoothed over" in the US, which became the world's "biggest [gas] exporter" (*NY10*) and added that those who were "very vocal" against the development were "incomers" and unfamiliar with previous energy developments and seismic surveys in the area (*NY17*). Lancashire supporters, however, acknowledged that tremors were the "only risk [the industry] struggle[d] to mitigate significantly [despite] the traffic light system" (*LN08*). While many Lancashire participants learned about fracking after the 2011 incidents, the interviewee described these tremors as equating to a "bus pass[ing] over" and argued that the area "had earthquakes of four on the Richter scale with no damage" (*LN08*). The interviewee was also aware of recent information about the increased risk of fracking in former coal mining areas and concerns over small faults but offered a few counterarguments– the view of another professor, the technological advancement of seismic surveys, and that fracking in stages meant unsafe sections could be avoided. Nevertheless, Lancashire supporters emphasised that “the next stage of operations with fracking and the flow testing [should] go ahead without any hiccups” for residents to give Cuadrilla “a stamp of approval and acceptance” (*LN14*). One also reasoned that a change in negative perceptions was possible as opponents were previously worried about increased construction noise at PNR but then realised this was not significant.

Supporters also did not express concerns about methane emissions or increased vehicle movements causing air pollution but claimed that importing gas was less environmentally friendly and more costly:

> [I]t’s totally stupid to put gas on a ship and ship it half around the world when you’ve got that under your feet. Those tankers can use up 230 tonnes of diesel a day to get that gas where it is; that’s a lot of pollution and it’s all of an extra expense as well, isn’t it? (*NY18*)

Regarding other gas concerns, one North Yorkshire interviewee claimed that there had been no smells from the conventional gas sites, while a Lancashire interviewee explained why concerns about flaring and evacuation plans were scaremongering:

> I don’t understand how a burning flare is anything different from us cooking on a gas rig, you know, you do that in an enclosed environment; whereas if that bit burns outside or anything, it is less harmful […]. So, I struggle a lot with the made-up themes, let’s say, of this whole thing. An example one of the new arguments is that there is no emergency planning in place; well, it’s not deemed to require an emergency plan, that is an evacuation plan, that is spoken with the local authorities, the Lancashire council, and the police and fire service. But […] they create this scare-story that you need to have a 5-mile evacuation plan through. So, for me, it’s not so much the stories which confirm that it is safe, it’s the ridiculousness of the stories which say it’s not safe. *(LN08)*

5.1.2 Health Risks

Echoing Bradshaw and Waite's (2017) findings, several opponents expressed concerns about physical and mental health. Fears about potential physical health risks, such as cancers, birth defects, and general breathing problems arose from doubts about the unknown effects of "chemicals" used in the fracking process and the materialisation of any other possible environmental risks (*NY13*). Opponents were particularly worried about young family members and the elderly, while one Lancashire participant revealed that older residents lived in mobile homes near PNR*:*

> Just the other side of it [PNR], (…) there are quite a lot of mobile homes and I think they are very frightened about what is going to happen, you know, worrying about earthquakes, and the air, 'cause a lot of them are elderly and they may have breathing problems and things, which they are the ones that it's going to affect first, especially when they are so close. (*LN12*)

Interviewees acknowledged that these health impacts would not be felt straightaway but showed "anticipatory anxiety" (Willow et. al, 2014, p.61). Many also claimed that fracking impacted on their lives and emotional wellbeing and mentioned feelings of worry and stress when discussing technology risks, the uncertainty behind the progress of local developments, and the potential scale of the industry as licenses had been granted for fracking in nearby areas. In addition, local developments appeared to have an impact on the mental health of residents who felt fracking had divided their communities or dedicated their time opposing the developments by joining meetings, participating in planning processes, and protests. Echoing the wider fracking scholarship, these findings showed that the technology's impact on residents' mental health could arise not only from other perceived risks, but also from the social changes and disruptions brought to their place and ways of life (Brasier et al., 2011; Jacquet, 2014; Willow et al., 2014; Evensen and Stedman, 2016; Beebeejaun, 2017).

In North Yorkshire, these feelings were evident in interviewees' fears that Third Energy would resume operations or sell out to INEOS, a larger and, in their eyes, more "aggressive" company (*NY01*). Many Lancashire participants, however, were upset with the central government's decisions to override LCC's rejection of PNR and put RW on hold. A few became emotional while describing how the development affected their lives:

> It's affected me more than I thought it ever would… it's insidious, it's crept into me… I can't… it's the first thing I think every morning, it's the last thing I think about when I shut my eyes, I dream about it… I mean everything, it's affected my family life, because the kids say to me 'gosh everything you talk about comes back to fracking', and I said yeah it does, I can't do anything now without you know… it's changed… there's been some positive changes, but there's been a lot of negative ones, I'm incredibly stressed, incredibly tired. (*LN13*)

In contrast, supporters of fracking did not foresee health impacts, arguing that "nobody around the world died from fracking" and that NGOs used "people's Achilles' heel" to stoke negative perceptions of the technology in their areas (*NY17*). These interviewees found it "understandable people getting stresses" as most people in their areas did not "have much knowledge of the industry" (*NY20*), so it was their "natural instinct (…) to want to resist [the technology]" (*LN14*). However, a couple North Yorkshire supporters mentioned that the local developments had negative effects on their own mental health related to disruption caused by protesters and feeling vulnerable or threatened for having a different opinion on the matter:

> That's awful, it does make you very worried, you feel vulnerable at times, you get hardened up to it, eventually, but it's a shock initially; I think it's a shock to anybody to get abused just because he has an opinion. (*NY17*)

5.1.3 Socioeconomic Risks

Similar to the survey findings, socioeconomic concerns expressed by interviewees who opposed fracking included: increased traffic and road-related issues; house devaluation; industrialisation; and impacts on local economic sectors. Opponents again regarded increased traffic as a key negative impact and described an increase in the number of HGVs during construction works while fearing the situation might worsen during the production phase and expansion of the industry. Many opponents were upset about companies breaching agreed traffic management plans as large number of trucks often drove in convoy, sometimes outside agreed hours and at a high speed when approaching or leaving the sites. One North Yorkshire resident, who was involved in a traffic survey in the area, elaborated on violations around KM and said this changed their opinion on the development:

> I was against it [fracking] in principle, but I wasn't that against this individual because it was a small one, but then as it started panning out, the protections that were supposed to be there didn't seem to be protecting the village (…). Because it was supposed to be two vehicles every fifteen minutes or something like that but they decided, at the instigation of the police, to send all vehicles in convoys, so you've got 11 vehicles coming through the village at one time. […] Because there was only one route agreed, again, if they couldn't get in the front gate because of the protestors, or if the road was shut between the gate and Kirby Misperton, which was the agreed road, then they turned right and went through Great Habton and the other villages and came round; and that route hasn't had an impact assessment done on it. (*NY14*)

Several interviewees felt the police facilitated and favoured the energy companies and "us[ed] the excuse of health and safety" to shut down the traffic even when only a few protesters were present (*NY05*). However, one North Yorkshire opponent mentioned that the police cooperated with residents to put sufficient safety measures in place. In contrast, road disruption caused by protesters blocking the road, jumping on and slow-walking in front of trucks was usually perceived favourably or as necessary by opponents as a means to lower truck speed and discourage contractors working with the energy companies.

Besides traffic and road closures, opponents talked about the suitability of transportation routes, future deterioration of roads, and road safety (Thomas et al., 2017a). Commonalities between the KM and RW sites and differences with PNR revealed that the development stage and geography of fracking sites were responsible for opponents' diverse viewpoints and experiences on traffic issues. During interviews, the second horizontal well at PNR was being built, the planning inquiry for the proposed RW site had re-opened allowing solely traffic considerations, and KM site had been put on hold and its rig and other equipment removed. A few North Yorkshire participants noticed more traffic in their area during rig removal, but still found this to be negligible compared to PNR. This was attributed to differences in the scale and construction requirements of each shale gas development, as KM was previously a conventional gas drilling site and had no horizontal drilling planned:

> This [KM] is an existing well site, the well was drilled in 2013, it's a vertical small frack, by fracking standards, there is no horizontal being drilled. What people don't get is that the first thing that has to happen on that site, I believe, 'cause it's so crammed, if they wanted to drill another well, is that they would extend the size; so you got the construction traffic. […]]. But those people, who, yes they'll have seen more traffic coming through the village, but that traffic is nothing compared to like PNR, where they have 30,000 vehicle movements, and 900 of those are HGVs. (*NY05*)

Traffic passing through a village and the ability of rural infrastructure to cope with large vehicles were shared concerns between North Yorkshire interviewees and Lancashire interviewees living near RW. A few residents close to the KM site mentioned occasional disruption and locals' discontent when the main village road was shut down or when "cars [were moved] to make room for the lorries to go through" (*NY02*). In contrast, another North Yorkshire interviewee who lived a few miles from KM said that traffic and road disruptions were localised issues since the road leading to site was "not important for getting anywhere" but only used by village residents (*NY04*). In addition, some North Yorkshire participants had reservations about HGVs using an old narrow bridge that “had been reinforced because of the EU regulations earlier” (*NY09*). While the KM rig was transferred away, it “got stuck on that bridge”, confirming worries that local “infrastructure [was not] built to have heavy goods vehicles” (*NY13*).

Residents near the RW site expressed similar concerns, arguing that walkers, horse riders and cyclists frequently used the surrounding rural roads and feared that approval of such a “rural site” would set a “precedent” for future shale-gas projects (*LN05*). More routes to RW were being assessed for planning permission at the time of the research and there were indications of rising local opposition, such more anti-fracking signs. Other Lancashire interviewees compared PNR and RW and concluded that differences in their location and transportation routes were key to how far fracking would negatively affect residents’ lives. They saw the lanes leading to RW as dangerous (*LN10*), while vehicles getting to PNR did not pass through a village, since its entrance was based on a A-road. One interviewee explained that PNR was overlooked before the development began and its distance from a village meant residents would be impacted less than those in Roseacre. Nevertheless, that A-road was described as “very busy”, serving many residents and commuters (*LN13*), and any road disruption affected people living further away from the site, which explained complaints in the area about delays caused by protesters.

Concerns about road safety were mentioned in both case studies. The proximity of the KM site to a more populated area again affected these perceptions, with one explaining that residents worried about “little children wandering around” and school buses, playgroups, and a childminder business in Kirby Misperton village (*NY13*).

Drawing on fracking impacts reported in America, some interviewees feared an escalation in accidents. North Yorkshire interviewees shared personal experience of a near collision on a narrow bridge and a Lancashire interviewee mentioned an accident at PNR:

> (*NY02)*: There was a police convoy of three police cars ahead of two big low-loader type of lorries, and the police up shot across the bridge; they made us stop in time, didn't they? Otherwise there will be ahead on collision; you know, there was no need for that, there was nobody else around, it wasn't as if there were loads of protesters, you know, and had to go fast to stop people from jumping on them.
> *(NY03)*: If I hadn't stopped we'd have crashed, you know, because of the speed they were coming across and you can't see…

> There was an accident with a cement mixer and it came the wrong way, hesitated, and a couple of civilians' car hit it, and, fortunately nobody was seriously hurt, but it destroyed the car; and that was solely down to poor communication, so there were issues around things like that which were quite concerning. (*LN13*)

In line with Bradshaw and Waite (2017), many residents who opposed fracking saw property devaluation as a significant negative impact that "put an uncertainty into [their] neighbourhood" (*NY02*). They shared stories about houses close to fracking sites, either their own or owned by relatives and neighbours, that had been devalued, were difficult to sell, or had sold at a reduced priced because of fracking. One interviewee pondered "why would you want to put your family at risk by living somewhere so close?" (*LN12*). In addition, some interviewees mentioned that insurance companies would not cover house structural damages caused by fracking.

A few opponents explained that many residents avoided talking about house devaluation so as not to "sound like a NIMBY" (*LN04*). However, the same interviewee explained that her family "worked really hard in [their] lives to retire to the countryside, to live a better way of life, and to enjoy the countryside, the peace and quiet, and [their] health" (*LN04*). Others added that "people [relied] on house prices going up for their wealth" (*NY02*) and, since many of the houses were bought through mortgages, they feared of living in "negative equity" (*NY12*).

Industrialisation of the rural areas was one of the most discussed negative impacts of fracking (see also Short and Szolucha, 2019; Jacquet, 2014; Willow et al., 2014; Thomas et al., 2017a; Evensen and Stedman, 2018). Many interviewees opposing fracking emphasised the beauty of their local area and emphasised its rural character. These positive place features were associated negatively with the technology (Section 4.5.1). At the beginning of an interview one participant described the local area as: "Beautiful, isn't it? And it seems a great tragedy, really, if it is blighted" (*NY09*). Many opponents pointed to the visual impacts of fracking when discussing industrialisation of the area. One participant described her astonishment when she saw the development for the first time:

> [I]t was like 'goodness', you know, that's what all this has been about. We have already seen windmills around; there are lots of private farms that have the smaller windmills. And one day, we are coming back from Malton on the back road, and we came around the corner to come to Little Barugh, and that was the first time I've seen it from... and once again your heart like it catches you because it's such a change in your vista. *(NY03)*

Many of these interviewees disliked the visual impact of the drilling rig, describing it as an "eyesore" (*NY01*), while others mentioned the visual impact of fences around the development and night-time lights. During these discussions, most opponents compared the appearance of wind turbines favourably to their local shale developments. While the removal of KM rig differentiated the visual impacts of different sites somewhat, most opponents were mostly worried about the number of future sites in their areas and the scale of shale gas industry:

> Once you accept the reality of how fracking is carried out, and the fact that is not just one well-site […]; it's a case you drill a well, you frack it, the production turns off, and you drill another, and another, and so on; so it's a whole series of wells. If

> it's going to be commercial, you are talking about probably of thousands, if not tens of thousands wells. So, consequent to that, it's absolutely inevitable that there is a great deal of traffic, a great deal of… well, the industry moves in and it's industrialisation, it's not pleasant, it's a heavy industry. *(NY08)*

In addition, some opponents emphasised the inappropriateness of the technology in a rural area while pointing out that "in planning, it [was] also quite legitimate to look at the character of the area and if it fitted with" (*NY06*). The North Yorkshire interviewee further reasoned that fracking in rural area was "more suitable (…) because less population is a good thing", but their area was "still quite populated (…) compared to Australia or America" (*NY06*).

Thoughts about the impact of fracking on other local industries often accompanied discussions about industrialisation. In both case studies, many opponents stated that their areas were economically dependent on tourism and agriculture. While they did not see immediate impacts, they expressed similar fears to participants in a study by Israel et al. (2015, p.145) that fracking would "crowd out" other established local sectors. Several Lancashire participants believed that the PNR site was the beginning of many more sites in the area:

> As far tourism goes, Francis Egan who is the boss of Cuadrilla, said in the early days and he has repeated many times that it is his intention that he wants to turn the Fylde [area] into Western Europe's largest onshore gas field. Would you go for a holiday in a gas field? (*LN10*)

North Yorkshire interviewees expanded more on the importance of tourism while describing how the development fell within the wider tourist destination of the area, which includes York, Whitby, North Yorkshire Moors, Castle Howard and which hosts the Tour de Yorkshire. A couple expressed concerns about impact of fracking on Flamingo Land, a theme park at the edge of Kirby Misperton, and speculated that the suspension and postponement of fracking operations after the summer season might have been done intentionally.

Opponents believed the effect on these industries would be greater and last longer if there was a water contamination incident, while some Lancashire interviewees elaborated what this would mean for agriculture. One Lancashire representative reported fears within the local farming community, while another discussed the export of British agricultural products:

> The EU was so concerned that they've said if there is even one spill from one well, then they would be a block on any agricultural produce from within a 30-mile radius from the well; and that refusal to accept would last for 30 years. So, all we need is one spill from one well and the whole of the Fylde [area] is out of commission for the next 30 years. (*LN10*)

Concurring with Bradshaw and Waite's (2017) findings, some opponents argued that their areas would "lose more jobs from agriculture and tourism than [they would] gain in fracking", and emphasised the need to assess the economic impact of the technology "holistically" (*NY08*). Having researched the impact of fracking on tourism in "comparable (…) rural communities with no particularly high employment" in Canada, one interviewee claimed that, usually, most jobs were given to "specialists brought in the area, not the indigenous population" (*NY16*). Some opponents argued that this temporary influx of workers could benefit tourism but only in the short-term, and wondered what the departure of the fracking industry would mean for their areas and sectors that had "taken probably decades if not centuries to build up" (*NY08*). The same interviewee was personally involved in local tourism in North Yorkshire and saw no immediate impact of fracking. However, they pointed out that there were "very real risks, but then there [were] perceived risks for both agriculture and tourism industry" (*NY08*), meaning that public perceptions of farming products and the area's image as a tourist destination could be negatively affected regardless of whether environmental impacts materialised.

Except for increased traffic and some road-related concerns, fracking supporters did not worry about other socioeconomic risks. They acknowledged increased traffic as a negative technology impact, but mainly because of protesters' actions in their area. Several saw traffic as a reasonable outcome from any energy development and reasoned that it would decrease after construction of the well and with proper on-site infrastructure. Another pointed out that agriculture also involved large-scale transportation. They expressed concerns about deterioration of local infrastructure because of additional HGVs, but hoped that energy companies would compensate and improve local infrastructure in the long-term, based on his knowledge of similar developments in the Shetland Islands. However, the interviewee emphasised that many residents viewed road closures and protesters' actions negatively for the disruption they caused:

> I have the same opinion as many people, I have no problem with protests but these people climbing on trucks and doing these clamp things that take hours to get off, that irritates the hell out of me since the road was blocked on occasions when I was trying to get to Pickering. (*NY20*)

Another North Yorkshire supporter explained that protesters not only made him aware of fracking and the local development, but were also the reason for joining RAAP (Ryedale Against Antisocial Protesters). A Lancashire supporter also mentioned a similar group, 'Reclaim the Road', which was established to oppose actions that disrupted local roads. The second phase of interviews in Lancashire coincided with large protests at PNR organised by 'Reclaim the Power', a national anti-fracking group, where the interviewee questioned the ethics of fracking protesters:

> If you think you are going to take part in a protest and actually the collateral damage you cause is greater than your intended target, then, morally, your actions are questionable, at the least…. So, disrupting the road; like on Wednesday, they had the walk on the road, you've got cars there, the temperatures reaching 30 degrees, people are not happy about it. (*LN08*)

Contrary to opponents, supporters regarded the involvement of police as favourable and necessary to accompany truck convoys or guarding the sites' gates, due to the protesters' actions. Nevertheless, they often commented negatively on the additional cost of policing to local areas.

House devaluation was only discussed briefly by a couple of supporters, who blamed the involvement of national NGOs in fearmongering, while arguing that the same local people would object to new housing developments or any kind of energy facilities if they believed it decreased house prices or created negative equity:

> It wouldn't matter… if it wasn't Cuadrilla, if someone else turned up and said we are going to put ten wind turbines on Wensely's farm, the same people would be campaigning against that, I guarantee it, because it's new and people don't want it where they live. The other thing that becomes apparent in all these situations with energy infrastructures and housing, and so on, is that people's motivation to resist stands I think from three key things, fears about wealth, health, and happiness. (*LN14*)

Regarding industrialisation of the local area, fracking supporters did not appear concerned even though most appreciated the rural character of their areas to some extent. Supporters discussed the visual impacts of fracking, claiming these would be temporary or efficiently screened in contrast to renewables or other local industries, such as agriculture:

> [H]ow aesthetic is so important when you can have wind turbines which can stand for 20 long years? And with decommissioning in 20 years there would be there. (…) When Cuadrilla finish the flow test in a two years' time, you'll be left with a number of well heads about standing 4 foot from the ground, and that's all that is going to be on the field, and you know, that would not visual from the road. (*LN08*)

One North Yorkshire supporter offered to show other conventional gas sites near Kirby Misperton to demonstrate that they were not visible from the road and argued many people in the area were unaware of their existence, while others emphasised that familiarity with local industries and previous energy developments played a key role in how these were perceived by long-standing residents:

> This is the third major gas planning application that's gone in the area; back in the early 90s was one for the generating station, and then was one in Thornton Dale, and then this one. So, this area actually has had a lot of gas exploration for many years in the area, but most people that lived here a long time accept that, you know, and not so bothered about it. (*NY17*)

The majority of interviewees who supported fracking did not believe the developments would negatively affect local tourism, as industrialisation and water contamination did not constitute concerns, whereas the impacts on agriculture were not mentioned. In North Yorkshire, one interviewee argued that the rides from the Flamingo Land were more visible than the shale development. Another participant who owned a local tourist business believed the site was too far away from the area's major attractions to be affected and explained that there were similar unfounded fears in the past over the nearby Knapton power station. They stated that the main reason they supported fracking was the benefits to tourism:

> And something like this in the area, they are going to want accommodation, they are going to want all the things tourists want basically, all the amenities and things, restaurants and entertainment and everything, and it will be all year-round. And, at the moment, you've got lots of people working in tourism, but that's like part-time, seasonal, basic wage. (*NY17*)

5.2 Perceptions of Positive Impacts of Fracking

5.2.1 The Need for Gas

The next two sections present the perceived technology benefits mentioned by interviewees who supported fracking, then opponents' counterarguments. Many interviewees were asked about fracking providing energy security, cheaper energy bills, and a smoother transition to renewables (Heffron et al., 2015; McCauley et al., 2013). Supporters emphasised the need for gas in the coming decades “to provide for electricity” and heating (*NY10*). Energy security was seen as a key benefit of exploiting shale gas (see also Bradshaw and Waite 2017; Thomas et al. 2017b). This was mostly highlighted in the context of political instability; the majority of supporters favoured the production of domestic gas since North Sea reserves were declining and condemned the country’s dependency on energy imports:

> I mean, we buy our gas from Russia, Ukraine, and all it’s piped in all way from there(…) Yes, if forever Russia or Ukraine turn that tap off, there is going to be only 1 or 2 days of supply of gas in the UK. Then what are we going to do? I think it has happened before, I think last year we had to import some gas from Peru or somewhere like that, somewhere really remote. (*NY10*)

During data collection, UK energy dependency on other countries, mainly on Russia, was frequently mentioned in the media and was often questioned by opponents. One supporter countered opponents’ point that fracking did not “supply much gas” by reasoning that it did supply “30% of Europe’s gas and [the UK fed] off that as well” (*NY17*).

Regarding energy affordability, none of the interviewees believed shale gas would reduce gas charges. However, one person saw this as “half of the argument” and pointed out that domestic shale gas could prevent charges from rising in the event of geopolitical instability (*LN08*). However, several supporters believed the technology could provide environmental sustainability by facilitating the transition to renewables (*NY17*). Most interviewees supported the idea of renewable energy but many saw it as an unreliable, inefficient and unfair way to meet the UK’s energy needs due to limited infrastructure and a reliance on public funding:

> [T]here is an issue with everything in energy production. But even then, 85% of homes in the UK use gas to heat. So, you got to transform all these forms to

> electricity if we are going to go all renewables. You know, renewables don't produce enough energy as such for heating. (*NY17*)

> I don't know if you know much about the [renewables] subsidy regime at the moment, but it's a bit like regressive tax in that everybody ends up paying a share of that subsidy through their electricity bills whether they like it or not. So, families saying that already live in fuel poverty, they ended up being hit the hardest by that, which I think is a bit unfair. (*LN14*)

In addition, some supporters saw a "climate benefit to displacing [imported] liquefied natural gas with a source of our own natural gas from under our feet" (*LN14*), while countering opponents' air pollution concerns. These findings contrast with the majority of other fracking studies, where climate change benefits were hardly ever raised (Thomas et al., 2017a;b; Bradshaw and Waite, 2017).

The majority of opponents dismissed arguments about the UK's energy dependency on Russia when asked whether energy security could be a benefit of the technology. A few mentioned "mixed messages coming from the government" (*NY14*) about energy security, citing recent government documents which reported that the country was using "less 1% of Russian gas", contrary to previous energy dependency claims (*NY07*). Therefore, most opponents did not perceive energy security as an immediate issue and some argued that there were still "known reserves" that could be used if "it wasn't for climate change" (*NY04*). Another opponent argued that the technology could not realistically ensure energy security since "it [would] be 10 years before it [produced] any meaningful quantities– that's 2028, (…) 2 years before [UK's commitment] to come out from fossil fuels" (*LN10*). However, others recognised that energy needs were increasing, indicating some "reluctant acceptance" of fracking in the future (Whitmarsh et al., 2015, p.423), if they "felt there was a genuine need […], a national catastrophe" of not exploiting national shale reserves (*NY06*). Some opponents also questioned INEOS's motives in extracting shale gas for securing energy domestic supplies and assumed they would use it for making plastic or other products. In common with Thomas et al.'s (2017b) participants, the majority of opponents saw fracking as an uncertain and unjustified energy technology compared with renewables, which they favoured:

> [O]k we got to deal with how we ensure our supplies, but I'm not convinced that this is the appropriate way, maybe not for this area. There are lots of other things, such as the wind power is being not as exploited as much as it can be […]. I think we need to get done of the past, 'cause this is not sort of defined safely, I think there are still too many questions over the effect towards the environment and all, so it's questionable at the moment. (*NY09*)

> And it is said we've got enough oil and gas to survive for the next 50 years anyway, by which time we won't be using any of it because they are cutting back in all that stuff because of climate change; so why they are digging more I don't know! (*LN01*)

In terms of environmental sustainability, interviewees argued for "the need to [move] away from fossil fuels" (*LN10*) and did not see fracking as a transitional technology. They claimed that "you [could not] have a bridge to renewables if you [did not] promote the renewables first" (*NY08*). Several criticised central government for not being "really committed to renewables", "cutting [down] the funding", and not promoting energy efficiency as the "first port of call" to reduce country's energy needs (*NY08*). Consistent with the literature, the majority of opponents believed fracking would deflect the country's attention from more sustainable energy pathways (Thomas et al., 2017b; Partridge et al., 2017; Cotton et al., 2014). As Thomas et al. (2017a) speculated, climate change was more important for residents' attitudes in the UK than in the US. For example, one opponent, showing a Not-In-Anyone's-Back-Yard attitude, argued that most locals cared about both the local and global risks of fracking:

> You see this as something that is threatening your whole community, which includes probably yourself, your children and grandchildren, your friends, your neighbours, your relatives; and a lot of this sort of people I'm talking about it's not a NIMBY thing, it's not a backyard thing, most of them are looking at the climate change issue, we don't want fracking anywhere if it's going to have such a massive effect. (*NY08*)

When it came to energy affordability, no opponents appeared to believe there could be a reduction in gas bills, some of whom justified this by arguing that the quantity of shale gas needed to influence was beyond its capacities and that the technology's viability depended on the global gas market.

5.2.2 Economic Benefits

While reduced energy costs was not seen as a potential benefit of shale gas for either supporters or opponents, opinions varied on other local and national economic benefits. As with other fracking scholarship (Thomas et al., 2017a; Bradshaw and Waite, 2017), those who supported fracking believed the industry would provide "a great boost" (*NY19*) to the local economy through employment opportunities, financial benefits, and money "flowing to local government" (*LN14*). Confirming the survey results and echoing Theodori (2009), supporters saw the industry as alleviating economic deprivation in both case study areas. One North Yorkshire interviewee emphasised how the area had "the lowest average income in Yorkshire" and the technology "would definitely make [it] more wealthy" (*NY20*). One Lancashire interviewee, meanwhile, foresaw fracking "as a real catalyst change (…) [that] might encourage decision-makers and leaders in Lancashire to think about actually growing the economy here rather than actually managing it into decline" (*NY20*).

Supporters also believed that the industry could provide year-round opportunities for tourism and welcomed local contractual work opportunities and the prospect of other jobs (see also Evensen and Stedman, 2018). While some acknowledged that the majority of specialised positions would require non-local staff, others argued that local people could gain new work skills in the long term. Some North Yorkshire interviewees regarded these local job opportunities as an incentive for young people to remain in the area by offering a “decent” income and the ability to “afford to buy a house” (*NY17*). A Lancashire participant believed that the shale gas industry would create a “clustering effect” like the one in “Aberdeen” or the local “aerospace” industry, while arguing it could become an “exportable industry” and be a prototype for other European countries (*LN14*).

A few supporters also referred to funds being allocated to nearby communities, either directly by the energy companies or through local councils retaining business rates from shale-gas sites. They believed that “payments to the communities would be megalithic” depending on the viability and price of shale gas (*NY17*) and could help prevent “public libraries being closed [and] rural bus services being lost because of funding cuts (*LN14*). Retaining local population and amenities were also identified as arguments for supporting fracking in Evensen and Stedman’s (2018) study as a way to promote “the good life” (p.142). However, one person emphasised the need to “keep a good close watch” to ensure the industry honoured its responsibilities and that the financial benefits provided met the community’s long-term needs (*NY20*) (see Willow et al., 2014).

Supporters appreciated the sponsorship of local sport teams by the industry but argued that protesters prevented these actions being recognised by communities. One Lancashire supporter suggested that Cuadrilla did not advertise these actions to avoid attracting negative attention from protesters, while some North Yorkshire interviewees were upset with protesters interfering with local businesses opportunities and funding of local sports teams:

> So there is a football, cricket club, and Third Energy offered them a hundred thousand pounds. Sponsorship money and such like to help with funds, because they have no other income, all their income is just charity-based; and they were

> scared to take it because they thought they might get abused by the protesters; so, that money, 120,000 pounds, went to Scarborough instead, instead of the local community. (*NY19*)

A Lancashire participant reasoned that, by sabotaging financial benefits and work opportunities, protesters were able to "deny that [fracking] can bring prospect to this area" (*LN08*). However, the interviewee also blamed Cuadrilla for not foreseeing and communicating early possible disruptions caused by protesters to local contractors, which led to work opportunities going to companies from outside the local area.

