Contesting Technologies in the Networked Society:

A Case Study of Hydraulic Fracturing and Shale Development

By

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Contesting Technologies in the Networked Society: A Case Study of Hydraulic Fracturing and Shale Development

Abstract:

In this dissertation, I study the network structure and content of a transnational movement against hydraulic fracturing and shale development, Global Frackdown. I apply a relational perspective to the study of role of digital technologies in transnational political organizing. The core question driving this inquiry is: *In what ways are environmental activists using new media technologies to challenge socio-political power structures*? I examine the structure of the social movement through analysis of hyperlinking patterns and qualitative analysis of the content of the ties of one European strand of the movement. I explicate three actor types: coordinator, broker, and hyper-local. This research intervenes in the paradigm that considers international actors as the key nodes to understanding transnational advocacy networks. I argue this focus on the international scale obscures the role of globally minded local groups in mediating global issues back to the hyper-local scale. While international NGOs play a coordinating role, local groups with a global worldview can connect transnational movements to the hyper-local scale by networking with groups that are too small to appear in a transnational network.

I also examine the movement's messaging on the social media platform Twitter. Findings show that Global Frackdown tweeters engage in framing practices of: movement convergence and solidarity, declarative and targeted engagement, prefabricated messaging, and multilingual tweeting. Global Frackdown tweeters integrate personal action frames with collective action frames, as well as engage in hybrid framing practices, that I describe as *transnational frame jumping*. The episodic, loosely-coordinated and often personalized, transnational framing practices of Global Frackdown tweeters support core organizers' goal of promoting the globalness of activism to ban fracking. Global Frackdown activists use Twitter as a tool to advance the movement and to bolster its moral authority, as well as to forge linkages between localized groups on a transnational scale.

In order to contextualize the anti-hydraulic fracturing social movement within the wider mediated discourse on the shale industry, I also study the relative prominence of negative messaging about shale development in relation to pro-shale messaging on Twitter across five hashtags (#fracking, #globalfrackdown, #natgas, #shale, and #shalegas). I analyze the top actors tweeting using the #fracking hashtag and receiving @mentions with the hashtag. Results show statistically significant differences in the sentiment about shale development across the five hashtags. Results show the discourse on the main contested hashtag #fracking is dominated by activists, both individual activists and organizations. The highest proportion of tweeters posting messages using the hashtag #fracking were individual activists, while the highest proportion of @mention references went to activist organizations. These results suggest hashtags can act as cohesive mediated public spheres within and of themselves. Thus, hashtags can be thought of as reflective of, and formative of, distinct "hashtag publics."

This study shows that activism against unconventional fossil fuels brings together very localized concerns about environmental risks associated with extractive industries with more abstract global concerns. I conceptualize this type of movement as a *translocal environmental movements*, which includes the following dimensions: the fusing of material and symbolic concerns, linkages across affected and potentially affected communities in at least two world regions, a sense of shared interests and goals, and the framing of opposition to shale development in terms of both local concerns and global ones.

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Chapter 1. Introduction

We are living in a world shaped by processes removing social relations from the local. As Giddens (1990) argues, modernity is inherently globalizing and networked with fundamental changes to co-presence and compressions of time and space (p. 63). These processes are rooted in ever-increasing global interdependence and is a dualistic, forward reaching process of "simultaneous transformations of [individual] subjectivity and global social organization" (Giddens, 1990, p. 177). Giddens defines globalization as processes of "uneven development that fragments as it coordinates-introduces new forms of world interdependence" (Giddens, 1990, p. 175). Within this context, the field of political communication is at a juncture, "a critical moment" according to Moy, Bimber, Rojecki, Xenos, and Iyengar (2012). There is a need for scholarship to transcend the traditional "oneto-many model of communication" to ask new questions and ground research in new ways that account for the networked nature of human relations, as they are both experienced in daily life and correspondingly manifest online (Moy et al., 2012). I take up that challenge by exploring the ways in which environmental activists are employing new communication technologies, and Twitter in particular, to alter the dynamics of political contention and power relations between citizens, the oil and natural gas industry, and nation-states.

In this dissertation, I study the network structure and content of a transnational movement, called Global Frackdown, against hydraulic fracturing and shale development. I use the term "transnational," rather than "international" or "global," following McMillin (2007) to emphasis communication processes that transcend nation-states but do not

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necessarily extend to every world region.¹ The core question, which drives this inquiry, is: *In what ways are environmental activists using new media technologies to challenge sociopolitical power structures*? I break this analysis down into two major parts, focused on both the network structure of the movement itself and the content of the movement's messaging. In chapter two, I examine the *structure* of the social movement through analysis of hyperlinking patterns and qualitative analysis of the content of the movement's messaging on the movement. In chapter three, I examine the *content* of the movement's messaging on the social media platform Twitter. In chapter four, in order to contextualize the anti-hydraulic fracturing social movement within the wider mediated discourse on shale development, I take a slightly different approach and study the relative prominence of negative messaging about shale development in relation to pro-shale messaging on Twitter across five hashtags during the same time period studied in chapter three. In addition, in chapter four I analyze the top actors tweeting using the #fracking hashtag and receiving @mentions with the hashtag.

This dissertation is structured following a three-article model. Each of the empirical chapters (chapters two through four) is written to be a stand-alone article as prepared for journal submission. Chapter two was presented at the Qualitative Political Communication pre-conference of the 2014 International Communication Association (ICA) annual meeting in Seattle, Washington in May 2014. In this introductory chapter I provide an overview of communication and environmental sociology literature to frame the project as a whole and supplement the literature reviews of each individual chapter. The topics included are:

¹ In addition, refer to my discussion of transnational social movements on page 18.

communication and media framing of environmental movements, transnational advocacy networks and environmental social movements. In addition, I provide background on controversy over hydraulic fracturing technology and the shale industry. I also provide a rationale for the use of mixed methods and a general framework for the overall study design. I introduce the data sources and data collection methods, for which greater detail is provided within each of the empirical chapters. In chapter five, I provide summative conclusions that cut across the three empirical chapters and suggest directions for future research.

I will now turn my attention to an overview of the case study issue, that of the drilling technology high-volume hydraulic fracturing, the shale industry, and a transnational social movement organizing against shale development, Global Frackdown.

Research Context: Hydraulic Fracturing as a Contested Technology

As journalist Tom Wilber writes in his book on Marcellus Shale it is about fissures, cracks in shale rock, cracks in the socio-technical systems of geoscience and industry, and of course in the social fabrics of communities sitting on top of "unconventional" gas deposits (Wilber, 2012). And, it is not happening just in the United States. This is to say that hydrofracking sits at the juncture of democratic decision-making over the application of science and technology in societies internationally, with profound implications for global energy policy and environmental governance. Hydraulic fracturing, a drilling simulation technique commonly referred to as "fracking," is a contested technology. It is also to some degree still an emerging technology, particularly in applications outside of the United States. The concept of "contested technology" has its roots in science and technology studies (see von Schomberg, 1995). In the case of "emerging" technologies, such as bioenergy or nanotechnology, "knowledge is incomplete and application and impact are uncertain or

contested" (Eaton, Wright, Whyte, Gasteyer, & Gehrke, 2014). Technologies are intertwined with scientific innovations and have become sites of struggle in late modernity (McNally & Wheale, 1995). Controversies over technological adoption are at their core about scientific uncertainty, risk perceptions, and public participation (Hennen, 1995). Examples of contested technologies and areas of contested science include: climate change, nuclear power, biotechnology and genetically modified organisms (GMOs), nanotechnology, the HPV vaccine, and the digital liberties movement. Control of technologies is a key point of contention (Croeser, 2012). Past research has examined energy technologies as contested, e.g. Sengers et al. (2010) on biofuels, Bauer (1995) on nuclear power, and energy development in the Navajo Nation (Powell, 2010). For the purposes of this research, I conceptualize of "contested technology" as: a technology about which there is not scientific consensus regarding its environmental, health, and social impacts, which are debated by competing stakeholders in the public sphere and regulatory areas.

Hydraulic fracturing on the rise. The use of hydraulic fracturing is increasingly widespread in the oil and gas industry. For a sense of the international distribution and the scale of shale oil and shale gas deposits, refer to Table 1. In U.S. Energy Information Administration (U.S. EIA) estimates of global technically recoverable shale oil and gas, the United States ranks second in terms of shale oil resources and fourth in terms of shale gas resources (U.S. EIA, 2013a).

				Trillion Cubic
Rank	Shale Oil	Billion Barrels	Shale Gas	Feet
1	Russia	75	China	1,115
2	United States	58	Argentina	802
3	China	32	Algeria	707
4	Argentina	27	United States	665
5	Libya	26	Canada	573
6	Australia	18	Mexico	545
7	Venezuela	13	Australia	437
8	Mexico	13	South Africa	390
9	Pakistan	9	Russia	285
10	Canada	9	Brazil	245
World Total		345		7,299

Table 1.1: Top 10 countries with technically recoverable shale oil and gas resources. The data for this table comes from the U.S. EIA report *Technically Recoverable Shale Oil and Shale Gas Resources: An Assessment of 137 Shale Formations in 41 Countries Outside the United States* (U.S. EIA, 2013a).

