Towards responsible governance of energy projects:

A dynamic analysis of values, interactions and events in the decision-making process on shale gas in Lancashire, UK

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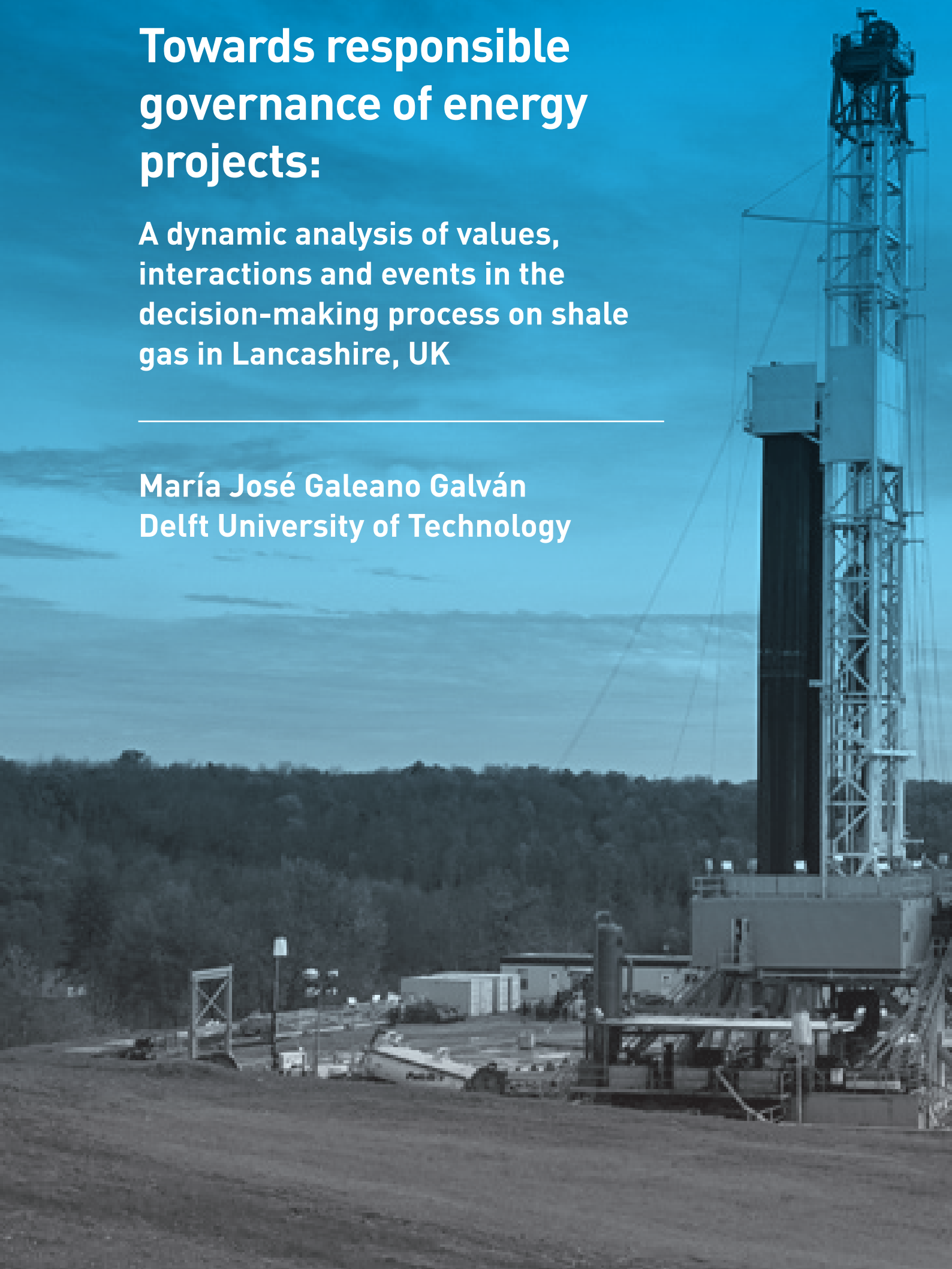

TOWARDS RESPONSIBLE GOVERNANCE OF ENERGY PROJECTS:

A dynamic analysis of values, interactions and events in the decision-making process on shale gas in Lancashire, UK

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EXECUTIVE SUMMARY

Research Problem

Energy projects are developed and executed in a complex network of interconnected actors, whom depend on each other's resources for reaching their individual interests and goals with regard to the project. These actors have a diversity of values (convictions or beliefs of what is worth striving for society to be good), perspectives and goals. Energy projects can give rise to controversies due to the different perceptions of actors regarding the project and its implementation process (the institutions in which the technology is embedded). Whereas controversies may be perceived as barriers for the implementation of energy projects, they can also provide opportunities for the articulation of conflicting values. In that light, the notion of responsible innovation can add a normative dimension to the governance of energy projects. Responsible innovation endorses the inclusion of the diversity of relevant public values to the development and implementation of energy projects. Hence, the responsible governance of energy projects implies creating strategies and solutions to accommodate the variety of values at stake.

For values to be accommodated in energy projects, they first need to be identified. The public debate can be used as a mean for the identification of relevant public values. However, this may prove challenging. The implementation of energy projects is a dynamic process, consisting of a series of intertwined decisions, involving different groups of actors at different decision-making times and places. The multiplicity of decisions lead actors to express different values or conceptualizations of the same value according to the topic under discussion. Hence, beyond methodological challenges, issues of power and agenda setting may lead to the contestation of the legitimacy of the identified values. The politics involved in the decision-making process may influence how values are articulated and when. Power imbalances may lead to emphasis on the values of powerful actors in the public debate. In addition, the process of agenda setting within arenas may encourage the expression of the values that "fit" the topic under discussion, while others remain hidden. Hence, the most frequently expressed values might not reflect the most relevant values from a democratic perspective. In fact, if the expression of values depends on specific groups of actors interacting at particular times and places, the legitimacy of the identified values might be contested.

The multiplicity of interactions in energy projects is reflected in different aspects of the decision-making process, such as the locations of decision-making (arenas), the degree of coordination between actors with similar goals (coalitions) and the interventions aimed at steering the process in desired directions (strategies). Therefore, this thesis focused on exploring how these aspects of the decision-making process shaped the expression of values in the public debate – the rhetoric use of values.

Case study: shale gas exploration in Lancashire

In that light, a case study was deemed necessary to facilitate an in-depth exploration of the dynamics of the decision-making process. The exploration of shale gas in Lancashire, UK was selected for several reasons. The occurrence of two earth tremors in 2011, related to the first fracking well built in Lancashire, led to a moratorium of the technique that lasted 18 months. Afterwards, the safe development of fracking was supported through the development of a proper institutional environment. The exploration activities were reactivated by Cuadrilla's proposal to develop the sites at Roseacre Woods and Preston New Road in Lancashire. This decision started a formal decision-making process surrounded by uncertainties and controversy. The uncertainties were related to the potential benefits and impacts of fracking in the environment, surrounding communities and the economy. The controversy was raised by the multitude of perspectives over if and how to implement the technique. Due to this combination of characteristics, this case was found suitable to analyse the research problem at hand. Hence, this report aimed at answering the following research question:

How has the rhetoric use of values been shaped by the arenas, coalitions and strategies in the decision-making process on shale gas in Lancashire, UK?

Research Methodology

Based on the research question, the research was divided into two parts based on the theoretical and empirical needs. First, the theoretical research was done by means of a literature review of the theories of decision-making in networks and VSD. Second, the empirical research was executed by means of a qualitative longitudinal analysis of newspaper articles available regarding the decision-making process in Lancashire, UK. As this method generates a large amount of data, a focus was kept on the aims of the research to select the data for analysis.

Building an understanding of decision-making processes

Network theory suggests that for the analysis of decision-making process, the object of study needs to be reconstructed. However, this reconstruction is selective in nature as it focuses on specifics aspects of the process. Central to the analysis of decision-making processes in relation with responsible innovation is the understanding of the interaction between actors. Therefore, the Rounds model was selected as a base for the intended analysis in this thesis. A round corresponds to a period of the decision-making process that is defined by the occurrence of a crucial decision. Crucial decisions are outcomes taken for granted by actors to start a new set of interactions. For the case of energy projects, the crucial decisions are related to the decisions taken as part of the formal procedures.

Moreover, three concepts were defined to characterize the dynamics of the decision-making process: 1) arenas, 2) coalitions and 3) strategies. First, arenas correspond to spaces in which actors interact to make decisions regarding specific subjects related to the execution of the energy project. Second, coalitions are groups of actors, which join resources to try to steer the process and who have a certain degree of alignment in interests or shared goals. Third, strategies are interventions aimed at influencing other actors' behaviours, the perceptions of problems and solutions, or the development of the decision-making process. Consequently, the analysis was focused on how the different elements of the rounds model shaped the expression of certain values at specific moments in time. .

Results: Unfolding dynamics of the decision-making process

Once the moratorium was lifted in December 2012, the different actors started to prepare for the reactivation of shale gas exploration in the UK. In the midst of the regulatory changes that were triggered by the new prospects of developing the shale gas industry, the company Cuadrilla decided to start the preparation of the planning application for the development of two sites in Lancashire. This event led to the beginning of the first of four rounds that have characterized the decision-making process in Lancashire. The outcomes and instances of the formal procedures at both project and institutional level were at the centre of the controversy in the shale gas debate. They represented the crucial decisions that marked the beginning of the different rounds of the project. In addition, they set the rules for the interactions between actors in the different rounds.

Round	Description	Time
1	Preparation to re-start exploration activities.	Jul 2013 - May 2014
2	'Business as usual' management of high profile applications	Jun 2014 - Jan 2015
3	New consultation on site-specific, contested aspects of the project	Feb 2015 - Jun 2015
4	Changing grounds with the planning appeal process	Jul 2015 - (?)

Arenas: locations for decision-making

Fifteen arenas were identified in the decision-making process. While the arenas at local level were focused on the development of the project, the arenas at national level were focused on the development of the regulatory system. In addition, formal and informal arenas were differentiated. The former were related to formalized processes of decision-making. The latter were related to the construction of the public perspective of the technology. The arena "planning application for Lancashire" was the main local (formal) arena. In Round 4, this arena was moved to the national level during the appeal process. The existence of arenas limited the possibilities of actors to influence the outcomes of the decision-making process. Actors could only join some arenas according to their resources. For example, formal national arenas, in

which safety, financial, planning and landownership regulations were being discussed, were closed (or very limited) to the influence of external actors.

Coalitions: coordination between actors

Four coalitions were identified in the decision-making process. They were differentiated by their position in the debate. Fracking supporters were organized in the coalitions of Policy enablers and Project promoters. Policy enablers worked at national level to promote a positive regulatory environment. Project promoters worked at local level to capitalize on the benefits of fracking for regional development. Fracking opponents were organized in the coalitions of Policy obstructers and Project contesters. Policy obstructed worked at national level to halt the development of shale gas by means of the regulations. Project contesters worked at local level to avoid Cuadrilla's applications approval. In addition, boundary spanners (actors working in both coalitions at either side of the debate) served as coordination points for the work of the coalitions at both levels. The existence of coalitions allowed actors to make an efficient use of their resources by joining efforts with other actors to achieve a shared goal.

Strategies: attempts to influence the direction of the process

Three types of strategies were identified. First, unilateral strategies sought to advance individual goals in spite of the interdependencies. They were used to kick-start decision-making processes (such as Cuadrilla's actions to start its planning applications), and to change the rules of interactions by means of the formal procedures (such as the UK's Department for Communities and Local Government's actions to fast-track fracking planning applications). Second, facilitating strategies attempted to facilitate cooperation to achieve mutually beneficial solutions. They were used to promote agreements regarding the execution of procedures (such as the agreements made in the Pre-Inquiry Meeting during the appeal process). Third, reciprocal strategies attempted to open up the definition of problems and solutions to block or advance specific positions in the debate. They were used to challenge the legitimacy of decisions, to form coalitions between actors, to raise complexity by including new definitions problems and solutions (such as the pro-fracking conferences for supply chain development for shale gas) and to communicate strategic information (such as the publication of reports supporting actors' positions). Reciprocal strategies were dominantly used throughout the decision-making process, which evidenced actors' awareness of their interdependencies.

Results: Shaping the rhetoric use of values in the public debate

Once the different aspects of the decision-making process were described, the values expressed by actors in the public debate were identified. Public values were defined as general and non-negotiable convictions or beliefs of what actors' think is worth striving for society to be good. The value identification process let to the identification of values based on two categories: substantive and procedural values. Substantive values were related to the technology and the effects of the project. Procedural values were related to the nature of the rules, regulations and procedures present in the decision-making process. In the public debate for shale gas in Lancashire, seven substantive values (Stability, Resource durability, Environmental friendliness, Aesthetics, Health & safety, Ownership and Welfare) and five procedural values (Accountability, Transparency, Subsidiarity, Distributive Justice and Procedural justice) were identified.

Rhetoric use of values: dynamics of value expression

Four values were identified as most frequently mentioned in the debate on shale gas in Lancashire: Accountability, Welfare, Environmental friendliness, and Health and safety. The emphasis on these values was stable across the different rounds. The substantive values of Welfare, Environmental friendliness, and Health and safety were related to the main concerns expressed by actors in the debate regarding the benefits and impacts of shale gas. The procedural value of Accountability was associated to the execution of formal procedures. In contrast, values such as Stability and Resource Durability had low emphasis. Even though these values may be considered relevant for the development of energy projects, it seems that the decision-making dynamics served as filter to neglect them.

Furthermore, the intensity of the expression of the procedural values of Accountability, Procedural justice and Transparency was found to be related to the outcomes and instances of the formal procedures for the project and changes in regulations. In turn, some values gained emphasis at different rounds due to developments in the decision-making process. For

example, the value of Aesthetics gained relevance in Round 3, when the debate focused on project specific issues such as traffic and visual impacts. Formal procedure's influence in the intensity has two implications. It pinpoints the role of formal procedures as triggers of the expression of values. It highlights the importance of an open deliberation around these procedures to allow the inclusion of the public values in the process.

Rhetoric use of values in arenas

All the identified values were expressed in several arenas at the same time. Due to their focus on specific topics, arenas may trigger the exploration of different aspects of the values under expression. For example, the value of distributive justice may be related to both discussions of financial compensations (in the context of financial regulations) and discussions of spatial distribution of risks (in the context of project definition). These conceptualizations may also reveal the prioritization of some values within the arena. They can also reveal possible value conflicts between arenas. Furthermore, the relevance given to specific values may be related to the power constellation of actors in the arena. Actors could also bring other topics for consideration in the arena. However, the probability of the associated values to gain momentum was limited if they could not provoke a response from other actors. This may explain the low expression of the values of Resource durability and Stability.

Rhetoric use of values by coalitions

The existence of coalitions was not connected to shared values but to shared interests and goals. This allowed the interaction of actors with different values. All the groups of actors expressed the full range of identified values throughout the decision-making process. Moreover, actors in all coalitions gave similar importance to the value of Procedural justice, but had different perspectives of its implications for the development of the decision making process. For example, Cuadrilla referred to the appeal decision as the following step of the democratic process, while anti-fracking campaigners portrayed it as a disregard for previous public consultation processes. The expression of the full range of values was especially visible in the boundary spanners. This would imply that they might act as collectors of the values expressed in the different coalitions. In this sense, coalitions serve as a space for magnifying the values that are relevant for their members into the public debate.

Rhetoric use of values through strategies

Different alternatives were identified for the expression of values associated to the use of strategies and the reactions of other actors to their use. Few strategies triggered a consonance between the values expressed in the input and reactions. Generally, the values expressed as input could have gotten three possible responses as reaction: a higher number of values, a lower number of values or no response at all. Additionally, strategies could trigger reactions without values being expressed through the inputs. This mismatch could indicate that the polarization of the debate led to a dialogue of the deaf between the different parties. Actors may not respond to the values expressed by the other actor, but instead to their own interpretation of what the other actor is saying. In addition, the lack of facilitating strategies impeded the development of a common understanding between different actors. Therefore, even though unilateral and reciprocal strategies may facilitate the expression of a variety of public values, the lack of facilitating strategies halted the possibilities for cooperation.

Conclusion

The rhetoric use of values refers to the expression of values in the debate. The dynamics of the decision-making process might shape the expression of values in three ways. First, strategies may act as triggers for actors to highlight specific values or conceptualizations of values. Second, arenas constrained the expression of (conceptualizations of) values according to the topic under discussion. In addition, not all actors can participate in the different arenas, which might limit their participation in the articulation of values of the different arenas. Finally, coalitions acted as platforms for actors to express the different conceptions of values through the execution of join actions.

Recommendations for the use of the public debate as a source of values

- The legitimacy of the identified values needs further attention. Further research is recommended on how to manage and which are the effects of power disparity and framing in the process of value identification.

- The connection between the presence of elected officials and the expression of public values deserves further research, especially in relation to the methodological challenges to identify possible arenas for value identification.
- The dynamics that lead a value to gain momentum need further research. In particular, regarding how different conceptualizations of values interact for a value to gain momentum in the debate.
- For methodological development, further research is recommended regarding the dynamics of actors' participation in different arenas and the changes in value conceptualizations within and between arenas.
- Further work is needed in understanding the implications of the existence of arenas for the process of design in VSD.
- As a means to ensure the inclusion of a variety of values in the design, the identification of the potential boundary spanners is highlighted. For this purpose, the execution of social network analysis is recommended as a way to reveal the interdependencies between actors.
- One often implicit factor of the value identification process, is the role of the design team, which is responsible for the process of value identification. Due to the legitimacy challenges that can be associated with the process of value identification, it is advised for VSD to build upon the literature on management of networks to gather lessons on how to allow a deliberative environment in the midst of interconnected actors with resources and power imbalances.
- The openness of National Governments to open the design of their institutions to a VSD approach needs to be assessed. This is desirable, but not necessarily feasible. Questions regarding under which conditions Governments would be willing to open the deliberation of the institutions and how to incorporate a value perspective in the formal policy-making process would need to be addressed.

Recommendations for the responsible governance of energy projects

- Responsible innovation requires the Government's willingness to open sensitive governance issues (such as the energy policy) to deliberation. Research is recommended on the feasibility of that and, if feasible, on how to develop the needed capabilities to respond to these challenges.
- The responsiveness of the regulatory system to the processes of public participation needs more attention. Further research could be focused on the needed conditions and capabilities for the regulatory system to adapt to the level of participation raised by controversial applications.
- Regulators are relevant for the accountability of the actions executed in the implementation of energy projects. The role of regulators and the desirability of having one sole regulator or a variety of them needs further attention. Further research may be useful regarding the influence of the capabilities of reflection and responsiveness for the definition of the role of regulators for energy projects.
- More attention is needed to the processes of knowledge generation in relation to the inclusion of divergent normative perspectives in the governance of energy projects. Further research is then recommended on the influence of the different types of knowledge to the formation of discourse of actors.

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"Wherever you go, go with all your heart."

Confucius

For me, the value of experiences is given by the amount of learning you can get from them. Executing this project has been a journey of self-reflection on my skills and competences as a researcher, anticipation of future challenges associated to the decisions taken, deliberations about the implications of my research and responsiveness to the challenges I encountered on my way. During this time, one of the most rewarding discoveries I made was realizing the strength of my support network. Therefore, I would like to extend my gratitude to them.

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CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

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1

RETHINKING THE GOVERNANCE OF ENERGY PROJECTS

In order to attain their greenhouse gas (GHG) emissions targets, governments are developing policies that simultaneously address and balance the three dimensions of the energy trilemma: energy security, energy equality and environmental sustainability. This implies providing reliable, affordable and low emissions energy to satisfy the needs of their populations. In that light, countries aim at capitalizing on existing and new low-carbon energy technologies, which is crucial for their social and economic development. Among others, opportunities are found in technological and cost breakthroughs in renewable energy and in shale gas discoveries (World Energy Council, 2013).

However, the selection and implementation of energy technologies to be used in a country's energy mix is not simple. In fact, many energy projects have failed as they have been surrounded by controversy in their decision-making process (Cuppen, Brunsting, Pesch, & Feenstra, 2015). One of the major reasons for such controversy is normative diversity, which relates to the variety of actors that are involved in the process. These actors all have different perspectives on the direction, speed and means of energy transitions (Stirling, 2009), and attempt to influence the decision-making process according to their own values, interests and resources. During the course of controversies, actors mobilize around emergent interests related to the impacts and benefits of energy projects (Cuppen, Pesch, Taanman, & Remmerswaal, Forthcoming).

Actors in the energy domain may perceive controversies as barriers for the implementation of energy projects. Nevertheless, controversies can also provide opportunities for the articulation of conflicting public values at stake, which are expressed in the public debate as a result of actors' interactions (Dignum, Correljé, Cuppen, Pesch, & Taebi, 2015). Public values are defined here as people's general and non-negotiable convictions or beliefs of what is worth striving for in order for society to be good. In decision-making processes, actors can be faced with two forms of interactions: formal and informal (Cuppen, Correljé, Pesch, & Taebi, 2015; van Popering-Verkerk & van Buuren, 2016). Formal interactions are structured by a system of rules and institutions that allow to evaluate the desirability of (a decision on) an energy project (e.g. assessment procedures,

decision-making rules and procedures). In contrast, informal interactions are rather unstructured and allow the public to establish an opinion regarding the energy project (e.g. discussion meetings, (social) media). While formal interactions only give space to the articulation of a predetermined set of values, informal interactions allow the inclusion of a greater diversity of existing and emergent values (Cuppen, Correljé, et al., 2015).

In that line (of reasoning), the project *RESPonsible innovation: linking formal and infOrmal assessmeNt in deciSion-making on Energy projects* (RESPONSE), of which this thesis project is part, takes the perspective that the assessment of public values occurs at both levels; formally through assessment procedures and informally through controversies reflected in the public debate. The RESPONSE project applies the notion of responsible innovation to the development and implementation of energy projects (Cuppen, Correljé, et al., 2015). Responsible innovation is defined by von Schomberg (2011) as "a transparent, interactive process by which societal actors and innovators become mutually responsive to each other with a view to the (ethical) acceptability, sustainability and societal desirability of the innovation process and its marketable products (in order to allow a proper embedding of scientific and technological advances in our society)."

For the RESPONSE project, responsible innovation is understood as an endorsement of the relevant public values associated to the process of innovation, development and implementation of an energy technology (Taebi, Correljé, Cuppen, Dignum, & Pesch, 2014). In that light, responsible governance of energy projects implies creating strategies and solutions to accommodate the variety of values at stake (Correljé, Cuppen, Dignum, Pesch, & Taebi, 2015). Governance is understood here as the mechanisms, processes, relationships and institutions through which states, markets, citizens and organizations articulate collective interests, establish rights and obligations, and mediate differences (United Nations Economic and Social Council, 2006).

This thesis project is based on the recognition that the dynamics of the decision-making process of energy projects are related to the interplay between formal and informal interactions (van Popering-Verkerk & van Buuren, 2016). Moreover, responsible innovation adds a normative dimension to the governance of energy projects. It encourages deliberation of normative diversity associated to energy projects to 'open up' diverging possible development pathways of energy technologies (Stirling, 2008). This perspective accepts that controversies cannot be avoided due to the uncertainties associated to energy projects. Hence, it is deemed necessary to explore the normative diversity associated to the dynamics of decision-making processes of energy projects as a way to contribute to their responsible governance (this argument will be elaborated upon in Section 1.3).

In that light, a case study provides the necessary elements to facilitate an in-depth exploration of the dynamics of a decision-making process. A key selection criterion for the case is the presence of controversy associated to the implementation of an energy project. The presence of the controversy allows for the expression of the normative diversity present in the decision-making process. Hence, the expression of public values can be analysed as part of the wider dynamics of the decision-making process. The exploration of shale gas in Lancashire, UK is an exemplary case of high levels of controversy in the decision-making process. The uncertainties related to the deployment of hydraulic fracturing have been at the centre of the public debate since the occurrence of two earth tremors in 2011, which were related to the first attempt to use the technology in the UK (Selley, 2012). In the remainder of this chapter, the characteristics of the case will be used to articulate the research problem at hand.

This introductory chapter presents the articulation of the dynamics and characteristics of the research problem at hand, which will lead to the definition of the research framework. First, section 1.1 highlights the particularities of the Shale Gas debate in the UK. Base don the particularities of the case, section 1.2 introduces the challenges that are associated to the endorsement of public values promoted by responsible innovation and the concept of rhetoric use of values as a focus for the analysis of the normative diversity brought about by controversies. Then, section 1.3 argues that, for the concepts of responsible innovation to be applied to the governance of energy projects, an understanding of processes of decision-making in networks is necessary to face the challenges

brought about by the identification of values in the public debate. In that light, section 1.4 presents the research framework that sets the scope of the research and its connection to relevant theories. Finally, section 1.5 connects the research framework to the remaining of this report by introducing the research plan that was followed to answer the questions triggering this research.

1.1 The complexities of shale gas exploration projects in the UK

Shale gas consists mainly of methane that is trapped within fine-grained sedimentary rocks called shale, which are found deep in earth (e.g. 2000-4000 m). Shales were formed from deposits of mud, silt, clay and organic matter, and have very low permeability, which makes shale gas extraction difficult (Bickle et al., 2012; Blake, 2016; Prpich, Coulon, & Anthony, 2015). Shale gas is the most common unconventional natural gas resource. Hence, in spite of its abundance; its production is economically unfavourable using conventional recovery methods. Therefore, hydraulic fracturing (from now on referred to as 'fracking') is necessary to stimulate extraction flow by increasing permeability (Blake, 2016; Prpich et al., 2015). Fracking "involves the injection of water, sand and chemicals at high pressure into horizontally drilled boreholes. This pressurized mixture causes the shale to crack. These fissures are held open by the sand particles so that the methane can flow up the borehole" (British Geological Survey, 2016). The combination fracking and horizontal drilling technology created an upsurge in shale gas' developments worldwide (Prpich et al., 2015). According to the British Geological Survey, estimates of technically recoverable shale gas resource in Bowland Basin in the UK ranges between 23.3 and 64.6 trillion cubic metres (Andrews, 2013); which has the potential to generate tax revenues of around £580 million per year by 2020 (Deloitte, 2013).

The first assessments of potential shale gas resources in the UK were done in 1985, but these were confronted with little interest from the Department of Energy to even publish the results (Selley, 2012). However, in the early 2000s, the potential for shale gas production in the UK was further enhanced for two reasons (Hays, Finkel, Depledge, Law, & Shonkoff, 2015; Selley, 2012). On one hand, the developments of the shale gas industry in the US provided the needed technological and economic feasibility, and generated an interest on obtaining similar economic benefits. On the other, the decreasing production of oil and gas in the North Sea reserves triggered the government to seek for new energy sources. Therefore, in 2006, during UK's 13th round of onshore oil and gas licensing, several companies were interested in exploring the resource. This process led to the construction, in 2010, of the first (and only) exploration well in the UK by the company Cuadrilla Resources Corporation. The site is located near the town of Blackpool in the county of Lancashire (Selley, 2012).

However, these exploration efforts attracted strong environmental lobby against fracking based on negative environmental impacts already visible in US and Europe (Selley, 2012). Furthermore, the occurrence of two seismic tremors in Lancashire led to a moratorium on the technology in 2011, which was removed 18 months later following the recommendations given by a series of research reports on resource estimates (Andrews, 2013), engineering safety (Bickle et al., 2012) and fracking's seismic risks (Green, Styles, & Baptie, 2012). Additionally, the government introduced new regulatory requirements for the mitigation of seismic and water contamination risks and a series of economic incentives for industry development (Cotton, 2015). As an attempt to restart the exploration of shale gas in the UK, Cuadrilla Resources Corporation proposed the development of two sites in Lancashire (Roseacre Wood and Preston New Road) in 2013 (See Figure 1-1). The project has evolved towards a fierce nation-wide controversy, which remains open at the time of the writing of this report.

Figure 1-1. Location of the two sites for Cuadrilla's project in Lancashire

In the UK, both the exploration of shale gas resources and the use of fracking as extraction technique are surrounded by a variety of uncertainties. First, resource evaluations are largely indeterminate. Hence, exploration projects need to be performed to determine the resources available for commercial exploitation (Hays et al., 2015). Second, the impacts and benefits of fracking are subject to extensive debate. On one hand, benefits are claimed in terms of economic growth, job creation, and energy security. On the other, concerns are expressed in terms of environmental impacts, seismicity, aesthetic aspects of the rural areas, human health, and social impacts on surrounding communities (Cotton, 2015; Hays et al., 2015; Jaspal, Turner, & Nerlich, 2014). Third, the debate takes place in the wider context of the UK's energy transition and shale gas' real contribution to climate change. Discussion focus on methane's potential as GHG, lifecycle analyses of shale gas exploitation and the role of shale gas in a low-carbon energy future (as bridge or barrier) (Cotton, 2015; Hays et al., 2015; Spataru, Drummond, Zafeiratou, & Barrett, 2015). Finally, the strength and capacity of the regulations to minimize health and environmental hazards of fracking are contested, based on experiences in the US (Hays et al., 2015).

Shale gas is seen as a new energy resource for the UK (Spataru et al., 2015), however, it has been a source of controversy since its initial developments. Some researchers have already started to explore social issues related to the early development of the technology in the UK context. Analysis have been focused on discourse development around fracking (Cotton, 2015; Cotton, Rattle, & Van Alstine, 2014; Jaspal & Nerlich, 2013; Upham, 2015), coalition formation in policy development (Cairney 2016), values for energy system change (Demski, Butler, Parkhill, Spence, & Pidgeon, 2015) and public perception (O'Hara, Humphrey, Andersson-Hudson, & Knight, 2015; Whitmarsh, Nash, Upham, Lloyd, & Verdon, 2015; Williams, Macnaghten, Davies, & Curtis, 2015). From these studies, it can be concluded that there is a variety of discourses on fracking, which are competing to influence policy-making in the UK. Moreover, the public is ambivalent regarding their perception of shale gas, although a more negative perception is starting to be developed.

In that light, the current institutional framework is deemed unsuitable to deal with the normative diversity to address the controversy triggered by the exploration of shale gas in the UK. Claims of lack of trust and inclusiveness in institutions and decision-making instances reinforce debates on procedural and distributive justice. However, most of these studies do not analyse the evolution over time of the issue. They either analyse a cumulative set of events at one point in time or collect data that reflects the public debate at that time. They used methods for data collection such like

focus groups (Williams et al., 2015), surveys (Cairney 2016; Cotton, 2015; Whitmarsh et al., 2015), combinations of workshops and surveys (Demski et al., 2015), and interviews (Cotton et al., 2014). Hence, they do not allow for an understanding on the dynamic aspects of the controversy and the relationship between public understandings, institutional behaviour and decision-making processes. The latter specially in relation to the institutions' willingness or ability to recognize and include the variety of public values and meanings at stake in the public debate (Williams et al., 2015).

This section has presented the context in which the exploration of shale gas in the UK is taking place. Both normative and scientific uncertainties were identified in relation to the benefits and impacts of fracking. Moreover, Cuadrilla's project aiming for the development of the sites of Roseacre Wood and Preston New Road has been selected as focus of analysis. The following section will take the debate on shale gas in the UK as a basis to present some of the key challenges associated to the endorsement of public values promoted by responsible innovation.

1.2 The challenge of including values in the development of energy projects

The conceptualization of responsible innovation as an endorsement of public values allows for the value-sensitive design (VSD) approach. which argues for a transparent and comprehensive methodology concerning the articulation of values as central to the design process of new technologies (Friedman, Kahn, & Bornin, 2006; van den Hoven, 2013). However, values are at stake not only in the design of technologies, but also in their implementation process. In that light, Dignum et al. (2015) argues that the inclusion of public values should also be extended to the design of the institutions in which the technology is to be embedded. Institutions refer to ''humanly devised constraints that structure political, economic and social interaction'' (North, 1991, p. 97). For the case of fracking, there are concerns regarding the suitability of the UK's regulations to safeguard values of safety and environmental protection. In addition, issues of accountability have also been raised due to the lack of an independent regulatory body overseeing the shale gas developments in the UK (Hays et al., 2015). By including the relevant public values at stake in the design of institutions, especially formal ones, they can provide the conditions for more democratic and socially accepted technologies and projects by allowing the inclusion of new normative imperatives (Correljé et al., 2015).

Moreover, as explained earlier, controversies are about value conflicts. Value conflicts occur when solutions aimed at safeguarding one value deemed as relevant for some actor(s) are perceived as a threat for safeguarding another value considered relevant for other actor(s). One example is found in the apparent conflict between the values of energy security and environmental protection regarding the desirability of fracking in the UK. In addition, in their research on the shale gas debate in The Netherlands, Dignum et al. (2015) evidenced the existence of another kind of value conflict, which occurs when both proponents and opponents of a project seem to endorse the same values. In these cases, contestation seems to arise from the divergent conceptualizations of the same value. Conceptualizations refer to different understandings on how the value could be served best. One example is found in the debate around the value of safety in fracking, which is related to both (i) introducing measures to monitor possible groundwater contamination from drilling and (ii) stopping fracking activities completely to avoid groundwater contamination. The existence of this kind of value conflict increase the complexity around the design of institutions, as the mere inclusion of relevant values is not enough. Therefore, there is a need to explore the different conceptions of values among the diversity of stakeholders and include them in the decision-making processes to enhance legitimacy (Dignum et al., 2015).

Another factor influencing the controversy in energy projects is the multitude of governmental levels involved in the decision-making process. There is an asymmetry in the allocation of responsibilities between local and national authorities. While the former evaluates the risk associated to specific projects in their vicinity, the latter define the general acceptability of the technology as part of the country's national energy policy (Correlje & Groenewegen, 2009; Pesch, Correljé, Cuppen, Taebi, & van de Grift, Forthcoming). In the case of shale gas in the UK, the national government has been

explicit in their interest for the adoption of shale gas in its energy mix. This is evident in the Prime Minister David Cameron's declaration that his government is "going all out for shale", to ensure the UK's energy and economic security (Watt, 2014), as well as in the general commitment of his government to support the shale gas industry's development (Hope, 2016). In turn, in Lancashire, the Cuadrilla-led project has triggered controversy and local authorities denied planning permits due to the project's possible impact on surrounding communities (Gosden, 2015). Consequently, many problems of societal acceptance have arisen due to misalignment in the distribution of cost and benefits, and the public's limited possibilities to influence the decision-making process. One example is found in the contestation of the role of shale gas as part of the UK's energy mix, as its public acceptance has been decreasing over the last two years (O'Hara et al., 2015).

Nevertheless, the inclusion of public participation in formal procedures does not guarantee the influence of civil society on the governance of energy projects as public participation activities entail more complexity than what is defined by the legislation. On one hand, practitioners face difficulties to agree on the meaning, objectives and adequate representation of the public. They also recognize several factors affecting the outcomes of these activities, such like informal communication, insufficient information and actor's willingness to make commitments (Glucker, Driessen, Kolhoff, & Runhaar, 2013; Martin & Morrison-Saunders, 2015; Rega & Baldizzone, 2015). On the other hand, actors have different understandings of what public participation entails. If no attention is paid to their divergent views and expectations, actor's willingness to participate may decrease, which affects the effectiveness of the procedure (Glucker et al., 2013). Therefore, there is a need to extend the inclusion of values in the design of the interactions between actors that may lead to opening up deliberations regarding value conflicts (Correljé et al., 2015).

The deliberation about values associated to energy projects are then relevant for the design of the technology, the institutions surrounding the technology and the instances of interaction between actors. However, a challenge remains regarding the identification of values that are expressed through the deliberations during the controversy. Dignum et al. (2015) recognize the identification of relevant and potentially conflicting values as one of the central methodological challenges of VSD. Their approach for solving it was to propose an explorative method for a structured identification of public values and their conflicts by using data from the public debate. This approach assumes that, when presenting their arguments in the public debate, actors may make value claims. Such claims are characterized by their reference to specific values that the actor attempts to include or highlight in the deliberations. In this thesis project, the expression of value claims as part of an actors' discourse is termed as *rhetoric use of values*.

This section has presented the different areas of an energy project that are associated to the deliberation of divergent public values held by different actors. The inclusion of values for the implementation of energy projects is central for responsible innovation. The identification of complexities in the institutional context of energy projects serves as a means to discern what responsible may entail for the responsible governance of energy projects. Based on the concept of rhetoric use of values, the next section will explore the challenges of analysing this concept in the context of the wider dynamics of the decision-making process. The case of shale gas in the UK will be used to support the line of reasoning.

1.3 The need to explore decision-making dynamics for the responsible governance of energy projects

The implementation of energy projects is related to a network of actors, which is composed of companies, civil society organizations, environmental organizations, government entities, among others. Decision-making processes in networks require all actors to cooperate for it to be effective, but tend to be capricious and unstructured due to several attributes of networks. Firstly, networks are characterized by a variety of actors, interests, means of power, etc., which give rise to differences that can hamper cooperation. Secondly, actors in networks are mutually dependent to reach their goals, which can compromise the speed and quality of the process. Thirdly, actors can

have a closed attitude against an intervening actor that does not fit their inner values, which limits interactions. Finally, networks are dynamic, which implies that actors' positions and level of participation are constantly changing (de Bruijn & ten Heuvelhof, 2008). Therefore, the interactions in network settings increase the complexity of the identification and inclusion of values into the decision-making process.

The formal instances of the decision-making process (e.g. permitting and assessment procedures) may also trigger or feed controversies in energy projects. In the case of shale gas in the UK, the government defined a set of formal procedures to guide the exploration activities. However, issues of procedural justice have emerged and gained strength due to sudden modifications in such procedures. These situations may lead a diversity of actors to feel underrepresented or excluded in the decision-making process and start using their means to try to advance their claims. For example, Greenpeace built a fracking rig in front of the parliament to protest against excessive government support for fracking (Osborne, 2016). Actors might not only seek to influence the means but also the ends of the process by using the social debate to open up the discussion towards the desirability of a project (Ferreiro, Gonçalves, & Costa, 2013). In those discussions, actors express the values that they consider pertinent as an attempt to open up the debate to new issues and perspectives.

Responsible innovation is a dynamic process of technological innovation, in which "public values have to be appropriately incorporated during the design process" (Taebi et al., 2014, p. 119). To achieve this goal, the public values at stake need to be identified. As controversies provide an opportunity for the articulation of the normative diversity, the public debate has been presented as a source for the identification of public values. However, the use of this source brings new challenges. The representation of the public debate is accompanied by the implicit assumption that *the implementation of energy projects refers to one decision, which is made through the interactions of one group of actors in relation to a particular set of values*. Yet, this is a rather simplified view of the implementation of energy projects. These projects have different dimensions, such as energy security, safety, economy, planning and zoning, among others. Thus, they are connected to the different processes of policy-making, which may occur at different governmental levels. Consequently, *energy projects are rather implemented through a series of intertwined decisions regarding different characteristics of the project and the institutions in which the technology is to be embedded* (see Koppenjan and Klijn (2004)).

In addition, there is not a single group of actors relevant for the implementation of energy projects. Each decision is related to different sets of actors who join the process according to their interests and means. Actors may express different values or different conceptualizations of the same value according to the decision that is under discussion. This multiplicity of decisions, groups of relevant actors and sets of (conceptualizations of) values poses a series of challenges for scholars concerned with the identification of values in the public debate. These challenges are related to the following questions: *How to decide which decisions to focus on for the identification of values? Which groups of actors and (conceptualizations of) values to include in the design process for technology and its related institutions? How to identify the value conflicts present in the different dimensions of the project? How to include values in the design of the technology and its surrounding institutions if they are defined in a series of interconnected decision-making processes?*

Beyond methodological issues, this situation raises new challenges for the identification of relevant public values in the public debate. The politics involved in the decision-making process may influence how values are articulated and when. Power imbalances may lead to emphasis on the values of powerful actors in the public debate. In addition, the process of agenda setting within arenas may encourage the expression of the values that "fit" the topic under discussion, while others remain hidden. Hence, the most frequently expressed values might not reflect the most relevant values from a democratic perspective. In fact, if the expression of values depends on specific groups of actors interacting at particular times and places, the legitimacy of the identified values might be contested. Hence, questions might be raised regarding which values are truly relevant for the implementation of energy projects. Based on these insights, the knowledge gap can be expressed as:

Knowledge gap	The identification of public values in the public debate requires insights in how the wider dynamics of a decision-making process influences the expression of values in the public debate. Beyond methodological challenges, issues of power and agenda setting may lead to the contestation of the legitimacy of the identified values.

In this context, the importance of understanding the dynamics of decision-making processes for the responsible governance of energy projects is highlighted. Insights are needed on how to deal with the multiplicity of decisions in relation to the identification of public values. Hence, this thesis project aimed at exploring this issue. The dynamics of the decision-making process for the implementation of energy projects are recognized to entail several aspects. The identification of values in responsible innovation is focused on one of such aspects: the public debate. However, the public debate occurs in connection with other aspects of the decision-making process (See Figure 1-2). This project addresses three of them: *coalitions*, *arenas* and *strategies*. *Coalitions* refer to a set of actors that coordinate their efforts and resources in attempt to steer the decision making process in a desired direction (Sabatier, 1988). *Arenas* are spaces in which actors interact to make decisions regarding specific subjects related to the energy project (van Bueren, Klijn, & Koppenjan, 2003). *Strategies* refer to interventions aimed at influencing other actors or the course of the decision-making process (de Bruijn & ten Heuvelhof, 2008; Koppenjan & Klijn, 2004). These three aspects are assumed to interact with the developments in the public debate and, hence, the rhetoric use of values by different actors. A research gap is identified in the need to explore how these three aspects of the decision-making process are related to the rhetoric use of values (the concepts introduced in this paragraph will be elaborated further in chapter 2).

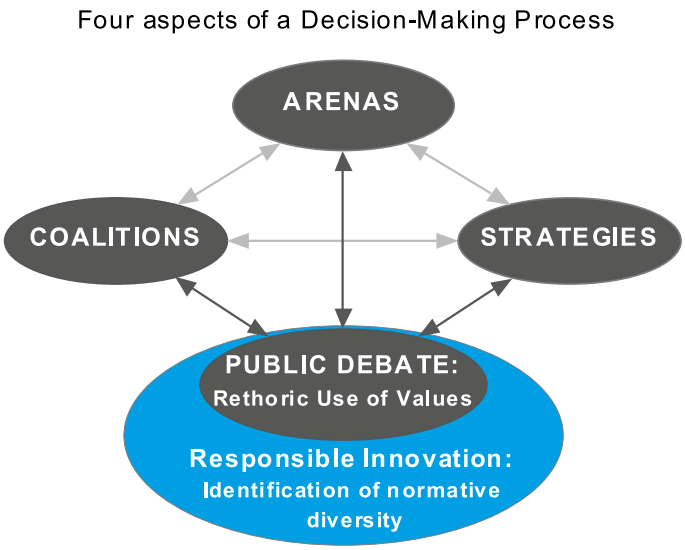


Figure 1-2. Relation between the different aspects of decision-making processes. Arrows in dark grey are the focus of analysis

Actors' use of strategies to attain their goals is expected in decision-making in networks, as there is a diversity of interests at stake and limited resources under debate. Moreover, the controversy is characterized by the emergence of conflicting values in different stages of the decision-making process as it moves to different arenas (from local to national level, for example). As different actors have access to different levels of resources (capital, knowledge, connections, authority, among others), power imbalances can arise concerning the possibility to influence the decision-making process. Hence, some actors form coalitions in an attempt to advance their common goals in spite of the power imbalances. This research assumes that the changes on each of these aspects can be

associated to changes in the rhetoric use of values by actors. This can be seen for example with the emergence of new values in the debate or of new conceptualizations of values in relation to changes in the other aspects. Furthermore, actors may express values for instrumental or normative reasons. The former refer to the expression of a value as a mean to advance specific goals. The latter refer to the expression of values as a reflection of the actor's principles in life. This thesis did not make any assumption regarding the reason behind the expression of values by the actors in the debate. The researcher did not have enough elements to discern the intentionality behind the expression of values in the public debate of shale gas in the UK.

This section presented the research gap that guided this research. The identification of public values was related to different groups of actors taking decisions at different levels with respect to different issues, which are all connected to the implementation of energy projects. This perspective is connected to three dynamic aspects of the decision-making processes: arenas, coalitions and strategies. Hence, it is seen as necessary to generate insights on how they interact with the rhetoric use of values in the public debate. Moreover, even though is recognized that the conceptualizations of values may also change over time, in this thesis the discussion on the normative diversity in the public debate will be kept at the level of values rather than conceptualizations. This implies that the overall public values that are expressed in the public debate will be identified without going into details on the specific conceptualizations attached to them. Due to the current developments in energy projects, it was considered that both theoretical fields (responsible innovation and decision-making in networks) could benefit from this research, as there is a need for a more responsible governance of energy projects. A process that would not seek to eliminate controversy, but to guarantee a level playing field in which a common understanding could be created regarding how countries could make decisions to face the energy trilemma.

By contributing to the research of the RESPONSE project, this thesis project aims to support the responsible governance of energy projects, which can contribute to the sustainable energy transition that is needed in society. The understanding of different aspects of controversy surrounding the development and deployment of new technologies is considered crucial for achieving such goal. The following section presents the scoping of the research, which led to the research questions guiding the analysis.

1.4 Research objectives and questions

The objective of this research is to contribute to the understanding of how complex decision-making dynamics in networks influence the application of responsible innovation notions for the responsible governance of energy projects. This is done by means of an empirical exploration of how the expression of public values in the public debate interacts with the wider aspects of the decision-making process on shale gas in Lancashire, UK. These aspects include the locations for decision-making (arenas), the coordination between actors (coalitions) and the interventions aimed at steering the direction of the process (strategies).

In order to operationalize the objective, the following research question was defined:

How has the rhetoric use of values been shaped by the arenas, coalitions and strategies in the decision-making process on shale gas in Lancashire, UK?

The following set of sub-questions was proposed to answer the main research question:

1. How can network theories be used to analyse the decision-making process in relation to the requirements of responsible innovation for the governance of energy projects?
2. What arenas, coalitions and strategies can be identified in the reconstruction of the decision-making process on shale gas in Lancashire?
3. What values have been expressed in the public debate during the decision-making process on shale gas in Lancashire?
4. How have values been expressed in the arenas, by coalitions and through strategies?
5. Based on these insights, what recommendations can be given for the responsible governance of energy projects?

1.5 Roadmap for the reader

Based on a combination of theoretical and empirical focuses, this research intended to draw recommendations to support the application of responsible innovation notions for the responsible governance of energy projects. This report summarizes the analysis that was carried out in order to reach such goal. This introductory chapter presented the basis for developing and scoping the research based on the identified research gap. Next, chapter 2 will provide the concepts needed to understand and analyse processes of decision-making in networks according to both a descriptive and a normative perspective. Afterwards, chapter 3 will present the methodological tools used to gather and organize the data needed on the case of shale gas in Lancashire. Subsequently, chapter 4 will present the findings of the research in the form of a reconstruction of the decision-making process in which events and actors' interactions different levels of complexity. Later, chapter 5 will analyse how these findings are connected to the rhetoric use of values during the decision-making process. Then, chapter 6 will present the recommendations and conclusions that can be drawn from the previous analysis. Finally, chapter 7 will introduce reflections of the author inspired by the development of this research.

Figure 1-3 presents the framework that was followed to perform the research and to write the building blocks of this report. As can be seen, the research was based on two parallel and intertwined focuses. On one hand, a theoretical research of key concepts of the theories of responsible innovation and decision-making in networks was done to build the conceptual framework for analysis. On the other, an empirical research on the case study of shale gas in Lancashire was performed to identify actors' interactions, events and values. The outcomes of both research focuses were used to perform the analysis of the decision-making process leading to conclusions and recommendations for the responsible governance of energy projects.

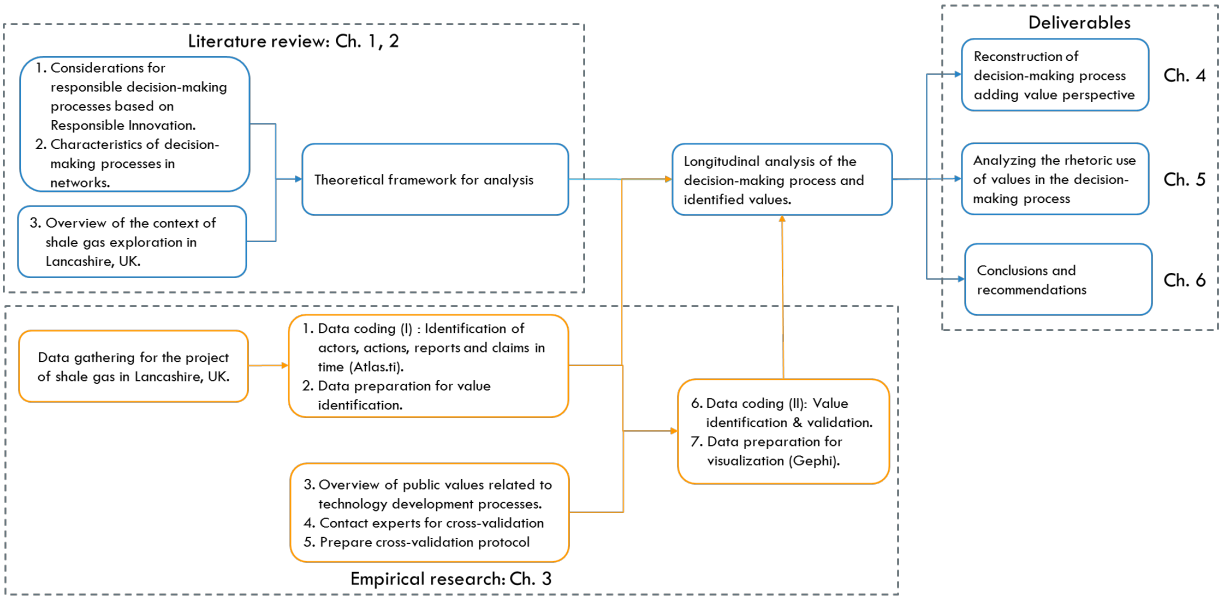


Figure 1-3: Research framework

2

BUILDING A CONCEPTUAL UNDERSTANDING OF DECISION-MAKING PROCESSES TO INTEGRATE NORMATIVE NOTIONS INTO THE ANALYSIS

From the research gap identified in chapter 1, it was indicated that an understanding of the dynamics of decision-making processes could provide insights for the responsible governance of energy projects. This chapter aims at providing the conceptual elements that are necessary for those insights to be collected based on a literature review of theories of decision-making in networks and responsible innovation. In order to do so, this chapter is focused on answering research question 1:

How can network theories be used to analyse the decision-making process in relation to the requirements of responsible innovation for the governance of energy projects?

The structure of this chapter provides the line of reasoning followed to provide an answer. As starting point, section 2.1 will focus on describing the characteristics of networks and their impact on decision-making processes. Then, it will be concluded that for performing an analysis of these processes, their reconstruction is necessary. Therefore, section 2.2 will suggest four methods available to reach such goal. Afterwards, section 2.3 will introduce the normative perspective of decision-making processes while highlighting the elements of decision-making in networks that are central to the methodological development of VSD. Finally, section 2.4 will present the model to be used and how it was adapted to be able to provide the desired elements for analysis.

2.1 The complexity of decision-making in networks

Over the past decades, public administration scholars have acknowledged that decision-making processes are becoming more complex (Teisman & van Buuren, 2012). The hierarchical structures, in which a central actor holds the steering capacity to define public policy problems and solutions, have been deemed inadequate to explain social processes occurring in an increasingly

interdependent and interconnected society. Nowadays, decisions are made in a society in which nobody is in charge; they are brought about by the interaction between actors with different and often conflicting rationalities, interests, resources and strategies (Crosby & Bryson, 1992; Kenis & Schneider, 1991; Kickert, Klijn, & Koppenjan, 2010). Consequently, two important sources can be identified for the increased complexity in decision-making processes: uncertainties regarding the dynamics and interdependencies in global networks and the power-sharing characteristics of the "network society" (Teisman & van Buuren, 2012).

A policy network refers to a decentralized concept of social organization and governance, in which control is dispersed among a multiplicity of action units, which are coordinated through the purposeful interaction of individual actors. Networks could be understood as "mechanisms of political resource mobilization in situations where the capacity for decision-making, program formulation and implementation is widely distributed or dispersed among private and public actors" (Kenis & Schneider, 1991, p. 41). The mobilization of resources is done through webs of ongoing relationships aiming to coordinate collective (or parallel) actions towards the solution of a common policy problem. An important advantage of using this concept is that it helps to understand not only the formal institutional arrangements but also the set of complex informal relations occurring in policy processes (Kenis & Schneider, 1991).

Networks are characterized by three elements. Firstly, a relatively stable set of actors. Secondly, linkages between actors that serve as communication channels and for the exchange of policy resources. Thirdly, the boundaries of the network that are set by processes of mutual recognition, which depend on functional relevance and structural embeddedness (Kenis & Schneider, 1991). Furthermore, the dominant decision rules and decision styles are often bargaining rather than confrontation. On one hand, the logic of confrontation inherently polarizes either/or relationships, which forces actors to choose sides. On the other, the logic of bargaining tend to stress common interests and unanimity. Moreover, due to dispersion in the capacity for collective action, decision-making and strategy formation processes in networks tend to be very time consuming. However, it is considered the only mechanism capable of mobilizing and pooling resources in contexts where policy resources are dispersed and actor's dependent (Kenis & Schneider, 1991).

The concept of networks is perceived as pivotal for managing decision-making processes, but not without criticism. On one hand, governance through networks might help solve wicked problems and enhance democratic participation in public policy-making. On the other, it may also create conflicts and deadlocks and make public governance less transparent and accountable, as decisions result from interactions between actors that are not necessarily elected to represent the interest of affected parties (Kickert et al., 2010; Sørensen & Torfing, 2009). Nevertheless, these criticisms are considered targeted at the existence of policy networks in the real world and not an inherent characteristic of them. These shortcomings could be avoided through proper network management (see de Bruijn and ten Heuvelhof (2008); Klijn, Koppenjan, and Termeer (1995); Rhodes (2008); van Bueren et al. (2003)). Therefore, the theoretical framework of the network approach is deemed suitable to open new perspectives on public policy making and its governance (Kickert et al., 2010).