On a national scale, supporters welcomed the industry's financial "independence" from taxpayers' contributions (*LN08*), which they felt would reduce the cost of energy imports. One supporter shared how shale gas could create substantial tax revenue that could facilitate the transition to renewables:

> This gas will be taxed, with an effective rate of somewhere 45-50% range. […] So there is a huge new source of tax revenue there, which I personally would like to see being ring-fenced so that we could use it to invest in things like renewables, so perhaps develop a subsidy mechanism for renewables which gets more renewables built but homeowners aren't the people that have to pay for it. (*LN14*)

In contrast, many opponents believed the government "overplayed" the number of jobs the industry would create (*NY16*), while arguing that many jobs could be lost in tourism and agriculture (Section 5.2.3). As with Jacquet's study (2014), many opponents emphasised that non-local specialised personnel would cover the majority of positions and that locals would mostly provide service jobs; a few Lancashire participants added that supply-chain contractors were already coming from Scotland or Holland:

> Local jobs! That's a farce; I can't dig a well, the only people that are going to benefit, local jobs are going to be take-aways and places like this [B&B]. […] I don't see any jobs suitable for the local community that anyone in a rural setting could do. (*NY15*)

> The jobs there are all automated, it's just like gas storage; obviously you have construction jobs, but once it's in place, and you sold concrete to them and they have used the portable toilets, you're talking about some security guards and some

> top level engineering specialists, it's not really going to boost the local economy. (*LN07*)

A few opponents regarded the work positions as unsustainable and "short-lived" due to the life expectancy of each well and the need to move away from fossil fuels due to climate change (*NY06*). One North Yorkshire interviewee compared this to a potash mine in the North York Moors National Park that they disliked but did not oppose:

> And it's one site, and it's going to create 1000 of permanent jobs for hundred years, and it's close to places like Whitby, you know, for tourism and the demising fishing industry. So, you would think quid pro quo, you know, and you are not peppering the landscape with all these things and sending these huge tracks everywhere. I mean obviously there will perhaps initially when the construction phase, but once its built, it's just one area that can be dealt sensitivity and it brings long term stability; where is one of other the things we learned from Pennsylvania is they [industry] move around from these [fracking] sites. (*NY05*)

Overall, opponents did not particularly welcome direct payments or community funds as they just wanted the industry to "go away" (*LN02*) and did not believe benefits could compensate for the potential environmental damages and house devaluation. However, several commented that larger financial benefits might tempt many residents to accept local shale developments, especially farmers who were struggling economically. In both case-study areas, residents living close to developments mentioned that they were contacted by the energy companies about their preferences for new facilities in the area, while people living further away also knew about this funding. In contrast, North Yorkshire opponents living near to developments were uncertain whether or how much compensation there might be, whereas Lancashire opponents were more aware of direct payments and criticised their distance-allocation approach:

> They offered houses within a certain number of metres £2,000, I think 12, 10 houses or something got that or could apply for that, not everyone took it. And the rest of the houses within a kilometre could receive £150; now considering that a lot of these are homeowners […], [this] is ridiculously small. (*LN13*)

A few participants doubted the provision of payments during the production stage of developments (based on profits) because energy companies were registered overseas, had an uncertain future financial status, and relied on "on the gas price of the time" (*NY04*). These views were more common in North Yorkshire, where Third Energy's financial status was in the spotlight at the time:

> The money issue is another divisive thing for communities. Plus, the fact that some of these firms will say you'll get 1% of the profits or x% of the profits, but where are the profits? If you've got Third Energy, whose parent company is in the Cayman Islands, and you've already got 54 million pounds worth of debt, you write off these debts whether there are really or not, your accountant says: 'oh let's write off the debt, then we are not making any profit yet'. (*NY08*)

Regarding other community benefits, a few opponents expressed annoyance about industry sponsoring local sports teams and events, describing these actions as "disturbing" when children were involved (*LN13*). Others believed the industry would "raise revenue" for the local and central government without these benefits extending to residents (*LN04*).

5.3 Summary and Reflections

This chapter has explored interviewees' viewpoints on perceived risks and benefits of fracking, addressing the first objective of the thesis. The interviews generally concurred with the survey results about the importance of different negative and positive impacts. While a polarisation of opinions on impacts was again evident, interviews delved more deeply into participants' understandings of that various environmental, health, and socioeconomic risks and benefits associated with fracking technology. While studies on fracking have often considered risks and benefits as explanations of opposition and support (e.g., Kriesky et al., 2013), this research also explored what residents believed about the other side's arguments providing a more complete picture of local perceptions of fracking impacts.

Echoing survey results (Sections 4.3.1; 4.3.2), negative effects on nearby communities, such as increased traffic and road-safety, industrialisation of local areas, and house devaluation were very significant for most interviewees who opposed fracking. However, a proportion saw water contamination as the most concerning risk, a finding that highlighted shades of opinions about negative impacts even among residents with the same overall attitude. Besides water contamination, some interviewees worried about water usage and how water would be prioritised in the event of an emergency. Echoing responses to open survey questions, the management of fracking waste emerged as a significant concern, since many opponents saw it as the source of other environmental risks. Many opponents also discussed air pollution in relation to increased traffic and/or fugitive methane emissions, though generally only did so briefly. Overall, opponents' perceptions of environmental risks portrayed fracking as a complex and intensive process "with the life cycle of the industry [ranging] from raw materials to waste disposal [and] posing new environmental challenges for communities beyond the drilling sites (Beebeejaun, 2017, p.420). While environmental risks mainly constituted a future concern for opponents, many reported experiencing some socioeconomic and health risks even in the early stages of the development of the fracking sites. A common finding across the discussion of technology risks among opponents was their worry about the scale of industry needed to make a difference to meeting the UK's energy requirements, which magnified future technology risks or aggravated existing ones. Opponents also did not believe that the technology could provide substantial benefits, while some of the local economic benefits proposed by the energy companies were not welcomed.

Conversely, fracking supporters downplayed many environmental, health, and socioeconomic risks and attributed them to scaremongering by environmental NGOs and local protesters, lack of knowledge of how fracking would be managed in the UK, and lack of familiarity with energy developments. Furthermore, a few supporters explained that some potential risks did not constitute concerns due to their temporariness, ability to be mitigated, and low chance of occurrence. Nevertheless, interviewees supporting fracking saw increased traffic and mental health concerns as negative effects, but mainly attributed these to protesters' actions. Supporters in turn justified their attitudes towards fracking in terms of energy security and environmental sustainability and the provision of national and local economic benefits. In contrast to survey participants, none of the interviewees favouring the technology did not perceive cheaper energy as a future benefit.

While this chapter explored residents' perceptions of impacts in relation to the formation of negative and positive attitudes, the selection of case-study locations was important as it highlighted the importance of place. The fact that many opponents emphasised local risks rather than basing their opinions on general evaluations of the technology confirmed the findings of previous studies that local perceptions of impacts are frequently place-driven and, thus, different from those found in national studies (Evensen and Stedman, 2016; 2017; 2018). Overall, residents' anticipated and lived-experiences of the negative impacts of fracking shaped their attitudes and explained these differences (see Evensen and Stedman, 2017). On the other hand, local positive impacts were welcomed by supporters in both areas as these were seen as potentially bringing important positive place changes (Evensen and Stedman, 2018).

Interview discussions further highlighted place and technology impacts interrelations by showing that perceptions of risks and benefits varied by the number and siting of fracking sites within local areas, their development stage, technology features and site requirements, as well as local temporal events and other energy developments. Most notably, while RW planning permission was still pending at the time, its location within Fylde area contributed to opposition by many Lancashire residents who participated in the study. The uncertainty behind the future of a fracking site, was, however, one commonality noted between the KM and RW sites. While KM had undergone some development works, its suspension and rig removal fed into opponents' worry and stress and issues of road-safety. On the other hand, PNR progression with horizontal drilling and other required infrastructure works created more traffic from HGVs and ongoing protests. All socioeconomic risks identified in the study troubled opponents near all three sites, but the rural geography of RW and KM and their proximity to larger settlements particularly weighted on their perceptions. Other local energy developments within case studies also contributed both positively and negatively to interviewees' perceptions of the impacts of fracking.

Overall, the research has shown that the technology impacts of fracking significantly affected the formation of residents' attitudes (Section 4.3.2). Opponents' attitudes were shaped by a mixture of environmental, health, and socioeconomic risks, with many stressing the more immediate and local negative impacts they experienced at the time (i.e., increased traffic and other road-related concerns). However, and similar to the survey participants, interviewees' perceptions of impacts were aligned with their attitudes towards fracking, supporting the idea that some opponents' pre-existing attitudes led them to place a greater emphasis on both current and future concerns (e.g., gas smells, physical health risks) and disagree with all potential positive impacts. Conversely, supporters' attitudes derived from the benefits the technology would bring in the future both on national and local level and a great disbelief in the realisation or severity of technology risks. These findings, therefore, reinforce Evensen and Stedman's (2017, p.10) suggestion that a "reverse" or "recursive" relationship could exist between attitudes towards contentious technologies and beliefs about their impacts due to a degree of confirmation bias. Building on the integrated approach adopted in the thesis, Figure 5.1 maps these key findings.

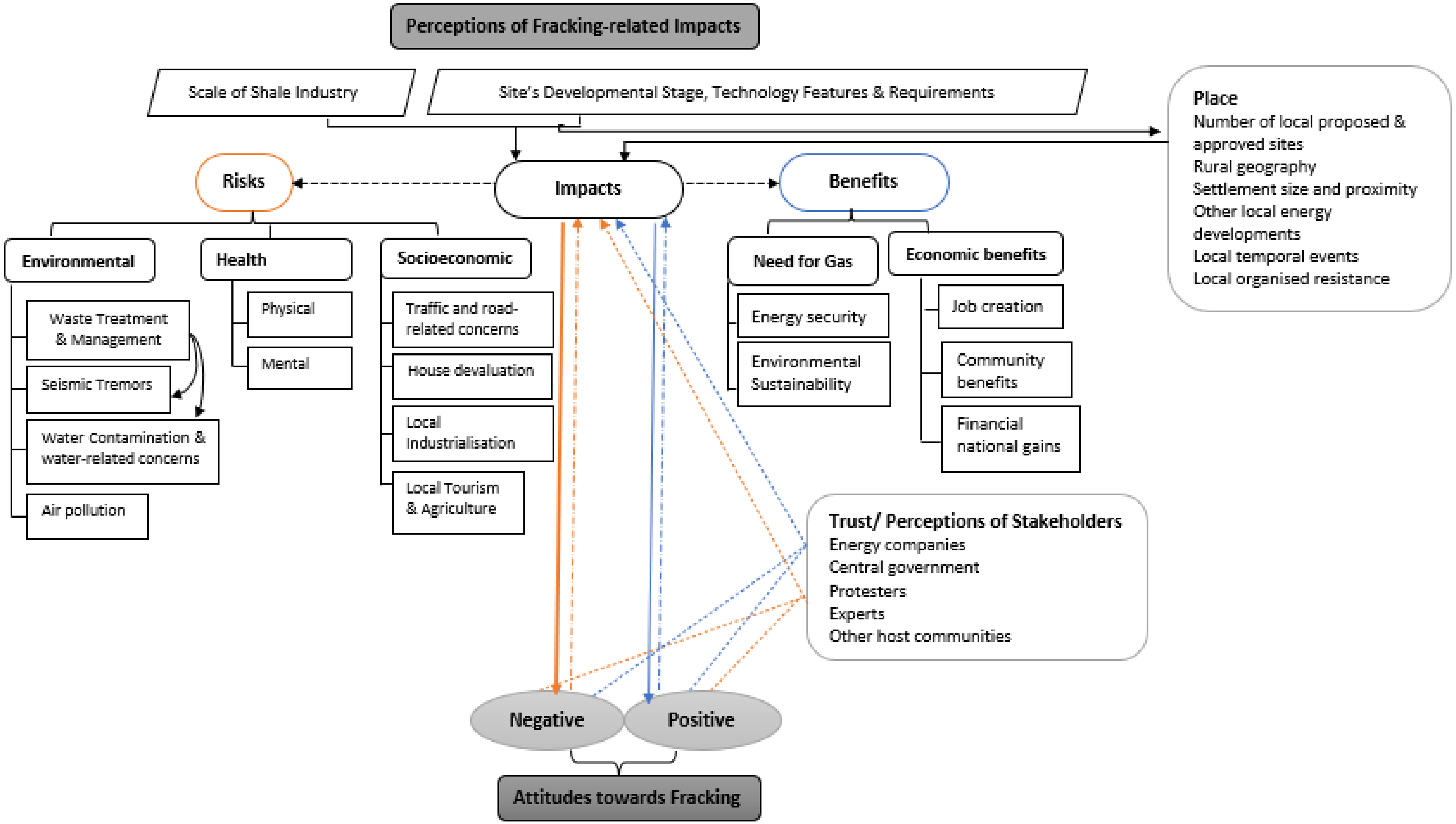

Figure 5.1 The role of perceived impacts of fracking in attitudes' formation

Furthermore, while the aim of this chapter was to explore residents' attitudes towards fracking and perceptions of technology impacts, the importance of trust in stakeholders of fracking and place became apparent during interviewees' discussions, both of which align with the survey results and strengthen arguments for the integrated approach adopted in the study. For fracking opponents, energy companies' actions – such as offering benefits and compensation payments – created mistrust in their motives and capability to manage technology risks. Conversely, protesters' actions and claims over environmental impacts made fracking supporters place less emphasis on these risks. Despite their attitude or location, many interviewees drew on reported experiences from other countries and on what they perceived to be credible sources of information. Therefore, perceptions of stakeholders involved in fracking affected the reciprocal relationship of attitudes–perceived impacts as trust acted as a mediator factor amplifying or attenuating how impacts were perceived (Oltra et. al., 2012; Cotton et al., 2014; Whitmarsh et al., 2015).

The following chapters explore in more detail issues of justice in shale-gas governance and how residents' sense of place and broader beliefs also feature as contributing factors to attitudes towards fracking.

Chapter Six
Perceptions of Justice in Shale-Gas Governance

The surveys and interviews revealed that residents' attitudes towards fracking were affected not only by perceptions of the technology but also wider contextual factors, particularly perceptions of fairness in the governance of shale-gas extraction and the impacts of fracking on residents' sense of place attachment (Oltra et al., 2012). This chapter addresses the second research objective by discussing issues surrounding shale-gas governance, including perceptions of planning processes, equity, accountability, and trustworthiness. Drawing on the environmental and energy justice literatures (Gross, 2007; Walker, 2009; Schlosberg, 2004; Walker and Day, 2012; Sovacool and Dworkin, 2015; Jenkins et al., 2016; Bailey and Darkal, 2018), Sections 6.1-6.3 focus on the three dimensions of justice exploring interviewees' perceptions of distributive (including spatial and temporal considerations); procedural (considering decision-making processes and public engagement); and recognition justice in shale-gas governance (on personal and communal levels and recognising the vulnerability of some subgroups of the local population) (Table 6.1). Following the same approach adopted in Chapter Five, interviewees' perspectives are explored through their contrasting attitudes towards fracking and case-study variations are highlighted where relevant.

Table 6.1 **Key themes in residents' perceptions of justice in shale-gas governance**							
Theme	**Sub-theme**	**Description**	**Number of Interviewees**				
			Sum	**-**	**+**	**LN**	**NY**
Distributive Justice	Spatial considerations	Juxtaposition of fracking-related impacts on national versus local spatial and on local versus local scales	30	23	7	13	17
	Temporal considerations	Juxtaposition of present and future fracking-related impacts	29	24	5	11	18
Procedural Justice	Perceptions of decision-making processes	Views on fairness of planning applications/hearings and the perceived stance of central government, local councils and politicians, and regulators	30	25	5	15	15
	Perceptions of public engagement	Views on the engagement of local communities in shale-gas development	30	23	7	13	17
Recognition Justice	Individual and communal injustices	Perceived recognition injustices on individual and community levels	20	14	6	11	9
	Vulnerability of communities' subgroups	Vulnerability of the elderly, farmers, local police, and local representatives	17	11	6	10	7
Total				**27**	**7**	**14**	**20**

6.1 Perceptions of Distributive Justice

Early studies on the ethics of extracting unconventional resources identified concerns about distributive justice– the fair allocation of impacts– as predominant, especially among communities with existing or proposed developments (Evensen, 2016). Scholars identified distributive injustices between industry and local communities, among residents, and in relation to future generations, but without agreeing about the "overall balance of risks and benefits" (Thomas et al., 2017a, p.8). In this study, interviewees came to various conclusions about whether hosting shale gas developments in their communities was acceptable. Their views were mixed in both case studies, but, as with the survey results, there was a general consensus among those holding the same (either positive or negative) attitude towards fracking. This section accordingly explores aspects of distributive justice through the viewpoints of opponents and supporters of fracking.

In line with Beebeejaun's (2017) UK findings, the majority of interviewees opposing fracking regarded it as a risky and unjustified technology that was being imposed on their localities against their wishes. Many opponents considered both negative and positive impacts and hinted that they led to an unfair allocation of burdens and benefits and that the positive impacts did not "offset", "balance", or "make up for" the negative ones (*NY01; NY08; NY05*) across different spatial and temporal aspects of distributive justice.

Shale-gas infrastructures often entail energy production in one locality to meet energy demands elsewhere, so inevitably spotlight questions about the spatial distribution of risks and benefits. On a national scale, several opponents did not see an immediate need for further gas exploration and emphasised that the industry would need to expand significantly to make a difference to domestic production and energy costs (Section 5.2.1). They therefore maintained that "the benefits [had] been greatly overplayed and the risks undersold" (*NY04*). Some participants recognised that economic benefits would accrue to local government but saw little prospect of this being extended to local communities (Section 5.2.2). As Evensen (2016) noted, opponents perceived that the fracking industry would gain the most from shale exploitation. Additionally, several opponents mentioned that shale developments took place in less populated areas in the US, but only one interviewee pointed to differences between the ownership of mineral rights in the two countries and argued that many locals were unaware of these differences. However, as interviewees were knowledgeable on fracking, mineral-rights ownership did not constitute a key distributive issue.

On a more local scale, many interviewees compared possible job losses in agriculture and tourism against those gained from the shale-gas industry and argued that the devaluation of their properties undermined local financial compensation (Section 5.1.3). Distributive injustices, meanwhile, were noted in the allocation and use of local funds within the community, where several participants objected to the sponsorship of local athletics teams and the types of facilities that stood to benefit from community funds (e.g., swimming pools, cinemas, community halls) (Section 5.2.2). Furthermore, a few opponents criticised the different amounts of money being paid directly to households based on distance from the fracking site (see also Cottons, 2016; Section 5.2.2). For example, one Lancashire participant described it "an insult" that "if you live within a kilometre [from PNR] you got £2500 [and] if you live within 1.5 kilometre you got something like £200" (*LN04*). Consistent with other energy and fracking studies which highlighted that the provision of financial benefits raised ethical considerations and questions about trust and transparency (Cass et al, 2010; Cotton, 2013; TNS BMRB, 2014, Thomas et al., 2017b), the majority of opponents described industry payments as a strategy "to buy its way into a community" (*LN13*) or "bribing" (*NY16*):

> *NY02*- Yes, it's like a backhander, or it's almost like blackmailing, isn't it? It's not a very pleasant...
> *NY03*- I think it's the thing that can be used as well by them. They say it's all very well complaining but you didn't stop taking the money when they offered it.

A North Yorkshire participant also suggested that the process for allocating community benefits lacked transparency and created distributional injustices and possible divisions in the community (Cotton, 2016):

> They've got to be more precise, because people in the local village would say, with reason… 'oh we are the ones who are getting the worse of the impacts, we get the traffic, we get the noise, so we should be getting the money'. But then people a bit more distant who would still be affected, are likely to say 'oh we've been affected too you know'. And then of course if you get a full network of wells, you know then everybody is affected. Naturally the local councils would say 'well we should have

> some of that because we've got to mend the roads and we've got to fix the infrastructure, so we want that'. (*NY08*)

The participant also discussed concerns about assurances over long-term payments (Cotton, 2016) and, referring to Third Energy's economic status at the time, explained that energy companies could present no profit by either "offsetting against tax" or being based abroad (*NY08*) (Section 5.2.2). Another interviewee drew on comparisons with a wind energy facility and argued for more citizen control (Arnstein, 1964) when suggesting that a share in the company for nearby residents could have led to a fairer allocation of economic benefits. Overall, interview findings echoed Cotton's (2013) recommendation for better guidance needed on the format of payments of host communities.

While some scholars noted that distributive injustices might be more evident in evaluations of the positive and negative economic impacts of fracking (Bradshaw and Waite, 2017), opponents felt that financial compensation was irrelevant or inadequate for accepting irreversible environmental and health risks. These findings concurred more with studies that highlighted the importance of water and air contamination to perceptions of environmental justice, especially distributive issues (Evensen, 2016). Opponents questioned the government's ethos for supporting fracking and one discussed the moral problems of endangering people's livelihoods for financial gain:

> [E]very village, every town has got a community, and are you prepared to put those people at risk purely in terms this is economic gain for the country, so you are the collateral damage? I mean going back centuries with […] mining for coal, quarrying for stone, goldmining, silver, whatever, and in every case literally thousands of people have been killed, poisoned… to exploit those materials, because at the time it was acceptable. (*NY08*)

Besides environmental, health, and economic impacts, many opponents emphasised social and other indirect local impacts, such as the increased police presence, its associated costs, and reduced trust in the government and regulators. As one Lancashire interviewee explained:

> [T]hey put £9 million into the local economy but it costs us £8 million in policing […]; some people have lost lots of money from the value of their house, a lot of people have been severely compromised by this development; and it's also damaged a lot of people's trust, trust in authority, and that's something that they are not going to recover from. And you know, things like the police, they've been caught in crossfire between the industry and the protests, but their relations with our community it is damaged now for ever, and that's from being placed in an impossible position, that's a by-product of this industry. (*LN13*)

Opponents also discussed intergenerational inequalities. Several worried particularly about fracking harming the health of future generations, though concerns for non-human beings were not raised (Evensen, 2016) (Section 5.1.2). Furthermore, opponents stressed the lack of climate justice behind central government's decision to support fracking (Schlosberg and Collins, 2014; Jenkins, 2018). They emphasised that shale gas extraction was "incompatible" with meeting climate goals and condemned the government's diminishing support for other renewable technologies (*LN05*) (Section 5.2.1).

Supporters, in contrast, did not perceive environmental injustices arising in their areas and generally believed that fracking would not produce significant adverse effects or were unlikely because of the UK's tough regulations. Echoing Perry's (2012) findings about residents' trust in different stakeholders in Pennsylvania, the majority of supporters saw the government as capable of regulating the shale gas industry, arguing that they "wouldn't have progressed" if anti-fracking protesters' "facts were correct" (*NY10*). In addition, some reasoned that "hazards" in other industries did not constitute a reason for not operating (*NY10*). One added that people were unaware of "risk control management" and did not distinguish between the "likelihood of [an impact] occurring" and its "consequence" (*LN14*). Supporters also voiced trust in the

UK shale gas industry, reasoning “why would the company put millions to do what they [were] doing if those fracks [were] to cause an earthquake?” (*LN08*). A few discussed the industry’s ability to avoid or mitigate some technology impacts and believed that local protesters were unaware these would be better regulated and monitored in the UK. Many supporters saw protesters’ views as scaremongering, while one described their loss in trust in protesters’ claims during a trip to America, where a local protester argued that fracking had contaminated his drinking water:

> The only thing I saw that I didn’t like was actually we went to this chap’s house who was a known and very big protester… he was complaining about the water being contaminated by the shale gas industry, and he had this pipe that was pouring into a bucket below… and he said: ‘this is what we’ve got’ [making a couching sound]’, and he smelled and staggered back… I went to that bucket and I couldn’t smell a thing, so I actually tasted it, it was pure water. This guy was doing that for dramatic effect (*NY20*).

Supporters who argued that the risks of fracking were low relative to the economic boost to their areas (Sections 5.1 and 5.2.2) consequently described that industry as being “fair with the villagers” in providing financial “sweeteners” to compensate for any disruption without seeing these as bribery (*NY10*). Nevertheless, the majority of supporters felt a sense of injustice resulting from protesters’ presence and actions. They believed these intentionally “push[ed] [potential benefits] away from the local community” (e.g., local work contracts, athletic sponsorships) (*NY17*) and created imbalances in the distribution of possible negative and positive impacts. Additionally, while supporters justified the police presence, they saw rising policing costs as unfair, especially where these were passed on to local residents (Section 5.1.3). One participant described “how one forms opinions”:

> I don’t think they were paying council tax living in this camp and that irritates me the hell out of me, because ordinary people are paying their taxes and, yet, those people are causing all this money to be spent on police. (*NY20*)

On a national scale, supporters believed that extracting shale gas could provide energy security until renewables became a more reliable source of energy supply (Section 5.2.1), a finding that confirmed the need for the technology was the most prominent ethical argument raised for supporting fracking (Evensen, 2016). Some supporters additionally felt that setting up the shale-gas industry was fairer than taxpayer-funded subsidy regimes for renewables and more generally tended to give greater weight to the security and equity dimensions of energy justice compared with environmental injustices potentially arising from shale-gas extraction. While environmental and energy justice are closely-aligned concepts, the findings confirmed that their different focus mattered (Bailey and Darkal, 2018). Perceptions of distributive justice were also filtered through different lenses depending on respondents' attitudes to fracking; opponents saw fracking as an unnecessary and uncertain technology that created many environmental and health risks, and framed the technology predominantly as an environmental issue; supporters primarily adopted an energy focus that focused mainly on issues of supply, availability, and environmental sustainability (Section 5.2.1) (Evensen, 2016; Sovacool and Dworkin, 2014; Luke and Evensen, 2018).

6.2 Perceptions of Procedural Justice

Many opponents commented on a lack of fairness and transparency in decision-making, including, as Gross (2007) noted, considerations over the impartiality of decision-makers, information access, and participation rights. Several opponents who expressed worries about climate change, geological faults, and changes in the character of their area criticised the fact these were not regarded as relevant considerations in planning applications and inquiries on shale gas developments. These findings confirmed that residents' evaluations of impacts extended "beyond those included in formal assessments" and echoed previous criticisms of the UK planning system for only including material considerations that were defined in the National Planning Policy Framework, while also highlighting connections between distributive and procedural justice (Thomas et al, 2017b, p.7; Beebeejaun, 2017; Rattle et al., 2018). In addition, some noted that current planning applications did not consider the cumulative impacts of future developments, even though future applications would need to take existing fracking sites into account (Cotton, 2016). Comparisons with other energy technologies also hinted at procedural justices (Thomas et al., 2017a), as one opponent noted: "If someone objects to a windfarm being built, that's grounds for turning it down, but even everybody objects to fracking and it can still be overruled; that's clearly not fair, is it?" (*LN05*). In Lancashire, three opponents found it ironic that the proposed RW site was judged by the planning system to be in keeping with the character of the area while exterior changes to their houses were not:

> *LN04*- In Roseacre, […] I'm not allowed to put a satellite dish, I'm not allowed to have UPVC windows, etc., because it is keeping with the rural area.
> *LN03*- That's right.
> *LN05*- But a […] rig is ok! [sarcastic tone]
> *LN03*- And again if you turn to the planning commission…
> *LN05*- Of course not…
> *LN03*- They say 'sorry, no you can't do that, end of the story'.
> *LN04*- How is that fair?
> *LN03*- It is not fair

Interviewees' worries about the impacts of fracking technology on the scenery in a rural site arguably indicated an "anti-project" type of objection (van der Horst, 2007, p. p. 2706; Wolsink, 2000). However, the previous interviewees from Roseacre Awareness group claimed they did not welcome the possibility of the area becoming industrialised, but "weren't anti-fracking originally" (*LN04*). They emphasised that they were an awareness group aiming "to establish what fracking [was] about and what the impacts were in [their] community" but, as they learned more about the technology risks, they became "against fracking anywhere" (*LN05*). Thus, their attitudes could be better described as a combination of "anti-process" resistance with Not-In-Anyone's-Back-Yard (NIABY).

In 2016, the Secretary of State for Communities and Local Government suggested reopening a public inquiry into Cuadrilla's appeal against the rejection of planning permission of RW on the grounds of highway safety. At the time of the interviews, the inquiry had recently closed but the final decision was still pending. While expressing their worries about increased HGV traffic and the unsuitability of routes, a few opponents highlighted the lack of opportunity for residents impacted by the proposed transport routes "to comment on environment and community" issues. (*LN05*). Others pointed out that traffic concerns "[were] the only things that the planning people, the Lancashire County Council can talk about" (*LN09*) and "the only thing people they can fight it on at the moment" (LN12). These views further illustrated perceived limitations in the decision-making process for people to object for reasons that were important to them (Beebeejaun, 2017). The Secretary of State's impartiality was questioned for reopening the public inquiry against the recommendation of the previous inspector. A few interviewees saw this as the government giving the industry "another chance" (*LN04*) and as unjustifiable:

> Once you've had an inquiry it can be reopened for two reasons- one misleading information was given to the inquiry or two because the inspector or somebody got something wrong legally […] On that occasion, the Secretary of State said: 'I think Cuadrilla could do better than that, I know they had four 'goes' to get the traffic through and everybody said no, I think they can have a fifth go'. The only thing is it's going to be reopened with a different planning inspector because the first one made his mind made up, we can't have that [sarcastic tone]! And it's going to be reopened on traffic safety grounds only […] and the new inspector is not allowed to have any sight or knowledge of any of the evidence that was presented in the original inquiry, and that's a real inquiry? (*LN10*)

All Lancashire opponents confirmed that Sajid Javid's decision contributed to their sense of procedural injustice and highlighted spatial inequalities in his decision-making (Bradshaw and Waite, 2017). They described him as "somebody in London" (*LN01*), who had "never been to [their] community […] overturned the decision of local policymakers" (*LN13*). Most felt frustrated that "local communities' opinions [hadn't] been taken into consideration" (*LN02*) and emphasised that "Lancashire said no" (*LN03*). They saw his decision as central government interference in local politics despite "every level of local government" (*LN05*) having opposed fracking in Lancashire and wondered "what's the point of the local council if they don't have any say?" (*LN01*). Other work on fracking noted similar trends towards the centralisation of decision-making in the UK planning system on shale gas (Rattle, et al., 2018; Cotton, 2016; Whitton et al., 2017; Short and Szolucha, 2019). Fearing further future changes in decision-making on shale developments (Cotton, 2016), several opponents believed that local power would be reduced even more if "the government allowed [fracking] as permitted development" (*LN04*). One person also pointed how the lack of outcome and process fairness turned residents with ambivalent attitudes towards fracking against it:

> We've got contacted a lot by people who were not particularly for or against fracking but were quite concerned about the democracy aspect of it and the local Government being overturned; quite a lot of people were very angry about that. And so they should be. The people who are local to an area should be the people who make the decisions about that area really; but the government want to take that further now, don't they? Because they're the ones saying it's a national infrastructure and take the decisions from locals completely.