At a time when discussion of climate change has been plagued by inaction, the energy industry is investing into the development of "unconventional" fossil fuel shale oil and natural gas drilling in the United States and abroad. Hydraulic fracturing and horizontal drilling have been hailed collectively as a "game changer" in the domestic natural gas market, with projections that by 2035 shale gas will account for 46 percent of U.S. production (U.S. EIA, 2011). According to the U.S. EIA projections, natural gas is slated to overtake coal's use for energy generation in the United States in 2035 (U.S. EIA, 2013b). Both production of natural gas and crude oil in the United States have increased "dramatically" since 2010 (Sieminski, 2014). The United States is projected to become a net exporter of liquefied natural gas (LNG) in 2016 and natural gas overall in 2018 (U.S. EIA, 2014). So, while this trend is well underway in the United States, governments worldwide are also looking to "unlock" shale deposits (Forero, 2012). However, the technology's reception globally has been mixed, with governments of countries such as Poland and Argentina

favoring development, while others such as France and South Africa have instituted moratoria or bans on the practice (Krauss, 2013).

Given that global shale gas resources are "vast" according to the U.S. EIA and that hydraulic fracturing is experiencing an international expansion, it is a key juncture at which to study cross-national opposition to the technology. Hydraulic fracturing is often framed as a boom, with shale gas as a "bridge fuel" in the transition to cleaner energy, or as the potential source of serious environmental and health concerns (see Engelder, 2011; de Wit, 2011; Howarth & Ingraffea, 2011). As a report from the International Energy Agency (IEA) points out, "No country is an energy 'island'" and the impacts of the "profound" shifts in the U.S. energy market have global implications (IEA, 2012). Yet little systematic knowledge exists as to the discursive dynamics of controversy over this technology internationally. As an extraction technology in energy production, it has the potential for political, social, environmental, and economic ramifications. Therefore, hydraulic fracturing provides an ideal case study of scientific and environmental controversy surrounding emerging energy technologies at the intersection of citizen participation in environmental governance and energy policy on a transnational scale.

While the economies of extraction and pressing environmental concerns such as climate change are global, drilling projects have the potential for significant environmental, health and social impacts on the local communities in which they are situated. These impacts are disputed by industry, civil society and scientific stakeholders along with the economic benefits (see Christopherson & Rightor, 2012; Engelder, 2011; Howarth & Ingraffea, 2011; Kinchy & Perry, 2012). Major areas of concern regarding shale gas extraction and hydraulic fracturing include: greenhouse gas (GHG) emissions and climate impacts relative to coal, a

lack of baseline data on drilling sites in the United States, public health and social concerns, seismic activity, the volume of water usage and potential for water contamination, and dealing with waste and produced water, as well as policy and regulatory considerations such as disclosure of the chemicals used in the hydraulic fracturing process and land restoration following extraction (UNEP, 2012). Other issues are social in nature, though they have public health implications as well, including: noise pollution and heavy truck traffic, increased transient male populations in drilling areas, increased demand for social services, rise in rent costs, and greater demand on local infrastructures (Christopherson & Rightor, 2012; Ferrar et al., 2013).

In this dissertation I do not make claims about the science of high-volume hydraulic fracturing and horizontal drilling. My intent in this section is to outline the major points of scientific and public controversy surrounding the technologies in order to contextualize my study of discourse over the technologies and the ways in which activists are using new media technologies in order to organize against shale development. I will now outline two key areas of contested science surrounding the impacts of hydraulic fracturing: climate change and water.

Climate-related issues. In regard to climate, the major point of scientific debate and public contention is the extent of methane emissions, a more potent greenhouse gas than carbon dioxide (e.g. Caulton et al., 2014; Howarth, Santoro, & Ingraffea, 2011; Wang, Ryan & Anthony, 2011; Wigley, 2011). Scientific debate centers on the timeframe of analysis, using a one hundred year timeframe versus a 20-year one (UNEP, 2012). Research suggests that on a 20-year timeframe shale gas could be worse for the climate than coal and would be similar to coal on a one hundred year time analysis (Wigley, 2011; Howarth et al., 2011;

UNEP, 2012). A major issue is estimating the amount of methane venting in the calculations of climate impact. Howarth and colleagues (2011) estimated that over the life of a well between 3.6 percent and 7.9 percent of methane from production leaks or is vented, making its greenhouse gas impact greater than that of conventional gas and coal production. However, Wang et al. (2011) suggest that the greenhouse gas impact of shale development can be lower than coal if methane emissions can be controlled. In research on wells in the Marcellus Shale in Pennsylvania, Caulton et al. (2014) found a significant level of variation between wells, with those in the drilling stage having high emissions. While containing methane during production is possible, in practice the gas is vented (see UNEP, 2012 for an overview of the related issues). In addition, the International Energy Agency notes that regardless of potential environmental benefits of natural gas, on its own natural gas cannot achieve the international climate target of limiting global average temperature increase to two degrees Celsius and shale development must be part of broader shifts in global energy systems (IEA, 2012, p. 12).

Water and public health-related issues. Another major set of concerns center around water. This includes both the high volume of water required to frack a well and the potential for water contamination, as well as other related public health concerns. To enter production a shale gas well requires between 2.9 and nine million gallons of water, equal to approximately 360 to 1100 truckloads of water, with tight gas requiring even higher volumes of water (UNEP, 2012). In regard to water quality, underlying public concern in the United States about the potential for water contamination related to hydraulic fracturing is that the usage of chemicals in the fracking process is not regulated by the U.S. Environmental Protection Agency (EPA). This is because the oil and natural gas industry was given an exemption from the Safe Drinking Water Act under the Energy Policy Act of 2005, though some states are attempting to regulate for full disclosure of chemicals used in fracking fluids (Finkel & Hays, 2013). While the scientific evidence is far from conclusive, potential issues related to water quality include: contamination of shallow aquifers with methane and chemicals from the fracking process, migration of gas from deep shale formations to aquifers, and disposal of wastewater (Vengosh, Warner, Jackson, & Darrah, 2013). There is a lack of peer reviewed epidemiological research on health effects in populations living near shale gas extraction (Finkel & Hays, 2013). As Finkel and Hays (2013) write, "There have been numerous anecdotal reports of respiratory, neurological, reproductive, dermatological, gastrointestinal, and other health complications that are attributed to natural gas operations" (p. 891). In response to public concerns, in 2011 the EPA started a multi-stage peer reviewed study of the impact of hydraulic fracturing on drinking water supplies, with results expected by late 2014 for public comment and peer review (EPA, 2014).

Policy implications. Because of its contested nature and the varying values and political climates cross-nationally, Sovacool (2014) concluded that shale gas would likely develop differently across countries. In a meta-review of more than one hundred studies published over the last 10 years, Sovacool (2014) notes that the costs and benefits of shale gas development are not evenly distributed geographically, nor are slated to occur at the same rate. Referring to the benefits and risks of shale extraction, he writes:

They also occur at different scales: the land, air, and human health impacts associated with fracking trend to be localized, whereas the systemic forcings of climate change are globalized. And they occur to different actors: landowners and producers benefit, conventional LNG exporters and those living adjacent to wells may suffer. In this way, shale gas production is really about picking your poison, and deciding which series of risks are acceptable but never eliminating risk itself. (Sovacool, 2014, p. 262)

It must be noted that there are important policy differences between the United States, where the shale industry is most advanced, and other world regions. First and foremost is the issue of mineral rights ownership. In the United States, unlike other nation-states, individual property owners often own the rights to minerals found under the surface of their land, whereas it is more common internationally for governments to own the subsurface mineral rights. In a July 2012 special issue on hydraulic fracturing, *The Economist* outlined key differences between the U.S. and European contexts for shale development, including: mineral rights ownership, higher population density in Europe and easier access to pipeline infrastructure in the United States (*The Economist*, 2012). Such factors may limit the reproducibility of U.S. shale development on an international scale (Sieminski, 2014).

International agencies have provided policy guidance and recommendations for best practices for shale development. The United Nations Environment Programme (2012) provided a series of technical and policy recommendations, including that hydraulic fracturing should not be carried out close to densely populated areas and in locations with water scarcity, implementing zero-venting and minimal flaring policies, requiring full disclosure of chemicals used in the process (p. 11). Noting that unconventional shale gas production has a greater environmental impact for local communities than conventional gas production, in its Golden Rules for shale development, the International Energy Agency (IEA) calls for: full transparency, monitoring of environmental impacts, engagement with local communities and stakeholders, adhering to high technical standards for well construction and placement, water recycling and safe disposal of waste, and zero-venting and minimal flaring (2012, pp. 13-14).

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Public opinion on hydraulic fracturing and shale development. In research on public opinion of hydraulic fracturing, in a nationally-representative survey in the United States, Boudet, Clarke, Bugden, Maibach, Roser-Renouf, and Leiserowitz (2014) find a low level of familiarity with the technology and mixed support for its use in the oil and gas industry, with 58% of survey respondents not knowing or being undecided, 20% being "somewhat/strongly opposed" and 22% being "somewhat/strongly supportive." Furthermore, they find that women, individuals with "egalitarian worldviews," newspaper readers (more than once a week) and concern for environmental impacts were more likely to oppose the hydraulic fracturing. On the other hand, for older, more conservative individuals, higher educational levels, and watching TV news more than once a week, concern for economic impacts were factors correlated with support for the technology's use (Boudet et al., 2014). These findings are in line with research from the Pew Research Center for the People and the Press (2012), which showed limited awareness of hydraulic fracturing with only 26% of survey respondents having "heard a lot about fracking" and 37% having "heard nothing at all." The Pew research found partisan differences in levels of support for hydraulic fracturing, with conservatives more likely to support it and liberals more likely to oppose the technology. Of individuals who had heard about the technology "at least a little," 52% were in favor and 35% opposed (Pew Research Center for the People and the Press, 2012). In Europe, public opinion research has shown that among the 27 member states of the European Union, 74% of survey respondents would be concerned about shale gas development in their neighborhood (Flash Eurobarometer 360, 2013).