For the case of shale gas in the UK, the National Government has been explicit in its intentions to include shale gas as part of UK's energy mix. However, interdependencies with other actors limit its capacity to achieve this goal (Parliament's approval of the proposed regulations, oil and gas companies willingness to invest in exploration projects, social license of the technology by civil society, etc.). Hence, the governance of exploration projects needs to recognize the opportunities and barriers arising from the associated network structures. Based on the assumption of increased complexity raised by the dynamics of policy networks, a following step would be to define how to deal with it or how to depict processes of decision-making in societies that are confronted with network structures. The following section will focus on which models can be used to describe, analyse and evaluate decision making in networks.

2.2 Models for the analysis of decision-making processes in networks

For the analysis of decision-making in networks, the decision-making process in the case of interest needs to be reconstructed. However, this reconstruction is selective in nature, since assumptions need to be made about its appearance. Such assumptions could be described in terms of models, which support the understanding of decision-making in distinctive yet partial ways (Teisman, 2000). This section presents four models that can be used for the reconstruction of decision-making processes in networks (See **Error! Reference source not found.**). Each of them presents their own logic in explaining the multi-actor setting of the decision-making process by focusing on specific aspects of it.

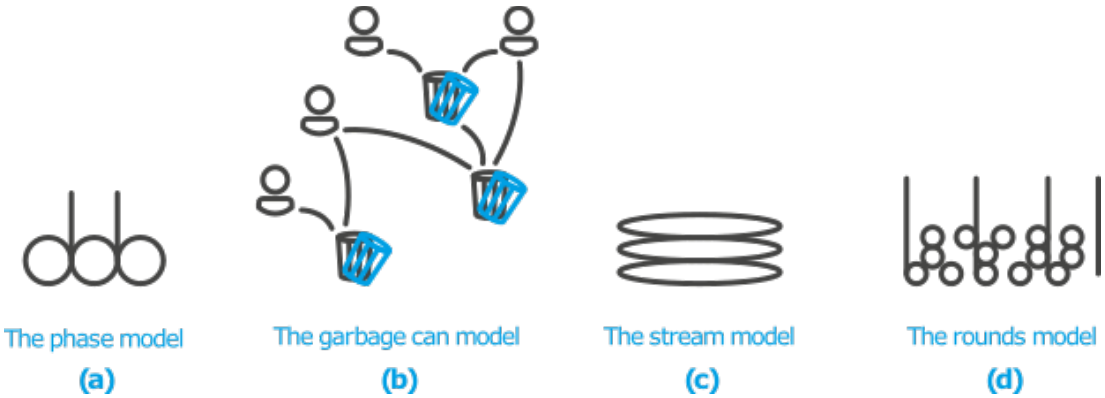


Figure 2-1. A depiction of the four models for the analysis of decision-making processes in networks: (a) The phase model: Distinct stages of formation, adoption and implementation; (b) the garbage can model: Garbage cans filled with various kinds of problems and solutions; (c) the streams model: Concurrent streams of problems, solutions and politics; (d) the rounds model: Series of interacting decisions taken by several actors (adapted from Teisman (2000) and Enserink et al. (2010).

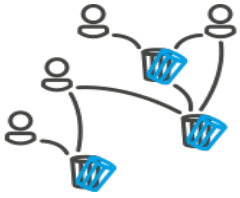
2.2.1 The phase model

The phase model represents decision-making processes as a succession of different stages in policymaking, which are interrelated but can still be conceived as distinct components of action. These stages are composed by situations related to (at least) the formation, adoption and implementation of policies. Each one has its specific characteristics and participants (Teisman, 2000). Even though the concept of phases may suggest a chronology, in practice the process is regarded as a cycle in which a number of iterations are possible (Crosby & Bryson, 1992; Enserink et al., 2010). Analysts using this model are aware that the process does not follow such a rigidly structured sequence in reality, especially in situations in which nobody is in charge. Nevertheless, the approach allows them to develop theories regarding the different stages (Crosby & Bryson, 1992; Teisman, 2000).

A characteristic of this model is that, from a situation originally unclear in nature, problem exploration activities are performed towards an unambiguous formulation of the problem. This step drives the rest of the cycle in order to define, adopt, implement and evaluate policy solutions. In addition, the evaluation is focused on the degree to which the solutions solve the problem effectively, efficiently and in a socially acceptable way. Its results are then used to improve the formulation of the problem. Problem formulation is seen as the first and most important step for

problem solving. Therefore, the phase model assumes decision-making as problem oriented (Crosby & Bryson, 1992; Enserink et al., 2010).

Even though decision-making is occurring in a multi-actor setting, this model assumes that there is, or should be, one focal actor whose decisions override those of others. Therefore, this actor determines the final definition of the problem and the policy to be adopted. Moreover, each phase is composed by decision-making moments that drive the process, in which a central decision is taken during the adoption as a transition from policy formulation to implementation (Crosby & Bryson, 1992; Teisman, 2000). Nonetheless, by assuming the existence of a focal actor, this model does not allow to fully understand the implications of policy making when the power is more evenly distributed among actors.



The garbage can model

(b)

2.2.2 The garbage can model

The garbage can model conceives the complexity of decision-making in situations of organized anarchies. These situations are characterized by the lack of consistent and clear hierarchy of objectives and preferences, absent or unclear routine procedures, and fluent participation of actors. The latter implies that participants are constrained in the time and effort they can devote to the different domains claiming their attention. Therefore, decision-making occurs in a context of goal ambiguity and diverse patterns of attention among participants (Cohen, March, & Olsen, 1972; Enserink et al., 2010; Mucciaroni, 1992).

Decision moments are depicted as garbage cans into which participants deposit various kinds of problems and solutions as they generate them. The content of a single can depends on the other cans available at that point in time, on the labels attached to these cans, on the production of waste and on the speed at which the cans are being emptied. Cans are emptied when a decision is made. In this setting, the result of decision-making is almost impossible to predict. It is the outcome of the interplay among several relatively independent streams within the organization: problems, solutions, participants and choice opportunities (Cohen et al., 1972; Enserink et al., 2010).

Furthermore, a partial uncoupling of problems and choices is allowed in this model, which challenges the logic of rational decision-making in which decision-making is though as a process for solving problems (Cohen et al., 1972).The garbage can model can explain unexpected or unanticipated outcomes in decision making processes (Enserink et al., 2010). However, its assumptions regarding attention patterns of participants fall short to include the influence of personal interests and values on the process. These factors can affect the willingness of actors to keep their attention on specific decisions in spite of their time limitations.

2.2.3 The streams model

The stream model

(c)

The streams model is also based on conceptions of organized anarchies. It describes decision making as a combination of three separate concurrent streams: problems, solutions and politics. Each stream has its own characteristics and dynamics. Therefore, they are not linked in any temporal sequence (Kingdon, 1995; Teisman, 2000). An issue is put on the decision-making agenda when there is a coupling of the three streams, which implies that “a problem is recognized, a solution is available, and the political climate makes the time right for change" (Mucciaroni, 1992, p. 460). Actors are located within and between the streams, they articulate problems and solutions and linkages between the streams (Enserink et al., 2010).

This model introduces two key concepts for understanding decision-making: policy window and policy entrepreneur. Firstly, a policy window is given by the coupling of the streams and it

represents opportunities for action in given initiatives. Furthermore, such windows are open for short periods and they occur due to regular events, such as elections, or irregular occurrences, such as crisis or major political changes (Kingdon, 1995). Secondly, such opportunities need to be seized and the issues must be pushed in the agenda before the conditions change, this critical role is performed by policy entrepreneurs (Mucciaroni, 1992). When a window opens, entrepreneurs try to capitalize on the opportunity to promote their specific problems and/or solutions. Once events are set in motion, actors lose control over the process. Consequently, the outcomes of the process are likely to be quite unpredictable (Teisman, 2000).

The streams model focuses on the role of opportunities and explicitly accounts for the role of politics in the process. It also provides explanations on the role of contextual developments in decision-making. However, it presents limitations to explain the strategic behaviour behind the interaction of actors, as it does not keep a track on them. Additionally, it does not provide tools to predict what types of problems are likely to be coupled with a certain type of solution, or the political conditions for them to reach a decision-making point. Finally, the model is also limited in exploring how the structure of formal procedures shape, constraint and facilitate problems and solutions in entering the decision-making agenda (Mucciaroni, 1992).

2.2.4 The rounds model

The rounds model

(d)

The rounds model assumes decision-making as consisting of different decision-making rounds. In these rounds, one or more definitions of problems or solutions are brought about by the interaction between different actors. Therefore, actors are the focus of the analysis. Actors are defined "as units capable of developing a recognizable course of action" (Teisman & van Buuren, 2012, p. 306). Activities in rounds can vary widely; they can be focused on exploring a problem, designing and selecting a solution, or a combination thereof. The classification of the activities of the round can also vary according to actors' perceptions. Actors may disagree on what can be labelled problems or solutions, what is defined as a solution for one actor can be perceived as a problem by another (Enserink et al., 2010; Teisman, 2000).

A decision-making round ends with the occurrence of a crucial decision, which is an outcome that is taken for granted and as a point of departure for new rounds of negotiations. Crucial decisions influence the rest of the process. Participants can perceive a gain in a round in terms of leading the problem definition and (preferred) solutions. However, each new round can change the direction of the process as new players can appear or the rules of the game can be changed. The rounds are accompanied by the occurrence of one or more arenas, which are places in which actors interact regarding problems and solutions targeting a specific issue. Finally, the rounds model assumes that problems and solutions are only relevant to the policy process when an actor introduces them (Enserink et al., 2010; Teisman, 2000; Teisman & van Buuren, 2012).

Many actors are involved in the process and they bring their own perceptions of problems and solutions, resources and objectives. Complex decision making then involves several actors making decisions. Therefore, decision-making is perceived as an intertwined "clew" of a series of decisions taken by different actors. This model provides insight into actors' interactions, where policy results are reached through mutual adjustment in the form of cooperation, conflict or avoidance (Teisman, 2000). However, it is limited on including the effects of contextual developments on the decision-making process. They are only included as long as an actor perceives them as either a problem or solution and decides to include them in their interactions. Additionally, this model does not have an explicit focus on the content of the decision-making process, but on how strategies of individual actors lead to collective outcomes (Teisman & van Buuren, 2012).

This section has presented four models that could be used for analysing different characteristics of the decision-making process in networks. Before selecting one as suitable for further analysis, it is seem necessary to present some conceptions of decision-making according to the framework of

responsible innovation. There is a normative background concerning decisions on technology due to its embeddedness in societal processes, particularly regarding its purposes, goals and side effects. Therefore, responsible innovation entails going beyond abstract ethical judgements to include concrete context and governance factors along with the quality of the knowledge available (Grunwald, 2014; van de Poel, 2009).

2.3 A normative approach to decision-making processes

In chapter 1, responsible innovation was defined as "a transparent, interactive process by which societal actors and innovators become mutually responsive to each other with a view to the (ethical) acceptability, sustainability and societal desirability of the innovation process and its marketable products (in order to allow a proper embedding of scientific and technological advances in our society)" (von Schomberg, 2011). By taking a closer look at it, the three characteristics of networks can be identified within this definition. Firstly, a variety of societal actors and innovators form a rather stable set of actors. Secondly, an interactive process sets the linkages for communication and resource exchange between the actors. Thirdly, a defined boundary is set by the shared interests regarding the innovation process and its marketable products. Moreover, governments are perceived to have limited power in the governance of new technologies due to their dependence on the insights and cooperation of societal actors. This recognition of collective or interdependent action is seen as a characteristic of the innovation process itself (Lee & Petts, 2013; Owen, Macnaghten, & Stilgoe, 2012; Owen et al., 2013; Sykes & Macnaghten, 2013; von Schomberg, 2013). Consequently, responsible innovation is framed in a network society where its governance is guided towards reaching a common goal for the (ethical) acceptability, sustainability and societal desirability of the innovation process and its marketable products.

Furthermore, the inclusion of the notions of transparency and responsiveness indicates some guidance towards the normative requirements for the interactions occurring in the process of developing and implementing a new technology. This can be further expanded by the four dimensions of responsible innovation presented by Owen et al. (2013): inclusive deliberation, reflexivity, anticipation and responsiveness. From this perspective, the process should be collective in order to allow for an inclusive deliberation of the different visions, purposes, questions and dilemmas brought about by different stakeholders. Moreover, it should allow reflection on both what is known and what is not known to maintain the connection with the ethical values at stake. Additionally, anticipatory analysis is necessary to foster potential benefits and uncover potential negative impacts. Finally, for the process to be shaped, previous reflection should provide basis for responsiveness in the sense of setting a direction for the innovation and influencing its subsequent trajectory and pace.

The four dimensions of responsible innovation couple reflexive capital with the process of decision-making. The effectiveness of these dimensions to foster the responsible development of technologies is related to their institutional embeddedness within decision-making bodies. As Guston & Sarewitz stated it: "the key to successfully grappling with unpredictability is to build a decision process that is continuously reflexive, so that the attributes of and relations between co-evolving components of the system become apparent, and informed incremental response is feasible" (As cited by Owen et al., 2013, p. 44). These conditions require the existing regulatory system to be adaptative, so that decisions and controls can be changed as new information becomes available, and in response to stakeholder and public values. Decision-making should then be transparent and proportionate, which may be limited by issues of scale and capacity, the speed of the innovation process and the tyranny of urgency (Lee & Petts, 2013; Owen et al., 2012; Stilgoe, Owen, & Macnaghten, 2013).

In this context, efforts to engage the public with controversial areas of technological development can be considered as disingenuous if these are perceived as an instrument to create support for an already decided upon plan. Then, the debate should be extended to decisions of desirability, which relates to question as to why it might be done and if so, how best to do it. Additionally, the dialogue about potentially contested technologies should ideally be used before positions become polarized

to help inform and improve decision-making (Guston, 2013; Owen et al., 2012; Owen et al., 2013; Sykes & Macnaghten, 2013). This deliberation sets the pace for actors to become mutually responsive, which has the potential to increase the articulation of a diverse set of public values within the innovation process (Fisher & Rip, 2013; von Schomberg, 2013). Nevertheless, dialogue and inclusion do not necessarily diminish conflict or lead to higher acceptability. Other actors also drive key decisions and agendas, which may or may not be aligned with the public ones (Lee & Petts, 2013). As conflict cannot be fully prevented, a switch of perspectives regarding the role of controversies may be helpful. During controversies, actors articulate their normative perspectives regarding the technology and its development process. Hence, a focus on the analysis of controversies may provide useful insights on the normative diversity related to technological developments.

In this research, responsible innovation is linked to endorsement of the relevant public values in the innovation process (Taebi et al., 2014). One of the approaches that can be used to include values in the development of technologies is Value Sensitive Design (VSD). Even though VSD was developed independently of the formalization of responsible innovation, its application accounts for its four dimensions. First, it explicitly recognizes the need to include a variety of stakeholders in the deliberation to identify values and to address value conflicts. Second, it requires constant reflection on the dynamics of the decision-making process to capture the emergent nature of values and to define how to solve value conflicts. Third, it requires anticipating impacts of the technology to uncover values and stakeholders that need to be included in the process. Finally, it requires flexibility to respond to these insights by adapting the technology, institutions and stances of stakeholder participation not only during the design but also during the implementation of the technology.

Furthermore, the public debate is important to open-up framings of issues that challenge existing assumptions and obligations. This inclusion is nevertheless accompanied by issues of power as actors have different expectations about the instrumental, substantive or normative benefits of dialogue. This condition extends the need to question framing assumptions not only of the particular issue at stake, but also of the participation processes themselves to increase their impact. Therefore, the innovation system should be located in a governance context designed to be as responsible as possible while considering both product and purposes. VSD is seen as a way to build the needed responsiveness (Stilgoe et al., 2013).

This section is focused on building a normative understanding of decision-making processes for them to be aligned to the requirements given by responsible innovation. Due to the explicit focus on VSD, the following subsection will present the key characteristics of this approach.

2.3.1 Characterizing VSD

Value Sensitive Design is a “theoretically grounded approach to the design of technology that accounts for human values in a principled and comprehensive manner throughout the design process” (Friedman, Kahn, & Borning, 2002, p. 1). It is characterized by several features. First, VSD seeks to proactively influence the design process from the early stages. Second, VSD strives to enlarge the space for value identification. Third, VSD expands the scope of human values to be considered in the design of technology with a special focus on the values of moral import. Fourth, VSD assets that certain values are universally held, but recognizes differences in conceptualizations depending on specific cultural settings. Fifth, VSD is based on an interactional theory in which people and social systems both shape and are shaped by technological developments. Finally, VSD identifies and accounts for direct stakeholders (parties directly interacting with the technology) and indirect stakeholders (parties affected by the use of the technology) (Friedman et al., 2006; Friedman et al., 2002).

VSD is grounded on three iterative and integrative investigations: conceptual, empirical and technical. Each of the investigations informs and is informed by the other investigations (Friedman et al., 2006; Friedman et al., 2002; Manders-Huits, 2011). Conceptual investigations are philosophically informed analyses of the issues related to the project at hand. They include the

theoretically grounded conceptualization of values and the identification of direct and indirect stakeholders. Value conflicts arise once values are identified and discussed. Empirical investigations focus on the human context in which the technology is located. They analyse stakeholder's understandings, contexts and experiences in relation to the technology and associated values. It also is concerned with the way stakeholders cope with value conflicts. Finally, technical investigations focus on the technology and the institutions in which they are embedded in. They can either be directed towards the design of the technology integrating identified values during the conceptual investigation, or towards researching how existing technologies enhance or constraint the expression of certain values. There is no recommended order to perform the three investigations as it is considered that it depends on the project at hand (Davies & Horst, 2015; Friedman et al., 2006; Friedman et al., 2002; Manders-Huits, 2011; van de Poel, 2009).

Additionally, Friedman et al. (2006) provided some guidance on the steps necessary to perform a design project according to VSD. These included: (i) select a value, technology or context of use, (ii) identify direct and indirect stakeholders, (iii) identify benefits and harms for each stakeholder group, (iv) map benefits and harms onto corresponding values, (v) conduct conceptual investigations of key values, (vi) identify potential value conflicts, and (vii) integrate value considerations into the organization structure. Within this perspective, values are conceptualized as what is considered important in life by a person or group of people. Moreover, by making an explicit focus on values of moral import, a list of 13 values was recommended as heuristics for the ICT domain: human welfare, ownership and property, privacy, freedom from bias, universal usability, trust, autonomy, informed consent, accountability, courtesy, identity, calmness, and environmental sustainability (Friedman et al., 2006).

It is noticed that a stakeholder analysis is one of the first steps of the VSD methodology. Even though this step is formally part of the conceptual investigations, it provides a needed input for both the empirical and technical investigations. The latter in terms of actors to engage and actors who might be affected by the technology, respectively. During the execution of the stakeholder analysis, the researcher aims at identifying the roles of individuals who will be affected (either directly or indirectly) by the technology under study. The focus on roles rather than individuals allows for the inclusion of the multiplicity of roles at play in people's interaction with their environment. In addition, this analysis includes the identification of potential negative and positive impacts for each role steaming from the technology development and use (Davis & Nathan, 2015).

Even though its virtues to systematically address issues of values in the design of technology has been recognized, VSD has received several critiques regarding its usability and ethical basis. Borning and Muller (2012) identified four issues of concern for the widespread adoption of VSD: the problems arising from claims of universality for values, the lack of context of the list of values offered as heuristics, the exclusion of the voice of participants in publications and the absence of an explicit account of researchers' standpoint on the debate. They suggested new or modified approaches for VSD to address these issues. Furthermore, Le Dantec, Poole, and Wyche (2009) pointed out three areas in which the methodology of VSD needs further refinement. First, the priority given to values listed as heuristics on the design process over values that can be discovered in the design context. Second, the lack of guidance on the empirical methods that are appropriate to guide research on values in a particular context. Third, the way in which VSD investigations privilege known values over value discovery by limiting value conceptualization to conceptual investigations. Then, they recommended a focus on the development of empirical methods that inform value-centred investigations and less prescription on the values to be considered.

Conversely, Manders-Huits (2011) centred her critique on VSD's lack of a normative elements to meet the requirements for including values into design in an ethically justified way. She explained this assertion based on five remarks: (i) the absence of a proper methodology for stakeholders' identification; (ii) the obscure nature of the integration between conceptual and empirical methods; (iii) the risk of committing the naturalistic fallacy (reducing an 'is' to an 'ought) when values are identified empirically; (iv) the underdevelopment of the concept of values; and (v) the lack of an explicit ethical theory to deal with value conflicts. She recommended the integration of VSD with

ethical theories to provide the needed normative basis. Moreover, Yetim (2011) also argued for the need of a ethical theory to inform VSD in the resolution of value conflicts. He was concerned by absence of explicit methods for supporting a deliberative and legitimate decision-making process in VSD. These concerns included decisions on stakeholder identification, common design communication, management of value conflicts, and design goals and means. He argued for the use of discourse ethics as adequate to address such concerns.

In turn, by applying VSD to a large-scale e-governance project in India, Johri and Nair (2011) noted that some issues were not as clear-cut in the field as presented in the framework. Among others, they highlighted the contextual and emergent aspects of values, the relevance of pragmatic features and the role of value intermediation in access to technology. In short, critiques can be associated to four different factors that need further clarification: the stance towards universal values, the definition of ethical commitments, the management of stakeholder participation and value emergence, and the explicit inclusion of the voice of participants and researchers (Davis & Nathan, 2015).

This subsection has provided the conceptual basis for understanding the characteristics and limitations identified concerning VSD. The following subsection will return the focus on decision-making processes in networks by connecting VSD to the development of energy projects in a network society.

2.3.2 Applying VSD to the design and implementation of energy projects

VSD has been mainly developed and applied in the field of human-computer interactions for the design of information technologies (Davis & Nathan, 2015). However, it has also been expanded to explore the inclusion of moral values to other fields of technological design (Taebi et al., 2014). One of these fields is the development and implementation of energy projects. Correljé et al. (2015) argued that market incentives and regulation alone are insufficient for the successful implementation of energy projects. In turn, they claimed that the accommodation of the variety of stakeholders' values in the design process is needed, not only in terms of the technology but also for the institutions and processes of stakeholder interaction surrounding the project. In this context, a stakeholder is defined as "any person or party who is affected by, or can affect, the technology and/or its institutional and societal context" (Correljé et al., 2015, p. 188). Based on this perspective, the responsible development of energy projects requires the decision making process to be (re)designed based on public values from the early phases of the project onward and to be flexible to adapt to the changes and emergent values that may arise during the project's development.

Nevertheless, in terms of technology design, there are some constraints to the full application of VSD's recommendation of early intervention in the design process. These constraints are related to the features that can be subject to design. For an entirely new technology, like the case of geoengineering or nanotechnology, the design space to include values is broad as there is no known technology design to take as reference. However, this is not always the case for energy projects. For example, for shale gas extraction, the combination of the technologies of horizontal drilling and hydraulic fracturing is what gives access to the resource. Then, when a project is proposed, the features subject to adaptation are related to the fracking fluid, the well design, the siting, the transportation system, the waste treatment, the drilling density, among others. This means, given the level of development of these technologies, that their introduction to a new context of use is what is subject to (re)design and not the entire object. By applying VSD to these technologies, it is assumed that it is still morally relevant to include public values to the introduction of these technologies even though the technological design space is more limited (see van den Hoven, 2013). This insight gives more weight to the inclusion of the institutions and public participation as part of the design focus to increase the legitimacy of the design process. Controversies do not arise only from values related to the technology, but also from the ones related to the decision-making process.

In this context, due to the societal relevance of energy projects, the design is focused on public values. Public values are defined as actor's general and non-negotiable convictions or beliefs of what is worth striving for in order for society to be good. Public values are specified in dynamic social processes where stakeholder interactions take place. During the specification, different conceptualizations of the same value may emerge as they are context dependant and change over time. Therefore, it is necessary to develop means to capture the emergent nature of values during the development and implementation of technology. The public debate has been deemed an appropriate source to grasp this dynamic aspect in the identification of public values (Correljé et al., 2015; Dignum et al., 2015; Taebi et al., 2014; Taebi & Kadak, 2010; van de Poel, 2009). Then, the design process should include clear mechanisms for the decision-making process to be fed by the value insights of the public debate and for it to be able to respond to them.

Based on the limitations presented in the previous section, three areas have been identified as critical for the application of VSD for energy projects embedded in a network society: the identification of stakeholders, the expression of values in the public debate and the role of the "design team". These areas are also related to elements of the theories of decision-making in networks that could contribute to their further development. Firstly, VSD emphasizes the need to consider both direct and indirect stakeholders in the design of the technology; still it lacks a clear methodology to do so (Davis & Nathan, 2015; Manders-Huits, 2011; Yetim, 2011). By taking a networks' perspective, the identification of actors may be supported by the identification of the relations between the actors participating in the decision-making process. Secondly, VSD stresses the need to include the values disclosed by the diversity of stakeholders into the design process. Then, the identification of values and value conflicts is central to the exercise of VSD. Dignum et al. (2015) proposed a methodology for value identification taking the public debate as a source. Nonetheless, as argued in chapter 1, more understanding is needed on how the dynamics of societal conflicts might influence the rhetoric use of values in the public debate at different points in time. This position acknowledges the possibilities for values to emerge and transform due to the interactions between actors in specific contexts (Correljé et al., 2015). Thirdly, VSD makes the implicit assumption of the existence of a design or research team who is "in charge" of the design process. Even though they are not necessarily the final decision-makers, they provide guidance for process execution. In the case of energy projects, it is not clear who should take this role and how to define it. Yet, the notion of network management can provide some insights to clarify its reach for the proper functioning of the network.

This section has provided some insights regarding how VSD can support the responsible governance of energy projects. Additionally, it has identified three critical areas for the application of VSD for energy projects in a network society: the identification of stakeholders, the expression of values in the public debate and the role of the "design team". From this analysis, some elements of the theory of decision-making in networks has been highlighted to have potential to provide insights into these areas: the definition of network, the actors' interactions, the events and the notion of network management. The following section would focus on the selection and adaptation of a model of decision-making in networks for guiding the analysis.

2.4 A framework for reconstructing the decision-making process based on normative needs

The previous section presented some characteristics of decision-making processes that are central for the implementation of VSD in energy projects. In addition, it highlighted the need to analyse the dynamics of decision-making processes to evaluate how they may influence the fulfilment of such normative requirements. As the articulation of values during controversies occurs through actors' interactions, the decision-making process should be reconstructed in such a way that it allows for understanding of these interactions. From the models presented in section 2.2, only the *rounds model* puts actors and their interactions central to the analysis. The other three models are found inadequate for several reasons. First, the phase model is inadequate because more than one actors' decision is necessary to execute energy projects. Second, the garbage can model obscures

actors' interactions, and it does not allow for analysing the influence of values in guiding actors' participation in the process. Third, the streams model is more focused on how actors respond to the interaction between streams than to the actions of other actors.

Moreover, the rounds model builds on the three aspects of decision-making process dynamics that were introduced as part of the research gap in chapter 1. This section will focus on building the key notions for using the rounds model to guide the analysis: rounds, arenas, coalitions and strategies.

2.4.1 Rounds

The interaction between actors makes decision-making processes in networks capricious in nature. This capriciousness is reflected in the content of the decision-making process, as the definitions of problems and solutions are contested, and in the irregular happening of the rounds with no clear initial or end point (de Bruijn & ten Heuvelhof, 2008). In the case of energy projects, the decision-making process is triggered by the decision of some party to develop a project in a specific area according to its natural resources. For shale gas, for example, after a company has been granted permissions to exploit an area with resource potential, a decision-making process starts when the company decides to start the legally required procedures of Environmental Risk Assessment for site selection. Afterwards, according to the rounds model, the decision-making process will be characterized by the occurrence of several rounds, each getting the project closer to either its cancellation or execution. However, it is not clear how this would happen. The interactions between actors can change both the characteristics of the project and of its related institutions.

In the rounds model, the decision-making process is conceptualized as a series of intertwined decisions of different actors, interacting to influence the process outcomes (Groenleer, Jiang, de Jong, & de Bruijn, 2012; Teisman, 2000). The rounds model is centred around the concept of *crucial decisions* that define a *round* and are taken for granted to start a new process of interaction (Teisman, 2000). The fact that a crucial decision is taken for granted does not necessarily imply that its outcomes are accepted. However, crucial decisions are relevant because they define a point of change in actors' interactions in terms of participants, resources, rules and strategies used. Even though decision-making processes occurring in rounds do not have a regular order, it can be said that energy project's development are bounded by the formal procedures in place. These procedures are generally designed to provide a reference time and decision locus for all the decisions that must be made for a project to be approved or rejected. Therefore, it is assumed that crucial decisions would be mainly defined by the formal procedures given in the regulations. This does not imply that these formal procedures are static. The interactions of the decision-making process can affect their pace and the outcomes of different rounds could lead to changes in the rules of the game and participants in each new round. Formal procedures provide an institutional frame in the form of rules of the game, which is in itself subject to change (North, 1990). The assumption of the relevance of formal procedures to define the rounds of the decision-making process also implies a power imbalance with respect to the actors that can take formal decisions. However, it does not imply that they can be considered central actors. Actors holding authority power are still connected to other actors by means of resource dependencies and, in the case of elected officials, they are constrained by their duties to their communities in terms of safeguarding the public values at stake. Moreover, resources can take the form of formal legal authority to make decisions, public opinion, information, mobilizable units, relations, financial resources and legitimacy (de Bruijn & ten Heuvelhof, 2008; Sabatier, 1988).

2.4.2 Arenas

The arenas represent the locations in which different decisions are made along the rounds (van Bueren et al., 2003). The arenas can be said to represent 'rooms' in which decision-makers meet regarding a specific issue. Sometimes the arena consists of one big table at which all actors exchange their ideas. In other occasions, they are composed by a small set of tables at which actors interact with each other in smaller batches. When rounds change, the characteristics of the arenas can also change. The room can get smaller or bigger, and actors may join or leave as the

topics under discussion change. This fragmentation of the decision-making process implies that "actors can be confronted with unexpected decisions made in other arenas in which they do not participate, which nevertheless have major consequences for them" (Koppenjan & Klijn, 2004, p. 57).

The establishment of some arenas can be associated to legally prescribed decision structures. When this is the case, these arenas are termed as formal. Examples can be found in the decision-making process about a law or as formal consultations performed as part of permitting procedures. Otherwise, arenas are considered to be informal. Workshops, conferences and community meetings are examples. The arenas can be identified by the presence of collective action in the interactions between actors. They are characterized by a decision focus or subject, its participants, its locus and its organizational arrangements. Actors can participate in one or more arenas in each round according to their resources and interests. In addition, there may be actors (and interests) that are not represented in any arena (Groenleer et al., 2012; Koppenjan & Klijn, 2004; Sabatier, 1988; van Bueren et al., 2003).

2.4.3 Coalitions

The network of actors formed around the development of energy projects can be defined as an issue network. These networks are characterized by loosely connected actors with divergent perceptions and a deep interest in the subject. Nonetheless, some groups of actors may establish closer relationships based on an alignment of common interests and goals. These groups are defined as coalitions. Coalitions join resources and coordinate actions in an attempt to steer the decision-making process and achieve a common goal. Their coordination can be reflected in collective actions and the alignment of interests (Koppenjan & Klijn, 2004; Rhodes, 2008; Sabatier, 1988; Schlager, 1995; Stone, 2002). For example, given their shared interest for the development of the shale gas companies, the National Government and companies may develop joined plans to promote the industry's benefits. In that light, networks can involve several coalitions. However, due to the rather short time span of decision-making processes of energy projects, it cannot be said that stable coalitions are formed. A higher level of coordination and alignment would be needed to define a common direction to influence the energy policy (Sabatier, 1988).

2.4.4 Strategies

Another characteristic of the interactions of actors in networks is strategic behaviour. Based on their perceptions of the environment and other actors, actors define strategies to advance their interests in the decision-making process. Strategies are not necessarily cooperative; actors can try to block the advance of the process or may not be interested in participating in certain interaction processes (de Bruijn & ten Heuvelhof, 2008; Koppenjan & Klijn, 2004). Three types of strategies are focused on in this research: unilateral interventions, reciprocal interventions and facilitating interventions (Koppenjan & Klijn, 2004). First, *unilateral strategies* are related to attempts to realize an individual formulation of a solution in spite of the dependencies. Actors take advantage of strategic resources such as authority or money to advance their positions in the debate. Second, *reciprocal strategies* result from the awareness of interdependencies. They relate to attempts to open up the definition of problems and solutions to block or advance specific positions in the debate. It also includes passive responses that look to reduce conflict. Finally, *facilitating strategies* are triggered by intentions to facilitate cooperation to achieve mutually beneficial solutions. Therefore, they aim at mediating conflicts, bringing parties together, etc.

Table 2-1 resumes the key concepts to be used to reconstruct the decision-making process based on the previous analysis. In order to generate inputs for the responsible governance of energy projects, the elements of the rounds model were extended to explore their relation with the rhetoric use of values in the public debate. This allows the inclusion of value considerations in the analysis during the different rounds of the process. The analysis in this report is focused on how the different

elements of the rounds model lead actors to express certain values at specific moments. The author wishes to emphasize that the succeeding analysis is concentrated on the development of the decision-making process, without making any judgment on the content of the public debate nor the position of actors in the debate as right or wrong.

Table 2-1. Key concepts for analysis of the decision-making process on shale gas in Lancashire, UK

Concept	Definition
Round	Period of a decision-making process that begins and ends with the definition of a crucial decision.
Crucial decisions	Outcomes that are taken for granted by actors to start a new round of interactions in the decision-making process. For energy projects, they are mostly defined by formal procedures.
Arenas	Locations in which actors interact to make decisions regarding specific subjects related to the execution of the energy project.
Coalitions	A set of actors which join resources to try to steer the process and who have a certain degree of alignment in interests or shared goals.
Strategies	Interventions aimed at influencing other actors' behaviours, the perceptions of problems and solutions, or the outcome direction of the decision-making process.

3
RESEARCH METHODOLOGY

In the quest to answer the research questions triggering this research, it was necessary to develop a research strategy to guide the process of data collection, verification and validation that served as input for analysis. This chapter aims at introducing the methodological tools that were used as means to execute the research at hand. As presented in chapter 1, the research strategy chosen for this research is a single case study. This decision is justified in a need to have a deep understanding of the complex dynamics of the case in terms of values, arenas, coalitions and strategies over a long period. Even though the focus on depth in the research impose restrictions on the generalization of its results, it does not necessarily imply that this generalization cannot be possible (See Barzelay, 1993; Flyvbjerg, 2006; McLeod, MacDonell, & Doolin, 2011). Therefore, the insights of this research provide an understanding of the phenomena, but further comparison with other case studies might be considered necessary to evaluate the validity of the results in different contexts (Cavaye, 1996; Verschuren, 2010). Nonetheless, due to the complexity of the subject of research and the time constraints of this master thesis project, it was considered that the focus on a single case study was sufficient to feed the discussion on the responsible governance of energy projects in the context of the RESPONSE project.

A case study is an empirical research strategy aiming at getting a profound and complete insight into one or several objects confined in time and space. Its contribution to knowledge is given by relating findings to generalizable theory. It is characterized by a small number of research units, a holistic perspective, and the study of the object in its natural context. In addition, it is associated with qualitative data and research methods, and intensive data generation. Different from experiments, it does not explicitly controls or manipulates variables. To achieve depth in the understanding of the object, data is gathered using either a triangulation of methods or sources. The selection of the case study is crucial and it is guided by the conceptual design on the information that need to be extracted of the research units. In single case studies, triangulation is key to eliminate chance and increase validity. Moreover, observations from several units of analysis within one case study can create and highlight theoretical constructs. This perspective is particularly

valuable when focused on the understanding on how people frame and solve problems (Barzelay, 1993; Cavaye, 1996; McLeod et al., 2011; Verschuren, 2010).

The selection of the case of shale gas in Lancashire, UK was based on several reasons. First, it is an example of the implementation and development of a new energy technology in an institutional context. Second, the development of the project has been characterized by a controversy, which is reflected in the public debate. Third, the location of the UK in the broader institutional context of Europe allows for cross-country comparison, which is desirable for the RESPONSE project. Finally, information of the project development and public debate is readily available in a language that facilitates the researchers' activities. The suitability of the case to analyse the research gap was already discussed in chapter 1.

Based on the research questions, the research was divided into two parts based on the theoretical and empirical needs. The theoretical research was done by means of a literature review of the theories of decision-making in networks and responsible innovation. The empirical research was executed by means of a longitudinal analysis of newspaper articles available regarding the decision-making process in Lancashire, UK. This chapter will present the methodology followed by each. Section 3.1 is focused on the theoretical research and section 3.2 on the empirical research.

3.1 Executing the theoretical research

The literature review aimed at building the conceptual framework used for analysis. The outcomes of this process were presented in chapter 2. This section is focused on introducing the steps followed to search and select the sources used as input. On one hand, the search process was performed with the use of the online search databases of Scopus and Web of knowledge. Table 3-1 presents the key words used for the search, reflecting the key concepts of each theory that were focused on the analysis. The search terms were used individually or in combination with others to steer the research towards desirable outcomes. On the other, the selection of proper articles out of the search query was based on their specific relevance to the subject. To mitigate the possibilities of not reaching key literature on the topics, snowballing strategies were used to identify articles frequently used by authors as reference to build their work. These articles were also included for consideration.

Table 3-1. Key works used during the search for each theory

Theory	Key words
Decision-making in networks	Policy network analysis, complex decision-making, decision-making process, network management, rounds, analysis, model, network, policy arenas.
Responsible Innovation	Responsible innovation, value sensitive design, public values.

For the review of the theories of decision-making in networks, an additional step was necessary to define the concepts in need of exploration. The development of the key concepts of these theories have been scattered alongside the development of policy-making analysis' theories, which are extensive. Therefore, this part of the literature review faced the risk of being incomplete due to the researcher's lack of general knowledge of the field to target the search. To overcome this challenge, the researcher appealed to the advice of an expert in the field in two forms: recommended class materials (Bachrach & Baratz, 1970; Cohen et al., 1972; de Bruijn & ten Heuvelhof, 2008; Groenleer et al., 2012; Kingdon, 1995; Susskind, 2008; Teisman, 2000; van Bueren et al., 2003) and an informal interview asking for recommended references for developing a better understanding of key concepts (Haas, 1992; Meijerink, 2005; Rhodes, 2008; Sabatier, 1988; Schlager, 1995; Stone, 2002). This process provided a list of references, which was used as base

for the discovery of other relevant sources through the execution of snowballing strategies. In addition, key concepts identified in these references were used to refine the search terms.

3.2 Executing the empirical research

The empirical research was aimed at providing the data inputs necessary for analysis. This research was qualitative in nature, as it was interested in the understanding of the dynamics of the process rather than quantifying them. Qualitative data are rich, complete, holistic and capable of preserving chronological order when relevant. However, qualitative research has some disadvantages. First, the processes of data collection and analysis are consuming and demanding. Second, the research process is subject to bias. Third, the researcher can be overwhelmed by the volume of data generated, which may inhibit data analysis. Finally, data analysis is not easy as the methods are not well-established. These challenges do not invalidate the conclusions or data drawn, but it requires appropriate research methods and practices to be systematically and consistently applied to manage them. Moreover, the latter implies a need to adequately describe the methods used for data collection and analysis as a way to be transparent on the logic chain followed during the research (Cavaye, 1996; McLeod et al., 2011).

Due to the interest on analysing the temporal dynamics of the decision-making process, a longitudinal qualitative analysis was considered suitable for the research. This analysis is focused on examining and constructing holistic explanations of processes of change. One of its major advantages is its flexibility and potential for continuous conceptual development throughout the research. However, this characteristic carries the risk of losing methodological focus and conceptual continuity. Longitudinal case studies involve collecting data over a long period to explore the change of some conditions over time. It is relevant to account for the multiple perspectives of the participants of the process to develop a holistic understanding of the phenomenon. The data gathering process can be complemented by variations of thematic and content analysis to facilitate the identification of patterns of change. To keep consistency, it is therefore important to keep the research objectives in mind when developing the coding process and data selection for further analysis (Koro-Ljungberg & Bussing, 2013; McLeod et al., 2011; Smith, 2003).

Based on such insights, the empirical research was done by means of the longitudinal of the decision-making process in Lancashire, UK. To overcome methodological challenges, a focus was kept on the aims of the research and the consistent use of the conceptual elements presented in chapter 2. Figure 3-1 presents the research activities performed as part of the empirical research and its connection with the research purpose and framework. The steps taken for the longitudinal qualitative analysis are further explored in this section. Sub-section 3.2.1 presents the procedure followed for data gathering and the argumentation for the selection of newspaper articles as data source. Then, sub-section 3.2.2 introduces the procedure followed for extracting the relevant data from the newspaper articles. Afterwards, sub-section 3.2.3 focuses on the process of value identification and validation based on the claims identified in the previous step. Next, sub-section 3.2.4 presents the tools from social network analysis used for data visualization and exploration. Finally, sub-section 3.2.5 presents the logic followed to relate the data gathered with the concepts introduced in chapter 2 to explore the dynamics of the decision-making process and its connection to normative elements.

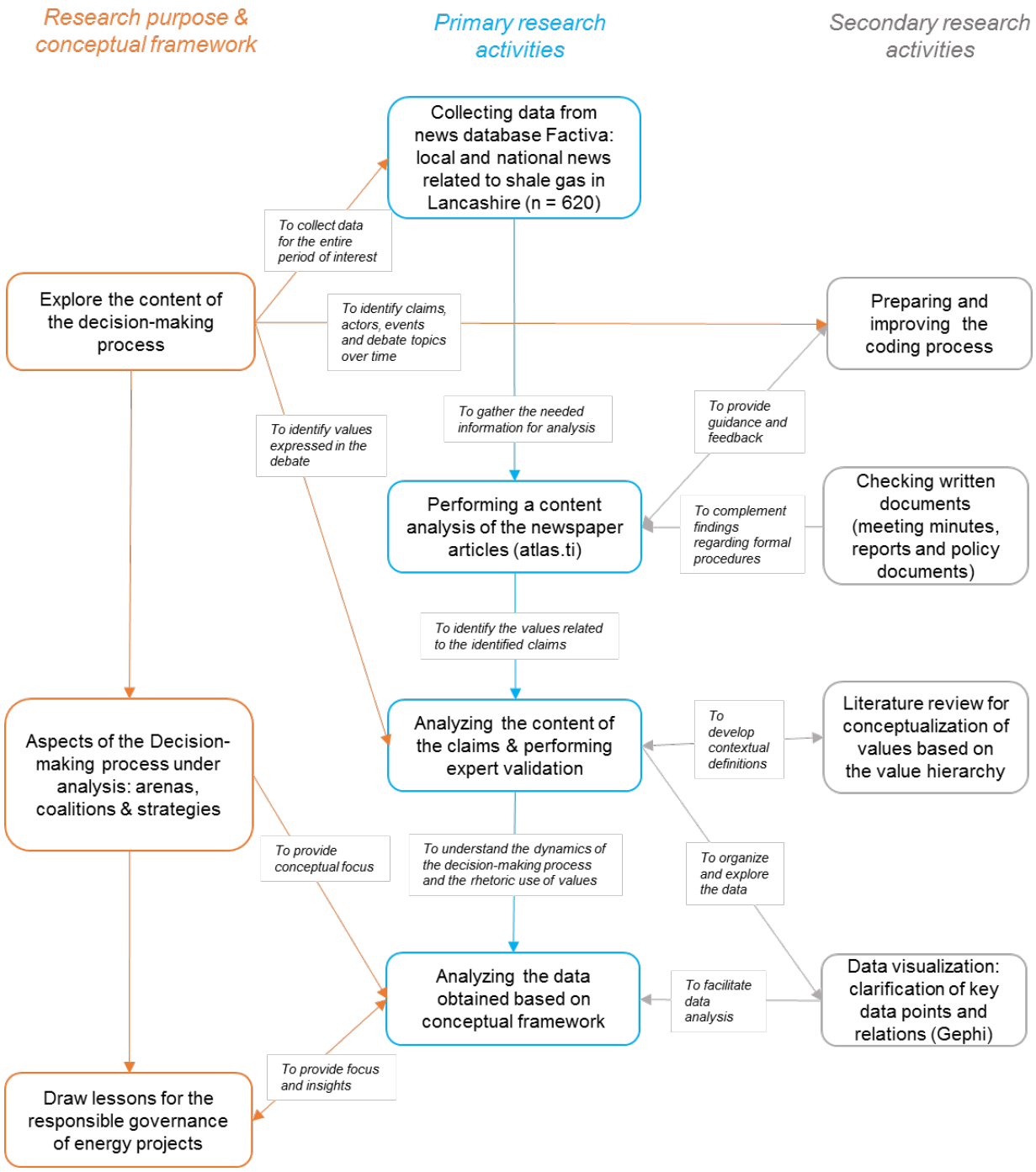


Figure 3-1. Connection between research purposes and research activities performed during the empirical research

3.2.1 Choosing a data source

The debate regarding the project for shale gas extraction was defined as the focus of analysis. Therefore, five data sources were identified that could provide information about the arguments used in the debate: newspaper articles, webpages of stakeholders, in-depth interviews, reports and policy documents. The final selection of newspaper articles as source was based on three arguments. Firstly, it was deemed necessary to have a source of data that would present the perspectives of as many stakeholders as possible to allow gathering a rich set of arguments to analyse and to allow for the identification of changes in discourse over time due to actors' interaction. Secondly, it was necessary to have a source in which the arguments made by actors were presented as close as possible to the way they were expressed by the stakeholders in different points of time. Finally, easiness of access to the information was considered relevant taking into account the time constraints of the research.

The media can be considered as a forum for the discourses of others, but it is also a speaker in its own right. Therefore, it is central for the production and transformation of meanings. The claims presented in the media are embedded with certain worldviews, judgments and preferences (Baumgarten & Grauel, 2009; Carvalho, 2007). The media is widely used to collect data regarding collective action and social movements as they allow observing changes in events and context over time. However, the reliability of their coverage have been contested (Wilkes & Ricard, 2007). In reference to the representation of science in the media, Carvalho (2007) argued that ideologies inside media organizations and their particular audiences influence the way information is filtered and interpreted. Conversely, Baumgarten and Grauel (2009) also recognize the production bias introduced to the data due to the filtering executed by the media, which is extended to the representation of actors in the public debate. Nevertheless, they acknowledge this data source to be the most suitable for longitudinal analysis compared with websites and interviews. Based on these insights, the use of a variety of newspapers was deemed necessary to provide different perspectives of the debate and the actors participating on it. By taking newspapers of a wide ideological positions and locations, it was assumed that the data would allow a more holistic perspective of the public debate regarding shale gas in Lancashire. The latter is aligned with needs of triangulation of sources in single case studies.

In order to have a better coverage of the debate at both national and local level, it was considered necessary to have newspapers operating at both levels as sources. The selection of local newspapers was based on importance at local level, and its explicit use to make announcements about the public consultation process by the company Cuadrilla (ARUP, 2014c, 2014d). The selection of national newspapers was based on recommendations made by other researchers that have analysed discourse in the shale gas debate in the UK, while taking into account the diversity of ideologies (Carvalho, 2007; Cotton et al., 2014; Jaspal & Nerlich, 2013; Upham, 2015). This process limited the search process to four local newspapers (Lancashire Evening Post, Blackpool gazette, Lytham St Annes Express, and Lancashire Telegraph) and seven national newspapers (The guardian, The Independent, The Daily Telegraph, The Sunday Telegraph, The Times, The Sunday Times and The Observer).

The news database Factiva was selected to collect the data due to its coverage of sources and countries (Dow Jones & Company, 2016). The use of an electronic database allows the collection of all relevant newspaper articles when combined with an appropriate selection instrument (Schafraad, 2006). The key words used were shale gas for local newspapers and shale gas and Lancashire for national newspapers. The selection of shale gas as key word was done to have a more complete view of the discussion around the resource extraction beyond the technology; it was assumed that it would allow the inclusion of discussions regarding related formal and informal institutions. The search was limited to the timeframe between January 1st, 2013 and March 31st, 2016. The initial date followed the lift of the moratorium on fracking and it targeted the exploration of the context in which Cuadrilla decided to start the project under study. The final date coincides with the end of the inquiry related to the appeal process. This search resulted in a database of 620 articles for analysis distributed by source as shown in Table 3-2 and by year as shown in Figure 3-2.

Table 3-2. Number of articles by source (Identical duplicates of articles identified by the search engine of Factiva were deleted from the data used as input for analysis)

National newspapers		Local newspapers	
Source	**Articles**	**Source**	**Articles**
The Times + Sunday Times	259	Lancashire Evening Post	117
The Daily Telegraph + Sunday Telegraph	156	The Blackpool Gazette	52
The Guardian	106	Lytham St. Annes Express	22
The Independent	48	Lancashire Telegraph	76
The Observer	14		
Total national	583	Total local	267
Total articles		850	
Total number of duplicates		230	
Total for analysis		620	

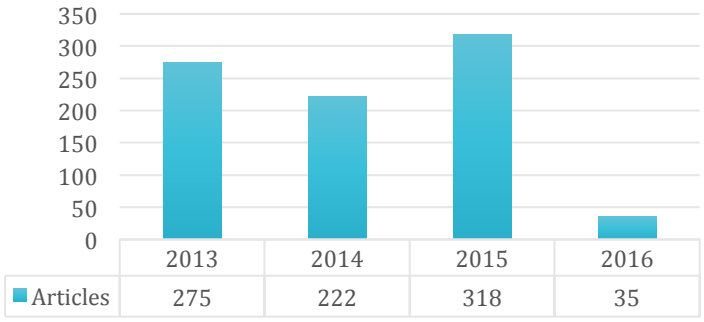


Figure 3-2. Distribution of articles per year

The outputs of Factiva were differentiated into separate files referring to either local news or national news. The division is related to the way the search process was performed. These documents were then used as input for the coding process. This step will be presented in the following sub-section.

3.2.2 Coding claims as the base for longitudinal analysis

Once a database of articles was built, the next step was to perform a qualitative content analysis. This process had two objectives. First, to act as an additional filter of articles that are not relevant for the research. Second, to identify and extract the key information held in the articles (See Schafraad, 2006). Due to the amount of data obtained, it was necessary to use a support tool to facilitate the coding process. The software atlas.ti was chosen based on its suitability to support this type of analysis. It has specific tools to manage the codes generated and to keep a track on relations between codes (atlas.ti, 2016). The use of software packages favour efficient data management, consistency and analytical transparency, and provide opportunities for exploring new insights through visualization tools. Nonetheless, it requires the researcher to be critical of her work as the relative ease of these tools can compromise the exploratory and interpretative character of qualitative research (Kaefer, Roper, & Sinha, 2015).

Due to the purposes of the research, a system of categories was defined to ensure the collection of the key information needed; thus reducing the complexity of the data for analysis. The initial proposal was later changed and extended during the process of data analysis. Qualitative content analysis requires the researcher to read and interpret all text to build a separate information base while keeping the consistency of the codes used. It provides a balance between a subjective interpretation of the contents of texts and a systemic process of coding. Moreover, it presupposes that the researcher is focused on what was said above the how it was said (Gläser & Laudel, 2013; Kaefer et al., 2015). However, in this research an exception was made in the sense that the claims were taken literally as codes. This step enabled the identification of expressed values in a further stage of the research.

The development of the initial system of categories was guided by the purposes of the research and the concepts developed in chapter 2. The longitudinal analysis was based on notions of Event Sequence Analysis, which is "focused on the reconstruction of sequences of events and on the identification and analysis of temporal patterns" (Spekkink, 2015, p. 136). The subject of the analysis was the network of actors involved in the decision-making process regarding Cuadrilla's project to develop the sites of Roseacre Woods and Preston New Road in Lancashire, UK. In that light, events can be defined as theoretically significant changes that the network of actors endures or brings about (Spekkink, 2015). Four concepts are central to the research in chapters 1 and 2: rhetoric use of values, arenas, coalitions and strategies. As these concepts are theoretical constructions, they needed to be operationalized to facilitate their identification in the empirical research. Hence, two types of events were identified: claims and actions. Claims are *opinions related to the Lancashire project expressed by involved actors to present their arguments in the debate (in their own words or as presented by the writer).* Actions are *activities performed by actors trying to steer the outcomes of the decision-making process.* The relevance of these events was given by their direct relation with discussion of Cuadrilla's project in Lancashire or the regulations under development for the exploration of shale gas in the UK.

One action needed special attention: the publication of reports to increase the knowledge base of the debate. Reports were treated as actions that attempted to steer the decision-making process in a desired direction. Hence, the reports were not checked for claims to include in the analysis. Nevertheless, when the reports were discussed in the media, some actors expressed their opinions regarding the contributions of the reports to the public debate. These were the claims included in the analysis in relation to reports. Furthermore, to keep track of the dynamic aspect of the research, all events were related to the time in which they occurred. As the events were extracted from newspaper articles, a certain delay is expected between the realization of the action and its publication. However, this does not affect the analysis, as this delay is consistently included in the data. It is then assumed that this delay does not affect the flow of the interactions. Finally, to keep track of the interactions in the debate, the actors participating in the debate were identified and classified according to type.

Additionally, it was considered desirable to keep a track of the general subject of the claim to support the understanding of the different conceptions of values. This classification was not exclusive however; some claims referred to various subjects. This additional layer of information provided insights of the content of the debate, which was used to provide some context for the reconstruction of the decision-making process and the process of value identification. Once the initial conceptualization of the coding process was finished, an iterative process of coding was performed. The iterations allowed the improvement of the categories as a variety of actors, subjects and actions emerged.

The coding process for claims followed a four-step logic: (i) defining the context for expressing the quotation (time and its connection to actions); (ii) characterizing the actor who expressed the argument; (iii) classifying the subject of the claim; and (iv) specifying the claim. For each step, a set of categories was used to identify and extract the relevant information uncovered while reading the article (see Figure 3-3).