Other participants added that while the majority of people protesting were "anti-fracking", some were "pro-fairness [and] pro-democracy" and were "more concerned about a decision been overhauled […] than environmental issues" (*LN05*). One elaborated that the nearby gas-storage development was refused many times by

"Lancashire County Council and two Secretary of States" before the company's appeal was accepted in July 2015 (*LN07*). Some Lancashire participants saw the decision as a precedent in central government's interference in local decision-making and that this was "the way it [was] going to be in terms of large industrial projects and big companies affecting local communities. (*LN07*)".

Similarly, one North Yorkshire interviewee's initial "opposition was not very strong except that it didn't seem to be what the local community wanted" (NY16). In contrast to the majority of opponents, the interviewee believed the anti-fracking movement was somewhat misinformed about the risks and concluded that fracking can be done relatively safely in the UK. However, they became more opposed, and even "radicalised", as the development progressed due to "police response to ordinary people" and potential "change [to] the nature of the area" (*NY16*). North Yorkshire opponents therefore also perceived procedural injustices but this was mainly directed at North Yorkshire County Council for giving planning permission to Third Energy to frack KM site, a decision that went against a large number of local objections:

> When it was being discussed at Northallerton by the Council, we submitted letters opposing it; 93% I think was the actual figure of people opposing it. It was passed by a planning committee of 11 people, 4 of which abstained, and it was just 7 people who made the decision to pass it. (*NY15*)

Others recalled that, at the planning hearing, there "were 3000 against 44" and people were shocked as "everyone was against it" (*NY13*). Several North Yorkshire opponents questioned North Yorkshire Council's impartiality, describing it as a "staunchly Tory" (NY08) and believed that the outcome was influenced by central government and councillors following "the party line" (*NY01; NY16*). Similar to viewpoints reported in Lancashire by Short and Szolucha (2019), many North Yorkshire opponents perceived that the "government [was] riding roughshod over the community" (*NY15*), even though the decision remained with local government, unlike in Lancashire. However, many participants focused on the divergence of the planning approval from Ryedale District Council's recommendation for a 5-year moratorium:

> I think what really annoyed people who are anti-fracking was the fact that the local district, Ryedale District voted against it and yet that was overruled. And people were thinking, there was a lot of talk about local democracy…but when it came down it, local democracy was forgotten for a bit so it can be a big business. (*NY02*)

Another perceived procedural injustice with a spatial element was that "democracy [had] been overwritten by a few people that nobody knows" (*NY03*), referring to North Yorkshire Council members who were not from Ryedale and the planning process taking place at County Hall in Northallerton, 34 miles away. One interviewee explained that Ryedale was part of a large county and suggested that councillors gave planning permission as it was "not in [their] backyard; it [was] just a little test-frack well over there [that their] constituencies don't know anything about it." (*NY08*). As a result, several North Yorkshire opponents felt that local wishes were ignored and planning permission was given by an outside and higher level of government.

Overall, many opponents felt that political affiliation played a role in government support for developments, but in North Yorkshire this was notable across all government levels. A few felt they could not "fault [Ryedale District Council] too much" (*NY06*) as it "voted against" fracking (*NY02*), but others claimed it was also a "Conservative-led" (*NY01*) and pro-fracking council and the moratorium was passed only because "all the Tories on the planning committee decided [to] abstain" to avoid liability for "predetermination" (*NY08*). Another complaint against Ryedale Council by some interviewees about two meetings was that it hired "an independent expert in fracking before the council made any more decisions" (*NY16*). This was because many people protested outside initially, which led to RDC allowing only a few people to attend the final meeting. The different stances of North Yorkshire Council and Ryedale Council and the diverse opinions on Ryedale's role among opponents could explain the weak correlations found in surveys about residents' trust towards 'County and District councils' (Section 4.4). Exploring these views separately could have provided further insights on the role of trust in governance on community attitudes to fracking.

North Yorkshire participants also criticised their Conservative Ryedale MP, Kevin Hollinrake, for his pro-fracking views, a point also noted in Rattle et al.'s (2018) analysis of the Lancashire and North Yorkshire planning hearings. North Yorkshire opponents felt that his stance hid a political motive instead of "thinking what his constituencies want[ed] and what [was] good for his constituency" (*NY01*). Some speculated that this was a condition for his election and that the previous MP, who was "anti-fracking, got pushed out by the party" (*NY07*). The majority of North Yorkshire opponents mentioned that they had contacted or encountered the MP during meetings or events, including those organised by him, but still felt he "was not listening" (*NY12*) or did not come proactively to speak with the community (*NY14*). Many regarded him as being dishonest about the risks and benefits of fracking, and referred to his reported conclusions from an MP's "fact-finding" trip to US (*NY01*); and the information provided during a local debate about the technology's safety held in Pickering. Some did not understand why the MP concluded that fracking was "a good idea" for Ryedale on his website (*NY04*), as other local people went to the same areas in the US and "came back with two different stories" (*NY12*) about negative impacts, (e.g., water contamination), and from meeting with anti-fracking groups. Another North Yorkshire opponent (*NY07*) mentioned that Hollinrake "put up a convincing argument" about how the technology would be safer than in the US due its distance from the aquifer and other future sites during a local debate attended by the Environment Agency, Health and Safety, Third Energy, and Ryedale residents. However, this was seen as “a bunch of lies” because when asked what legislation guaranteed UK operations would be safe, the MP admitted that there were “only recommendations”. The debate ended with a minority of people supporting fracking but a few days later, the MP broadcasted that Ryedale residents supported fracking based on a questionnaire he had distributed. The participant explained how his attitude towards fracking was shaped by uncertainties surrounding the technology and distrust in his MP:

> When you see things like that, and you’ve been to that meeting, saw what happened, you saw which hands got up, so that’s not the press telling me, I saw it. And then I saw him on telly; where does trust then go? Out the window! I don’t trust a word that man says[…] And the [survey] questions were if you could be assured fracking would be safe, would you be in favour? Well, why would you answer no? If it was safe, of course I’d be. The reason I’m against it is I don’t believe it can be done safely! (*NY07)*

In contrast, only a few references were made about Conservative MP for Fylde, Mark Menzies. These were less harsh despite him not responding to invitations to meet protesters at the PNR site, unlike politicians from other parties, a move that was described as “really contentious for a lot of people” (*LN13*). Some Lancashire opponents explained that he thought the proposed RW development was unsuitable- even though it was not within his constituency- because of HGV traffic but believed “the regulations [could] be put in place to make [PNR] safe” (*LN04*). His stance was therefore seen as more “diplomatic” (*LN13*), an observation shared by Rattle et al. (2018) in relation to Cuadrilla’s appeal hearings. Ben Wallace, Conservative MP for Wyre and Preston North, where the RW site sits, was perceived as more “anti-fracking” after he objected to the re-opened public inquiry (*LN03*).

Overall, central government's support for shale gas industry and what they saw as inaccurate or contradictory information did not reassure opponents of the developments. Some opponents added how erroneous information about an initially "trivial" issue shaped their attitude from one "that just trusted [the government] wouldn't do it if it was that dangerous" (*NY04*). These interviewees questioned the statement "that a fracked well for a decade uses as much as water as a golf course uses in a month" (*NY04*), which the "government was repeating" (*NY05*) and which was included in the 2012 Royal Society and Royal Academy of Engineering report that contributed to the lifting of the fracking ban at the time. Having also heard that "10 million gallons of water [were used] per frack", one opponent looked into water usage on golf courses and concluded that "fracking was equivalent to about 184 golf courses, not one" (*NY04*). These interviewees added that there could be less opposition if the government was more honest about the risks and had said they would "proceed very carefully [and] not be in a rush" (*NY04*).

In addition, several opponents believed that many government officials were unfamiliar with recent research on fracking or were indifferent about "listening to what the evidence is out there" (*LN04*). A group of Lancashire interviewees said that when Claire Perry, the then Minister of State for Energy and Clean Growth, was approached by anti-fracking campaigners, she said to be "not interested" in receiving a copy of Professor Peter Styles' report about fracking in ex-coal mining areas (*LN05*). Consistent with the viewpoints held by opponents and local representatives in Short and Szolucha's (2019) analysis of Lancashire planning applications, these interviewees also highlighted that access to important information had been restricted, referring to a DEFRA report about the impacts of fracking on rural communities that included "bad conclusions about property values" (*LN05*). They explained that the report was heavily redacted before Friends of the Earth's lodged a freedom of information request and added that the release of the full report was "deliberately held back until the last possible moment" after LCC made its planning decision. Although "not illegal", they described this as a "very contrived" move (*LN05*).

Several opponents believed fracking was becoming a more political issue and emphasised that this was a Conservative-led policy. Some suspected "corporate lobbyism" or "nepotism" within national government (*LN04; LN03*), echoing Short and Szolucha' (2019) findings. One explained how perceptions of central government shaped their anti-fracking attitude:

> I have a list of what I'm concerned about, it's the cost, and the waste, and the corruption in the Conservative party- that's my issue [..] The whole reason we are in the situation is because the former Chancellor Osbourne, his father-in-law was a director of a fracking company; and they were about to pack up, that was 2015, they've done the Preese Hall and it's all gone a bit wrong, and he said 'I'll reduce tax so it will be less than the tax on North Sea gas, so it might be economically viable for you to continue', so they did. That it's just pure corruption cause his father-in-law was director of a fracking company. *(LN09)*

Whilst some interviewees saw fracking as divisive as Brexit, others believed Brexit was the government's priority at the time, but wanted fracking to become more important on political agendas in the hope of a future ban in England. Interviewees speculated whether a change in government would stop fracking but were generally pessimistic this would happen. More locally, interviewees from both case studies described Fylde and Ryedale as Conservative areas, in which MPs' "seat[s] [were] safe" regardless of what happened with shale gas developments (*LN13*). Nevertheless, many stated that they would not vote Conservative at the next election, including longstanding Conservative voters:

> It’s just depressingly sad when you found out how much the Government have lied…. And suddenly you realise that there in no way you can turn to, there is nothing you can do it about it; you can’t complain to any independent body because… the ones with any power to do anything, they are controlled by the Government. You suddenly realise you can rely on nobody and that nothing you are told can be accepted; you just can’t think they are telling the truth ‘cause they are the Government or whatever, and it leaves you feeling really, really depressed. I have always voted Conservatives, always in 44 years; never ever again. (*LN10*)

The impartiality of regulators was often questioned when opponents talked about whether fracking could be done safely if it was well-regulated. While some thought it could, the majority emphasised the irreversibility of technology risks, arguing that UK government’s “we-got-gold-standards” approach did not guarantee that “it can’t go wrong here” (*NY07*), as other governments around the world would have argued the same “before all these problems arose” (*NY08*). Opponents focused mainly on the Environment Agency, whereas only a few references were made to the Health and Safety Executive. Some interviewees acknowledged the Environment Agency’s presence in meetings, which initially provided a level of reassurance:

> We were seduced, if that’s the right word, by the fact that the Environment Agency were very heavily involved […] and we thought that they’ve got our best interest at heart; and like a lot of people who still feel like that, you are just seduced into thinking well they wouldn’t let it happen if it’s going to cause any harm, but obviously that’s not the case, you know, the more you look into it. (*LN12*)

Many opponents emphasised the Environment Agency’s inability to monitor the shale-gas industry due to reduced funding and staffing, especially if the number of sites increased:

> I was talking to somebody who is an expert on methane escaping from the ground, but then it turned out he’s an expert on landfill, and he’d been drafted in just for the Kirby Misperton thing. And you think, if they are drafting in people from the landfill side, the landfill is understaffed, and you got somebody who’s got a good idea but not real in-depth expertise, and that’s for one test-frack. What happens when it is 10 wells or 100 wells, 1,000 or 10,000? The only way you are going to fund that is by putting the charge directly to the industry, and then as they say the piper can call the tune (*NY08*).

Opponents also commented on a lack of transparency and accountability, echoing TNS BMRB's (2014) findings and the complexity of the UK shale-gas regulation regime noted by Rattle et al. (2018). During a community meeting which the Environment Agency attended, some North Yorkshire interviewees found it "worrying" that some issues "weren't under their control" and that it was unclear whose "remit" they fell under (NY02). Similarly, a Lancashire participant argued that the regulators "just pass[ed] the buck" when asked whether the "multi-agency approach works because no agency ever has responsibility for anything that could be contentious" (*LN10*). Finally, several Lancashire participants pointed out that the Environment Agency had already stopped "groundwater monitoring for previous sites", including Preese Hall, where the previous tremors occurred (*LN05*).

Several opponents saw it as inevitable but problematic that the industry would become self-regulating and that its accountability would be further diminished. They believed that energy companies would act more responsibly if they were "scrutinised very closely" (*NY08*) and argued that they would "start off with fairly good standards, but ten sites down the line they will start to cut corners for cost" (*LN04*). However, not everyone focused on the distant future; some interviewees feared that it would be "too late" by the time an energy company reported an air-contamination incident if it was self-monitored. Others, referring to the 2011 Lancashire tremors, noted that "it took Cuadrilla six months before they admitted how wrong it had gone; it took them six weeks before they admitted there was a problem" (*LN10*). These findings support previous research that Lancashire residents' early experiences of fracking shaped their perceptions of Cuadrilla as an unreliable company (Beebeejaun, 2017; Bradshaw and Waite, 2017; Short and Szolucha, 2019).

Public participation in decision-making on shale developments was also explored as a key component of procedural justice. Many interviewees attended formal and informal events, spoke at public enquiries, and responded to consultations. Aside from other participation injustices, such as the reopened RW public enquiry and Ryedale Council's meetings, two interviewees complained about the limited time they were allowed to speak at enquiries and the difficulties of commenting on multiple, simultaneous consultations. Nevertheless, the majority of opponents said they exercised their statutory right to be involved in the planning process. According to Arnstein's (1964) 'ladder of citizen participation', their involvement reflected a degree of tokenism, whereby decision-makers engage in dialogue with residents rather than providing a one-way flow of information (Haggett, 2011) but as was noted in the KM site planning process, interviewees felt unable to contribute to the outcome. They described they "felt injustice" as the planning permission "[overrode] the local feelings" and that was why residents and people outside their area "stood up" (*NY02*). However, the planning permission for PNR and reopening of the RW enquiry reflected a more technocratic and top-down approach to decision-making that many scholars criticise for strengthening local opposition (Wolsink, 2007a; 2007b; Bell et al., 2005; Devine-Wright, 2013; Whitton and Charnley-Parry, 2018).

Perceptions of procedural injustice also emerged in relation to the actions of energy companies. In both case studies, opponents reported energy companies breaching traffic management plans (Section 5.1.3) (see also Bradshaw and Waite, 2017). Interviewees were also asked whether they met with Cuadrilla or Third Energy representatives during a meeting and their thoughts on their engagement approach. Many opponents living close to the sites said they were contacted by mail, while one

Lancashire opponent described how Cuadrilla had initially given the impression that "we won't do anything without telling local community first" by sending "big glossy brochures through the post", that over time became just "one folded paper" (*LN12*). The interviewee expressed "feeling relieved" initially by how the company addressed residents' queries during their first meeting but argued that this was only temporary:

> [after attending] another meeting, which was held by the people who [gave them] the other side of the story, [their] concerns started to grow and realise it [was] not going to be as clean, simple, and environmentally friendly as [they] were given to understand at the initial meeting (*LN12*).

Conversely, some North Yorkshire opponents argued that their concerns were not addressed sufficiently by Third Energy during community meetings and described their attitude as "blasé" for not acknowledging that there was "a problem" with the local community and that negative impacts "could happen because it happened elsewhere in the world" (*NY02*). Illustrating Third Energy's failure to gain "qualified support" (Bell et al., 2005, p. 460; Haggett, 2011), interviewees claimed that information on water contamination was not "back[ed] up with" scientific evidence or sufficient visual representation to understand why the aquifer could not be polluted (*NY03*). Beebeejaun (2017) similarly described how technical information provided did not fully consider residents' fears in US cases. Some expressed more sympathy for Third Energy, commenting that "the poor people didn't have a chance [as] everyone was totally against it" during the meetings (*NY11*), but did not see these meetings unfolding any other way as residents did not believe the technology had "any good side" (*NY13*).

A few interviewees shared different views on whether they preferred to be "contacted directly" (*NY12*), reflecting Cotton's (2013) suggestion that stakeholders with different characteristics and interests can prefer different forms of engagement. One person explained that Third Energy offered to "come around and see you" during community meetings if people were concerned, but still “did not want them in the house” (*NY11*). In contrast, another interviewee living close to PNR would have welcomed it “if someone actually came around” but argued that Cuadrilla did not “have a face in the community” (*LN02*). The interviewee added that if Cuadrilla had held regular community meetings or set up an office where people could discuss concerns, they would have looked more transparent rather than “sort of hiding” (*LN02*). However, a Lancashire resident living close to the RW site claimed that Cuadrilla did visit when they first heard about fracking, but their approach “raised a lot of suspicions” as many people would be at work and could not meet at such short notice:

> It was end of January 2014 when two young girls banged on my front door at 10 o’clock on a Wednesday morning and when I opened the door they said: ‘We are from Cuadrilla. And we are going to drill just up the road on Roseacre Wood and we are going to frack up there. If you want to know anything more about it, these are some brochures and there is a meeting’. I said good, when is there a meeting? They said 3 o’clock this afternoon. (*LN10*)

The interviewee added that Cuadrilla later claimed they held “a meeting with the villagers and no one was bothered” (*LN10*). Similarly, a North Yorkshire resident said that a lack of clarity about the starting date of operations contributed to them opposing the development as Third Energy was: “not telling the truth or [not knowing] what they were doing” (*NY14*). Echoing studies on fracking in other countries that argued perceived “heavy handed corporate tactics or bullying” incidents impacted on residents’ trust in the industry (Thomas et al. 2017a, p.9), another North Yorkshire opponent described the attitude of Third Energy’s representative during a local athletic event it had sponsored:

> I was medic in an event two years ago and it turned out that the event was sponsored by Third Energy because they wanted to look good to the local community. It was an event involving school children and they were giving gifts away to the kids. And when I got there, there was this massive great display of Third Energy… and one of the gentlemen there was a gentleman that I had seen in one of our events, and I just said ‘oh you are here now, are you bribing the school kids?

> You should be ashamed of yourself'. […] They contacted my boss and said that they should sack me because of my opinions. (*NY15*)

Lancashire residents acknowledged but criticised other ways Cuadrilla tried to engage, such as "doing live stream from the site once a month […] to show to people how safe it [was] while people could ask questions (*LN04*). This was seen as "all PR stuff", and interviewees said they could not "believe [any] answer anyway, 'cause everything just got a spin on it" (*LN12*). Another found it "scary" that they proposed building a "fracking college" (*LN09*), whereas others mentioned that Cuadrilla had "engaged with business and boards of commerce" in recent years (*LN13*) but interpreted this as one way the company "bought themselves into the local communities" (*LN04*). In contrast to studies that found that management of the community fund by a third party would be welcomed (TNS BMRB, 2014), some Lancashire opponents argued that it was inappropriate that a member of that committee was also an "executive of the Chamber of Commerce" and "totally pro-fracking" (*LN05*).

Some interviewees acknowledged that the Community Liaison Group (CLG) formed part of Third Energy's voluntary pre-application engagement (Hilson, 2015; Cotton, 2016), but they felt meetings were held only when necessary. The KM CLG paused shortly after the rig was removed but there was an expectation that meetings would resume when Third Energy returned. RW CLG stopped when its planning application was sent to LCC. Similarly, a PNR CLG formed prior to the LCC planning decision, and after around two years, it resumed with a different setup and more local community representatives. In both cases, the majority of opponents felt the industry was "there to tick a box" (*NY15*) rather than meaningfully engage or, as Haggett (2011) described, it was an "an end in itself" (p.16). In relation to PNR CLG meetings, a Lancashire opponent argued that Cuadrilla was "not trusted" because "compliance should be the bare minimum of standards […] to reassure local residents" (*LN13*). The interviewee cited their request for an emergency-evacuation plan, which Cuadrilla was not "obliged to provide":

> Finally, 3 months ago, we pressed so hard and said "no, we are demanding it"; and they brought in the Lancashire Resilience leader who basically spoke about generic risk, and they are falling back all the time on the fact that they are not required by law to provide a site-specific plan, unlike the nuclear industry and the arms industry, which we are sat next right between a nuclear reprocessing plan and BAE Systems both of whom have specific emergency plans in place. All we ask is for these guys is to put a specific plan in place whether they are required by law or not, to be a good neighbour, to be in the interest of transparency, it's put that planning in place. (*LN13)*

Criticism of industry attitudes during CLG meetings in both case studies reinforces how industry actions can influence perceptions of procedural injustice (Smith and McDonough, 2001; Maguire and Lind, 2003). The KM CLG meetings did not initially provide adequate answers to questions but became "more open" and productive with the arrival of Alan Linn, the new director, who wanted to "engage with the community more" (*NY14*). Similarly, PNR CLG members saw early meetings as fruitless due to Cuadrilla's representative being "very antagonistic" towards to people they "knew were anti-fracking" (*LN11*). They saw some improvement after his replacement but were still not entirely satisfied with how Cuadrilla addressed concerns. They believed other CLG members (Cuadrilla, regulators, LCC, and police) communicated secretly "on a much higher level" and excluded them (*LN11*). Their suspicion was confirmed by a freedom of information request that revealed their attempt to remove the meeting chair and discussions on whether representatives with anti-fracking attitudes should also leave.

Cuadrilla and Third Energy appeared to consider engaging with the wider host community to a greater extent than the shale industry did in the US (Petrzelka et al., 2018). However, their approach to communications still appeared "fractured" (ibid, p.198), even within CLG meetings, where communications channels between companies, local representatives, and residents were not clearly defined, relied on social media and the internet, and excluded some elderly people from information or voicing concerns. Some North Yorkshire interviewees felt that proper information exchange was lacking from CLG meetings and that “everyone [was] doing [their] own little thing” (*NY13*). One interviewee explained that they became involved in the KM CLG because, besides general information on Third Energy’s website, there was not “very much […] about day-to-day of things” or “who was representing [their] village” (*NY14*). The interviewee explained that whatever happened at meetings was reported on a webpage that was mainly for residents. Acknowledging exclusion of the elderly, the KM CLG member suggested appropriate ways for Third Energy to communicate with residents to explore their views and preferences. Similarly, a member of PNR CLG published meeting discussions on Facebook to supplement the minutes on Cuadrilla’s website. The Lancashire interviewee explained that local representatives submitted their own notes to their councils, which then became “part of [their] council meetings”, and residents at CLG meetings “would talk to their neighbours” afterwards, though there was “no coordinated way of getting that information out there” (*LN13*).

Some interviewees were asked whether improvements in communication could change residents’ attitudes towards the development. The KM CLG member believed it was too late but added that, although the majority opposed the development, “they might not feel so strongly about it […] to go and protest” as “there [was] always a conventional gas industry there” (*NY14*). One PNR CLG member explained that loss in trust towards Cuadrilla played a significant part in many residents opposing the technology:

> I could ask questions on behalf of a resident in the Community Liaison Group meeting; I could be given an answer; sometimes I think I might be told the truth. Even if I think I’m being told the truth, the residents don’t necessarily believe it;

> they are not reassured because the whole way this has been managed from start to finish it's never been about reassurance of communities; it's been about imposing this at their will; and, therefore, they're never going to be trusted now… they could have the best, tightest, gold standards regulations and they'll never be trusted. (*LN13*)

Cuadrilla's application for an injunction against protestors added to Lancashire participants' negative impressions of the company. The court decision came during one group interview and one participant explained that actions such as "lock-ons, lorry-surfing, and slow-walks [would] constitute obstruction of the highway" (*LN04*). The injunction was perceived as "the final straw" and "a bitter realisation for a lot of people how the world operates" (*LN13*). Another recognised that the police had "a tight line to tread between allowing Cuadrilla to continue their business and upholding the right of the protesters to protest at something they disagree with" (*LN10*). However, they did not understand why "draconian" measures were allowed and why protesters were increasingly treated "as terrorists" by the police. They commented that the injunction was "undoubtedly the law, not justice" (*LN10*).

Cuadrilla's injunction did not surprise several interviewees, who knew INEOS already had one in place. Many opponents were astonished how a company could win an injunction against "people unknown" or take the Scottish government and National Trust to court (*NY07*). These were seen as threats to democracy that jeopardised people's right to protest; several interviewees described "what happened [had] gone way beyond fracking (*LN10*), with one person highlighting how inconsistent these actions were when "they [had] just unveiled this statue to the suffragettes down in London" (*NY01*). Additionally, the injunctions fed interviewees' suspicions of lobbyism. North Yorkshire participants flagged this more, as many believed that INEOS, owned by

James Ratcliffe, the "richest man in Britain", and with a PEDL licence in the area, could buy out Third Energy if they became insolvent (*NY07*).

In both case studies, interviewees who favoured fracking agreed that energy companies followed planning procedures and acquired planning permissions legally. Supporters disputed fracking-opponents' perceptions of unfairness in the decision-making process but saw some procedural injustices arising from protesters' involvement. A North Yorkshire supporter, responding to protesters' reasoning that they would not "be here if it wasn't for fracking", emphasised that Third Energy had the "lawful right to do their business" as it went through a "democratic process" (*NY17*). Regarding the number of objections received by North Yorkshire County Council, another person argued that it was the "nature of politics" for any authority to "look at things pragmatically" (*NY20*). The participant elaborated that councils should "listen to all sides and consider all aspects" and not "stop doing things… just because [there were] a lot of objections" (*NY20*).

Some interviewees additionally pointed out that opponents of fracking often recounted that "99% of Ryedale said no", but said that these figures were inaccurate (*NY17*). As one explained, "it was only 4,300 people" that sent their objections, which did not correspond to the equivalent number of Ryedale residents (*NY19*). North Yorkshire Council also received letters "from all over the country", as another participant argued, including "820 [that] were fraudulent" (*NY17*). Having acquired this information through a freedom of information request, the participant revealed that a parish clerk had sent objections on behalf of the councils that were actually "on his own back" (*NY17*). Some North Yorkshire supporters also gave their account of Ryedale District Council's meetings that fracking opponents criticised for limiting public participation:

> These people from all over the country went to a local council in Malton, demanded our council pay for lawyers to do research to say how bad fracking is; and the council shut the meeting down, didn't they? They had to close the meeting. Fifty of them just walked in at a council meeting one evening. They had to have another meeting to discuss whether they are going to pay for lawyers or not; £50,000 because they demanded that; this area hasn't got £50,000 spare to spend on what is not. Our elected councillors were actually considering 'cause they were being bullied into doing it. (*NY19*)

One supporter defended his conclusions about the Ryedale MP's trip to the U.S., explaining that the MP visited areas known for water-contamination complaints and met with people from "both sides", including university researchers, to understand how the technology could affect his constituency. The interviewee added that the MP paid for the trip personally to avoid suspicions of bias (*NY20*). Other interviewees pointed out that their local MP was "re-elected in 2017" in an area with a lot of anti-fracking campaigning but his "votes went up 6%" (*NY17*). One added that Mark Menzies' "votes went up 10%", concluding that "if people really were that against fracking in these areas, the votes would have gone down even if they would still be re-elected" (*NY17*).

Lancashire supporters did not mention their local MPs but criticised LCC's rejection of Cuadrilla's planning application. They felt it was procedurally unjust that local councillors went against the advice of their own "legal department and planning officer" and acted "outside their remit" (*LN08*). They found it "unfair that they [were] asked to make decisions on things like this, where not only they [had] been pressured, but it [was] not something that they [were] familiar with it" (*LN14*). Supporters thus also perceived local councillors as "being under intense pressure" (Beebeejaun, 2017, p.427), but attributed this to anti-fracking lobbying, a view that coincided Short and Szolucha's (2019) report of events over the weekend before LCC's decision, though they interpreted the situation differently (Section 2.4). They speculated that councillors gave in to anti-fracking groups to avoid taking political responsibility and added that Cuadrilla's appeal was expected, since councillors knew noise and visual impacts did not constitute valid grounds for refusing the PNR application. One reasoned that the "background for appeals" was part of the planning process written in law "by British lawmakers", and, laws were "part and parcel of democratic process" (*LN14*). Having argued that the Secretary of State's decision was "sound" as it was "challenged in the courts twice […] and dismissed", the participant concluded that opponents regarded the planning decision as undemocratic only because it was made "outside of their county" and went against their wishes. (*LN14*). While the recruitment of interviewees supporting fracking in Lancashire was more challenging than in North Yorkshire, the study showed that there were some "strong local voices […] to counter the accusations of democratic illegitimacy", somewhat contradicting Rattle et al.'s (2018, p.235) view.