Civil society responses to shale development. There are two main civil society responses to the shale industry. One set of environmental organizations, such as the

Environmental Defense Fund and the Clean Air Task Force, take a regulatory approach of working with the shale industry to promote best practices for the disclosure of chemicals used in the fracking process (see Center for Sustainable Shale Development, n.d.). On the other hand, a different set of organizations, including Food and Water Watch, Friends of the Earth Europe, 350.org, and Greenpeace, take a more radical approach of calling for bans or moratoria on the use of hydraulic fracturing in the oil and natural gas industry. In this dissertation, I focus on the more radical civil society response to the shale industry, a loosely coordinated international day of action called Global Frackdown, united around a call to ban the technology because it is transnational in nature.

The first Global Frackdown day of action was held on September 22, 2012, and a second one was held on October 19, 2013. The Global Frackdown mission statement reads:

Fracking for oil and gas is inherently unsafe and the harms of this industry cannot be fully mitigated by regulation. We reject the multi-million dollar public relations campaign by big oil and gas companies and urge our local, state, and national officials to reject fracking. We stand united as a global movement in calling on governmental officials at all levels to pursue a renewable energy future and not allow fracking or any of the associated infrastructure in our communities or any communities. We are communities fighting fracking, frac sand mining, pipelines, compressor stations, LNG terminals, exports of natural gas, coal seam gas, coal bed methane and more. Fracking is not part of our vision for a clean energy future and should be banned. (Global Frackdown, n.d.)

The day of action has been loosely coordinated by the civil society organization, Food and Water Watch, based in Washington, D.C., with a satellite office in Brussels. It should be noted that international day of action itself is not a new tactic; its use dates to anti-world trade organization protests in the late 1990s and the Zapatista movement in Mexico (Chadwick, 2007). For the 2013 Global Frackdown day of action more than 200 events were planned in 27 countries (Food and Water Watch, 2013), making it a transnational social

movement, or one with supporters in at least two nation-states, engaged in contentious action in at least one state other than the one in which a group is based or at an international scale (Tarrow, 2001).

The data for this dissertation project comes from the 2012 and 2013 Global Frackdown days of action. I will now overview the areas of literature that ground this dissertation project.

Communication Power in the Networked Society

Media are situated at the core of contests over meaning and representation in society. The underlying question of theoretical debates over what scholars have termed "communication power" or alternately, "media power," is one of where power lies within a system, and to what extent might new communication technologies facilitate changes to those power relations. According to Thompson (1995) "media power" is a form of "symbolic power," as opposed to economic, political, military forms of power. As a form of soft power, he defines it as "the capacity to intervene in the course of events, to influence the action of others and indeed to create events, by means of production and transmission of symbolic forms" (Thompson, 1995, p. 17). According to Couldry (2003) power is unequally distributed throughout social systems. Thus, he calls for communications scholars to "look not only at the distribution of economic and organizational resources and at contests over specific media representations of reality, but also at the sites from which alternative general frames for understanding social reality are offered," (Couldry, 2003, p. 41). As Couldry and Curran point out in their influential work on the "paradox" of media power, media act as channels for the transmission of information and sites of "social conflict in late modernity" but media corporations also act as powerbrokers in their own right, with social power of their own. They write, "Media power is *an emergent form of social power* in complex societies whose basic infrastructure depends increasing on the fast circulation of information and images" (p. 4). It is the changing dynamics for control of societal "representational resources" and access to distribution channels that are opening the potential for larger-scale shifts in the mediated power relations.

New media technological platforms, such as social media sites, thus offer the potential to act as sites for the generation and transmission of alternative representations. This is at the root of what Castells (2009) terms "communication power" in the "global network society." He defines "network society" as "a society whose social structure is made around networks activated by microelectronics-based, digitally processed information and communication technologies," (Castells, 2009, p. 24). As noted earlier, in late modernity the social structures are inherently globalizing, giving rise to the "global network society." So while individuals experience globalization in a localized manner, on a systems scale the functions are globalized (see Castells, 2009, pp. 24-27). Increasingly interconnected structural linkages have fundamentally altered the dynamics of power relations between nation-states and civil society, opening new channels for political contention on a transnational scale. In Castells' conceptualization of "communication power" the World Wide Web gives rise to new forms of "mass self-communication" that offer the possibility of reaching global audiences (p. 55). These structural transformations to national and global information communication infrastructures are enabling activists to exercise new forms of social, representational power with the global network society to reshape political discourses (p. 53).

Referring to privatization and concentration of ownership in media systems, Bennett (2003) raises what was, circa early 2000s, the basic question facing communication researchers interested in the effects of new ICTs on political mobilizations, asking, "Have these changes in media systems limited the capacity of groups contesting established power arrangements to communicate both among themselves and to larger publics?" (p. 17). Today, with the rise of social networking sites such as Twitter and Facebook, the questions have shifted to asking "how" has this new media ecology changed the dynamics of collective action (Tufekci, 2011).

While they are thus not "new" in terms of social association or social life, the technical hardware of the Internet and the software of the World Wide Web that have developed alongside it, have opened new avenues for interconnected human relations, as well as the study of their "digital traces" and are being used by activists new tools in political contention in transnational social movements (Newman, 2010; Barabási, 2003; Tarrow, 2001). Networks act as channels for the transmission of information needed for action. Thus, new communication technologies offer the potential to be used by activists to alter "oppositional information/action cascade(s)" (Tufekci, 2011).

The Social Construction of Nature, Framing, and the Environment

The field of environmental communication has its origins in the study of rhetoric (Cox, 2006; Oravec, 1984). How we view the natural world is the result of complex dialectic processes (Cantrill & Oravec, 1996). Burke (1966) proposes that through "symbolic action" symbols define how we see the world. From a constructionist perspective, nature is "nature" because we "know" it as such (Williams, 1980). Communication serves to not only mirror human relations with the natural world but in "naturalizing" these interactions (Milstein,

2009). Communication is therefore at the core of contests over how we define environmental problems (Cox, 2006; Milstein, 2009). Underlying ideological constructs give meaning to how we both perceive and use resources, with very real material environmental consequences (Oravec, 1984; Sklair, 1994). Discourse serves as a reproducer of the political economy of capitalism. Analyzing the ways in which we socially define the natural world allows us to begin to see how we can alter the conditions that produce environmental crises.

Media coverage of environmental issues. In the process of constructing environmental problems, media play a central role of "presenting" environmental claims (Hannigan, 2006). Past research has shown that media coverage educates audiences about environmental "problems," as well as serves agenda-setting and framing functions (Cox, 2006). Yet, mainstream news organizations reproduce dominant discourses on the environment that privilege industrialization and capitalism (DeLuca, 1999; Sklair, 1994). Media coverage of environmental issues is cyclical and focuses on dramatic visual imagery, such as the Love Canal or Three Mile Island (Cox, 2006; Hansen, 2010). On the whole, news about the environment is episodic, with a focus on "natural" catastrophe and little analysis of long-term risks (Dunwoody & Griffin, 1993; Hansen, 2010). In understanding journalistic work on the environment, scholars have noted the importance of journalistic production routines, the political economy of news production and overlapping ownership of mainstream media outlets with polluters as influencing media coverage of the environment (Dunwoody & Griffin, 1993; Cox, 2006). When covering the environment, journalists rely on official and governmental sources, making it more difficult for environmental activists to get their messages into news coverage (Hansen, 2010). It is not enough for activists to simply get into the headlines; they face the double task of shifting hegemonic discourses.

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Framing environmental issues. How environmental issues are "framed" in mass media has material consequences for policy directives on both national and international levels (Buttel & Taylor, 1994; Hutchins & Lester, 2006). Frames are interpretative devices that give meaning to situations and make certain elements of a narrative more prominent (Entman, 1993; Goffman, 1974). Each policy issue has its own "culture" defined through these "interpretive packages" (Gamson & Modigliani, 1989). Since the mid-1980s, scholars have employed frame analysis in the study of social movements (Benford & Snow, 2000). Movements generate what scholars refer to as "collective action frames" (Gamson, 1992). These "action-oriented" shared meanings provide a framework for movement activities (Benford & Snow, 2000). Gamson (1992) identifies three parts to collective action frames: injustice, agency, and identity. The injustice component is the "critical catalyst" needed to galvanize action (Gamson, 1992, p. 58). These frames are "adversarial" and depend on a clear target that is responsible for the injustice about which a collective "we" can take action (Gamson, 1992; Gamson & Meyer, 1996). Taylor (2000) identifies environmental justice as a master frame activists use to build a sense of collectivity and mobilize affected communities around environmental injustices.

Environmental social movements have historically depended on mass media to transmit their messaging to broader publics (Hutchins & Lester, 2006). They tap into universal frames of sustainability and use science to enhance their credibility (Della Porta & Piazza, 2007; Horton, 2010; Taylor & Buttel, 1992; Yearly, 1994). Activists engage in "concentrated struggle" with journalists to set the terms of public debate surrounding environmental protection, often with limited success (Hutchins & Lester, 2006). In the case of Earth First!, Schlechtweg (1996) finds it is portrayed as a violent eco-terrorist group despite the organization's stated commitment to non-violence. The debate over logging old growth forests is presented through the off-used dualism of "jobs" vs. the "environment." In related research, DeLuca (1999) finds that activists use "image events" to challenge technocratic discourses. Hutchins and Lester (2006) conclude that activists must keep increasing the showiness of their tactics to maintain media attention.