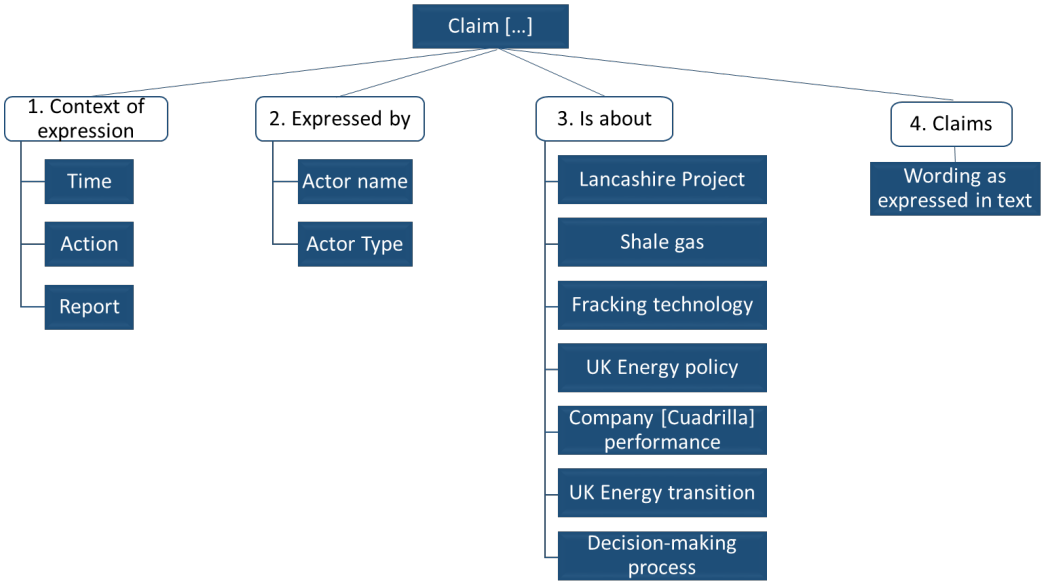


Figure 3-3. Categories used for the coding process of claims

The coding process for actions followed a two-step logic: (i) defining the context for executing the activity (time and its connection to other actions); and (ii) specifying the action. For each step, a set of categories was used to identify and extract the relevant information uncovered while reading the article (see Figure 3-4). For a more detailed description of coding process execution, the reader is referred to the Appendix A.

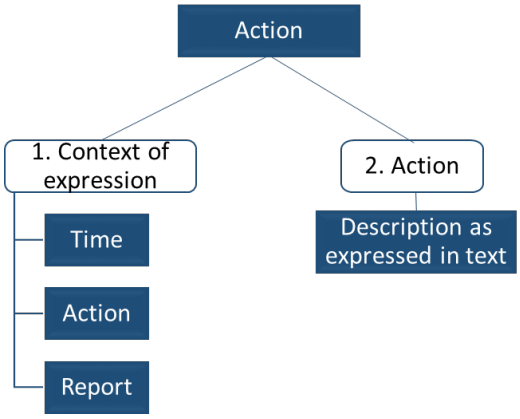


Figure 3-4. Categories used for the coding process of actions

As mentioned earlier, one advantage of atlas.ti is the possibility to keep track of the relationships between codes. This feature was especially useful to relate the events to their time dimension. Table 3-3 presents the relationships that were tracked between codes in order to gather more information about the developments in the decision-making process. It can be noticed that all events can trigger other events to happen. Once the 620 articles were coded, a verification process was executed to check that the relationships were properly set between the codes and the time dimension was kept for all of them.

Table 3-3. Relationships between codes as identified in the program atlas.ti

Code 1	Code 2	Relationship	Objective
Actor	Time	Actor A expressed Claim C on Time T	Keep track of every time an actor expressed his/her arguments in the debate.
Subject	Time	Subject S was mentioned on Time T	Keep track on every time a subject was mentioned in the debate.
Claim	Time	Claim C was made on Time T	Keep track on the time the claim was expressed in.
Action	Time	Action X was executed on Time T	Keep track of the time for events occurrence.
Report	Time	Report R was mentioned on Time T	Keep track of the time a report is either published or referred to in the debate.
Time	Time	Time T2 follows Time T1	Keep track of the sequence between months and years for the construction of a timeline.
Claim	Action	Claim C is associated to Action X	Keep track of the claims that were expressed during the occurrence of an action.
Claim	Report	Claim C is associated to Report R	Keep track of the claims that were expressed triggered by the publication of a report.
Claim	Claim	Claim C1 is associated to Claim C2	Keep track of the claims that are related to each other as belonging to the same conversation.
Action	Action	Action X2 contradicts Action X1	Keep track when an action by an actor contradicts something that he/she has done in the past.
Actor	Claim	Actor A expressed Claim C	Keep track of which actor expressed a specific claim.

This section has described the process followed to transform the input of newspaper articles into a more concrete dataset that contained the information associated with key elements for analysis, in terms of categories of codes. Afterwards, the information regarding codes and relationships was exported from atlas.ti to excel in order to have a more workable version of the information. When inconsistencies were found in the data, the file in atlas.ti was used to clarify the situation and updates were done to both files to keep consistency. Even though this step provided crucial elements for analysis, the claims still needed to pass through another analysis to identify the values expressed on the debate. The next sub-section will focus on this step.

3.2.3 Identification of values

For this research, public values were defined as general and non-negotiable convictions or beliefs of what is worth striving for society to be good. This is in accordance with the focus on public values for responsible innovation presented in chapter 2. The identification of values was based on the claims put forward by different actors in the debate, which were identified following the methodology described in the previous section. The methodology proposed by Dignum et al. (2015) was used as reference. The application of this methodology for the analysis of the shale gas debate in the Netherlands was taken as guide also for the conceptualization of values. The methodology is based on the analysis of the claims using van de Poel (2013)'s concept of a "value hierarchy".

As the name indicates, the value hierarchy refers to a hierarchical structure of three levels: values, norms and design requirements (Dignum et al., 2015; van de Poel, 2013). A limited number of values are located at the top, such as safety. These refer to intrinsic values that are pursued for their own sake. Norms are found in the middle. They refer to actions that support those values. They may include objectives (such as "maximize safety" without specific targets), goals (that specify

a tangible target) and/or constraints (that set boundaries or minimum conditions). Finally, design requirements are found at the bottom. They are "very specific and detailed and they form the core of (engineering) design" (Dignum et al., 2015, p. 5). The coherence of the structure is based on two relations. On one hand, "*specification*" refers to the translation of higher-level elements into lower level elements in the hierarchy. As they entail value judgements, usually more than one specification is possible. On the other, the "*for the sake of*" relation can connect lower level elements with higher-level elements if, for example, a norm is defined for the sake of a certain value. This relation is asymmetrical and it gives a connotation of motivation or justification to higher-level elements (van de Poel, 2013).

Dignum et al. (2015) observed that the public debate was mainly concerned with the level of norms. Norms "can be made explicit and expressed in the form of arguments, which are put forward in the public debate. Such arguments comprise "normative statements about how the world should be" (Dignum et al., 2015, p. 5). Therefore, the arguments used in the debate allowed the exploration of values expressed by actors. The claims identified in the articles were the arguments given by the actors in the debate. By taking newspaper articles as source, this research deviates from the proposed methodology. Dignum et al. (2015) explored different sources to collect a sufficiently rich overview of the arguments put forward by various stakeholders. When the expressed argument did not clearly related to a specific value, other documents from the stakeholder were used for clarification. The deviation is not seen as problematic, as it accounts for the differences in purpose of the research. This research's intention is not to provide a full overview of the public debate on shale gas, but to identify the values that are expressed through the interactions in the public debate. Moreover, claims could have both factual and opinion contents. When facts, defined as statements with objective content that is well-supported by available evidence (Corvino, 2015), were presented, the actors' choice for presenting the fact at that point of the debate was judged as a value preference to feed the debate.

The process of value identification was iterative in nature. Values were inferred based on the content of the debate and refined based on insights from the literature on VSD, ethics of technology and values related to energy systems. As an initial step, the researcher performed a literature review of these fields to draw a list of values that are related to the development of technologies. This step provided theoretical basis for the conceptualization of the values, which was done afterwards. The theoretical insights were complemented by the insights of the initial analysis of the articles and an initial round of classification in order to refine the list of values identified. Finally, a process of validation was performed with the involvement of two experts to achieve a triangulation of perceptions. The selected experts were previously involved in the value identification process for the shale gas debate in the Netherlands. The validation was composed by the contrast between an individual value identification and a joint deliberation to address points of disagreement.

Example of the value identification process

The focus of the value identification process were the values that were referred to in the claims. This means the values that were identified as expressed by the actor in the claim. Hence, values were added as another code for each claim. In order to provide the reader with more clarity about this process, two claims are used as example:

- *Claim 1: "If we don't have a healthy community people won't be able to work. It's too dangerous to risk contaminating our water. This should come over any economic considerations" (Frack Free Lancashire, June 2015).*
- *Claim 2: "We want local councils and local people to benefit from this exploration. We expect 20-40 wells to be drilled in exploration and I think it's very important for local communities to see some benefit." (Department of Energy and Climate Change, January 2014).*

The first claim is explicit in its concerns for the health of the communities due to the impacts of fracking, which refers to the value of *Health and Safety*. In addition, it puts this value in contrast with economic considerations of benefits from fracking, which is related to the value of *Welfare*. The second claim refers to the fair distribution of costs and benefits when it states that communities

should see some benefits while exposed to the impacts of fracking. Hence, it was related to the value of *Distributive Justice*. Nevertheless, the value identification process was not straightforward for all claims. For a more detailed account on the value identification process and how the conflicting claims were managed, the reader is referred to the Appendix B.

The process of value identification faced the risk of cognitive bias due to the influence of the researcher's own value system and the risk of attention bias due to the amount of claims to analyse (527). In order to be transparent and following recommended practice (See Borning & Muller, 2012), the researcher acknowledges that the values of sustainability, accountability and justice are central to her value system. As an external observer, she does not hold any position regarding the shale gas debate in the UK. Nevertheless, during the research, she has reflected on the arguments given on both sides of the debate and she recognizes the complexity of the situation, given the broader energy security context in which the extraction of shale gas is considered.

Additionally, the cognitive bias was attempted to be balanced with the inclusion of two experts to support the process of value identification. This expert validation allowed for a triangulation of perceptions regarding values, This does not necessarily eliminate the inherent subjectivity, but increases the reliability of the findings. The triangulation of diverse perspectives favours a more complete analysis of each claim as each researcher focuses on specific aspects of the claim to make a judgement according to their experience and value system. Finally, the attention bias was attempted to be balanced by performing the identification of values in batches. However, this was not always possible for the external experts, which had limited time to support the research. Thus, it is assumed that, by using the three perspectives for selecting the final values, the biases could be decreased to a certain extent.

This section has described the theoretical ground and results of the process of value identification. With the identification of the values referred to in the claims, the process of coding of the data was completed. Hence, the data was ready for further analysis. However, as is expected in a qualitative research, a large amount of data was generated. Therefore, to be able to extract key information and to generate visualizations that support the analysis, a support tool was necessary, which is presented in the next sub-section.

3.2.4 Using support tools from network analysis

Network analysis includes the broad array of methodological tools for the analysis of relational configurations and structures (Kenis & Schneider, 1991). Due to the immense amount of data that resulted from this process, it was deemed necessary to use a tool that could support activities of data mining and visualization. The software Gephi 0.8.2 was selected due to its suitability to handle large amounts of data with relationships between them, as it was designed for social network analysis (Gephi, 2016). Additionally, this program allows for a dynamic temporal analysis, which facilitated the analysis of the different rounds in the decision-making process.

Mining graph patterns facilitates further characterization, discrimination, classification and cluster analysis of sophisticated structures and their interactions. Related tools has the advantage of admitting large amounts of structured data as input. These networks has been usually studied in a social network context. Therefore, the process is referred as social network analysis. A social network is the conceptualized as a heterogeneous and multi-relational dataset, which is represented by a graph. The entities composing the network are represented as nodes and the relationships between such entities are represented by links named edges. Both nodes and edges have attributes (Han & Kamber, 2006). For this research, actors, claims, actions, reports and values are all considered nodes of the network. The edges were the identified relationships between the nodes. In order to prepare the data for Gephi, the outputs from the coding process and the value were transformed into appropriate inputs for the program. The reader is referred to Appendix C for more information about this process.

The visualization tools associated to social networks analysis facilitate the presentation of key information for the different points in time for the decision-making process. The analysis can be focused on some of the node classes and also can be restricted to an specific period, a round for example. These possibilities were highly desirable as for the purposes of this research. In addition, there is a key concept associated with social network analysis that was taken into account in this research: degree centrality. This notion is related to the number of links that a node has with other nodes, in this case only the direct links were considered. This is a measure of the "popularity" of the node in the network (Ghali, Panda, Hassanien, Abraham, & Snasel, 2012; Lambertini, Magnani, Marzolla, Montesi, & Paolino, 2014). This measure of local centrality was mainly used to refine the visualization of the nodes by setting their size depending on this measure. This feature provided insights about which actions triggered more responses in the public debate and, therefore, were more relevant during the interactions.

So far, the methodology has described the way the data was collected and organized for further analysis. Nonetheless, for the analysis intended in this research, a final transformation of the data is required to relate the empirical data with the concept developed in chapter 2. The following sub-section presents the methodology used for such analysis.

3.2.5 Developing a procedure to relate empirical data with theoretical concepts

For the reconstruction of the decision making process, three concepts were presented to decrease the complexity of the process and enhance understanding of the dynamics. These concepts were arenas, coalitions and strategies. These concepts were based on notions of collective and individual action. In actors' quest towards their desirable outcomes, they can take the rules and institutions as granted or they can attempt to change those rules in a way that their interests and/or beliefs are assumed to be protected (Schlager, 1995). It is expected that, by focusing on individual and collective actions, some explanation can be given of the beliefs guiding the actions and how that actions influence the dynamics of the decision-making process.

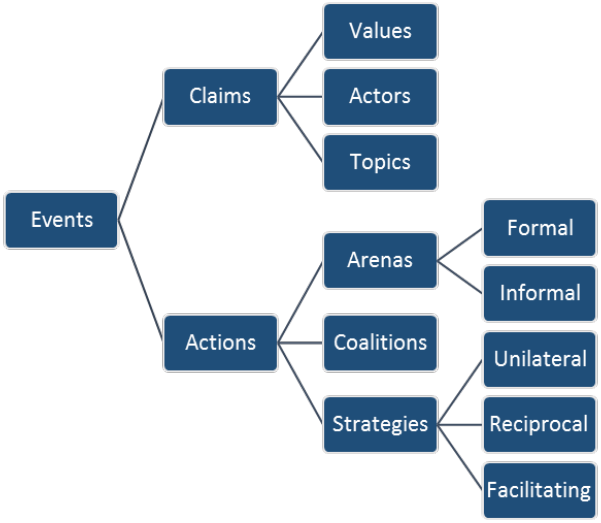


Figure 3-5. Connection between empirical research and theoretical concepts

The events identified during the empirical research provided the necessary elements for analysis that supported the characterization of the arenas, coalitions and strategies present in the decision-making process (Figure 3-5). Once the analysis of the claims and their associated values was finished, the researcher turned her attention to the actions to identify the arenas, coalitions and strategies present in the decision-making process. First, the actions (including the reports) were organized in time and classified according to the round they were performed. Second, the claims that were expressed on relation to these actions were identified. These claims were expressed by

both the actors who were participating in the activity or by the opponents to the realization of the activity. This differentiation between supporters and opponents was kept throughout the rest of the analysis. In addition, this implies that there is a focus on the values expressed in relation with actions with respect to the values that were not, which needs to be considered as a limitation of the analysis. Third, the values associated to the claims of both supporters and opponents were identified. In addition, the resources used by the different actors were also identified (financial resources, decision-making authority, etc.). Fourth, the locations of the decision-making process that led to the execution of the actions were identified. These locations were associated to the arenas of the decision-making process. Finally, the strategies associated to the actions that were executed were identified according to the means used and outputs obtained. In particular, unilateral strategies were assumed to be related to an actor taking advantage of its power in terms of money, mobilizable units or authority to advance a certain position. The identification of strategies implicitly assumes that every action is the result of an actor's strategy.

The identification of coalitions was done by focusing on the interactions between actors during the execution of actions in the decision-making process. The coordination between actors was evidenced in two ways. In first place, if the action was executed through the join work of several actors, this was identified as a collective action. In second place, if some groups of actors joined forces to oppose to actions or decisions made by other actors, these situations were also identified as collective action. If evidence was found of repetitive collective action among some actors, it would be said that they were forming a coalition. In this research, actors were not interviewed. Therefore, evidences of collective actions were assumed to be an indication of the degree of coordination between actors.

The use of the notions of actions (and reports) to identify theoretical concepts does not imply that the information related to the claims were excluded from the analysis. The values identified in the claims were used in two forms. First, to identify the main values represented by the actors in specific moments of time. Second, by identifying the claims triggered by the actions and reports, values related to these can be identified. This step was critical for explaining the expression of public values in relations to the arenas, coalitions and strategies.

This section has explained the connection between the data gathered empirically and the theoretical concepts used to reconstruct and understand the dynamics of the decision-making process. As the process of data gathering produced a large amount of data, is not possible to include it as part of this report. A separate file was created with the information, which is going to be stored in the repository of the RESPONSE project. The reader is referred to Dr.ir. Eefje Cuppen for requesting access to the file. The following chapter will focus on presenting the results of the research.

4

UNDERSTANDING THE DYNAMICS OF THE DECISION-MAKING PROCESS FOR SHALE GAS EXPLORATION IN LANCASHIRE

This chapter present the case study of the project for the development of two sites (Roseacre Wood and Preston New Road) by Cuadrilla Resources Corporation in Lancashire, UK. This chapter aims at reconstructing and understanding the decision-making process taking as basis the concepts developed in chapter 2. Events and actors' interactions were then used as indicators to operationalize the dynamics of the process. Therefore, this chapter aims at answering the following research question:

What arenas, coalitions and strategies can be identified in the reconstruction of the decision-making process for shale gas in Lancashire?

This chapter aims at presenting different aspects of the decision making process based on the concepts built in Chapter 2. In section 2.1, the institutional context of the decision-making process for shale gas projects in the UK is introduced. In section 2.2, the rounds model is applied to the case to identify the crucial decisions characterizing the transition between rounds in the decision-making process for shale gas in Lancashire. Then, the rounds are described by means of the actions and reports occurring along the process. In section 2.3, the application of the rounds model is extended to the identification of arenas, coalitions and strategies in order to provide a description of the dynamics of actors' interaction. Finally, during the debate, the actors presented their positions through claims. These claims are assumed to be related to the expression of actors' values in the debate. Therefore, section 2.4 presents the values identified in the different rounds of the debate based on the claims expressed.

4.1 Introducing the institutional context for shale gas developments in the UK

Decision-making processes unfold as an interconnection of formal and informal interactions between actors. An insight on the institutional context would provide information about the existing formal procedures surrounding the exploration of shale gas in the UK. In 2008, the UK established legally binding targets of GHG reduction and developed a framework to achieve an economically credible emissions reduction pathway (Committee on Climate Change, 2016). Nevertheless, in 2013, the gas and electricity regulator presented an obscure perspective for the UK's energy system. The country faced challenges to ensure security of supply in the near future. This was associated to the closure of coal and oil generation plants, coupled with lack of investments in new ones. Hence, the country was increasing its dependency on imported gas (Ofgem, 2013). The risks to the security of supply have remained a concern over time (Ofgem, 2015). The national government's strategy to face this challenge have been centred on promoting nuclear and domestic oil and gas developments (with a strong support for shale gas extraction) and an ambivalent support for renewables (cutting onshore wind's subsidies while encouraging energy efficiency, for example) (Department of Energy and Climate Change, 2015b, 2016b). In that light, the Department of Energy and Climate Change established the Office of Unconventional Gas and Oil in 2013 to develop the shale gas industry in the UK. This office works closely with the Treasure and the regulators to balance the incentives for investment and the safe and environmentally responsible implementation of the technology (Department of Energy and Climate Change, 2016a).

Due to the complexity of the regulatory process, the Department of Energy and Climate Change (2015a) developed a regulatory roadmap, which is presented in Figure 4-1. The regulation of shale gas in the UK is divided among several bodies. Firstly, the Oil and Gas Authority (OGA) is in charge of issuing the petroleum exploration and development licences (PEDL), approve the hydraulic fracturing programme, data reporting methods and induced seismicity monitoring program. Second, the Mineral Planning Authority (MPA) is in charge of issuing the planning permits to allow operations in a specific area. The execution of Environmental Risk Assessments (ERA) and Environmental Impact Assessments (EIA) are part of the application process for planning permits. Third, the Environmental Agency (EA) is in charge of issuing the environmental permits. Fourth, the Health and Safety Executive (HSE) checks the well design and should be notified of the intention to drill. Fourth, the British Geological Survey (BGS) should also be notified of the intention to drill. Finally, if necessary, the Coal Authority is in charge of issuing the permits if the well will encroach on coal seams (Department of Energy and Climate Change, 2015a).

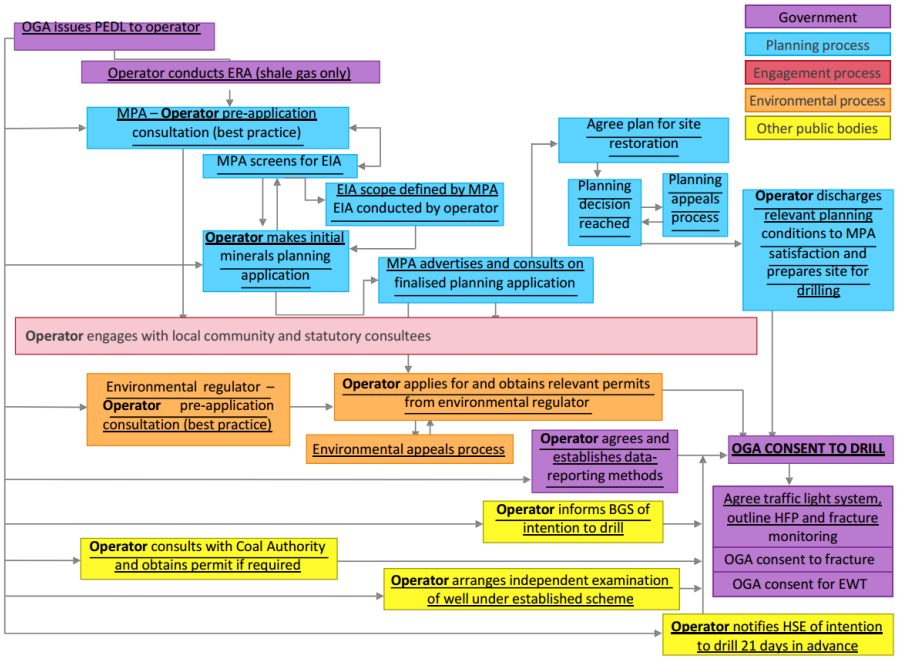


Figure 4-1. UK's regulatory roadmap (Taken from Department of Energy and Climate Change (2015a))

For the case of Lancashire, the OGA issued the PEDL 165 to Cuadrilla during the 13th Licensing round in 2008 (Department of Energy and Climate Change, 2008a, 2008b). After the moratorium was lifted in 2012, new proposals were developed for shale gas exploration in Lancashire, which have so far only covered the authority of the Environmental Agency and the Mineral Planning Authority. The controversy and the decision-making process under analysis were focused on the granting of the planning permissions by the MPA, which in this case is represented by the Lancashire County Council's Development Control Committee. According to the regulations, the applications should be assessed in accordance with the planning law. Therefore, the decision should be informed by the advice of statutory consultees and the representations received from the public through the formal consultation process. Furthermore, if the MPA rejects the planning applications, Cuadrilla has the right to appeal through the Planning Inspectorate to the UK's First Secretary of State. The appeal process should be triggered within six months of the date of the decision by the MPA (Department of Energy and Climate Change, 2015a). The decision-making process for Cuadrilla's projects has gone through all the stages of the planning procedure up to the appeal process, which was triggered after the rejections of the planning applications for both sites Roseacre Woods and Preston New Road by the Lancashire County Council.

The planning system is concerned with ensuring every development is an acceptable use of the land, and with the impacts of the land use. Key issues that can be associated to an application include site location, water (e.g. run-off from site), traffic volumes, on-site storage facilities, noise, groundwater, induced seismicity and waste. The MPAs are not in charge of control processes, health and safety issues or emissions, which are subject to approval under other regulatory regimes. Therefore, the MPAs are advised not to duplicate the work of other regulators, such as the EA, on those topics (Department of Energy and Climate Change, 2015a). The limitations on the grounds for decision-making for the MPAs may increase the controversy regarding the outcomes of the process if some actors perceive the decision to be lacking valid grounds. Likewise, the exclusion of some controversial issues (such as flaring or water pollution) from the scope of the planning system may lead to two outcomes. On one hand, some actors may perceive their concerns to be ignored throughout the decision-making process. On the other, some actors may take advantage of the situation to try to dismiss the concerns regarding such issues. In any case, this factor has the potential to trigger or increase the controversy around the project.

The regulations of fracking in the UK are related to different aspects of the implementation of the technology (e.g. safety, finances and taxes, planning system). Proposals for a new law or to changes to an existing law are presented to the Parliament in the form of Bills. The National Government or Members of the Parliament can present bills, which will take the form of acts once they are approved (Parliament.uk, 2016f). The most relevant bill that was discussed during the course of the decision-making process for shale gas in Lancashire was the Infrastructure Bill. This bill was approved in January 2015 after it was discussed on both houses of the parliament (House of Lords and House of Commons). The final act included safeguards for onshore hydraulic fracturing (including the prohibition of fracking in protected areas) and authorizations to use deep-level land (at least 300 m below surface level) for oil and gas exploitation (Parliament.uk, 2015).

4.2 Reconstructing the decision-making process: application of the rounds model

In December of 2012, the then Secretary of State for Energy and Climate Change, Ed Davey, decided to lift the moratorium imposed to the execution of hydraulic fracturing activities in the UK. This decision was based on the results of research following the occurrence of two tremors near Blackpool in Lancashire in 2011 (Cotton, 2015). Once the moratorium was lifted, a period started in which the different actors started to prepare for the potential execution of exploration activities in the UK. One of such actors was the oil and gas company Cuadrilla, which established a partnership with Centrica in June 2013 for the development of exploration projects in Lancashire. The identification of the different rounds was based on the occurrence of formalized crucial decisions. These decisions were either part of the formal procedures or considered necessary for the development of the decision-making process. For the case of Lancashire, the occurrence of decisions in formal decision-making was bounded to the planning regulations in place. It can be highlighted that the performance of the MPAs is related to their ability to make decisions within the timeframes set by the regulations.

The decision-making process was studied since January 2013 until March 2016. As can be seen in Figure 4-2, some periods were characterized by high activities of the actors in terms of events of the decision-making process. The decisions taken during these periods were assumed to be relevant during the decision-making process. The periods of high activity (or peaks) occurred in June 2013, February 2014, May to July 2014, January 2015, June to August 2015 and February 2016. Peak 1 occurred in June 2013 when Cuadrilla, following the planning procedures, announced the beginning of the Environmental Risk Assessment in July 2013. Cuadrilla hired the consultancy firm Arup to lead the preparation of the planning applications. The high activity in February 2014 is related to the announcement of the sites selected for drilling (peak 2). As such, site selection was considered part of Cuadrilla's preparation for exploration and they did not trigger significant changes in the debate. Then, peak 3 took place between May and July 2014. It corresponded to the submission of the planning applications. This step triggered the procedures of formal consultation by the Lancashire County Council. Therefore, it set the start of the second round. Peak 4 occurred in January 2015 and corresponded to the date that was set for decision-making on the applications. When Planning Officers gave the advice to reject both applications, Cuadrilla agreed a further delay with the Lancashire Council through the submission of additional information on the project. Then, a second consultation process started centred on site-specific aspects of the project, marking the beginning of the third round. The peak of June to August 2015 corresponds to the formal decision-making process for Cuadrilla's planning applications (peak 5). The Lancashire County Council decided to reject both applications. Then, in July 2015, following the planning system regulations, Cuadrilla decided to appeal these decisions against the UK's Secretary of State. This decision started the fourth round, which was characterized by the execution of an inquiry for appeal starting in February 2016 (peak 6).

Based on the previous analysis, it was found that eight formalized decisions were crucial for the definition of the rounds of the decision-making process. These decisions are presented in Table 4-1 in relation to the rounds they opened or closed. The sequence of these decisions were determined

by the formal procedures in place. Two actors seemed to be central in the decision-making process: the Lancashire County Council and Cuadrilla. This sets a contrast with the portrayed complexity of decision-making in networks for energy projects. The fact that other actors are not directly responsible for the decisions defining the rounds can be found in the formal procedures and it is related to the assumption that crucial decisions are formalized ones. Formal procedures set the rules for all other actors to participate in the decision-making process. For a description of all activities related to the formal procedures executed in relation to the Lancashire project, the reader is referred to the Appendix D.

Table 4-1. Rounds identified in the decision-making process. The actors with decision-making authority are found between brackets.

Round	Time	Initial decision	Closing decision
Preparation to re-start exploration activities	Jul 2013-May 2014	Execution of required Environmental Risk Assessment (Cuadrilla)	Submission of planning applications to Lancashire County Council (Cuadrilla)
'Business as usual' management of high profile applications	Jun 2014-Jan 2015	Acceptance of the applications (Lancashire County Council)	Agreement to delay the decision on the planning applications (Lancashire County Council & Cuadrilla)
New consultation on site-specific, contested aspects of the project	Feb 2015-Jun 2015	Open formal consultation (Lancashire County Council)	Decision to reject both applications (Lancashire County Council)
Changing grounds within the planning appeal process	Jul 2015-(Pending)	Decision to trigger the planning appeal process (Cuadrilla)	Decision on appeal (UK's Secretary for Communities and Local Government)

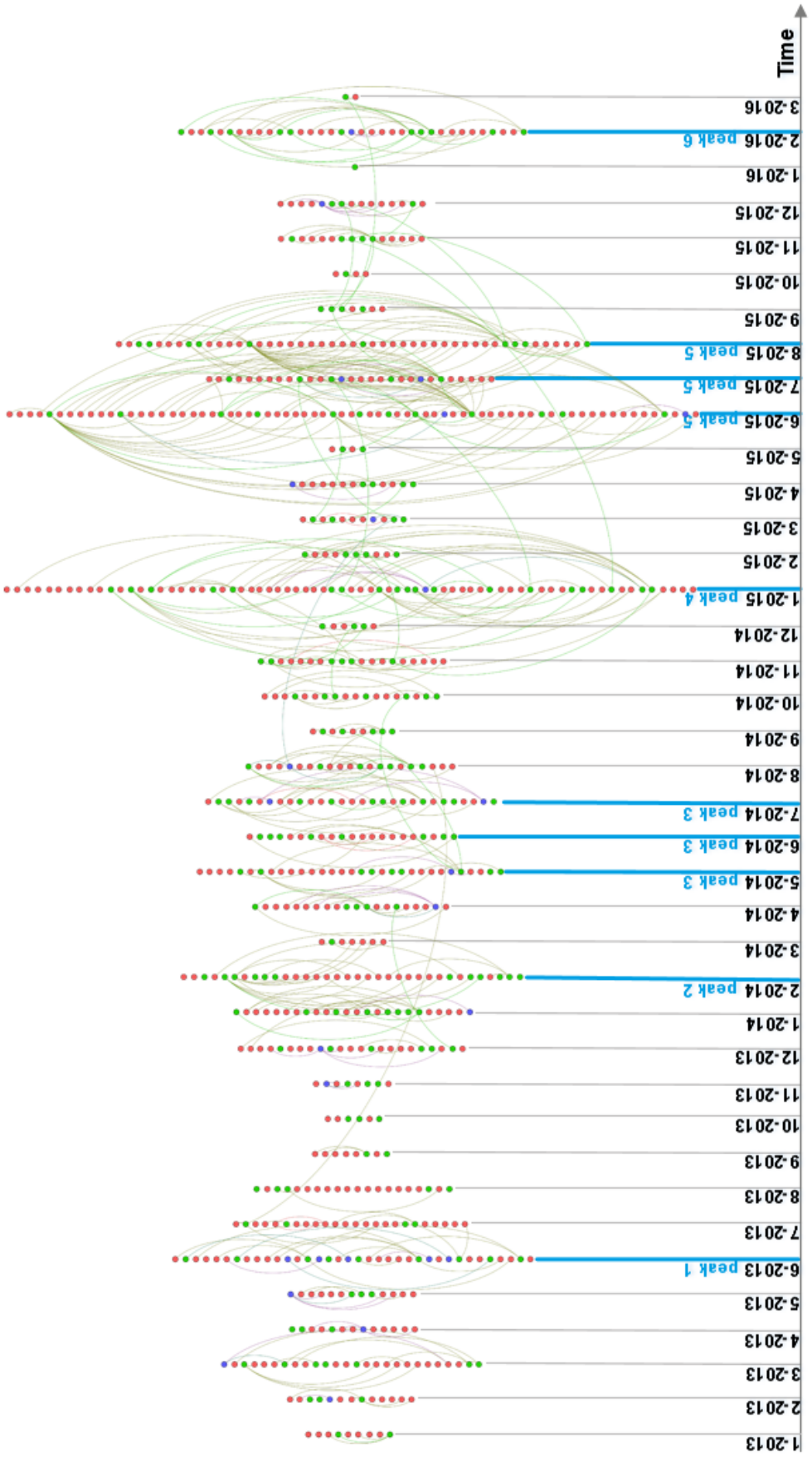


Figure 4-2. Representation over time of the events identified between January 2013 and March 2016

Even though the events occurring between the lift of the moratorium and Cuadrilla's decision to re-start its exploration activities were not part of the formal decision making process, they set the environment for the re-activation of fracking activities in the UK. Therefore, this period, denominated the round zero, was included in the analysis. This section aims at describing the actions that characterized each round of the decision-making process. Each sub-section corresponds to a round of the decision-making process. To keep a track on changes in both the implementation of the project and its surrounding institutions, the rounds are described regarding the developments in the two levels: project and regulations. The key actions are highlighted and visualized in accompanying figures. As a starting point, Table 4-2 introduces the main actors participating in the debate.

Table 4-2. Main actors participating in the debate

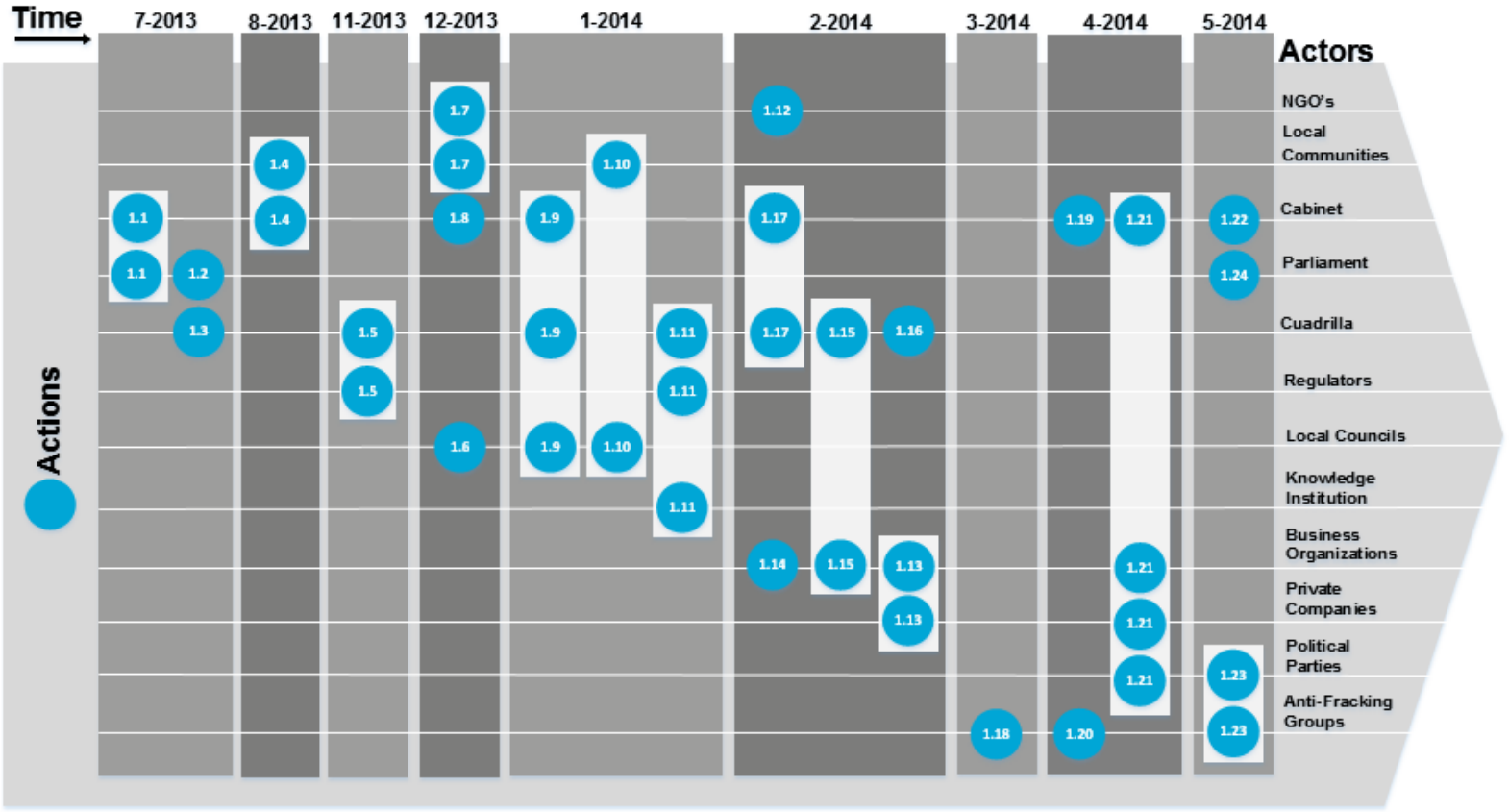
Type	Actors	Role
Business Organization	North West Energy Task Force	Promoting safe and responsible development of shale gas as a motor for regional development
	Lancashire Chambers of Commerce (East and North & Western)	Seizing opportunities for Lancashire's businesses growth
	United Kingdom Onshore Oil and Gas Group	Representing the interests of the onshore oil and gas industry in the UK
Civil Society	Local pro-fracking groups. Main participants: Backing Fracking and Blackpool Fracking for a Better Future.	Creating support for shale gas development
	Local anti-fracking groups. Main participants: Frack Free Lancashire, Keep East Lancashire Frack Free, Preston New Road Action Group, Residents Action on Fylde Fracking and Roseacre Awareness Group	Performing activities trying to stop fracking in Lancashire
Environmental NGO	Campaign to Protect Rural England	Campaigner for the protection of the rural countryside
	Friends of the Earth	Campaigner on urgent environmental and social issues
	Greenpeace	Campaigner for the protection of the environment
	Royal Society for the Protection of Birds	Campaigner for the protection of wildlife in the UK
Local Government	Lancashire County Council.	Decision-maker regarding the planning applications for land use of Lancashire
	Local authorities. Main participants: Burnley Borough Council, Fylde Borough Council Preston City Council, Woodplumpton Parish Council, Rossendale Bourough Council and Ribble Valley Bourough Council	Responsible for the development of their cities (or towns) and the wellbeing of their inhabitants
Cabinet	Prime Minister David Cameron	Leader of the government
	Chancellor of the Exchequer George Osborne	Responsible for the economic and financial policies in the UK
	The UK's Department for Communities and Local Government	Responsible for the proper functioning of the planning system
	The UK's Department for Environment, Food & Rural Affairs	Responsible for the protection of the environment and the development of the rural economy
	The UK's Department of Energy and	Responsible for the development of

Type	Actors	Role
	Climate change	clean, affordable and secure energy sources
Regulatory bodies	British Geological Survey	Responsible for providing geoscientific data regarding UK's natural resources
	Environment Agency	Regulator for the protection and enhancement of England's environment, where Lancashire County is located
	Public Health England	Responsible of the health and safety of the citizens of England
	Oil and Gas Authority	Regulator of the onshore and offshore oil and gas operations
Parliament	House of Lords and House of Commons	Responsible for legislation and scrutiny of the Government's work
	Official Opposition Shadow Cabinet	Ensuring National Government's accountability for policies and programs implemented
Private companies	Cuadrilla	Developer of the shale gas exploration project in Lancashire
	Centrica	Supplier of electricity and gas for the UK and Cuadrilla's partner for the Lancashire project
Knowledge generation institutions	Royal Society, Task Force on Shale Gas, Chartered Institute of Environmental Health, Committee on Climate Change, among others.	Providing information about the risks and benefits associated with fracking

4.2.1 Exploring the environment leading to the reactivation of shale gas exploration activities

Once the moratorium was lifted, different actors started to prepare for the re-activation of exploration activities in the UK. At national level, the concerns were divided between ensuring the existence of a proper regulatory framework for the safe development of fracking and creating the incentives for both companies and local communities to support the execution of exploration projects. During this time, the Chancellor of the Exchequer announced tax breaks for companies and opened the door for the discussion on benefits distribution for communities, which were joined by Cuadrilla and parliament members for Lancashire. In addition, due to Lancashire's large reserves of shale gas, the members of the parliament for Lancashire also insisted on the development of proper safety regulations before giving their support for fracking. Conversely, the UK Onshore Oil and Gas Group was developing best practice guidelines for community engagement and chemicals disclosure to promote the industry's commitment to safety and working with local communities during the development of their projects.

At local level, the announcement triggered the reorganization of the already existing anti-fracking campaign groups, such as Frack Free Fylde and Residents Action on Fylde Fracking, to promote their views regarding the risks of fracking among local communities. These activities included inviting a citizen of Canada to share her experience with fracking and water pollution. At the same time, the first reports on the economic impacts of shale gas development for Lancashire (Deloitte, 2013; IoD, 2013) started to set the division line between the views of some local businesses and the anti-fracking campaigners regarding fracking's impacts and benefits. In spite of the emerging local opposition, Cuadrilla decided to capitalize the positive environment and announced its intentions to submit applications for exploration sites to the Lancashire County Council in June 2013.



Cabinet
Prime Minister
Department for Communities and Local Government
Department for Energy and Climate Change

Parliament
House of the Lords Economic Affairs Committee
Official Opposition Shadow Cabinet

Local Councils
Preston's Environmental Scrutiny Panel
Freckleton Parish Council
Rossendale Council

Regulators
Environental Agency
Public Health England

NGO's
Campaign to Protect Rural England
Greenpeace

Anti-Fracking Groups
Frack Off Burnley
Frack Free Blackpool
Roseacre Awareness Group

Knowledge Institutions

Business Organizations
North East Lancashire Trade Union Council
North West Energy Taskforce
East Lancashire Chamber of Commerce
North & Western Lancashire Chamber of Commerce

Private Companies
Engineering firm Addison plc
Lytham Technology
IGas

4.2.2 Round 1: Preparations to re-start exploration activities

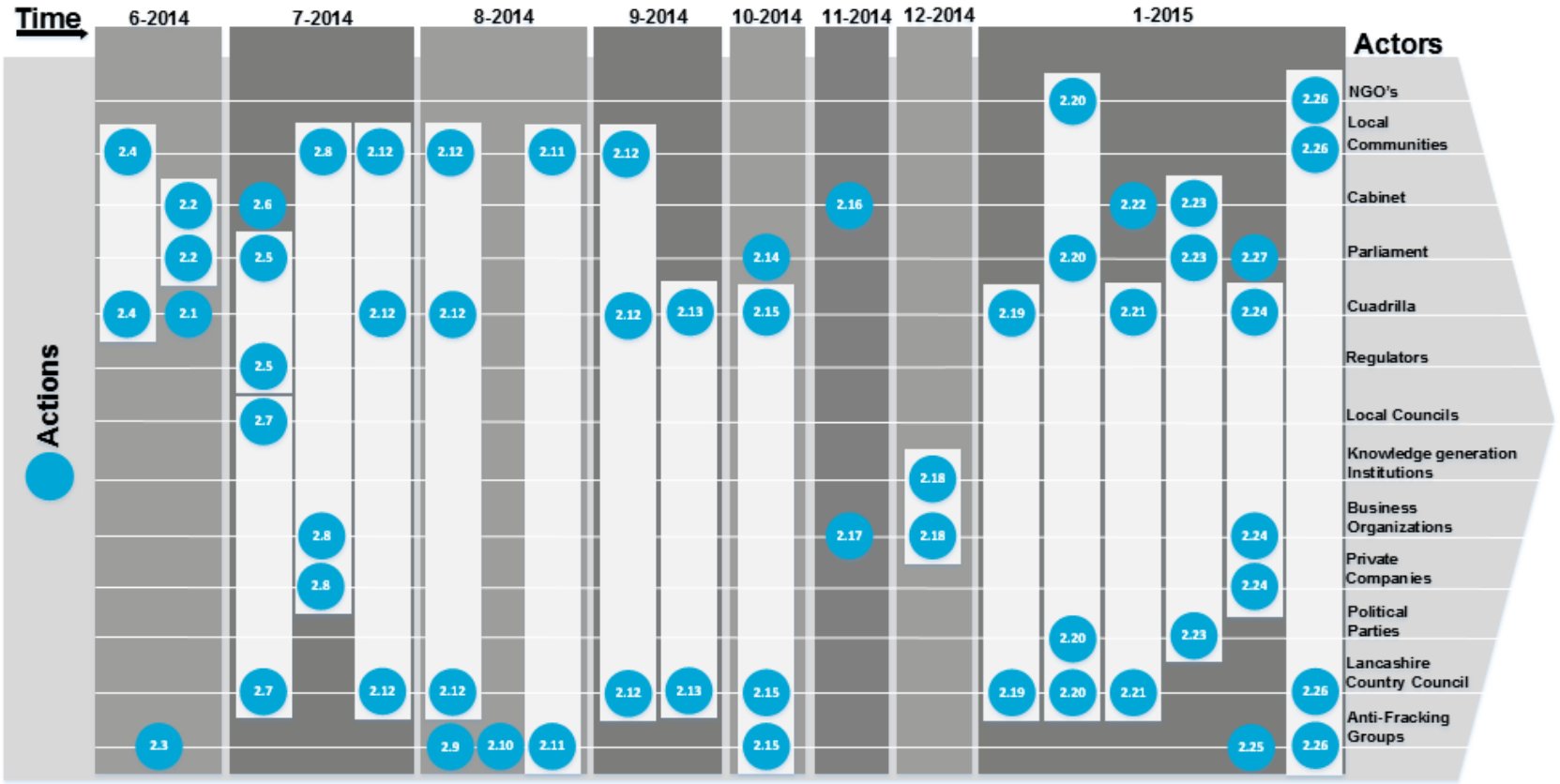
The beginning of the first round was marked with regulatory changes to the planning system in July 2013 (*action 1.1*). The state councils were no longer able to investigate issues of induced seismicity, flaring, venting and groundwater pollution before granting permission for application. These issues were remitted to the Environmental Agency. Additionally, at national level, a controversy was triggered by a conventional drilling project by Cuadrilla in Balcombe, Sussex. A protest was held during July and August 2013 due to the prospects of the site opening the door for fracking in the area. The high level of participation in the protest attracted national attention on fracking and led to the cancelation of the project. Facing these complications, the national Government accepted the need to promote the benefits of shale gas to gather support and the Prime Minister visited Lancashire with such purposes (*action 1.4*). Conversely, the Official Opposition Shadow Cabinet shade light to the close relations between government officials and the shale gas industry, which contested the transparency of the Government regarding its support for shale gas development (*action 1.2*).

Later on, new regulatory discussions were set in place. In January 2014, the government announced its proposal for the compensation package of local communities, while adding incentives to the local Councils in terms of tax rates (*action 1.9*). This proposal was confronted with positive reactions of local councils and Cuadrilla, and negative reactions of Environmental NGOs calling it bribery. In turn, the Lancashire parliament members organized themselves for negotiating a higher share. In February 2014, the Campaign to Protect Rural England requested further regulatory controls over any drilling in Lancashire (*action 1.12*). This demand were followed in April 2014 by the announcement of stricter regulations for fracking and investments on research for decreasing the environmental impacts of fracking by the Department of Energy and Climate Change (*action 1.19*). At the same time, from December 2013, Greenpeace took advantage of the laws protecting landowners' rights to start a legal bid to block fracking through local citizens' opposition to grant permits for fracking under their lands (*action 1.7*). In response, Cuadrilla expressed its concerns to the national Government in February 2014 (*action 1.17*). This action led to proposals of changes in landownership regulations to facilitate resource extraction in May 2014 (*action 1.22*).

At project level, Cuadrilla started the execution of the public consultation activities related to the Environmental Risk Assessment in July 2013 (*action 1.3*). In February 2014, it announced the selection of Preston New Road and Roseacre Woods as the sites to start exploration activities in Lancashire (*action 1.15*). Hence, Cuadrilla performed the Environmental Impact Assessment activities from January 2013 to March 2013 as part of the preparation for applications' submission (*action 1.16*). For the local anti-fracking campaigners, this period was characterized by further organization and the creation of new groups in different communities. A relevant group created during this time was the Roseacre Awareness group in March 2013 (*action 1.18*). At the same time, the first protests were performed targeting the Local Council and industry-supportive events in the area (*action 1.20 & action 1.23).* In view of the controversy, between January and February 2014, some local councils opened spaces for debates with their communities to gather their concerns regarding the proposals and to define their position regarding the project (*action 1.10 & action 1.6*). In contrast, the front of the supporters of fracking started to organize itself with the creation of the North West Energy Taskforce in February 2014 (*action 1.13*). This organization is an association of local businesses backed by Cuadrilla and Centrica, which promotes the opportunities for regional development associated with the development of the shale gas industry. This group focused its actions in conferences aimed to inform and prepare local businesses to capitalize on the potential opportunities (*action 1.14 & action 1.21*).

In terms of knowledge generation, this long period can be seen as a further preparation for the start of shale gas exploration. To inform the debate, reports focused on the impacts of fracking on health and water, which were among the main concerns of the citizens. These reports concluded that risks were low and could be mitigated through proper regulation (CIWEM, 2014; PHE, 2013) (*action 1.5 & action 1.11*). Additionally, in January 2014, the Committee of Economic Affairs of the House of the Lords announced the results of their research on the economic impacts of fracking (*action 1.24*).

Based on them, they supported the Government's commitment to develop the fracking industry in the



Parliament
Fylde Parliament Member
Blackburn Parliament Member
Burnley Parliament Member
Environmental Audit Committee
House of the Lords

Cabinet
Prime Minister
Department for Energy and Climate Change
Chancellor of the Exchequer

Lancashire County Council
Lancashire Country Council Leader

Anti-fracking Groups
Preston New Road Action Group
Reclaim the power camp
No dash for gas
Keep East Lancashire Frack Free
Gayzer Frackman
Frack Free Lancashire
Other anti-fracking groups

NGO's
Friends of the Earth
Greenpeace

Business Organizations
North & Western Lancashire Chamber of Commerce
East Lancashire Chamber of Commerce
UK Onshore Operations Group
North West Energy Taskforce

Private Companies
TUTIS Concepts
Local businesses

Local Councils
Blackpool Council
Blackburn with Darwin Borough Council

Knowledge Generation Institutions
Academics
Experts

Regulators
Oil and Gas Authority (DECC)

Political Parties
Labour Party
Green Party

UK and the necessity of regulatory changes to facilitate this process (Economic Affairs Committee, 2014). Such announcement provoked confronting reactions by different actors in the debate. In turn, the Department of Energy and Climate Change published a regulatory map to provide clarity on the regulations and best practices related to shale gas exploration in the UK in December 2013 (*action 1.8*). These recommendations were said to be followed by Cuadrilla when it announced that it was ready to submit the applications for both sites by the end of May 2014 (*action 2.1*).

4.2.3 Round 2: 'Business as usual' management of high profile applications

At the beginning of the round, the regulatory debate started with the official announcement of the Infrastructure Bill in June 2014, which authorized the use deep-level land for fracking without landowners permit (*action 2.2*). This proposal sparked protests by Greenpeace. Furthermore, the Infrastructure Bill faced struggles to get approval in the parliament. First, in October 2014, the House of Lords made proposed changes to deregulate the chemicals that could be used for fracking (*action 2.14)*. However, the opposition parties identified this and several other points as problematic and decided to block the Bill's approval until their demands were accepted. In addition, the pressure on the cabinet increased when members of the Environmental Audit Committee called for a ban of fracking in January 2015, which was supported by the findings of their report on the environmental risks of fracking (Environmental Audit Committee, 2015) (*action 2.27*). Therefore, the cabinet was forced to accept the opposition's conditions to ban fracking from environmentally sensitive areas, monitor groundwater at least 12 months before starting operations and regulate the chemicals that could be used for injection. Hence, the Bill was approved in January 2015 (*action 2.23)*.

The Infrastructure Bill was not the only regulatory change occurring during this round. At local level, the Councils of Lancashire, Blackpool, and Blackburn with Darwin Borough decided to support the developers' understanding of the planning system by preparing a Supplementary Planning Document in July 2014 (*action 2.7)*. At national level, in July 2014, the Department of Energy and Climate Change announced more regulations for environmentally sensitive areas (*action 2.6*) and the stimulation of the estimation of UK's shale gas resources by announcing the opening of the 14th Licensing Round (*action 2.5*). This bid included half a dozen blocks in East Lancashire. Conversely, in January 2015, the Chancellor of the Exchequer announced the creation of a shale gas sovereign wealth fund to boost the economic development of the North of England, where Lancashire is located (*action 2.16)*. Nevertheless, the Chancellor's transparency was contested by the publication of a leaked letter by Friends of the Earth in January 2015. In the letter, he requested cabinet members to "prioritize" the development of shale gas in the UK (*action 2.22)*.

At project level, the Lancashire County Council started the formal public consultation in June 2014, and it was extended until September 2014 (*action 2.12)*. The high profile of the applications attracted the submission of thousands of representations from individuals and groups. For this reason, the Council and Cuadrilla had to agree on two occasions on delaying the formal decision-making meeting to January 2015 (*action 2.13 & action 2.15)*. This time was deemed necessary for the Planning Officers to analyse the application documents and the representations received before giving their advice. In January 2015, their advice was published (*action 2.20)*. They recommended the rejection of both applications on noise and traffic grounds. In light of this outcome, Cuadrilla decided to request a deferral of the decision and submitted additional information on alternative traffic and noise control plans for the sites (*action 2.19)*. During the formal decision-making meeting held in January 2015, representations were heard and the request by Cuadrilla was discussed. Following legal advice, the Council decided to delay the decision and to start a new round of public consultation on Cuadrilla's new plans (*action 2.21)*.