Supporters also discussed the morality and effectiveness of protesters' actions in delaying local developments (Short and Szolucha, 2019) and argued that lobbying was used by both sides. One participant found it ironic that one local protester had "appealed six times against planning refusals" for his own business and stated that "you can't have a cake and eat it" (*LN14*). Protesters' ability to delay decision-making for nearly two years at PNR was described as "strategic" and "legitimate", whereas "attack[ing] the supply chain [to] undermine potential investments within the industry" was perceived as unethical and unsuccessful in delaying the development (*LN08*). North Yorkshire supporters held similar views but believed environmental lobbying was successful on a national scale; they saw protesters as responsible for central government inquiring into Third Energy's financial resilience before the final hydraulic fracking consent was issued (HFC). However, some criticised central government for being "too slow" to reach a decision and argued that certain "career politicians" who lacked work experience needed to understand the local economic losses caused by the delays (*NY17*):

> We need tax revenues and things like; [protesters] don't seem to understand of how an economy works. And the Government has been frustrated with that decision; the equipment was there. Did they really think Barclays bank would let that loan go under? You know Barclays bank are funding Third Energy. Now it seems Barclays's best interest is to ensure it goes through properly and safely, because then they make their investments worth something. But, then, you get the government that wouldn't press go; nobody wants to press the button that says go, and it's a sham. (*NY17*)

Third Energy's financial situation was also raised by Lancashire participants, who reasoned that energy companies, like "early stage development companies" in other sectors "with no sales and […] big loses", could remain solvent as long as they "got investors willing to keep putting money in" (*LN14*). One participant explained that Third Energy had "applied a regulatory burden" on themselves to show goodwill, as, technically, they did not have to apply for an HFC since the KM well was drilled before the 2015 Infrastructure Act was introduced. Another Lancashire supporter described Third Energy's financial status as campaigners' "silver bullet" and were now "lobbying Greg Clark not to give permission" to PNR because of the lack of an emergency evacuation plan, which again was "not required" (*LN08*). This participant added that protesters, supported by media, created this "David-Goliath story" about the financial status of energy companies but believed it was misleading:

> [T]he likes of Third Energy […] are not profitable entities, because they are exploration entities. So, this whole movement is nonsense, in fact the whole thing is reverse, the Davids are the operating companies and the Goliaths are these local protesters who are funded by NGOs; again, it's all perception. (*LN08*)

Overall, supporters believed that England had some of the "safest regulations in the world" and were satisfied with the regulators. Several interviewees drew comparisons with the US to argue that UK shale gas developments would be better regulated since "shallow fracking" (*NY17*), on-site storage of wastewater, and facilities close to residential areas were not allowed. However, participants did not elaborate on the role and effectiveness of regulators, with the exception of one who emphasised that health and safety controls were "staggeringly good compared to general industry [and] certainly compared to farming" (*NY20*). Speaking about the government's capability to regulate multiple shale gas developments, the same participant explained that inspectors only needed to do "snap audits" to ensure operators were complying and "doing their own audits" (*NY20*). They argued that the "industry would be producing, hopefully, a really sound structure of inspection" (*NY20*).

Following comments in the 2017 Conservative Party manifesto (Bradshaw and Waite, 2017; Greg Clark (2018), the Secretary of State for BEIS announced in a written ministerial statement during the second round of interviews that the government was planning to set up a Shale Environmental Regulator– comprised of the Environment Agency, the Health and Safety Executive and the Oil and Gas Authority– to simplify the regulators' roles in shale gas developments. Despite opponents' concerns about the role and accountability of regulators, only one supporter commented on this, describing it as "very expensive window-dressing" to "sway people around" and satisfy calls for a single regulator "that were made in some quarters" (*LN14*). The interviewee reasoned that "a degree of separation" was imperative to maintain fair decision-making and avoid commercial interests being able to "lobby for the laws to be written in a certain way and to be regulated in a certain matter" as happened in the US (*LN14*).

To overcome perceived procedural injustices on both sides, the interviewee reasoned that planning applications with "a national significant element", such as large energy developments, should be decided by a planning expert employed by local councillors (*LN14*) so that decisions could made locally without councillors being "influenced politically" by election considerations (*LN14*). Supporters did not see procedural injustices in "speeding up" decision-making for shale gas projects (*NY20*) and welcomed the possibility (Cotton, 2016). One interviewee saw the EA considering giving environmental permits within 12 weeks instead of the current 16 weeks as positive and argued that there was "no timeline" for the HFC yet (*LN14*). Others suggested that testing shale reserves to determine their quality and quantity should have taken place first, followed by a process to decide whether to move to the exploration stage incorporating "considerations for people and the place" (*NY20*). This approach was seen as preferable for addressing uncertainties about the technology, alleviating perceived negative impacts, reducing social disruption, and promoting better engagement by energy companies.

Supporters' opinions on industry's engagement with communities differed between and among case studies. Several North Yorkshire supporters spoke positively about Third Energy's approach of posting letters with updates, providing information during local meetings, and establishing a CLG. They also appreciated the company's openness and explained that people could arrange a visit to Knapton power station. However, one interviewee believed that the "operators [did] not seem to defend themselves very well" against anti-fracking campaigners' claims about environmental and health risks (*NY20*). Lancashire supporters, however, criticised Cuadrilla emphasising the importance of the "early days", when people's negative attitudes were forming, and believed that new information provided now would be susceptible to "confirmation bias" (*LN08*). They held Cuadrilla accountable for losing the "information war" by not disputing campaigners' "misconceptions" of technology risks and allowing them "to fill that void of knowledge" (*LN08*). They argued that Cuadrilla should have identified residents' concerns, talked more thoroughly and honestly about possible risks, and not let campaigners "inflame" them, because then residents could at least object to the development "for the right reasons" (*LN14*). One supporter described how Cuadrilla's initial approach to local residents was negatively associated with fracking in US:

> [W]hen they started doing its engagement earlier on for the original sites, the people doing it were two very nice guys, that genuinely do understand the process very well, but they were from America; and I don't think it helped, particularly after the tremors, that you had two guys from Pennsylvania going to village halls around Lancashire, telling communities about shale gas. I think it was too easy to create the perception in people's minds like it's just going to be just like the US, and here are these two guys riding on the horses to come and drill tens of thousands holes in Lancashire, pumping all the gas, and disappear off into the sunset. (*LN14)*

Cuadrilla's limited engagement was seen as acceptable due to the financial status of exploration companies but supporters believed that "they could have made themselves a massive saving on security, [and] perception" by taking a more proactive approach (*LN08*). They felt that Cuadrilla was still "refusing to change", referring to the limited publication of company's sponsorship of local teams and events. Nevertheless, supporters perceived that the industry and campaigners were equally "guilty" for the situation, with the latter stoking the "tension" and impeding information provision and dialogue (*LN14*).

6.3 Perceptions of Recognition Justice

Recognition justice is closely intertwined with distributive and procedural justice, though many authors recognise (Walker, 2009; Schlosberg, 2004; Walker and Day, 2012; Sovacool and Dworkin, 2015; Jenkins et al., 2016; Bailey and Darkal, 2018) it as also acknowledged as a distinctive branch of environmental and energy justice that highlights the importance of respecting the diverse identities and individual experiences of those directly affected by shale-gas developments (Schlosberg, 2004).

While there was a plurality of opinions on fracking, interviewees raised questions about the equal representation of views in shale-gas governance between and among host communities and highlighted the disruption caused by fracking developments to the local areas and livelihoods (Smith and McDonough, 2001; Gross, 2007; Groves, 2015). Opponents emphasised the privileging of national over local interests. One argued that, while the social, environmental, and economic pillars of the National Planning Policy Framework (NPFF) were "supposed to have equal weight" but that the latter was the main argument for fracking. Equally, the interviewee identified similar rifts within the community to those created by Brexit:

> Well, when […] it's affecting your social environment, and your community and your whole environment, you are a little bit more concerned about those other two pillars of the NPPF. […] Because this is the social aspect, this is the fact that our village has been split in two, and neighbours are glaring at each other, because I'm pro-fracking and you are anti-fracking, and you have a sign that says ban fracking, and I think we need the jobs, we need the cash and all the rest of it. (*NY08*)

Several opponents saw recognition injustices in government's disregard for Northern rural areas that made them feel somewhat insulted (Walker, 2009). They expressed their discontent being portrayed as the "desolate North" when talking about the suitability of fracking in less populated areas of the UK (see also, Cotton, 2016 and Rattle et al., 2018). A few argued that it felt like they were "an experiment" (*LN13*) and that their areas are far from "remote barren areas like Australia or America" (*NY08*). One reasoned that "it might seem like there [was] lots of space, but actually somebody [lived] there, […] a farmer might be close by, a little hamlet or a little village" (*NY01*). Several opponents felt that decision-makers "in London" were too far away to care about fracking risks in their areas and condemned the government for false promises about giving more autonomy to local communities. While these concerns were interpreted as distributional or recognition injustices in the literature (Cotton et al., 2014; Cotton, 2016; Rattle et al., 2018), opponents’ emphasis was not the unfair allocation of risks but power inequalities and disrespect of their place identities (Walker, 2009). Many opponents saw the imposition of the shale industry as devaluing their areas and argued that “rather than bringing us up, it will take us down” (*NY05*) (Walker, 2009). A Lancashire opponent, referring to other developments proposed in the area (such as casinos, gas storage, and fracking), believed that residents were “being bombarded with negative suggestions and the local government [was] overridden by the national government all the time” (*LN09*). Similarly, a North Yorkshire opponent worried about how the area was now perceived outside their community (Cotton et al., 2014):

> And I think we all felt quite badly about the television reports and the newspaper reports in sort of how Kirby Misperton has always been referred to. I remember saying to my husband for goodness shake we’ve got friends all over the country and they all will be saying “oh that’s village where *[we]* live, isn’t it?”[…] it is very disruptive to a small village. (*NY09*)

Jenkins et al. (2016) and Groves (2015) also note that misrecognition, as part of recognition justice, can arise from stereotyping local groups and disregarding their emotions, values, and place-based concerns. Similarly, some opponents argued that their views on fracking were not NIMBYism and felt offended by arguments that residents and representatives were scaremongering since they had “the right to ask questions” (*LN13*). Drawing on the police presence in the areas and recent injunctions brought by INEOS and Cuadrilla against protestors, several opponents further argued that their communities’ had a “right to protest” (*LN01*) against fracking, as they have been “left with no choice [but to] fight it” (*LN05*).

Case-study demographics and participants’ insights also identified the elderly as a vulnerable group whose needs were not fully recognised in fracking host communities (see also Walker and Day, 2012; Petzelka et al., 2018). Some interviewees voiced despair, saying they “would be dead” (*NY13*) before seeing any benefits from gas production and would only experience the disruption, stress and anxiety caused by the developments. While the physical health impacts of fracking constituted a future concern, current mental health impacts put a strain on some older residents with pre-existing health conditions, while concerns were expressed in Section 6.2 about the digital exclusion of elder residents.

Opponents saw further injustices in the lack of recognition of farmers as vulnerable or powerful local stakeholders within the areas. Consistent with studies that saw fracking as the “devil's bargain” for rural areas (Malin and DeMaster, 2016; p.278; Brasier et al., 2011; Willow et al., 2014), many referred to the ethical dilemma faced by farmers over whether to rent land to developments or seismic monitoring equipment to improve their livelihoods. Only one person was involved in agriculture sector but several described farmers’ current financial situation as “desperate” or “struggling” (*NY08; NY15; LN04*) and saw these financial benefits as unethical and responsible for creating additional divisions within those sub-communities. While a few Lancashire interviewees acknowledged farmers’ economic challenges, they were more critical of a local farmer’s decision to lease land for the RW development “to diversify because farming and dairy [were] not going to bring enough money in” (*LN04*). Their focus on this farmer indicated some tension between farmers and other locals. One person mentioned that the farmer appeared “arrogant” during a parish meeting, saying that “it [was] the farmers who [owned] all the land, so it [was] up to [them] how the land [operated]” (*LN10*). This experience highlighted how community divisions could emerge at an early stage where there were perceived injustices in who had a say about the land used to host a shale-gas development. Finally, some participants hinted at a form of injustice in farmers’ initial lack of knowledge of possible negative impacts, the possibility of protests, and long-term accountability for the land. Two participants shared the following:

> And people have actually gone back after they looked into it what Cuadrilla were saying and just though at the time 'oh £2,000 for a small piece for land it's not a bad idea'. But they now realise, and some have actually gone back to Cuadrilla and said 'we want to give you that money back, here's the cheque for £2,000', 'oh no! No, you've signed the contract now, you are tied in'. *(LN06)*

> One of the farmers in this area went to the National Farmers Union because they have been informed that once the well-head is finished […], they are only responsible for that well-head for 5 years […] the responsibility then falls on to the landowner whose land it's on, and they can't get insurance for it. (*NY15*)

Furthermore, a few opponents from both case studies commented on the difficult positions in which local representatives were sometimes placed in balancing multiple roles and views within their communities. They argued that councillors should remain neutral if they sat on development control committees, and that 'anti-fracking' representatives should moderate their personal beliefs so as to represent everyone and every viewpoint in their community, alongside that of the energy company. Other opponents also acknowledged the police's difficult position despite criticising their behaviour.

A few supporters argued that the government lacked the determination to support the industry and felt energy companies did not always promote the positive impacts of the developments sufficiently or counter negative perceptions (Section 5.2). The government's reluctance and industry's passivity towards protesters' arguments made some supporters feel exposed for their views, which they had to defend without the same resources as the anti-fracking movement. One local representative referred to a report by Yale University that claimed fracking had no effect in water quality around Marcellus:

> These [reports] are produced but they don't get the publicity that they should do; and I think the operators don't seem to defend themselves very well. The people who are against it come up with all the stuff, but it's never, you don't get anything rebutting that in the papers by the operator; they can't leave it to people like me, I'm not an engineer. (*NY20*)

Some North Yorkshire supporters and members of RAAP described protesters' "tactics [as] bullying" (*NY17*) and felt their viewpoints did not carry the same weight when they, or people they knew, were intimidated on a personal or professional level for their beliefs. They provided an example when they were scheduled to meet with the local MP and police assistant constable to discuss their views. They were informed on the day that anti-fracking protesters demanded to be present, which made them feel intimidated and resulted in them cancelling the meeting. Interviewees also felt disappointed by local councillors with anti-fracking views for being "one-sided" (*NY18*) because they did not "defend the local businesses" and "represent everybody" in the area (*NY17*). These findings corroborate Perry (2013), who argued that bullying did not come solely from the industry, but also from fellow residents who questioned the technology impacts of fracking. However, this study showed that opponents and supporters both felt they were not being listened to by local politicians (Perry, 2013).

Bradshaw and Waite (2017) discussed "how representative" local opposition was of their community during the Lancashire public hearings (p.33). Supporters generally believed there was a disproportionately low representation of views on local shale developments, referring both to their own and those of people that held less strong views. One complained that "the whole argument [was] being framed at anti-fracking protesters, the industry, and industry's supporters" and asked "what [was] the representation of the ordinary people" (*LN08*) referring to the silent majority of residents (Gross, 2007). Another interviewee reasoned that "If you took a vote in and you'd probably find that 10,000 people were against it, that's a lot of people, but there might be hundreds of thousands who have not said anything and they have not objected" (*NY20*). These results indicated that supporters saw local opposition to fracking as expressive of a "democratic deficit" in their areas (Bell et al., 2005; p.460). However, some supporters flagged the predicament local representatives faced in having to decide on shale-gas applications with no specialist knowledge and, in the case of Conservative representatives, being expected to accept local projects where planning permission was given by the Conservative central government despite vocal opposition from some of their constituents. Comparing the level of industry engagement between the UK and the US, one Lancashire supporter attributed imbalances to another recognition injustice, explaining that Cuadrilla initially underestimated local opposition and "lacked […] understanding of British culture and planning system[s]" (*LN14*).

A few supporters also identified the local police force as another vulnerable group. One described the police as "the pig in the middle" trying to "facilitate the protests but also ensuring that the company can do its lawful work as well" (*NY17*). A Lancashire supporter said that it was unavoidable that the government and police took tougher approach towards the anti-fracking protest movement for the "anarchist" or "anti-police" outsiders that came to the area (*LN10*). Overall, supporters disliked their areas becoming foci for fracking protests and resented national protesters and extreme activist actions that disrupted their sense of place (Cotton et al., 2014; Jacquet, 2014).

6.4 Summary and Reflections

This chapter has addressed the second research objective of understanding how perceptions of justice and experiences with the regulatory authorities and stakeholders involved in proposing, consenting, and resisting local developments affected residents' attitudes towards fracking. Building on findings from Chapter Five and Six, Figure 6.1 illustrates how perceptions of distributive, procedural, and recognition justice in shale-gas governance affected attitudes towards fracking and interacted with place and impacts of fracking in the two case studies.

Opponents and supporters came to different conclusions about whether distributive injustices had occurred that reflected different features of environmental and energy justice (Jenkins et al., 2016; Bailey and Darkal, 2018). The polarisation of interviewees' viewpoints can also be attributed to the stage and intensity of industry activity in the areas, since residents only had limited experience of the impacts of fracking at that time (Schafft et al, 2013; Thomas et al., 2017a; Brasier et al., 2011; Theodori, 2009). Opponents did not see a justification for the technology at the national level or identify substantial local economic benefits, whereas supporters did not recognise significant risks arising from developments. These findings highlight the temporal nature of the research (Section 3.2.1), as participants' perceptions of distributive justice could differentiate in the future, including those with more neutral attitudes towards fracking developments (Section 4.x), if they experience a greater range of both technology risks and benefits (see Schafft et al., 2013; Thomas et al., 2017a).

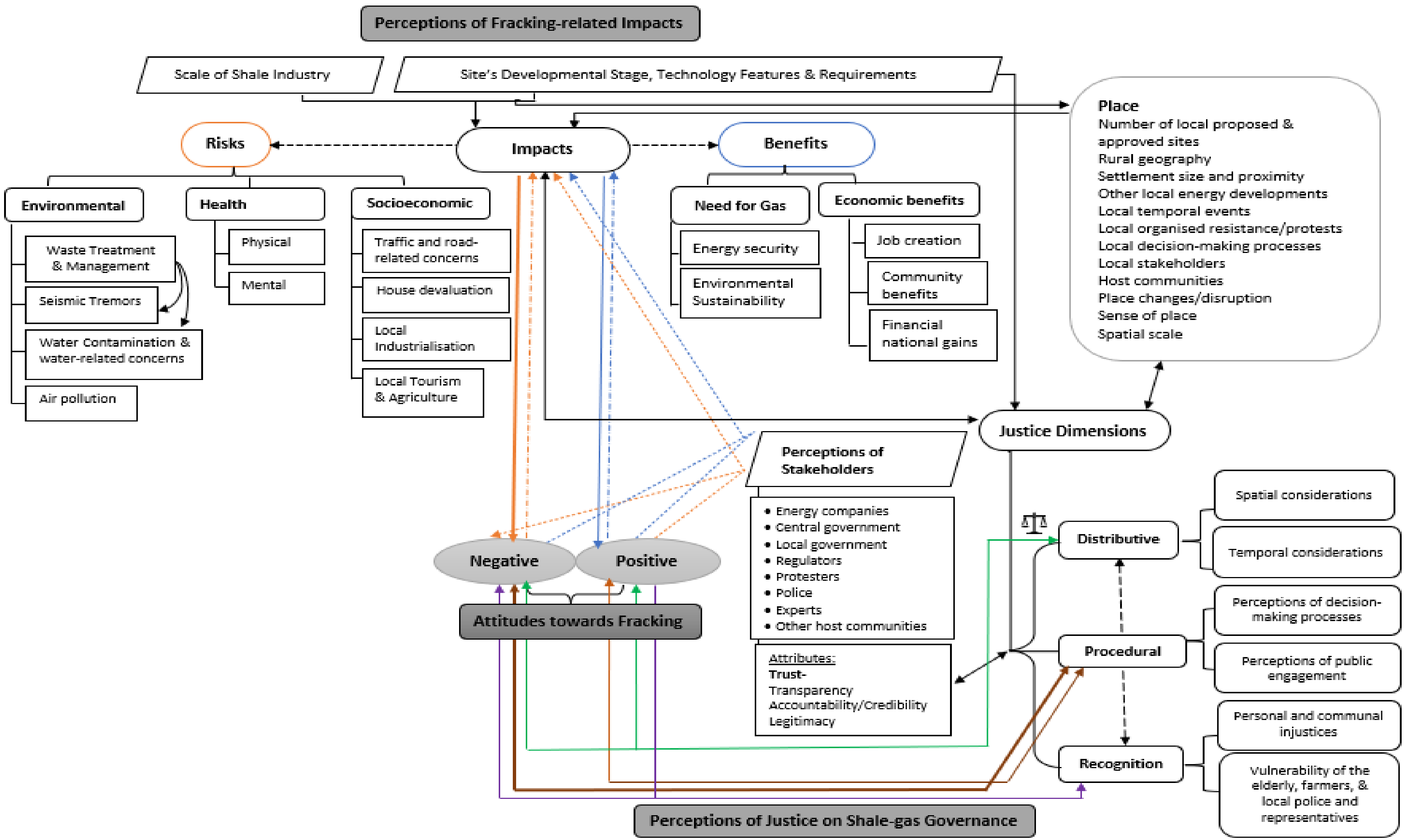

Figure 6.1 The role of perceptions of justice in shale-gas governance in residents' attitudes

Overall, procedural justice dominated discussions, indicating that perceptions of "bad governance" influenced opponents' attitudes (Bomberg, 2017, p.77). This was noted in both areas, in contrast with Rattle et al.'s (2018) findings about the importance of such issues only in Lancashire based on planning hearings. Discussions about procedural justice focused on interviewees' perceptions of the planning processes, public engagement, and the stakeholders involved (e.g., governmental, industry, protesters, and others) reaffirming the importance of transparency, accountability, and trust noted in shaping attitudes towards fracking developments (Williams et al., 2015; Cotton, 2016; Bomberg, 2017; Bradshaw and Waite, 2017; Beebeejaun, 2017). While the chapter drew on the three dimensions of justice, the level of trust (or lack of) stood out as a significant feature of stakeholders involved in shale-gas governance on many occasions. The chapter showed that trust affected, and was affected by, perceptions of justice, especially in relation to decision-making processes, local participation, and the behaviour of industry, and confirmed its role as both an important "characteristic" and "outcome" of public engagement (Walker et al., 2010, p. 2657). For most opponents, perceived procedural injustices led to irreversible distrust towards the government, the shale-gas industry, and the police (Oltra et al., 2012). Consistent with Section 5.3 and other studies (Oltra et al., 2012; Szolucha, 2018), trust often amplified or attenuated risk perceptions and benefits, while previously experienced risks further affected perceptions of trust in stakeholders (e.g., the 2011 Lancashire tremors).

Due to the local focus of the research, distributive, procedural, and recognition justice dimensions were highly interrelated and considered by most interviewees. The inability of planning authorities to consider all the perceived risks of fracking added to opponents' perceptions of unfairness in decision-making and further underlines the interconnectedness of distributive and procedural justice (Cass and Walker, 2009). Equally, the lack of consideration of the “soft social impacts of development”, such as the rural character of areas, place changes, and residents’ sense of place created recognition injustices (Evensen, 2016, p.282). Procedural and recognition justice also became entangled where interviewees’ perceptions of the unfair representation of residents, democratic deficits, and disregard of local feelings, concerns, and values undermined future meaningful engagement and communication (Jenkins et al., 2016). Including recognition justice as a distinct dimension emphasised the diversity of local groups and their varying experiences of shale-gas developments. Opponents’ perceived recognition injustices contributed to their negative attitudes towards developments, while supporters’ stance on fracking generally remained unaltered despite the reported difficulties with having their views, or the views of other local people who supported or were ambivalent about developments, equally heard and considered in the decision-making processes. Interviewees’ attitudes towards fracking also prompted some issues of misrecognition, especially in the case of some opponents who felt the need to justify that they were not NIMBYs (Jenkins et al., 2016; Groves, 2015).

These perceived injustices caused directly or indirectly by fracking led both to community divisions and to the mobilisation of anti-fracking or anti-protesters groups as residents sought to protect their areas from changes and retain their sense of place (Evensen and Stedman, 2018). While recognition justice by default focuses on place and people in place, the research showed that all perceptions of dimensions were place-dependent constructs. Perceptions of procedural justice reflected each site’s level of progression, planning permission procedures, energy company engagement, and local protests, while perceptions of distributive justice demonstrated the importance of spatial scale through supporters' emphasis on national benefits and opponents' emphasis on local risks.

While perceptions of procedural and recognition justice were more varied and less absolute than perceptions of distributive justice, interviewees' views, like with the survey results, aligned mainly with their attitudes towards fracking. For some opponents, perceived injustices were of greater significance than technology impacts. The study showed that neutral or weak initial opposition to fracking became more negative due to the imposition of the industry, inaccuracies in information provision, and perceived biases in decision-making. These findings confirmed that "outcome fairness" and "fair process" can profoundly shape community acceptance of energy developments (Gross, 2007, p.2375). Although perceptions of justice undoubtedly affected residents' attitudes towards fracking, interviewees' appraisals of whether planning processes were fair indicated that "outcome favourability" could also sway views as part of a recursive relationship (ibid). As Gross (2007) noted, opponents' prior attitudes can, and it seems did in this case, affect perceptions of process fairness and outcome legitimacy. For example, supporters' perceived recognition injustices did not change their pro-fracking attitudes, whereas those living in living in Lancashire also saw the local decision-making process fair despite detecting some discrepancies. On the other hand, Third Energy gained planning permission without appeals or involvement from central government, but opponents still saw the decision as problematic and made beyond the local level (Bradshaw and Waite, 2017). Lancashire opponents did not express any negativity towards LCC which had largely objected the local developments, unlike the perceived injustices previously reported by Beebeejaun in Lancashire (2017). While the research methods used (e.g., not focusing on responses to public hearings) and the unique characteristics of each local community under investigation could be responsible for these differences (Thomas et al., 2017a; Luke and Evensen, 2018), it was most likely due to the time-gap between the studies and a degree of confirmation bias as Lancashire opponents focused instead on the perceived overturning of local planning decisions by the central government.

Overall, opponents' perceptions of distributive, procedural, and recognition justice concurred with their view that the industry "[came] in without any social licence" (SLO) (*LN13*) (Boutilier et al., 2012; Boutlier, 2014; Luke, 2017; Bradshaw and Waite, 2017), indicating the increased use of the term by scholars, the media, and members of the public (Boutilier, 2014). The study findings indicate that all the main features of SLO– legitimacy, credibility, and trust towards the energy companies– were important to justice perceptions and also helped to explain variations in community support between the case studies[59]. For example, North Yorkshire residents' support to Third Energy reached the highest level of SLO– identification (Boutilier and Thomson, 2011; Boutilier, 2014). Lancashire supporters, meanwhile, saw Cuadrilla as competent but recognised limitations in their engagement approach, suggesting that their support probably remained at the approval stage (ibid). However, opponents saw social resistance as legitimate, credible, and trustworthy regardless of their own personal involvement (Luke, 2017). The interview findings thus agreed with recent studies that "multiple social licences […] may exist within a community, with diverse and sometimes opposing views held by different groups and individuals (Luke and Evensen, 2018., p. 131; Dake et al., 2014).

[59] Issues of legitimacy, credibility, and trust have been described as fundamental features of SLO that contribute respectively to different levels of community support for local developments– acceptance, approval, and identification (Boutilier and Thomson, 2011; Boutilier, 2014; Bradshaw and Waite, 2017).

The next chapter brings together findings about the importance of place and explores residents' sense of place and broader values before evaluating the integrated approach adopted in the study.

Chapter Seven
Towards an Integrated Framework for Understanding Perceptions of Fracking

7.1 Introduction

This chapter moves towards creating an integrated framework for understanding perceptions of shale-gas by exploring residents' socio-psychological processes, their connections with fracking attitudes and perceptions of impacts and justice. Bringing together the previous findings, this chapter first explores the role of place in perceptions of shale-gas fracking and examines interviewees' sense of place (Section 7.2). Section 7.3 then examines residents' worldviews as a broader socio-psychological construct in the formation of perceptions of and attitudes towards fracking, fulfilling the third research objective of the study.

The survey results reinforced the idea that multiple reasons beyond NIMBYism affected residents' attitudes towards fracking, while the interviews explored the complexity of these relationships in greater detail. The Chapter continues synthesising the research findings by examining connections between attitudes towards fracking and perceptions of technology impacts, justice, trust, sense of place, and worldviews– the thesis' final research objective (Section 7.4). From this, the study proposes an 'Integrated Framework for Understanding Perceptions of Fracking' that deepens understanding of the ways individuals and communities respond to controversial energy developments. It provides a visual summary of how individuals interpret fracking in their area to provide new insights on how perceptions of impacts, justice, place, and worldviews intertwine to affect attitudes towards contentious energy technologies. In particular, it reveals that rather than trying to claim that one single set of factors has pre-eminence over, or is the root source of, the other variables, it examines how they co-exist in reciprocal, mutually-informing and interacting relationships. For example, place connections influenced perceptions of the acceptability of impacts but were not the sole determinant. Similarly, perceptions of justice were partly rooted in place but were also driven by non-place-dependent notions of what was right and wrong, and by general perceptions of safety or otherwise of fracking technology. The framework additionally explores how environmental, sociocultural, and political values encompassed in worldviews were also responsible for shaping perceptions of impacts, justice, and place, and positions attitudes at the core of the framework interacting with all other components (Stern et al., 1995; Evensen and Stedman, 2017). In developing the framework, the thesis adds to the academic literature on attitudes to fracking by exploring these interactions between factors that have hitherto mainly been examined in isolation, supported by empirical evidence from two case studies where fracking operations were at an early stage of development.

7.2 The Role of Place in Perceptions of Fracking

The survey results showed that the perceived appropriateness of the location of sites, people's connections with their local areas, and local features influenced residents' attitudes towards fracking (Sections 4.3.2; 4.5.1), while Chapters Five and Six further identified place as an important factor in interviewees' perceptions of impacts and justice. This section synthesises and expands on these findings to better understand the role of place in shaping perceptions of shale-gas fracking. In doing so, the thesis has conceptualised place as both an objective and subjective construct, using Agnew's (1987) three-part definition of place as a location, locale, and sense of place (Cresswell, 2015). Location usually indicates a specific point on the Earth's surface[60] or something's

[60] "[O]r in the Earth's case a specific location vis-à-vis other planets and the sun" (Cresswell, 2015, p. 13).

position relative to the point, while locale and sense of place highlight the geographical and social aspects of place that make places meaningful (Cresswell, 2013; 2015). Locale reflects the setting within which people's lives and relationships emerge from the interaction of material and social features (e.g., natural and built environment, demographic and cultural characteristics), whereas sense of place emphasises people's emotions and bonds towards places (Agnew, 1987; Cresswell, 2013; 2015; Scannell and Gifford, 2010). While acknowledging these interlinked dimensions of place, this section uses the objective meanings of place– the physical location of fracking sites and their relative distance from people's homes– as the starting point of discussion. Spatial scale (global, national, regional, local) also exists as another objective manifestation of place that affected interviewees' perceptions of fracking and place meanings (Cresswell, 2015). The study also considers the character and features of the local areas, types and senses of community, and residents' varied attachments and identities to explore interplays between locale and sense of place and their relationship with perceptions of fracking (Table 7.1) (Cresswell, 2015; Jorgensen and Stedman, 2006). Therefore, this section takes a different approach to previous chapters and discusses the variations in interviewees' perceptions of place between and within the case-studies, while including comparisons between supporters and opponents of fracking where necessary.