Environmental Social Movements and Organizations

Social movement organizing around environmental concerns has increased since the 1980s (Sutton, 2000). These movements fall under the rubric of "new social movements" (NSMs) or movements centered around shared collective identity rather than class-based mobilizations (Sutton, 2000, pp. 13-15). According to Watts and Peet, NSMs are "an effort by national and global civil society – social networks and transnational coalitions – to impose some sort of control over transnational corporations and irresponsible or rogue states" (2004, p. 4). Analysis of such movements bridges material and symbolic frameworks. On the one hand, as Keck and Sikkink write, "Environmentalism is less a set of universally agreed upon principles than it is a frame within which the relations among a variety of claims about resource use, property, rights and power may be reconfigured" (1998, p. 121). At the same time, environmental social movements and transnational advocacy networks (see below) involve actors that are in "structurally unequal positions" relative to state, corporate and multilateral actors (p. 121). Analysis of these power relations is central to explaining "environmental control and contestation" from a political ecology perspective (Bryant, 1998, p. 85). Political ecology's goal to study environmental issues within a "regional context" is particularly well suited to the study of social movement organizing. Social movements in the Global South are "livelihood struggles" (Redclift, 1987, as cited in Bryant, 1992, p. 25).

Transnational advocacy networks and environmental organizing. A number of factors have lead to the rise in coalitions that Keck and Sikkink (1998) term "environmental transnational advocacy networks"-or TANs-since the mid-1980s, including: "New ideas about the relationship between [the] environment and development; more organizations and new communications technologies; and opportunities to influence new international institutions concerned with the environment" (Keck & Sikkink, 1998, p. 132). These nonstate actors are made up of constituencies that "are bound together by shared values, a common discourse, and dense exchanges of information and services" (Keck & Sikkink, 1998, p. 2). These networks include internationally based social movement organizations that work with local groups, generally in the Global South, but are not reducible to them. They can also include: foundations, governmental, and super-governmental agencies (Keck & Sikkink, 1998, p. 9). TANs are simultaneously structures or "patterns of interactions" and sources of collective agency. As Keck and Sikkink write, "When we talk about them as actors, however, we are attributing to these structures an agency that is not reducible to the agency of their components" (1998, p. 5). Personal relationships between individuals working locally and internationally are a key component in their effectiveness (p. 145). Thus, TANs build on personal relationships and are generative of agency in groups.

Drawing on sociological literature on "contentious politics," or "episodic, collective interaction among makers of claims and their objects," Tarrow defines *transnational social movements* as:

Socially mobilized groups with constituents in at least two states, engaged in sustained contentious interaction with powerholders in at least one state other than their own, or against an international institution, or a multinational economic actor. (2001, p. 11)

With the advent of new media technologies, and in particular social media platforms, transnational activists working in TANs can facilitate the maintenance of international strong and weak social ties, develop movement messages—or collective action framing—and spread information more quickly about violations of international norms beyond nation-states.

Power relations in environmental movements. In research on cross-regional organizing, past research has found that environmental organizing in developed countries exerts an influence on the trajectory of environmental mobilizations in the Global South (see Keck & Sikkink, 1998; Longhofer & Schofer, 2010; Watts & Peet, 2004). Longhofer and Schofer (2010) find support for a world society model of domestic environmental organizing in developing countries. For industrialized countries in the West, domestic factors explained the formation of "environmental associations." On the other hand, they conclude, "Global forces are a powerful catalyst for environmental organizing in the developing world" (Longhofer & Schofer, 2010, p. 505). According to Watts and Peet, transnational NGOs acting in local movements may affect domestic policy and local NGO structure, as well as how such local groups "build political strategy and alliances" and the ways in which crossregional coalitions build political capital on the part of local organizations (2004, p. 27). International ENGOs have also been found to actively frame the discourse of environmental "crises" in developing countries to appeal to Western publics (Bryant & Bailey, 1997, p. 137; Keck & Sikkink, 1998, p. 135). Understanding that the global is embedded with the local and vis-à-vis, in order to understand environmental contention, research must take up the study of power relations both between institutional and non-institutional actors, but also within social movement networks that transcend geographical boundaries (Bryant, 1992; Escobar, 1999).
I will now address the challenges of researching new media, a rationale for mixed method research, and my general study design.

Study Design

New media are changing the "contours" and meaning of fieldwork (Burrell, 2009, as cited in Coleman, 2010). It is less and less clear-cut what is a "field" and even qualitative research is transcending physical research sites, as is the case with "netnography," or the application of ethnographic research methods to the study of online communities (Kozinets, 2010). The "network revolution" allows researchers to study "digital traces" of interpersonal networks that existed before but now are made "material" in new ways (Latour, 2011). The corresponding profusion of available data has opened new avenues of research on social structure and human interrelationships (see Barabási, 2003; Latour, 2011). As Ginsburg writes, "Our methods must be at least as intelligent as our thinking" (1997, p. 61). Even for consumers it is a challenge to keep pace with the rapidly evolving media landscape and a challenge for media researchers is to adapt our methodologies to make sense of the synergistic effects of preexisting social ties with new technologies that also enable generating new ties, as well as the altering of preexisting ones. As such, I take a mixed methods approach because I do not believe as researchers we can fully understand trans-local nature of digitally-networked social movements in late modernity without considering interdependent effects of network structure, individual relationships (informal ties), and formal organizational linkages on political contention.

Mixed method research. Mixed methods research (MMR) dates to the late 1980s, with some early precursor work going back to 1959, and developed across disciplines, from education to sociology and nursing (Creswell & Plano Clark, 2011, pp. 20-21). MMR is a

distinct approach that recognizes that the "complexity" of research questions requires researchers to be open to employing a diverse array of methods, depending on the questions or problem under study (Creswell & Plano Clark, 2011, p. 21). The "classic" definition of MMR, from Greene, Caracelli and Graham, states that it "includes at least one quantitative method (designed to collect numbers) and one qualitative method (designed to collect words)" (1989, as cited in Creswell & Tashakkori, 2007, p. 303). According to Creswell and Plano Clark, in MMR the qualitative component provides a "detailed understanding of a problem," while the quantitative part yields a "more general understanding" of the phenomena under study (2011, p. 5). They outline the characteristics of MMR as: the collection and analysis of both qualitative and quantitative data, which is rooted in a study's research questions; an integration of both types of data; one or both may take "priority;" the underlying assumptions account for mixed methods data; and the researcher employs a plan for a mixed methods approach (Creswell & Plano Clark, 2011, p. 5). In this study, I employ the qualitative methods of in-depth interviews and textual analysis, combined with the quantitative research methods of hyperlink network analysis and computer-assisted content analysis.

Despite the potential advantages of combining qualitative and quantitative methods, mixed method studies are still far from the norm across the social sciences, including communications research. In a meta-analysis of mixed method research prevalence rates in both pure (psychology and sociology) and applied (nursing and education) disciplines, Alise and Teddlie find that there has been an increase in MMR with the highest rates found in the applied fields (2010, pp. 120-121). However, quantitative research methods remained the dominant approach in their content analysis of the top five journals in each field, with 85 percent of the studies in the pure disciplines and 54 percent in the applied ones (Alise & Teddlie, 2010). MMR is still also underutilized in communications research. It is possible that scholars are conducting mixed methods research but not marketing their work as such. For example, a study comparing fair trade networks in the United States and United Kingdom by Bennett, Foot, and Xenos (2011) was published in the *Journal of Communication*, one of the top-ranked academic publications in the mass communications field. While the researchers compared a "think description" of the narratives of the two networks with a hyperlink network analysis of the fair trade network structures in the two countries to draw conclusions about interplay between narratives and network structural properties, nowhere in the article did they label their research "mixed method." So, while MMR has potential for communications research, as well as across the social sciences, it is still rare.

There are many techniques for ensuring research quality, "validity" on the quantitative side, "triangulation" on the qualitative one (see Babbie, 2008; Denzin & Lincoln, 1994). Chenail (1997) proposes the idea of a "plumb line" for qualitative research, which I believe can be applied to developing a MMR project. He writes, "By plumb, I mean that there should be a basic and simple reason for doing a study; something like a mission statement or maybe, a mission question for the project, by which you can keep track to see if you are beginning to drift from your line of inquiry or if you are staying on course with your research" (Chenail, 1997, p. 2). In this spirit, as introduced above, the basic mission question for my research is:

In what ways are environmental activists using new media technologies to challenge socio-political power structures?

Thinking about the role of networks, as Latour points out, "In its simplest but also in its deepest sense, the notion of network is of use whenever action is to be redistributed" (2011, p. 797). So to me, what is "new" and warranting of the focus of scholarly attention is not networks per se, but rather the ways in which network dynamics may (or may not) be altered within the context of evolving media technologies as activists *use* them. Technologies are just tools, what is interesting is *how* they are used.