During this round, anti-fracking campaign groups increased their activities. The creation of new groups led to the emergence of the Preston New Road Action Group in June 2014, which was concerned with the proximity of one of the sites to their homes (*action 2.3)*. The anti-fracking groups set up a protest camp on a field near the Preston New Road's site for three weeks in August 2014 (*action 2.11)*. Campaigners of the Reclaim the Power camp joined this protest, which increased its

visibility. In addition, the campaigners kept their focus on spreading information on the risks of fracking

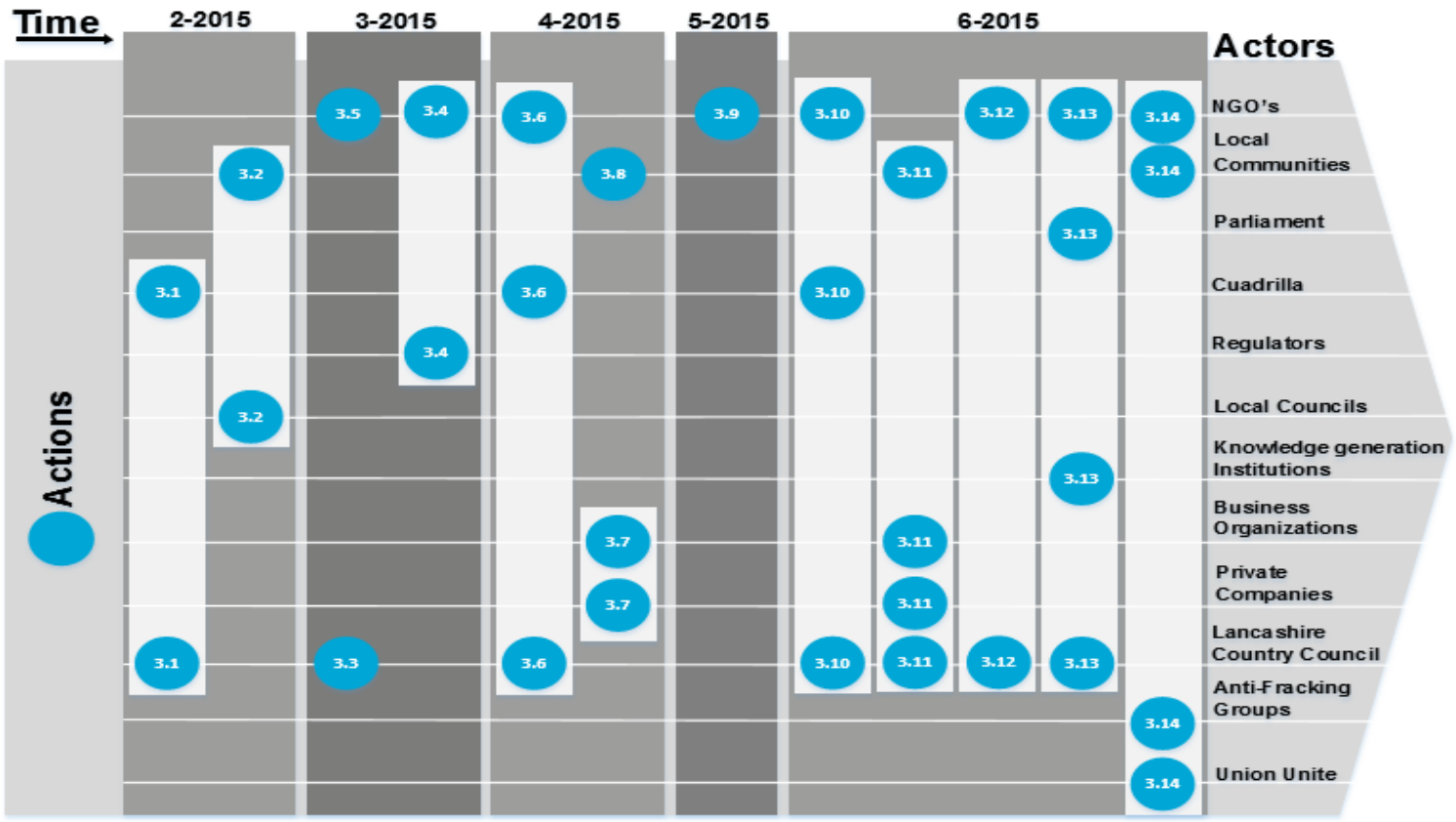


Figure 4-5. Actions occurring in Round 3

by participating in public events across the County (*action 2.10)*. In addition, the publication of an incomplete report about the impacts of fracking on the rural economy by the UK's Department for the Environment, Food and Rural Affairs was also the focus of the protests (DEFRA, 2015) (*action 2.9)*. Protestors demanded access to the full report before the Lancashire County Council was due to make a decision. The level of the protest increased again in January 2015, when the Council was due to make the decision. Demonstrations, meetings and signature collections were done to put pressure on the Lancashire County Council to reject the project (*action 2.25 & action 2.26)*.

In turn, Cuadrilla used this time to continue its post-submission engagement activities (*action 2.4)*. These activities aimed at promoting the results of the Environmental Impact Assessment and the benefits of the technology among locals. Additionally, in January 2015, it launched a supply chain online portal together with both Lancashire's Chambers of Commerce. The portal served as a registry for companies interested in becoming a supplier for Cuadrilla (*action 2.24*). The purpose of this alliance was to enable local businesses to capitalize the opportunities arising from explorations' projects. As supportive activities, the UK Onshore Oil and Gas Group held the first round of "Let's Talk About Shale", which finished in December 2014, in an attempt to increase the information base of local communities around fracking (*action 2.18)*. In addition, the North West Energy task Force held conferences and published papers promoting the benefits of fracking and putting pressure on the local Council to approve the applications (*action 2.17 & action 2.8)*. After the decision-making meeting, supporters celebrated the delay of the decision and the local Council agreed with Cuadrilla a new date for the decision in February 2015, which set the start of the third round (*action 3.1*).

4.2.4 Round 3: New consultation on site-specific, contested aspects of the project

Due to its focus on specifics of the project, this round is mainly characterized by actions occurring at local level. After agreeing to delay the decision, the Lancashire County Council opened a new round of consultations on the new information presented by Cuadrilla in March 2015 (*action 3.3)*. During this time, the controversy around the uncomplete report by the Department for Environment, Food and Rural Affairs about the impacts of fracking on the rural economy continued as Greenpeace appealed to the UK's Transparency watchdog in March 2015 to force its publication (*action 3.4)*. At the same time, anti-fracking campaigners focused on contesting the legitimacy of the supporters of fracking and their claims. They performed surveys to prove that business supporting the activities of the North West Energy taskforce were not locals in March 2015 and to provide the views of real estate agents on the negative impacts of fracking on house pricing in May 2015 (*action 3.5 & action 3.9)*. In turn, between February and April 2015, the inhabitants of the villages affected by Cuadrilla's new traffic plans started organizing themselves to oppose these proposals (*action 3.2 & action 3.8)*. Furthermore, in April 2015, supportive businesses announced investments to transform local ports into shale gas hubs (*action 3.7*).

Once closed, the public consultation process was again characterized by a high number of representations by the public. Therefore, in April 2015, the Lancashire County Council and Cuadrilla agreed again on delaying the decision until June 2015 (*action 3.6)*. At the beginning of June 2015, the advice of the Planning Officers was published (*action 3.10*). They recommended the approval of the Preston New Road site subject to a lengthy number of conditions being met (Lancashire Planning Officer, 2015a) and the Rejection of Roseacre Woods due to unacceptable impacts from traffic increase in the area (Lancashire Planning Officer, 2015c). On June 23, the formal decision-making meeting started with hearings of representations of different actors (*action 3.11*). Protesters met outside the city hall to make their position clear (*action 3.14)*. The debates were lengthy, they included considerations of legal advices on the grounds the Council had for rejecting the application of Preston New Road in spite of the Officer's recommendations. Nevertheless, after these deliberations, the Council decided to reject both applications due to their impacts on the life quality of local communities (Development Control Committee, 2015). In particular, the application of Preston New Road was rejected on grounds of landscape and visual impacts, and the application of

Roseacre Woods was rejected on grounds of traffic impacts (*action 3.12 & action 3.13)*. This decision triggered several

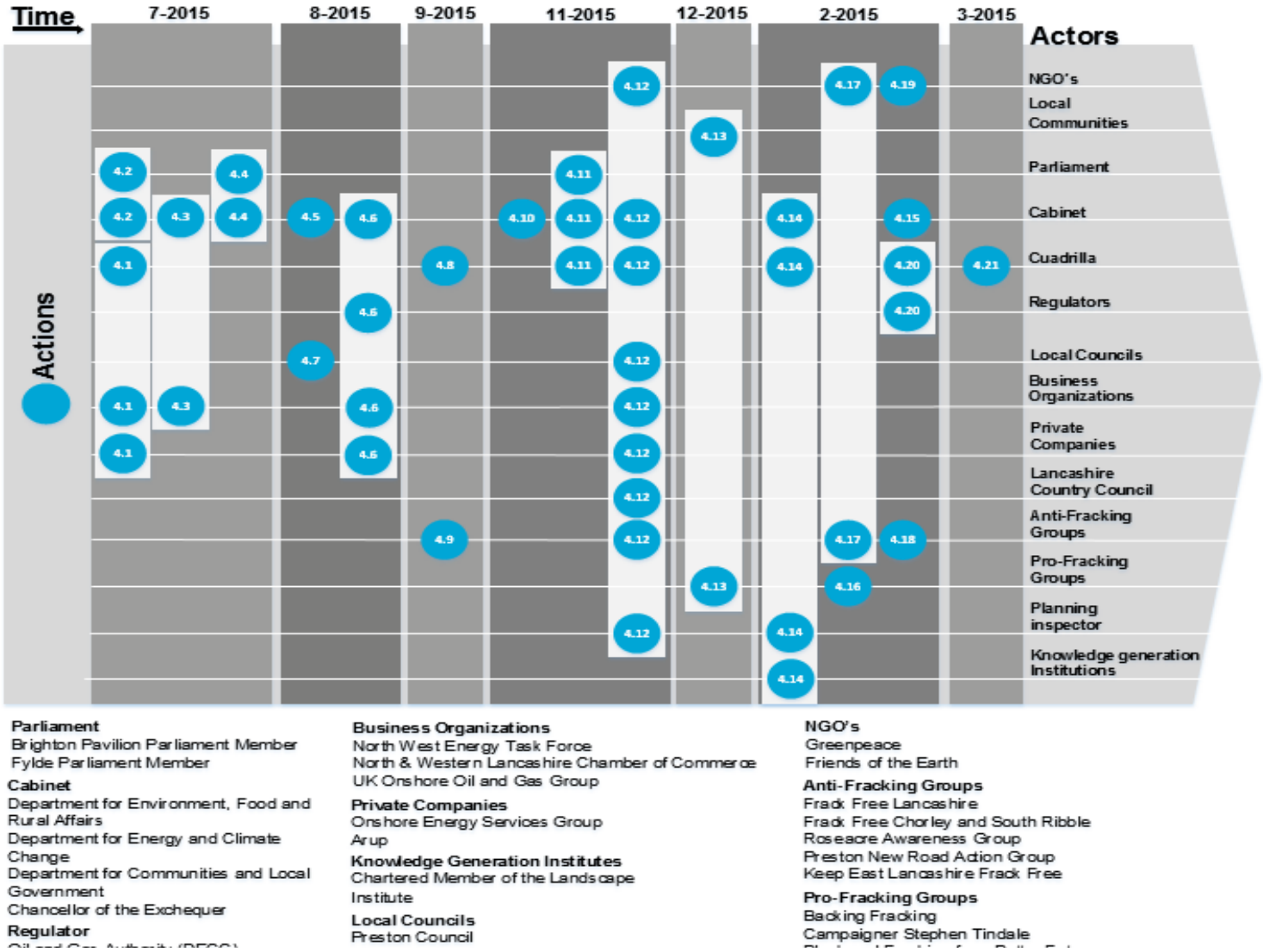


Figure 4-6. Actions occurring in Round 4

reactions. On one hand, anti-fracking campaigners celebrated the decision but were cautious of Cuadrilla's reaction on a possible appeal. On the other, the shale gas industry lamented the decision and pointed out to the failures of a planning system that takes one year to reach a decision, when the regulatory time is 16 weeks. The industry recommended the Government to review and improve this system if they wanted to keep the interest of investors. Under this environment, Cuadrilla decided to follow the procedures of the planning system by stating its intentions to appeal the Lancashire County Council's decision, which marked the beginning of the fourth round (*action 4.1*).

4.2.5 Round 4: Changing grounds within the planning appeal process

Given the slow development of the exploration of shale gas in the UK, the government decided to perform major regulatory changes. In July 2015, the Department of Energy and Climate Change announced changes to the fracking regulation (*action 4.3*). It allowed companies to perform groundwater monitoring without requiring permits. Groundwater monitoring was set as a requirement for fracking in the Infrastructure Act and its permitting process was perceived as a possible source of delay for exploration projects. Additionally, it changed its perspective on the prohibition of fracking in environmentally sensitive areas (*action 4.4*). In July 2015, it approved the execution of exploration activities in existing Sites of Special Scientific Interest, which contradicted its January's announcement during the enactment of the Infrastructure Bill. However, in November 2015, fracking operations were again forbidden from these sites (*action 4.10)*. Moreover, in August 2015, the Department for Communities and Local Government announced changes in the planning system to fast-track planning applications (*action 4.5)*. These changes imply that the UK's Secretary of State for Communities and Local Government will be actively considering "calling in" fracking planning applications and appeals on a case by case basis. "Calling in" refers to "the power of the Secretary of State to take the decision-making power on a particular planning application out of the hands of the local planning authority for his own determination" (Smith, 2016, p. 3). It also included assessing the performance of local Councils to make a decision within the regulatory timeframe, making the low performers more likely to be overruled.

In addition to changes in regulations, other actions occurred at national level in relation to the development of shale gas in the UK. In July 2015, the full report by the Department for Environment, Food and Rural Affairs about the impacts of fracking on the rural economy was released accompanied of statements regarding its condition as a draft (DEFRA, 2014) (*action 4.2*). Its findings, however, did not have a great impact on the public debate as would have been expected due to the persistence in its publication. In turn, the Oil and Gas Authority announced the results of the 14th Licensing Round in August 2015, which allowed the exploration of shale gas in East Lancashire (*action 4.6)*. Finally, the transparency of the Government's decisions was again contested in February 2016. This was done by means of a leaked letter from three Secretaries of State (Energy and Climate Change, Environment, Food and Rural Affairs, and Communities and Local Government) to the Chancellor of the Exchequer, in which they committed to avoid the creation of new barriers for shale gas development (*action 4.15)*.

In September 2015, Cuadrilla submitted the Appeals to Lancashire County Council's decision to the Secretary of State for Communities and Local Government (*action 4.8)*, which was followed by an announcement of that Secretary in November 2015 to "call in" the final decision on the appeal due to its major importance at national level (*action 4.11)*. This decision sparked opposition from local governments and anti-fracking campaigners that perceived it as a way for the national Government to overrule local democracy. The appeal process was defined to consist of an inquiry in which representations of interested groups would be heard by a neutral planning inspector. Then, the inspector would prepare a report for the secretary to make the decision. As preparation, a pre-inquiry meeting was held in November 2015 to make administrative arrangements between the different parties (Planning inspector, Department for Communities and Local Government, Cuadrilla, Lancashire County Council, Parish Councils of the communities affected by the project, North & Western Lancashire Chamber of Commerce, Friends of the Earth, Roseacre Awareness Group and Preston New Road Action Group,) (*action 4.12)*. The public inquiry was held from

February to Mach 2016 (*action 4.14),* but the results are still uncertain to the time of the writing of this report.

During this round, the different parties prepared themselves for the public inquiry. The anti-fracking campaigners continued the creation of new groups and the execution of demonstrations to raise awareness among the public (*action 4.9 & action 4.17)*. In February 2016, they performed protests in front of the parliament and the inquiry site as a way to express their position (*action 4.19 & action 4.18)*. Furthermore, the Preston City Council voted to oppose fracking inside or nearby its boundaries in August 2015 (*action 4.7)*. Conversely, Cuadrilla announced moving the locations of its headquarters to Lancashire to demonstrate its commitment to regional development. The change of location was completed in March 2016 (*action 4.21*). Additionally, in February 2016, it attacked the legitimacy of Friends of the Earth. It accused the group of misleading its regulator by making political campaign through its charitable arms, which is forbidden by charities regulation (*action 4.20)*. Moreover, supporters groups also performed demonstrations in Lancashire to protest the loss of the County's pioneering spirit by the refusal of the applications and to show their support during the inquiry (*action 4.13 & action 4.16*).

This section presented the developments that characterized each rounds at two levels. On one hand, the changes in the regulatory regimes at national level were presented as they had a direct influence on the decision-making process. On the other, the interactions between actors at local level that influenced the decision making process regarding the project in Lancashire. It can be noticed that there is a complex interconnection between the two levels, with some actors being active at both levels. In order to provide a further understanding of the interactions between actors. In the next section, the identified arenas, coalitions and strategies are presented to unveil the dynamics of the process. Even though the rounds model does not focus on the content of the debate, the reader is referred to Appendix E for an overview of the topics discussed on each round.

4.3 Understanding actors' dynamics: the role of arenas, coalitions and strategies

Three aspects were introduced in chapter 1 as relevant to understand the complexity entailed by decision-making processes for the implementation of energy projects: arenas, coalitions and strategies. This section presents the results of the identification of this entities for the case of shale gas in Lancashire, which was based on the procedure described in section 3.2.5.

4.3.1 Arenas: A view on the spaces used for decision-making

The concepts of arenas is useful to understand the multiplicity of decisions that are being made during the decision-making process. This section is focused on introducing the arenas identified in the different rounds for the project in Lancashire. The arenas were characterized by four characteristics: (i) the topic of the decisions being made, (ii) the actors that were participating, (iii) the level at which the decisions were being discussed (local or national), and (iv) the type of actor interactions allowed in the arena (formal or informal). First, the topics were used to give a name to the arenas. Second, the changes in the participating actors gives an indication of the changes in the interests of actors in different rounds. Third, the level of the decision (national or local) also serves as an indication of the aspects of the project implementation under discussion. While the arenas located at local level were focused on discussions on the project's impacts for Lancashire, the arenas located at national level were centred on the regulatory system that should guide the exploration of shale gas. Even though they are located at different levels, the decisions made in one arena may interact with the decisions being made in another, as actors could be active in arenas located in different levels at the same time. Finally, the formal arenas are related to formalized decision-making processes in which a set of rules and institutions structure the interactions between actors, such as in the enactment of a Bill. In turn, informal arenas are relevant for the construction of the public perspective of the technology. The objective of these venues is to provide elements for

influencing the public opinion and perception around the risks and benefits of the project at local level and the role of shale gas in UK's energy mix at national level. Table 4-3 presents the results of the identification of venues and the rounds in which they were active.

Table 4-3. Active arenas during the different rounds. Numbers in the cells correspond to the number of actors directly involved in the decision-making process

Level	Arena	Type	Description	Round			
				1	2	3	4
Local	Local meetings	Informal	Congregation of actors active at Lancashire to discuss and decide upon their positions in the fracking debate. Eight related actions were reported in the media. Example: congregations to organize anti-fracking groups.	10	1		1
	Open debate on shale gas impacts and benefits	Informal	Promotion of specific positions and information regarding the benefits and impacts of fracking in Lancashire. It also included the contestation of the legitimacy of some actor's claims regarding their representativeness of the public perception of fracking. Example: Prime Minister's visit to urge local citizens to back fracking based on community benefits	9	12	4	8
	Planning application for Lancashire project	Formal	Formal procedures executed as part of the planning system for the applications to start an exploration project. It includes the actions of actors trying to influence the decision outcome. Fifty-five related actions were identified in the media. Example: Lancashire County Council Meeting in June 2015 to decide upon the project.	4	22	26	2
	Conferences	Informal	Conferences organized by the North West Energy Taskforce to promote the benefits of fracking for Lancashire. Two conferences were reported in the media. Example: the North West shale gas supply chain conference.	6	4		
	Platform for business development around fracking	Informal	Creation and capitalization of opportunities for local businesses around Cuadrilla's plans for shale gas extraction in Lancashire. Five related actions related to this arena were identified. Example: the creation of the online supply chain portal by Cuadrilla and both Chambers of Commerce of Lancashire.	6	5	1	1
	Preston City Council decision-making over fracking	Formal	Decision-making process in the Preston City Council regarding the position of the city regarding fracking in its area. Three related actions were identified related to this arena. Example: Preston Council decision to oppose fracking inside or nearby its boundaries	4			1
	Shale gas planning policy making	Formal	Preparation of a Supplementary Planning Document by the Lancashire County Council, the Blackpool Council and the Blackburn with Darwin Borough Council to advice developers of exploration projects in their area.		3		
National	Open debate on shale gas	Informal	Promotion of wider views regarding shale gas in relation to its impacts and benefits, its role in the UK's energy mix and the cabinet's management of	3	15	10	15

Level	Arena	Type	Description	Round 1	Round 2	Round 3	Round 4
	UK		transparency in its relationships with the shale gas industry.				
	Shale gas financial policy making	Formal	Policy making process regarding the distribution of the financial benefits of fracking to local communities and the taxation of the shale gas industry. Seven related actions were identified in the media. Example: Creation of the sovereign wealth fund for the North of England from shale revenues.	6	2		
	Shale gas planning policy making	Formal	Policy making process regarding the adjustments of the planning system to the management of projects for the exploration of shale gas. Three related actions were identified in the media. Example: Changes in the planning system to fast-track planning applications for fracking.	3			8
	Shale gas safety regulation policy making	Formal & Informal	Policy making process regarding the conditions for the safe and environmentally sound extraction of shale gas in the UK. Twenty-four related actions were identified in the media. Example: Publication of a Regulatory roadmap for onshore oil and gas extraction.	8	15	4	
	Shale gas resource estimation	Formal	Promotion of the process of shale gas exploration to estimate the resource available for commercial exploitation. Five related actions were identified in the media. Example: Execution of the 14th Licensing round.		3		4
	Shale gas land ownership policy making	Formal	Policy making process regarding the changes to the rights of owners to decide over the use of deep-level land under their property. Eight related actions were identified in the media. Example: Authorization to use deep-level land without landowners consent through the Infrastructure Act.	6	7		
	Impacts on Rural Economy Report publication	Informal	Contestation over the publication of an incomplete report about the impacts of fracking on the rural economy by the UK's Department for the Environment, Food and Rural Affairs. Four actions were identified in the media. Example: Greenpeace appeal to UK's transparency watchdog to put pressure on the report's release.		6	2	1
	Appeal process for planning applications	Formal	Process of appeal for Cuadrilla's planning application after the UK's Secretary of State for Communities and Rural Affairs "called in" the application. Ten related actions were identified in the media. Example: Execution of the public inquiry.				18

By looking at the local arenas, it can be noticed that the number of formal and informal arenas is balanced. Nevertheless, half of the arenas are not recurring, they were opened only during one or two rounds of the debate concerning specific decisions that were not contested in later stages of the debate. The recurring arenas are mostly informal, and their use is related to different actors. On one hand, anti-fracking campaigners mostly used local meetings to organize their actions. On the other, fracking supporters mainly used conferences to promote their message of the benefits of the shale gas industry. Therefore, Anti-fracking campaigners targeted this arena for protests. Finally, the open debate was used to influence the public opinion and usually was concerned with the risks and benefits of the technology and the project. Conversely, the only formal arena that was recurrent, was the one in which the application by Cuadrilla was being discussed. The planning regulations in place guided the characteristics of this arena through the different rounds. Hence, it took the form of Environmental Risk Assessment and Environmental Impact Assessment in the first round, public consultation and formal meetings in round two and three, and it mutated to a national arena of the appeal process in the fourth round. The latter changed was facilitated by the changes in the planning regime and the decision of the Secretary of Communities to take the final decision.

By looking at the national arenas, it can be seen that they are mostly formal as they are concerned with the processes of policy making related to shale gas extraction in the UK. None of these policy-making processes was active throughout the entire decision-making process. Firstly, the financial policy-making was focused on issues of taxation and benefits distribution. Even though not all the actors were satisfied with the final proposal, it seems that none of them could challenge the decision made in the second round to continue the discussion in further rounds. Secondly, the changes in the planning system were done during the first and last round. It can be said that the venue was reopened in the fourth round as a response to the pressures of the national Government for the system to be more agile and responsive to the fracking applications. Thirdly, the estimations of the commercially exploitable resources of the UK was a priority of the Oil and Gas Authority, which opened the 14th Licensing round to accelerate this process. Fourthly, the land-ownership policy making was opened during the first and second rounds to respond to the legal actions by Greenpeace to block fracking through landownership rights. It took the form of the Infrastructure Bill, which was enacted after agreements with the opposition. Finally, the policy-making process for the regulation of shale gas was central to the discussion on whether the country was prepared for ensuring a safe and environmentally sound shale gas exploration. In contrast, one of the informal arenas focused on the debate over the report on fracking impacts in the rural economy, which was used to contest the legitimacy of the Government's intention to provide the public with full information of the benefits and impacts of fracking. At the same time, the debate at national level went beyond the benefits and impacts of the development of the shale gas industry. It also brought attention to the relations between governmental bodies and the oil and gas industry. This focus targeted at contesting the legitimacy of the Government to make decisions for the common good and its independence from the interests of the industry.

Decisions made on different arenas could be coupled as means of negotiation. There was a coupling of the topics discussed in the safety regulations arena and the landownership one in January 2015. When some parliament members threatened to trigger a ban on fracking, the government was forced to prohibit fracking on environmentally sensitive areas in order to get the approval of the infrastructure Bill. This was the only occasion in which the parties making decisions in different arenas were forced to open up the solutions under discussion to make agreements. The safety regulations arena was only discussed in an informal way after this decision was made. In addition decisions made in some arenas may also limit the decisions made in another one. For example, in the national planning policy-making arena, the planning system was changed to limit the grounds for applications' considerations in the first round. In turn, this decision limited the decision-making space for the local arena of planning application for the Lancashire project. This can be seen in the dissonance between the grounds presented for the rejection of the project when compared with the concerns expressed in the public debate (e.g. visual impacts on landscape vs. health risks of current future generations)

An interaction was evidenced between the formal arenas (in which decisions were being made following the existing formal institutions) and the informal arenas (in which the different actors

organized themselves or promoted their positions in the debate). The arenas provided a location for the formal and informal interactions that occurred between actors in the decision-making process. In particular, formal arenas included both formal and informal interactions occurring around the topic under discussion. Furthermore, the formal national arenas were more focused on a particular set of actors, which led local actors to feel excluded from these discussions. This discomfort was expressed by means of asking the national Government to open up spaces for a public debate regarding if and how fracking should be developed in the UK. Even though the formal local arena for the decision on Cuadrilla's project gave room for public participation, actors did not perceive that these spaces promoted an open debate. The arena was transformed into a "war zone" in which the different groups of actors presented the arguments that supported their position and waited for the other's side reaction in a contest of strength. When each round closed, this feeling was visible among the anti-fracking campaigners when saying that they could not rest after the decision was made, instead they had to get ready for Cuadrilla's next move. Therefore, this environment promoted the polarization of the actors and a closed attitude towards cooperation and open deliberation.

In conclusion, the existence of arenas limits the possibilities of actors to influence the outcomes of the decision-making process. Actors are limited by their resources to participate in all the arenas in which their interests are being discussed. In addition, some arenas are closed to external actors; this is the case of the formal national arenas. The local inhabitants' interests are represented through their parliament members. Locals may write letters for parliament members to promote their positions, but this is not always guaranteed. Furthermore, the diversity of venues disperse the attention of actors from a single topic. The cognitive capacity of actors limits their capacity to keep track on the developments of each arena. For additional information about the topics discussed per venue on each round, the reader is referred to Appendix F.

4.3.2 Coalitions: A perspective on actors' collective action

Coalitions provide an understanding on how actors join efforts to advance their position in the decision-making process. Coalitions are formed through the interactions of actors based on shared interests and goals. The participation on such communities is triggered by the perceived benefits in terms of resource use and the potential for achieving common goals. This section presents the coordinated communities identified among the actors based on the actions executed in the decision-making process.

As starting point, actors performing actions in the debate were divided according their position regarding fracking and their level of action. On one hand, three groups of actors were identified. First, the actors whom openly supported and promoted the development of shale gas exploration in the UK. Second, the actors whom were against the development of fracking in Lancashire or the UK. Third, the actors who were either neutral, conditionally supportive of fracking or ambiguous on their position. It was observed that this group was less likely to join coalitions as they were still forming their own perceptions of the technology. On the other hand, actors could focus their actions on the arenas that were active at national level or local level. Figure 4-7 presents the results of this classification for the actors with a clear position in the debate. In general, the local Councils, the parliament and the regulators kept their positions neutral or unclear, and local business were distributed between both positions.

Once the positions of the actors were clear, the evidences of common actions or a supportive position of other actor's actions was assumed as an evidence of coalition formation. Hence, four coalitions were identified. Each side of the debate was characterized by the presence of two coalitions operating at local or national level. Some actors were active at both national and local level and acted as coordination point, these individuals can be identified as boundary spanners as they engage in inter-group relations (Richter, West, Van Dick, & Dawson, 2006; Williams, 2002). Hence, the coalitions are introduced according to its focus:

i. **Policy Enablers:** Actors operating at national level who promoted the development of a regulatory environment that facilitates the execution of exploration activities. This

community is composed by the Government bodies, the Oil and Gas industry, the business organizations and some members of the parliament (Political parties: Labour, Liberal democrats and Conservatives).

ii. **Policy Obstructers:** Actors operating at national level who try to either impede the development of exploration activities or make changes in the regulation to impose stricter conditions. This community is composed by environmental NGOs and some members of the parliament (Political parties: Green, Labour and Conservatives).

iii. **Project Promoters:** Actors operating at local level who promote the benefits of fracking for the regional development. They also highlight and capitalize the business opportunities derived from the shale gas industry. This community is composed by supportive civil organizations, businesses associations, the Oil and gas industry, the Department of Energy and Climate Change and local businesses.

iv. **Project Contesters:** Actors operating at local level who raise awareness towards the risks of the technology and perform activities to block project's execution. This community is composed by civil organizations, environmental NGOs and supportive political parties.

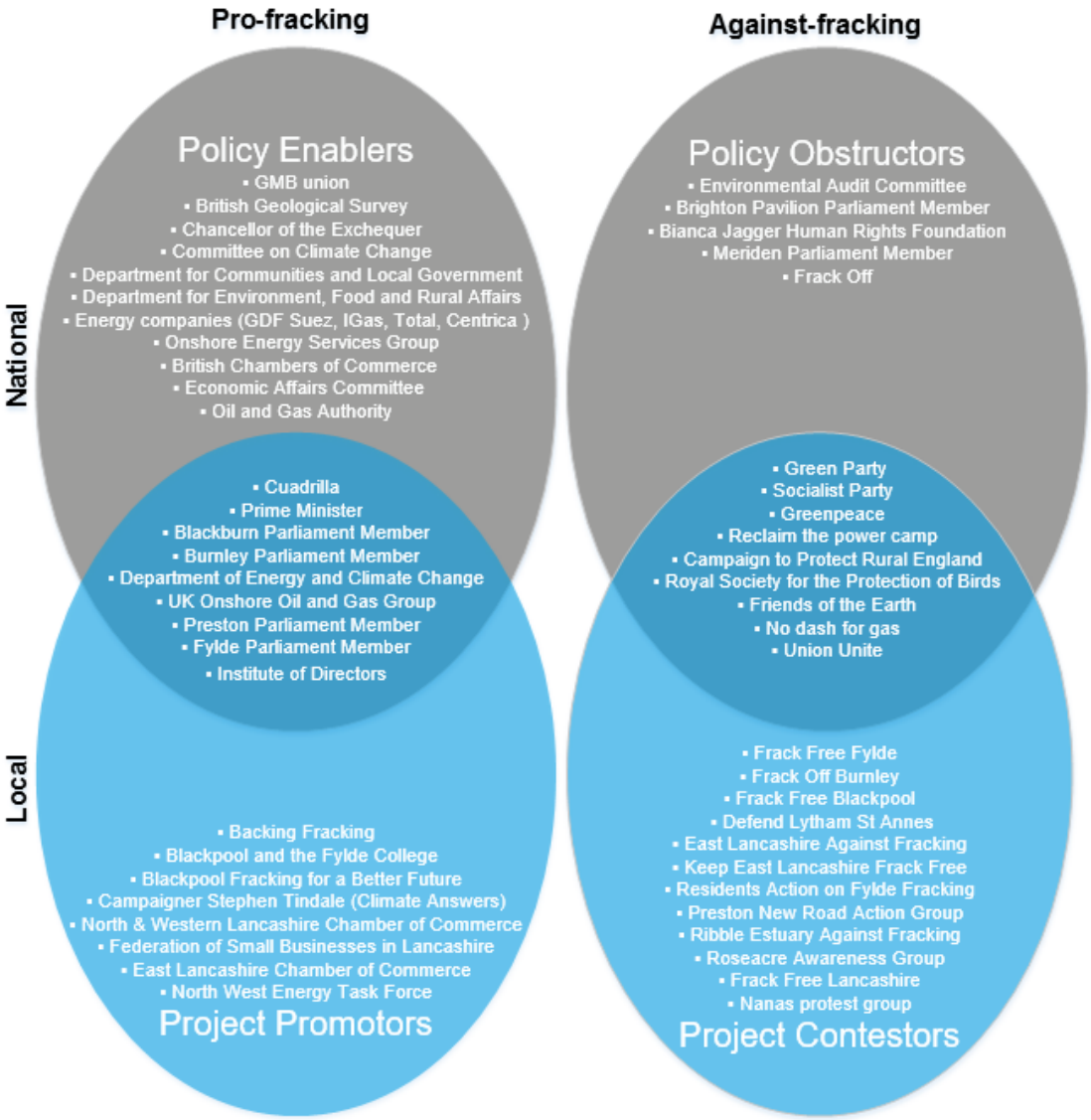


Figure 4-7. Distribution of actors in the different coalitions

The activities of the Project Promoters and Project Contesters were targeted to gaining public support for their position. Nevertheless, they manage different agendas. The promoters were less focused on public demonstration and tried to make visible the possible benefits of the development of the shale gas industry. Examples of their actions are found in the conferences for supply chain development and an online portal for registering to be Cuadrilla's potential contractors. In turn, the Contesters were focused on public demonstrations and related actions to put pressure on decision-makers to oppose fracking. Examples of its actions are found in the occupation of a field nearby Preston New Road as a protest and the collection of signatures requesting Lancashire Council Leader's objection of Cuadrilla's applications. The main resources of this group are the people who compose them.

Conversely, the Policy Enablers and Policy Obstructers were focused on influencing the regulatory framework for shale gas development. The Enablers concentrated their efforts on identifying possible bottlenecks for the development of exploration activities and proposing regulatory changes to minimize them. Nevertheless, they also proposed legislation aiming at assuring the public of the safety of the process. Examples of their actions are the Infrastructure Bill and the development of the regulatory roadmap for exploration. In contrast, The Obstructed try to build barriers for the development of the exploratory activities in terms of either legislation or legal blocks. They are also focused on contesting the legitimacy of the relations between government officials and the shale gas industry Examples of their actions are the ban calling that forced the national Government to ban fracking in environmentally sensitive areas and Greenpeace's initiative to block fracking using landownership rights. Finally, it should be noticed that the actions of the coalitions cut across different arenas.

The work of coalitions was distributed across the arenas and was more visible in some than in others. For example, the Policy Obstructers showed low coordination in their actions for the Resource Estimation venue, the opposition in this venue had been more individual than collective. Furthermore, the close communication between the industry and the national Government compared with the perceived distance between the national Government and the public gave room to speculations about the role of lobbying in policy development for shale gas. It also contested the transparency and the legitimacy of the government officials to protect the public interest over the private ones. In effect, environmental NGOs exploited this situation as a strategy for affecting the publics' perception of fracking. They used legal aids to reveal the communications between the industry and government officials as "evidence" that the national Government was following the wishes of the shale gas industry. The attack on the legitimacy of actors was also used by Cuadrilla when accused Friends of the Earth of misleading their regulator. Therefore, legitimacy can be considered a valuable resource for the work of coalitions as it was at the centre of the controversy regarding the actions performed by different actors.

In conclusion, the existence of coalition allows the actors to make a more efficient use of their resources. It allows actors to represent their interests in several venues, even if they do not have a direct access to them. It is important to notice that these coalitions do not necessarily share the same values and can be pursuing the same goal based on different objectives. Nevertheless, the interaction between their members may allow the development of a common understanding of the problems and solutions under discussion in the decision-making process. In addition, the boundary spanners were relevant as they acted as coordination bridges between the actors executing activities at different levels.

4.3.3 Strategies: an outlook of the variety of actors' interventions

Strategies refer to the interventions of actors in the decision-making process, for the shale gas process in Lancashire, the identification of strategies was focused on the analysis of actions performed by actors. In chapter 2, strategies were classified in three types: unilateral, reciprocal and facilitating. While the use of unilateral strategies seek to advance individual goals in spite of the interdependencies, the use reciprocal and facilitating strategies capitalize on the interdependencies

to steer the decision-making process in some desired direction. Reciprocal strategies attempt to open up the definition of problems and solutions to block or advance specific positions in the debate. Facilitating strategies attempt to facilitate cooperation to achieve mutually beneficial solutions. This section introduces the strategies used by actors in the decision-making process.

The decision of Cuadrilla to start the planning procedures can be seen as a unilateral strategy to kick-start a decision-making process. The use of this strategy gave a direction to the decision-making process, while opening spaces for deliberations regarding how to implement the project. This use of unilateral strategies to kick-start a decision-making process was also evident when the Cabinet announced the Infrastructure Bill. Unilateral strategies were also used to change the rules of interactions by means of changes in the formal procedures in the planning system. Changes were announced in July 2013 and August 2015, as a way to build favourable conditions for fast decision-making regarding fracking applications. In addition, unilateral strategies were also used to change the patterns of interdependencies between actors. For example, Cuadrilla moved its headquarters to Lancashire while using local contractors for the supply of services. This is perceived as a way to create interdependencies with local businesses so they become more supportive of fracking as they can evidence the possible benefits associated to shale gas exploration and commercial exploitation.

In turn, facilitating strategies were mainly used to promote agreements regarding procedures. For example, the execution of the pre-inquiry meeting in November 2015 was aimed at getting actors to reach agreements regarding the way the inquiry was going to be executed, without discussing the contents of decision-making. In this way, an environment was created in which the different parties could perceive the procedures to be fair and open. Likewise, the UK Onshore Oil and Gas Group and the Union GMB joined forces to develop a charter that could include the views of the oil and gas workers, local communities and the industry regarding safety in fracking. Finally, reciprocal strategies were used for several purposes. First, actors challenged the legitimacy of decision due to exclusion of their views. This strategy was mainly used by anti-fracking campaign groups to accuse the cabinet of prioritizing the interest of the shale gas industry interests over the public one in decision-making for shale gas exploration. Second, actors formed coalitions with other parties to increase the visibility of their claims. This was done by both sides of the debate as presented in the previous section. Third, strategies were used to raise complexity. Several parties used the inclusion of broader definitions of the problem or alternative solutions. For example, the North West Energy Taskforce used the conferences to couple the need to develop shale gas in Lancashire to the problems of the local business in the area. In addition, the anti-fracking campaign groups attempted to couple the energy security problem with the development of renewables. Finally, the communication of strategic information was also used as an strategy to steer the debate to particular problems' formulation. This is the case for example of the publication of the report of the impacts of fracking in the supply chain by the UK's Onshore Operators Group.

In the decision-making process for shale gas in Lancashire, reciprocal strategies were dominant during all rounds. This can be explained by the design of the formal procedures in the planning system. The activities of public consultation were embedded in both the preparation of the applications and their discussion once submitted in the local Council. Therefore, actors were aware of their interdependencies and thus focused their efforts on influencing the grounds for decision-making. Nevertheless, the use of this kind of strategy did not enabled cooperation. As was said before, the decision-making process increased its level of controversy over time. Actors were aware of their interdependencies and tried to use them to block the advance of the goals of the other actors. However, the signature of the Infrastructure Bill was an example of negotiation between actors, which was achieved by opening up the debate by negotiating the decisions on two arenas: land-ownership and safety regulations policy-making. Nevertheless, unilateral strategies were also used especially in national arenas. Actors capitalized on their formal decision-making authority and financial resources to advance their positions in the debate. Figure 4-8 presents the strategies used per round of the decision-making process. It can be noticed that facilitating strategies were hardly used. As these strategies are meant to mediate conflicts and bring actors together, their low use

may be a reflection of the polarization of the debate. The different parties may have found their positions to be irreconcilable and were not interested on making concessions.

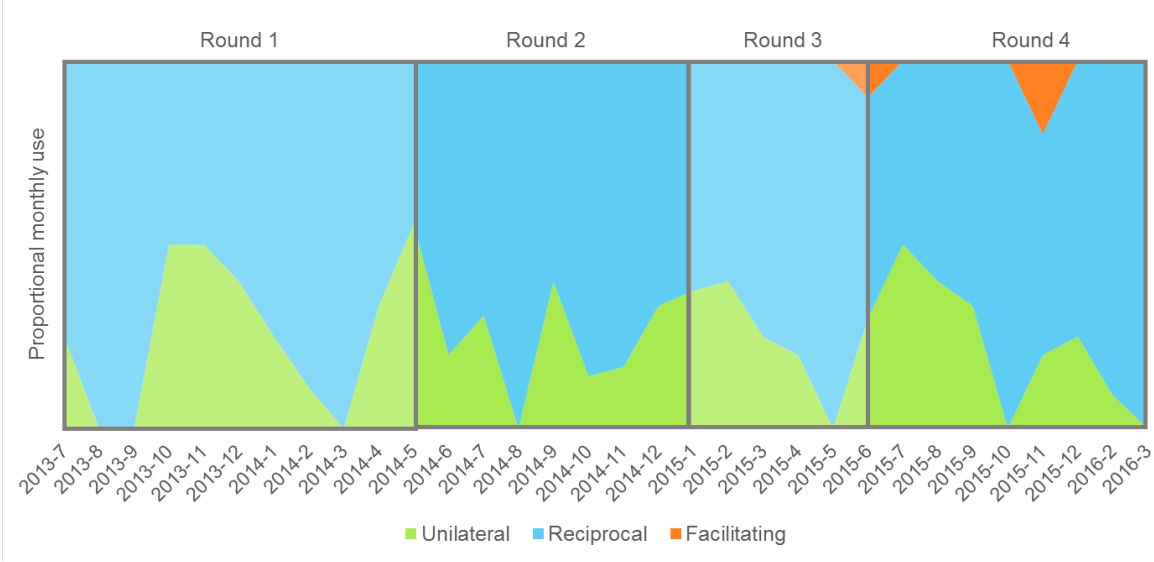


Figure 4-8. Strategies used per round of the decision-making process

Furthermore, during the analysis, the actions were classified according to the affiliations of the actors or procedures in which they were embedded. Figure 4-9 present the use of the different strategies by the different types of actions. In connection to the low presence of facilitating strategies, it can be seen that they were only used by pro-fracking actors and in a formal instance of the decision-making process. On one hand, the pro-fracking actors used this strategy to join forces between the UK Onshore Oil and Gas Group and the GMB union to promote the development of skills and safety in unconventional oil and gas explorations sites. This join work seek to be extended to local communities in an attempt to articulate and clarify their concerns. On the other, the pre-inquiry meeting represented an intervention in which all actors were forced to interact to reach agreements on the rules and arrangements of the appeal process.

In addition, it is worth noticing that the Cabinet and Cuadrilla were the actors with the larger share of unilateral strategies' use. Generally, the cabinet proposed the changes of regulation in a unilateral fashion. Once the announcement was done, the negotiations started -when necessary- to make the arrangements for its enactment. Therefore, the national Government capitalized in its formal decision-making authority in its attempts to lead the process towards its goal: starting shale gas explorations in the UK. In contrast, Cuadrilla made use of its financial resources and authority in its attempts to steer the decision-making process. Examples of these interventions are found in its decision to re-start exploration activities in the UK, offer financial compensation to local communities, initiate the appeal process and move its headquarters to Lancashire.

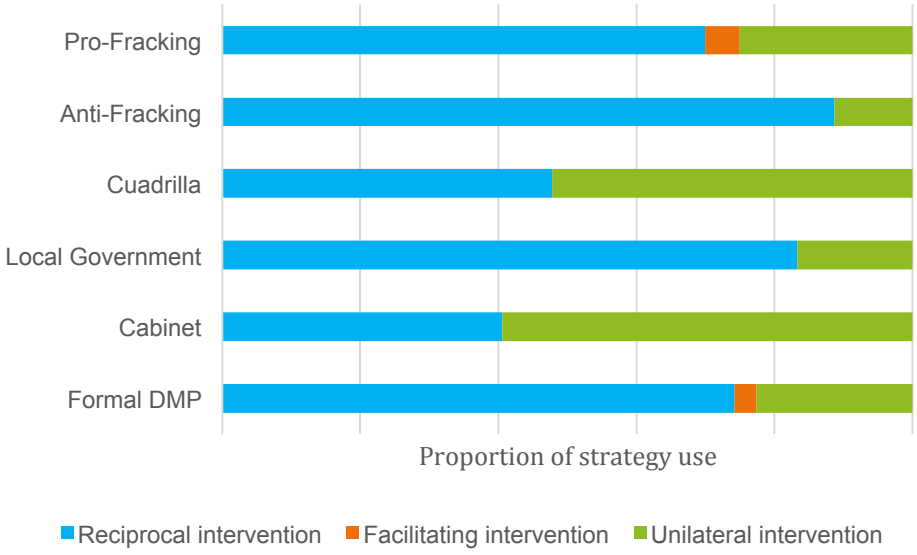


Figure 4-9. Strategies used per type of actions in the decision-making process

In conclusion, strategies represent the way actors decide to act in order to advance their interests in the decision-making. For the Lancashire project, the actors were highly aware of their interdependencies but made no significant efforts to generate mediation spaces in the middle of a polarized debate. Strategies were aimed not only at influencing the outcomes of the decision in Lancashire, they also included the attempts of actors to gain public support for their perspective. The public opinion was perceived as a desirable resource to increase the legitimacy of the claims of either side of the debate.

This chapter has focused on presenting the dynamics of the decision-making process in terms of rounds, arenas, coalitions and strategies. Therefore, four rounds were identified in the process: Preparation to kick-start exploration activities, 'Business as usual' management of high profile applications, New consultation on site-specific, contested aspects of the project, and Changing grounds within the planning appeal process. In addition, the different arenas, coalitions and strategies evidenced in the debate were identified and described. The following chapter will build in the understanding of these dynamics to establish a connection with the rhetoric use of values in the debate.

5

CONNECTING THE DOTS: LINKING DECISION-MAKING DYNAMICS WITH THE RHETORIC USE OF VALUES

The dynamics of the decision-making process has been associated to the actions identified for the case of shale gas exploration in Lancashire. Nevertheless, the claims expressed by actors' in the public debate add another layer of complexity to these dynamics. When actors express values in these claims, there are said to be referring to the rhetoric use of values by the different actors in the debate. This chapter aims at connecting the dynamic aspects of the decision-making process, which were described in chapter four, to the values that were expressed in the debate at different points of time. Therefore, it aims at answering the following research questions:

What values have been expressed in the public debate during the decision-making process on shale gas in Lancashire?

How have values been expressed in the arenas, by coalitions and through strategies?

The first step towards answering these questions is the description of the values identified in the decision-making process, which is done in section 5.1. Then, the analysis will focus on how the three concepts used to describe the dynamics of the decision-making process gives shape to the rhetoric use of values by actors. First, section 5.2 introduces the values that are expressed in the different arenas of the decision-making process. Then, section 5.3 presents the connection of the values with the actors participating in the coalitions. Finally, section 5.4 would relate the values that accompany the use of certain strategies with the values that are used in response to these interventions.

5.1 Describing the values expressed in the decision-making process

From the claims identified in the public debate, most of them referred to the expression of public values, which were defined as general and non-negotiable convictions or beliefs of what is worth striving for society to be good. This sections presents the values identified in the public debate. In the analysis of the shale gas debate in Lancashire, two different types of value hierarchies were identified. Firstly, a hierarchy of substantive values (Figure 5-1). These values are related to the technology and the effects of the project (Dignum et al., 2015). This hierarchy had three main values: security of supply, sustainability and economic viability. Secondly, a hierarchy of procedural values (Figure 5-2). These values relate to the nature of the rules, regulations and procedures that constitute the decision-making process. They include issues of stakeholder participation (Dignum et al., 2015). This hierarchy had two main values: trust and justice. Example of the value identification process

The focus of the value identification process were the values that were referred to in the claims. This means the values that were identified as expressed by the actor in the claim. Hence, values were added as another code for each claim. In order to provide the reader with more clarity about this process, two claims are used as example:

- *Claim 1: "If we don't have a healthy community people won't be able to work. It's too dangerous to risk contaminating our water. This should come over any economic considerations" (Frack Free Lancashire, June 2015).*
- *Claim 2: "We want local councils and local people to benefit from this exploration. We expect 20-40 wells to be drilled in exploration and I think it's very important for local communities to see some benefit." (Department of Energy and Climate Change, January 2014).*

The first claim is explicit in its concerns for the health of the communities due to the impacts of fracking, which refers to the value of *Health and Safety*. In addition, it puts this value in contrast with economic considerations of benefits from fracking, which is related to the value of *Welfare*. The second claim refers to the fair distribution of costs and benefits when it states that communities should see some benefits while exposed to the impacts of fracking. Hence, it was related to the value of *Distributive Justice*. Nevertheless, the value identification process was not straightforward for all claims. For a more detailed account on the value identification process and how the conflicting claims were managed, the reader is referred to the Appendix B.

The process of value identification faced the risk of cognitive bias due to the influence of the researcher's own value system and the risk of attention bias due to the amount of claims to analyse (527). In order to be transparent and following recommended practice (See Borning & Muller, 2012), the researcher acknowledges that the values of sustainability, accountability and justice are central to her value system. As an external observer, she does not hold any position regarding the shale gas debate in the UK. Nevertheless, during the research, she has reflected on the arguments given on both sides of the debate and she recognizes the complexity of the situation, given the broader energy security context in which the extraction of shale gas is considered.

Table 5-1 presents the general conceptualizations associated to values identified and one example of actors' expression of the value.