Table 7.1 Key themes in residents' perceptions and interpretations of place							
Theme	**Sub-theme**	**Description**	**Number of Interviewees**				
			Total	**-**	**+**	**LN**	**NY**
Location	Spatial scale & Absolute location	Global, national, regional, local place-dimensions; Position of a fracking site within an area	34	27	7	20	14
	Proximity	Relative location to fracking site(s)	34	27	7	20	14
Locale	Local character	Rurality, settlement patterns, communities and their demographics	34	27	7	20	14
	Local features	Perceived positive and negative social/physical characteristics	33	26	27	19	14
Sense of place	Sense of community, Place attachment and identity	Communities of place and interests; Feelings of unity & isolation/ Experiences of disruption & mobilisation; Traditional/active types of attachment; Changes in residents' place & social identity	34	27	7	20	14
	Other (non) place-attachment types	Less frequent considerations of (non) attachment, such as place dependence, relativity, and alienation	6	5	1	1	5
Total				**27**	**7**	**14**	**20**

The significance of local context emerged from variations in residents' perceptions of impacts and justice based on: the number of fracking sites within each case study, the stage of developments, their characteristics and technological requirements (e.g., construction of horizontal wells/ previous conventional well); the rural character of local and regional area; the position, condition and accessibility of major and smaller roads; spatiotemporal events (e.g., water restrictions); and, decision-making processes, actions and behaviour of local stakeholders (Sections 5.4). Other established or proposed developments at the local and regional levels also appeared to be important. For instance, many North Yorkshire interviewees assessed the impacts of the technology and the industry's credibility by drawing on conventional gas sites in the area, Knapton power station, and Flamingo Land theme park. Some Lancashire opponents complained about the industrialisation of the wider area, one describing it as the "Bermuda Triangle of gas" and explained that, besides gas-storage and the PNR developments, a gas-power station was under construction in Wyre District and "all the investment and facilities [were] going into one area" and were "linked" by the fact that there would be "someone that wants to produce gas, someone that needs gas, and someone that stores gas" (*LN07*). Meanwhile, other developments in Lancashire added to opponents' perceptions of procedural and recognition injustices (e.g., emergency plans for the aerospace industry and the nearby nuclear reprocessing plant, the decision-making process for gas storage, and proposals for a major casino in Blackpool), contributing to the argument that familiarity with energy technologies and other infrastructures in the areas was crucial but could only provide "ad-hoc explanations" of how these shaped residents' perceptions of a new local fracking development (Whitmarsh et al., 2015; Oltra et. al., 2012, p.233). These findings indicate the importance of location as an influence on the perceived appropriateness of the siting of fracking developments but also as a component and filter of perceptions of technology impacts and justice.

Opponents' emphasis on local impacts and the fact that distributive, procedural, and recognition injustices were to a large degree locality-based evaluations indicated that, alongside the location of fracking sites, residents' distance from developments was important to their evaluations of fracking sites (Agnew, 1987; Cresswell, 2013). The survey results showed that the environmental and social impacts of fracking on nearby communities were particularly important among residents with negative attitudes towards fracking, but perceptions of trust in decision-making processes and institutions ranked slightly higher as a contributing factor to attitudes (Section 4.3.2). Further analysis revealed that, while most interviewees with negative attitudes towards fracking worried about the risks of fracking, those living 4-10 miles away from the KM and PNR sites (including those near the RW site) flagged a broader range of procedural injustices, which often became their primary for opposition. These findings indicated that people's proximity to fracking sites played an important role in that, for members of the community not yet directly and negatively affected, perceived lack of fairness and transparency in decision-making processes contributed more to their negative attitudes (Gross, 2007; Van der Horst, 2007) (Section 6.4).

The relatively equal importance attached to negative impacts among opponents could be attributed, as Gross (2007) notes, to interviewees having a personal interest in and/or strong *a priori* opinions on the fracking development (West et al., 2010). Nevertheless, those living closer to the sites were generally able to expand on the disruption to their areas due to their 'lived experiences' of the tangible and/or immediate negative impacts of fracking (e.g., increased traffic, industrialisation, house price devaluation) (Willow et. al., 2014; Sangaramoorthy et al., 2016; Sovacool et al., 2020). Thus, the study showed, in line with Clayton and Opotow (2003), that those directly affected were influenced by the most striking characteristics and impacts of the development and/or by their preferred outcomes, which, in turn, explained a degree of bias in their perceptions of distributive justice. These findings also confirmed that "scale matters" when exploring community perceptions of fracking and showed that personal experiences of impacts could explain why these contribute more to the formation of attitudes than perceptions found on larger geographical scales (Evensen and Stedman, 2016, p.17; 2017). However, interviewees' consideration of national or international issues, such as energy security, affordability, and climate change suggested that attitudes towards fracking are never entirely place-independent when one considers place as spatial scale (Cresswell, 2015).

While increased traffic, road disruptions, and added stress were noted in both case studies, more North Yorkshire participants spoke about how their daily lives were interrupted by the development due to their proximity (Section 4.5.1). For example, some discussed times "when the road through the village was closed [which] was disconcerting for a lot of folk in Kirby Misperton" and other residents [*NY09*]. Most opponents accepted the need for activism that contributed to this disruption, but held Third Energy and the police accountable for allowing convoys of trucks that breached the traffic management plan, moving residents' cars unnecessarily, and inconsistently shutting the road:

> I didn't really know my heart was so strong; 'cause the police closed the road and I wanted to get out […], because somebody has jumped on top of a wagon. […] I said my father is in an old folks' home in Pickering, and I go to see him on a Monday; if I don't see him, he will get very stressed, so I expect you to have this road open within the hour and stormed off. The old heart went boom! [*NY12*]

> And Third Energy and the police were as seen as the good; I mean I was disrupted with my daily living and they kept saying 'oh it's the protestors, it's the protestors', and I said it's not, if you weren't here, the protestors wouldn't be here. [*NY15*]

Despite increased traffic at PNR, Lancashire interviewees did not talk about similar incidents, which can be explained by them living further away from a village or closer to the RW proposed site. Lancashire opponents, however, frequently mentioned disruptions to their livelihoods and impacts on their mental health, personal time, and family relations caused by the length of fracking activities, planning processes, and discussions (Section 5.1.2):

> Something important that I want to get across is the amount of money that is costing our community; not just money, but health, stress, anxiety, but it costs literally tens of thousands of pounds to try to fight this […]. If I got paid what I was

> when I was in industry, I would be a millionaire, the amount of time I put in. But you put the amount of time in because it means something for you as an individual; whereas when I worked, I wasn't committed to it in the same way, but now it affects me personally and my family and the future, and you do it, don't you? [*LN04*]

Besides proximity, the local character of the areas, in terms of the degree of rurality and settlement patterns, differentiated residents' experiences and perceptions of impacts (e.g., traffic and transport routes). These place components often combined with interviewees' length of residence in the area also contributed to variations in opinions on the sense of community and whether divisions occurred due to the polarisation of attitudes towards fracking or other factors. During initial visits to the case studies and the design of postal surveys, it was noted that the KM site was adjacent to Kirby Misperton and Great Habton villages. As one Lancashire supporter noted:

> Over in Kirby Misperton there is a rural community because you've got a collection of houses all built within certain area next to it, which is a little community, whereas Preston New Road there is no community, it's just an A road; […] it's in-between communities, there is no community near. So, the location of the site it's a difference here, it's not on their doorstep. (*LN08*)

The interviewee also described the nearby hamlets as "isolated communities" compared to Kirby Misperton, which was a "cohesive village, (…) big enough [so] the people can have opposing views to the whole thing and feel empowered to actually express those opposing views". *LN08* therefore believed that residents of the hamlets near PNR would not "want to rock the boat" since they had to continue living there. The interviewee saw the notion of a singular community as "contrived", whereas Kirby Misperton could arrive at "a community response" because of its characteristics and settlement structure. They also noted different attitudes between people from different social classes living in the Fylde area. *LN08*, who lived in Blackpool, explained that it was one of the most deprived areas in England and inhabited mainly by working-class people who "[did not] care or [were] up for it [fracking]". In contrast, the interviewee saw NIMBYism as more evident among middle class residents in more affluent areas like Lytham. Overall, the interviewee believed that most local people were “indifferent” towards the development and did not “see the potential benefits” or were not “engaging” enough to do so. Saying that there was a community division therefore “overstated [the] case”, even though an “anti-protest kind of opinion” had emerged because of the disruption caused by protests. *LN08* concluded that “realistically, the only community [was] the anti-fracking community” that formed because of the development.

Two Lancashire opponents who lived close to PNR agreed. One explained that they did “not have a relationship with their neighbours” as they live “200-300 metres” apart (*LN02*). The other knew or speculated about the views of their neighbours but did not see it as “divisive” as in their “little hamlet [they had] never had a discussion about it” (*LN12*). The interviewee did not want to change her opinion of others because of differences of opinion on fracking and argued that it was like “Brexit, you keep it to yourself” (*LN12*). They both referred to Wrea Green, the closest village to PNR, as a more concrete community, but noted that there was “no visible opposition, [except for] one or two signs” (*LN02*). In contrast, *LN02* argued the opposite for people living near RW, where “every house [had] a sign up and […] they [were] all very against it, together, for that field”. Despite fracking being a contentious topic:

> You catch people’s feelings on it, you don’t say anything yourself and they would say bloody protesters! That’s the thing; people are not for fracking, they are just against the protestors now. (*LN02*)

Interviewees near RW confirmed that the majority of local residents opposed the developments. They identified conflicts with the farming community (Section 6.3) but remained unsure whether there was division within the community, arguing that it depended on whether community was defined as their village or the wider Lancashire community. They felt that the fact the Roseacre community was in “near present danger” (*LN05*) explained why local opposition was more visible than in communities further away that not fully comprehend the need for protests and complained about travel disruption.

Conversely, interviewees noted that the RW development encouraged them to socialise with others in their community. Interviewees involved in the anti-fracking movement explained how this gave the area “more of a sense of community” (*LN05*) by providing opportunities to meet people from diverse social, political, religious backgrounds who unified behind a “common purpose” (*LN04*). Nevertheless, they recognised that residents who were indifferent or hostile towards the protests did not share these feelings, adding that they were often accused of not being locals or having personal motivations, and that some conflict existed within the anti-fracking movement over strategies for resisting developments.

North Yorkshire interviewees also spoke about community divisions within Kirby Misperton, while views on fracking in the surrounding area showed the importance of local features. Some interviewees from a nearby hamlet said they lived in “a very tiny [and] private community” (*NY03*) that was “untouched by fracking at the moment [despite being] closer to it from Kirby Misperton on the map as crow flies” (*NY02*). They reported that only a few residents have attended meetings and were not aware of any KM supporters but only some residents who showed a level of “ignorance” (*NY15*). In contrast, Kirby Misperton residents described tensions in their community related to the protests. One reported that “when the police closed the road one day”, a neighbour “went absolutely berserk [shouting] ‘we need the gas, we need the gas!’” [*NY12*]. Others mentioned fellow residents stopped talking or greeting each other when they realised they had participated in KM protests. Interviewees from Kirby Misperton appeared aware of the varied attitudes within their community:

> ten households [have] got more open against fracking and protested in some form; there is three or four families, obviously they are not very open, who I know are very against the camps, the people at the gate, and their neighbours that oppose it. (*NY14*)

However, they added that some anti-protest residents changed their minds as they got to “know the people” from the camp and built a neighbourly “connection” (*NY14*). *NY14* nevertheless argued that fracking was not discussed extensively, had no effect on relationships with those “know you better”, and saw tensions resulting mainly “from people outside the village” (*NY14*). While some Kirby Misperton opponents claimed neighbouring Habton was also divided, one local supporter only perceived Kirby Misperton “the epicentre” of these “very strong feelings” arguing that the KM site was not a topic of debate in social gatherings further away from the area (*NY20*). The interviewee found it unlikely that “brothers would fall out here” and, instead, claimed that fracking was not “like Brexit, which [was] producing quite strong feelings one way or the other; most of the people that [were] not against it tend[ed] not to be heard so much”.

However, some North Yorkshire opponents worried about future family divisions based on reported experiences of rural communities with fracking abroad and in Southern England and memories of the negative social effects of the mining industry. Those that lived 4-6 miles from the site also discussed people’s attitudes towards fracking within their areas, social groups, and families. One felt that s/he had to “try canvas lot of my friends before speak[ing] out in public” (*NY06*) despite the general opposition. Others were happy their village was not divided because there was overall opposition, compared with another village where people were “looked down upon” and “challenged in shops just for wearing [an anti-fracking] badge” (*NY05*). Interviewees who had moved to the area from cities attributed this to the area being “very conservative”, both “with a small” and “a capital ‘C’” (*NY04*). They explained that most people believed central “government knows best” and “if you [said] you [were] opposed to fracking, somehow you [were] a protester and a delinquent” (*NY05*). They also explained that people in rural areas frequently “relied on their neighbours” and fracking would “damage” this sense of community (*NY05*). Despite the “nastiness” (*NY05*) many opponents experienced for engaging with local protests and similar to in Lancashire, some North Yorkshire interviewees felt that fracking became the “focal point of communities getting together” and increased “community spirit” and social engagement (*NY08*). With KM operations suspended at the time, protests stopped and the protest camp was dismantled, leaving one interviewee feeling nostalgic. Two opponents also mentioned that they recently went with “40-50” people from the area for “a reciprocal visit” to Misson Springs Road fracking site in Doncaster to show their support for the local opposition (*NY12*).

Drawing on these findings, some interviewees interpreted sense of community as community of place, whereas others stressed that new communities had formed between residents and protesters with similar attitudes towards fracking (Scannell and Gifford, 2010b; Luke, 2017). One Lancashire opponent discussed how communities of place and interest often intertwined (ibid):

> So, now I feel the narrative of local and non-local is non-existent because we are all local, the camps are now part of the local community. The borough councils inspected for health and safety, for food hygiene, they’ve given fire safety advice, so, they feel there is a duty of care towards them. So, they have sort of all assimilated really. And we provide food. We just share our lives whether we choose to live on a camp or in our own homes. (*LN13*)

As it started to emerge within the theme of locale, interviewees identified both positive and negative local features as important components of their sense of place and its disruption by the local fracking developments. Similar to the surveys, they valued their area's: i) rurality and natural beauty, ii) way of life (sense of community and belonging, quality and local values, and peace and quiet, and iii) accessibility and amenities (Section 4.5.1). Many North Yorkshire interviewees spoke fondly about the rurality of the area independently of their attitudes towards fracking. Those from rural Lancashire expressed similar feelings, whereas others appreciated their area's semi-rural nature that combined proximity to countryside, coast, and cities. While residents' appreciation for their way of life was widespread, their emphasis on sense of community, particularly in North Yorkshire, showed a "social bondedness" with, and a "physical rootedness" in, the area that reflected different aspects of sense of place (Perkins and Long, 2002, p.68) (Section 4.5.1). However, as with the survey results, some interviewees mentioned deprivation and were critical of local mind-sets (Section 4.5.1). Some North Yorkshire interviewees noted limitations in local infrastructure and facilities and worried about young people being unable to find work and afford houses, while some Lancashire interviewees emphasised lack of investment and jobs and alcohol and drug abuse, especially when referring to Blackpool.

Perceived positive and negative local features shaped most residents' sense of place and prompted different conclusions about the effects of fracking on the area (Scannell and Gifford, 2010). (Section 4.5.1). Supporters' perceptions of fracking as an economic opportunity and a way of keeping young people in the area to address local deprivation echoed scholars' findings in other rural and often peripheralised communities in the US (Kriesky et al. 2013; Schafft and Biddle, 2015; Evensen and Stedman, 2018).

Conversely, opponents who valued the area's rural character and natural beauty made them see fracking as a threat to their area (McLachlan, 2009; Devine-Wright, 2013; Schafft and Biddle, 2015; Bomberg, 2017; Luke, 2017; Jaspal et al., 2014). This was most notable for opponents from North Yorkshire and Lancashire residents near RW site, showing again the importance of local character and features between and within cases studies (Sections 4.5.1; 5.1.3). For example, two interviewees who travelled to Pennsylvania compared its "wilderness" to Ryedale's "vales and farmland and villages every couple of miles" (*NY05*). The change in the area's character was crucial even to one North Yorkshire opponent who felt the industry was "pretty safe, but on balance it probably still [was not] quite right for this region" (*NY16*), especially if it expanded. Another opponent, drawing on the social impacts of the energy "boom in America" (*NY06*) (such as labour in-migration and violence), expressed sadness that children may not have the opportunity to know this "nice area" in the same way as fracking would "jeopardise" the area's features. *NY06* interviewee was "not 100% against fracking everywhere" and argued that, if there was genuine need and justification for exploring unconventional resources, then the "North Sea […] would be the best place to do it". For some opponents, therefore, local physical features and sense of place formed the main reasons for opposition, despite objections extending beyond their areas on most occasions (Section 4.2.2).

Besides the "unfortunate publicity" that was "very disruptive to a small village" and threatened the place identity of some North Yorkshire opponents (Section 6.3) (see Jacquet, 2014), some respondents felt the area was no longer their "quiet neighbourhood" because of excessive policing [*NY09*]. Some respondents described how police searched the area excessively to safeguard the arrival of trucks; one interviewee told police: “[t]here were less people looking for Osama Bin Laden than you prats in this bloody village!’ [*NY12*]. Not all views about the police were negative, however, as one resident who was expecting regular medical assistance at home described that they developed “a good relationship” and put “a system in place”, using a password to allow people to access the village at those times [*NY09*]. However, the interviewee mentioned “instances where some carers were very officiously told that they would not go through [and] that the road was closed”, and, despite the “year of disruptions” and worries, they “survived” [*NY09*]. In addition, some North Yorkshire opponents mentioned the temporary closure of a public footpath near the KM site used as a shortcut and for recreation:

> I was walking my little dog down one of the footpaths, which I’ve walked ever since I’ve been here. And the security bully-boys came out and said ‘you cannot walk down here’, and I said ‘I think you find I can’, and he said ‘no, you just can’t walk down here. North Yorkshire Council have shut it’. I said, where are all the signposts?’ […] And the gentleman got quite angry and abusive, and I actually turned to him and said ‘if that’s the case are you going to physically stop me from walking down here?’, and he was like ‘no’, […] and so I did. [*NY15*]

For some opponents, the rig getting stuck at the nearby old bridge during its removal confirmed that Third Energy cared little about local features that were important to affected communities. Such incidents affected opponents’ sense of place but some also talked about the uncertainty brought by the suspension of the KM development and an unnecessary sense of disruption caused by being “in a kind of limbo” since “nothing [was] final” [*NY09*] (Sangaramoorthy et al., 2016).

Similar to Rattle et al.’s (2018) observations of residents who spoke at Lancashire and North Yorkshire public hearings on fracking, interviewees were generally fond of their areas regardless of their attitudes towards fracking and recognising negative local features (Section 4.5.1). Echoing Perry (2012), the insularity among residents was raised by those not born in the area, some of whom still felt like outsiders after years living there (Relph, 1976). For instance, one North Yorkshire opponent disliked the "small-town mentality and the difficulty of being accepted as local by the real local people who've been here for 3-4 generations, [even after] 20 years" (*NY16*). The interviewee claimed that it was generally "the people that [came] from outside" who were more "involved" in local social and cultural activities, incorporating residents of the past "20-30 years" (*NY16*). Another opponent explained that Kirby Misperton used to be an "isolated village" and residents who lived there "the longest [were] the ones that [were] most against the protestors", while the ones who "openly [got] down to protest [were not] here as long" (*NY14*). One Lancashire opponent also noted these place-identity differences, while discussing how protesters were often classified as "locals and nationals":

> I'm not originally from this area, but does that make me non-local? Does it mean my voice has no validity because I was born somewhere else? […] But it's very convenient for this, the media to talk about it, 'cause instantly then sets up a hostility in people. Because Fylde coast has been quite insular; from my experience coming in, people tend to be very proud of the area, they are very proud of their heritage and their roots in the area, and they are very defensive of it, and quite suspicious of outsiders; [but] that's changing, because our towns are actually expanding (*LN13*).

The above findings echoed survey results that length of residency and varieties of place attachment could help to understand similarities between supporters and opponents' views on fracking (Section 4.6). Indeed, many opponents decided to move to their area within this time for its natural beauty and tranquillity, suggesting a more active place attachment (Gustafson, 2014; Lewicka, 2011b; Hummon, 1992) (Section 4.6):

> I fell in love with this area a very, very long time on a holiday; and it seemed the logical place to come when we had to take very early retirement. We looked at all

> sorts of other options and in the end we decided, let's just go, Ryedale will be fine, we have had lots of lovely holidays; and it is a lovely place to be because you've got ready access to the sea, to York, the countryside, it's beautiful. (*NY09*)

> I moved into Inskip 25 years ago; rural, nice little village, nothing there you know, purely for peace and quiet as business is in Preston […]; and bang, out of the blue, out of the whole of England, there it is talking about fracking in our doorstep. (*LN03*)

These findings align with previous research that identified a negative relationship between local acceptance of energy developments and active place attachment or those whose place identity stemmed from rural surroundings (Scannell and Gifford, 2010; Van der Horst, 2007; Devine-Wright and Howes, 2010; Devine-Wright, 2013; 2014; Jaspal et al., 2014; Schafft and Biddle, 2015; Luke 2017). Opponents who exhibited active attachment were also more likely to become involved with local organised opposition (Devine-Wright, 2014; Lewicka, 2014; 2011b; Gustafson, 2014), ranging from responding to planning applications and hearings, displaying anti-fracking signs, attending meetings, monitoring traffic, and donating money or supplies to protesters' camps to participating in demonstrations and acts of protest. Reflecting changes to their social and place identities caused by fracking (Clayton and Opotow, 2003), one North Yorkshire interviewee proudly accepted that local opponents were labelled "geroactivists" (*NY01*). Similarly, some Lancashire residents described their decision to participate in a 'lock-on' demonstration as proof protesters were both outsiders and locals:

> I have never done anything worse than speeding or parking tickets in the past. And, I thought we've tried everything else; we've been engaged with our MPs and our councillors, we sent letters to newspapers, spoken to public inquiries- I've spoken to public inquiries; we responded to the Government consultation documents, and, frankly, it got us nowhere. So, we were left with a very stark choice to either give up and go away- and I'm not really that kind of person- or we step it up; so, I decided that really I have no choice but to take part in direct peaceful action, which I did. So, I'm now officially a criminal, I was charged with obstruction of the highway and been given a 12-month conditional discharge.

One also suggested holding the interview at the anti-fracking camp to highlight the connections residents had developed with protesters. Interviewees whose opposition was less active (e.g., anti-fracking signs in houses), meanwhile, attributed this to work limitations, either a lack of free time or fear of acquiring a criminal record. The one non-active opponent explained that it was because he learned about fracking later on and stopping it now it felt “hopeless” (*LN02*).

On the other hand, fracking supporters mainly exhibited a more traditional place attachment, contrary to Devine-Wright’s (2013) findings that no association existed between support and this type of place attachment. Some had moved to the areas over 30 years previously, while others said they had lived locally “all [their lives]” and talked about family members in their areas (*NY19*). As previously mentioned, North Yorkshire supporters flagged their familiarity with the area and previous energy developments when arguing that fracking would not industrialise the area (Section 5.1.1; 5.1.3). For some residents fracking was not necessarily undesirable if it resonated with their sense of place (McLachlan, 2009; Venables et al., 2012; Devine-Wright, 2013). One emphasised how agriculture was a heavy industry that was part of their place identity:

> Its beauty is within the eye of the beholder… You can drive through this area and people do not see the absolute nightmare of higgledy-piggledy farm sheds, and grain dryers, all the stuff that goes with agricultural industry, because it is an industry. […] People don’t complain about that [showing farming equipment] because it’s part of their life. (*NY20*)

While most fracking supporters acknowledged positive features of their areas, they did not elaborate on its natural beauty, but, instead, highlighted the way of life and security it provided, which was now threatened by outsiders:

> You drive around you see farms; you see trucks in the fields and things, kids playing outside; you know it’s not like a city; you are not scared to let your kids outside to play like it would be in a city. (*NY19*)

> It’s like going back in time really, it’s really a lovely place to live, and that’s one of the things we find very hard to stomach is when the protests got out of hand. (*NY17*)

For most supporters who exhibited more traditional place attachment, overcoming deprivation through local developments and discouraging “professional” non-local protesters [*NY20*] were seen as ensuring “continuity” within their areas (Gustafson, 2014, p.40). North Yorkshire supporters attributed disruption solely to protesters and emphasised how they occupied a field illegally for their anti-fracking camp. Some argued that newer residents did not always understand the area’s needs and cared only about house prices (Section 5.1.3). The indirect impacts of fracking, however, arguably changed some supporters’ “unreflected rootedness” and prompted some active attachment (ibid). North Yorkshire supporters became more socially involved, seeking people with similar views beyond their existing social circles (Lewicka, 2014; 2011b; Gustafson, 2014). This was also the case for one supporter who expressed some place relativity in their ambivalence and provisional acceptance of fracking (Gustafson, 2014) but said disruption by protesters made him more protective of his area:

> In the last year I’ve been involved with fracking and the disruption it’s brought to the area, not the fracking as a whole but outside protesters, non-locals that disrupted the area. So this is what I became more interested about as opposed to the fracking itself; I think fracking will go ahead whether we decided or wanted to go ahead or not. But it’s the protesters, the antisocial protesters that I have an objection to in our area, in our community. (*NY19*)

Interviewees frequently mentioned other residents’ experiences and referred to known pro- and anti- fracking locals within their discussions. However, some also drew from beyond personal and local experiences and memories in their evaluations of fracking. Some supporters drew parallels with the country’s experiences with the Irish Republican Army when talking about protesters, accusing them of causing conflicts with the police, threatening the area’s peace and safety, and negatively shaping young people’s behaviours. Several interviewees considered the negatives and positives aspects of coal mining (environmental impacts, local jobs, strikes, and police behaviour), while one discussed the Suffragettes in relation to people's right to protest and be respected for their views (Section 6.2). As Scannell and Gifford (2010) note, experiences and values passed through generations can create community place attachment and encourage place protective actions. However, considering different interpretations of place and geographical scales, attachment can range from a room to one's neighbourhood or nation (Tuan, 1977; Cresswell, 2015). Thus, supporters' arguments that fracking would benefit the UK could be perceived as them holding stronger attachments on national level (see Perry, 2012).

While most interviewees showed positive place attachments, the possibility of fracking making some opponents feel more negatively about their area indicated an undercurrent of place alienation (Hummon, 1992; Gustafson, 2014). Some opponents expressed a wish to move away (see Sangaramoorthy et al., 2016), while some North Yorkshire opponents said that they would not have moved there if they had known about fracking at the time:

> Anyone who can leave is leaving, I promise you; and the rest want to. We want to leave, but we can't. […] We could have gone anywhere and we end up in Kirby Misperton, can you believe? It was my fault. (*NY13*)

The inability to sell their house or the fear of negative equity also revealed some place dependence– a ''functional connection based specifically on the individual physical connection to a setting" (Raymond et al, 2010, p.426). Nevertheless, as the survey showed, most older interviewees did not exhibit complete place dependence because employment did not tie them to the area (Section 4.5.1). However, supporters' past employment or familiarity with the oil and gas industry contributed positively to their perceptions of fracking. Thus, the study largely agrees with Rattle et al. (2018) about the importance of demographic characteristics within affected communities when considering their sense of place and how this has been disrupted by fracking, even though retirees' opposition was not founded on a desire to take up job opportunities.

The polarisation of attitudes towards fracking detected in both areas echoes Luke and Evensen's (2018) findings in Australia and North America that 'in communities where substantial discourse had occurred but widespread development had still not taken place […] representations were more polarised and oppositional" (p.143). Overall, the lengthy pre-development discussions, possible confirmation bias, local socialisation and mobilisation supports the idea that perceptions of fracking were not just created individually (Whitmarsh et al., 2015; Jacquet and Stedman, 2014), but were also shaped by other residents and communities of interest (Luke, 2017; Scannell and Gifford, 2010b). These findings again confirmed the importance of place in that fracking developments changed both the physical settings of the areas and the lives and social relationships of communities (Agnew, 1987; Cresswell, 2013; 2015).

To conclude, this section has explored how place affected, and was affected by, the potential of and people's attitudes towards fracking. Acknowledging the complexity of place, place was perceived as both an objective and a subjective concept comprised of the interlinked components of location, locale, and sense of place (Figure 7.1). Participants' responses that the appropriateness of sites and personal connections to the areas affected attitudes towards fracking in important but varied ways (Section 4.3.2). This causation aligns with Evensen and Stedman (2017), who saw place attachment[61] as a broader phenomenon that also contributed to the formation of attitudes in the US Marcellus Shale region. Interview discussions showed that attitudes

[61] This was measured by agreement with the statement: "My community is special to me as is; I would not want anything to change." "(Evensen and Stedman, 2017, p.16)

towards fracking were heavily influenced by local contexts, but the importance of place was also evident at different spatial scales. The study found both the location of individual fracking sites (i.e., PNR, KM) and the possibility for more sites in the country to be important influences on attitudes. However, consideration of the impacts of fracking on the national and international scales, and through the lens of distributive justice, showed that perceptions of fracking were always place-dependent to some degree. The distance of residents from sites affected their experiences of impacts and their emphasis on different justice dimensions. In addition, the survey showed that some non-residents living in nearby counties expressed concerns about fracking at a regional level, while others exhibited a more mobile sense of place (e.g., visiting family and friends in the areas) (Lewicka, 2014; Gustafson, 2001; 2014) (Section 4.1.1; 4.5.1).