Social network analysis. In their most basic form "social networks" are not new and networks are "present everywhere" (Barabási, 2003, p. 7). Sociologists, among others, have studied social networks for the better part of a century in the form of a set of methods known now as "social network analysis" (Newman, 2010; Scott, 2010). Dating to psychiatrist Jacob Moreno's research on social interactions in the 1930s and his innovation of diagrams he called "sociograms," it must be clarified that "social networks" are not limited to what we now commonly refer to them as, meaning Facebook or Twitter (see Newman, 2010, pp. 36-37). Furthermore, "society" to sociologists is "social association" or "distinct system of social relations" (Giddens, 1990, p. 12). Network science can be traced to Leonhard Euler's study of the Königsberg Bridges (Barabási, 2003). Networks are made up of interdependent structural relations, or "edges" connecting "nodes," that can act as channels for the transmission of information (Wasserman & Faust, 1994). Hyperlinks are one such type of linkage (Newman, 2010, p. 5).

For this research I take a social network perspective. Rather than test for correlations or causality between variables where individual observations are assumed to be independent of each other, this approach focuses on the structural relationships between "actors" that are assumed to be *interdependent* (Wasserman & Faust, 1994, p. 4).² Within sociology—an argument that can be extended to communication research—Emirbayer advocates for replacing the dominate "static" view of social processes with a "relational" paradigm that can accommodate "dynamic, unfolding relations" (1997, p. 281). Accordingly the goal of social network analysis, as a set of methods, is to describe and test "patterns of social structure" (Wasserman & Faust, 1994, p. 56). "Social structure" is conceptualized as "a relatively prolonged and stable pattern of interpersonal relations" (Freeman & Romney, 1987, as cited in Wasserman & Faust, 1994, p. 56). Therefore, the variables are structural in nature. These structural "linkages" are "channels for [the] transfer or 'flow' of resources (either material or nonmaterial)" (p. 4). For example, information is one such resource that "flows" through a network. In this case, I am interested in how new media technologies, specifically website hyperlinking networks and the social networking platform Twitter, act as "channels" for the transmission of information through a social movement.³

Social network analysis allows researchers to describe the "actual" structure of social relations—as opposed to idealized network structure—between actors (Phillips, 1991, p. 759). Phillips notes the "interdependence" of network *structure* and the *agency* of individual actors within it. The idea is that the structure of relationships between interdependent "actors"—either organizations or individuals—both supports and at the same time constrains the actions of these actors within a social movement (see Phillips, 1991; Wasserman & Faust, 1994).

 $^{^{2}}$ Each "actor" is an observation. So the units of analysis are these actors, which in my research are going to be social movement organizations (SMOs).

³ Wasserman and Faust consider information transfer to be a "non-material resource" (1994, p. 38).

Data sources and collection. As a mixed method dissertation, this project includes data from multiple sources: hyperlinks between the websites of Global Frackdown partner organizations, in-depth qualitative interviews with representatives of European anti-shale organizations, and messages from the social media platform Twitter related to the Global Frackdown social movement and shale development more generally.

For chapter two, the data comes from the 2012 Global Frackdown. To construct a Global Frackdown hyperlink network I developed a "seed list" of organizational actors based on a website listing of organizational partners for the Global Frackdown 2012 day of action (see Appendix C). The hyperlink data was collected on April 20, 2013 using a web-scrapping tool, Issue Crawler, made available by the Digital Methods Initiative at the University of Amsterdam (Digital Methods Initiative, n.d.). I ran a web crawl set to two iterations, meaning the tool drilled down two pages deep into each of the seed list websites. In order to be included in the network, an "actor," or website node, needed to have hyperlinks to or from at minimum two of the URL starting points in network.

According to the definitive foundational text on social network analysis, Wasserman and Faust (1994) "actors" can include "collective social units," social movement organizations in this case, as represented by their organizational—or group—websites (p. 17). They write, "Further, most social network applications focus on collections of actors that are all the same type" as what are called *one-mode* networks (p. 17). Thus, in this research I study a one-mode network of organizational partners to the anti-fracking Global Frackdown network, as represented by websites as the nodes in the network and hyperlinks between them as the network edges. The web is a "directed network," meaning that hyperlinks are directional edges between them (Newman, 2010, p. 63). Web crawlers can be used to study the structure of hyperlink networks between website nodes (Newman, 2010, p. 67).

To supplement analysis of Global Frackdown hyperlinking patterns, I wanted to trace one strand of the social movement qualitatively to study the content of the ties. My goal was to trace a strand of the anti-shale movement from a Swedish broker organization to the transnational level. Interviewees were selected for their involvement with anti-shale activism on a local level in Sweden or on a regional EU level operating in Brussels. Key spokespersons or representatives from each organization were interviewed. In total, I conducted ten interviews with 12 people (see Appendix D). I then focused my analysis on the interrelationships between five organizations, as reported in interviews with representatives of each group.

For chapter three, I examine a two-week window into the anti-hydraulic fracturing environmental movement trying to gain traction in the public sphere, centered on the transnational Global Frackdown day of action on October 19, 2013. The data for this project comes from a dataset of 9,449 tweets containing the main movement hashtag #globalfrackdown. The data was collected between October 13 and 27, 2013, using the software DiscoverText.⁴ This online platform enables the gathering of a range of social media content, including from services such as Facebook, Google+, and Twitter, as well as for human coding and computer-assisted classification. Data collection was restricted to publicly available Twitter posts for a two-week time period, spanning one week before and one week following the October 19, 2013, Global Frackdown day of action. DiscoverText

⁴ The DiscoverText platform is available from Texifer, LLC at http://www.discovertext.com/ (Textifter LLC, n.d.).

contracts with GNIP, the first licensed Twitter data provider, which provides Twitter posts to the Library of Congress, as well as for other research and commercial applications. This enables researchers to collect data from Twitter's public application programming interface (API). Thus, the dataset of #globalfrackdown tweets can be considered complete and comprehensive for the two-week time period under study.

In addition, as discussed above for chapter two, I conducted in-depth semi-structured interviews with transnational activists working for organizations that took part in Global Frackdown. My goal was to triangulate my analysis of the movement's Twitter practices and learn about their other uses of new media tools to organize against hydraulic fracturing on a transnational scale. Interviewees were selected for their involvement with the movement as transnational coordinators.

Lastly, for chapter four the data was collected using the cloud-based textual analytic software DiscoverText, the same software that was used to collected the data for chapter three. The program allows researchers to collect data from the Twitter "firehose" through the social data provider GNIP. Thus, I was able to collect a full corpse of all tweets for the hashtags under study during a two-week window of heightened contention over the shale industry and hydraulic fracturing technology, from October 13 to October 27, 2013. This date range was selected to cover one week prior to and one week following the day of action against hydraulic fracturing Global Frackdown. Data was collected for five hashtags: #fracking, #globalfrackdown, #natgas, #shale, and #shalegas. A total of 72,195 tweets were collected. The sample was then narrowed to the English language tweets (n=64,973) for analysis. The hashtag #fracking had the highest number of tweets (44,548), followed by #globalfrackdown (7,565), #natgas (5,040), #shale (5,063), and #shalegas (2,757).

Outline of the Chapters

This dissertation includes five chapters. Following this introductory chapter, the second chapter consists of the first article-length piece made up of a macro-level analysis of the Global Frackdown social movement's hyperlink network structure combined with qualitative analysis of one movement strand. In this chapter, I argue that the combination of networked activism with the diffused nature of unconventional shale exploration and extraction has given rise to a new form of natural resource movement, one which fuses the identity-based dynamics of new social movements with environmental justice concerns typical of natural resource struggles in post-colonial contexts. Analysis shows that activism against unconventional fossil fuels brings together very localized concerns about environmental risks associated with extractive industries with more abstract global concerns. Across movement scales, activists viewed non-public listservs as the most important tools for information exchange, as well as the planning and coordination of actions.

In chapter three, the second article-length piece, I examine the content of social movement framing through analysis of the ways in which Global Frackdown tweeters use the social media platform to communicate transnationally "in-the-moment" as events unfold. My findings show that Global Frackdown tweeters engage in framing practices of: movement convergence and solidarity, declarative and targeted engagement, prefabricated messaging, and multilingual tweeting. As I will show, Global Frackdown tweeters integrate personal action frames with collective action frames, as well as hybrid framing practices. The episodic, loosely coordinated and often personalized, transnational framing practices of Global Frackdown tweeters support core organizers' goal of promoting the globalness of

activism against hydraulic fracturing. I term this synergy of local-global framing, which is transnational but also localized, transnational frame jumping.

In chapter four, the final empirical piece of this dissertation, I present an analysis the valence of sentiment about hydraulic fracturing and shale development, as well as levels of certainty of opinion, during a period of heightened controversy over the issue. I analysis proshale and anti-shale sentiment across five hashtags: #fracking, #globalfrackdown, #shale, #shalegas, and #natgas. The results for the #fracking, #globalfrackdown, and #shalegas were majority anti-shale in valence. The results for #shale and #natgas were in their majority proshale. Across all five hashtags, the majority of tweets express certainty. The results indicate statistically significant differences across the hashtags, with some hashtags being more antishale than expected by chance (the general hashtag #fracking and the social movement hashtag #globalfrackdown), while others (#natgas, #shale, and #shalegas) were more proshale in overall sentiment that would be expected by chance alone. These results indicate that, as the general public increasingly gets news about a range of topics including science and technology issues through social platforms, discourse is segmented such that the valence of sentiment audiences are exposed to varies significantly across hashtags related to a given topic. In addition, the level of certainty expressed in tweets varied significantly across hashtags, with the activist hashtag #globalfrackdown having a higher degree of certainty that would be expected by chance. This chapter includes analysis of the actors posting with the hashtag #fracking and those actors receiving the most @mentions for this hashtag.