Table 5-1. Values identified in the public debate on shale gas in Lancashire

Value	Definition	Source
	Substantive values	
Stability	National and international stability in relation to energy supply, including concerns about import dependence, geopolitical tensions due to changes in energy reserves, and concerns regarding the reliability of the indigenous energy sources. *Example: "The UK will need solar, wind, nuclear and gas to meet our electricity and heating needs for many years to come. This online survey shows that many believe like us that the development of natural gas from UK shale could have an important role to play in helping to secure the UK's energy future" (Cuadrilla, October 2014)*	(Dignum et al., 2015; Sovacool, 2013)
Resource durability	"Availability of resources for future generations. This may include the conservation of existing finite resources, as well as the development of alternative resources to compensate for depleted resources." *Example: "Fracking cannot be compatible with our long-term commitments to cut climate changing emissions unless full-scale carbon capture and storage technology is rolled out rapidly, which currently looks unlikely" (Environmental Audit Committee, House of Commons, January 2015)*	(Dignum et al., 2015, p. 8)
Environmental friendliness	""Preserving the status of nature leaving it no worse than we found it' (Taebi & Kadak, 2010, p. 1347). This value is presented here in the non-anthropocentric mode, which assigns an inherent value to the environment." *Example: "This licences put some of our most precious wildlife sites under threat. Species such as kingfisher, bittern and goldeneye could be put at risk in these special places and should be protected from the Government's fracking plans" (Royal Society for the Protection of Birds, August, 2015)*	(Dignum et al., 2015, p. 8)
Aesthetics	"The intrinsic value of the beauty of nature. Changes in the landscape can impact the experienced beauty of the landscape." *Example: "Roseacre is a small, tranquil rural hamlet and the area attracts lots of walkers and cyclists. What will it look like when there are several sites flaring gas and HGV's driving down our narrow country lanes taking away toxic waste?" (Roseacre Awareness Group, March 2014)*	(Dignum et al., 2015, p. 8)
Health and safety	"'[A] state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" (WHO, 1948).An argument relates to the value of health when it compromises, or refers to, the state as defined by the World Health Organization or when it inhibits people from reaching this state. *Example: "We found that well integrity is of key importance, but the most common areas of concern, such as the causation of earthquakes with any significant impact, or fractures reaching and contaminating drinking water, were very low risk. Fracking could be done safely but it needed tight control in the UK" (Royal Academy of Engineers, July 2013)*	(Dignum et al., 2015, p. 8)
Ownership	Refers to a general right to property, which entails a group of specific rights, including a right to possess an object, use it, manage it and bequeath it. It is related to owner's ability to decide upon the activities to be performed on their property. *Example: "Landowners would be unaffected by drilling beneath their property and seeking permission endangers the scheme" (Cuadrilla, June 2014)*	(Friedman & Kahn, 2003; Friedman et al., 2006)

Value	Definition	Source
Welfare	Affordability and economic viability of the decision (not) to pursue shale gas exploration and exploitation. This includes concerns regarding fuel poverty and economic impacts for housing valuation, job creation and regional growth. *Example: "Coupled with our region's talent and drive, I am certain shale gas could bring real jobs and investment opportunities to countless local communities" (Federation of Small Businesses in Lancashire, July 2014)*	(Dignum et al., 2015; Sovacool, 2013)
Procedural values		
Accountability	Refers to providing evidence to justify past actions to others. It is guaranteed by the presence of "[s]ound political and legal basis with a corresponding institutional framework". *Example: "While I am sure there will be claims that this is some kind of Government conspiracy, it is actually more democratic in that the decision will be taken by an elected representative of the UK Government, rather than an unelected civil servant with no democratic oversight" (Fylde Parliament Member, November 2015)*	(Dignum et al., 2015; Hulstijn & Burgemeest e, 2014)
Transparency	Refers to the tendency to be open in communication regarding information and intentions related to the decision-making process. *Example: "It is shameful that the Government is keeping secret the impacts of shale gas extraction. The public has a right to know. This morning we are here at the Department for Environment, Food and Rural Affairs to remind them that… the public demands to know the facts about fracking. Censoring is not an acceptable option" (No dash for Gas, August 2014)*	(Hulstijn & Burgemeest e, 2014)
Subsidiarity	"Public action should be taken at the level of government closest to the citizens who benefit the most from the action" (Spaans, Trip, & van der Wouden, 2013, p. 30). It is related to giving to the different levels of government control over the right things at the right time on the decision-making process. *Example: "It was "extremely shocking" that the government felt it could override local democracy. People who object to fracking are not going to roll over. Why else do we have local planning committees other than to give local people a voice?" (Lancashire County Council, August 2015)*	(Friedman & Kahn, 2003; Spaans et a 2013)
Distributive Justice	"The fair distribution of costs, benefits, and other positive and negative external effects. This includes both spatial and temporal distributive justice. The spatial part refers to distribution of negative and positive consequences in a physical spatial sense. The temporal aspect includes intergenerational issues and includes exploitation of resources for future generations, as well as the environment we leave behind." *Example: "Lancashire is being used as a test ground and we are the collateral damage. Whatever happens, this is now a divided community" (Local community member, January 2015)*	(Dignum et al., 2015, p. 9)
Procedural Justice.	Proper stakeholder participation, transparency, honesty, as well as timely, full, and unbiased information in the procedure of planning, exploratory drilling, and exploitation. *Example: "As an organization standing up for land ownership and property rights we have serious concerns with these proposals. The consultation process has been extremely one-sided, simply meeting the demands of the energy industry while disregarding the rights and concerns of property owners" (CLA, August 2014)*	(Dignum et al., 2015; Pols & Spahn, 2014)

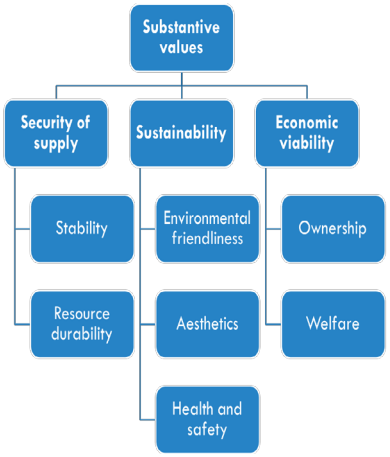


Figure 5-1. Value hierarchy of substantive values

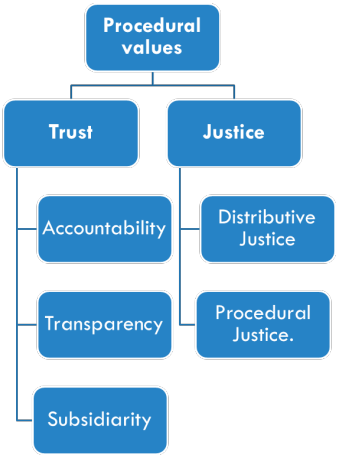


Figure 5-2. Value hierarchy of procedural values

Claims were identified as the arguments expressed by involved actors to present their opinions regarding the implementation of the Lancashire project. Figure 5-3 presents an overview of the values more frequently expressed throughout the public debate. It is worth noticing that the value of Accountability was the most frequently mentioned value in the debate. This implies that, in general, actors' responsibility over the consequences of their actions and the existence of a sound legal and institutional system supporting decision-making were highly relevant for the actors' participating in this debate. This finding is in line with the importance given to the development of proper regulations to ensure the fracking could be done safely before any exploration activity initiated. Moreover, the substantive values of Health and Safety, Environmental friendliness and Welfare followed as the more frequently mentioned in the debate. This finding is connected with the debates over risks and benefits from fracking for Lancashire and for the UK. Moreover, it is surprising that the values of Stability and Resource Durability were relatively neglected during the debate. One of the triggers for the UK to look for new energy sources was the potential energy crisis arising from the decreasing North Sea reserves and the projected closure of several coal and nuclear based power plants. Nevertheless, the actors did not framed the debate in relation to the energy problem, but on safety, environmental and economic grounds.

Furthermore, the number of values that were identified in relation to each claim varied widely. In average, three values were identified as expressed by actors per claim. However, some actors were quite extensive on their claims by listing all the reasons they had to support or to oppose fracking. When this list was extended to their perspectives on the occurrences in the decision-making process, the number of values would reach up to nine values.

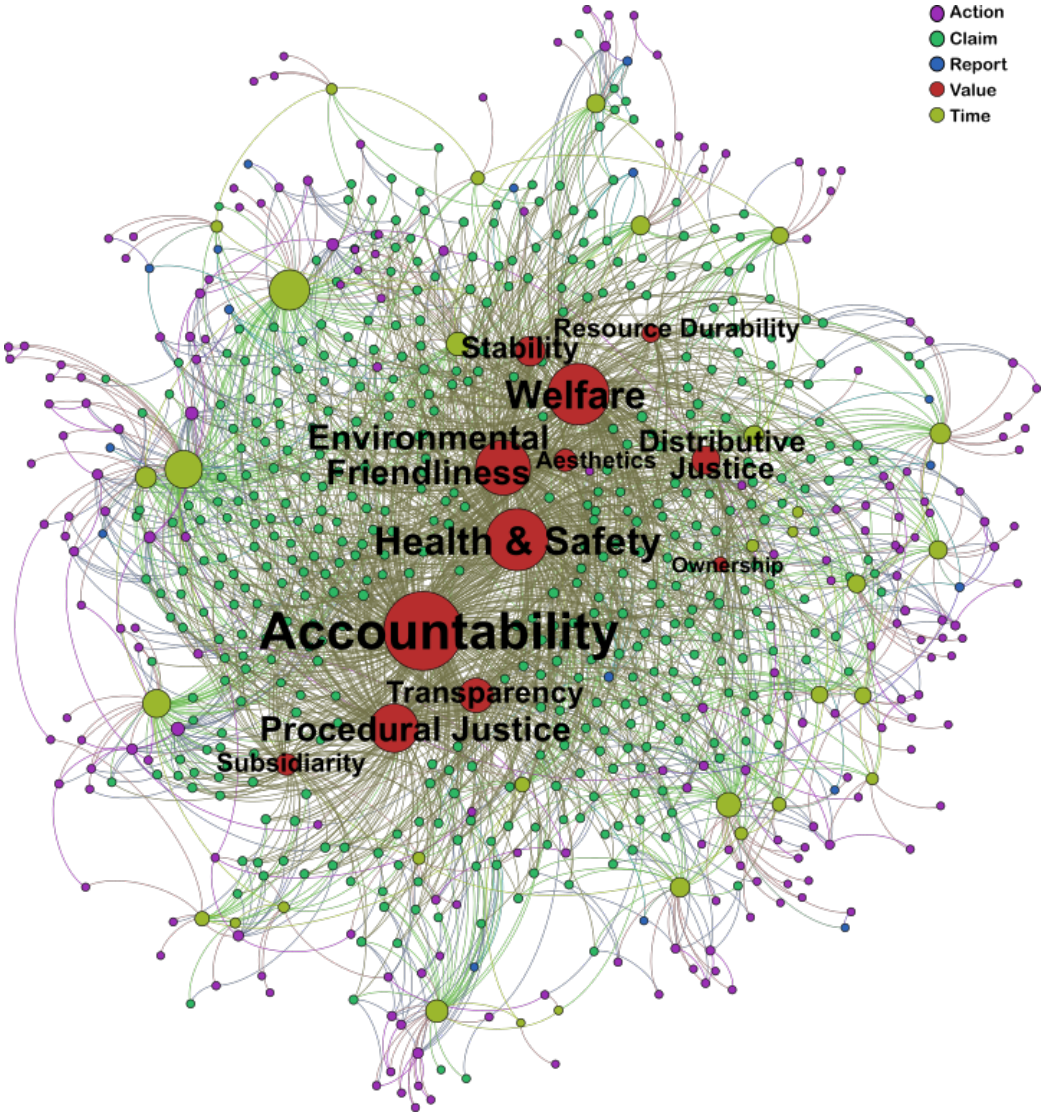


Figure 5-3. Representation of the centrality of the different values in the debate. Time refers to months of the decision-making process, which were included to serve as connection between the actions and claims.

As a complement to the identification of values, the claims were connected to values in relation to how they were used by actors. A positive relation indicate that actors felt the expressed value(s) were being protected or enhanced by the developments of the decision-making process. In contrast, a negative relation implied that actors felt the value was being threatened by the developments of the decision-making process or was being neglected in the debate. In order to understand this perspective, the case of actors' reaction to the announcement of Cuadrilla of its decision to appeal the decision of the Lancashire County Council can be used as example. On one side, Cuadrilla presented its decision to be protecting the value of Procedural justice and Accountability. They believed to have a strong case and that the appeal process was just the following next step in the democratic procedure. On the other, Friends of the Earth perceived it to be threatening the values of Subsidiarity and Procedural justice. They believed the decision was a disregard for local democracy and a violation of the wishes of local communities that oppose to the execution of fracking in their area. Figure 5-4 present the perception of actors in terms of positive or

negative links between the claims and the values. In general, all values are related to both perceptions, which indicates the differences on how actors translate values into norms. From this figure, it can be concluded that the controversy in this debate is more rooted in the different conceptualizations of values held by actors.

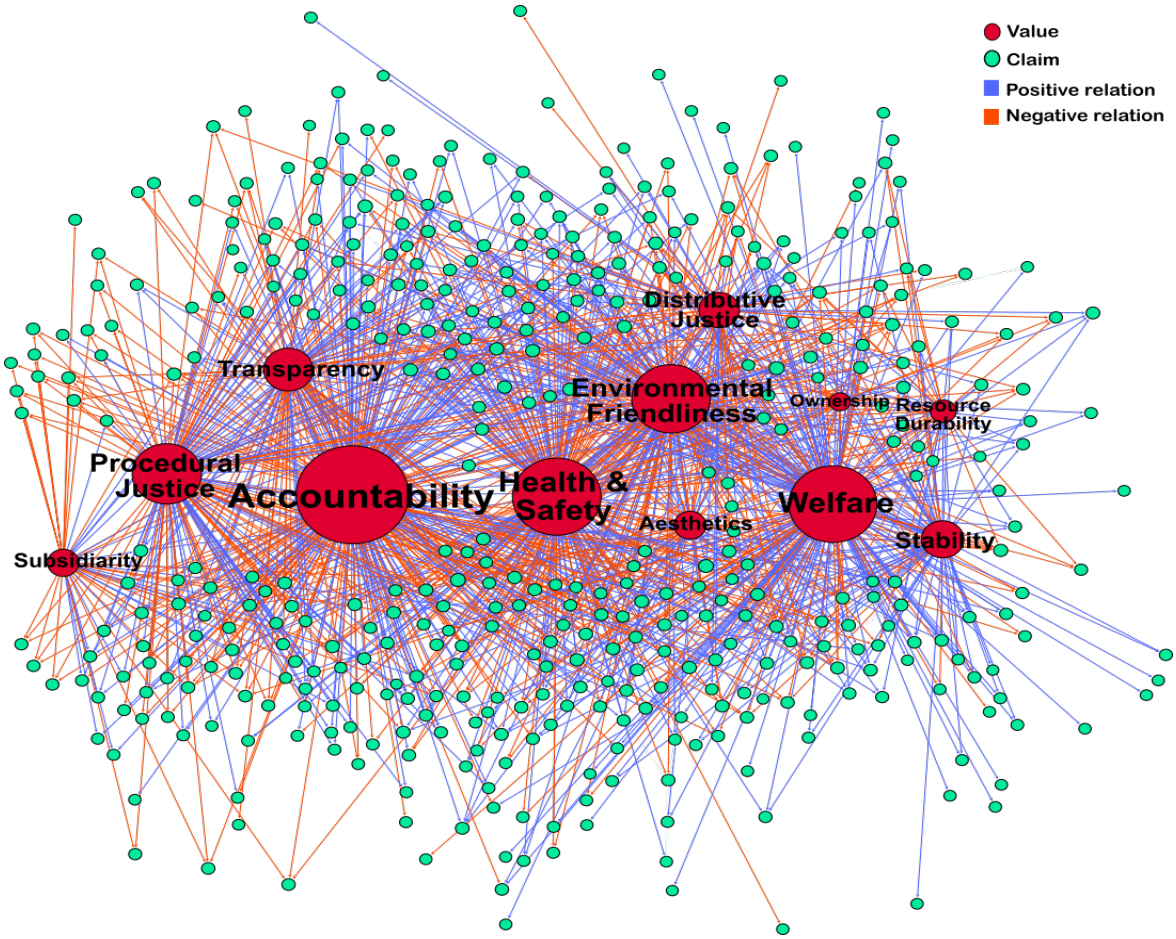


Figure 5-4. Relation between the claims and actors' positive and negative perception of values

So far, a general picture has been given regarding the expression of values in the public debate. Figure 5-5 presents the changes in the frequency of the expression of values per month during the decision-making process for shale gas in Lancashire (for more clarity regarding the changes in particular values, the reader is also referred to Figure 5-6 and Figure 5-7 to see the changes in frequency for individual values). It can be noticed that the value of Accountability is the most frequently mentioned over time. Increases in frequency were evidenced around the crucial decision-making points for the project in the planning system. In addition, the peaks in frequency that are not directly related to the formal procedures in the planning system are related to announcements of changes in regulations. For example, a peak is visible in December 2012, time in which a regulatory roadmap was published by the Department for Energy and Climate Change. In turn, changes in the frequency of the values of Procedural justice and Transparency are also related to the execution of formal procedures and policy making processes for the regulations of shale gas in the UK. In particular, concerns regarding Procedural justice increased in the fourth round, when the appeal process for the project. This fact can be related to the increased uncertainties brought about the change of rules given by the Department of Communities and Local Government by introducing mechanisms to fast track fracking planning applications and appeals. Based on this insights, it can

be said that the grounds for decision-making and the definition of responsibilities regarding the possible benefits and impacts of the implementation of fracking were a constant concerns for the actors involved in the debate.

Regarding the remaining procedural values, it can be observed that they were a relatively decoupled from the formal procedures for project decision-making. During the first two rounds, the value of Distributive justice was more related to the developments of the regulations regarding the distribution of the financial benefits of fracking to local communities. During the third round, it was coupled with the formal procedures as it was expressed in relation to the distribution of the (wider) possible impacts and benefits of fracking in Lancashire. Nevertheless, it was also observed that the frequency of expression of this value decreased during the fourth round, which could be related to the change of level of the decision-making process from local to national. In turn, the value of subsidiarity was barely mentioned during the first three rounds. When it was mentioned, it was in relation to the engagement of local communities in the decision-making process. Nevertheless, the frequency of expression increased in the fourth round. This fact can also be related to the intervention of the Department for Communities and Local Government into the appeal process. In this context, the value of Subsidiarity was expressed in relation to the appropriate level for decision-making. With local actors saying perceiving the changes as an attempt to overrule local democracy.

In contrast, the substantive values of Health & safety, Welfare and Environmental friendliness were the mentioned very frequently in the debate. In particular, their use is related to expression of expected benefits and impacts for fracking and the particular project, the role of shale gas for the UK's energy transition, grounds for changes in regulations and the characteristics of the development of the UK's shale gas industry. Hence, these values referred to the main issues associated with the technology and its implementation in the UK. During the different rounds, these three values are mentioned with a similar frequency across the different months. However, it is worth noting the differences in the frequency during two crucial decisions: the delay in January 2015 and the final rejection in June 2015. At the time of the first decision, the value of Health and safety was highly expressed in the public debate. This can be associated to the grounds for the advice of Planning officers (traffic and noise), the introduction of new plans by Cuadrilla to handle such issues, and the discussions regarding the enactment of the Infrastructure Bill at national level regarding banning fracking in environmentally sensitive areas and authorizing the use of deep level land. In contrast, the value of Welfare was the most mentioned one while the final decision of the two applications was being discussed. This can be associated to an attempt of the Cabinet, supportive local businesses and groups, and companies to promote the benefits of fracking or to show their disagreement to the final decision reached by the Lancashire County Council. Finally, it is noticed that during the fourth round, values of procedural justice are mentioned more frequently than the substantive ones, which can be seen as an indication of the relevance given to the way the decision was going to be made once the appeal process was triggered.

Even though they were less frequently mentioned, more emphasis was put on the substantive values of Ownership and Aesthetics during certain rounds of the decision-making process. The frequency of the value of Ownership increased by the end of the first round, when the cabinet announced the inclusion of changes in the landownership regulations in the Infrastructure Bill. However, once the Bill was enacted at the end of the second round, the mention of the value decreased in the debate. In turn, the frequency of the value of Aesthetics increased in relation to the crucial decisions taken in January 2015 and June 2016. On one side, the advice of the planning officers in January 2015 was related to noise and traffic issues, which were also related to impacts on the rural landscape. On the other, the grounds for the rejection of the applications in June 2015 was inacceptable visual impacts on the landscape for Preston New Road. The impacts on landscape are related to the expression of the value of Aesthetics. At this point, it can be noticed that there is a mismatch between the frequency in which the value of Aesthetics was expressed in the public debate and its use to justify the grounds for decision-making. This value does not reflect the main concerns of involved actors, which are more related to the values of Health and safety, Welfare and Environmental friendliness. This mismatch can be partially explained by the limitations

set on the planning system regarding the grounds for decision-making. It can be noticed that these grounds do not allow for a wider deliberation of the concerns of the different actors.

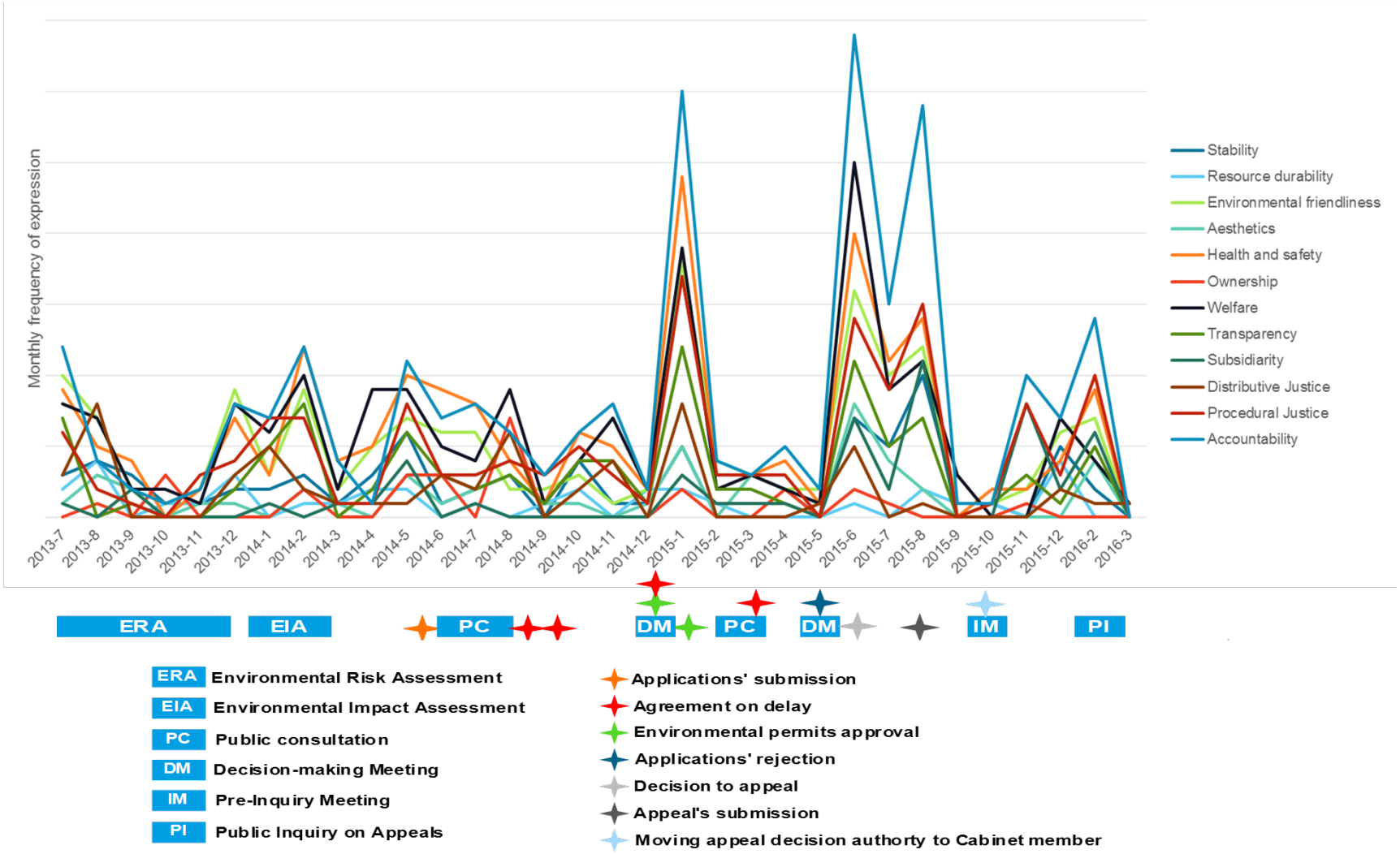


Figure 5-5. Changes in the frequency of values mentioned in relation to the formal procedures in the planning system for Cuadrilla's

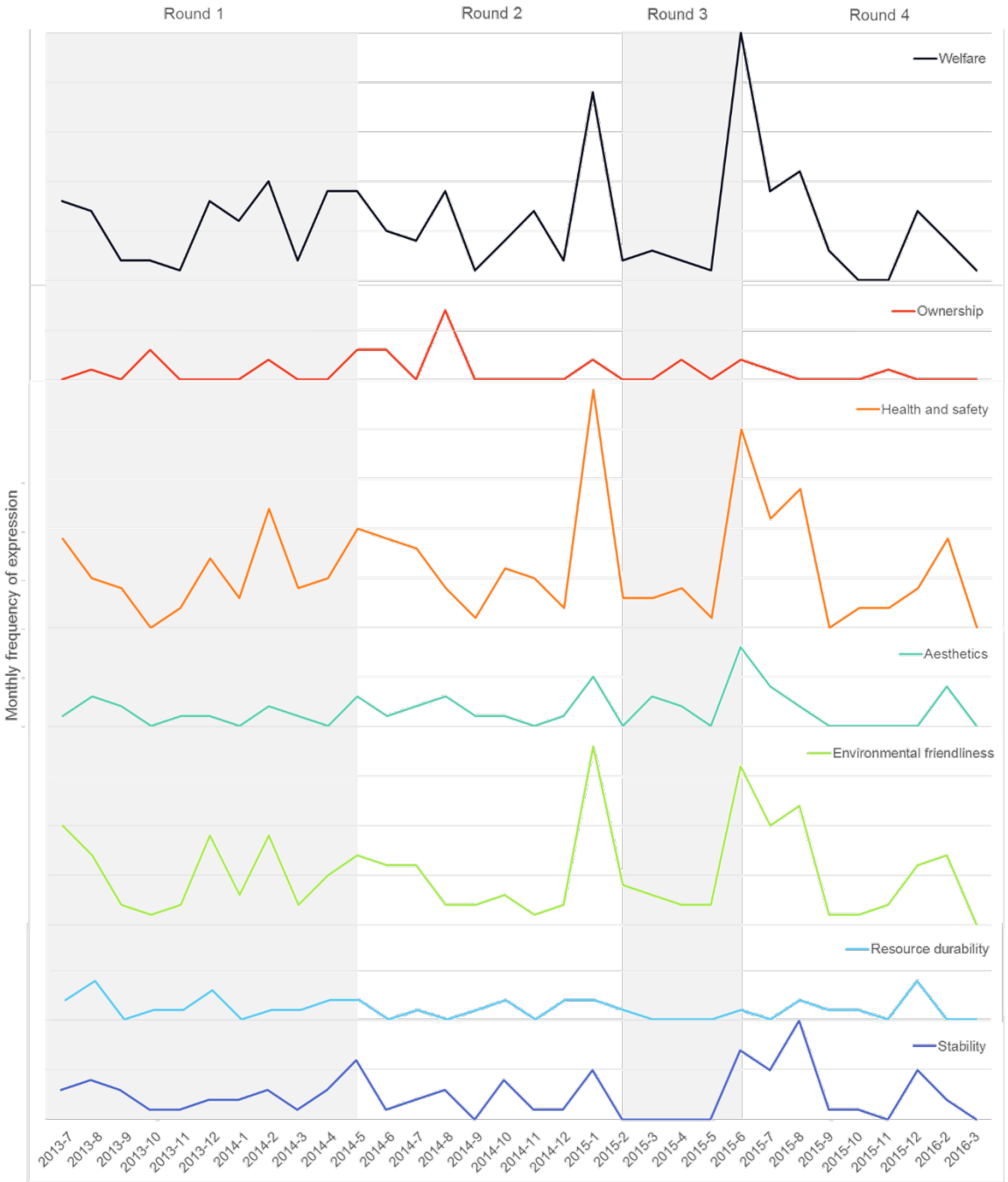


Figure 5-6. Distribution of the expression of the identified substantive values over time

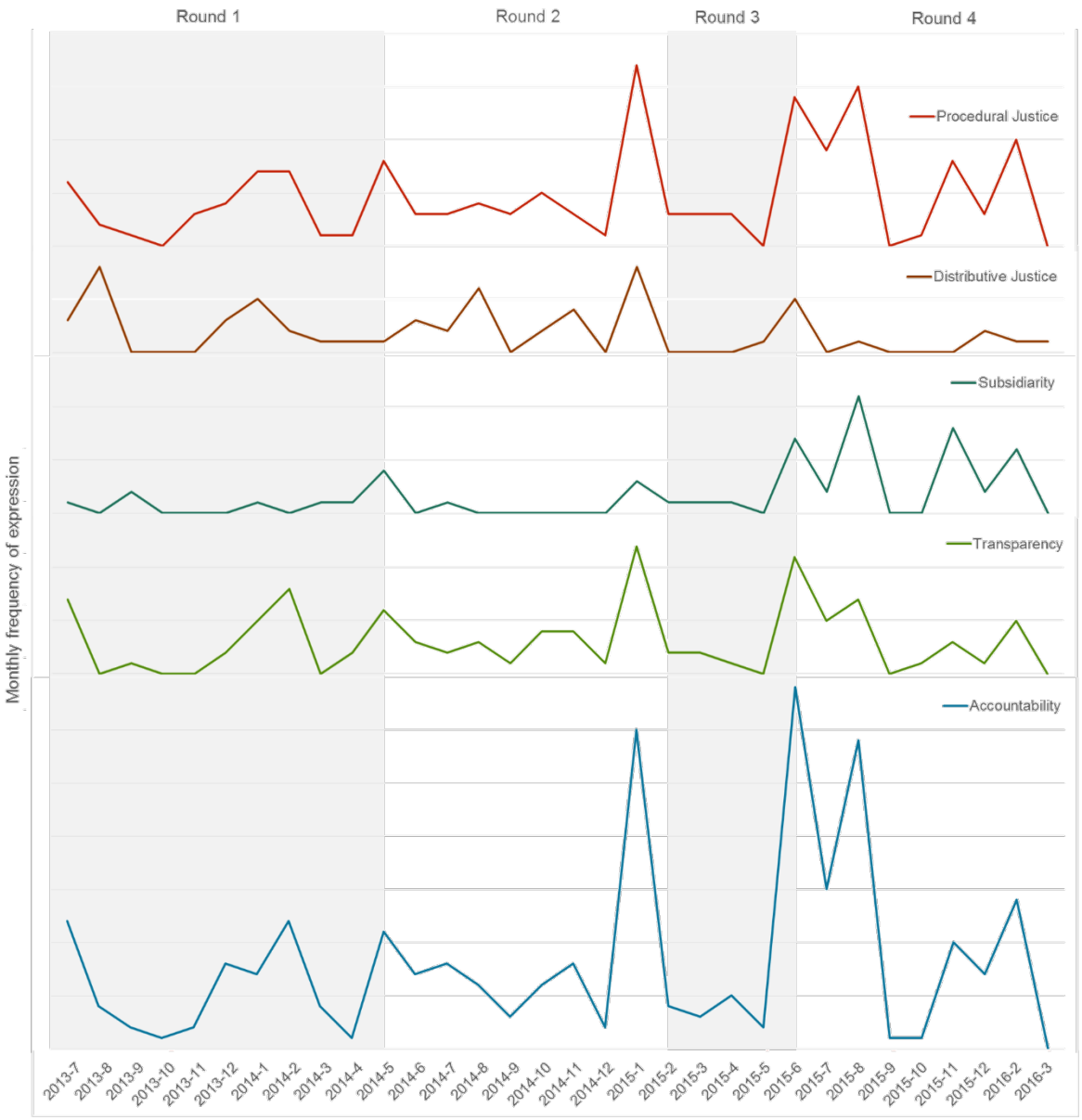


Figure 5-7. Distribution of the expression of the identified procedural values over time

Furthermore, it can be observed that the values of Stability and Resource durability were barely mentioned during the different rounds of the decision-making process. This fact can be deemed as surprising taking into account that the decision-making process is related to the implementation of an energy technology. In addition, the project is embedded in a wider context of uncertainty regarding the UK's energy security and the fulfilment of the UK's legally binding GHG emissions targets. This observation highlights that not necessarily the most frequently mentioned values in the public debate are the most relevant ones (or at least the ones expected to be more relevant).

This section introduced the rhetoric use of values on each round of the decision-making process. It allowed to identify the more frequently expressed values in the debate and how the changes in the rounds shapes the expression of values in the debate. The changes in the rules and actors' interaction between the rounds can trigger or halt the expression of some values. These results indicate that all the values were constantly expressed in the public debate. The expression of values in the public debate is fluid and responds to the developments of the decision-making

process. The same value may be expressed in the context of the project implementation or of the regulations policymaking. These issues can be explored in more detail during the analysis of the arenas. The following section will focus on how the effect of the different locations of the decision-making process.

5.2 Exploring the connection between arenas and the rhetoric use of values

Fifteen arenas were identified to be active during the different rounds of the decision-making process. Seven of those venues were located at local level and eight at national level. The claims expressed in association to the actions occurring in each arena were used to identify the values expressed as part of each arena. Table 5-2 presents the results of the values identified per arena on each round of the decision-making process for shale gas in Lancashire. At first glance, it can be noticed that the values are expressed in several venues at the same time. For example, the values of Environmental friendliness and Health and safety were mentioned in sixteen venues. As each arena is focused in a distinctive topic, actors have to adapt their value claims to fit the environment. Furthermore, it can be observed that at local level, informal venues tended to focus on a group of values on each round. The formal decision-making process by the County Council is the only arena in which consistently most values are expressed along the different rounds. This finding can be explained due to the open nature of the process, which is based on extensive public consultation. It gives room for actors to express all the values they consider relevant. Nevertheless, the existence of this arena did not halt the polarization of the positions. This may imply that existence of a space for actors to express their arguments is not enough to create a cooperative environment.

In the previous section, it was found that all values were mentioned during the all the rounds. However, it was also noticed that their expression was connected to different issues under discussion and decisions being made in the decision-making process. By looking at the arenas, a location can be given to the changes in expression of the values. For example, the increase in frequency of the value of Subsidiarity in the fourth round can be seen as a response to the creation of a national arena for the appeal process, in which local actors may perceive to have a lower power to influence the outcomes. As Fairclough and Fairclough (2015) pointed out, in addition to the guidelines given by the planning system, the local councillors, as elected representatives, have an obligation to make decisions that embody the interests of local communities. Hence, the local communities may perceive that their concerns are taken more seriously when discussed by local or regional actors. Moreover, the creation of a new arena may not be sufficient for a value to be more expressed in the debate, the existence of a concrete proposal for discussion can explain the changes. For example, the value of Ownership can be considered relevant for the landownership policymaking arena. Nevertheless, the frequency of expression of the value only increased when the Infrastructure Bill was proposed. This fact boosted the relevance of discussing issues related to ownership as part of the decision-making process. In addition, once the arena stopped existing, the frequency of expression of the value of Ownership also decreased. In turn, the high frequency of expression of a value in the public debate may be related to its perceived relevance for the topics under discussion in several arenas. For example, the value of Accountability was expressed through most of the arenas in the different rounds of the decision-making process. Due to the uncertainties surrounding the implementation of fracking, it can be expected that issues of responsibility are relevant for actors' decision-making at different levels.

The expression of the values in several arenas bring about questions regarding how these values are expressed through the different arenas. Even though this research did not focused on the differences in value conceptualizations, the value of Distributive justice will be used as an example. To understand the differences in value expression at different points in time, one claim from the national financial policymaking arena in round 1 and one claim from the local Lancashire planning application in round 3 will be used:

Table 5-2. Values expressed on each venue of the decision-making process throughout the different rounds.

Round	Level	Venue	Values											
			Stability	Resource durability	Environmental friendliness	Aesthetics	Health & safety	Ownership	Welfare	Accountability	Transparency	Subsidiarity	Distributive justice	Procedural justice
1	L	Conferences												
	L	Local meetings												
	L	Open debate on shale gas impacts and benefits												
	L	Planning application for Lancashire project												
	L	Platform for business development around fracking												
	L	Preston City Council decision-making over fracking												
	N	Open debate on shale gas development in the UK												
	N	Shale gas financial policy-making												
	N	Shale gas land ownership policy making												
	N	Shale gas planning policy making												
	N	Shale gas regulation policy making												
2	L	Conferences												
	L	Local meetings												
	L	Open debate on shale gas impacts and benefits												
	L	Planning applications for Lancashire project												
	L	Platform for business development around fracking												
	L	Shale gas planning policy making												
	N	Impacts on Rural Economy Report publication												
	N	Open debate on shale gas development in the UK												
	N	Shale gas financial policy making												
	N	Shale gas land ownership policy making												
	N	Shale gas regulation policy making												
	N	Shale gas resource estimation												

Round	Level	Venue	Values											
			Stability	Resource durability	Environmental friendliness	Aesthetics	Health & safety	Ownership	Welfare	Accountability	Transparency	Subsidiarity	Distributive justice	Procedural justice
3	L	Open debate on shale gas impacts and benefits												
	L	Planning applications for Lancashire project												
	L	Platform for business development around fracking												
	N	Open debate on shale gas development in the UK												
	N	Impacts on Rural Economy Report publication												
	N	Shale gas regulation policy making												
4	L	Local meetings												
	L	Open debate on shale gas impacts and benefits												
	L	Preston City Council decision-making over fracking												
	L	Planning applications for Lancashire project												
	L	Platform for business development around fracking												
	N	Appeal process for planning applications												
	N	Impacts on Rural Economy Report publication												
	N	Open debate on shale gas development in the UK												
	N	Shale gas planning policy making												
	N	Shale gas resource estimation												

- *Claim 1: "We want local councils and local people to benefit from this exploration. We expect 20-40 wells to be drilled in exploration and I think it's very important for local communities to see some benefit" (Department for Energy and Climate Change, January 2014)*
- *Claim 2: "Rejecting Cuadrilla's plans is the only way to stop Lancashire's communities and environment being made the UK's guinea pig for risky and polluting fracking" (Friends of the Earth, June 2015)*

Claim 1 is related to the fair distribution of financial benefits for communities as a way to compensate them for the nuances of drilling. This conceptualization is aligned with the value of Welfare, which can be seen as central for the national arena. Claim 2 is related to an unfair distribution of risks between Lancashire and the rest of the UK. This conceptualization is aligned with values of Health and Safety and Environmental friendliness, which can be considered relevant for this local arena. Hence, this can be seen as an indication that the conceptualization of values is related not only to the topics under discussion in the arena, but also to the values that are prioritized in the arenas. More research would be needed to explore how the arenas shape the changes in value conceptualizations by actors.

Furthermore, some actors can couple several arenas during negotiations in an attempt to reach a desired outcome. An example of these mechanisms was seen in the negotiations for the enactment of the Infrastructure Bill. Through the landownership policymaking arena, the cabinet was trying to get authorization for the use of deep-land without landowners' permissions. This proposal was related to the values of Ownership and Welfare. Through the safety regulations arena, the Labour party, which represented the official opposition to the Cabinet, was trying to increase the strength of the regulations by closing some identified problems, such as the authorizations to use any chemical for injection and to frack in environmentally sensitive areas. This proposal was related to the values of Environmental friendliness and Health and Safety. When the Environmental Audit Committee proposed a ban on fracking in January 2015, the Cabinet coupled the two arenas in an attempt to avoid the ban of fracking, a highly undesirable outcome. At the end, the Infrastructure Bill was enacted given the inclusion of the environmental and safety safeguard proposed by the opposition. This situation indicates that value conflicts may occur between different arenas and that the deliberation around these conflicts may occur only the coupling of the arenas.

Finally, the existence of arenas has an additional implication for the rhetoric use of values. Actors are limited regarding the arenas they can join. Then, they may try to use the arenas they are participating in to introduce the values they consider relevant as grounds for the decision. This may lead the value expressions to be excluded for considerations if other actors do not consider them relevant for the discussions in the arena. Furthermore, actors may not be aware of the values that are mentioned in other arenas or of the agreements in value-trades that may have led to some decisions in other topics. This fact may increase the controversy due to misunderstandings of other arenas' developments or to normative judgements about the rightness of the value conceptions developed in the different arenas.

This section focused on describing how the rhetoric use of values may be related to the existence of different arenas. Arenas give room to the development and enhancement of different value conceptions in the debate, which may increase the controversy, as actors are not necessarily aware of the developments in other arenas. Even if actors find agreements with respect to certain aspects of a value in one arena, this does not imply that they will reach agreements in another arena. These findings highlight the need for a common and coordinated space for actors to discuss about the values that are relevant for the development of the project in terms of the technology and its associated institutions. The following section will switch the focus from the location to the interaction between actors with similar interests or goals in the form of coalitions.

5.3 Exploring the connection between coalitions and the rhetoric use of values

Coalitions emerge through the collective action of different actors along the debate. These coalitions are not necessarily formed based on shared values, but on shared goals. For example, the owner of the Smart Spa-hotel is against fracking based on the values of Aesthetics and Welfare as he thinks fracking will damage the reputation of the area. Likewise, the members of the Nana's protests group are against fracking based on the values of Accountability, Distributive justice and Procedural Justice as they think the government is trying to impose fracking on local communities without considering the consequences for future generations. Based on the different perspectives brought together in the coordinated communities, it was considered necessary to explore the expression of values by the different types of actors. For a complete view on the interests and values of individual actors, the reader is referred to Appendix G.

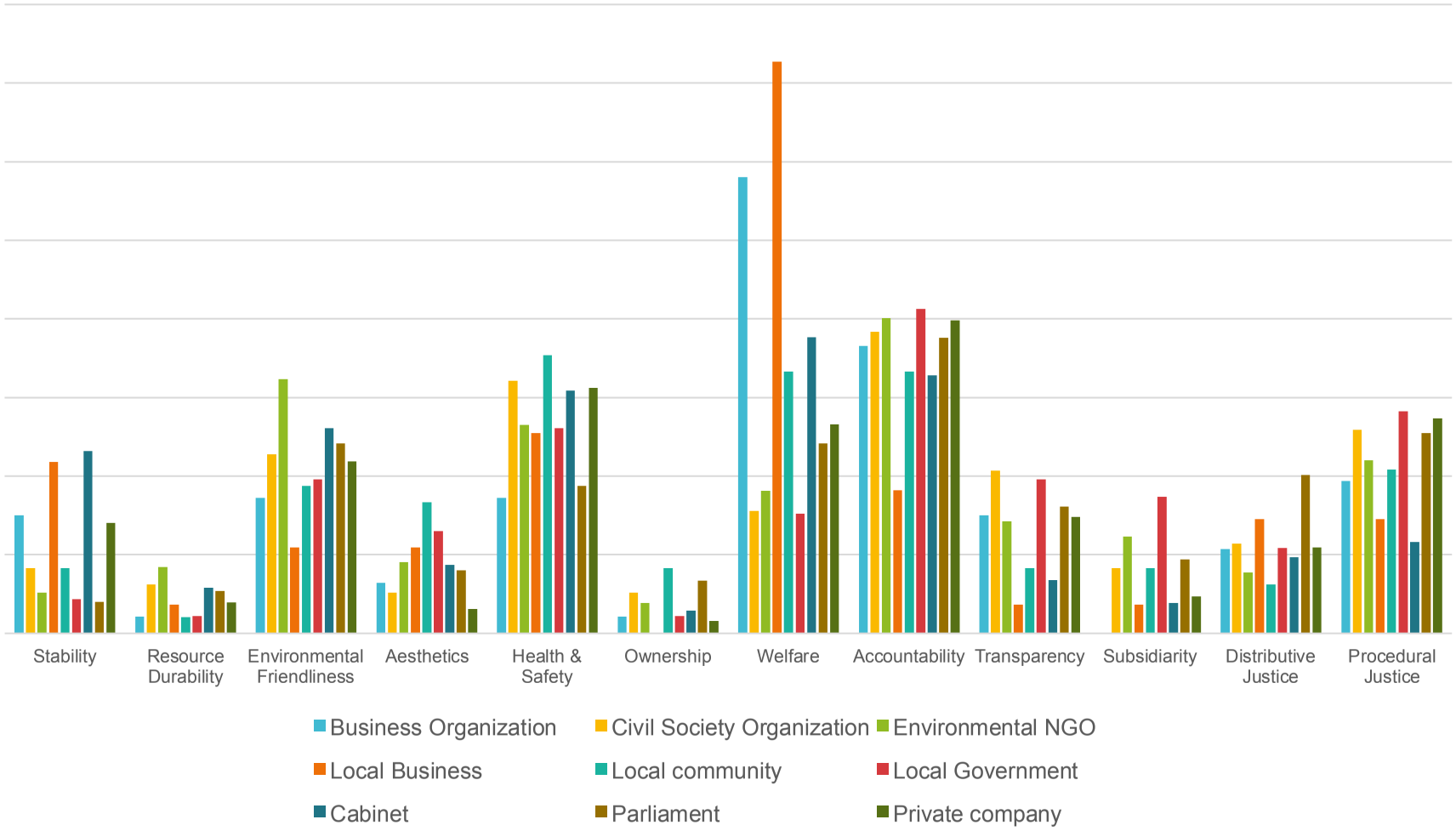


Figure 5-8. Values expressed in the debate according to the type of actor. Each line correspond to the proportion of the expression of the particular value with respect to all the values expressed by the actor

As coalitions are not based on shared values, it is seen as necessary to analyse the values that are expressed by the different groups of actors who compose the different coalitions. Figure 5-8 presents the values expressed by the different groups of actors. It can be noticed that most of the groups expressed all values during the public debate. Exceptions are found in the local businesses, who did not express any claim in relation to the value of Ownership and in the business organizations, who did not express any claim related to the value of Subsidiarity. In general, the different groups of actors gave significant relevance to the expression of the values Health and safety, Environmental friendliness, Welfare and Accountability, which may explain why they were among the more expressed values in the debate. Nonetheless, some differences can also be highlighted when analysing the graph. First, some groups expressed more substantive values than procedural values; among these are the national Government, local communities, local businesses and business organizations. It can be noticed that most of these actors belong to the communities of Policy Enablers and Project promoters. Second, only the local Government expressed more procedural values than substantive values. This may be related to the fact that they generally expressed themselves in relation to the formal decision-making process for the project of shale gas in Lancashire.

Even though coalitions are not based on shared values, some actors inside the coalitions seem to share the expression of similar values in the public debate. For example, the coalitions of Policy Enablers and Project Promoters shared similar levels of expression of the values of Stability and Welfare. The Cabinet, Business organizations, Local businesses and Private companies put high emphasis in these values. This is visible with claims such as:

- "*The need for the production of indigenous gas is as strong as ever as our reliance on foreign sources of gas increases day by day. Eighty per cent of UK homes rely on gas for heating, while half a million jobs in chemicals and energy intensive industries are underpinned by gas" (UK Onshore Oil and Gas Group, August 2015)*
- *"We are backing the safe development of shale gas because it's good for jobs giving hardworking people and their families more financial security, good for our energy security and part of our plan to decarbonise the economy" (Department for Energy and Climate Change, August 2015)*

Given the low frequency of expression of the value Stability in the public debate during all the rounds, it can be concluded that this groups attempted to promote fracking through its benefits for energy security, but were not successful in promoting a debate around this value.

Furthermore, the value of procedural justice was similarly relevant for actors in different coordinated communities. This value represented approximately 10% of the values expressed by the private companies, business organizations, local inhabitants, civil society organizations, environmental NGOs and the parliament members. This finding represent a common ground among what the different communities find relevant. All communities value proper participation, transparency and timely information in the formal procedures associated to shale gas exploration. However, their perspectives regarding how to safeguard this value are diverse. For example, when the Lancashire County Council decided to reject both applications, actors from different coalitions reacted:

- *"An important plank of the Government's energy policy and manifesto commitment has been reduced to a position that, despite all the advice, a rejection has been given. This, after 15 months of a long, drawn-out process cannot be right, and I urge the government to urgently review the process of decision-making" (UK Onshore Oil and Gas Group, June 2015)*
- *"Mr Egan criticised council officers' "frankly unacceptable" decision to admit legal opinions procured by green group Friends of the Earth, which advised councillors there were valid grounds for refusal, but then refuse to hear contrary legal advice obtained by the fracking industry" (Cuadrilla, June 2015)*
- *"The decision proves that, in spite of all the government's efforts to force through fracking, local communities can prevent it from going ahead" (Brighton Pavilion Parliament Member, June 2015)*

- *"Fracking is a huge issue for communities across our region and a cause for deep concern. Here in Lancashire county councillors need to listen to tens of thousands of people from across the county who have objected and reject all applications for fracking" (Union Unite, June 2015)*

All this actors are boundary spanners of the supporters or opponents of fracking. Each of them is introducing a different conceptions of how the decision-making process by the Lancashire County Council safeguarded or threatened the value of Procedural justice. The procedures set the rules of the game and any change of them may lead to contestation. This was not only clear in the case of the appeal process, but also in the reactions to the yearlong delayed decision of the Lancashire County Council as has been presented.

During the identification of the coalitions, the individual actors were associated to the values expressed during the collective actions. It was noticed that the boundary spanners were usually associated to the expression of all the values in the debate. These actors generally belonged to the two coordinated communities based on their position. Therefore, it can be said that they functioned as a collector of the values that were deemed relevant by the members of the coalitions at both levels. The identification of these actors is then relevant for processes of coordination between the opposing communities. These actors may act like bridges between the actions taken at both levels and support the proliferation of value conceptualization.

This section provided some insights on how the different actors that belong to the coalitions express values in the public debate. Coalitions served as connection points where different actors can work together without necessarily sharing the same values. Shared goals may be pursued in spite of the differences in the values expressed by different actors to justify the actions taken. Hence, through the interactions in these coalitions, actors may build an understanding of the overall picture for the different members of the community. Moreover, actors in these communities may participate in several arenas. Therefore, if higher levels of coordination are achieved, the coalitions may serve as a communication point for the different members regarding the actions taken in the active arenas. Nevertheless, this can also increase the polarization of the debate as the actors start constructing similar meanings for the problems and solutions being discussed in the debate. In addition, the points of collective action are scattered in time. This fact can halt the possibilities for constructing bridges and common understandings among actors. The following section will focus on how the use of different strategies is connected to the expression of values in the debate.

5.4 Exploring the connection between strategies and the rhetoric use of values

Actors use strategies to try to advance their goals. In the decision-making process for shale gas in Lancashire, actors have mainly used reciprocal strategies throughout the decision-making process. Once a strategy was identified, the claims expressed in relation to the strategy were also identified. Then, the identification of values expressed was done according to two perspectives. First, the perspective of the actor(s) using the strategy. The values expressed in the claims that accompanied the execution of the strategy were identified and labelled as inputs. Second, the perspective of the actor(s) reacting to the strategy used. The values expressed in the claims of the actor(s) that reacted to the execution of the strategy were identified and labelled as reactions. This classification served the purpose of allowing the comparison between the rhetoric use of values associated to the different actors associated to the use of a strategy. Table 5-3 presents the result of this analysis.

Table 5-3. Values associated to the use of the different strategies in the debate

Round	Strategy	Claim type	Values											
			Stability	Resource durability	Environmental friendliness	Aesthetics	Health & safety	Ownership	Welfare	Accountability	Transparency	Subsidiarity	Distributive justice	Procedural justice
Round 1	Unilateral	Input												
		Reaction												
	Reciprocal	Input												
		Reaction												
	Facilitating	Input												
		Reaction												
Round 2	Unilateral	Input												
		Reaction												
	Reciprocal	Input												
		Reaction												
Round 3	Unilateral	Input												
		Reaction												
	Reciprocal	Input												
		Reaction												
	Facilitating	Input												
		Reaction												
Round 4	Unilateral	Input												
		Reaction												
	Reciprocal	Input												
		Reaction												
	Facilitating	Input												
		Reaction												

Reciprocal strategies try to open up the debate to different formulations of problems and solutions. Therefore, it is not surprising that this strategy were used to add or highlight all the different values in the debate throughout all rounds. This strategy was also successful in provoking the expression of the almost the same diversity of values as the ones used as input. For example, the North West Energy Taskforce used conferences as a way to make the problem formulation more broad by coupling the need to develop shale gas in Lancashire to the problems of the local business in the area. As inputs, actors supporting this strategy expressed values of Welfare, Environmental friendliness, Health and safety, Stability, Subsidiarity and Procedural justice were mentioned as input, which denotes a higher number of issues associated to shale gas. In response, anti-fracking

campaigners reacted by expressing values of Environmental friendliness, Welfare and Health and safety. The following claims are examples of inputs and reactions:

- *Input: "There is nothing new about gas, but this is a new source of home grown gas. These are all proven methods. This has been used around the word and there is nothing new about it. Lancashire have been chosen as the first place to try fracking in the UK because the rich reserves beneath it. We know shale gas is here. The Bowland shale stretches along 12 counties. We will see shale exploration in Yorkshire, Lincolnshire and Sussex, not just in the North West. As long as local businesses, schools and colleges grasped the opportunity early on, jobs would remain local" (Department for Energy and Climate Change, April 2014)*
- *Reaction: "If fracking starts it will pollute the air and cause an absolute racket (noise)" (Local community inhabitant, April 2014)*

In turn, unilateral strategies presented a different behaviour. Even though during the first two rounds, they were used to add a variety of values on the debate while triggering a reaction that included almost all the values used, during the last two rounds there was a higher mismatch between the values associated with the inputs and the reactions. This could imply that the actors were not so receptive to the values used as input with the use of these interventions. It could also imply that they developed their own assumptions about the actors using this strategy and reacted accordingly. It should be noticed that unilateral strategies were highly used by the National Government to introduce changes to the regulations or to changes the rules of the game. When it changed the rules of interaction with respect to clarifying the regulatory process for shale gas in the UK in December 2013, the Cabinet expressed values of Environmental friendliness, Health and safety, Welfare, Stability and Accountability. In response, Environmental NGOs responded with the expression of values of Environmental friendliness, Health and safety and Accountability. Examples of claims used as input and reaction are:

- *Input: "Large scale production could create thousands of jobs and give almost 1bn pounds to local communities. It could adversely impact communities, through traffic congestion, fumes and pressure on water supplies. There could be large amounts of shale gas, but we won't know for sure until further exploration. This marks the next step ion unlocking the potential." (Department for Energy and Climate Change, December 2013)*
- *Reaction: "We believe that the impacts of commercial shale gas exploitation on the climate and on wildlife should be fully assessed and that the industry should be strictly regulated to minimise any potential impact. These announcements have done nothing to reassure us that Government will deliver this." (Royal Society for the Protection of Birds, July 2013)*

Even though the Government always highlighted their intention to promote a safe development that would benefit the country's economy and energy security, other actors started to question the transparency of the Cabinet and associated its actions to attempts to force the technology against local wishes. For example, the government's legitimacy was challenged by the Official Opposition Shadow Cabinet with the expression of the values of Accountability, Transparency, Environmental friendliness, Health and safety and Procedural justice. This was

- *Input: "David Cameron's failure to come clean over his relationship with Lynton Crosby has created a situation where his decisions are open to question. Whether it is tobacco or alcohol and now fracking, we need to know what role lobbying has played in deciding what our Prime Minister does" (Official Opposition Shadow Cabinet, July 2013).*

Conversely, facilitating interventions were hardly used in the debate. They were associated to few values but failed at gathering any response from the other actors in the public debate. For example, when the UK Onshore Oil and Gas Group joined efforts with the GMB Union for the development of a join safety charter that would address the concerns of UK's oil and gas workers, values of Stability, Environmental friendliness, Distributive justice and Welfare were mentioned in claims such as:

- "*Having access to gas is a matter of national security. The truth is we are going to be using gas including shale gas for a long time to come. Given these facts we need to honestly consider the moral and environmental issues about transporting gas, including shale gas, across oceans*

and continents and being increasingly dependent on gas from countries with regulatory and environmental standards lower than ours" (GMB Union, June 2015)

The use of facilitating strategies is aimed at mediating conflicts and bringing parties together, something that is considered crucial for the responsible governance of energy projects. It is therefore surprising that no actor considered relevant the need to find points of agreement as a way to handle the increasing polarization of the debate in Lancashire. At this point, it is worth noticing that the anti-fracking campaigners were constant in their request for the National Government to stop the prospects of exploration activities until an open debate on the use of fracking occurred at national level. This point connects again with the fact that the existence of public consultation activities related to the project in Lancashire was not considered enough for actors to discuss the project. The campaigners felt the need for a space to discuss if and how to develop fracking projects in the UK. However, no space was opened to discuss UK's energy policy and the role of shale gas on it. Then, the spaces opened through facilitating activities may have not been considered relevant for the actors to facilitate the expression of values in the debate.