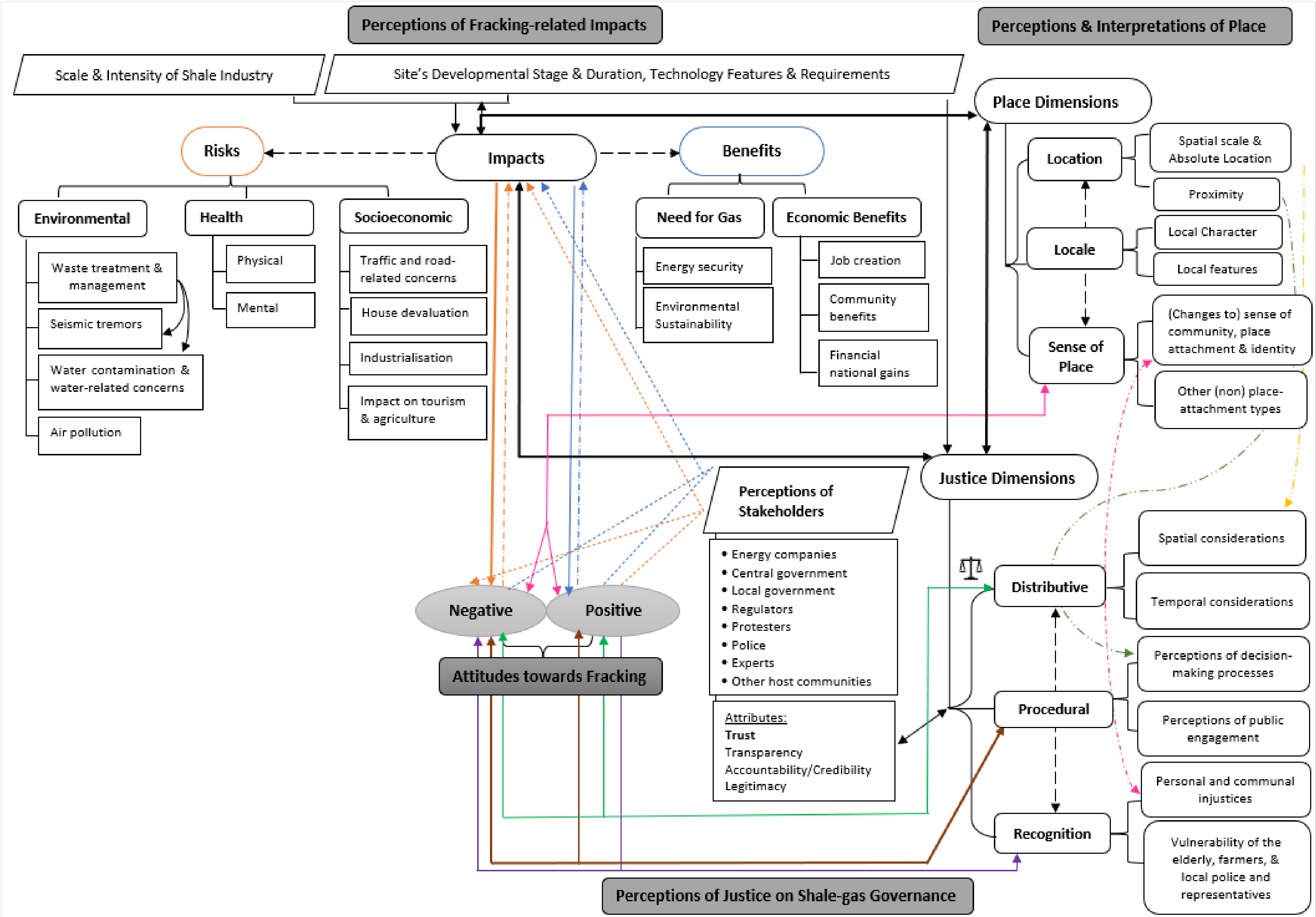

Figure 7.1 The role of place in residents' perceptions of and attitudes towards fracking

Spatial scale, residents' proximity, and the local features of the areas (i.e., scattered/clustered settlements, rurality, and local infrastructures) intertwined, shaped, and differentiated communities of place. The study aimed to understand the attitudes and reasonings of fracking host communities but defining who constituted part of the community proved challenging from the beginning. Therefore, the thesis acknowledges both communities of place and interests (Section 3.2.2; 3.3), but the former was geographically restricted mainly on district and county levels. However, interviewees also recognised geographical communities on smaller spatial scales (e.g., hamlets, villages), and identified differences for communities near existing or proposed fracking sites in terms of sense of community, perceptions of community divisions, and other personal experiences or perceived disruptions caused by fracking developments. The findings indicated that communities of place and interest frequently entangled, suggesting that evaluations of fracking rarely involve single processes. For example, interviewees drew on experiences of fracking among overseas communities and exchanged information and experiences with other people interested in fracking at different spatial scales. As interview discussions revealed, host communities also joined or created communities of interest. Another interesting finding was that communities in Lancashire and North Yorkshire became new communities of interest through which other potential UK host communities could learn how to resist fracking developments.

The study showed that both the demographic characteristics of communities and the physical features of areas shaped residents' sense of place and elicit different evaluations of fracking (Section 4.5.1; 4.6; 5.1.3). In so doing, the findings concur with Evensen and Stedman's (2018) view that residents wanted to pursue "the good life" (p.142) and their attitudes derived from “preserving objective goods which are important in the community or needing to bring about a new order in the community because it currently lacks certain objective goods” (p.144). Therefore, interviewees’ support or opposition was determined to a significant extent by whether fracking was seen as a good fit for the local area (McLachlan, 2009; Devine-Wright, 2013; Evensen and Stedman, 2018). However, this section also highlighted two-way connections between place and perceptions of fracking, showing that local developments directly or indirectly affected the way most interviewees felt about, identified with, or acted within the local area, and, therefore, their sense of place.

This study aligns with many US studies in stressing the importance of local impacts (especially social impacts) to residents’ attitude formation on how fracking did or might affect their way of life (Jacquet, 2014; Evensen and Stedman, 2016; 2018; Willow et. al, 2014; Perry, 2012). The perceived positive or negative changes fracking might bring stemmed from residents’ concern about the future of their places, suggesting communal dimensions to place attachment (Scannell and Gifford, 2010). However, residents’ fears about house prices, health impacts, and disruptions to their ‘peace and quiet’ from fracking technology or protests showed concerns about their lives and wellbeing, suggesting that their place attachments also had strong personal dimensions. The study thus reinforced the idea that place attachment is a ‘complex and multifaceted concept’ and that the distinction between the group and individual dimensions of its people component is not always clear (Low and Altman, 1992, p.3; Scannell and Gifford, 2010).

Furthermore, while opponents showed more active place attachments and supporters more traditional ones, the study showed that residents in both case studies often held multiple and varied place attachments (Groves, 2015). However, no placelessness was detected and none of the interviewees expressed indifference towards their areas (Hummon, 1992; Gustafson, 2014). The majority saw their places as ‘home’ (Section 4.6), though most opponents had lived there for fewer years. This led some to be perceived by themselves or other long-standing residents as outsiders. Some who moved there from cities regarded the areas as insular and struggled to identify with the areas. On most occasions, however, opponents moved there because of their rural character and had environmental affiliations. While fracking threatened some opponents’ place identities, their concern, involvement, and socialisation increased their ‘insideness’ and create new social identities as local protestors (Relph, 1976; Luke, 2017; Evensen and Stedman, 2018). In contrast, supporters perceived themselves as insiders who had a better understanding of local needs because they had lived there for longer, whereas their place identities were threatened by non-local protesters (ibid). To conclude, while place has emerged as important influence on attitudes to fracking in overall terms, this section has deepened understandings of how the different dimensions of place affected these perceptions.

7.3 The Role of Worldviews in Perceptions of Fracking

Evensen and Stedman (2017) argued that place attachment was an important antecedent of attitudes in areas with experience of fracking and saw place attachment as “a value attached to a general belief” (p.16). Concurring with the literature on values and general beliefs (or worldviews) as precursors of attitudes (Stern et al., 1995; Groot et al., 2013; Jacquet and Stedman, 2014), general beliefs about protecting the environment and private property rights[62] also appeared to contribute to the formation of attitudes at different scales (Evensen and Stedman, 2016; 2017). The previous findings also indicated that fracking opponents and supporters were influenced by other broader beliefs. The survey initially revealed that each group valued the environment in different ways when considering human actions and technologies (Willow et al., 2014). (Section 4.5.2) This was reinforced by interview discussions about distributive justice that showed that opponents and supporters drew conclusions through different lenses, with the former prioritising environmental injustices and the latter viewing fracking more as an energy justice issue (Section 6.1). Nevertheless, some supporters considered the carbon footprint of imported oil and gas from abroad offering environmental justice arguments, while they all welcomed the economic benefits of fracking (Section 5.2). Therefore, supporters' emphasis on UK energy independence and economic factors signalled the prioritisation of different values, but also echoes ideas in the literature that geographical scale, local economic context, and environmental values all played a role in attitudes towards energy technologies (Bonaiuto et al., 2002; Clayton and Opotow, 2003; Carrus et al., 2005; 2014).

While perceptions of fracking impacts and justice were mostly locally rooted and experiential, some drew on broader beliefs about energy technologies and geopolitical issues (e.g., UK energy security and climate goals) that reflected different views on politics and power relationships. Opponents and supporters held contrasting viewpoints on trust towards governmental and non-governmental stakeholders (Section 4.4.1; 6.2), which possibly affected how they received information about fracking. Supporters'

[62] These were determined by participants' agreement with the statements: "The balance of nature is very delicate and easily upset by human activities" and "A first consideration of a good political system is protection of private property rights". (ibid)

disapproval of protesters corroborated Evensen and Luke's conclusions (2018) that they held different social identities to opponents. Many interviewees joined communities of interests that aligned with their attitudes, creating the possibility of confirmation bias in what arguments and evidence was prioritised (Section 5.3; 6.4). However, as previously noted, both opponents and supporters wanted to defend what they valued in their areas, suggesting that different reasonings underpinned their evaluations of the changes fracking would bring (Evensen and Stedman, 2018). Overall, accepting risk perceptions as social constructs and the diverse but "patterned" interpretations of local impacts, environment, technologies, stakeholders, and preferred behavioural or management approaches supported the idea that interviewees with contrasting attitudes were influenced by different broader beliefs (Leiserowitz, 2006, p.49; Thompson et al., 1990; Steg and Sievers, 2000; West et al., 2010; Oltedal et al., 2014; Jacquet and Stedman, 2014). This section accordingly uses cultural theory's worldviews to explore interviewees' perceptions of fracking. Table 2.1 is repeated here to remind readers of the main characteristics of hierarchists, individualists, egalitarians, and fatalists, before Figure 7.2 illustrates the key connections between worldviews and perceptions of and attitudes towards fracking in the two case studies.

Table 2.1 Cultural theory's worldviews				
Worldview	**Grid- Group dimension**	**Characteristics**	**Social participation**	**Perceptions of Nature**
Hierarchist	High grid High group	Believe in the need for a well-defined system of rules; Freedom of action is highly controlled by authorities and actions reflect collective interests; Fear changes to status quo; Favour institutions and experts' knowledge.	Active in societal debates	Nature is tolerant; Natural resources are exploitable within certain limits; Relations with nature regulated by institutions; Willing to accept risks and new technologies that are justified by governmental authorities or experts who can establish them within proper boundaries.
Individualist	Low grid Low group	Prefer a 'market' form of organisation valuing individual initiative and following whichever development path offers the best financial prospects; Pursue own interests and personal gain; Fear restraint of their individual autonomy; Favour market liberalism; Politically placed to the right.	Active in societal debates	Nature is resilient to anthropogenic activities; Natural resources are abundant; Follow a trial-and-error approach presuming that nature will return to its original stable position after any disturbance; Technologies perceived as opportunities.
Egalitarian	Low grid High group	Pursue collective interests without activities being strictly regulated; Fear social inequalities and are sceptical towards institutions and experts; Favour political action for increasing social equality; Politically placed to the left.	Active in societal debates	Natural resources are depleting; Nature is fragile to anthropogenic activities; Sensitive to low probability-high consequence risks that can threaten people or even future generations; Supporters of the precautionary principle and sustainable approaches.

Table 2.1 Cultural theory's worldviews (continued)				
Worldview	**Grid- Group dimension**	**Characteristics**	**Social participation**	**Perceptions of Nature**
Fatalist	High grid Low group	Feel isolated in the face of an external world imposing arbitrary restrictions on them and that they have no control over situations; They are not withdrawn from society, but adopt a 'what will be, will be' attitude; Do not pursue collective interests and unable to pursue their own; Mostly unaware of risks; Fears are irrelevant as they have no say in decisions.	Inactive in societal debates; Perceived to represent the 'silent majority' and due to their passive stance, they usually excluded from the majority of cultural theory analyses.	Nature is capricious and unmanageable; They take advantage of whatever comes to their way.

Sources: Douglas, 1978; Thompson et al., 1990; Milton, 1996; Oltedal et al., 2014; Boudet et al., 2014 ; Rippl, 2002; Rayner, 1992 West, 2008; West et al., 2010; Weir, 2008; Adams, 1995; Steg and Sievers, 2000; Wildavsky, 1987.

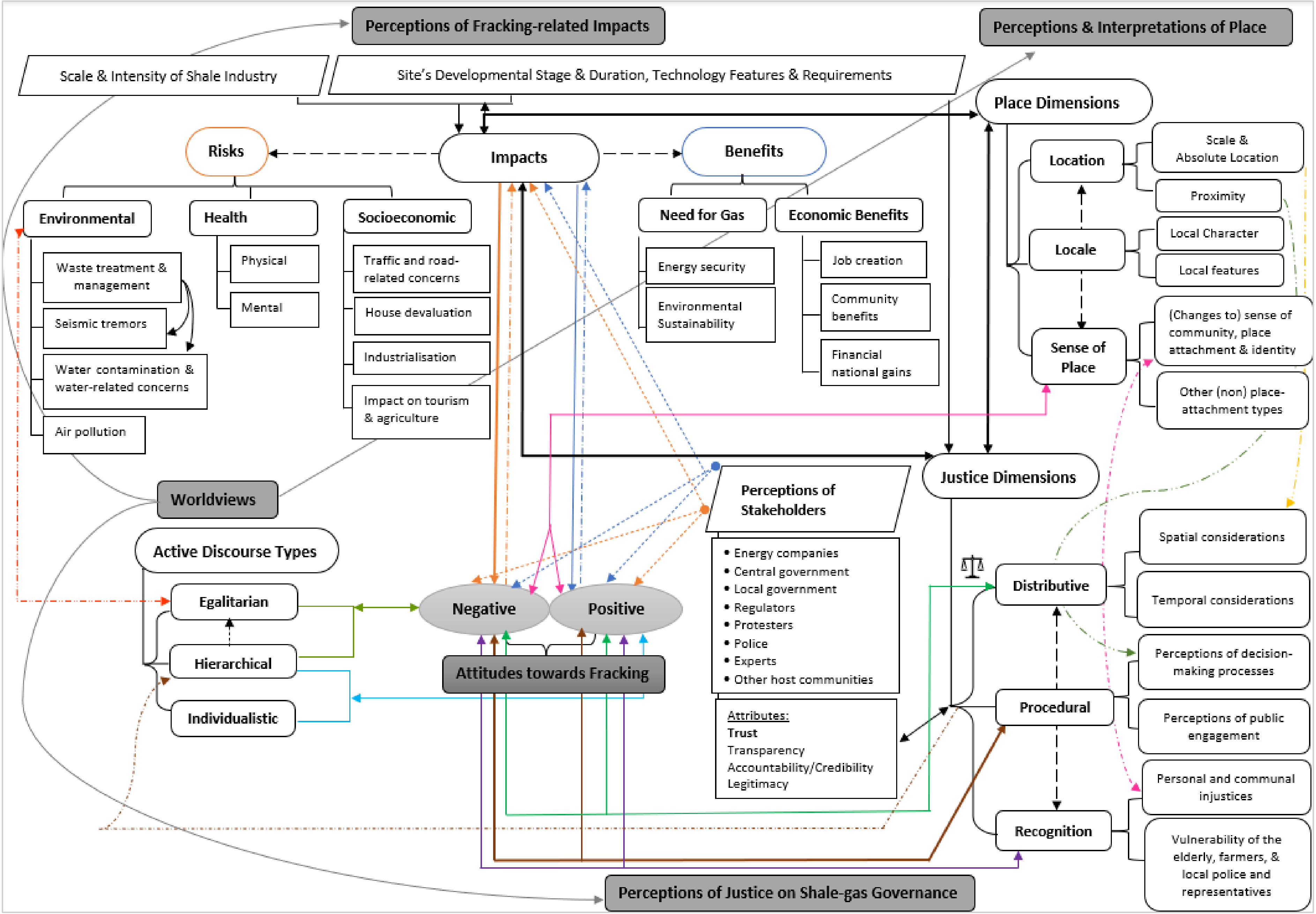

Figure 7.2 The role of worldviews in residents' perceptions of and attitudes towards fracking

While the majority of interviewees appreciated the natural beauty of their areas and offered environmental arguments to defend their opinions, opponents (see also Section 4.5.2) held stronger egalitarian views. Most preferred a more precautionary approach to fracking and feared that using untested and unsustainable technologies could cause irreversible damage on a local, national, or international level (Rayner, 1992; Adams, 1995; Weir, 2008; Cotton et al., 2014). Instead, opponents favoured renewables as a sustainable energy source as they were concerned that continued oil and gas extraction could exacerbate climate change. Their sensitivity to low probability-high consequence risks for themselves and future generations also emerged in discussions about nuclear energy, waste treatment, an infrastructure (Peters and Slovic, 1996; Rippl, 2002; West, 2008; Weir, 2008):

> In February, a well blew out in Oklahoma; there was a 3-mile exclusion zone and an air exclusion zone over it…. they'll say it's unlikely it's going happen, but it could happen; how likely were the Grenfell Tower disaster? (*LN13)*

Most opponents distrusted the government and saw protests as a necessary response to injustices created by the unfair imposition of fracking developments in their areas. These views arguably showed the low sympathy for hierarchic structures and high group attachment suggested by egalitarianism (Rippl, 2002; Boudet et al., 2014). However, based on their discussions, several opponents also expressed hierarchical views. Some interviewees appreciated information from what they saw as credible scientific/expert sources and believed the shale-gas industry should be strictly regulated but were willing to accept fracking if the case became justifiable (Sections 4.5.2, 5.2.1) (Rippl, 2002). Other opponents used to hold Conservative political views and trust the government and police, but "changed the way [they] look[ed] at everything" (*LN11*) after experiencing perceived injustices within the fracking process. One "[saw] a lot more injustice in the world than maybe two years ago" (*LN13*), while another "[did] not take anything at face-value anymore" (*LN12*). A few opponents added that their experiences had made them and their families more conscious of the impacts of other anthropogenic activities, such as the Heathrow airport expansion, meat consumption, choosing environmentally friendly electricity providers, and electric cars.

Supporters tended to express a mix of hierarchical and individualistic worldviews (see also Section 4.5.2). One explanation for this might be that their environmental perceptions were expressive of worldviews that stressed humans' supremacy over the environment and nature's resilience (Steg and Sievers, 2000). However, no supporters described natural resources as abundant and, on this point, their views leaned more towards hierarchism (Thompson et al., 1990; Adams, 1995). Most supported the extraction of unconventional fossil fuels to meet national energy needs and enable the transition to renewables, and accepted the government's justifications for promoting fracking, planning process outcomes, and the supported regulatory bodies that safeguarded the process (Rippl, 2002). Their dislike of protesters and endorsement of the police arguably also showed an appreciation of defined systems of rules and preservation of the social status quo (Rippl, 2002; West, 2008; Weir, 2008; Boudet et al., 2014). However, most supporters saw fracking not as a threat but as a financial opportunity (Thompson et al., 1990; Rippl, 2002; Kriesky et al. 2013; Bomberg, 2017). A couple showed stronger individualist worldviews when highlighting the low-risk probability and safety of other energy developments in their area and other places and criticising the government for lack of decisiveness and understanding of the business world (Rippl, 2002; West, 2008; Weir, 2008) (Section 6.2). These supporters further indicated a preference for 'market' forms of socioeconomic organisation in accepting that energy companies should profit from fracking and stressing the financial losses to local businesses caused by protesters and planning delays (Oltedal et al., 2014; Boudet et al., 2014).

The surveys included all cultural theory's worldviews, but fatalism was excluded from the analysis as all interviewees cared about their local fracking developments and spent their time to share their opinions (Rayner, 1992; West et al., 2010; Verweij et al., 2011). The research findings highlighted that, while environmental worldviews formed an area of distinction between interviewees with contrasting attitudes to fracking, supporters' views on governance arrangements and the management of fracking developments were not homogenous (Section 4.5.2; 6.2). In addition, the study concurs with cultural theory studies that stress people often hold multiple and dynamic worldviews (Thompson, 1982; et al, 1990; Verweij et al., 2011; West et al., 2010). The accumulation of perceived social injustices caused by fracking challenged some opponents' current beliefs, shifting them towards egalitarianism and indicating a reciprocal relationship between worldviews and specific beliefs about fracking (Thompson, 1982; West, 2008; Stern et al., 1995; Evensen and Stedman, 2017).

While Evensen and Stedman (2017) viewed individuals' attachment to community and the status quo as broader beliefs, perceptions of place, as more specific beliefs about localities are normally seen as post-cedents of worldviews (Stern et al., 1995; Fulton et al. 1996; Estévez et al., 2015; Dietz et al., 2005; Hernes and Metzger, 2017). Therefore, while sense of place and worldviews are both sociopsychological processes through which affected communities evaluated fracking, this study treats worldviews as more overarching. This view is supported by the fact that all interviewees wanted "the best" for their areas, but their broader environmental and socio-political beliefs led them to assess fracking in different ways. Other studies also suggest that broader values and heritage are important for the development of community place attachment and cognitive schemas[63] are an essential component of place identity and the psychological process of place attachment (Proshanksy et al., 1983, p.62; Scannell and Gifford, 2010). The hierarchical position of these sociopsychological constructs and their symbiotic relationship also reflect the multiple and overlapping identities people held (Clayton and Opotow, 2003). For example, place identity constitutes part of one's self-identity (Proshanksy et al., 1983), while physical local features and perceptions of nature shape individuals' environmental identity (Scannell and Gifford, 2010). Luke (2017) found place identity to be important in the formation of perceptions of technology but noted that values and social identity were important for local attitudes and resistance towards fracking. Other scholars described that social identity derives from cultural characteristics that are also present in worldviews and create "a sense of belonging, attachment, or involvement with a group based on shared values, motivations, characteristics, or experiences" (Clayton and Opotow, 2003, p.299). Here, it becomes increasingly apparent that, while worldviews are not necessarily place-based, there is a reciprocal relationship between place and worldviews as physical and social local features, cultural context, and the accumulation of memories and experiences in place developed during a person's lifetime contribute to, and often challenge, people's broader beliefs and values (Proshanksy et al., 1983; Brown and Perkins, 1992; Stern et al., 1995; Oreg and Katz-Gerro, 2006; Scannell and Gifford, 2010).

[63] Schemas are "thematic and stylised" collections of information- including knowledge and beliefs about objects and one's self- through which people make sense of the world; these can be linked to notions of identity, familiarity, place dependence and distinctiveness (Proshanksy et al., 1983, p.62; Scannell and Gifford, 2010; Fullilove, 1996). (Section 2.1.2.1)

7.4 An Integrated Framework for Understanding Perceptions of Fracking

The study has explored the reasonings behind attitudes towards fracking to understand its acceptability to residents of affected communities in Lancashire and North Yorkshire, two English counties with projects at the early development stages when the research was conducted. The survey results (Chapter Four) confirmed that multiple factors underpinned residents' attitudes towards fracking, while Chapter Five used semi-structured interviews to explore perceptions of risks and benefits in greater detail and Chapter Six examined perceptions of distributive, procedural, and recognition justice among opponents and supporters of local fracking developments. The importance of place as an influence on attitudes emerged within these chapters and has been explored further in Chapter Seven in order understand different perceptions of place and community, and how place-based and broader psychological processes (sense of place and worldviews) shaped, and were shaped by, local fracking developments. Through this approach, the study has highlighted multiple and frequently reciprocal interconnections between worldviews, perceptions of impacts, justice, and place, and attitudes towards fracking attitudes.

The aim of this section is to synthesise and visually represent the key interconnections identified between attitudes towards shale-gas fracking and perceptions of impacts, justice, trust, sense of place, and broader worldviews. Addressing the final research objective, the study reflects an *Integrated Framework* for understanding perceptions of fracking (Figure 7.3) as a way of elucidating more fully how and why individuals and communities respond to controversial energy developments in the ways they do.

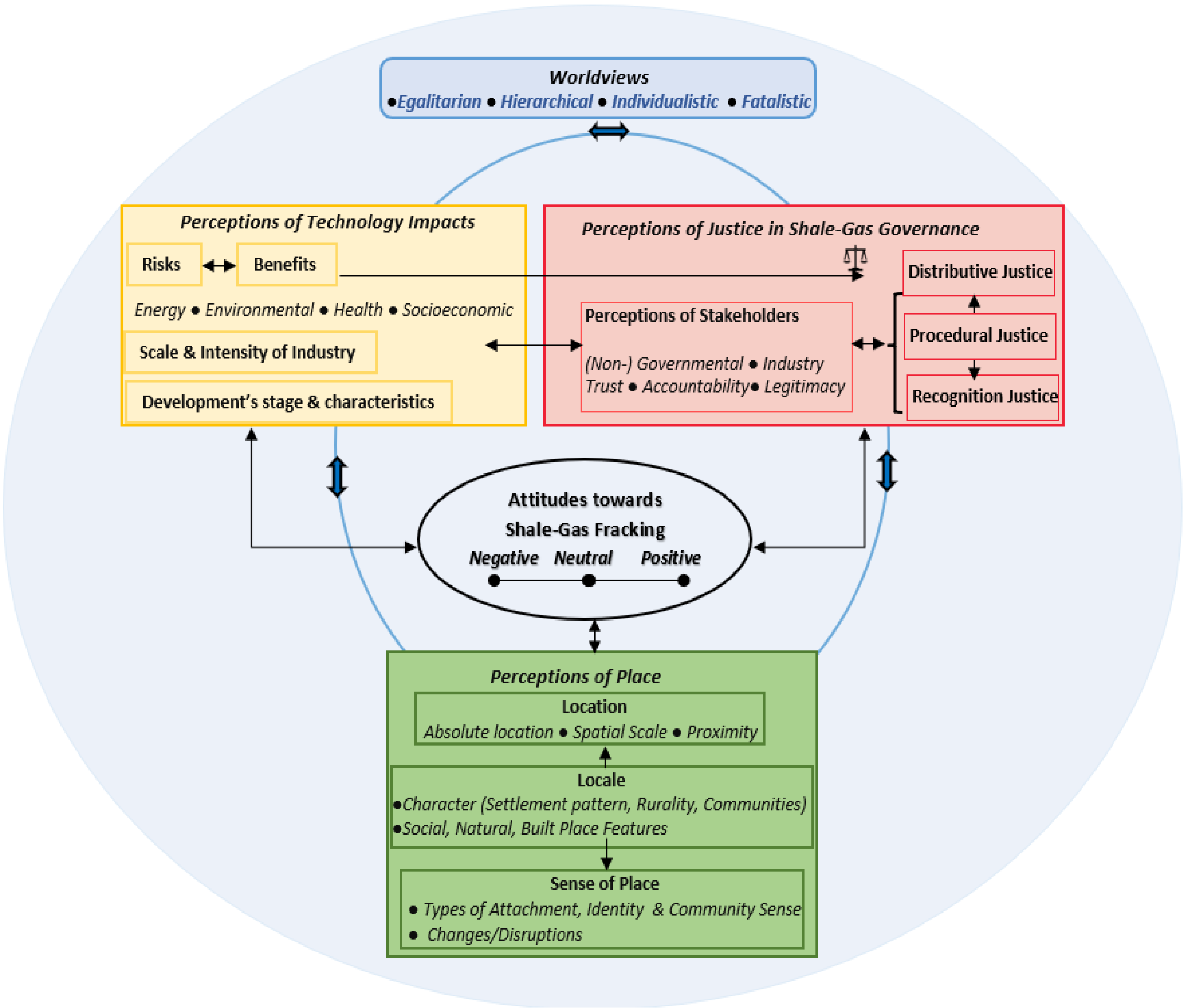

Figure 7.3 An *Integrated Framework* for Understanding Perceptions of Fracking

Drawing on Figures 5.1, 6.1, 7.1 and 7.2, overall attitudes towards fracking are positioned at the centre of Figure 7.3 and are linked directly to perceptions of: impacts (risks and benefits, scale and intensity of industry, and site's specific characteristics and developments stage); justice in shale-gas governance (perceptions of stakeholders, and distributive, procedural and recognition justice dimensions); and place (location, locale, and sense of place). In so doing, it aligns with views expressed elsewhere in the literature that portrays attitudes as positive or negative preferences towards specific situations and perceptions as broader cognitive processes that shape these evaluations (Stern et al., 1995; Fulton et al. 1996; Estévez et al., 2015; Dietz et al., 2005; Whitmarsh et al., 2015, Hernes and Metzger, 2017). Worldviews in turn are represented as encircling the other factors depicted in Figure 7.3 to highlight their existence at a more fundamental level and their role in underpinning both perceptions and attitudes (Stern et al., 1995; Evensen and Stedman, 2017). This reflects the findings that indicated pre-existing biases in residents' perceptions of and attitudes towards fracking in which worldviews encompass overarching cognitive "patterns of perceiving, justifying, reasoning, and feeling [that includes] perceptions of time, space, nature, human nature, justice, risk, blame, leadership, and governance" (Verweij et al., 2011, p. 745). In this regard, the research drew on studies that saw 'perceptions' of an energy technology or environmental issue as an overarching concept that includes both attitudes and perceptions of risks and governance (Whitmarsh et al., 2015; Hernes and Metzger, 2017), but also considered perceptions of place as an important contextual influence on attitudes and perceptions. The proposed framework thus seeks to capture individuals' processes of attitude formation, but incorporating cultural theory's worldviews and consideration of different types of communities and social local features (as subcomponents of place perceptions) reflects the sociocultural construction of impacts and how individuals are influenced by other residents or group affiliations (Douglas, 1978; Rippl, 2002; Oltra et al., 2012; Jacquet and Stedman, 2014).