Lastly, in chapter five I present summative conclusions drawn from the three empirical chapters of this dissertation in relation to environmental communication theory, model the "scaling-out" scale-shift processes of translocal environmental movements, and discuss directions for future research. In addition, I comment on the potentials and challenges of mixed method research within the field of communications.

Chapter 2. Unconventional Fossil Fuels and the New Natural Resource Movements: An Exploration of Network Structure and Tie Content

Digital media enable political movements to maintain weak ties transnationally in new ways. In order to develop models that reflect the realities of networked communicative processes scholars must examine both the underlying network structure and the content of these ties. In this study, I take a two-pronged approach to examine both the network structure and tie content of a transnational movement, Global Frackdown, calling for a ban on hydraulic fracturing, commonly referred to as "fracking," and unconventional shale fossil fuels. First, I take a macro-level snapshot of the movement's network structure, and then examine one European strand of it in more detail. This approach affords a look at the synergy of online and offline movement dynamics. In order to holistically understand the dislocations and disruptions afforded by new media, scholars need integrate methods to shed light on not only a movement's digital traces but also how the people behind who make up a movement are actually using new media tools. In the case of Global Frackdown, I argue that the reconfigured networked relations combined with the diffused nature of unconventional shale exploration and extraction are giving rise to a new form of natural resource movement. These translocal environmental movements fuse the identity-based dynamics of new social movements with environmental justice concerns typical of natural resource struggles in postcolonial contexts. They upend the traditional model of transnational advocacy networks. As I will show, while actors share similar concerns across movement scales network position within movements matter, with actors having divergent roles based on their positionality within a network. My theoretical contribution is to conceptualize actor types within a transnational environmental movement and the dynamics of their interrelationships.

Literature Review

Networked connectivity enables environmental movements to maintain weak ties transnationally more than ever before, affording them new methods for attempting to disrupt socio-political power structures. New media enable environmental activists to engage in efforts targeted at international solidarity (Pickerill, 2003). As past research has shown, organizational structures and collective action processes alike are being reconfigured using new media technologies, which allow individuals to foster larger, more diverse networks of weak ties (Bennett & Segerberg, 2012; Chadwick, 2007; Karpf, 2012; Rainie & Wellman, 2012). Within networks weak, or more distant, ties are more likely to provide new information (Granovetter, 1973). The Internet also enables "organizational hybridity," characterized by lowering transaction costs and reconfigured, more fluid organizational structures (Chadwick, 2007; Karpf, 2012). It facilitates the quicker diffusion of information and the spread of tactical innovations between movement actors (Earl, 2010). New media tools also collapse space and time by allowing for asynchronous communication removed from geographical constraints (Castells, 2009). Within networks, individuals can perform specialized roles (Rainie & Wellman, 2012). As Gould (1991) showed, individual-level informal ties and more formalized organizational linkages interact in mobilization processes. Thus, within networks we can expect that actors, in other words the individuals acting on behalf of collectives, could also occupy specialized roles.

While scholars have examined the effects of what Castells (2009) terms the "Network Society" and its implications for power relations, there is little scholarship on the synergies of macro-level network characteristics with actor types within transnational activist networks and the roles they inhabit within them. While networked connectivity and new media technologies allow activists to transcend movement scales, questions remain as to the dynamics at play within these networks and the specific ways in which activists are connecting with the goal of enacting social change.

Transnational advocacy networks and political ecology. Two core bodies of literature inform this study: transnational advocacy networks and political ecology. Transnational advocacy networks are dense networks of information exchange between non-state actors with shared values and common discourses (Keck & Sikkink, 1998). They can include international social movement organizations working with local groups, foundation, media, and government actors (Keck & Sikkink, 1998). An underlying assumption is that international actors are serving a *helping* function for local groups. What is implied is that Northern organizations (e.g. in the United States, Canada or Europe) are assisting ones in the Global South, or other post-colonial contexts, which are the ones located in in the regions where contention is situated. Such transnational associations are often characterized by uneven participation along North-South lines, with dominance by Northern-based entities (Smith, 2002; Smith & Wiest, 2005). However, international organizations can provide models and resources for organizations in the Global South, which can take on a world polity orientation (Longhofer & Schofer, 2010).

Secondly, political ecology—a sub-discipline of geography, anthropology, and environmental sociology—brings politics and political economy concerns into analyses of environmental issues (Bryant, 1992; Bryant & Bailey, 1997; Watts & Peet, 2004). This theoretical perspective centers on unequal power relations and an understanding that environmental problems are not isolated from their symbolic and material co-construction (Bryant & Bailey, 1997). Underpinning this theorizing is the geographical concept of scale. Scale itself is a socially and politically constructed concept (see Goodman, Boykoff & Evered, 2008). In order to be successful environmental movements need to transcend scales and splinter dominant power relations (Goodman, Boykoff & Evered, 2008). Given a conceptual grounding centered on the politics of post-colonial development, scholarship from a political ecology perspective is often focused on the effects of natural resource extraction in the Global South, indigenous communities or on other marginalized populations (e.g. Gedicks, 2001; Goodman, Boykoff, & Evered, 2008; Watts & Peet, 2004). While a political ecology perspective on contention over natural resources has much to offer analyses of digitally mediated political activism surrounding the environment, there is little theoretical crossover.

Therefore, in this study I examine the network *structure* of the transnational antishale movement Global Frackdown, with a case study of the *content* of a subset of these ties. In other words, I ask:

RQ1: What are the macro-level linkages, or ties, between organizations and activists, and what is the content of those ties? *RQ2:* What are the actor types and their roles within the transnational anti-shale movement?

My analysis addresses both symbolic and material concerns. It is informed by both network theory from political communication and more traditional perspectives on extractive industries from a political ecology perspective.

Study Context: The European Union and Shale Gas

The European Union (EU) has become a hotspot of contention over hydraulic fracturing. Individual EU member states have taken varied policy approaches, with France and Bulgaria banning its use, while the governments of Poland, the United Kingdom, and

Romania favor exploration. The EU presents a contradiction on energy policy. It has laid out a vision of a regional economy where resources are "sustainably managed" in order to reach a climate change reduction target of 80 to 95 percent in greenhouse gas emissions by the year 2050 (European Commission, 2011b). Yet, according to the European Commission's *Energy* Roadmap 2050, following the rapid development of unconventional natural gas production in the United States, natural gas has the potential to be a key resource in the transformation to a low-carbon energy system (European Commission, 2011a). It must be noted that there are important regulatory differences between the United States and European countries when it comes to the oil and natural gas industry. Unlike the United States where mineral rights are head by individual property owners, in some other countries they are owned by the state. This diminishes the strong financial incentives for landowners to agree to the siting of wells on their land. Further complicating the issue, the EU cannot ban hydraulic fracturing; decision-making lies in the area of national competence. However, at a regional level the EU can mandate environmental standards. In November 2013, the European Parliament passed a resolution requiring environmental impact assessments at both the exploration and extraction phases of shale development, among other risk management requirements.

Sweden was the first country in Europe to see shale gas exploration, with Dutch Royal Shell receiving permission to explore for natural gas in approximately 25 percent of the southern region of Skåne from the *Bergsstaten*, or Swedish Mining Inspectorate, in May 2008. While Shell left its Skåne concessions in 2012, reportedly because the results of preliminary three test drillings in the communities of Sjöbo, Hörby, and Tomelilla did not warrant further investigation, a Swedish company, Gripen Oil and Gas AB, currently has gas exploration rights on the island of Öland and the province of Östergötland. Globally, Sweden is a top country in terms of sustainability with a low dependence on fossil fuels and a leader within the European Union in renewable energy (RobecoSAM AG, 2013; Sedghi, 2012). The Swedish government has taken a middle-road approach on shale, making it a useful case for tracing the relations between local and transnational actors opposing the shale industry. Because Sweden was the first country in Europe to see exploration for shale gas in the region, a Swedish organization endorsing the Global Frackdown, Heaven or sHell, is central to my analysis. As I will show it operates as a "broker" organization. Heaven or sHell looks marginal in the macro-level view of the movement but it plays a very important function by linking other, what I term hyper-local organizations, into the broader transnational movement.

Methods

For this research I take a network approach to the study of social life (Wasserman & Faust, 1994). Rather than test for correlation between variables, I study structural relationships between actors assumed to be interdependent, as illustrated by hyperlinking patterns and as reported through in-depth interviews. Hyperlinks reflect a "politics of association" between actors and facilitate exchange of symbolic and material resources (Ackland & O'Neil, 2011; Rogers & Ben-David, 2008). Combining in-depth interviews with social network analysis of Global Frackdown hyperlinking patterns, my goal was to trace one strand of the anti-shale movement from the Swedish broker organization Heaven or sHell to the transnational level. Using snowball sampling to trace the network from the local to transnational level in Sweden or on a regional EU level operating in Brussels. Key spokespersons or representatives were interviewed from each organization. I also interviewed

two geologists from the *Sveriges geologiska undersökning* (GSU), or Geological Survey of Sweden, as well as individuals from the Swedish Friends of the Earth affiliate *Jordens Vänner*, an environmental think tank *Foros* based in Stockholm, and the U.S. branch of a key coordinating organization Food and Water Watch. In total, ten individuals were interviewed. I focused my analysis on the interrelationships between the five organizations, as reported in interviews with representatives of each group. I examine commonalities in how activists frame the shale-related issues; contextualize their work and the relationships between organizations. The unit of analysis is "organization" and the units of observation are nodes and edges in macro-level social network analysis and activist texts in micro-level qualitative case study. I transcribed each and then coded them thematically, iteratively developing a set of working themes employing a grounded theory approach (Saldaña, 2009).