In addition, a closer look was paid to the how the values were expressed values when using strategies. As it can be seen in the previous examples, there are different dynamics regarding the number and type of values expressed in relation to the use of a strategy or as a reaction to its use. By looking at the number and match between the values expressed during the use of the different strategies, Figure 5-9 presents the different alternatives that were identified for the case of shale gas in Lancashire. First, a few values can be used as inputs, while triggering the expression of several values, which may or may not include some of the values used as input (Increased value expression). Second, several values are included as inputs while triggering a response focused on few values (Decreased value expression). Third, the values expressed as inputs and reactions can be similar in number and type (Consonance of value expression). Fourth, the values can be expressed as inputs, while not triggering any response from other actors (Inputs only). Fifth, the values can be expressed as reactions while no value was expressed as input (Reactions only). Finally, there is the case in which no value is expressed in relation to the strategy (Null value expression).

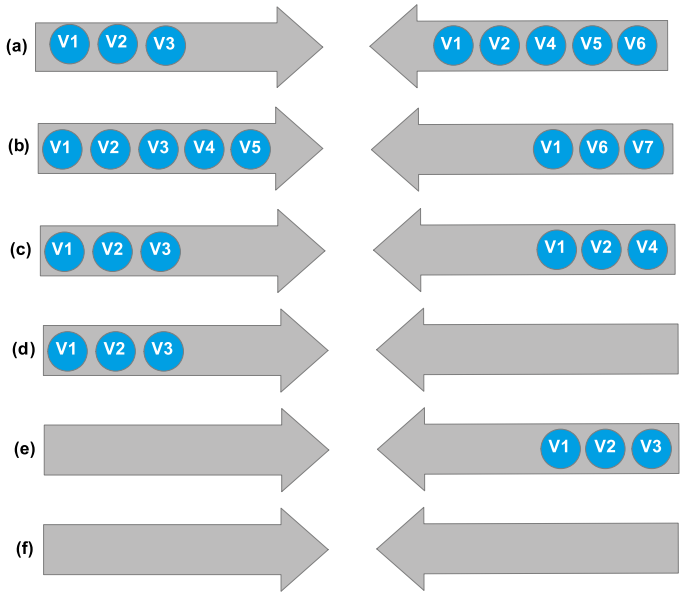


Figure 5-9. Expression of values in inputs and reactions during the use of strategies. (a) Increased value expression, (b) Decreased value expression, (c) Consonance of value expression, (d) Inputs only, (e) Reactions only, (f) Null value expression

The different alternatives of value expression during the use of strategies were identified in relation to the type of strategies identified (See Table 5-4Figure 9-1). Several observations can be made

from this table. Compared to reciprocal strategies, unilateral strategies had a higher tendency to trigger the reaction of actors to express values. The use of strategies is not necessarily related to the expression of values in the debate, this can be seen in the number of strategies with null value expression. Almost all the reciprocal strategies were used to express values as inputs to the decision-making process without triggering, which may be related to attempts to drive the definition of the problems and/or solutions in specific directions. Finally, it is worth noticing that this relationship does not necessarily imply that actors are using values strategically. It only informs of the values that are expressed when justifying or announcing an action in the public debate.

Table 5-4. Relation between the alternatives for value expression associated to the use of strategies and the type of strategies used in the debate over time.

	Unilateral					Facilitating			Reciprocal				
Round	**1**	**2**	**3**	**4**	**% Total**	**1**	**3**	**% Total**	**1**	**2**	**3**	**4**	**% Total**
Increased value expression	4	5	0	5	29%	0	0	0%	3	7	3	2	13%
Decreased value expression	1	1	0	0	4%	0	0	0%	1	1	3	3	7%
Consonance of value expression	2	3	2	1	16%	0	0	0%	1	1	0	1	3%
Inputs only	1	2	5	2	20%	1	0	50%	14	22	6	11	46%
Reactions only	3	4	0	0	14%	0	0	0%	1	1	1	3	5%
Null value expression	4	3	0	1	16%	0	1	50%	10	5	5	9	25%

This section has presented the way the use of different strategies facilitates the expression of different values through the debate. Strategies are not directly associated to any sets of values. The strategic behaviour of actors has triggered the expression of a variety of values in the debate to the point that it is difficult to identify which values are relevant for the different actors. Moreover, reciprocal strategies allowed the inclusion of the variety of values in the debate. However, they did not bring the actors any closer to the realization of their goals or the need to cooperate. The decision for the exploration of shale gas in Lancashire has evolved into a process of pull and push in order to gather the public support, which is seen by actors as a way to gain legitimacy for their position in the debate. In these circumstances, it can be said that even through the strategic behaviour of actors facilitated the emergence of the variety of values in the debate, a need was identified for facilitating interventions especially in relation to the definition of the rules of the game.

This chapter focused on analysing the connection between the rhetoric use of values and the different dynamics of the decision-making process. Firstly, the values related identified in the debate were explored and related to the different rounds of the decision-making process. Later on, the analysis focused on how the arenas, coalitions and strategies interacted with the expression of values. The arenas represented the spaces available for actors' interaction and were characterized by the expression of the values in different locations at the same time. The coalitions allowed actors to work together on the same goals and represented opportunities for actors to get to know what is happening in the arenas they are not directly participating. Finally, strategies triggered the expression of the variety of values on the debate, but the lack of facilitating strategies in the case of Lancashire may explain the level of polarization and controversy reached. The researcher also analysed the relation between the emergence of new actors in the debate and the values that were introduced. The reader is referred to Appendix H to check this additional analysis.

6
CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

Energy projects are embedded in a network of interconnected actors. Energy projects may give rise to controversies due to the normative diversity associated to the project and its implementation process. Whereas controversies may be perceived as barriers for the implementation of energy projects, they can also provide opportunities for the articulation of conflicting values. In that light, the notion of responsible innovation was used to add a normative dimension to the governance of energy projects. Responsible innovation endorses the inclusion of relevant public values to the implementation of energy projects. A key step of this process is the identification of relevant public values. In chapter 1, it was argued that the public debate could be used as a mean for the assessment of values. However, this may prove challenging. The implementation of energy projects is a dynamic process, consisting of a series of intertwined decisions, involving different groups of actors at different decision-making times and places. Hence, beyond methodological challenges, issues of power and agenda setting may lead to the contestation of the legitimacy of the identified values.

The multiplicity of interactions is reflected in different aspects of the decision-making process, such as the locations of decision-making (arenas), the coordination between actors (coalitions) and the interventions aimed at steering the process in desired directions (strategies). Therefore, this thesis focused on exploring how these aspects of the decision-making process shaped the expression of values in the public debate – the rhetoric use of values. In that light, a case study was needed to facilitate an in-depth exploration of the dynamics of the decision-making process. The exploration of shale gas in Lancashire, UK was selected due to its combination of uncertainties and controversy. The uncertainties were related to the potential benefits and impacts of fracking on the environment, surrounding communities and the economy. The controversy was raised by the multitude of perspectives about whether and how to implement the technology. Hence, this report aimed at answering the following research question:

How has the rhetoric use of values been shaped by the arenas, coalitions and strategies in the decision-making process on shale gas in Lancashire, UK?

To answer the research question, several steps were taken. As starting point, a framework for analysis was built based on theories of responsible innovation and decision-making in networks (chapter 2). From this process, it was concluded that actors' interactions were central for the analysis. Hence, the rounds model was selected to reconstruct the decision-making process. Then, a longitudinal qualitative analysis was performed to collect the empirical data needed for analysis (chapter 3). Based on this data, the different elements of the rounds model (arenas, coalitions and strategies) were identified (chapter 4). From this process, three conclusions were drawn. First, due to actors' limited resources, the existence of several arenas limited their possibilities to influence the outcomes of the decision-making process. Second, the existence of coalitions allowed actors to make an efficient use of their resources by joining efforts with other actors to achieve a shared goal. Third, even though actors were highly aware of their interdependencies in their use of strategies, they did not make any significant effort to generate mediation spaces in the middle of a polarized debate. Subsequently, the relevant values in the public debate were identified (chapter 5). Public values were defined as general and non-negotiable convictions or beliefs of what actors' think is worth striving for society to be good. From this process, it was concluded that twelve values were expressed in the public debate on shale gas in the UK (Stability, Resource durability, Environmental friendliness, Aesthetics, Health & safety, Ownership, Welfare, Accountability, Transparency, Subsidiarity, Distributive Justice and Procedural justice). Finally, the analysis was focused on how the different elements of the rounds model shaped the expression of certain values at specific moments in time. The results of this process are elaborated upon in this section to answer the main research question.

As starting point, four rounds were identified during the decision-making process (Table 6-1). Cuadrilla's project was the first fracking proposal in the UK after the moratorium was lifted in December 2012. Hence, the research found that the debate was focused on both the implementation of fracking and the definition of its regulations. Furthermore, the formal procedures at both project and institutional level were at the centre of the controversy in the shale gas debate. They represented the crucial decisions that marked the beginning of the different rounds of the project. In addition, they set the rules for the interactions between actors in the different rounds.

Table 6-1. Rounds identified in the debate

Round	Name	Time
1	Preparation to re-start exploration activities.	Jul 2013 - May 2014
2	'Business as usual' management of high profile applications	Jun 2014 - Jan 2015
3	New consultation on site-specific, contested aspects of the project	Feb 2015 - Jun 2015
4	Changing grounds with the planning appeal process	Jul 2015 - (?)

The decision-making process on shale gas in Lancashire took place in a highly interconnected network with high power disparities. On one hand, the formal decision-making power of the Cabinet was used to create a favourable regulatory environment for fracking. In addition, the financial resources and connections of the Oil and Gas industry might have given them an advantageous position to pursue its goals. This was evident in the multitude of reports and conferences promoting the benefits of shale gas. On the other hand, social acceptance was described as a highly desirable resource for shale gas development. Influencing the public opinion regarding fracking had been at the centre of the activities of the coalitions. This resource gave the civil society organizations and environmental NGOs a negotiating position in the debate. Their level of support or opposition was perceived as a measure of social acceptance of the technology.

Changes in the rhetoric use of value over time

Four values were identified as most frequently mentioned in the debate on shale gas in Lancashire: Accountability, Welfare, Environmental friendliness, and Health and safety. The emphasis on these values was stable across the different rounds. The substantive values of Welfare, Environmental friendliness, and Health and safety were related to the main concerns expressed by actors in the debate regarding the benefits and impacts of shale gas. The emphasis on the procedural value of Accountability can be related to changes in the regulations and in the rules for actors' interactions. Conversely, the values less expressed in the debate were Ownership, Resource durability and Aesthetics. These three values were associated to the landownership rights, the long-term solution of the energy problem and the development of the countryside. Furthermore, it is worth noticing the relative low emphasis given to the values of Stability and Resource durability in the debate of an energy project. These two values may be considered relevant for the development of the energy system in the UK. However, they were not openly discussed in the debate. This fact indicates that the dynamics of the decision-making process served as a filter to highlight certain characteristics of the project, while neglecting other possible relevant ones.

The crucial events influenced the emphasis given to the expression of certain values in the different rounds. These events also represented a platform for the expression of neglected values. In Round 2, the public consultation process increased the expression of the values of Accountability, Procedural justice and Transparency. Actors gave more importance to the relation between the grounds for decision-making, the institutional and legal system in place and the openness of the different actors. Changes in these three values were coupled to the relevant formal procedures and changes in the regulations. In turn, when the process shifted to site-specific aspects of the project, the value of Aesthetics gained emphasis. In addition, in Round 4, the value of Subsidiarity gained emphasis due to changes in the planning system, and the value of Stability gained emphasis during in relation to the announcement of the 14th Onshore Oil and Gas Licensing round. Furthermore, decisions arising from formal procedures induced major changes in the intensity of value expression. This fact has two implications. It pinpoints the role of formal procedures as triggers of the expression of values. It highlights the importance of an open deliberation around these procedures to allow the inclusion of the public values in the process.

Arenas shaping the rhetoric use of values

In addition, in chapter 1 it was argued that values emerge through the controversy and that the inclusion of these emergent values is relevant for the responsible development of energy projects. Nevertheless, all values were expressed during all rounds in the decision-making process. This situation leads to questions of what is really emerging through the societal conflict in this debate. By looking at the relation between the arenas and the values expressed in them, it can be observed that the arenas may had triggered the exploration of different aspects of the values. For example, the value of distributive justice was expressed in the national financial policymaking arena in round 1 as a fair distribution of financial benefits to compensate local communities for the nuances of drilling. In contrast, the same value was expressed in the local Lancashire planning application arena in round 3 as the fair distribution of the risks related to fracking between Lancashire and the rest of the UK. It can be noticed that these conceptualizations were aligned with values that may be considered relevant for their corresponding arenas: Welfare for the national arena and Environmental friendliness and Health and safety for the local one.

Furthermore, the identified values were discussed in several arenas at the same time. The emergence of conceptualizations in the different arenas needs closer attention and further research. The identification of the different conceptualizations is relevant to identify the points of conflicts among actors participating in different arenas. Furthermore, actors could also bring other topics for consideration in the arena. However, the probability of the associated values to gain momentum was limited if they could not provoke a response from other actors. Maybe this can explain the low expression of the values of Aesthetics, Ownership and Resources durability, as their expression was limited to few arenas.

Strategies shaping the rhetoric use of values

Different alternatives were identified for the expression of values associated to the use of strategies and the reactions of other actors to their use. Few strategies triggered a consonance between the values expressed in the input and reactions. Generally, the values expressed as input could have got three possible responses as reaction: a higher number of values, a lower number of values or no response at all. Additionally, strategies could trigger reactions without values being expressed through the inputs. This mismatch could indicate that the polarization of the debate led to a dialogue of the deaf between the different parties. Actors may not respond to the values expressed by the other actor, but to their interpretation of what the other actor is saying. This situation would imply that the actors were not responsive to the values expressed by other actors. In addition, the lack of facilitating strategies impeded the development of a common understanding between different actors. Therefore, even though it was observed that unilateral and reciprocal strategies might facilitate the expression of a variety of public values, the lack of facilitating strategies halts the possibilities for cooperation. The latter interventions can be the focus of responsible innovation in this context.

Even though the Cabinet was expected to act as a mediator in the process, its actions generated more uncertainty in the debate. Its choice of unilateral strategies closed up the debate on several topics. It also created mistrust regarding the Cabinet's connection to the shale gas industry. In addition, other actors perceived the constant changes in the Cabinet's position as a lack of a consistent vision for UK's energy transition. These changes also halted the trust of the different parties in the capacity of the Cabinet to keep its commitments and protect their values. One example is the change in the regulations regarding environmentally sensitive areas in August 2015, which was inconsistent with the agreement reached earlier that year. The Cabinet was under a lot of pressure in terms of ensuring energy security and economic development. Hence, it needed to find suitable solutions and be quick in their implementation. Nevertheless, it has not being responsive to the other concerns expressed by the public. These were related to the values of Health and safety and to the development of alternative energy sources. The constant changes in the regulatory regime could be an indication of lack of reflection, anticipation and deliberation by the Government officials. Dimensions that are essential for the responsible governance of energy projects according to responsible innovation.

Coalitions shaping the rhetoric use of values

The existence of coalitions was not connected to shared values but to shared interests and goals. This allowed the interaction of actors with different values, which may be more receptive to the values expressed by others given the shared goals. By analysing the expression of values by the different groups of actors, it was concluded that all groups expressed all values. Moreover, actors in all coalitions gave similar importance to the value of Procedural justice, but had different perspectives of its implications for the development of the decision making process. For example, Cuadrilla referred to the appeal decision as the following step of the democratic process, while anti-fracking campaigners portrayed it as a disregard for previous public consultation processes. The expression of the full range of values was especially visible in the boundary spanners. This would imply that they might act as collectors of the values expressed in the different coalitions. In this sense, coalitions serve as a space for magnifying the values that are relevant for their members into the public debate.

In conclusion, the rhetoric use of values refers to the expression of values in the debate. The dynamics of the decision-making process might shape the expression of values in three ways. First, strategies may act as triggers for actors to highlight specific values or conceptualizations of values. Second, arenas constrained the expression of (conceptualizations of) values according to the topic under discussion. In addition, not all actors can participate in the different arenas, which might limit their participation in the articulation of values of the different arenas. Finally, coalitions acted as platforms for actors to express the different conceptions of values through the execution of join actions.

6.2 Discussion

From the findings presented in the previous section, it was concluded that three different aspects of the decision-making are fluid. First, arenas can become active at any point in time according to the developments in the decision-making process. They can also experience changes in terms of the actors participating and the decisions being made. Second, actors might join or abandon coalitions according to changes in their interests and in the decision-making process. Third, strategies can be used at any point in time according to actors' available resources and the direction of the decision-making process. In turn, this dynamic context shapes the expression of values in the public debate. They can provide insights for exploring the challenges associated to the use of the public debate for the identification of relevant public values. This section is focused on discussing wider implications of these findings.

Methodological development

The concept of arenas raises complexity for the identification of public values. This complexity is evident in several aspects. First, values were expressed in several arenas at different times. Then, questions are raised regarding which locations to select for analysis (What grounds can be used for this selection?). Second, different groups of actors participate in each arena. Friedman et al. (2006) presented the identification of the actors as one of the first steps for value identification. However, if actors are selected at the outset, the selection of actors faces the risk of focusing on specific arenas while neglecting other relevant (emergent) ones (such as selecting the arena where the project is discussed, but neglecting the ones discussing the regulations). Third, arenas can be coupled for the negotiation of value conflicts between them. This indicates that value conflicts occur within and between the arenas. The variety of conceptualization of values in different arenas may not be in itself a source of conflict that needs to be addressed. Scholars interested in the identification of values from the public debate are then challenged to find ways to account for the diversity of actors and value conceptualizations between and within arenas. Further research may be focused on two points: exploring the dynamics of actors' participation in different arenas and the changes in value conceptualizations within and between arenas.

In line with the previous insight, even if a methodology is developed to account for the diversity of actors and value expressions in different arenas, challenges remain when the identified values are to be included in the design of the energy project. For instance, should the deliberations accompanying VSD processes create a different arena or should they capitalize on the current ones? If a separate arena is created, it may face the risk of not influencing the developments in the other arenas. However, any attempt to extend the process to several arenas may face the risk of being hampered by strategic behaviour. The latter may also increase procedural challenges regarding how to manage possible divergent developments in different arenas. Further work is needed in understanding the implications of the existence of arenas for the design process in VSD.

Legitimacy concerns

The use of the public debate as a source of values has also implications for the legitimacy of the values that are identified. Surprisingly, the values of Stability and Resource durability had low emphasis in the public debate of an energy project. This study indicated that the dynamics of arenas, coalitions and strategies often highlighted certain characteristics of the project, while neglecting possible relevant ones. Power imbalances and processes of agenda setting within the arenas may halt the expression of values by less powerful actors. They may also force actors to conceptualize values in relation to dominant ones, which may decrease the normative diversity of the debate. In this context, it would be interesting to research how to manage (or at least identify) the effects of power disparity and framing in the process of value identification.

Throughout the analysis, a phenomenon was observed regarding the expression of values. Namely, under particular circumstances, some values could gain momentum in the public debate. Their expression would be increased at certain points of the decision-making process. Actors were

engaged in the expression of these values. It was observed that changes in the content of the decision for the project in Lancashire influenced the emphasis put on the value of Aesthetics. Nevertheless, the factors that may trigger a value to gain momentum are not clear enough, less their implications for the identification of public values. If some actors could influence the decision-making process towards the expression of certain values, this would add weight to the legitimacy concerns. It is considered that a better understanding of this process could be reached through the analysis of changes of value conceptualizations over time. This may lead to better insights regarding how the interactions of different value conceptualizations may lead a value to gain momentum in the debate.

The influence of politics

Formal procedures can be deemed as politically engaged. In the case of Lancashire, actors tried to influence the outcomes and instances of these procedures in an attempt to advance their goals. The importance given to these procedures can partly explain their power to trigger the expression of values in the public debate. Nevertheless, by comparing the formal procedures executed by the Environmental Agency and the Lancashire County Council, it was noticed that the permitting process of the former did not face the level of controversy than the one of the latter. The presence of locally elected officials may be one of the reasons for this. Elected officials may consider to have a duty to represent the interests of their constituencies (Fairclough & Fairclough, 2015). Hence, the arenas in which elected officials have decision-making power may be perceived as more legitimate to discuss public concerns. This situation contributes to the political engagement of formal procedures. Hence, the connection between the presence of elected officials and the expression of public values deserves some attention. This especially in relation to the methodological challenges to identify possible arenas for value identification.

Responsible innovation suggests that anticipatory analysis is necessary to uncover possible value conflicts at early stages of project implementation (Stilgoe et al., 2013). However, due to the fluid nature of decision-making processes, it is worth questioning to what extend anticipation is possible. Furthermore, questions could be raised regarding what this anticipatory analysis would imply for the political engagement that this way of value expression (reaction to formal procedures) brings. The articulation of values through formal procedures enriches the public debate. It may give the opportunity to less powerful actors to express their perspectives regarding the technology. Hence, it is worth considering to what extend anticipatory analysis is desirable. A balance between anticipation and emergence may be needed. Further research may be associated to the implications that a focus on the emergence would have to the anticipatory analysis of responsible innovation.

Governance challenges

The limitations of the formal planning procedures to manage fracking applications could be noticed throughout the developments of the decision-making process. Due to the controversy and uncertainty associated to the technology, the interests at stake were high. Hence, the system was overloaded by the participation of actors, which led to several delays of the decision. The Cabinet framed this problem as low performance of local councils. However, another perspective is possible. The design of the planning system seems to fail to respond to the public concerns regarding the technology. While the planning regulations limit the grounds for decision-making for local councils, the public opens the discussion to wider issues. This mismatch lead to increase in the controversy. In addition, the process of the Environmental Agency does not seem responsive to the environmental concerns of the local citizens. In this light, the design of the formal procedures related to the public consultations carried out by regulators further work. Even though it would not desirable to redesign these procedures every time a new technology is implemented, the regulatory systems could increase their responsiveness to the characteristics of the different projects under discussion. Further research would be needed regarding the feasibility of this proposal.

In addition, in the case of Lancashire, a need was identified to open up the debate to the level of the energy policy. Nevertheless, the definition of the energy policy is a highly politicized issue. In the

UK, alternative pathways to face the energy crisis are being closed due to lock-in of political decisions. Hence, each technology is treated separately according to incumbent interests. Inconsistencies in the management of different energy technologies served also as triggers of controversy. This situation raises a challenge for the responsible governance of energy projects. It requires a National Government willing to engage in deliberation and reflection regarding wider governance issues. This would imply the development of these capabilities in Government officials. Interesting questions associated to these issues are then what situations may lead Governments to engage in and commit to deliberation processes, and how these capacities can be developed in Governmental institutions. Furthermore, VSD argues for the need to include values in the design of institutions. Then, clarity is needed on what aspects of the institutions the National Government is willing to include in the design process for VSD and how to handle the connection of the design process with the institutions that are not included in the design process.

Furthermore, it was observed that many problems and inconsistencies arose from the multitude of regulatory bodies associated to the exploration of shale gas. The concerns of people regarding safety or environmental problems were not attended by the Environmental Agency or Public Health England. Thus, the actors felt they were being neglected. In addition, opponents mistrusted any endeavour of cooperation promoted by the oil and gas industry. The creation of a sole regulator for shale has been suggested (Hays et al., 2015). The idea of one regulator may be attractive as a way to have one actor who could be naturally engaged in several arenas at the same time. However, this situation can also increase the potential for some issues to be neglected in the debate. Hence, the creation of this entity would need the articulation of reflective and responsive capabilities to address the different issues under discussion in the decision-making process. This perspective adds another layer to the study of the feasibility of the creation of such regulator.

Finally, one interesting finding was also found in the management of information. Information was communicated strategically to support certain positions in the debate. Publications were faced with scepticism and criticism from actors with conflicting positions. The different regulators and ministries of the National Government performed their own research regarding the impacts of fracking. However, this only served to increase the controversy regarding the transparency of the Cabinet. In such a context, a need is identified for negotiated knowledge. Nevertheless, no evidence was found of attempts by the Cabinet to open a deliberation on the uncertainties regarding fracking. Even though it is not sure that negotiated knowledge can solve controversies, it may at least serve to uncover the assumptions and sources of information that are trusted by the different parties. In addition, online communication and experience sharing has been used to contest “objective” scientific knowledge. If information is used as a base for the articulation of the discourse of actors, another challenge for the responsible governance of energy projects is the management of the diversity of sources of information. Further research may be targeted at the influence of the different types of knowledge on the formation of discourse of actors.

6.3 Recommendations

Based on the previous insights, recommendations were drawn. They were focused on addressing the challenges associated to the use of the public debate as a source of values and the responsible governance of energy projects.

Recommendations for the use of the public debate as a source of values

- The legitimacy of the identified values needs further attention. Further research is recommended on how to manage and which are the effects of power disparity and framing in the process of value identification.
- The connection between the presence of elected officials and the expression of public values deserves further research, especially in relation to the methodological challenges to identify possible arenas for value identification.

- The dynamics that lead a value to gain momentum need further research. In particular, regarding how different conceptualizations of values interact for a value to gain momentum in the debate.
- For methodological development, further research is recommended regarding the dynamics of actors' participation in different arenas and the changes in value conceptualizations within and between arenas.
- Further work is needed in understanding the implications of the existence of arenas for the process of design in VSD.
- As a means to ensure the inclusion of a variety of values in the design, the identification of the potential boundary spanners is highlighted. For this purpose, the execution of social network analysis is recommended as a way to reveal the interdependencies between actors.
- One often implicit factor of the value identification process, is the role of the design team, which is responsible for the process of value identification. Due to the legitimacy challenges that can be associated with the process of value identification, it is advised for VSD to build upon the literature on management of networks to gather lessons on how to allow a deliberative environment in the midst of interconnected actors with resources and power imbalances.
- The openness of National Governments to open the design of their institutions to a VSD approach needs to be assessed. This is desirable, but not necessarily feasible. Questions regarding under which conditions Governments would be willing to open the deliberation of the institutions and how to incorporate a value perspective in the formal policy-making process would need to be addressed.

Recommendations for the responsible governance of energy projects

- Responsible innovation requires the Government's willingness to open sensitive governance issues (such as the energy policy) to deliberation. Research is recommended on the feasibility of that and, if feasible, on how to develop the needed capabilities to respond to these challenges.
- The responsiveness of the regulatory system to the processes of public participation needs more attention. Further research could be focused on the needed conditions and capabilities for the regulatory system to adapt to the level of participation raised by controversial applications.
- Regulators are relevant for the accountability of the actions executed in the implementation of energy projects. The role of regulators and the desirability of having one sole regulator or a variety of them needs further attention. Further research may be useful regarding the influence of the capabilities of reflection and responsiveness for the definition of the role of regulators for energy projects.
- More attention is needed to the processes of knowledge generation in relation to the inclusion of divergent normative perspectives in the governance of energy projects. Further research is then recommended on the influence of the different types of knowledge on the formation of discourse of actors.

6.4 Limitations and future research

This research took the public debate as a source of values arising in the societal conflict for shale gas in the UK. The selection of media articles as source allowed identifying a diversity of actors and arguments feeding the public debate. However, this source faced two limitations. First, it neglects the perspectives of actors that, while being relevant, do not take an active part of the research. For example, the views of the consumers of gas and electricity were not included in the debate. Second, the media can have some interference in the selection of the people they interview or the views that are presented and how. Hence, they may magnify some events and include the perspectives of actors that are necessarily active in the public debate. Although this limitation was

addressed with a diversity of sources for the newspaper articles, it is still possible that some events or actors were excluded from the analysis as no newspaper consider them news worthy.

Due to time constraints, the identification of values was based only on an interpretation of the claims made by actors. This decision was also based on the limited availability of some actors, such as public officials, for interviews. Different participants of the value identification process focused on different parts of the claim to identify the values. This may have led to the identification of more or less values than the ones intended by the speaker. Due to the amount of values that were associated to each actor, it was difficult to identify which ones were in fact relevant for the actor. Interviews with relevant actors would have been helpful to clarify the values expressed in the debate. Therefore, future research could include interviews of key actors as a way to evaluate the limitations of the values identified with the use of arguments as data source. The views of the different actors can also increase the understanding on how the dynamics of the decision-making process shaped the rhetoric use of values. In turn, the identification of values was also associated to cognitive and attention biased of the researcher. The cognitive bias is given by the researchers' value system and the attention bias is given by the amount of claims to be analysed. These biases were mitigated with the inclusion of two experts as explained in section 3.2.3.

the cognitive bias is also balanced with the inclusion of two experts to support the process of value identification. This process allows a triangulation of perceptions regarding values, which does not eliminates the inherent subjectivity but increases the reliability of the findings. The diversity of perspectives favours a more complete analysis of each claim as each researcher focuses on specific aspects of the claim to make a judgement according to their experience and value system. Finally, the attention bias was balanced by performing the identification of values in batches. However, this was not always possible for the external experts, which had limited time to support the research. Thus, it is assumed that, by using the three perspectives for selecting the final values, the biases could be decreased a certain extent.

Another disadvantage of the use of newspapers in this research was associated with the observation and analysis of coordinated communities' formation. In this research, they are associated with evidences of collective actions based on the different actions identified in the decision-making process. However, this methodology is limited to study what is happening before for the realization of these actions and it can hide the presence of other actors who were involved but not mentioned. For the matters of this research, the focus on collective action was considered enough to provide an initial understanding on how the dynamics of collective action influence the expression of values. However, for future development of stakeholder analysis for VSD, it is advised to go deeper on how actors are coordinating their activities and their connection with the project network.

The data collected through the analysis might be used to expand the insights presented in this research. The current research was kept at the level of values, but a focus on the level of value conceptualizations may provide insights into how the conflicting views of values are articulated in the different arenas, by the different coalitions and through the different strategies. Based on the data generated, the different value conceptualizations may be identified by analysing the contents of the claims associated to the different values. A thematic analysis can be executed to identify the different conceptualizations. Furthermore, the analysis of strategies could be made more explicit by extending the analysis into how specific strategies halted or supported the articulation of values in the public debate. In this case, empirical and theoretical work would be needed for the conceptualization and identification of the different strategies.

This research focused on one case study to analyse the relation between the dynamics of decision-making processes and the rhetoric use of values. In order to complement or contest these findings, it is necessary to analyse other decision-making process occurring in different institutional contexts. The comparison of the findings from the different analysis can serve as a means to improve the validity and usefulness of the recommendations given above. Hence, future research may focus on performing similar analysis on different institutional contexts and with different technologies to

identify common characteristics of the dynamics of value expression that could be incorporated to the methodology of VSD for energy projects.

This research highlighted the relevance of legitimacy as part of the dynamics of the decision-making process. First, the issue of the contestation of the legitimacy of the national Government to decide what technologies contribute to the public good and the future of the energy mix. Future research could focus on the perceptions of the public regarding decision-making processes at national level and the sources of mistrust. Second, if VSD is to be in charge of a design team, future research should focus on the characteristics of this role for it to be recognized as legitimate for all involved parties. Third, the case of shale gas extraction in the US was used in the UK debate as an example of the impacts and benefits of the technology. The claims on economic benefits, groundwater pollution, industrialization of the countryside, among others, were based on the experiences shared by the Federal Government or US citizens. The use of social media and internet to share the experiences with the technology can become an opportunity or a barrier for its implementation in other places. The social media and online communication are changing the dynamics of knowledge exchange and what is considered legitimate knowledge. Based on these insights, topics for future research are also found on the role of social media and online search engines in the discourse formation of actors and in the contestation of expert-based knowledge. Additionally, the implications of online experience sharing on the development of government proposals for new energy developments and its response from the public could be researched.

7
RESEARCH REFLECTION

This chapter is focused on presenting the author's reflection on three different points of the research: the methodology used, the complementarity of the theories used: responsible innovation and decision-making in Networks, and the implications of the findings for responsible governance of energy projects.

7.1 Methodological challenges

One important part in qualitative analysis involves a reflection on the usefulness and lessons learned of the research design used (McLeod et al., 2011). This research was based on a longitudinal analysis of the case of shale gas for the UK. This process was highly time intensive, the coding process required high levels of attention and clear decision-rules in order to avoid the inclusion of irrelevant data or the omission of relevant one. The explicit connection of the coding process with the concepts of events and claims helped to keep a focus on the dynamics of the decision-making process. However, the connection between the theoretical concepts and the empirical operationalisations may need a closer look from the beginning of the research to ensure the data is collected in a way that facilitates the analysis. Additionally, the labelling of the codes facilitated its coupling with other programs for data mining and visualization. The definition of a systematic approach to the coding process was key for data analysis and verification. It also unveiled the hidden assumptions the researcher made when classifying the information she found on the articles.

Moreover, the use of social-network analysis tools was useful to manage the high amount of data gathered. The use of this approach can be extended to the analysis of the connections between actors to provide a better support of the identification of coordinated communities. However, the use of several tools to gather and analyse the data can also lead to the inclusion of errors in the data when transferred from one format to the next one. In addition, it adds learning and time burdens to the researcher as she has to get used to several interfaces. The use of several tools also adds

complexity to the analysis as the researcher incorporates another decision to the research logic: which tool to use to present the results of each part of the research. Difficulties to make such choices can lead the researcher to focus too much in details and lose the track of the main research question. In short, the methodology used provides enough tools to analyse the debate in a systematic way, but increases the risks of losing track of the main line of research if each step is not explicitly connected to the research objective.

Finally, another challenge comes from the researcher's view on values. The researcher was explicit regarding the exclusion of any assumption regarding the intentions behind actors' expression of values. Yet, the framing of the expression of values as rhetoric "use" still leaves a connotation of a utilitarian perspective for the use of values. For the author, the top of the pyramid in the value hierarchy is related to the core values of actors, those that are non-negotiable. Values are differentiated from interests in the way that they represent the things that individuals find worthy for society to be good and, thus, they are not willing to negotiate this perspective. In this research, the identification of values was related to the norms expressed in the debate. Even through the word "negotiation" has been mentioned as part of the decision-making process, the author does not intent to communicate that values, at any level are negotiable.

7.2 Comparing theories: VSD and Decision-Making in Networks

Networks theory have been under development for decades and has explored different aspects of how actors' interactions support policy-making processes. Energy projects are embedded in a network society. In addition, the application of VSD for these projects is process oriented, aiming at including the design of the institutions and instances of actors' participation to the technology's design. Therefore, VSD could build on the knowledge base of networks' theory to improve its understanding of processes of institutional design, especially in ling-term interaction processes. In this research, the usefulness of network theory was explored through the connection of value expressions with the dynamics of the decision-making process. The concepts of arenas, coalitions and strategies for understanding different aspects of the dynamics of value expression has been found useful to gather lessons for the methodological development of VSD. Moreover, the concept of network management can be useful for the development of the role of the design team that would be required as part of VSD's activities. Another relevant input of network theories is its explicit focus on the dynamics of the process. A focus on the dynamic aspects may benefit the rather static perspective of VSD. A focus on the dynamic aspects of the processes of value identification and inclusion in the design may provide new insights for methodological improvement.

Nevertheless, it was found that the network theories could also benefit from the developments of VSD. One aspect that differentiates these theories is the importance given to strategic behaviour. Strategic behaviour is taken as granted for Network theory, while VSD and neglects its influence. Nevertheless, the researcher advocates for a balance between the two perspectives for the responsible governance of energy projects. On one hand, the perspective that actors only act based on the interests and goals does not give room for resolution of the value root of some controversies. For the case of energy projects, the debate on values it is seen as necessary to find solutions that better fit the needs of a highly interconnected society that is more aware of its relation with the environment. Values should not be treated as a negotiable part of people's position. The network theory could then benefit from including VSD's normative perspective on how to handle value conflicts in relation to mediation in facilitating interventions. On the other hand, strategic behaviour is part of human behaviour. It should not be denied, but recognized. The reflective dimension of responsible innovation can also benefit of people's reflection on strategies used and their consequences as a way to improve decision-making processes. Strategies can facilitate the expression of values in the debate and the resolution of lock-in situations. When done in line with the interdependencies in the network, unilateral interventions can also force cooperation by creating room for an open debate. In short, the two theories are perceived as complementary on some of the limitations of the other. It is considered worthy to identify common grounds that would allow the

inclusion of normative principles in the dynamics of decision-making in networks towards a more responsible governance of energy projects.

7.3 Implications for the management of Decision-Making processes for shale gas in the UK

The analysis performed in this research unveiled characteristics of the processes of decision-making for energy projects in the UK. First, it has observed that they are highly politicized. The National Government is the highest decision-making body. Decision-making can be represented as a process of pull and push between different parties to reach (or not) an agreement. In the debate for shale gas, this polarization escalated towards a "free fight" in which parties in the different positions did not listen to their opponents. By observing the actions of the national Government, it can be concluded that its position was unresponsive to the interdependencies it had with other actors. None of the regulators of unconventional oil and gas exploration stepped into the process to prevent the polarization or to respond to the concerns expressed by the different actors. The national Government entities lacked coordination, reflection and anticipation on the management of the process. It has been advised that one regulator is needed for shale gas in the UK. The findings of this report put a caution on such recommendations. The distribution of regulatory regimes across a wide range of ministries and agencies makes more difficult to keep track on the changes happening in the different arenas at local and national level. Therefore, there is no anticipation of possible consequences on the myriad of changes being proposed and no preparation for the response of the different interested groups.

Second, the national Government used the case of the US as an example of the economic benefits associated to shale gas, without being careful on the negative image associated with fracking and the US. The officials dismissed the probability of getting the same results because of UK's stricter regulation. Nevertheless, anti-fracking campaigners contested the credibility of such claims. This point brings into light the importance of transparency and anticipation in the transfer of technology. The national Government fired back with reports making literature reviews on the impacts of fracking in several fields in other countries. Nevertheless, this process was expert led. The specific concerns of the citizens were not included, which led to the contestation of the scope and outcomes of such research processes. Hence, for the case of controversial technology transfers, like fracking, it is essential to generate participative knowledge from the outset. The public is not willing to blindly believe in the experts' claims unless they can see their concerns reflected in the scope of the research.

Finally, the essence of the controversy comes from the national Governments' pressure on solving the energy issues of the UK. The forecast of a possible energy crisis by the end of the decade had put the national Government in a difficult position to ensure a stable and affordable energy supply. Therefore, it is pushing the realization of the project without opening up spaces for other actors (beyond energy companies) to gain something from the position. The public is aware of the possible crisis, but the related values of Stability and resource durability are not in the top of their minds when debating about the Lancashire project. The lack of connection between the debate and the UK's energy issues may be related to the uncertainties associated with fracking. Part of the public seems unwilling to accept technologies with associated unforeseen consequences. However, uncertainty is intrinsic to the innovation process. This situation implies two challenges for the Government. First, how to manage the expectations of the public regarding technology's impacts. Second, how willing it is to open up the debate on UK's energy future for a participative process of policy-making. In addition, how to make it happen in a transparent way that reflects the imminent energy crisis without pushing the selection of any solution.

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9
APPENDICES

APPENDIX A. COMPLEMENT OF THE CODING PROCESS

The coding process was one of the most crucial steps during the execution of the empirical research. This appendix provides a complementary description of the process followed and the considerations taken into account.

As a preparation for the coding process, it was necessary to gain understanding of the project and its context in addition to the guidance given by the purpose of the research and the theoretical framework. As a starting point, the classification system was guided by a need to have information about the actors, the actions performed by actors, the claims used in the debate and the timing of such expressions. Therefore, a relevant question guiding the process was the definition of what makes a quote relevant. First, it was defined that it had to entail the opinion of an actor that joined the public debate. Second, it had to account for the actor's perspectives about the development of the project and/or the conditions for that to happen in terms of institutions or mechanisms of participation. Finally, it was decided to exclude the explicit position of the newspapers in the debate. The actors to be acknowledged should have the capacity to interact with others directly regarding the subjects discussed in the debate. Conversely, for the actions, it was considered relevant if it was mentioned in the newspapers.

The focus on the context of the claims in terms of actions (and reports) was added afterwards as the researcher realized the need for other elements to reconstruct the decision-making process. These elements were necessary to provide explanations about the emergence of values based on the conceptual model. In addition, the topics discussed in the claims were deemed as providers of a complementary perspective to the actions that were being identified in the debate. A balance between content and context. However, the identification of subjects was done in a superficial fashion and it was not explored further during the analysis. It was not the focus of the research to analyse the development of the discourse over time.

At this point, the researcher made herself familiar with atlas.ti and its features to define how the initial system could be transformed into usable codes. Atlas.ti proved to be easy to learn and to manage. It works under a hierarchical system of codes. The codes can be grouped in families of codes to keep a track of the defined categories. Due to the amount of data to code, the code hierarchy implied the development of a systematic approach of the coding process to be able to perform such categorization. Moreover, the program allows to keep track of the relations between codes. This feature was deemed extremely useful to trace the interaction between the events as a way to reconstruct the decision-making process. Additionally, the data was extracted based on the relations tracked in the public debate.

Once an initial categorization was developed, an iterative process of refinement of the coding process started. The newspaper articles used as input were extracted from Factiva according to the location of the newspapers used as source into local and national news. The coding process started with the local news from January, 2013. This process consisted of two stages. Firstly, the first 20 articles were read and coded using the initial categories. Then, changes were done to the categories to include emerging categories not fitting with the initial ones or to improve the definition of the initial categories. Afterwards, the articles were recoded with the new categorization to keep consistency. Secondly, the same process was repeated to analyse 80 articles. The main adjustments of the codes came from the categories subject, action and actor type. This can be explained with the exploratory nature of the coding process with respect to these three categories. As a result, the categories presented in Table 9-1 were developed and the codes listed in Table 9-2 were used.

Table 9-1. Description of the categories identified during the coding process.

Category	Description
Events	**Theoretically significant changes**
Claims	Actors' arguments as expressed in the debate.
Action	Activities performed by actors trying to steer the outcomes of the decision-making process. The activities related to the formal decision-making process were included based on further classification: • Permit request (Submit or delay) • Permit decision (Positive or negative) • Formal DM meeting (Outcome: Decision, Information or Delay) • Formal public consultation
Report	Reports mentioned to increase of the knowledge base used in the debate.
Context of expression	Contextual factors surrounding the expression of the claim
Time	Time reference for the identified events.
Author of claim	Characteristics of the actor that expressed the claim.
Actor name	Name of the actor
Actor Type	General classification of the actors based on common characteristics with other actors participating in the debate.
Subject	Central topics discussed in the claim under analysis.
Lancashire Project	Reference to general characteristics, impacts and/or benefits of the project proposed for Lancashire. Additionally, when mentioned, the position of the actor with respect to the development of the project is also traced.
Shale gas	Reference to the characteristics of the resource and the possibilities it gives for the development of a shale gas industry.
Fracking technology	Reference to general characteristics, impacts and/or benefits of the technology needed to perform fracking activities. Additionally, when mentioned, the position of the actor with respect to the desirability of the technology's use in the UK is also traced.
UK Energy policy	Characteristics of the policies related to the energy system and its development. The policies are discussed in relation to the possibilities of adding shale gas to the energy mix of the UK.
Company performance	Evaluation of the company Cuadrilla regarding to its suitability to perform fracking activities compared to the best safety and industry standards.
UK Energy transition	Discussion about the proper energy mix for the UK and the role of different technologies to reach the binding emission targets set in 2008.
Decision-making process	Perceptions about the general characteristics of the decision-making process and the particularities of the formal procedures being executed.

It should be noticed that the descriptions of the categories were used to guide the researcher as a mean to reduce bias during the classification. Nevertheless, the differentiation of subjects was not always clear-cut. Therefore, the researcher decided to include all the subjects under revision, as she could not justify the selection of one over another. Moreover, sometimes the claims were extensive, for example when included in opinion articles. The researcher approach with these claims was to keep the central ideas expressed that referred to the main arguments for the actor's position. The focus on the argumentation is explained by the assumption that the value perceptions are found in the level of norms, on the reasons rather than the facts. Finally, when groups with a

neutral or unclear position performed some actions, these were included as external actions for simplicity.

Table 9-2. List of codes used per category

Category	Codes
Event	
Claim	• Claim
Action	• Cuadrilla actions [C] • Anti-Fracking campaigners actions [A] • Supporters actions [S] • External actions [X] • National Government actions [G] • Local governments actions outside formal DM process [L] • Permit request [E] • Permit decision [E] • Formal DM meeting [E] • Formal public consultation [E]
Report	• Report
Context of the claim	
Time	• Month • Year
Author of claim	
Actor name	• [name or position as stated in newspaper]
Actor Type	• Local government • National government • Parliament • European Parliament • Private company • Business organization • Environmental NGO • Knowledge generating institution • Civil society organization • Local community inhabitant • Local business • Actors outside the UK
Subject	

Lancashire Project	• General project
	• Impacts & Benefits
	• Position
	  ○ Support
	  ○ Reject
	  ○ Conditional support
	  ○ Neutral
	  ○ Unclear

Shale gas	• Resource • Industry development

Category	Codes
Fracking technology	• General project • Impacts & Benefits • Position • Support • Reject • Conditional support • Neutral • Unclear
UK Energy policy	• Taxation • CO2 emissions • Planning regulations • Land ownership regulations • Safety regulations • Benefits distribution • Dictates from the EU
Company performance	• Company [Cuadrilla] performance
UK Energy transition	• Renewables role • Shale gas role • Shale oil role • Fossil fuels role
Decision-making process	• Perception • Explicit mention of procedures

As said earlier, it was necessary to develop a proper system to keep the order in atlas.ti due to the amount codes generated. There were 1037 codes generated after the analysis. The term event was used to refer to actions. Table 9-3 presents the translation of the categories of codes in atlas.ti. Code families were created to match the categories. It should be noted the use of such as system proved valuable and time-saving in former stages of the process.

Table 9-3. Codes as used in atlas.ti

Category	Coding in atlas.ti
Time	Time_Year_Month number_Month Ex. Time_2013_1_January
Action	Event_Category & Number_Details Ex. Event_A1_Frack Free Fylde meet to outline proposals to bring their cause to wider audiences
Report	Report_Number_Name_By: Author Ex. Report_1_Shale Oil:the next energy revolution_By: PwC
Actor	Actor_Actor Type: Actor name Ex. Actor_Business Organization: United Kingdom Onshore Oil and Gas Group
Subject	About_Subject Category_Related Code: Details Ex. About_Decision Making Process_Explicit mention of procedures: Environmental permits
Claim	Claim_Expression Ex. Claim_We support public involvement in the decision being made on our proposed exploration sites.

To conclude, the subjective nature of qualitative analysis is explicit during the coding process due to the amount of decisions it entails. In order to counteract this disadvantage, the researcher should aim to be transparent with respect of her choices. This appendix presented an account of the concepts and choices made through the coding process. The relevance of developing a proper system that matches both the needs of the research and the support program is highlighted. Furthermore, the revision of the coding process is performed constantly in later stages of the analysis as hidden inconsistencies are discovered. The amount of data facilitates the emergence of mistakes, but the use of complementary visualization tools supported the verification process. This is especially true during the preparation of the file to be used as an input in such processes as described in section 3.4.

APPENDIX B. COMPLEMENT OF THE VALUE IDENTIFICATION AND VALIDATION

Central to this research was the identification of values that were expressed in the debate at different points in time. Due to the subjective nature of values, this part of the research required a systematic approach and active deliberation with other researchers in the field. The latter enabled a critical reflection for justifying the choices made and it also aimed at diminish the cognitive bias related to the process of value identification. This appendix covers the additional activities performed to identify the values expressed in the debate.

Values were conceptualized in this research as general and non-negotiable convictions or beliefs of what is worth striving for if society is to be good. Once the data was exported from atlas.ti, it was organized in an appropriate format to support the process of value identification. Taking into account the relationships between the codes, a table was created relating claims, actors expressing them and the time of the expression. This table was taken as the input for value identification.

Furthermore, as the process of value identification followed the methodology of Dignum et al. (2015), it was considered necessary to have an interview with the main author to get recommendations and insights for the task. The outcomes of the meeting gave the researcher elements to decide how to adapt the methodology for her research and a theoretical input to start the conceptualization of values. The value identification was performed in four stages:

I. A literature review of the fields of VSD, ethics of technology and values related to energy systems to create a conceptual understanding.
II. A conceptualization of the values based on the insights the researcher got from her initial analysis of the articles and the concept of value hierarchy.
III. An initial classification of the claims, based on the value conceptualization and the concept of value hierarchy, to identify the values related to each claim.
IV. A process of validation with two experts.

Firstly, the literature review was explorative in nature, it targeted to the identification of values related to technology development. This process led to the identification of 45 values (see Table 9-4). These values and their definitions are not mutually exclusive. However, the exploration provided the researcher with wide theoretical grounds to reflect on how to conceptualize the values for the research. Secondly, the value conceptualization was based on the values identified by Dignum et al. (2015), as they also worked around shale gas and tracking. However, the debates were not equal, the researcher needed to adapt the conceptualization based on her reflection after the coding process and the theoretical grounds gained in the first stage. Thirdly, the researcher executed individually the process of value identification. This entailed reading the claims and reflecting on which values were mentioned based on the definitions. This process also led to the refinement of the value conceptualizations based on the researcher's reflection. Sometimes, the researcher was faced with a claim in which no value was apparently mentioned, it was decided to not to relate any value to them instead of forcing the definitions. Furthermore, more than one value could be identified from a single claim.

Table 9-4. List of values resulting from the literature review

Value	References
Accountability	(Dignum et al., 2015; Flüeler & Blowers, 2007; Friedman & Kahn, 2003; Friedman et al., 2006; Hulstijn & Burgemeestre, 2014)
Aesthetics	(Dignum et al., 2015)
Affordability	(de Bruijn & Dicke, 2006)
Autonomy	(Beauchamp & Childress, 2001; Friedman, 1996; Friedman & Kahn, 2003; Friedman et al., 2006)
Autonomy and power	(Demski et al., 2015)
Beneficence	(Beauchamp & Childress, 2001)
Calmness	(Friedman & Kahn, 2003; Friedman et al., 2006)
Courtesy	(Friedman et al., 2006)
Democracy	(Pols & Spahn, 2014)
Distributive Justice	(Beauchamp & Childress, 2001; Dignum et al., 2015; Pols & Spahn, 2014; Wüstenhagen, Wolsink, & Bürer, 2007)
Economic viability	(Taebi & Kadak, 2010; Taebi & Kloosterman, 2014)
Efficiency and not wasteful	(Demski et al., 2015)
Energy justice	(Sovacool, 2013)
Energy security	(Brown & Huntington, 2008; Correljé, Groenewegen, Künneke, & Scholten, 2014; Demski et al., 2015; Sovacool, 2013)
Environmental friendliness	(Dignum et al., 2015; Taebi & Kadak, 2010)
Equality	(de Bruijn & Dicke, 2006)
Flexibility (decision)	(Flüeler & Blowers, 2007)
Freedom from Bias	(Friedman, 1996; Friedman & Kahn, 2003; Friedman et al., 2006)
Health and safety	(Dignum et al., 2015)
Human Welfare	(Friedman & Kahn, 2003; Friedman et al., 2006)
Identity	(Friedman & Kahn, 2003; Friedman et al., 2006)
Inclusive involvement	(Flüeler & Blowers, 2007)
Informed consent	(Beauchamp & Childress, 2001; Friedman & Kahn, 2003; Friedman et al., 2006; Friedman et al., 2002)
Intergenerational justice	(Taebi & Kadak, 2010; Taebi & Kloosterman, 2014)
International stability	(Dignum et al., 2015)
Justice	(Beauchamp & Childress, 2001; Pols & Spahn, 2014)
Non-maleficence	(Beauchamp & Childress, 2001)
Openness	(Flüeler & Blowers, 2007)
Ownership and Property	(Friedman & Kahn, 2003; Friedman et al., 2006)
Privacy	(Friedman & Kahn, 2003; Friedman et al., 2006)
Procedural Justice	(Dignum et al., 2015; Pols & Spahn, 2014; Wüstenhagen et al., 2007)
Process and change	(Demski et al., 2015)
Protection of environment and nature	(Demski et al., 2015)
Quality of service	(de Bruijn & Dicke, 2006)
Reliability of supply	(Correljé et al., 2014; de Bruijn & Dicke, 2006)

Value	References
Resource durability	(Dignum et al., 2015; Taebi & Kadak, 2010)
Safety	(Taebi & Kadak, 2010; Taebi & Kloosterman, 2014)
Security	(Sovacool, 2013; Taebi & Kadak, 2010; Taebi & Kloosterman, 2014)
Social inclusion	(de Bruijn & Dicke, 2006)
Social justice and fairness	(Demski et al., 2015)
Sustainability	(Friedman & Kahn, 2003; Friedman et al., 2006; Taebi & Kloosterman, 2014)
Technological applicability	(Taebi & Kadak, 2010)
Transparency	(Flüeler & Blowers, 2007; Hulstijn & Burgemeestre, 2014)
Trust	(Friedman & Kahn, 2003; Friedman et al., 2006; Friedman et al., 2002; Nickel, 2021; Wüstenhagen et al., 2007)
Universal usability	(Friedman & Kahn, 2003; Friedman et al., 2006)
Welfare	(Dignum et al., 2015)

Finally, the process of value validation was divided in four phases:

i. The selection of the experts.
ii. The individual identification of values.
iii. A joint meeting to set agreements to handle differences in classification.
iv. The final identification of values based on the agreements.

First, the experts involved in the validation process were Dr.ir. Marloes Dignum and Dr.ir. Udo Pesch. On one hand, Dr.ir. Dignum's research is focused on responsible innovation in the field of values and the public acceptability of energy technology. On the other, Dr.ir. Pesch's research interest are oriented towards responsible innovation, science and technology studies, technology dynamics, environmental politics, public administration, and philosophy. He is also involved in the RESPONSE project. Both experts were involved in the research project for identifying values in the shale gas debate in the Netherlands. Therefore, they were familiar with the methodology and they were considered suitable to support this research. Both experts agreed to be part of the process.

Secondly, an individual meeting with each expert was held. As preparation, the value conceptualizations were sent to the experts in advance for them to familiarize with the definitions. At the beginning of the meeting, the general context of the shale gas project in Lancashire was explained together with the notion of values used by this research. The experts were invited to ask any question regarding the process of value identification before they started. Afterwards, the table with the claims was made available for them to identify the values. The used codes for the values instead of the full name for efficiency, the initials of the values' names were used. For the values with the same initial letter, the second letter was also included in the code. For one of the experts, the process took two hours. For the other, the file was kept for five days before sending the results.