Adopting abductive reasoning and using quantitative and qualitative methods (Section 3.2.1), the study showed that an integrated approach to understanding local attitudes towards fracking reflected the fact that most residents incorporated several areas of reasoning into their evaluations of fracking developments. The survey revealed moderate and strong correlations between attitudes and views on the appropriateness of specific sites, environmental effects, social effects on communities, personal connections with the area, and levels of trust towards decision-making processes and institutions (Section 4.3.2). The interviews provided further insights on how even residents who came to similar conclusions about fracking often differed in their primary reasons for objecting or supporting. Some opponents emphasised certain environmental risks more or perceived greater procedural injustices, while others highlighted personal attachments to the area and suggested that if fracking was necessary, it should be conducted away from local communities to protect their ways of life and the place identity of future generations (see Willow et al., 2014; Luke 2017). Conversely, participants' reasons for supporting fracking focused on its benefits and ability to enhance the area without them necessarily gaining personally. Interview discussions also suggested that some residents became interested in and supportive of local fracking developments because of disruption caused by protesters to their sense of place. Hence, while the survey indicated that residents' connections to their areas were given less weight in attitude formation towards fracking than perceived impacts and injustices, the interviews revealed place to be an important, if highly multifaceted and sometimes intangible, factor. This more holistic view supports ideas in the literature that NIMBYism offers inadequate and unidimensional explanations for local opposition (Devine-Wright, 2011a; 2013; Van der Horst, 2007; Wolsink, 2007a; Gross, 2007), but also recognises the importance of considering perceived impacts, justice issues, and sense of place simultaneously (Cotton, et al., 2014; 2016; Willow et al., 2014; Sangaramoorthy et al., 2016; Evensen and Stedman, 2018; Ryder and Devine-Wright, 2022; Ryder et al., 2023).

Moving towards the centre of the diagram, Figure 7.3 indicates a sense of moving from general to more specific concepts, but seeks to avoid a top-down structural representation to emphasise more relational views of the different influences that stress their reciprocity rather than a fixed hierarchy. This reflects the idea that broader environmental, sociocultural, and political worldviews underpin both perceptions and attitudes, but also that direct interactions between more distant constructs and feedback loops exist (Stern et al., 1995; Leiserowitz, 2006). For example, participants' beliefs about climate change and renewable energy could shape attitudes towards fracking without perceptions of impacts acting as a mediator factor (Evensen et al., 2023). However, opponents and supporters' contrasting egalitarian and individualistic/hierarchical views on nature's resilience to human interference and energy technologies, along with their consideration of impacts, supports the idea that environmental worldviews frequently affected evaluations of the risks and benefits of fracking, which subsequently affected attitudes. One explanation for this relationship stems from the study's focus on affected communities, as attitudes towards fracking on a local level have been found to reflect specific impacts, whereas views on national issues tend to be influenced more by general worldviews (Evensen and Stedman, 2016;

2017). This also highlights the importance of scale in understanding reasonings behind attitudes towards fracking (Evensen and Stedman, 2016; Clayton and Opotow, 2003). Thinking further about connections between place and worldviews, environmental worldviews can also help to explain how people value the physical features of their areas, which for some participants indicated more active place attachment. Equally, the degree of group participation and other sociocultural values encompassed in cultural theory's worldviews help to shape perceptions of place (e.g., social involvement and the creation of different types of communities).

Seeing justice as something operationalised through both formal legal channels and shared norms and values (Clayton and Opotow, 2003, p.300) helps to explain how the socio-political aspects of worldviews could inform perceptions of procedural justice and trust towards the government's supportive stance towards shale gas. This was particularly evident in residents' assessments about the legitimacy and outcome of the planning processes for fracking sites in that perceptions of fairness were influenced both by perceived technology risks and whether decision-making "deviat[ed from] core values about how society should take such decisions" (Wolsink, 2007a, p.1203). These underlying values also differentiated fracking supporters' views on how effectively the government and energy companies managed developments. More broadly, the results indicate that all the underlying environmental, sociocultural, and political values embedded in worldviews may play a role in residents' trust in different stakeholders, such as environmental NGOs, local councils, central government, energy companies, and other residents, and their preferred community engagement approaches (Cotton, 2013; Clayton and Opotow, 2003). Finally, recognising the importance of residents' values constitutes the connecting link between worldviews, recognition justice, and place identity, and echoes insights in the literature that stress the need to include deeper and less tangible explanations for understanding the diversity of local concerns and attitudes (Clayton and Opotow, 2003; Oltra et al., 2012; Groot et al., 2013; Wolsink, 2007a; Whitton et al., 2017; Luke, 2017; Evensen and Stedman, 2017; Sovacool et al., 2020). Clayton and Opotow's (2003, p.298) comment "what is fair for whom" underlines the subjectivity of justice as a concept and how individuals prioritise different values, e.g., financial growth, energy security, in their evaluations of the justice issues associated with the impacts and decision-making processes surrounding fracking. In turn, while people tend, perhaps unconsciously, to maintain their current worldviews and often adjust their perceptions of places and individual issues accordingly, the study showed that fearing or learning about certain technology risks, perceiving distributive or procedural injustices, and experiencing changes to their sense of place can equally shift their worldviews within a reciprocal relationship, for example, where some fracking opponents became more environmentally conscious or changed their political beliefs.

Building on this relational and contingent view further, perceptions of impacts also varied based on their temporality, scale, and derivation directly from the fracking process or the wider process of shale-gas exploration. During the early stages of fracking developments, residents often relied on information about previous or anticipated impacts in ways that both amplified or attenuated perceptions of impacts and trust in stakeholders (Oltra et al., 2012; Cotton et al., 2014; Whitmarsh et al., 2015; Szolucha, 2018a; 2018b; Sovacool et al., 2020). Trust in stakeholders in turn interacted with all justice dimensions, but perhaps the strongest relationship existed with procedural justice because, for most fracking opponents, the decision-making processes, the engagement of industry with local communities and some police behaviour damaged these trust relationships (Oltra et al., 2012). Relationships also emerged between perceived impacts and distributive justice as the latter was determined by weighing the risks and benefits of fracking. However, lack of consideration of opponents' perceived "soft social impacts" of fracking related to their sense of place or other factors that were not accepted in the planning processes (e.g., cumulative risks) added to their senses of recognition and procedural injustices (Evensen, 2016, p.282; Szolucha, 2018a; 2018b).

The findings indicated that more local concrete communities, with closer to sites, felt the disruption caused by fracking more intensely either due to its impacts or the time spent participating in planning processes, whereas direct and indirect impacts were both filtered through residents' sense of place where placed-centred impacts potentially changed their way of life (Evensen and Stedman, 2016; 2018; Willow et al., 2014; Perry, 2012). Objective aspects of place (spatial scale, absolute location, proximity) also underpinned residents' perceived injustices when assessing fracking sites, financial compensation, and their distance from the sites and decision-making centres. As noted in Section 7.2, even within the same county, residents' location proved significant, as those living further from PNR and KM prioritised procedural rather than distributive justice as a reason for opposition. Additionally, the surveys managed to capture some neutral fracking attitudes with participants' attributing the lack of place disruption to their residency proximity and stage of local development (Sections 4.2.2; 4.5.1). However, the study often highlighted the importance of the number of sites in an area independent of their development stage. Therefore, considering the potential scale of shale industry, as many opponents flagged, it is possible that other later-affected communities would not have been only concerned about additional risks, but may also perceive more distributive and recognition injustices due to the concentration of other proposed fracking sites in the North of England (Aryee et al., 2020; Ryder and Devine-Wright, 2022).

The sociodemographic characteristics of communities also played a role in interpretations of fracking, differentiating those who held more traditional or active place attachments, those with prior familiarity with local energy infrastructures, and whether fracking agreed with what residents valued beneficial for their area. The character of the areas and other local developments (including gas-related ones) affected residents' evaluations of fracking and its impacts. Local fracking developments threatened both opponents' and supporters' place identities creating recognition injustices (Jaspal et. al., 2014; Cotton et. al., 2014), whilst the polarisation of attitudes towards fracking and perceived changes to residents' livelihoods revealed community divisions and feelings of non-attachment. Despite this, many residents who socialised with others and joined communities of interest also reported gaining a greater sense of community that reflect similar findings in Sovacool et al.'s (2020) study of perceptions of fracking in Lancashire. Overall, residents' connections to their areas and experiences with previous developments made them more alert to issues regarding how shale-gas developments were being governed but perceived injustices equally contributed to changes in their social involvement and sense of community.

Drawing on the above, while an individual's primary objection or support for fracking can derive from a single factor, on most occasions, evaluations sprung from amalgams of perceptions of impacts, justice, and place. A good example of how impacts, justice, and place perceptions co-existed reciprocally was the anxiety residents experienced and how respondents talked about mental health impacts as a form of recognition injustice (Sections 4.5.1; 5.1.2; 6.3) (Jacquet, 2014; Beebeejaun, 2017; Bradshaw and Waite, 2017). Stress and anxiety emerged not only from the perceived impacts of fracking technology but also changes in community relationships and the time consumed by planning processes and lobbying to resist existing and proposed developments (Section 6.2). Police conduct and the disruption by protesters additionally magnified “the collective trauma already experienced” (Short and Szolucha, 2019, p.274). Later studies came to similar conclusions about stress and anxiety in the case-study areas and other nearby fracking-host communities (Aryee et al., 2020; Sovacool et al., 2020).

The study has provided a deeper insight into the importance of place in often providing the context for perceptions of fracking. This echoes Sovacool’s (2014) views concerning the ‘uniqueness’ of each fracking site in terms of technological and planning requirements, impacts, governance, and local stakeholders. Additionally, while spatial scale differentiated perceptions of impacts and distributive justice, the study’s focus on affected communities highlighted the significance of recognition justice and the strength of interconnections between the distributive, procedural and recognition dimensions of justice (Section 6.4) (McCauley et al., 2013; Jenkins et al., 2016; Bailey and Darkal, 2018). The key contribution of the integrated framework is that it recognises the multiple reasonings through which individuals form attitudes towards` fracking while stressing how they intertwine within an attitude “complex” rather than trying to claim that any single category of attitudinal influence holds clear pre-eminence over the other categories explored in this study. Attitudes additionally did not appear to be solely the end-result but also an interactive part of the framework affecting and reinforcing perceptions of impacts, justice, and place. Therefore, the study addressed its research aim and found that understanding the heterogeneity of community perceptions of fracking is better achieved relationally through exploring how the components of the integrated framework mutually informed and interacted with each other.

While Figure 7.3 focused on residents' perceptions of fracking developments in their local area, it also provides opportunities to examine attitudes beyond the immediate locality. As the survey showed, some non-Lancashire or North Yorkshire resident cared about these areas because they lived there in the past, had family and friends, or visited for recreational reasons (Section 4.5.1). Others lived in nearby counties and feared the impacts of fracking would extend to their areas or argued that the technology was not only a local issue (Section 4.1.1). Place, in terms of spatial scale, proximity to fracking sites, communities of interest, and sense of place can therefore still be useful in understanding non-residents' perceptions of fracking. For people living further away, proximity may influence their interest in, or knowledge of, fracking, whereas, for those who are aware of fracking, broader worldviews, regional or national impacts, or perceived procedural injustices could influence their attitudes more (Evensen and Stedman, 2016; 2017). The framework's flexibility and integrated approach could also potentially be used in different socio-political contexts and to understanding other emerging and contested energy technologies. It is also plausible that people with stronger fatalistic worldviews would have more neutral or indifferent views on local energy developments, but due to their nature researchers would find it difficult to document this.

However, the study's abductive reasoning and methodology means that generalisation of the findings should be approached cautiously. For example, the study may have overlooked other explanations for public attitudes. While worldviews reflect different environmental, technological, socio-political values, the study did not explore other possible values (see Stern and colleagues, 1994; 1999; 2000[64], Schwartz; 1992; 1994) or the influence of social structure and early life experiences as precursors of values and worldviews (Stern et al., 1995). The survey's purposive sampling approach also meant that statistical tests were not performed to determine the contributing of individual explanatory factors to fracking attitudes. In addition, while the study identified spatiotemporal local events affecting perceived impacts of fracking, reasons why people with initially neutral attitudes became opposed to developments and shifts in political beliefs and towards more pro-environmental behaviours occurred, Figure 7.3 does not reflect time as a factor as it only provided a "snapshot" of participants' views at the time of data collection (Denscombe, 2014, p.8; West et al., 2010). Therefore, the proposed framework does not represent all possible reasons affecting attitudes to fracking but offers an analytical tool to untangle its complexity and comprehend how attitudes are shaped during a specific period, why responses are not cohesive between and within affected communities, and how and why different explanatory factors (or parts of them) are combined or prioritised differently between individuals.

[64] In their value-belief-norm model investigating individual pro-environmental behaviours, Stern and colleagues classified personal values into egoistic, social-altruistic and biocentric (Stern and Dietz, 1994; Stern et al, 1999; Stern, 2000). Schwartz (1992, 1994) initially developed a framework to measure dimensions of values they considered to be found universally. His framework consisted of fifty-two value-items representing ten value types in four main categories: (i) openness to change (self-direction, stimulation, and hedonism value types); (ii) conservatism (conformity, traditionalism, and security value types); (iii) self-transcendence (universalism and benevolence value types); and (iv) self-enhancement (power and achievement value types).

Chapter Eight
Conclusion

8.1 Introduction

Worldwide, challenges of how countries should respond to the energy trilemma of energy security, access and affordability, and decarbonisation continue to accumulate (Heffron et al., 2015). Despite growing national opposition, local resistance and moratoriums in Scotland and Wales, successive UK governments have supported the exploration of unconventional resources via fracking in England in response to declining North Sea oil and gas reserves and pressures to reduce dependency on hydrocarbon imports (Bolton and Foxon, 2013; DECC, 2013; Whitmarsh et al., 2015; Andrews, 2013). However, the prospect of shale-gas fracking in England has prompted strong reactions, both positive and negative, nationally and within prospective host communities. This study has sought to deepen understanding of the heterogeneity of these perceptions of fracking through investigation of attitudes in two English host communities at the time when the technology was still emerging. Having reviewed the energy-siting literature, the study identified that scholars have examined attitudes to the deployment of new energy technologies through a variety of lenses, including perspectives of technology, justice, and socio-psychological processes to move beyond NIMBY explanations for local opposition but found that these factors are rarely, if ever, examined in an integrated way. A tendency to investigate individual influences also characterised much of the literature on community attitudes to fracking in the UK and other countries (O' Hara et al., 2015; Whitmarsh et al., 2015; Williams et al., 2015; Theodori, 2009; Wynveen, 2011; Brasier et al. 2011). Building on the logic that attitudes to new energy technologies are likely, in reality, to be influenced by multiple interacting factors encompassing all the lenses examined in previous research rather than being the product of individual influences, the aim of this thesis became to investigate whether and how an integrated approach can help to deepen understandings of host communities' attitudes to fracking as a deeply contentious technology and the reasonings underpinning these attitudes. In so doing, the thesis addressed four research objectives (Textbox 1.3):

Textbox 1.3 Research Objectives
1. To examine community attitudes towards fracking in Northern England (Lancashire & North Yorkshire) and understand how perceptions of impacts of the technology affect these attitudes.
2. To understand how experiences and perceptions of justice and trust in the regulatory authorities and stakeholders involved in proposing, consenting, and resisting local developments affect attitudes towards fracking.
3. To assess the ways in which residents' senses of place and worldviews contribute to the formation of attitudes towards and perceptions of fracking.
4. To explore the ways in which impacts, justice in shale-gas governance, sense of place, worldviews, and attitudes towards fracking are connected, and to critically evaluate the potential of an integrated approach to deepen understandings of how individuals and local communities respond to controversial energy developments.

Preston New Road (PNR) in Lancashire and Kirby Misperton sites (KM) in North Yorkshire were selected as case studies of two prominent locations where planning permission had been granted for fracking activities. Methodologically, the study used a mixed-methods approach combining quantitative surveys (postal and online) and qualitative semi-structured interviews (individual and group) to achieve breadth and depth of understanding of community views. The following sections summarise the study's key findings and contribution to knowledge (Section 8.2), discuss its limitations (Section 8.3), and suggest future research directions and policy recommendations (Section 8.4).

8.2 Key Research Findings and Contribution to Knowledge

Addressing the first research objective, the study found that community attitudes towards fracking were predominantly negative in both case studies and stronger than opposition previously reported on national scales (O' Hara et al 2015; Andersson-Hudson et al., 2016; Whitmarsh et al., 2015; Bradshaw and Waite, 2017). However, local support was greater in Lancashire, whereas neutral or ambivalent views were generally very low highlighting the polarisation of residents' attitudes due to the local focus of the thesis. However, only a trivial minority of residents arguably fitted the typical NIMBY profile of supporting such a technology in principle but opposing it on a local scale and, instead, the majority expressed Not-In-Anyone's-Back-Yard attitudes (Wolsink, 2000; van der Horst, 2007). Giving merit to the integrated approach adopted, data analysis early showed that positive and negative impacts, justice and trust in stakeholders, and place-based reasons (site appropriateness, local features, and place connections) provided better explanations for residents' attitudes than NIMBYism arguments (Wolsink, 2007; Devine-Wright, 2013; Cotton, 2016; Williams et al., 2015; Thomas et al., 2017b).

Residents' main perceptions of negative impacts can be summarised as: a) environmental (waste treatment management, seismic tremors, water contamination and other water-related concerns, and air pollution, b) health (physical and mental), and c) socioeconomic risks (traffic and road-related issues, house devaluation, industrialisation of the local area, and impact on local tourism and agriculture). In turn, the main positive impacts identified were: a) the need for gas (energy security, affordability, and environmental sustainability) and b) economic advantages (job creation, community benefits, and financial national gains). The study found perceived environmental and social impacts of the technology to be key contributing factors to residents' attitudes, supporting the idea that impacts were not simply technological. The study revealed further differentiations in perceived impacts not only concerning their negative and positive outcomes, but also their scale, temporality, and derivation directly from fracking or the wider processes of, and requirements needed for, exploring shale gas (Beebeejaun, 2017). Most fracking opponents prioritised the more local and immediate negative impacts (e.g., increased traffic, house devaluation, industrialisation) (Thomas et al., 2016; 2017; Evensen and Stedman, 2016). However, many also worried about the potential scale of shale industry which would aggravate local risks and climate change. Therefore, the thesis confirmed that residents' concerns about fracking went beyond those able to discuss at planning applications and hearings (Thomas et al, 2017b; Beebeejaun, 2017; Rattle et al., 2018).

The study also contributes to the literature of public perceptions of fracking by recognising the interconnections of some impacts (i.e., management of fracking-fluid waste, earth tremors and water contamination) and highlighting the importance of understanding the heterogeneity of opinions even between residents with the same attitude towards fracking. For instance, while opponents agreed on and prioritised most risks similarly, some of secondary importance impacts (e.g., water usage) became a catalyst for turning some residents' neutral attitudes to negative. On the other hand, the thesis' findings shed new light on why fracking supporters did not share the same worries about the technology as opponents. Supporters assessed the severity or likelihood of most risks to be low due to UK's strong regulations and argued that environmental NGOs often exaggerated about fracking risks. They perceived themselves to be better informed than opponents due to their familiarity with energy technologies, either from past/current work experience or long-lasting residency in the areas. While supporters recognised increased traffic and some experienced stress and anxiety, these impacts were mostly attributed to the disruption by fracking protesters. Though very few supporters believed that fracking would lower consumer energy prices in both areas, the prioritisation of other fracking benefits was somewhat different due to the stronger environmental values in North Yorkshire and greater deprivation issues in Lancashire.

Polarisation of opinions was again evident when addressing the second research objective of exploring how experiences and perceptions of justice on shale governance affected communities' attitudes towards fracking. Opponents and supporters emphasised different dimensions of justice and trust in governmental and non-governmental stakeholders. While both groups appreciated independent experts, the majority of opponents were more sceptical and more likely to distrust the national government, local councils, the Environment Agency, and energy companies. Most supporters meanwhile distrusted more local and national environmental groups and other residents in their area. While residents' views greatly aligned with their contrasting attitudes, the study found these to be both place-based and dependant on broader values to a great extent, highlighting the subjective construction of justice perceptions. The study reinforced the significance of all three justice dimensions as a way to better understand the experiences of host communities with fracking and the formation of diverse perceptions of (McCauley et al., 2013; Jenkins et al., 2016).

Due to the early development stage of fracking sites in the areas, residents' perceptions of distributive justice appeared more absolute, with opponents believing mostly in risks and perceiving environmental injustices and with supporters seeing the technology as an energy justice issue. However, procedural justice constituted a key driver for shaping attitudes to fracking in the areas, as the perceived imposition of the industry against local wishes, inaccuracies in information provision, and perceived bias in decision-making were also considered by residents in the wider Lancashire and North Yorkshire area who were not affected as directly by the developments. The research focus on local communities justified the close interrelation of distributive, procedural, and recognition justice dimensions. Again, however, the lens of recognition justice helped to reveal how perceptions of justice were underpinned by prior standpoints, the outcomes of decisions, and how their identities were constructed within decision-making processes. Most notably, several opponents saw the government privileging national over local interests, disregarding their place-based concerns, and insulting their place identities by describing their areas as 'the desolate North' and them as NIMBYs (Cotton, 2016; Jenkins et al., 2016). Some supporters, however, having experienced alleged bullying, showed greater reluctance to share their views and saw local opposition as a form of recognition injustice that undermined democracy by not giving sufficient opportunities to be heard or considering the silent majority.

Aspects of procedural justice (i.e., the planning processes, public engagement, and the behaviour of the government, regulators, operators, and protesters) affected the level of trust in these stakeholders, flagging the importance of transparency, accountability, and credibility (Williams et al., 2015; Cotton, 2016; Bradshaw and Waite, 2017; Beebeejaun, 2017). In turn, the study found that trust amplified or attenuated perceived impacts creating two-way relationships and, thus, constituting justice as both a direct and indirect attitudinal factor towards fracking (Oltra et al., 2012; Whitmarsh et al., 2015; Szolucha, 2018a; 2018b). However, the degree of "outcome favourability" from both supporters and supporters indicated some confirmation bias and a reciprocal relationship between attitudes towards fracking and perceptions of justice on shale-gas governance (Gross, 2007, p.2375). For example, Lancashire supporters saw the decision-process as fair, arguably because it reflected their preferred outcome, and expressed trust in Cuadrilla despite recognising limitations in their engagement approach. Meanwhile, North Yorkshire opponents still saw the decision somewhat illegitimate for going against their will and made beyond the immediate local level despite the more straightforward planning process.

The study next focused on exploring participants' sense of place and cultural theory's worldviews as two socio-psychological processes scholars have identified as attitudinal influences on environmental and energy issues (Manzo and Devine-Wright, 2014; West et al., 2010). However, the significance of place and broader beliefs had already started to emerge when examining perceptions of technology impacts and justice on shale-gas governance. Perceptions of place became an overarching factor that encompassed sense of place along with other more objective interpretations of place (i.e., location, distance from fracking sites, and spatial scale) and local features (i.e, physical, social, demographic). The commonalities and differences between areas/fracking sites highlighted the importance of local context. The study confirmed that sense of place affected residents' attitudes towards fracking, but exploring the interplay of these place sub-components revealed showed its effect was also subconscious and indirect by affecting perceptions of technology impacts (Stern et al., 1995; Lewicka, 2014; Evensen and Stedman, 2017).

For example, a greater sense of community and a higher level of disruption were felt by residents near KM and RW sites due to the rural character and settlement structure of their area. Most supporters and opponents in both areas appreciated the local character and way of life, exhibiting generally positive attachments. However, supporters were perhaps more traditionally attached having lived locally usually longer, while opponents held more active attachments having consciously moved into the areas within the last two decades (Lewicka, 2014). Exploring what local features residents valued and wanted to change in their areas provided an understanding of why some residents saw fracking as a threat and others as an opportunity (McLachlan, 2009; Devine-Wright, 2013; Kriesky et al. 2013; Jaspal et al., 2014; Bomberg, 2017; Evensen and Stedman, 2016; 2018; Thomas et al., 2017b). Opponents appeared to have a stronger place identification with the areas stemming from the appreciation of their natural surroundings, while supporters saw the technology as a way to address local deprivation issues (e.g., jobs, retaining youth population) (Schafft and Biddle, 2015; Luke, 2017; Jaspal et al., 2014; Evensen and Stedman, 2018). Some opponents also exhibited other types of sense of place, such as place alienation and dependence, from their willingness or inability to relocate elsewhere due to house devaluation, future fracking risks, and the overall local disruption (see Sangaramoorthy et al., 2016). While fracking threatened some residents' place identities, reciprocal relationships between sense of place and perceptions of fracking were also noted. Strong attitudes did not cause only community divisions but also prompted some cohesion from forming new communities of interests and strengthening existing place identities.

Exploring the influence of broader beliefs on fracking attitudes, the study found that environmental worldviews were determinantal, with opponents and supporters weighing the value of the environment differently when considering human actions and technologies (Willow et al., 2014; Luke, 2017). Opponents expressed strong egalitarian views caring for issues beyond their local area, such as climate change, and preferring more precautionary approaches to risky technologies (Cotton et al., 2014), whereas supporters' discourses aligned with individualism and/or hierarchism believing in nature's resilience to technology impacts due to good management provided by governmental institutions and the shale industry (Rayner, 1992; Adams, 1995; Weir, 2008). These findings supported that, besides views on the environment, broader socio-political beliefs were equally important influences on the formation of fracking perceptions. Some opponents also held hierarchical worldviews but shifted towards more egalitarian perspectives due to the disruption by fracking, suggesting that worldviews both shaped, and were shaped, by the developments. Drawing on the academic literature, the study saw worldviews as a higher cognitive concept affecting perceptions of impacts, justice, and place, and, consequently, attitudes towards fracking, without, however, removing the possibility of a direct effect as well (Stern et al., 1995; Evensen and Stedman, 2016; 2017).

Finally, the study assessed whether an integrated approach of exploring technology impacts, justice in shale-gas governance, sense of place, and worldviews led to deeper understandings of individual and community responses to fracking developments– the final research objective. The study provided insights on how residents who came to similar conclusions about fracking often differed in their primary reasons for objecting or supporting. Some opponents emphasised certain environmental risks more or perceived greater procedural injustices, while others highlighted personal attachments to the area and wanted to protect their ways of life and the place identity of future generations (Willow et al., 2014; Luke, 2017). Conversely, supporters focused on its benefits and ability to enhance the area without them necessarily gaining personally.

Therefore, the integrated approach confirmed that NIMBYism offers inadequate and unidimensional explanations for local opposition (Devine-Wright, 2013; Van der Horst, 2007; Wolsink, 2007a; Gross, 2007).

Synthesising research findings, the study proposed an *Integrated Framework* for Understanding Perceptions of Fracking (Figure 7.3). Attitudes towards fracking were positioned at the centre of the diagram and were linked directly to perceptions of technology impacts, justice in shale-gas governance, and place. Worldviews, as more general constructs, encircled both perceptions reflecting the idea that broader environmental, sociocultural, and political beliefs underpin both perceptions and attitudes, but also that direct interactions between more distant constructs and feedback loops exist (Stern et al., 1995; Leiserowitz, 2006). While residents could prioritise one contributing factor, on most occasions, attitudes were formed from interaction between worldviews and one or multiple impact, justice, and/or place perceptions. The thesis contributes to knowledge by considering simultaneously multiple determinants to fracking attitudes not to decide on the pre-eminence of one set of factors, but to highlight that comprehending the ways the framework's subcomponents were connected and interacted can elucidate the heterogeneity of residents' reasonings and responses to controversial energy developments. This particular important as attitudes resulted from this amalgam of interconnections, but as constructs they are also very subjective, temporal, and circumstantial to current events. While the framework illustrated an individual's process of forming an attitude, it recognised the sociocultural influence of other residents or group affiliations on the construction of impacts (Douglas, 1978; Rippl, 2002; Oltra et al., 2012; Jacquet and Stedman, 2014). Attitudes additionally were not solely the end-result but also an interactive part of the framework affecting and reinforcing perceptions of impacts, justice, and place. Therefore, the study addressed its research aim and found that understanding the heterogeneity of community perceptions of fracking is better achieved relationally through exploring how the components of the integrated framework mutually informed and interacted with each other.

The flexibility of the integrated framework makes it potentially applicability to other energy or social contexts (e.g., underground heating and storage technologies or countries with different power relationships between government and local communities). It may also be used for considering fracking attitudes at larger spatial scales, where worldviews, place, and local impacts may carry different weights in how far they inform attitudes than was the case within host communities examined in this study (Evensen and Stedman, 2016; 2017). Either way, the thesis adds to the growing literature of public perceptions of shale-gas fracking and other energy-sitting technologies by illustrating the usefulness of combining often-distinct social science literatures and exploring the reasonings behind community responses to novel and contested developments from multiple vantage points simultaneously (Whitmarsh et al., 2015). However, while the study took an interdisciplinary approach, it significantly contributes to human geography by identifying place as a central factor to fracking attitudes (Cresswell, 2013; 2015). The study also expands the literatures of worldviews, risks perceptions, sense of place, and justice not only by contextualising them into the case of shale-gas fracking, but also by combining them and exploring their interconnections (Cotton, 2013; et al., 2014; Jacquet, 2014; Thomas et al., 2017a; Whitmarsh et al., 2015). Additionally, the study agrees with scholars' suggestions for considering various aspects of sense of place (Giuliani, 2003; Jorgensen and Stedman, 2006; Lewicka, 2011a; Devine-Wright, 2013; 2014; Williams, 2014) and supports other qualitative cultural theory studies that have showed that residents usually hold multiple and dynamic worldviews (Thompson, 1982; et al, 1990; Verweij et al., 2011; West et al., 2010). Finally, the thesis adds to the rapidly expanding field of energy justice acknowledging recognition as a key justice dimension (McCauley et al., 2013; Jenkins et al., 2016; Bailey and Darkal, 2018).