Digital data collection. According to Hansen, Shneiderman, and Smith (2010, p. 185) there are three types of questions that can be addressed with network data: What are the nodes (websites in the case of this research)? What are the network edges (the hyperlinks between websites)? and What are the boundaries to a network? To construct the Global Frackdown network I first developed a "seed list" based on a website listing of organizational partners for the Global Frackdown 2012 day of action. I then collected data on each organization's geographical location, strategic focus, and whether or not they work directly on issues related to shale development. I used an organization's headquarters listing to determine its geographical physical location, rather than locations in which it worked when they where not the same. In cases where a headquarters was not listed, I looked up the organization's web URL in an online Whois domain ownership database as a proxy for organizational headquarters being the location where the domain was registered. After

removing organizations without a website listed and Facebook pages, the seed list for Global Frackdown consisted of 162 URLs.

The hyperlink data was collected on April 20, 2013 using a web-scrapping tool, Issue Crawler, made available by the Digital Methods Initiative at the University of Amsterdam (Digital Methods Initiative, n.d.).¹ I ran a web crawl set to two iterations, meaning the tool drilled down two pages deep into each of the seed list websites. In order to be included in the network, an "actor," or website node, needed to have hyperlinks to or from at minimum two of the URL starting points in network. Given that the software excludes websites which are not co-linked, as well as those which are sub-domains of parent sites, the number of websites, or "nodes" included in the Global Frackdown network is 126, with 371 edges, or connections of at least one in-link or out-link, between them.

I imported the network data into the network analytic software UCINET to examine measures of network density and centrality (Borgatti, Everett, & Freeman, 2002). Using Google Fusion Tables I mapped the full listing of 2012 Global Frackdown partner organizations (N=180). Lastly, I visualized the network and obtained additional network statistics with the open source software Gephi (Gephi, 2012).

Results and Discussion

Network structure of anti-fracking activism. The movement, which presents itself as global, while transnational in scope, is characterized by an uneven geographical distribution of participation. For the 2012 Global Frackdown day of action, there were 180 partner organizations, based in 16 countries. The majority of organizations are North

¹ A web crawler is an automated computer program that "crawls" or scraps the web downloading information from web site link tags from a given starting page, or "seed list" set of web pages. After completing each page the crawler moves on to the next one (Newman, 2010, p. 65).

American, 77%, with 67% of those originating in the United States. The next highest world region is Europe, with 18% (see Figure 2.1). Not all Global Frackdown partners have an apparent link to anti-hydraulic fracturing activism. Rather, they deal with a broad range of social justice themes, including: anti-toxics/pesticides, agriculture and food, landowner associations, legacy ENGOs, river and water advocates, the Occupy movement, climate change, promoting renewables, and anti-nuclear.



Figure 2.1: Global Frackdown 2012 Partner Organizations

In terms of regional integration, the South American, Asian, and Australian organizations were so peripheral that they do not appear at all within the co-link network. The network is also denser within Europe than North America (see Table 2.1 on the next page). The average path length, meaning the number of hops it takes on average to get from any one actor within the network to another, is 3.46 and the diameter, or the longest path within the network, is 10. The undirected graph density is 0.04; while a low score it is higher

than would be expected of the World Wide Web at random (Newman, 2010). Out-degree centrality is a count of a particular website's, or "node," hyperlinks outwardly to other websites within the network. In-degree centrality is a count of the number of hyperlinks pointed inwardly, in an information-seeking sense, toward a given website node from within the network. It can be thought of as a "popularity measure" but one that does not recognize the prominence of each individual node (Hansen et al., 2010, p. 40). With a degree centrality measure all nodes are weighted equally. The website with the highest in-degree centrality score, or in-links, is the main site of *Ecologistas en Acción* (Ecologistas en Acción, n.d.).

Region	Nodes	Out-Degree	In-Degree			
		Centrality	Centrality			
Africa	3	3(M=1)	1(M=0.33)			
Europe	23	5113(M=222)	3,952(M=172)			
North America	100	5,697(M=57)	6,860(M=69)			
Directed density=0.024; undirected density=0.043						
Average path length=3.46						
Diameter=10						

Table 2.1: Network Centralities by Region

The hyperlinking patterns reflect a power law distribution, meaning that nodes display preferential attachment, or that websites with a high number of degrees attract more ties based on their status as hubs within the network (Barabási, 2003), while most websites have few in-links and out-links. Other top actors in terms of in-degree include Friends of the Earth International, Greenpeace, the climate organization 350.org, and several French Canadian anti-fracking organizations, as well as an air quality association and Montreal-based river protection foundation (see Table 2.2). The top ten actors in terms of out-degree scores, meaning those who send the most out-links to other actors within the network include again French Canadian, Spanish, and Friends of the Earth affiliates. The top out-degree

actors also include the Swedish organization Heaven or sHell, which links primarily to 350.org, Friends of the Earth-Europe, and Greenpeace. This means that Heaven or sHell displayed more informational-seeking linkages into the transnational network

	Out-Degree		
1,580	1. Lesamisdurichelieu.blogspot.ca	3,042	
1,413	2. Kologistakmartxan-		
	nafarroa.blogspot.com.es	1,027	
966	3. Altervillarrobledo.wordpress.com	810	
663	4. Heavenorshell.se	651	
567	5. Tierra.org	623	
532	6. Biritemarket.com	533	
521	7. Nofrackingfrance.fr	529	
477	8. Foe.co.uk	445	
438	9. Foeeurope.org	434	
433	10. Vigilancegazo.wordpress.com	429	
	1,413 966 663 567 532 521 477 438	1,5801. Lesamisdurichelieu.blogspot.ca1,4132. Kologistakmartxan- nafarroa.blogspot.com.es9663. Altervillarrobledo.wordpress.com6634. Heavenorshell.se5675. Tierra.org5326. Biritemarket.com5217. Nofrackingfrance.fr4778. Foe.co.uk4389. Foeeurope.org	

Table 2.2: Top Actors

Betweenness and eigenvector centrality. Network centrality is a measure of actor prominence and location within a network (Wasserman & Faust, 1994). An actor with a high degree of centrality is indirectly linked to many others, allowing it to function as a gatekeeper for the transmission of information within a network. There are several measures of centrality. The two I will address here are betweenness centrality, proposed by Freedman (1979), and eigenvector centrality. Betweenness centrality is a measure of the extent to which an actor lies between others within a network, indicating nodes, which are positioned to act as "brokers" or "bridges" for information flow. This means that betweenness centrality can serve as an indicator of "informational linkages" between nodes, in this case Global Frackdown partner organizations, within the hyperlink network. Eigenvector centrality is similar to degree centrality but accounts for the factor that not all nodes in a network are weighted equally (Newman, 2010). A particular node's importance within a network is relative to the rank of the nodes it is connected to. In other words, a website that is linked to a few key, high ranking websites will have a higher score than one linked to more marginal sites (Hansen et al., 2010, p. 41). An early version of the Google PageRank was based on eigenvector centrality (Hansen et al., 2010, p. 41).

. Canadians.org0. Marcellusprotest.org0 Foei.org0.	.057 0.048 .031 .031	Eigenvector Centralities1. Greenpeace.org2. Foodandwaterwatch.org3. Foe.org	1 0.842 0.805
. Marcellusprotest.org 0. . Foei.org 0.	.031 .031	3. Foe.org	
. Foei.org 0.	.031		0.805
•			0.000
Euripernantemenies and	007	4. Foei.org	0.767
. Environmentamerica.org 0	.027	5. Foeeurope.org	0.719
. Globalexchange.org 0.	.024	6. Globalfrackdown.org	0.669
. Foe.co.uk 0	.022	7. Gaslandthemovie.com	0.549
. Acfan.org 0	0.022	8. Foe.co.uk	0.538
. Amisdelaterre.org 0	0.021	9. Canadians.org	0.409
0. Nyagainstfracking.org 0	.021	10. Amisdelaterre.org	0.376
1. Foe.org 0.	.017	11. Tierra.org	0.343
2. Buckeyeforestcouncil.org 0.	.017	12. 350.org	0.338
3. Foeeurope.org 0.	.017	13. Environmentamerica.org	0.294
4. Alternatives.ca 0	0.016	14. Globalexchange.org	0.276
5. Dontfrackmichigan.com 0	0.015	15. Waterdefense.org	0.213
6. Aqlpa.com 0	.013	16. Biologicaldiversity.org	0.203
7. Aitec.reseau-ipam.org 0.	.013	17. Pennenvironment.org	0.200
8. Gaslandthemovie.com 0	.012	18. Energyactioncoalition.org	0.193
9. Greenpeace.org 0.	.012	19. Frackaction.com	0.144
0. Neogap.org 0	.012	20. Credoaction.com	0.136
1. Chej.org 0	.011	21. Alternatives.ca	0.133
2. Nofrackingfrance.fr 0	.010	22. Delawareriverkeeper.org	0.125
	.009	23. France.attac.org	0.122
4. Grassrootsinfo.org 0	.008	24. Environmentohio.org	0.118
	0.007	25. Environmentcalifornia.org	0.115

 Table 2.3: Top 25 Betweenness and Eigenvector Centralities

Note: The scores presented here are on a standardized index, ranging between 0 (low) and 1 (high).