Thirdly, once the identification was finished, a table was created comparing the classification done by each of the researchers. Then, the claims were classified according to the level of agreement between the values identified by the researchers as presented in Table 9-5. The results with this classification was sent to the experts as preparation for the joint meeting. Additionally, approaches were prepared in advantage on how to handle disagreement. Initially, it was decided that some claims could keep all the values identified as they presented high levels of agreement. Then, a set of claims was identified for discussion between the researchers for joint value identification. In addition to the claims with total disagreement, other claims were included for discussion: the claims in which at least one researcher did not identified any value and the claims in which a value was

added. In total, 28 critical claims were discussed in the validation meeting. Finally, based on the rules developed in the discussion of critical claims, decisions were made on how to handle the claims with moderate agreement.

The validation meeting was a process of reflection and deliberation between the researchers based on their individual experience classifying the values. It should be noted that the experts also identified the values of reliability of information and national pride in two separate claims (Claim_346 and Claim_245, respectively) However, these were left out of the classification as they were not systematically applied. In addition, reliability is considered a dimension of the value of trust and its addition could be considered for future work. Table 9-6 presents the results of the individual deliberation of the critical claims and the values identified (or not) for each claim.

The deliberation process was guided by a recognition that there is overlap between the conceptions of values. They are related to each other. Therefore, the experts considered that there was not disagreement but different perceptions over the same claims. Claims have different levels and compositions, thus, different readers would focus on different aspects of the claim and interpret it differently. Based on this insight, it was decided to include all different positions regarding the values referred to the claims with moderate disagreement. Another aspect that was discussed is the fact that actors express in their claims a combination of their positions in life and their positions regarding the shale debate. They have intentions when making the claim and that can interfere with the values that were referenced in the claim.

Table 9-5. Coding process for classifying level of agreement between researchers

Code	# Claims	Description	Approach
A	67	Values were recognized and agreed upon by the three participants.	Keep All
A	97	Values were recognized and agreed upon by at least two participants.	Keep All
B	156	Even though one value was recognized only by one participant, the others were agreed upon by two or three participants.	Deliberation for rules
A	42	Each participant identified only one value, but there was not agreement regarding which one.	Deliberation for rules
B	131	Even though some values were recognized and agreed upon by two or three participants, there is more than one value only recognized by one.	Deliberation for rules
C	18	Even though some values were recognized and agreed upon between two participants, the third participant presented a very different selection.	Deliberation for rules
A	16	Total disagreement between the values identified by the participants.	Deliberation on values

As a rule for handling conflicting claims, it was decided that the claims that were criticizing the debate (or generating a debate of the debate) were unclear regarding to the value that was being referred to. Therefore, no value was attached to them. Additionally, due to the personal perspectives of the experts, the values of accountability and transparency are understood to have similar implications by them. Therefore, when both reviewers mentioned those values, both were taken into consideration. Moreover, the value of subsidiarity was understood to be related to giving local communities a voice to make decisions. Then, it was extended from discussions of the appropriate level from which to make decisions.

There was also a discussion related to traffic issues. It was concluded that these issues could be related to several values according to the context of the claim. First, matters of nuisance and accidents could be related to health and safety. Second, nuisance can also be related to aesthetics of the rural area due to the amount of trucks passing by. Third, accidents can also be related to

environmental friendliness due to possible air pollution or land contamination if chemicals are released. Finally, traffic can also be related to welfare if framed in terms of maintenance of the roads and its impact for other economic activities in the area. Conversely, relations to carbon footprint were also related to health and safety due to the potential health problems pollution can cause.

Cognitive limitations of researchers were also discussed. Sometimes, the length of some claims and the lack of context made difficult to identify values. The fact that it was a lengthy process also added room for avoiding a deep reflection on meanings of the value for each claim. Consequently, some attention bias could have influenced the results. The triangulation of sources or perspectives for the process of value identification provided addressed such issues to a certain degree. However, it is recognized that the individual interpretations and perspectives of the reviewers and their normative background composed this process.

Finally, even though nothing is assumed about the intentionality of the authors of the claims when expressing themselves, they are supporting the construction of the different frames of the debate. Some actors may use discursive strategies to avoid a direct participation in the debate on values, which increase the complexity and difficulty the process of value identification. This limitation is inherit to the analysis of the public debate, which can only be fully addressed by direct contact with the stakeholders. The latter is difficult for this research due to the amount of stakeholders and time constraints. Due to the polarized nature of the debate, it was considered that a wide variety of stakeholders should be contacted to clarify their positions, including the government officials. Therefore, it was decided not to include any interview as verification of values.

Table 9-6. Results of the deliberation of critical claims. Values highlighted in cyan were selected as expressed in the claim. The grey highlight implies that no value was related to the claim. Values are: Stability [ST], Resource durability [RS], Environmental friendliness [EF], Aesthetics [AE], Health and safety [HS], Ownership [O], Welfare [W], Accountability [AC], Transparency [T], Subsidiarity [SU], Distributive justice [DJ] and Procedural justice [PJ]. Letters in the cells refer to the name of the researcher who assigned them to the claim: Marloes [M], Udo [U] and María [J].

Claim	Code	Values												Deliberation comments
		ST	RD	EF	AE	HS	O	W	AC	T	SU	DJ	PJ	
Claim_99	A													Claim considered as prominently ambiguous. The intentions of the author were related to her views on gender equality and, as second level, some reference to values related to shale gas was done, but remained unclear. Therefore, no value was related to this claim. It was also considered, due to the ambiguity, that this claim did not added value to the debate as it did not introduced a new point of debate.
Claim_101	A					U		U	J	M			U	Values excluded based on not recognizing a clear link between the value and the claim. Recognition of overlap between values especially in the procedural ones.
Claim_122	A								U	M			J	Recognition of different layers for interpretation. All different interpretations are recognized as pointing out to different aspects of the claim.
Claim_127	A								U		M	J	J	Recognition of different layers for interpretation. Values excluded based on not recognizing a clear link between the value and the claim.
Claim_131	A			M		U			U	M			J	Values excluded based on not recognizing a clear link between the value and the claim. Recognition of overlap between values especially in the procedural ones.
Claim_198	A		J					M						Agreement that, even though the claim is unclear. The value being prominently related to in the claim is welfare due to the reference to material goods.
Claim_206	A								U	M			J	Different conceptions of accountability and transparency recognized by different reviewers with respect to the claim, agreement of accepting both interpretation when assigning values.
Claim_273	A					U			U	M			J	Recognition of different layers for interpretation. All different interpretations are recognized as pointing out to different aspects of the claim.
Claim_286	A													This claim was excluded due to its reference as a debate on the debate. Only an indirect reference to values that is not so clear.
Claim_289	A								U		J		M	Recognition of different layers for interpretation. All different interpretations are recognized as pointing out to different aspects of the claim.

Claim	Code	Values												Deliberation comments
		ST	RD	EF	AE	HS	O	W	AC	T	SU	DJ	PJ	
Claim_309	A													This claim was excluded. It only makes an indirect and unclear reference to the values in the debate.
Claim_346	A				U					M			J	Even though health and safety was not initially identified, it is added to this claim after a second revision. Aesthetics was excluded after a discussion of the different normative dimensions of traffic, which concluded in a need for more context to associate traffic to values different from health and safety. The value of trust here was also related to reliability. This additional dimension was not systematically explored in other claims but adds another perspective to the procedural claims to the debate.
Claim_394	A			U		J								Due to the discussion of the normative dimensions of traffic, this claim was also related to health and safety.
Claim_404	A								U		M		J	Recognition of different layers for interpretation. All different interpretations are recognized as pointing out to different aspects of the claim.
Claim_406	A								U		J		M	Recognition of different layers for interpretation. All different interpretations are recognized as pointing out to different aspects of the claim.
Claim_422	A			U				U	U	M			J	Recognition of different layers for interpretation. All different interpretations are recognized as pointing out to different aspects of the claim.
Claim_27	A												U, J	By focusing on the aspect of councillors' representativeness of their constituencies, it was agreed that this claim was referring to procedural justice.
Claim_47	A								U, J					By focusing on the aspect of "long established planning process as a justification of action, it was agreed that the value of accountability was being referred to.
Claim_56	A								U, J					By focusing on following the regulatory path as a justification of proper action, it was agreed that the value of accountability was being referred to.
Claim_158	A													This claim was excluded. It only makes an unclear reference to the values in the debate.
Claim_48	B								J		U		U, J	By focusing on the explicit reference to the position of local communities and the participation on the decision-making process, it was agreed that the values of subsidiarity and procedural justice were referred to.
Claim_245	B	U	U, J	U, J		J		U	U, J				M	Recognition of different layers for interpretation. All different interpretations are recognized as pointing out to different aspects of the claim. Additionally, the value of national pride was also recognized

Claim	Code	Values												Deliberation comments
		ST	RD	EF	AE	HS	O	W	AC	T	SU	DJ	PJ	
														as part of this claim.
Claim_294	B			U, J	U									This claim was excluded. It only makes an indirect and unclear reference to the values in the debate.
Claim_303	B			J					U, J					By focusing on the way the ministers were confronted by the available evidence and public opinion to justify their acts, it was agreed that the value of accountability was being referred to.
Claim_333	B				J	J				U, J				By focusing on the negative connotation that the way fracking is developed (number of wells and traffic), it was agreed that the value of aesthetics was being referred to.
Claim_497	B										M	M, J		By focusing of the aspects of sharing success and the importance that local people support the decisions on the technology, it was agreed that the values of subsidiarity and distributive justice were referred to.
Claim_518	B		U	U, J					U, J					By focusing on the connotations of dirty fossil fuels, wrong side of history and the Paris agreements, it was agreed that the values of resource durability, environmental friendliness and accountability were referred to.
Claim_455	C								U, J					By focusing on the direct reference for the councillors to account for the recommendations of the planning inspectors, it was agreed that the value of accountability was being referred to.

In order to finish the validation process, the main researcher used the agreements reached during the joint deliberation to refine the value identification. Therefore, all values identified were included in the analysis to account for the variety of perspectives. In addition, it was deemed necessary to track the direction of the relationship between claims and values, in line with the previous step. Therefore, when performing the refinement of the value identification process, the researcher focused on whether the claims and values had a positive or negative relation. This classification was based on how the stakeholder presented their perception on values. This means, on whether the value was being enhanced or being threatened by either the development of shale gas or the occurrences surrounding the procedures and institutions of the decision-making process.

To conclude, this appendix presented the process and choices made during the identification and validation of the values expressed in the claims. Due to the extension of the data input, this process is subject to cognitive and attention bias. However, it is expected that the triangulation of perspectives would provide a better ground to the results of this process.

APPENDIX C. COMPLEMENT OF THE DATA PREPARATION FOR VISUALIZATION

The use of several tools for analysis requires the researcher to adapt the outcomes from one program to be used as input for another. This process needed to be systematic to decrease the chance of adding errors to the data. It also proved to be a good opportunity to perform data verification. This appendix is focused on presenting the tools used to organize the data in a central file to be used as base for the rest of the analysis.

Gephi is a useful tool to visualize large amounts of data. However, it has specific requirements regarding the data to be used as input for analysis. It requires two datasets as input. On one hand, it requires a dataset containing the information of the nodes of the network. It is recommended to have a short name for the nodes, so the names can be easily added to the visualization. Additionally, other columns can be added to account for classifications of the nodes. This information is relevant for the filters used to select the data to be included on each graph and to facilitate the differentiation between nodes in terms of colours. On the other hand, it requires a dataset containing the information of the edges of the networks. The edges represent the relationships between the different codes. Other columns can also be added to facilitate filtering and presentation. The names of the codes used in the edges must correspond with the ones used in the nodes dataset. The edges dataset requires the explicit identification of a source and a target to clarify the direction of the relations between the codes.

Due to the specifications of the inputs for Gephi, the researcher is required to transform its initial data to fit these requirements. For this research, this process was done in two phases. In first place, the data collected using atlas.ti was exported as a code network. This file contained, among others, information about all the codes generated in the program and all the relationships that were set between the codes during the coding. Later on, the data needed was extracted from this file and then transformed in excel until it fitted Gephi's requirements. This process was verified by contrasting the information on the excel file with the one in atlas.ti. Moreover, during this process, some mistakes were identified in the coding, which implied going back to the articles to clarify information. Nevertheless, this additional step improved the quality of the data used for analysis. As the value coding was performed using an excel file, it followed a different procedure. It was necessary to develop a program that executed this transformation to be time efficient and minimize errors.

Handling large amounts of data is common in social network analysis. During the course of this research, the researcher learnt to use several tools supporting the execution of qualitative analysis. Nevertheless, Dr. Wouter Spekkink, who is an expert in data analysis, supported her during this part of the research. Besides giving general advices, he developed the programs presented in section C1 and C2 to facilitate the transformation of raw data into a proper inputs for Gephi. The code presented in section C1 aimed at allowing the assignment of several time stamps to the codes being repeated over time (subjects and actors). It took as input the initial edges dataset. The code presented in section C2 had two objectives. On one hand, to transform the identified values into nodes. On the other, to generate relationships between claims and values that could be used as edges. It used the outcome of the value identification process as input.

C.1 Program used to attach a timestamp to the nodes so they can be included in Gephi's dynamic analysis

```
# The input file for the script is an edge list with 5 columns, with the timestamp in the fifth column.
# The time stamp has the following format: "yyyy-mm"
# The names of the entities (i.e., About, Claim, Actor, Event, Report) are in the first column.
# The first column is sorted in a way that ensures that the all edges belong to the same source
entity are all grouped together (e.g., alphabetically sorted on the first column).
SolveTimeStamp <- function(data) {
```

```
                                # We first make a matrix to store our results in. Could have been a table
as well, I guess.
   results <- matrix(nrow = length(unique(data[,1])), ncol = 2)
                                # We need to make a separate iterator for iterating through the results list.
                                # This iterator will be incremented manually.
   iterator <- 1
                                # We go through the entire list of our source data.
   for (i in 1:nrow(data)) {
                                # The first entry of the data is a special case, so we treat it separately to
prevent errors.
      if (i == 1) {
                                # First we assign the entity label to the first column of the results matrix.
         results[iterator, 1] <- data[i, 1]
                                # Then check what kind of timestamp we should put in the second column
of the results matrix.
                                # We use the substring function to check which month the original
timestamp refers to.
                                # The end date for the new timestamp will depend on the month (i.e., 30,
31 or 28 [for February]).
                                # This generates a lot of code, but the idea is very simple.
         if (substring(data[i, 5], first = 6, last = 7) == "01" || substring(data[i, 5], first = 6, last = 7) ==
"03" || substring(data[i, 5], first = 6, last = 7) == "05" || substring(data[i, 5], first = 6, last = 7) == "07"
|| substring(data[i, 5], first = 6, last = 7) == "08" || substring(data[i, 5], first = 6, last = 7) == "10" ||
substring(data[i, 5], first = 6, last = 7) == "12") {
            results[iterator, 2] <- paste("[",data[i, 5], "-01, ", data[i, 5], "-31]", sep="")
         } else if (substring(data[i, 5], first = 6, last = 7) == "04" || substring(data[i, 5], first = 6, last =
7) == "06" || substring(data[i, 5], first = 6, last = 7) == "09" || substring(data[i, 5], first = 6, last = 7) ==
"11") {
            results[iterator, 2] <- paste("[",data[i, 5], "-01, ", data[i, 5], "-30]", sep="")
         } else if (substring(data[i, 5], first = 6, last = 7) == "02") {
            results[iterator, 2] <- paste("[",data[i, 5], "-01, ", data[i, 5], "-28]", sep="")
         }
                                # Then we have all our other cases. These fall into two groups:
                                # One group concerns entities that we have not encountered before.
                                # We treat these similarly to the entity in the first row of the data file.
                                # A second group concerns entities that we have already encountered.
                                # In this case the timestamp needs to be appended, instead of newly
created.
      } else {
                                # For the first group.
         if (data[i, 1] != data[i-1, 1]) {
            iterator <- iterator + 1
            results[iterator, 1] <- data[i, 1]
            if (substring(data[i, 5], first = 6, last = 7) == "01" || substring(data[i, 5], first = 6, last = 7) ==
"03" || substring(data[i, 5], first = 6, last = 7) == "05" || substring(data[i, 5], first = 6, last = 7) == "07"
|| substring(data[i, 5], first = 6, last = 7) == "08" || substring(data[i, 5], first = 6, last = 7) == "10" ||
substring(data[i, 5], first = 6, last = 7) == "12") {
               results[iterator, 2] <- paste("[",data[i, 5], "-01, ", data[i, 5], "-31]", sep="")
            } else if (substring(data[i, 5], first = 6, last = 7) == "04" || substring(data[i, 5], first = 6, last
= 7) == "06" || substring(data[i, 5], first = 6, last = 7) == "09" || substring(data[i, 5], first = 6, last = 7)
== "11") {
               results[iterator, 2] <- paste("[",data[i, 5], "-01, ", data[i, 5], "-30]", sep="")
            } else if (substring(data[i, 5], first = 6, last = 7) == "02") {
               results[iterator, 2] <- paste("[",data[i, 5], "-01, ", data[i, 5], "-28]", sep="")
            }
```

```
                                # For the second group.
        } else {
            if (substring(data[i, 5], first = 6, last = 7) == "01" || substring(data[i, 5], first = 6, last = 7) ==
"03" || substring(data[i, 5], first = 6, last = 7) == "05" || substring(data[i, 5], first = 6, last = 7) == "07"
|| substring(data[i, 5], first = 6, last = 7) == "08" || substring(data[i, 5], first = 6, last = 7) == "10" ||
substring(data[i, 5], first = 6, last = 7) == "12") {
                results[iterator, 2] <- paste(results[iterator, 2], ", [",data[i, 5], "-01, ", data[i, 5], "-31]",
sep="")
            } else if (substring(data[i, 5], first = 6, last = 7)== "04" || substring(data[i, 5], first = 6, last =
7) == "06" || substring(data[i, 5], first = 6, last = 7) == "09" || substring(data[i, 5], first = 6, last = 7) ==
"11") {
                results[iterator, 2] <- paste(results[iterator, 2], ", [",data[i, 5], "-01, ", data[i, 5], "-30]",
sep="")
            } else if (substring(data[i, 5], first = 6, last = 7) == "02") {
                results[iterator, 2] <- paste(results[iterator, 2], ", [",data[i, 5], "-01, ", data[i, 5], "-28]",
sep="")
            }
        }
    }
  }
                                # Finally, we go through the matrix with results to finish the formatting of
the timestamps.
  for (i in 1:nrow(results)) {
    results[i, 2] <- paste("<", results[i, 2], ">", sep = "")
  }
                                # And we return the result.
  return(results)
}
```

C.2 Program used to transform the outputs of the value identification process into nodes and edges for Gephi

```
TransformCodes <- function(data) {
                                # We first make a list in which we store our edges temporarily.
  storage <- list()
                                # We also make an iteratore, which we use to iterate through our data
manually.
  iterator <- 1
                                # We need to go through the rows and the columns of the data file.
  for (i in 1:nrow(data)) {
    for (j in 1:ncol(data)) {
                                # We assume the following:
                                # 0 stands for a value with a negative direction.
                                # 1 stands for a neutral direction.
                                # 2 stands for a positive direction.
      if (!is.na(data[i, j]) && data[i, j] == 0) {
                                # If we encounter a 'hit', then we make an edge and store it in the list.
        storage[[iterator]] <- c(colnames(data)[j], rownames(data)[i], "ISNEGATIVEVALUEIN")
                                # And we increment the iterator by 1.
        iterator <- iterator + 1
      } else if (!is.na(data[i, j]) && data[i, j] == 1) {
        storage[[iterator]] <- c(colnames(data)[j], rownames(data)[i], "ISPOSITIVEVALUEIN")
        iterator <- iterator + 1
      } else if (!is.na(data[i, j]) && data[i, j] == 2) {
        storage[[iterator]] <- c(colnames(data)[j], rownames(data)[i], "ISNEUTRALVALUEIN")
```

```
            iterator <- iterator + 1
        }
      }
    }
                              # If the list is finished, we convert it into a data.frame.
    results <-do.call(rbind.data.frame, storage)
                              # Before we write the data.frame into and edge list, we assign appropriate
column names to it.
    colnames(results) <- c("Source", "Target", "Type_2")
    write.table(results, "Edges_Values-Claims.csv", sep = ';', row.names = F)
                              # We also want to write a nodes list, but this is quite simple.
                              # The nodes that we want are simply the column names of the data file.
    nodes <- colnames(data[,2:ncol(data)])
    type <- rep("Value", length(nodes))
    nodes <- as.data.frame(cbind(nodes, type))
    colnames(nodes) <- c("Id", "Type")
    write.table(nodes, "Nodes_Values-Claims.csv", sep = ';', row.names = F)
    cat("The nodes and edge list have been written to the disk.\n")
}
```

Gephi provides support for visualizing data using different layouts. Every layout allows organizing the data in such a way to highlight specific information or patterns. Gephi's installation includes a set of predefined layouts, which were used. However, an additional layout was used in this research: Event Graph Layout. This layout facilitates the creation of event graphs by organizing the events in an user-specified order (Spekkink, 2014). For this research, the order variable represents the order in which events occurred over time. The order was calculated based on the month and year in which the event occurred using the formula:

$$Order = year - base\ year + (month \times 0.083)$$

The base year is 2013, which is the initial year of the decision making process. The term 0.083 approximates the division 1/12, which is a proxy to the "location" of the month in the timeline.

This appendix presented some characteristics of Gephi and the additional activities that were necessary to transform the data resulting from the coding process into a proper input for further analysis. Learning these tools implied an additional time investment for the researcher, which was not properly accounted for during the research planning. Nevertheless, having the support of an expert proved valuable to identify and develop useful tools and to speed up the learning process.

APPENDIX D. FORMAL PROCEDURES FOR SHALE GAS EXTRACTION IN LANCASHIRE

Decision-making processes unfold as an interconnection of formal procedures and informal interactions between actors. To be able to analyse such dynamics, it is necessary to understand how the formal procedures surrounding the exploration of shale gas in the UK are designed and how they have been executed for the case of the development of shale gas in Lancashire. This appendix aims at providing a general overview of how these procedures have been executed for the project of shale gas extraction in Lancashire.

Based on the available documents regarding the execution of activities in the county's planning system, the list of formal procedures that were executed around the project for shale gas exploration in Lancashire by Cuadrilla is presented in

Table 9-7. The information presented here is complementary to the findings from the longitudinal analysis. They were used to make explicit the discussions occurring during the formal procedures. This information was used to complement the findings presented in chapter 4.

Table 9-7. Activities associated to formal procedures' execution for the shale gas exploration project in Lancashire

ID	Date	Activity	Code	Description	Actors involved	Input	Outcome	Sources
E1	2008	Cuadrilla is awarded with the Petroleum Exploration and Development Licence PEDL 165	Permit decision: positive	The 13th Licensing Round opened invitations for application on November 7, 2007. Applications were accepted until February 6th, 2008. Afterwards, the Secretary of State agreed to offer 93 PEDL on May 28th, 2008. Then, Cuadrilla's licence was granted in September, 2008.	Secretary of State for the Department of Business, Enterprise and Regulatory Reform, & Operators	Opening of applications for licensing	Licence granted	(Department Energy and Climate Change, 2008a, 2008
E2	Jul-Oct 2013	Cuadrilla: Stage Overview 1 - ERA	Public consultation	General consultation to provide views of Cuadrilla's exploration program and collect the public's views on environmental risks.	Cuadrilla, ARUP as consultancy, public and key stakeholders.	Decision to develop the sites	Consultation documents and outcomes: ERA	(ARUP, 2014a, 2014 2014c, 2014
E3	Nov-Dec 2013	Cuadrilla: Stage Overview 2 - ERA	Public consultation	General consultation to provide an update of the project and receive feedback from the initial Environmental Risk Assessment (ERA).	Cuadrilla, ARUP as consultancy, public and key stakeholders.	ERA initial consultation	Consultation documents and outcomes: ERA	(ARUP, 2014a, 2014 2014c, 2014
E4	Jan-Mar 2014	Cuadrilla: Stage Site Specific 1 - EIA	Public consultation	Site-specific consultation to introduce the proposed sites and plans for preparing the applications, including details of the Environmental Impact Assessment.	Cuadrilla, ARUP as consultancy, public and key stakeholders (see reports)	Identified need by MPA to develop EIA	EIA consultation & planning documents and outcomes	(ARUP, 2014a, 2014 2014c, 2014
E5	Apr-May 2014	Cuadrilla: Stage Site Specific 2 - EIA	Public consultation	Site-specific consultation to present an overview of the emerging findings of the EIA.	Cuadrilla, ARUP as consultancy, public and key stakeholders (see reports)	EIA initial consultation	EIA consultation & planning documents and outcomes	(ARUP, 2014a, 2014 2014c, 2014
E6	May 2014 - Present	Post-submission of planning applications	Public consultation	Execution of engagement activities with local communities to answer their questions about the projects and promote the results of the EIA.	Cuadrilla, Public and Key stakeholders	Submission of planning application	Outcome of planning application & appeal	(ARUP, 2014a)

ID	Date	Activity	Code	Description	Actors involved	Input	Outcome	Sources
E7	May-Jun 2014	Submission of planning applications to Lancashire council	Permit request: submit	Cuadrilla submitted planning applications to Lancashire County Council for its shale gas exploration plan. The application for Preston New Road was submitted on May 29th and for Roseacre Woods on June 16th. The Local Council validated them to start the formal consultation process.	Lancashire council & Cuadrilla	Preparation of planning documents	Submission of application and preparations for statutory consultation	(Cuadrilla, 2016b, 2016 Lancashire County Council, 2015d, 2015
E8	Jun-Sep 2014	First consultation for shale gas sites	Public consultation	Physical and online copies of the planning application documents were made available for the public to make their representations.	Lancashire County Council, NGOs, Cuadrilla, interest groups, public	Application documents publication	Representations submitted	(Lancashire County Council, 2014c, 2015 2015e)
E9	Sep 3, 2014	Development Control Committee Meeting 1	Meeting: Information	The Committee held its first meeting regarding the applications. They discussed how to handle the considerable amount of interest, visible in the several thousand representations received.	Lancashire council, Cuadrilla	Planning applications	To visit the site at Preston New Road.	(Lancashire County Council, 2014b)
E10	Sep 7, 2014	First agreement to delay decision	Permit Decision: delay	The county council agreed with Cuadrilla to delay considerations for application.	Lancashire council, Cuadrilla	Request from Planning Officers to Cuadrilla	Agreement to delay decision until Nov 2014.	(Lancashire Evening Pos 2014a)
E11	Nov 26, 2014	Second agreement to delay decision	Permit Decision: delay	The county council agreed with Cuadrilla to delay considerations for application.	Lancashire council, Cuadrilla	Request from Planning Officers to Cuadrilla	Agreement to delay decision until Jan 2015.	(Lancashire County Council, 2014d)
E12	Nov 6, 2014	Cabinet meeting	Meeting: Information	Dr Sakthi Karunanithi, Director of Public Health, presented a report setting out the potential health impacts both exploration sites in Lancashire.	Cabinet, Director of Public Health	Agreement with Public Health England about Health Impact Assessment on May 8	Advice: Risks can be mitigated by proper regulation	(Karunanithi, 2014; Lancashire County Council, 2014a)

ID	Date	Activity	Code	Description	Actors involved	Input	Outcome	Sources
E13	Dec 2014	Second public consultation of the Environmental Agency	Public consultation	The Environmental Agency started considerations of Cuadrilla's applications in June. The first round of consultation closed in August. The second round of consultation for relevant information before granting permits to Cuadrilla.	Environmental agency, Cuadrilla	Permit request by Cuadrilla	Public consultation before final decision.	(Lancashire Evening Pos 2014b)
E15	Jan 16, 2015	Environmental permits for PNR granted	Permit decision: positive	The Environmental Agency granted the environmental permits for the site in Preston New Road.	Environment agency, Cuadrilla	Permit request by Cuadrilla	Approval of permits	(Cuadrilla, 2016b)
E16	Jan 2015	Request from Cuadrilla to defer project decision	Permit request: delay	Cuadrilla request to add additional information for his planning applications in view of the negative advice given by the Planning Officers on the applications.	Cuadrilla, Lancashire council	Advice from Planning Officers	Official request	(Cuadrilla, 2015b)
E17	Jan 2015	Development Control Committee Meeting 2 and previous public hearings	Meeting: Delay	The Committee gathered in the City Hall to receive representations for the applications. In view of the submission of additional information by Cuadrilla on Jan 23 and its related deferral request, it decided to follow legal advice and grant the deferral.	Lancashire council, Cuadrilla, other stakeholders	Applications by Cuadrilla and official request	Deferral of applications' decision	(Lancashire County Council, 2015a; Lancashire Planning Officer, 2015
E18	Feb 6, 2015	Environmental permits for RW granted	Permit decision: positive	The Environmental Agency granted the environmental permits for the site in Roseacre Woods.	Environmental Agency, Cuadrilla	Permit request by Cuadrilla	Approval of permits	(Cuadrilla, 2016c)
E19	Mar-Apr 2015	Consultation of further information	Public consultation	Physical and online copies of the additional information documents were made available for the public to make their representations.	Lancashire council, Cuadrilla, other stakeholders	Further information by Cuadrilla	Representati ons submitted	(Lancashire County Council, 2015b)

ID	Date	Activity	Code	Description	Actors involved	Input	Outcome	Sources
E20	Apr 23, 2015	Fourth agreement to delay decision	Permit Decision: delay	Due to the amount of representations received based on the additional information consultation, the county council agreed with Cuadrilla to delay considerations for application.	Lancashire council, Cuadrilla	Deferral of applications' decision	Agreement to delay decision until June 30.	(Lancashire County Council, 2015c)
E21	June 23, 2015	Development Control Committee Meeting 3	Meeting: Delay	The Development Management Officer presented the details of the case to the Committee. In addition, representations from 23 individuals were also heard.	Lancashire council, development manager officer & representatives	Deferral of applications' decision	Continuation of the meeting the next day	(Developmer Control Committee, 2015; Lancashire Planning Officer, 2015
E22	June 24, 2015	Development Control Committee Meeting 4	Meeting: Delay	Debate on the application for Preston New Road. The refusal was discussed. However, as planning officers advised granting the permission, time was given for receiving legal advice on how to proceed.	Lancashire council, development manager officer & representatives	Meeting held on 23th of June	PNR application decision deferred to June 29.	(Developmer Control Committee, 2015)
E23	June 25, 2015	Development Control Committee Meeting 5	Meeting: Decision Permit decision: Negative	Discussion about the legal advice, which was made public for transparency. Debate on Roseacre Woods application to reach a decision.	Lancashire council, development manager officer & representatives	Meeting held on 24th of June	Application for Roseacre Woods was rejected.	(Developmer Control Committee, 2015)
E24	June 29, 2015	Development Control Committee Meeting 6	Meeting: Decision Permit decision: Negative	Discussion about the legal implications of rejecting the application for Preston New Road in opposition to the advice given by the planning officers.	Lancashire council, development manager officer & representatives	Meeting held on 25th of June	Application for Preston New Road was rejected.	(Developmer Control Committee, 2015)
E25	July 23, 2015	Cuadrilla decides to Appeal	Permit request: submit	Cuadrilla announced plans to appeal the refused planning permits for both sites in Lancashire.	Cuadrilla	Lancashire council decision	Cuadrilla decision	(Cuadrilla, 2015a)

ID	Date	Activity	Code	Description	Actors involved	Input	Outcome	Sources
E26	Sep 2015	Cuadrilla submitted Appeals	Permit request: submit	Cuadrilla submitted four Appeals to the Secretary of State against the decisions to refuse planning permission for both exploration sites.	Cuadrilla, Secretary of state, Lancashire council	Decision of appeal	Kick-start of the appeal process	(Lancashire County Council, 2016b)
E27	Nov 19, 2015	Appeal Pre-Inquiry meeting	Meeting: Decision	The purpose of the Pre-Inquiry Meeting (PIM) was to discuss the administrative arrangements for the Inquiry and not the merits of the case. The Inspector Wendy McKay) has been appointed by the Secretary of State to report to him with recommendations.	Lancashire County Council, Cuadrilla, Interest groups, Local councils, Environmental NGOs.	Decision of appealing by Cuadrilla & Decision by Secretary of communities to take the final decision	Logistics agreements and arrangements for inquiry	(Curtis, 2015
E28	Feb-Mar 2016	Inquiry	Public consultation	Process of 12 days for parties to present their evidences and statements.	Lancashire County Council, Cuadrilla, Interest groups, Local councils, Environmental NGOs.	Documents, statements, Proofs in hearings	Decision on appeal (pending)	(Palmer, 201

APPENDIX E. OVERVIEW OF TOPICS DISCUSSED IN THE DEBATE

Even though the rounds model does not focus on the content of the debate. During the data gathering process, some information was collected about the subjects of the claims to give an overview of the topics under debate. This appendix aims at presenting an overview of the topics discussed in the different rounds of the debate.

Figure 9-1 allows to compare the differences in the main topics discussed between rounds. Before the start of the decision-making process, the debate was focused on the technology, its impacts and benefits. In addition, there was a focus on the regulatory environment that should be developed to allow the safe development of the shale gas industry in the UK and the role of shale gas in UK's energy transition. During the first round of the process, Cuadrilla decided to prepare planning applications for shale gas development. It can be seen that the debate is predominantly centred on the technology. This fact is related to the uncertainty regarding the impacts and benefits, and the site selection. Moreover, the protest in Balcombe that forced Cuadrilla to abandon plans for a conventional oil well in the area brought the process of hydraulic fracturing to the public attention. The fears of the local communities on prospects of future fracking damaging the countryside started to be spread around the country. Once Cuadrilla submitted its applications, a period of delays of the decision-making process started. The applications gained a lot of attention, which translated in thousands of representations. Therefore, discussions on the decision-making process gained traction and the debate had a dual focus during the second round: the technology and the decision-making process.

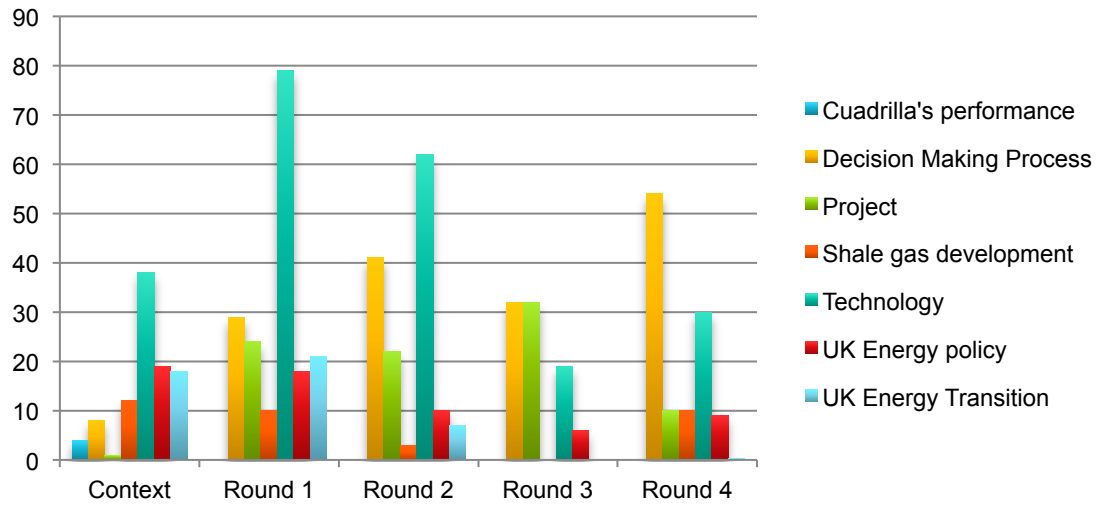

Figure 9-1. Distribution of topics per round of the decision-making process

Once the agreement on a second consultation period of the additional information started, the debate changed its focus in the third round. The long delay in the decision-making process -the decision was taken one year after submission- raised discussions about the capacity of the planning system to handle these applications, the national government's interference in the decision and the merits of the project itself. The switch on the debate from the technology to specifics of the project was triggered by the grounds for refusal given during the Planning Officers' advice in January. The project was contested for site-specific reasons and not technology related ones. Therefore, actors in the debate focused on magnifying their perspectives on those site-specific aspects to advance their positions in the debate. These aspects included traffic and noise. More

local actors joined as Cuadrilla's new traffic plans affected villages that were not actively engaged in the process before.

Finally, the Communities Secretary decided to get involved in the appeal decision and to make more changes to the planning system. Opponents of the technology perceived those changes as the national government's attempt to overrule local decision-making. Therefore, the focus of the debate was mainly given to the decision-making process. It can be noticed that these changes moved the debate from local to national level. In addition, the Oil and Gas Authority announced the results of the 14th licensing round, which included more areas of Lancashire and the UK. Therefore, discussions on the technology surged again in an attempt to get more clarity about its impacts and benefits given this new scenario.

As can be noticed, many regulatory changes were happening parallel to the decision-making process in Lancashire. These changes contributed to increase the level of controversy of the case as some actors perceived it as an attempt of technology pushing by the government. This fact is exemplified by the accusations made by Friends of the Earth of collusion in the Cabinet to ensure the development of the Shale Gas Industry. This increase of the controversy raised doubts about the proper timing and procedures to make amendments to the regulatory system during an active decision-making process. In the UK, the Cabinet is the highest decision-making body. Nevertheless, the legitimacy of the decisions made for the development of shale gas has been contested due to the open support of Cabinet members. This complexity of this situation favours the identified need of VSD for energy projects of extending the focus of the design process. Conflicts also arise when actors perceive that they cannot contribute to the design of the institutions surrounding the technology.

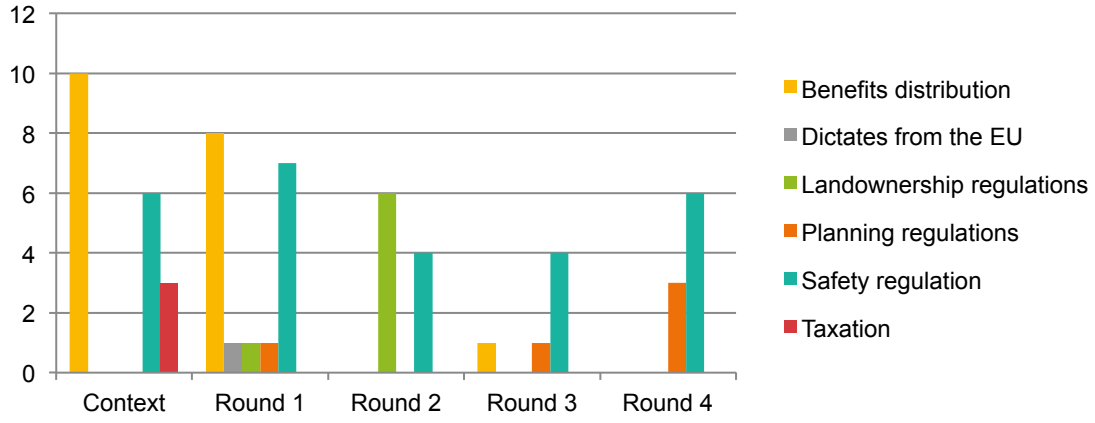

Figure 9-2. Aspects under discussion about the UK Energy Policy

As a mean to explore the topics discussed in relation to UK's energy policy, Figure 9-2 was generated. Several aspects can be noticed from this figure. First, concerns over safety regulations have been constant throughout the entire decision-making process. The predominance in the last rounds sparked by the proposals to allow fracking in environmentally sensitive areas. Second, financial policies related to taxation and benefit distribution dominated the beginning of the debate. They were central in the period between lifting the moratorium and submitting the planning applications. This reflects the importance given to providing the proper incentives for both companies and communities to support the execution of exploration activities in the UK. Third, land-ownership regulations were mainly discussed in the second round due to the proposal and enactment of the Infrastructure Bill. Changes in land-ownership regulations were triggered by Greenpeace's proposals to use ownership rights to block fracking. Finally, planning regulations were mainly discussed in the last rounds due to the changes performed in the planning system. It is worth noticing that in Round 1, the planning system was deemed as the valid guideline to assess the merits of the project and make decisions. Nevertheless, the proposed changes gave rise to doubts of the legitimacy of the new planning system to allow local communities to decide over

developments in their area. Conversely, the proposed changes were also praised as a needed renovation to reduce bottlenecks in a burdensome planning system.

The changes in topics give an indication of the motivations of actors to join the debate and the topics that are advocated in the different rounds of the debate. This appendix presented such insights as a way to complement the analysis presented in chapter 4 regarding the developments in the different rounds of the process.

APPENDIX F. COMPLEMENT OF THE DESCRIPTION OF THE ARENAS

The arenas represent the location in which different decisions are made along the rounds. The arenas can be said to represent rooms in which decision-makers meet regarding a specific issue. Sometimes the venue consists of one big table in which all actors exchange their ideas. In other occasions, they are composed by small set of tables in which actors interact with each other in smaller batches. Sometimes the space for decision-making changes with time, the room gets smaller or bigger in the changes of the rounds. In any case, the arenas represent spaces for actors to interact on decisions concerning a specific topic. This appendix aims at presenting the full description of the arenas identified for the project in Lancashire.

The identification of arenas was based on an analysis of the different actions and reports related to the decision-making process. Claims associated to those actions and reports were identified and their associated values were also related to the arenas in which they were discussed. The arenas are relevant for understanding the different spaces in which values are expressed. The transformation of the arenas is visible in the changes of topics during the different rounds and in the actors that participated in the process. Table 9-8 presents the full description of the arenas based on the analysis of the Lancashire project. The arenas have been classified by two grounds: Level and Type. First, their level refers to whether they were active at national or at local level. Second, the type is related to whether or not they were part of a formal procedure of decision-making. Additionally, the strategies and resources used by actors were included and a plus sign (+) was added to the dominant strategy.

The information presented in this appendix pretends to provided a broader overview of the dynamics in the different arenas to facilitate reader's understanding of the connection between the different concepts used.

Table 9-8. Full description of the arenas identified in each round of the debate

Round	Level	Type	Arena	Topics	Strategy	Actors involved	Actors interested	Related resources
Round 0	Local	Informal	Local meetings	- Anti-fracking campaign organization - Discussion on fracking's impacts on water quality	- Reciprocal intervention	- Frack Free Fylde - Residents Action on Fylde Fracking	- Local community inhabitants	Mobilizable units, Legitimacy, Relations
Round 0	Local	Informal	Open debate on shale gas impacts and benefits	- Safety measures for fracking - Fracking impacts on wildlife - Shale gas impacts - Transparency on reports about impacts - Benefits of shale gas development - Pros and cons of extracting shale gas	- Reciprocal intervention (+) - Unilateral intervention	- Cuadrilla - Residents Action on Fylde Fracking - Frack Free Fylde - Local community inhabitants - Ribble Estuary Against Fracking - Friends of the Earth - Institute of Directors - Diocese of Blackburn - Green party		Financial resources, Authority, Mobilizable units, Legitimacy
Round 0	Local	Formal	Planning applications for Lancashire project	- Decision to submit applications for shale gas extraction in Lancashire	- Unilateral intervention	- Cuadrilla	- Defend Lytham St Annes - Residents Action on Fylde Fracking	Financial resources, Authority, Mobilizable units
Round 0	National	Informal	Open debate on shale gas development in the UK	- Shale oil development - Cuadrilla's safety performance - Shale gas extraction in Lancashire - Cuadrilla's willingness to invest for shale gas development	- Unilateral intervention	- PwC - Cuadrilla - Royal Society for the Prevention of Accidents - Centrica - Chancellor of the Exchequer (Treasury) - Friends of the Earth	- General public	Information, Legitimacy, Financial resources, Authority

Round	Level	Type	Arena	Topics	Strategy	Actors involved	Actors interested	Related resources
Round 0	National	Formal	Shale gas financial policy making	- Shale gas taxation - Distribution of community benefits - Information about potential economic benefits	- Reciprocal intervention - Unilateral intervention (+)	- Chancellor of the Exchequer (Treasury) - Department for Energy and Climate Change - UK Onshore Oil and Gas Group - Cuadrilla - Deloitte	- Campaign to Protect Rural England - Greenpeace - Friends of the Earth - Parliament	Formal DM authority, Financial resources, Relations, Information , Legitimacy
Round 0	National	Formal	Shale gas planning policy making	- Changes in planning regulation (Fast-track)	- Reciprocal intervention - Unilateral intervention (+)	- Chancellor of the Exchequer (Treasury) - Department for Energy and Climate Change - UK Onshore Oil and Gas Group	- Friends of the Earth - Parliament	Formal DM authority
Round 0	National	Formal	Shale gas regulation policy making	- Lifting moratorium on shale gas extraction - Establishment of the regulator: Office for Unconventional Gas & Oil - Development of good practice guidelines - Shale gas carbon footprint - Environmental Agency permits - Community engagement guidelines	- Reciprocal intervention - Unilateral intervention (+) - Facilitating intervention	- Department for Energy and Climate Change - Office for Unconventional Gas & Oil - Parliament - UK Onshore Oil and Gas Group - Committee on Climate Change - Cuadrilla - IGas - Environmental agency - Friends of the Earth	- Frack Free Fylde - Greenpeace	Formal DM authority, Financial resources, Legitimacy - Authority
Round 0	National	Formal	Shale gas resource estimation	- Potential resources definition - Potential resources exploration	- Reciprocal intervention - Unilateral intervention (+)	- British Geological Survey - IGas - Cuadrilla	- Greenpeace	Information , Legitimacy

Round	Level	Type	Arena	Topics	Strategy	Actors involved	Actors interested	Related resources
Round 1	Local	Informal	Conferences	- Supply chain opportunities from fracking - Protesting against shale gas extraction	- Reciprocal intervention	- North West Energy Taskforce - Department for Energy and Climate Change - Green Party - IGas - Engineering firm Addison plc. - Frack Free Blackpool	- Local community inhabitants	Relations, Financial resources, information, Mobilizable units
Round 1	Local	Informal	Local meetings	- Anti-fracking campaign organization - Building support for fracking - Open community debate to get information - Information sharing about fracking - Protesting against shale gas extraction	- Reciprocal intervention	- Frack Free Freck - Cuadrilla - National Government - Local community inhabitants - Freckleton Parish Council - Roseacre Awareness Group - Residents Action on Fylde Fracking - Diocese of Blackburn - Frack Off Burnley - Socialist Party		Mobilizable units, Financial resources, Relations, Legitimacy
Round 1	Local	Informal	Open debate on shale gas impacts and benefits	- Building support for fracking - Fracking impacts on wildlife - Fracking implications for East Lancashire - Supply chain developments around fracking - Involvement with community projects - Spread information on impacts	- Reciprocal intervention - Unilateral intervention	- Prime Minister - Local community inhabitants - Royal Society for the Protection of the Birds - North East Lancashire Trade Union Council - Remsol - Ground Gas Solutions - Cuadrilla - Lowther Pavilion Theatre - East Lancashire Against Fracking		Legitimacy, Relations, Financial resources, Expertise, Information

Round	Level	Type	Arena	Topics	Strategy	Actors involved	Actors interested	Related resources
Round 1	Local	Formal	Planning applications for Lancashire project	- Appointment of company responsible for EIA execution - Public engagement activities related to ERA - Sites selection for application - Public engagement activities related to EIA - Protest to make visible fracking impacts (Drilling rig) - Polls' execution to gather public opinion - Definition of benefits for local communities from proposed project - Realization of a health impact assessment for both sites - Announcement of applications' submission	- Reciprocal intervention (+) - Unilateral intervention	- Cuadrilla - Arup - Greenpeace - Lancashire County Council	- East Lancashire Chamber of Commerce - Lancashire County Green councillor - Friends of the Earth - Federation of Small Businesses in Lancashire - Friends of the Earth	Formal DM authority, Financial resources, Information, Authority, Mobilizable units, Visual aids, Public opinion
Round 1	Local	Informal	Platform for business development around fracking	- Joining to capitalize opportunities from shale gas - Spreading the benefits of fracking for supply chain development	- Reciprocal intervention	- North West Energy Taskforce - Lytham Technology - North & Western Lancashire Chamber of Commerce - UK Onshore Operations Group - Ernst and Young - Department for Energy and Climate Change	- Greenpeace - Friends of the Earth	Relations, Financial resources, Information, Legitimacy
Round 1	Local	Formal	Preston City Council decision-making over fracking position	- Preston's council position development - Bid for Cuadrilla's HQ and cautionary acceptance of fracking	- Reciprocal intervention	- Preston's Environmental Scrutiny Panel - Preston City Council - Preston Parliament Member - Cuadrilla	- Ribble Estuary Against Fracking - Residents Action on Fylde Fracking - Friends of the Earth	Formal DM authority, Legitimacy, Relations

Round	Level	Type	Arena	Topics	Strategy	Actors involved	Actors interested	Related resources
Round 1	National	Informal	Open debate on shale gas development in the UK	- Relationship government-shale industry - Shale gas industry development	- Reciprocal intervention	- Official Opposition Shadow Cabinet - Frack Off - Prime Minister		Information, Legitimacy
Round 1	National	Formal	Shale gas financial policy-making	- Definition of benefits to local councils - Definition of benefits to local communities - Distribution of community benefits - Bribery of government and companies through compensation schemes	- Unilateral intervention - Reciprocal intervention (+)	- Prime Minister - Cuadrilla - Department for Energy and Climate Change - Parliament Members from Lancashire - Local politicians - Greenpeace	- Rossendale council	Formal DM authority, Legitimacy - Financial resources - Authority
Round 1	National	Formal	Shale gas land ownership policy making	- Actions to block fracking without land-owners consent - Changes in land ownership regulations for allowing fracking - Voluntary payments for land access - Economic impacts of fracking information	- Unilateral intervention (+) - Reciprocal intervention	- Greenpeace - Local community inhabitants - Cuadrilla - Department for Energy and Climate Change - House of the Lords Economic Affairs Committee - National government		Formal DM authority, Mobilizable units, Information, Legitimacy, Relations
Round 1	National	Formal	Shale gas planning policy making	- Changes in planning regime	- Unilateral intervention	- Department for Communities and Local Government - Parliament - Department for Energy and Climate Change	- Friends of the Earth - Defend Lytham St Annes	Formal DM authority

Round	Level	Type	Arena	Topics	Strategy	Actors involved	Actors interested	Related resources
Round 1	National	Formal	Shale gas regulation policy making	- Fracking health impacts definition - Environmental permits for waste management - New regulatory map for fracking and Environmental Impact Assessment - Relationship government-shale industry - Stricter regulatory control for fracking - Economic impacts of fracking information	- Unilateral intervention - Reciprocal intervention	- Public Health England - Department for Energy and Climate Change - Environmental Agency - House of the Lords Economic Affairs Committee - Chartered Institution of Water and Environmental Management - Cuadrilla - Greenpeace - Campaign to Protect Rural England	- Friends of the Earth - Royal Society for the Protection of Birds - UK Onshore Operators Group - Centrica	Formal DM authority, Information , Relations, Legitimacy, Legal aids
Round 2	Local	Informal	Conferences	- Information on benefits for Fylde coast - Information on benefits for local communities	- Reciprocal intervention	- North West Energy Taskforce - Local businesses - Federation of Small Businesses in Lancashire - Local community inhabitants		Information , Relations, Financial resources
Round 2	Local	Informal	Local meetings	- Anti-fracking campaign organization	- Reciprocal intervention	- Preston New Road Action Group	- Local community inhabitants	Mobilizable units
Round 2	Local	Informal	Open debate on shale gas impacts and benefits	- Economic impacts information - Perceived risks on fracking - Increase awareness on fracking - Creation of local college focused on oil and gas industry's needed skills - Policy paper for fracking support	- Reciprocal intervention	- AMION consulting - iGas Energy plc - Peel Environmental Ltd - European Parliament Member - Keep East Lancashire Frack Free - Blackpool and the Fylde College - Department for Energy and Climate Change - Department for Business, Innovation and Skills - Onshore oil and gas industry		Information , Financial resources, Mobilizable units, Visual aids, Relations

Round	Level	Type	Arena	Topics	Strategy	Actors involved	Actors interested	Related resources
						- Cuadrilla - Friends of the Earth - North West Energy Taskforce		
Round 2	Local	Formal	Planning applications for Lancashire project	- Submission of planning applications for the project - Execution of protests against the projects targeted at Local Councils and Cuadrilla's proposed sites - Community engagement activities after submission - Promotion of EIA results of the projects - Legal actions for blockage of protests in farmers' land - Council's preparation for decision-making - Formal public consultation period of the projects - First agreement for delay of decision-making - Local Councils decide their position towards	- Unilateral intervention - Reciprocal intervention (+)	- Lancashire County Council - Cuadrilla - Keep East Lancashire Frack Free - Local community inhabitants - Greenpeace - Gayzer Frackman - Reclaim the power camp - Local farmers - Fylde Council - Media - Friends of the Earth - Public Health England - Environmental Agency - Lancashire Planning Officers - Development Control Committee - Fylde Parliament Member - Green Party - North West Energy Task Force	- Defend Lytham St Annes - UK Onshore Oil and Gas Group	Formal DM authority, Mobilizable units, Authority, Financial resources, Relations, Public opinion, Legal aids, Information, Legitimacy

Round	Level	Type	Arena	Topics	Strategy	Actors involved	Actors interested	Related resources
				project - Second agreement for delay of decision-making - Health impact assessment for sites - Formal consultation on environmental permits - Decision on environmental permits - Planning officers give their advice: rejection - Request of a third delay of the decision to submit additional information - Third agreement for delay of decision-making - Local businesses try to put pressure on Council to grant permission - Anti-fracking campaigners try to gather support from Council's leader - Meeting for information sharing about fracking before Council's decision-making meeting		- Local businesses - North & Western Lancashire Chamber of Commerce - Frack Free Lancashire - Lancashire County Council Leader		
Round 2	Local	Informal	Platform for business development around fracking	- Online supply chain portal	- Reciprocal intervention	- Cuadrilla - North & Western Lancashire Chamber of Commerce - East Lancashire Chamber of Commerce - Local Businesses - TUTIS Concepts		Relations, Financial resources
Round 2	Local	Formal	Shale gas planning policy making	- Supplementary planning document as advice for developers	- Reciprocal intervention	- Lancashire County Council - Blackpool Council - Blackburn with Darwin		Formal DM authority