Besides its theoretical input, the thesis makes empirical and methodological contributions to knowledge. The study appeared to be the first empirical investigation in two areas with proposed and/or existing developments that explored the diversity of residents' fracking perceptions[65]. Furthermore, the study was one of the first attempts to combine qualitative and quantitative methods to better capture and understand community perceptions of fracking while explicitly exploring multiple explanatory factors (Thomas et al., 2016; Williams et al., 2015).

8.3 Research Limitations

The proposed *Integrated Framework* possibly did not include all possible reasons affecting attitudes to fracking but still constituted a useful heuristic device to untangle its complexity and comprehend how attitudes were shaped during a specific period, why responses were not cohesive between and within affected communities, and how and why different explanatory factors (or parts of them) were combined or prioritised differently between individuals. Considering other possible limitations of this thesis, generalising findings from case-study research should always be considered with caution, though the inclusion of two areas and the combination of qualitative and

[65] For example, considering residents with different proximity to sites, with neutral or positive attitudes beyond the planning hearings, and with no participation in decision-making processes or local activist groups (see Section 2.3).

quantitative methods aided the validity of the study through data and methodological triangulation (Section 3.1.3). However, the study only provided a “snapshot” of local opinions on fracking and, therefore, the research findings would not necessarily be reproduceable or have full validity for other settings and issues (Denscombe, 2014, p.8; Creswell, 2009; Yin, 2014).

Nevertheless, other studies were conducted in the same case study areas closely prior and afterwards to this research, many of which came to similar conclusions for the influences they examined. The focus of these studies on the same areas were not considered as a limitation as none of them conducted a parallel comparative study that simultaneously researched multiple attitudinal factors. McNally et al. (2018) surveyed York residents and focused on how the use of the word ‘fracking’ affected perceptions; Rattle et al. (2018) compared PNR and KM planning submissions, highlighting the importance of local identity and perceived democratic deficit in local opposition but did not examine other factors; Aryee et al. (2020) focused on experienced levels of stress combining data from a previous survey in 2017 that covered a wider area around the PNR (Section 3.3.1), while Szolucha contributed to this study conducting observations and interviews near KM in 2020 and bringing insights from her previous qualitative work near PNR (2018b) with specific foci on temporality and psychosocial stress; and, Sovacool et al. (2020) interviewed various Fylde residents in 2019 and explored similar positive, negative, and shifting ambivalent experiences to understand individuals’ narratives and reasonings behind opinions on fracking. The last two studies were part of a larger NERC/ESRC project that explored similar issues to aspects of the integrated framework in isolation but not all the factors considered in this study (Section 2.3). As such, they add further weight to arguments for an interdisciplinary approach as well as prompting reflecting on issues of research fatigue and some methodological and analytical aspects of the thesis.

Both case-study areas were under-researched at the first half of 2018, but, during the interviews, a documentary was produced on KM and other students were engaged in research with residents about various fracking-related issues (Section 3.3.1). Several interviewees also had received postal contact from the respective energy companies on multiple occasions, which could have affected their reception of the survey. Additionally, one opponent highlighted how the attitudinal survey question made him more conscious of his opinions of fracking, indicating the capacity for research to influence participants' views. As both areas, but particularly PNR, were seen as "extreme" case-studies for "the rich source of information" (Denscombe, 2014; Sovacool et al., 2020, p.949), it was anticipated that they would gather more attention over the years. Reflecting on these, scholars need to consider research fatigue and also the influence of previous studies in providing information for and influencing community responses.

The similar range of the postal survey between the case-studies brought out the importance of proximity of communities and their settlement structure but excluded other nearby villages in Lancashire. Although Aryee et al. (2020) included one such village, Wrea Green, and found strong similar levels of local opposition to PNR (Section 3.3.1), consideration of this area could have enabled the recruitment of more interviewees supporting the developments. Recruiting supporters also proved challenging for Sovacool et al. (2020), and most likely reflects supporters' unwillingness to participate and share their views on a polarising topic. However, as Bailey et al. (2011, p.145) pointed, responses to contested energy technology developments often attract “vocal minorities” as “non-response often occurs as a result of disinterest or lack of awareness of the topic”. Based on residents’ low participation in anti-fracking groups (Section 4.5.1), the local opposition documented in the thesis was interpreted as demonstrative of the strong oppositional feelings in the areas, but still leaves questions about the silent majority and whether their lack of participation derived from ignorance, lack of interest, fatalistic worldviews, feelings of non-attachment, or other factors that require further investigation (Gross, 2007; Rayner, 1992; Hummon, 1992; Bailey et al., 2011; Gustafson, 2014). As a further point, the study continues to have confidence that the framing of the technology as ‘fracking’ among host communities did not affect their perceptions (Section 4.2.2), despite McNally et al.’s (2018) findings in York. It nevertheless remains important that researchers reflect on the terminology used when exploring perception of shale-gas fracking in addition to considering participants’ level of familiarity and distance from local developments.

While the survey captured some neutral views towards fracking, these were excluded after a certain point because they made up only a very small proportion of participants to facilitate the analysis of data based on the contrasting positive and negative attitudes (Section 4.3.1). Sovacool et al. (2020) explained that their interviewees who initially self-defined themselves as neutrals offered mixed and contrasting reasonings due to “the complexity involved in grappling with how shale gas development contributes to, or conflicts with, their culturally embedded aspirations” (p.959). The thesis took a different approach of distinguishing interviewees based on their overall final attitude at the time of data collection whilst considering their different reasonings. However, similar to the thesis’s findings, Sovacool et al. (2020) found that some residents with ambivalent or neutral attitudes shifted to more oppositional ones towards local developments after negative experiences, such as traffic congestion and commuting delays, whereas others shifted to more supportive attitudes because of the impacts of protests. These findings also concurred with some survey participants' explanations of why they felt no direct disruption from the developments (Section 4.5.1). While both approaches are justifiable and logical, they highlight the subjectivity of each researcher's interpretation and analysis of a phenomenon (Saunders, 2016), but also the importance of considering sense of place and its disruption as an attitudinal factor.

Finally, due to the stage of the developments at the time of data collection, discussing issues of distributive justice without a degree of repetition of the perceived risks and benefits of fracking was unavoidable. Nevertheless, this approach was considered beneficial as it provided different lenses for examining perceptions of impacts that highlighted the significance of different spatial and temporal scales and how individuals weighted these to come to conclusions about fracking. The latter is particularly important where residents' experiences of different positive and negative impacts lead to different conclusions or produces more ambivalent attitudes in the future (Schafft et al., 2013; Kriesky et al. 2013; Thomas et al., 2016), if the shale industry resumes and becomes more intensive in England.

8.4 Future Research Directions and Policy Recommendations

As was noted earlier, this study examined a snapshot of community attitudes towards fracking at a particular point in time but recognised the dynamic and temporal nature of attitudes. Scope therefore exists to probe the effects of particular events, for example, by examining how the later tremors and moratoria have affected perceptions of seismic risks and notions of trust or how the global energy crisis prompted by Russia's invasion of Ukraine have affected opinions on shale gas as a way to address energy security. While Devine-Wright et al. (2021) explored perceptions of the 2019 fracking moratorium and found that public distrust led some participants to see it as a political ploy, future studies could focus on whether the on-and-off support for lifting the moratorium created more uncertainty and stresses among possible fracking host communities.

Drawing on the literature of public perceptions of fracking beyond the UK, future research could additionally court the views of a broader range of UK stakeholders, such as farmers and other landowners, energy companies, and decision-makers, to help contextualise and nuance the views analysed in this study (see Jacquet, 2012; Perry, 20112; Theodori, 2013; Willow et al., 2014; Malin and DeMaster, 2016). Some interviewees, for example, mentioned that local farmers were reluctant or had agreements with the energy companies not to speak out. While Aryee et al. (2020) also noted some avoidance from the farming community, it is worthwhile for scholars to attempt to investigate fracking perceptions of farmers given their inclusion in perceived recognition injustices and the rural location of many fracking sites in England.

Future research could also employ larger and more representative samples to test the thesis's *Integrated Framework* at different geographical scales, in different places, and to provide more rigorous statistical assessment of the contribution of each attitudinal factor to attitudes. Another future research direction would be to identify any other attitudinal influences that may have been overlooked and need to be included in the conceptual framework to make it more comprehensive. For example, while the academic literature has recognised media as an important amplifier of risk perceptions and some studies have explored perceptions of fracking on the internet and social media (Jacquet, 2014; Jaspal et al., 2014; McNally et al., 2018; Devine-Wright et al., 2021; Rattle et al., 2021), scholars could explore more to what extent the media influenced the trustworthiness of, and receivability of information from, various stakeholders and how virtual communities (e.g. Facebook groups) built around support or opposition to fracking affected residents' sense of place. Generally, over the course of the thesis, social science research on fracking and energy justice has expanded significantly (Clough, 2018; Griffiths, 2019; Ryder and Devine-Wright, 2022); however, sense of place still remains an under-explored dimension (Cotton et al., 2014). Based on the research findings, future studies would benefit from exploring the influence of various and often-contrasting aspects of sense of place on attitudes to energy technologies. Furthermore, other disciplinary researchers could employ perhaps more specialised psychological and sociological approaches to probe more explicitly and in a more expert way some of the factors explored in the study, such as worldviews.

Lastly, if the fracking moratorium is lifted in the future, the challenge for UK policymakers would be to find appropriate ways to incorporate the underlying and intangible types of concerns within planning applications to avoid procedural and recognition injustices (Cass and Walker, 2009; Perry, 2013; Cotton, 2016; Evensen, 2016; Jenkins et al., 2016; Thomas et al, 2017b, p.7; Beebeejaun, 2017; Thomas et al, 2017b). Another practical recommendation is that any successful engagement with host communities would require energy companies to adopt multiple strategies to reflect residents' diverse worldviews, community needs, and place meanings (Cotton, 2013; Whitton et al., 2017; Evensen and Stedman, 2018; Whitton and Charnley-Parry, 2018; McNally et al., 2018).

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Appendices

Appendix I: Survey Invitation

SHALE GAS FRACKING AND LOCAL COMMUNITIES… PLEASE SHARE YOUR VIEWS!

My name is Magda (Magdalini) Kechagia and I am conducting PhD research at Plymouth University on opinions on shale gas extraction and fracking in local communities in Lancashire and North Yorkshire. My focus is in on Preston New Road and Kirby Misperton fracking sites.

I would be very grateful if you would please spare around 15-20 minutes to complete a questionnaire asking about your local area and community, and energy and environment issues. I am especially interested in your opinions on how shale gas fracking in your area might affect you. Your opinions are really important in understanding local community's feelings towards the development of shale gas fracking in the UK.

The PhD is funded by Plymouth University and is entirely independent piece of research.

By completing and returning this questionnaire (freepost envelop included) you consent to the use of the data in further analysis. You have the right to withdraw until the time the data analysis for the thesis is completed (December 2018). Please, note down and quote your questionnaire code for any future communication. The survey results will be used to identify general trends and patterns. No individual identities will be disclosed either in any research reporting.

ALL INFORMATION YOU PROVIDE IN THE QUESTIONNAIRE WILL BE TREATED AS STRICTLY ANONYMOUS AND CONFIDENTIAL.

***** If more people (adults) in your household want to share their views, I am happy to send you another copy or you can use the online version: https://www.surveymonkey.co.uk/r/V3FR3P9

If you have any questions, please contact me by email: magdalini.kechagia@plymouth.ac.uk

Appendix II: Questionnaire

SECTION A: ***THIS SECTION EXPLORES YOUR OPINION ABOUT YOUR LOCAL AREA AND COMMUNITY***

Code:

A1: Do you live in North Yorkshire?

□ Yes, I do   □No, but I am interested in or have ties with local area/community

A2-a: If yes, how long have you lived in your area?

□Less than a year   □1-5 years   □6-10 years   □11-20 years   □ 21-49 years   □More than 50 years

A2-b:If no, could you explain your connection with this area?(If you need more space, feel free to use the last blank page)

A3: To what extent do you agree/disagree with the statements below

	Strongly Agree	Agree	Neither Agree or Disagree	Disagree	Strongly Disagree
I am proud to be from this area	□	□	□	□	□
I considered this place to be my home	□	□	□	□	□
I miss the area when I'm away too long	□	□	□	□	□
I feel like I don't belong in this area	□	□	□	□	□
I would not mind relocating somewhere else	□	□	□	□	□
I have never considered how I think of the area	□	□	□	□	□
This area reflects the type of person I am	□	□	□	□	□
I like the area because of its natural surroundings	□	□	□	□	□
I like the area because of its strong sense of community	□	□	□	□	□
My employment ties me here	□	□	□	□	□
I have a lot of good memories from this area	□	□	□	□	□
I have strong family ties in this area	□	□	□	□	□
I like to wonder around & discover new things in the area	□	□	□	□	□
I like to keep up with changes in the area	□	□	□	□	□
I like to attend community events	□	□	□	□	□
The community is proactive and holds a lot of social events	□	□	□	□	□
Most people in the community care only about themselves	□	□	□	□	□
I rarely speak to my neighbours	□	□	□	□	□

A4: Are you a member of any community, environmental, political group/club? If yes, please mention which ones

A5: What do you think are the most positive or negative features about your local area and community? Please provide up to 3 feauture for each

Positive

Negative

SECTION B: *THIS SECTION EXPLORES YOUR VIEWS ON ENERGY ISSUES AND TECHNOLOGIES*

B1: To what extent do you agree/disagree with the statements below

	Strongly Agree	Agree	Neither Agree or Disagree	Disagree	Strongly Disagree
People should use as much energy as they want	☐	☐	☐	☐	☐
Investing in renewable energy is important to reduce climate change	☐	☐	☐	☐	☐
Weather patterns change naturally and people should stop worrying about climate change	☐	☐	☐	☐	☐
Concern about the environment restricts technological innovations too much	☐	☐	☐	☐	☐
Industry left it to itself will harm the environment	☐	☐	☐	☐	☐
Environmental and energy decisions should be more informed by participation by members of the public	☐	☐	☐	☐	☐
National energy choices should not only depend on economic and social factors but also environmental factors	☐	☐	☐	☐	☐
The UK should invest more in environmental friendly energy technologies even if it costs more	☐	☐	☐	☐	☐

B2: To what extent do you agree that the UK should develop...

	Strongly Agree	Agree	Neither Agree or Disagree	Disagree	Strongly Disagree
Nuclear enegy	□	□	□	□	□
Fossil fuel energy	□	□	□	□	□
Renewable energy	□	□	□	□	□

B3: Which of these energy sources is the MOST effective in helping the UK achieve the following goals? ***Please tick one in each column***

Sources / Goals	Secure energy supplies	Provide affordable energy prices for consumers	Tackle climate change by reducing greenhouse gases	Contribute to a competitive economy
Nuclear energy	□	□	□	□
Fossil fuel energy	□	□	□	□
Renewable energy	□	□	□	□

B4: Which of these energy sources is the LEAST effective in helping the UK achieve the following goals? ***Please tick one in each column***

Sources / Goals	Secure energy supplies	Provide affordable energy prices for consumers	Tackle climate change by reducing greenhouse gases	Contribute to a competitive economy
Nuclear energy	□	□	□	□
Fossil fuel energy	□	□	□	□
Renewable energy	□	□	□	□

SECTION C: *THIS SECTION EXPLORES YOUR OPINION ABOUT SHALE GAS FRACKING*

C1. How much do you know about hydraulic fracturing, commonly known as fracking?

□ A lot □ Some knowledge □ A little □ Just the name □ Haven't heard it before

C2. Generally, do you agree with the extraction of unconventional resources (e.g gas/oil from shale)?

□ Strongly Agree □ Agree □ Neither agree or disagree □ Disagree □ Strongly Disagree □ Don't know

C3. To what extent do you agree/disagree that shale gas extraction and fracking in your area is a good idea

□ Strongly Agree □ Agree □ Neither agree or disagree □ Disagree □ Strongly Disagree □ Don't know

C4. How far is your home from the nearest shale gas fracking site?

□ 1 mile or less □ 2-3 miles □ 4-10 miles □ 11-15 miles □ More than 15 miles □ Don't know

C5. What effect have the following reasons had on shaping your attitude towards shale gas fracking?

	Very positive effect	Positive effect	No effect	Negative effect	Very Negative effect	Don't know
Appropriateness of specific site in question	□	□	□	□	□	□
Environmental effects	□	□	□	□	□	□
Social effects on nearby communities	□	□	□	□	□	□
Personal connection with the area	□	□	□	□	□	□
Level of trust towards decision making processes and institutions involved	□	□	□	□	□	□

C6. To what extent do you believe that shale gas fracking will...

	Strongly Agree	Agree	Neither Agree or Disagree	Disagree	Strongly Disagree
Cause earthquakes	□	□	□	□	□
Provide cheap energy in the future	□	□	□	□	□
Increase air pollution	□	□	□	□	□
Increase local jobs and business opportunities	□	□	□	□	□
Contaminate groundwater/ drinking supplies	□	□	□	□	□
Provide economic benefits to the community	□	□	□	□	□
Negatively impact on local tourism	□	□	□	□	□
Benefit UK economy in total	□	□	□	□	□
Increase vehicle traffic	□	□	□	□	□
Industrialise the landscape	□	□	□	□	□
Be a useful transitional technology as we move toward renewables	□	□	□	□	□
Reduce property values	□	□	□	□	□

C7. In your opinion, how will (has) shale gas fracking affect(ed) your area or daily life?

□ Very positively □ Somewhat positively □ No impact □ Somewhat negatively □ Very negatively □ Don't know

C8. Please explain the main reasons for your answer (If you need more space, feel free to use the last blank page)

C9. Considering the development of shale gas fracking, how much do you trust the following bodies

	Completely	A lot	Indifferent	A little	Not at all
National Government	□	□	□	□	□
Local County & District Council	□	□	□	□	□
The Environment Agency	□	□	□	□	□
Other residents in local area	□	□	□	□	□
Local environmental groups	□	□	□	□	□
Large environmental groups (e.g. Friends of the Earth)	□	□	□	□	□
Energy companies (who don't provide compensation to the community)	□	□	□	□	□
Energy companies (who provide compensation to the community)	□	□	□	□	□
Independent experts	□	□	□	□	□

C10. To what extent do you agree/disagree with the statements below

	Strongly Agree	Agree	Neither Agree or Disagree	Disagree	Strongly Disagree
Decision making about the project has involved opportunities for local people to have a say	□	□	□	□	□
A few people in the community would benefit from the development	□	□	□	□	□
The development went through a fair planning process	□	□	□	□	□
In order to achieve national energy goals, some communities should accept fracking developments	□	□	□	□	□
Energy companies should provide benefits that balance out potential risks	□	□	□	□	□
Energy company has engaged in discussions with the local community	□	□	□	□	□
Potential impacts were assessed thoroughly	□	□	□	□	□

SECTION D: *THIS SECTION EXPLORES YOUR VIEWS ON ENVIRONMENTAL ISSSUES*

D1:To what extent do you agree/disagree with the statements below:

	Strongly Agree	Agree	Neither Agree or Disagree	Disagree	Strongly Disagree
There are limits to growth beyond which industrialised society cannot expand	□	□	□	□	□
When humans interfere with nature it often produces disastrous consequences	□	□	□	□	□
Humans must live in harmony with nature in order to survive	□	□	□	□	□
The balance of nature is delicate and easily upset	□	□	□	□	□
The government should dictate clear rules about what is and what is not allowed	□	□	□	□	□
With expert management and more scientific research, we can establish the extent of environmental problems and prevent	□	□	□	□	□
Steps should be made to regulate behaviour harmful to the environment	□	□	□	□	□
The public requires educating on the dangers of environmentally dangerous activities	□	□	□	□	□
The environment is adaptable and will recover from any harm caused by people	□	□	□	□	□
Humans have the right to modify the natural environment to suit their needs	□	□	□	□	□
Humans need not to adapt to the natural environment because they can remake it to suit their needs	□	□	□	□	□
There is no use worrying about the environment, I can do nothing about it anyway	□	□	□	□	□
Environmental protection methods are pointless because nature is unpredictable	□	□	□	□	□
I have very little control over environmental risk	□	□	□	□	□
There is no point engaging in environmental actions as it rarely changes anything	□	□	□	□	□

SECTION E: ***THIS SECTION ASKS YOU FOR SOME DETAILS TO HELP ANALYSE AND INTERPRET THE DATA***

E1. What is your age?

□ 18-24 □ 25-34 □ 35-44 □ 45-54 □ 55-64 □ 65-74 □ 75+

E2. Are you..?

□ Female □ Male □ LGBT □ I prefer not to say

E3. What is your highest level of education or qualification?

□ No formal education □ GCSEs/ O-levels □ Vocational Qualification □ A-Levels □ Degree □ Higher Degree (Master, PhD)

E4. Are you..?

□ Employed □ Self-employed/freelance □ Unemployed □ Retired □ Homemaker □ Student

Thank you very much for your participation in this survey. Your help and views are really appreciated!

If you have more to say and would like to discuss your views about shale gas fracking in a small group or indivividually, please provide some contact details
Name: Email adress: Telephone:

ALL THE INFORMATION YOU PROVIDE IN THIS QUESTIONNAIRE WILL BE BE TREATED AS STRICTLY ANONYMOUS AND CONFIDENTIAL

BY RETURNING THIS QUESTIONNAIRE YOU GIVE CONSENT FOR THE INFORMATION PROVIDED TO BE DISSCUSED IN THE ANALYSIS OF THE SURVEY

PLEASE NOTE DOWN YOUR QUESTIONNAIRE CODE FOR ANY FUTURE COMMUNICATION

Appendix III: Interview Guide

UNIVERSITY OF PLYMOUTH
FACULTY OF SCIENCE AND ENGINEERING

INTERVIEW GUIDE

Principal Investigator: ***Magdalini Kechagia***
Title of Research: ***Perceptions of shale gas fracking in local communities in the UK***

1. Where do you live? How long have you been living here?
2. How would you describe your local area? What do you like most/least?
    a. Physical elements: Do you like living/ working in a rural area? How important is the local area's rural environment/landscape to you?
    b. Social elements: How would you describe your local community?
3. How do you feel about shale gas extraction and fracking? How did you learn about it?
    a. In general/ in the UK?
    b. In your local area?
4. Are you concerned with any potential risks associated with fracking?
    a. If yes, what are those? Which ones are you are most concerned with and why?
    b. Do you think these risks can be minimised if there are good regulations and monitoring systems in place?
5. What do you think are the benefits of fracking overall?
    a. For your local area?- jobs?
    b. For the country?- energy security/ independence ?cheaper energy?
6. Do you believe shale gas fracking has affected, or will affect, your local area?
    a. If yes, how do you think that?
    b. Have you been involved in a demonstration or KM camp? Would you like to share your experience? What do you think about the protests? What impact/influence have they had on the development of fracking and local area?
7. How much do you trust the actions and decisions of... in the development of shale gas fracking?
    a. Government
    b. North Yorkshire County council/ MPs- Kevin Hollinrake
    c. Energy companies- Third energy
    d. Environmental organisations- Foe, Frack Free Ryedale/ Kirby Misperton etc

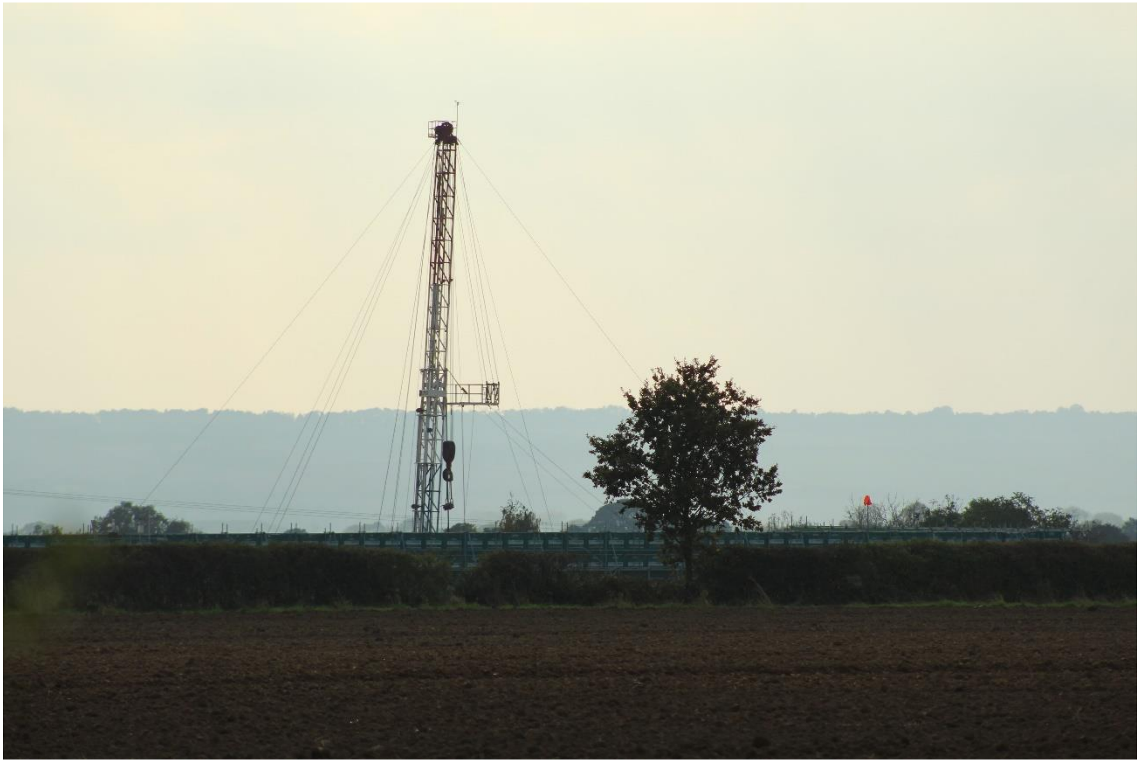
Appendix IV: Researcher's Photos


PLEASE
SHOW YOUR
SUPPORT BY
BEEPING AS
YOU PASS
THANK YOU!
WHEN RED
LIGHT SHOWS
WAIT HERE


NURSERY
COMMUNITY
ACTION
HUB
POWER TO THE PEOPLE
GOVERNMENT
FRACKING
DEMOCRACY
ENTRANCE


STOP
FRACKING


PROTECT OUR
CHILDREN
PROTECT OUR
COUNTRYSIDE
SAY NO TO FRACKING
Keep Ryedale
rural
NO Fracking




YH63 GPE
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THIRD ENERGY
NOT Welcome Here!

Appendix V: Interviews Information Sheet and Consent Form

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FACULTY OF SCIENCE AND ENGINEERING

RESEARCH INFORMATION SHEET

Principal Investigator: ***Magdalini Kechagia***

Title of Research: ***Perceptions of shale gas fracking in local communities in the UK***

Aim of research

To understand the opinions of local communities about shale gas fracking and reasons for these opinions.

Description of procedure

The interview will last approximately 1-1$^{1/2}$ hour depending on the number of people participating. As a participant you will be asked to share your thoughts about how shale gas fracking will affect, or has affected, your area and community. In particular, you will be asked about your connection with the area, your views about potential impacts of the technology (risks and benefits), and your feelings towards different stakeholders involved in the decision-making and development of the fracking site. To encourage discussion, early survey results and photographs from the local area and fracking site may be used. To capture what said correctly and facilitate the data analysis, the interview will be recorded by using a voice recorder device.

Description of risks

You will not be intentionally exposed to any risks, though the conversation may lead to topics that are sensitive to you. If this happens and you feel uncomfortable or distressed, you can stop and request a break or ask to terminate the interview. In case of a group interview, participants should be asked not to disclose what discussed to third parties and adopt 'a what said in the room stays in the room' policy to ensure everyone's anonymity. It is possible that conflicting opinions may be expressed by group members; please be respectful of others.

Benefits of proposed research

The research is designed to gain a greater understanding of the main factors shaping local attitudes and perceptions towards shale gas fracking. Participating in the research will allow you the opportunity to contribute your feelings and opinions about various themes and to voice any concerns/issues you may have related to your local area. Publication of the research results may be used in the future by other stakeholders in the advancement of decision making related to the application of controversial energy technologies in local communities.

To Right to withdraw

You have the right to withdraw from the interview at any point without giving explanations. The focus groups/ interviews results will be used to identify general patterns and trends. No individual identities will be disclosed either in numerical reporting or any quotations provided. You have the right to withdraw from the research until the time the data analysis for the thesis is completed (September 2018).

If you are dissatisfied with the way the research is conducted, please contact the principal investigator in the first instance: magdalini.kechagia@plymouth.ac.uk or 07881775330. If you feel the problem has not been resolved, please contact the secretary to the Faculty of Science and Engineering Human Ethics Committee: Mrs Paula Simson 01752 584503.

PLYMOUTH UNIVERSITY
FACULTY OF SCIENCE AND ENGINEERING

CONSENT TO PARICIPATE IN RESEARCH PROJECT/ PRACTICAL STUDY

Principal Investigator: ***Magdalini Kechagia***

Title of Research: ***Perceptions of shale gas fracking in local communities in the UK***

Brief statement of purpose of work

You are invited to participate in a research study conducted by Magdalini Kechagia as part of her PhD project concerning the development of shale gas fracking in England. This study is independently funded by Plymouth University and has no connections with industry, local authorities or other organised groups.

The main purpose of the research is to understand opinions of local communities about shale gas fracking and how these opinions are formed. The study will examine: a) opinions towards fracking and its potential impacts, b) residents' relation with their local area and how fracking may affect it, and c) opinions towards main regulatory authorities and stakeholders involved in promoting and deciding on fracking applications and decision-making processes (central government, local councils, regulators, energy developers and action groups).

This interview will be recorded as a reference used. The details of the person being interviewed will be kept confidential. Your participation is completely voluntary. You may choose not to answer specific questions and can withdraw at any time during the interview. You can withdraw your participation from the study until the time the data analysis is finalised (September 2018).

The objectives of this research have been explained to me.

I understand that I am free to withdraw from the research at any stage, and ask for my data to be destroyed if I wish.

I understand that my anonymity is guaranteed, unless I expressly state otherwise.

I understand that the Principal Investigator of this work will have attempted, as far as possible, to avoid any risks, and that safety and health risks will have been separately assessed by appropriate authorities.

Under these circumstances, I agree to participate in the research.

Name: ……………………………………….

Signature: ....…………….. Date:...............…………..