Round	Level	Type	Arena	Topics	Strategy	Actors involved	Actors interested	Related resources
						Borough Council		
Round 2	National	Informal	Impacts on Rural Economy Report publication	- Release of report with omitted sections - Pressure for release of full report - Execution of protest for government to release full report	- Reciprocal intervention	- Department for Environment, Food and Rural Affairs - Reclaim the power camp - No dash for gas - Anti-fracking groups - Brighton Pavilion Parliament Member - Roseacre Awareness Group	- Prime Minister - Chancellor of the Exchequer	Authority, Information, Mobilizable units, Legitimacy
Round 2	National	Informal	Open debate on shale gas development in the UK	- Protest letter urging to stop fracking - Relationship government-shale industry - Impacts on household insurance - Rejection of another application - Lack of Prime Minister's responsiveness to communities - Increase information base for general public's understanding of fracking - Walking protest against fracking	- Reciprocal intervention (+) - Unilateral interventions	- Greenpeace - Local community inhabitants - Anti-fracking groups - Liverpool Victoria Insurance - UK Insurers - South Downs National Park - Friends of the Earth - Residents Action on Fylde Fracking - Gayzer Frackman - Cuadrilla - Centrica - Total - GDF Suez - Task Force on Shale Gas	- Prime Minister - British Geological Survey	Mobilizable units, Legitimacy, Information, Legal aids, Authority, Financial resources, Relations

Round	Level	Type	Arena	Topics	Strategy	Actors involved	Actors interested	Related resources
Round 2	National	Formal	Shale gas financial policy making	- Proposal on local communities compensation - Sovereign wealth fund for the North of England proposal and creation	- Unilateral intervention (+) - Reciprocal intervention	- Chancellor of the Exchequer - Ineos	- Friends of the Earth	Formal DM authority, Financial resources, Authority
Round 2	National	Formal	Shale gas land ownership policy making	- Changes in law: Infrastructure Bill - Execution of protests due to Infrastructure Bill's proposals on land ownership rights - Putting pressure on MPs for them to oppose to Infrastructure Bill - Amendments to Infrastructure Bill	- Unilateral intervention - Reciprocal intervention	- Chancellor of the Exchequer - Department for Energy and Climate Change - National government - Blackburn Parliament Member - Greenpeace - House of the Lords - Parliament Members	- Local community inhabitants - East Lancashire Against Fracking - Residents Action on Fylde Fracking	Formal DM authority, Mobilizable units, Legitimacy
Round 2	National	Formal	Shale gas regulation policy making	- Proposal for moratorium from local Council - Call on fracking ban in parliament - Information on environmental risks from Parliament committee - Negotiation to close loopholes in regulation - Restrictions for environmentally sensitive areas - Publication of health impacts of fracking - Expansion of monitoring system - Tougher regulations for fracking - Government's plans for	- Unilateral intervention (+) - Reciprocal intervention	- Department for Energy and Climate Change - Prime Minister - Chancellor of the Exchequer - Cabinet - Labour party - Meriden Parliament Member - Environmental Audit Committee - Official Opposition Shadow Cabinet - Brighton Pavilion Parliament Member - Fylde Borough Council - British Geological Survey - Public Health England - Chartered Institute of Environmental Health	- UK Onshore Oil and Gas Group - Cuadrilla - Roseacre Awareness Group - Keep East Lancashire Frack Free - Lancashire County Green councillor	Formal DM authority, Financial resources, Information , Legitimacy

Round	Level	Type	Arena	Topics	Strategy	Actors involved	Actors interested	Related resources
				shale gas industry development - Relationship government-shale industry		- Greenpeace - Friends of the Earth		
Round 2	National	Formal	Shale gas resource estimation	- New licensing round - Clarification of financial availability for exploration in spite of gas prices	- Unilateral intervention	- Oil and Gas Authority (DECC) - Burnley Parliament Member - Cuadrilla	- Keep East Lancashire Frack Free - Lancashire County Green councillor	Formal DM authority, Financial resources
Round 3	Local	Informal	Open debate on shale gas impacts and benefits	- Location of fracking supporters belonging to the North West Energy Taskforce - Impact on property prices	- Reciprocal intervention	- Greenpeace - JLL property consultants - North West Energy Taskforce - Frack Free Lancashire		Information, Financial resources
Round 3	Local	Formal	Planning applications for Lancashire project	- Definition of the new decision-making date after third delay agreement - Decision on environmental permits - Local meeting to discuss Cuadrilla's new traffic plans in Woodplumpton - Formal public consultation on additional information - Fourth agreement for delay of decision-making - Decision to oppose Cuadrilla's new traffic plans by Broughton inhabitants - Open petition against fracking in Lancashire to submit in public consultation	- Reciprocal intervention (+) - Unilateral intervention	- Lancashire County Council - Cuadrilla - Environmental Agency - Woodplumpton Parish Council - Local community inhabitants - Greenpeace - Broughton inhabitants - 38 Degrees - Lancashire Planning Officers - Development Control Committee - East Lancashire Chamber of Commerce - Inspired Energy - Legal experts - Friends of the Earth - Brighton Pavilion Parliament Member - North West Energy	- UK Energy Research Centre - North & Western Lancashire Chamber of Commerce - Fylde Council - Bianca Jagger Human Rights Foundation - Green Party - Breitling Energy Corporation - IGas - UK Onshore Oil and Gas Group - University of Glasgow - Department for Energy and Climate Change - British Chambers of Commerce	Formal DM authority, Mobilizable units, Authority, Legitimacy, Information, Financial resources, Relations

Round	Level	Type	Arena	Topics	Strategy	Actors involved	Actors interested	Related resources
				- External advice from New York officials for Lancashire County Councillors - Planning officers give their advice: rejection RW and approval PNR - Formal decision-making meeting by Lancashire County Council - Representation of the public's perspective during the formal meeting - Execution of protests against fracking outside of formal meeting's location - Legal advice influence the decision-making process, fifth delay for Preston New Road - Decision to reject application for Roseacre Woods - Decision to reject application for Preston New Road		Taskforce - Local businesses - Institute of Directors - Number One St Luke's Hotel - Union Unite - Frack Free Lancashire - Elected Officials of Protect New York - Lancashire County Independent councillor - West Lancashire County councillor - Preston New Road Action Group - Roseacre Awareness Group	- University of Sussex	
Round 3	Local	Informal	Platform for business development around fracking	- Developments of supply chain around fracking	- Unilateral intervention	- Peel Gas and Oil - North West Energy Task Force		Financial resources, Relations
Round 3	National	Informal	Open debate on shale gas development in the UK	- Public opinion on shale gas - Health impacts of fracking - Re-election of David Cameron as Prime	- Unilateral intervention - Reciprocal intervention (+)	- Usurv.com - UK Onshore Energy Services Group - Medact - Department for Energy and Climate Change		Public opinion, Information, Legitimacy, Authority

Round	Level	Type	Arena	Topics	Strategy	Actors involved	Actors interested	Related resources
				Minister - Impact on property prices		- Mike Hill - Prime Minister - Parliament - General public - Research agency Redshifft - Greenpeace		
Round 3	National	Informal	Impacts on Rural Economy Report publication	- Pressure to release of DEFRA's report	- Unilateral intervention	- Greenpeace - UK Transparency watchdog	- Department for Environment, Food and Rural affairs	Legal aids, Information
Round 3	National	Informal	Shale gas regulation policy making	- Joint charter creation focusing on safety, skills and supply chain developments - Relationship government-shale industry	- Facilitating intervention - Reciprocal intervention	- UK Onshore Oil and Gas Group - GMB union - Greenpeace - Media	- Local community inhabitants	Financial resources, Mobilizable units, Expertise, Information , Relations
Round 4	Local	Informal	Local meetings	- Anti-fracking campaign organization	- Reciprocal intervention	- Frack Free Chorley and South Ribble		Mobilizable units
Round 4	Local	Informal	Open debate on shale gas impacts and benefits	- Contestation of affiliations of local businesses to pro-fracking cause - Information sharing about government's support for fracking - Vigil to support fracking in Lancashire	- Reciprocal intervention	- Frack Free Lancashire - North West Energy Taskforce - Local businesses - Friends of the Earth - Backing Fracking - Blackpool Fracking for a Better Future - Local community - Campaigner Stephen Tindale (Climate Answers)		Information , Mobilizable units
Round 4	Local	Formal	Preston City Council decision-making over fracking position	- Decision to oppose to fracking in Preston	- Unilateral intervention	- Preston Council		Authority

Round	Level	Type	Arena	Topics	Strategy	Actors involved	Actors interested	Related resources
Round 4	Local	Formal	Planning applications for Lancashire project	- Decision to submit appeals for applications on both sites - Submission of appeals to Secretary of State	- Unilateral intervention	- Cuadrilla - Lancashire County Council	- North & Western Lancashire Chamber of Commerce - North West Energy Task Force - Onshore Energy Services Group - Friends of the Earth - Roseacre Awareness Group - Preston New Road Action Group	Authority, financial resources
Round 4	Local	Informal	Platform for business development around fracking	- Cuadrilla announces moving its national headquarters to Lancashire - Cuadrilla confirms support for Lancashire's regional development by moving its headquarters	- Reciprocal intervention	- Cuadrilla	- North & Western Lancashire Chamber of Commerce	Financial resources, Relations

Round	Level	Type	Arena	Topics	Strategy	Actors involved	Actors interested	Related resources
Round 4	National	Formal	Appeal process for planning applications	- National government decides to take in final decision on appeal - Meeting for pre-inquiry arrangements - Lancashire council express their position to Communities' Secretary - Start of inquiry process - Demonstration of support for fracking outside the inquiry location - Demonstration of opposition to fracking outside the inquiry location - Representation on how is the life under the threat of fracking next to inquiry location - Public support for local decision-making - Execution of protest outside Parliament for decision-making level change	- Unilateral intervention - Facilitating intervention - Reciprocal intervention (+)	- Department for Communities and Local Government - Cuadrilla - Planning inspector - Lancashire County Council - Arup - North & Western Lancashire Chamber of Commerce - Friends of the Earth - Roseacre Awareness Group - Preston New Road Action Group - Westby-with-Plumptons Parish Council - Newton-with-Clifton Parish Council - Treales, Roseacre and Wharles Parish Council - Chartered Member of the Landscape Institute - Greenpeace - Friends of the Earth - Fracking supporters - Frack Free Lancashire - Keep East Lancashire Frack Free	- Fylde Parliament Member - Official Opposition Shadow Cabinet - Local community inhabitants - General public - Parliament - Nanas protest group	Formal DM authority, Relations, Expertise, Information, Mobilizable units, Visual aids, Public opinion, Financial resources
Round 4	National	Informal	Impacts on Rural Economy Report publication	- Government releases complete version of DEFRA's report	- Reciprocal intervention	- Department for Environment, Food and Rural Affairs	- Brighton Pavilion Parliament Member	Information

Round	Level	Type	Arena	Topics	Strategy	Actors involved	Actors interested	Related resources
Round 4	National	Informal	Open debate on shale gas development in the UK	- Promotion of shale gas benefits - Fracking health and environmental impacts - Public opinion on shale gas - Energy minister's visit to methane coalbed site to make comparisons with shale gas' potential ones - Possible delay of fracking development in UK due to appeal process - Pressure for Government to stop supporting fracking - Role of shale gas in UK's future - Celebrity urges Prime Minister to stop support for fracking - Transparency of Friends of The Earth - Traffic related-environmental impacts of fracking	- Unilateral intervention - Reciprocal intervention	- Ineos - Task Force on Shale Gas - Department for Energy and Climate Change - Media - Green Party - Greenpeace - University of Nottingham - UK Onshore Oil and Gas Group - Gayzer Frackman - Friends of the Earth - Mark Ruffalo - Cuadrilla - Charities regulator - Roseacre Awareness Group - Prime Minister		Formal DM authority, Financial resources, Information , Public opinion, Relations, Expertise

Round	Level	Type	Arena	Topics	Strategy	Actors involved	Actors interested	Related resources
Round 4	National	Formal	Shale gas planning policy making	- Government's plans for ensuring shale gas industry development - Changes in planning regime: fast-track to central government allowed -Permitted development rights expectation to facilitate exploration - Changes in legislation regarding environmentally sensitive sites - Consultation on licenses in more environmentally sensitive areas - Decision to reject fracking in Sites of Special Scientific Interest	- Unilateral intervention - Reciprocal intervention	- National government - Department for Communities and Local Government - Department for Energy and Climate change - Department for Environment, Food and Rural Affairs - Chancellor of the Exchequer - Parliament - UK Onshore Oil and Gas Group - Cuadrilla	- Local business Eagle and Child Inn - Friends of the Earth - Local community inhabitants - Lancashire County Council - Campaign to Protect Rural England - Official Opposition Shadow Cabinet - Brighton Pavilion Parliament Member - Keep East Lancashire Frack Free - Royal Society for the Protection of Birds - Greenpeace Roseacre Awareness Group	Formal DM authority, Relations
Round 4	National	Formal	Shale gas resource estimation	- First results of 14th licensing round - North-South divide in licensing - More licenses granted	- Unilateral intervention (+) - Reciprocal intervention	- Oil and Gas Authority - Shale gas industry - Department for Energy and Climate change - UK Onshore Oil and Gas Group	- Lancashire County Council - Local community inhabitants - Greenpeace - Friends of the Earth	Formal DM authority, Legitimacy

APPENDIX G. STAKEHOLDER ANALYSIS

The public debate is an open space for all actors to include their views regarding the decision-making process in curse. During the analysis in curse, several actors were identified through their participation in the decision making process. In order to gather insight into their position towards the project it was necessary to make a deeper analysis. This appendix presents the results of this process.

Actors in the shale gas debate were divided into several categories depending on their intrinsic characteristics. In addition, based on the value identification process, the main values expressed by each group of actors was identified. Moreover, actors join the debate motivated by their values and/or long-term objectives. They can perceive fracking to either support or block the attachment of their objectives. Therefore, they develop interests regarding the project that, in turn, also influence their actions and claims. Table 9-9 presents the result of the stakeholder analysis of the actors.

It can be noted that this analysis only presents a perspective on the perspectives of the actors regarding the development of the exploration project by Cuadrilla. The fact that they have interests or resources does not imply that they would use it or that they would join the debate. At the same time, the fact that they focus on the expression of some values does not imply that these are their core values. This research does not make any assumption regarding that but embraces that it is necessary to provide a complete perspective of the actor's stakes in the decision-making process.

In addition, it can be notices that several actors have relations as a resource that can be used. Part of the public debate was focusing on contesting the transparency of actors based on the discovery of these relations. In this research that was made explicit with the listings of the coordinated communities. It is advised that the stakeholder analysis is extended to the relations between actors for the case of Value Sensitive Design of Energy Projects. This perspective would open up the debate regarding which are normal working relations between the parties and which ones are not legitimate. Nevertheless, as relations are a resource, they are prone to strategic behaviour of actors. Therefore, their management remains a challenge for the kind of deliberations that are desired in the design process of VSD.

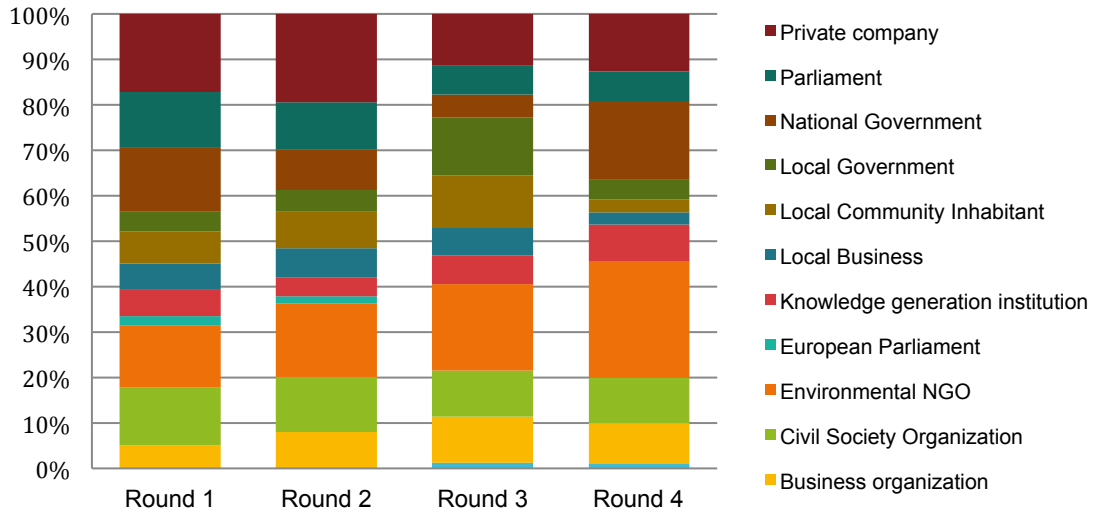

Figure 9-3. Changes in actor composition among the rounds

Additionally, Figure 9-3 present the distribution of actors' participation in the debate in the different rounds of the decision-making process. It can be notices that there is a switch on the actors leading

the debate during the different rounds. First, one of the most significant changes is associated to the environmental NGOs, which have gained space on the debate with the passing on the rounds up to the point of being the most influential actor in the last round. Second, the participation of the national government varied between the rounds. It started with a significant participation in the first round, which decreased to its lowest point during the third round. The significant participation in the last round it came after a change of the rules triggered by Cuadrilla's appeal decision. Third, the participation of local actors increased from the first round, towards a significant contribution in the third round. This finding is aligned with the characteristics of the third round as it was focused on site-specific issues of the projects. However, during the last round their participation is minimal. This change reflects the change of the decision-making process on Cuadrilla's application from a local to a national venue. Finally, the participation of private companies also varied in time. During the first two rounds, they were significant actors in the debate, which changed in the third round. Nevertheless, with the appeal process, their participation level increased again. This participation is also associated to the announcement of the 14th Licensing round.

To conclude, this appendix presented a short discussion on actors and their characteristics. The table introduced more information about the actors that can provide insights into their actions in the debate. Moreover, the perspectives regarding actors' participation in time allowed gaining insights on how the events occurring in the decision-making process affected the level of participation of actors in the debate.

Table 9-9. Stakeholder analysis of the actors participating in the debate

Actor Type	Main values per type	Actors	Interest	Desired situation/ Objective	Resources
Business Organization	Welfare, Accountability and Procedural justice	British Chambers of Commerce	- Capitalize the economic boost and energy possibilities from shale gas	- Increase the competitiveness of UK businesses (BCC, 2016)	Financial resources, relations
		Chemical Industries Association	- Development of indigenous sources of energy	- Increase the competitiveness and growth prospects of UK's chemical sector (CIA, 2016)	Relations
		EEF North West	- Cheap energy from shale gas	- Develop the UK manufacturing sector (EEF, 2016)	Relations, information, expertise
		Federation of Small Businesses in Lancashire	- Capitalize the potential investment and employment opportunities related to the shale gas industry	- Boost regional economic development (FSB, 2016)	Relations, financial resources, information
		Institute of Directors	- Capitalize the potential investment and employment opportunities related to the shale gas industry	- Protect and enhance the development of the business in the UK (IoD, 2016)	Financial resources, relations, legitimacy
		Lancashire Enterprise Partnership	- Capitalize the potential investment and employment opportunities related to the shale gas industry	- Boost Lancashire's economic growth and job creation (LEP, 2016)	Relations
		North West Energy Task Force	- Kick-start shale gas extraction	- Responsible development of shale gas industry driving regional development (NWETF, 2016)	Relations, Legitimacy, financial resources, information

Actor Type	Main values per type	Actors	Interest	Desired situation/ Objective	Resources
		East Lancashire Chamber of Commerce	- Create and seize opportunities for Lancashire's businesses to capitalize the shale gas industry development	- Support Lancashire's economic development (East Lancashire Chamber of Commerce, 2016)	Legitimacy, mobilizable units, relations, financial resources, authority
		North & Western Lancashire Chamber of Commerce	- Create and seize opportunities for Lancashire's businesses to capitalize the shale gas industry development	- Support Lancashire's economic development (NWLCC, 2016)	Relations, Legitimacy, financial resources, mobilizable units
		Onshore Energy Services Group	- Kick-start shale gas extraction	- Ensure that UK's SMEs can capitalize opportunities from shale gas development (OESG, 2016)	Relations
		Stay Blackpool	- Capitalize the potential employment opportunities from the shale gas industry	- Development of the Hospitality sector in Lancashire (StayBlackpool, 2016)	Relations
		United Kingdom Onshore Oil and Gas Group	- Kick-start shale gas extraction	- Development of the onshore oil and gas industry in the UK (UKOOG, 2016)	Legitimacy, relations, financial resources, information, public opinion
Civil Society Organization	Accountability, Health and safety, Procedural justice, Environmental friendliness and	Local fracking supporters' campaigners. Directly participated in the debate: Backing Fracking and Blackpool Fracking for a Better Future.	- Capitalize the economic benefits for the community	- Long-term welfare of Lancashire's inhabitants (BackingFracking, 2016; Blackpool Fracking for a Better Future, 2016)	Mobilizable units
		CLA, North West regional branch	- Defend the land-owners' rights in view of fracking's developments	- Protect the land ownership rights and welfare of inhabitants in the countryside	Relations

Actor Type	Main values per type	Actors	Interest	Desired situation/ Objective	Resources
	Transparency			(CLA, 2016)	
		Diocese of Blackburn, Church of England	- Responsible development of fracking	- Balance between human welfare and the protection of God's creation (Diocese of Blackburn, 2016)	Legitimacy, relations
		GMB (Britain´s General Union)	- Ensure the development of the needed skills and safety measures for fracking	- Improve the working conditions of workers in the UK (GMB, 2016)	Mobilizable units, expertise
		Unite (Union in the UK)	- Stop fracking development in the UK	- Protect workers' rights in the UK (Unite, 2016)	Information, mobilizable units, relations
		Green Party	- Stop the integration of shale gas to UK's energy mix	- Promote the development of fossil free and affordable energy (Green Party, 2016)	Legitimacy, information, relations
		Local anti-fracking campaigners. Directly participated in the debate: Defend Lytham St Annes, East Lancashire Against Fracking, Frack Free Blackpool, Frack Free Fylde, Frack Free Lancashire, Keep East Lancashire Frack Free, Nanas protest group, Preston New Road Action Group, Residents Action on Fylde Fracking, Roseacre Awareness Group and Ribble Estuary Against Fracking.	- Stop fracking development in Lancashire	- Long-term wellbeing of Lancashire's current and future inhabitants (Frack Free Lancashire, 2016; KNAG, 2016)	Legitimacy, mobilizable units, information, relations
		National anti-fracking	- Stop this project as	- Promote the development	Legitimacy,

Actor Type	Main values per type	Actors	Interest	Desired situation/ Objective	Resources
		campaigners. Directly participated in the debate: Bianca Jagger Human Rights Foundation, Frack Off, No dash for gas and the Reclaim the Power action camp.	platform to avoid further developments of the shale gas industry in the UK	of fossil free, renewable energy - Stop the use of fracking in the UK (Frack Off, 2016; Reclaim the Power, 2016; The Bianca Jagger Human Rights Foundation, 2016)	information, mobilizable units
Environmental NGO	Accountability, Environmental friendliness, Health and safety, and Procedural justice	Campaign to Protect Rural England	- Stop fracking's disruption of the beauty and tranquillity of the countryside	- Protect and shape UK's countryside (CPRE, 2016)	Mobilizable units, legitimacy
		Friends of the Earth	- To ban fracking in the UK	- Promote renewable energies to face UK's energy crisis (FOE, 2016)	Legitimacy, mobilizable units, information, public opinion, relations, visual aids
		Greenpeace	- Stop fracking to avoid its associated risks for the natural environment	- Protect nature and promote environmentally responsible solutions (Greenpeace, 2016)	Mobilizable units, visual aids, information, legal aids, legitimacy, public opinion, financial resources
		Royal Society for the Protection of Birds	-Ensure proper regulation of fracking to avoid damages to wildlife and environmentally sensitives sites	- Protection of natural sites to save birds and wildlife (RSPB, 2016)	Mobilizable units, legitimacy

Actor Type	Main values per type	Actors	Interest	Desired situation/ Objective	Resources
European Parliament	Welfare, Stability, Health and safety, and Environmental friendliness	Members of the European Parliament. Directly participated in the debate: MEP for North West England (Liberal Democrats), MEP for North West England (UKIP) and MEP for Scotland (Conservative)	- Safe development of fracking while ensuring proper benefits for local communities	- UK's economic development and energy security	Information
Knowledge generation institution	Accountability, Environmental friendliness, Health and safety, and Welfare	Research centres and universities. Directly participating in the debate: Committee on Climate Change, Centre for Global Energy Studies, Chartered Institute of Environmental Health, Climate Answers, Deloitte, Durham University, Ernst & Young, Futureye Consultants, Grantham Research Institute on Climate Change and the Environment, Institute for Public Policy Research, JLL property consultants, PwC, Royal Academy of Engineering, Royal Society, Royal Institution of Chartered Surveyors, Task Force on Shale Gas, UK Energy Research Centre, University of Columbia, University of Glasgow, University of Newcastle, University of Oxford and	- Provide objective information to feed the debate around fracking	- Proper exploration of the risks and benefits associated with fracking	Information, expertise, relations, financial resources

Actor Type	Main values per type	Actors	Interest	Desired situation/ Objective	Resources
		University of Sussex.			
Local Business	Welfare, Health and safety, and Stability	Small and medium local businesses operating in the area. Directly participated in the debate: Danbro, Eagle and Child Inn, Engineering firm Addison plc., Inspired Energy, Lytham Technology, Moonstone Brewery, Remsol, Smart Spa-hotel, Thwaites Brewery, TUTIS Concepts and 300 others whom participated through a letter expressing opposition.	- Capitalize opportunities arising from the shale gas industry supply chain - Stop fracking to avoid impacts on farming and tourism	- Economic development of the region	Relations, financial resources, information; mobilizable units
Local Community	Health and safety, Accountability, Welfare and Procedural justice	Inhabitants of Lancashire.	- Capitalize on the employment and community benefits from fracking - Stop fracking to avoid its impacts on current and future generations	- Long-term wellbeing of Lancashire's current and future inhabitants - Regional economic development	Mobilizable units, public opinion
Local Government	Accountability, Procedural justice, Health and safety, Environmental friendliness	Burnley Borough Council.. Directly participated in the debate: Council leader	- Maintain an open attitude to capitalize possible opportunities from fracking	- Town's development and inhabitants' wellbeing (Burnley Council, 2016)	Authority, legitimacy
		Fylde Borough Council. Directly participated in the debate: Council leader and Liberal Democrat Councillor	- Avoid safety risks for inhabitants - Protect Fylde's green and pleasant image	- Borough's development and inhabitants' wellbeing (Fylde Council, 2016)	Legitimacy

Actor Type	Main values per type	Actors	Interest	Desired situation/ Objective	Resources
	and Transparency	Lancashire County Council. Directly participated in the debate: Council leader, Green councillor, Independent councillor and Labour councillor. Decision is made by the Development Control Committee after the advice of the Planning Officials.	- Proper evaluation of the applications according to regulation - Avoid safety risks for inhabitants	- County's development and inhabitants' wellbeing (Lancashire County Council, 2016a)	Formal DM authority, information, relations, authority, legitimacy
		Preston City Council. Directly participated in the debate: Preston Environmental Scrutiny panel	- Stop fracking inside Preston and around its boundaries	- City's development and inhabitants' wellbeing (Preston City Council, 2016)	Formal DM authority, legitimacy
		Ribble Valley Bourough Council. Directly participated in the debate: Council leader	- Keep a balance between resident's concerns and the need for cheap energy supplies	- Borough's development and inhabitants' wellbeing (Ribble Valley Borough Council, 2016)	Legitimacy
		Rossendale Bourough Council. Directly participated in the debate: Council leader	- Keep balance between community benefits and applications' merits	- Borough's development and inhabitants' wellbeing (Rossendale Borough Council, 2016)	Formal DM authority
		West Lancashire Borough councillor	- Reject applications due to government interference	- Borough's development and inhabitants' wellbeing (West Lancashire Borough Council, 2016)	Authority
		Woodplumpton Parish Council. Directly participated in the debate: Council Chairman	- Stop Cuadrilla's traffic plans through the village	- Parish's development and inhabitants' wellbeing (Woodplumpton Parish Council, 2016)	Authority
National Government	Welfare, Accountability, Health and safety, Environment	Cabinet	- Development of indigenous sources of energy	- Promote UK's economic development - Ensure energy security and affordability to UK citizens (Gov.uk, 2016g)	Formal DM authority

Actor Type	Main values per type	Actors	Interest	Desired situation/ Objective	Resources
	al friendliness and Stability	Chancellor of the Exchequer George Osborne	- Taxes incomes from fracking - Include shale gas in UK's energy mix - Boost the UK's economic development through the shale gas industry	- Promote UK's economic development - Ensure energy security and affordability to UK citizens (Gov.uk, 2016f)	Information, formal DM authority
		Department for Communities and Local Government	- Development of indigenous sources of energy - Improve the planning system to support appropriate shale gas exploration	- Proper land planning and use in UK in line with needs - Allow locals to shape their area (Gov.uk, 2016c)	Formal DM authority
		Department for Environment, Food & Rural Affairs	- Understand and minimize possible negative impacts of fracking on the environment and rural economies	- Safeguard the natural environment - Develop the rural economy (Gov.uk, 2016d)	Information, formal DM authority
		Department of Energy and Climate change	- Kick-start the safe development of fracking in the UK	- Development of secure, clean and affordable energy supplies - Mitigate climate change (Gov.uk, 2016e)	Formal DM authority, legitimacy, relations, financial resources, information
		British Geological Survey	- Estimate potential shale gas resources - Monitor environmental issues associated with fracking (seismicity activity, groundwater quality, etc.)	- Provide objective and authoritative geoscientific data, information and knowledge for the UK to use its natural resources (BGS, 2016)	Formal DM authority, Financial resources, legitimacy, relations, information

Actor Type	Main values per type	Actors	Interest	Desired situation/ Objective	Resources
		Environment Agency	- Ensure applications conform to environmental safety regulations	- Protect and improve the environment while supporting sustainable development (Gov.uk, 2016a)	Formal DM authority, information, Relations
		Prime Minister David Cameron	- Include shale gas in UK's energy mix - Boost the UK's economic development through the shale gas industry	- Promote UK's economic development - Ensure energy security and affordability to UK citizens (Gov.uk, 2016i)	Formal DM authority, legitimacy, information
		Public Health England	- Assess health risk related from fracking - Ensure well-construction is aligned with proper safety standards	- Protect and improve UK's health and wellbeing (Gov.uk, 2016b)	Information, legitimacy
		Oil and Gas Authority	- Ensure the inclusion of shale gas to UK's energy mix - Provide the permits and incentives to increase shale gas exploration	- Ensure the proper regulation and development of the onshore oil and gas industry to maximize UK's economic benefits (Gov.uk, 2016h)	Formal DM authority
		Valuation Office Agency	- Evaluate the impacts of fracking for property's value	- Appropriate valuation of properties for taxation and benefits (Gov.uk, 2016j)	Formal DM authority

Actor Type	Main values per type	Actors	Interest	Desired situation/ Objective	Resources
Parliament	Accountability, Welfare, Environmental friendliness, Distributive justice, Procedural justice	House of the commons. Directly participated in the debate: Blackburn Parliament Member, Blackpool North and Cleveleys Parliament Member, Brighton Pavilion Parliament Member, Burnley Parliament Member, Fylde Parliament Member, Hyndburn Parliament Member, Lancaster and Fleetwood Parliament Member, Preston Parliament Member, Rossendale Parliament Member and Wyre and Preston North Parliament Member	- Appropriate benefits distribution for local communities - Strengthen regulations to reduce fracking impacts on local communities - Promoting shale gas exploration - Stop fracking due to its impacts on the rural communities - Ensure government's transparency in its management of the shale gas industry	- Safeguard the public's concerns and interests during policy making - Find suitable solutions to UK's energy problems (Parliament.uk, 2016d)	Formal DM authority, Financial resources, legitimacy
		Environmental Audit Committee	- Stop fracking to fulfil with climate change and environmental protection targets	- Ensure Government's policies and programs safeguard environmental targets and support sustainable development (Parliament.uk, 2016b)	Formal DM authority, information
		Economic Affairs Committee	- Promote the development of the shale gas industry	- Promote UK's economic development through research and policy recommendations of timely issues, such as fracking (Parliament.uk, 2016a)	Formal DM authority, information
		House of the Lords. Directly participated in the debate: Baroness Sandip Verma, Lord Greaves and Lord Howell	- Ensure an appropriate regulatory environment for responsible development of fracking	- Revision and amendment of policies proposed by the commons to promote UK's development (Parliament.uk, 2016e)	Legitimacy

Actor Type	Main values per type	Actors	Interest	Desired situation/ Objective	Resources
		Official Opposition Shadow Cabinet	- Contest Government's open support for fracking - Stop fracking due to environmental concerns	- Ensure Government's accountability for policies and programs implemented (Parliament.uk, 2016c)	Legitimacy, information, authority, mobilizable units
Private company	Accountability, Health and Safety, procedural justice, Welfare and Environmental friendliness	Centrica	- Execution of exploration project in Lancashire - Profit from shale gas exploration	- Long-term, safe and reliable provision of energy to customers (Centrica, 2016)	Financial resources, authority, legitimacy, relations
		Cuadrilla	- Execution of exploration project in Lancashire - Profit from shale gas exploration	- Expansion of oil and gas exploration activities (Cuadrilla, 2016a)	Authority, information, relations, public opinion, legal aids, financial resources, expertise
		iGas	- Kick-start exploration projects in UK - Profit from shale gas exploration	- Capitalize the potential of UK's unconventional oil and gas resources (IGas, 2016)	Relations, financial resources, information, authority
		INEOS	- Kick-start exploration projects in UK - Profit from shale gas exploration	- Develop a home-grown supply of gas for its chemical companies (INEOS, 2016)	Financial resources, authority
		G Frac Technologies	- Capitalize on the supply chain opportunities of shale gas exploration	- Expand its activities in UK (eFrac, 2016)	Expertise
		LV - Liverpool Victoria Insurance	- Changes in insurance conditions due to uncertain impacts of fracking	- Provide appropriate insurance coverage for people and businesses (LV, 2016)	Authority

Actor Type	Main values per type	Actors	Interest	Desired situation/ Objective	Resources
		Marriot Drilling Group	- Capitalize on the supply chain opportunities of shale gas exploration	- Expand its activities in UK (Marriot Drilling Group, 2016)	Expertise
		Nats - Air Traffic Control Services	- Stop fracking unless Cuadrilla updates the radar to avoid interference by drilling	- Ensure the safety of air traffic in the area of Lancashire (NATS, 2016)	Expertise, Legal aids
Actors outside the UK	Accountability, Health and safety, Stability and Procedural justice	Breitling Energy Corporation	- Kick-start exploration projects in UK	- Promote shale gas development in the UK (Breitling Energy, 2016)	Financial resources, relations
		Elected Officials of Protect New York	- Provide advice to Lancashire County Council during the contested decision about fracking projects	- Prevent fracking to be developed in Lancashire (Elected Officials, 2016)	Legitimacy

APPENDIX H. EMERGENCE OF VALUES ACCORDING TO THE ACTORS' FIRST CLAIM IN THE DEBATE

There are several reasons for an actor to join the debate with value claims. Even though this research does not focus on such motivations, the fact that actors decided at some point to join the debate surrounding the decision-making process was considered relevant for analysis. First, actors can bring new values to the debate through their interventions. Second, actors can join the debate to highlight a value that they consider relevant but neglected in the decision-making process. Third, actors can join the debate to respond to the way other actors operationalize values they find relevant. Therefore, it was considered relevant to analyse the values referred to during the first claim of each actor. This appendix present the results of such analysis. The analysis will only focus on the claims and the values connected to them. Sometimes actors made several claims during their first intervention in the debate. All of them were included in the analysis.

As a starting point, the entire decision-making period was analysed to make a comparison with the results obtained using all the claims. Figure 9-4 presents the first claims and their associated values. The size of the nodes correspond to their degree or number of relationships with other nodes. It can be seen that the main values expressed were Accountability, Welfare, Health and safety and Environmental friendliness. This result corresponds with the values expressed using all the claims. It is worth noticing that the values of Aesthetics, Ownership and Distributive justice have more relative relevance during the first claims of actors. This can be an indication that actors tried to highlight this values when joining the debate.

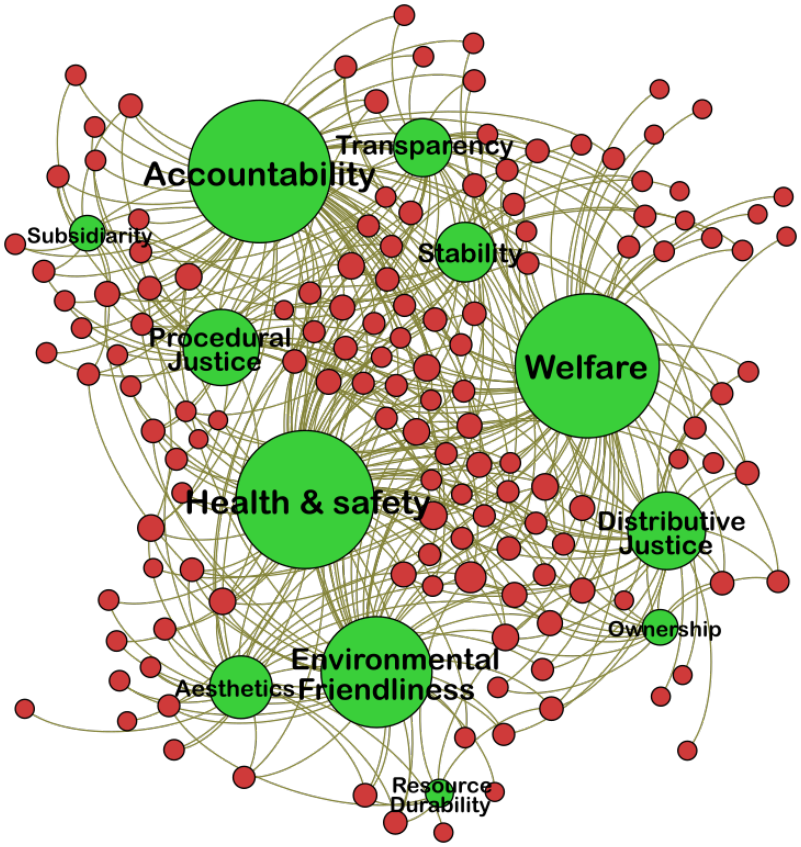

Figure 9-4. Values related to the first claims of actors through the entire decision-making process

The following subsections will present the relationship between claims and values during each round. It is worth noticing that, due to limitations of Gephi, the size of the values is not adjusted for each round. This means that the proportions given by all the claims are maintained in the analysis of each round. Therefore, the reader is invited to bring its attention to the number of edges related to each value node when looking at the images.

H1. Value expression during Round 1

During the first round, the values of Welfare, Health and Safety, Environmental friendliness and Accountability were the values with the higher amount of mentions (Figure 9-5). The debate in this round is mainly focused on the technology and on the policies for benefits distribution and safety regulation. Therefore, it can be concluded that the value claims were used to highlight this values as relevant for the development of the decision-making process. Furthermore, it can also be noticed that although all values were already mentioned in this round, they were expressed with different intensities.

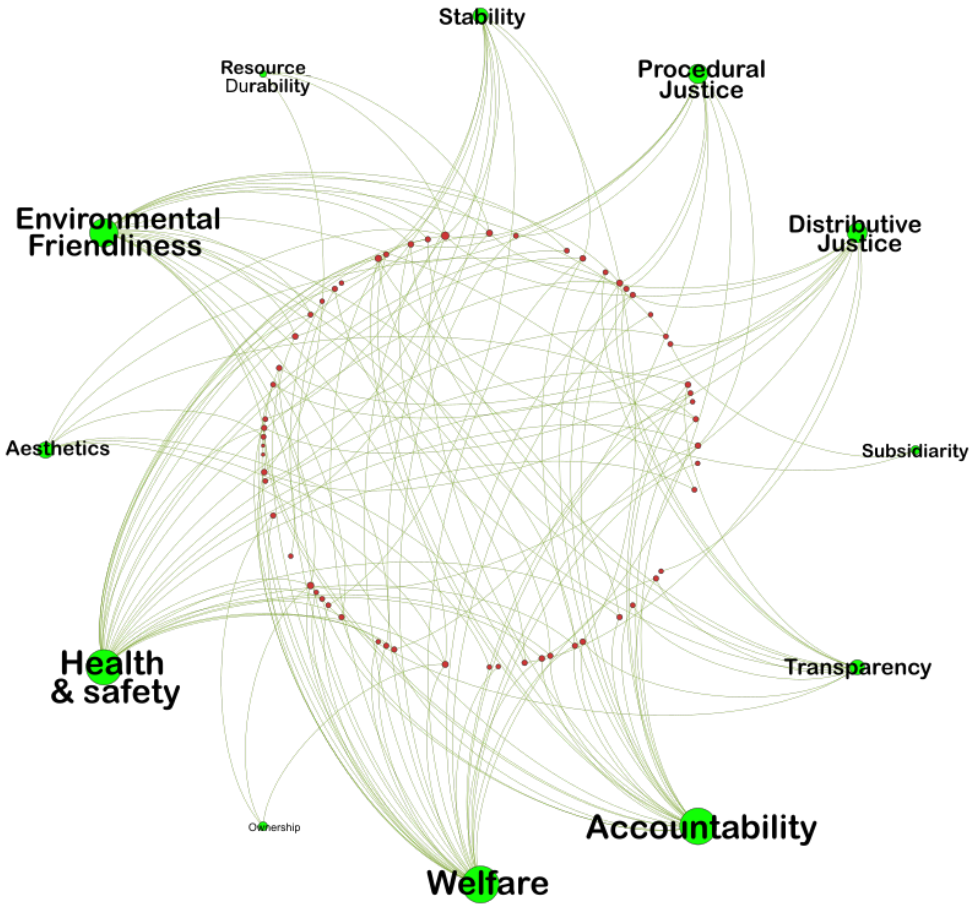

Figure 9-5. Values expressed in actors' first claim in Round 1

H2. Value expression during Round 2

During the second round, the values of Welfare, Health and Safety, Accountability and Distributive justice were the values with the higher amount of mentions (Figure 9-6). The debate in this round was centred on the technology and the decision-making process. Moreover, the land-ownership and safety regulations were being under discussion. The emergence of the procedural value of Distributive Justice is more likely to be related to actors joining the debate over the land-ownership regulations. The changes were contested due to the uncertainties regarding the future impacts of the use of fracking. Moreover, all values were mentioned again, with Ownership having its peak of expressions in this round.

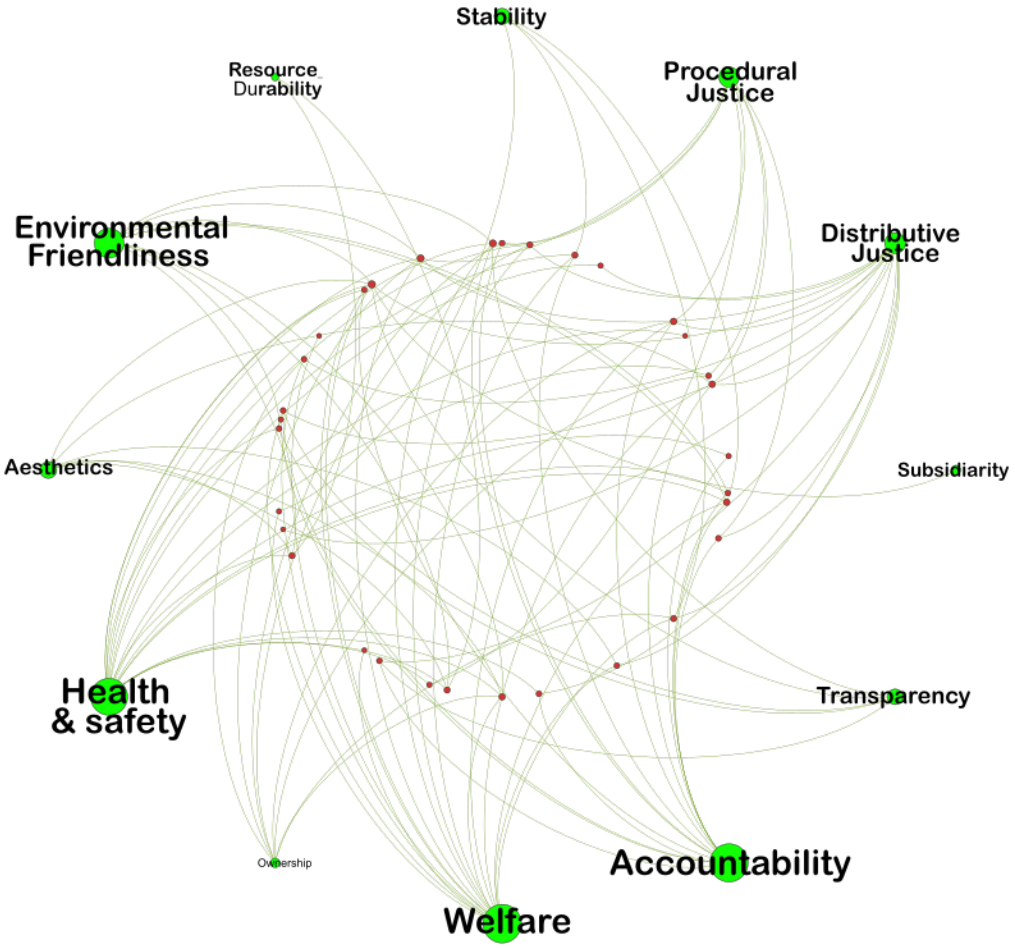

Figure 9-6. Values expressed in actors' first claim in Round 2

H3. Value expression during Round 3

During the third round, the values of Accountability, Welfare, Health and Safety, Environmental friendliness and Aesthetics were the values with the higher amount of mentions (Figure 9-7).The debate in this round was focused on site-specific issues of the project and the decision-making process. These issues were related to traffic and noise. The emergence of Aesthetics can be related to views of the “industrialization” of the countryside. This round was marked by its local character. Therefore, the values emerging in this round are mostly associated to local actors that were affected by Cuadrilla’s new plans and wanted their views to be considered. In addition, it can

be noticed that Resource durability was not mentioned during this round. This can be related to the local character of the debate.

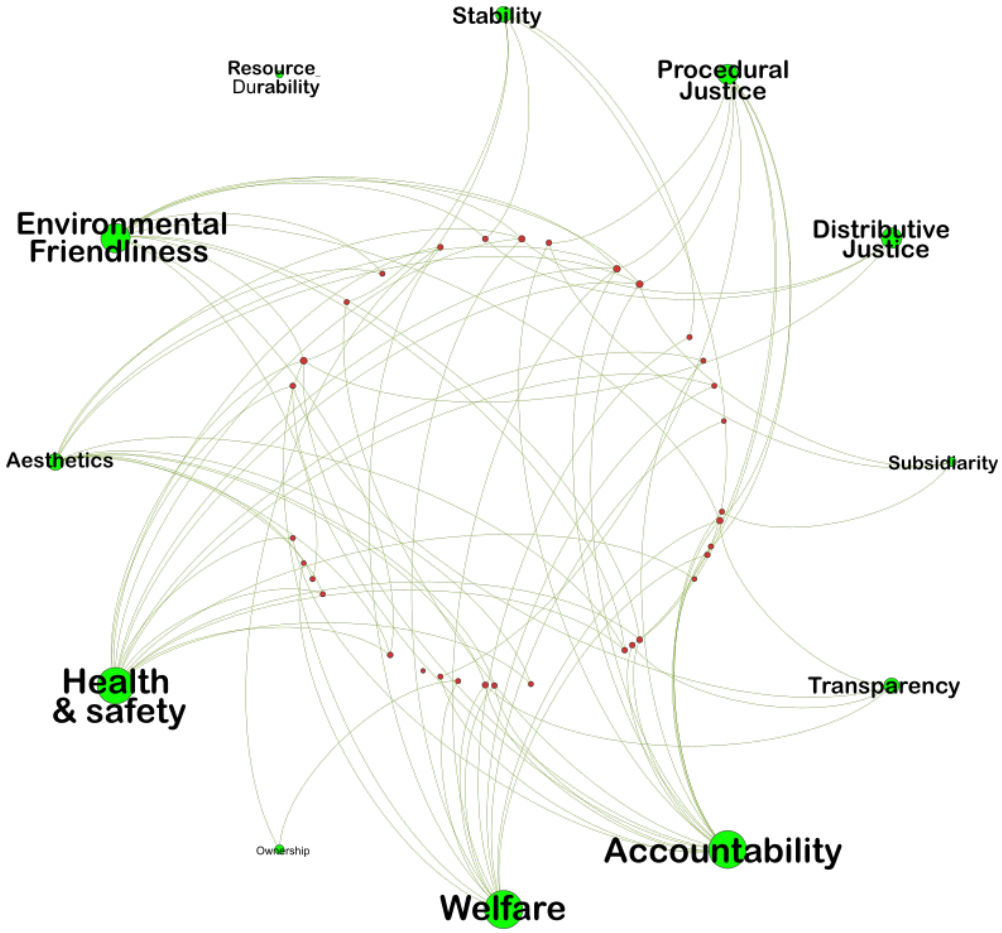

Figure 9-7. Values expressed in actors' first claim in Round 3

H4: Value expression during Round 4

During the fourth round, the values of Accountability, Welfare, Health and Safety, Environmental friendliness and Procedural justice were the values with the higher amount of mentions (Figure 9-8). The debate in this round was related to the technology and the decision-making process. The change of level of the debate with the appeal process and the publication of the 14th Licensing Round's results triggered actors' to join the debate. Furthermore, the changes in the planning regulation and resource estimation were being discussed. This fact can explain the emergence of Procedural justice as relevant for actors in this round.

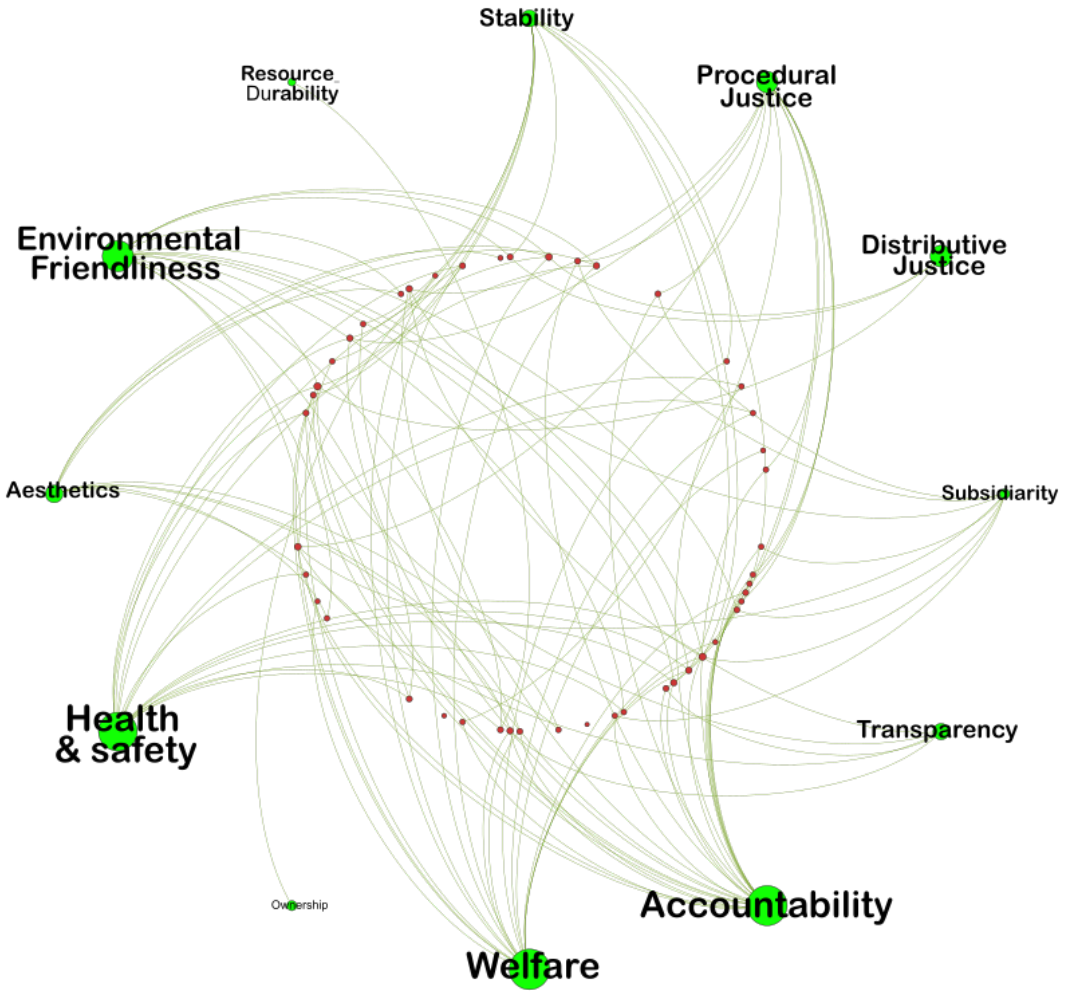

Figure 9-8. Values expressed in actors' first claim in Round 4

To conclude, all values were mentioned in all rounds. However, as explained in chapter 5, they were operationalized in the context of different arenas. If the actor decided to join the decision-making process using value claims, it may be associated to her/his perception that not enough attention was paid to it or that it was threatened. Furthermore, the emergence of the values may correspond to the actor's operationalization of the value or to the contestation of another actor's representation of the value. In any case, for the analysis to provide better insights, the focus should be switched from the identification of values to the identification of the norms actors use to operationalize the value. This analysis is in line with Dignum et al. (2015)' conclusion that there are two levels of value conflicts: an inter-value conflict, for example environmental friendliness and welfare for the anti-fracking campaigners, and an intra-value conflict, for example the definition of Stability as both the development of renewables for opponents and the exploitation of shale gas for supporters. Conversely, event though all the values were expressed from the first round, some of those values remained almost neglected throughout the debate. This fact may imply that even though actors try to include their own values in the debate, the values only become relevant when they gather reactions or support from other actors.

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Towards responsible governance of energy projects:

A dynamic analysis of values, interactions and events in the decision-making process on shale gas in Lancashire, UK

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