As Table 2.3 above shows, overall the Global Frackdown network's betweenness

scores, normalized to fall between 0 and 1, are relatively low. The top actor 350.org's score

is only 0.057. Betweenness centrality scores indicate that some organizations not within the

top actors in terms of in-degree and out-degree could play an important role in the

transmission of information within the network, e.g. the Council of Canadians and Marcellus

Protest, based in Pittsburgh, Pennsylvania, in the Marcellus Shale region of the United States. Another organization active in the Marcellus Shale region, New Yorkers Against Fracking has been active in lobbying New York Governor Andrew Cuomo to ban hydraulic fracturing in the state. Others are parent or affiliates of legacy environmental organizations Friends of the Earth and Environment America, indicating pre-existing formal organizational relationships (see Figure 2.2).



Figure 2.2: Betweenness Centralities

In terms of eigenvector centrality, the scores are higher, with the international environmental organization Greenpeace having a score of 1, the highest possible, meaning that it is well integrated with other key actors within the network. Greenpeace is followed in terms of high eigenvector centrality scores by the coordinating organization Food and Water Watch, a Washington, D.C.-based nongovernmental organization and consumer rights group focused on issues of water, food, corporate and government accountability. Food and Water Watch owns the domain of globalfrackdown.org, the coordinating platform for the day of action, which comes in fourth for eigenvector centrality, following the U.S. branch of Friends of the Earth. The website for the film *Gasland*, the anti-fracking documentary Academy Award for Best Documentary in 2011, comes in at number seven. The site serves as an organizing platform for the anti-fracking movement, including a "Take Action" section.

On a macro-scale, hyperlinking patterns show that while connections are issue-based, they form synergies around pre-existing formal organizational alliances and relationships. Larger generalist environmental organizations, such as Friends of the Earth and its affiliates, along with issue public actors such as 350.org, that do not work solely on shale issues, help to anchor the network and link issue actors—often local volunteer-run groups targeting a specific shale project or company—into the transnational network and to broader globalized environmental concerns. Next, to explore the content of network ties in detail, I discuss the common concerns and interrelationships between actors in one European branch of the network.

Actor types and roles. In order to examine the *content* of network ties I traced one strand of the network from Swedish organization Heaven or sHell to European Union regional coordinators in Brussels and other Swedish anti-shale groups that do not appear in

the hyperlink network, which I label "hyper-locals." Analysis reveals three actors types: EU coordinators, brokers, and hyper-locals. A distinctive aspect of this structure is the linkage between a regional environmental organization based in Brussels, Friends of the Earth-Europe, and the Swedish broker organization, Heaven or sHell. This structure largely bypasses national-level coordination, in favor of local-local and local-transnational connections (see Figure 2.3).



Figure 2.3: Qualitative Local-Regional European Union Network Ties

The EU-level *coordinators* play a filtering role. Their activities include: regional information sharing, lobbying European Union institutions, providing local volunteers with scientific and policy arguments, as well as aiding in the capacity building of local groups. They espouse a goal of making meaning of complex science for local activists, while seeking

to keep the focus on the local scale. As Heaven or sHell illustrates, the key function of a *broker* organization within the network is to serve as a conduit for information flow between local groups and the transnational scale. An important aspect of it is its locally-rooted, yet globalized orientation. In contrast, *hyper-local* actors are immersed in confronting active exploration projects in their communities. In the Swedish case, like the broker group, they are made up of volunteers. Hyper-locals engage in some national activities but are very focused on their regional situations. All of the activists from local groups, both brokers and hyper-locals alike, contextualized of their activism in terms of local history, with a strong sense of connection to place and concern for local environments.

Common concerns. In this section I detail the common concerns shared across movement scales. As I will show, activists share concerns surrounding water and contextualize risk relative to their perceptions about the experience of the shale industry in the United States. Additionally, themes raised in interviews address the intertwined issues of climate change and economic crisis, as well as shale gas as indicative of an underlying democracy problem. In the view of participants, shale exploration carries undue environmental, health, and social risks to land and local livelihoods. Problems associated with the technology include intensive water usage, toxic chemicals and concerns over cumulative risk, air emissions, a lack of industry transparency and skepticism about the potential of shale gas to serve as a transition fuel to low-carbon energy systems. An underlying element of these risk perceptions is uncertainty about applicability of hydraulic fracturing technology in Europe.

All participants associated hydraulic fracturing with risk, particularly risk of drinking water contamination and intensive water usage. For example, activists from the local group

Rädda Vättern, activists' main concerns with shale gas exploration centered on planned exploration in the lake itself and the potential for contamination of drinking water supplies (Rädda Vättern, personal communication, July 2, 2013). Echoing local Swedish activists, both of the regional European Union campaigners framed concerns over shale gas extraction similarly in terms of water contamination and chemical usage. As a campaigner from Friends of the Earth-Europe stated:

The main issue associated with shale gas and the use of hydraulic fracturing is the way you use the water. I mean all the issues associated with the hydraulic fracturing is how you use the water because then you mix it with chemicals and naturally occurring materials, again water, drinking water whether it's underground or surface water drinking water. It is all related to water in the end. (Friends of Earth-Europe, personal communication, June 17, 2013)

Fracking is a powerful frame activists associated with risk and uncertainties regarding environmental impacts, particularly as related to water.

A common theme was reference to problems with hydrofracking in the United States and a lack of baseline data collected prior to the start of drilling projects. Across scales activists contextualized their opposition to hydraulic fracturing and shale gas development in Europe in relation to their perceptions about experiences with the technology in the United States. In the view of EU campaigners the United States presents poor examples of shale industry practices and unknowns regarding the climate impacts associated with hydraulic fracturing. In the opinion of the Food and Water Watch-Europe campaigner, "The experience in the U.S. shows that there is obviously poor transparency about chemicals, huge impact locally on water supply because it requires such high volumes of water, air emissions associated with fracking" (Food and Water Watch-Europe, personal communication, June 14, 2013). Activists saw shale gas as indicative of an underlying democracy problem, of local communities not having a say in decision-making over environmental governance and natural resource management. Local groups, in particular, framed shale gas extraction in terms of democracy as a root concern. They did not limit their opposition to shale gas to specific technologies; all expressed that they were working within the political system to change national mineral legislation and discussed problems with the national political culture. As a member of Heaven or sHell in Skåne, the most established organization stated:

We've always had these two goals in our campaign. One goal was to change the law and the other goal was to forbid fracking. I guess that's maybe a difference that is quite unique in regard to other environmental groups in Europe because we've have a big focus on the law. We don't just see shale gas and fracking as the problem. We are well aware that there's other minerals, which can have very dangerous problems in extraction. (Heaven or sHell 2, personal communication, June 18, 2013)

Furthermore, local activists felt disenfranchised from the political process and shared a perception of a lack of public consultation in decision-making processes over natural resource extraction. As one individual from Rädda Vättern stated, "You have no control what they [the companies] are doing because they, no one controls seriously what they are doing" (Rädda Vättern 2, personal communication, July 2, 2013). Another echoed that companies are left to police themselves and expressed concern over a lack of government oversight, "In Sweden there is [a lack of government oversight], for industries and for mining companies and for gas companies, it's very much up to the company to control itself" (Rädda Vättern 1, personal communication, July 2, 2013). Like other local activists, he drew connections to other non-shale extractive industries sectors, "In the northern part of Sweden where we have lots of mines, five out of seven mines are letting too much poison out in the environment, more than they are allowed to but not one single mining company has been in a court of law" (Rädda Vättern 1, personal communication, July 2, 2013). Local groups drew connections to past natural resource struggles and also contextualized their understanding of shale gas in relation to previous struggles and personal activism.

Shale gas and hydraulic fracturing are interlinked to larger issues of action on climate change and within the context of economic crisis. In the European Union, member states control their energy mix while the European Commission dictates environmental regulations and climate targets at the regional European Union level. According to both Swedish and EU campaigners, post-2007 in the context of the Eurozone economic crisis at the EU level discourses have been affected by a sense of climate fatigue. As a member of the hyper-local Swedish group AMFÖ stated, climate change work cannot be done globally and must be addressed locally, "We must in Sweden take a big discussion about fossil fuels and the environmental problems that we are standing in front of so fracking is part of a bigger problem" (AMFÖ, personal communication, June 25, 2013). As a EU coordinator pointed out, opposition was not limited to fracking itself but rather included fossil fuels in general, "It's not just the technology that we're against. We're just against this whole idea, even if you could come up with a 'green' fracking or, or somehow get it out without fracking it would still be a problem around carbon budgets and how much can we actually get out of ground without getting beyond that two degrees [climate] target" (Food and Water Watch-Europe, personal communication, June 14, 2013). Similar to other extractive industry sectors, antishale activists work to refute industry arguments about economic development and job creation. In the words of the Friends of the Earth-Europe campaigner, "We also see a clear risk for our economy. We see more and more when you look behind the facts even the economies of shale gas doesn't work. We see that a lot of U.S. operators are currently in

bankruptcy because the principle the way it works simply doesn't seem to be working with all the boom and bust cycles" (Friends of the Earth-Europe, personal communication, June 17, 2013).

While opposing the shale industry and the continued investment into fossil fuels, activists presented a vision for an alternative energy future and drew local-global connections. Activist groups, in the words of one hyper-local activist, act in "small cells" in each locale but build relationships and strengthen weak ties across scales to bolster their respective activism through drawing on shared concerns and experiences, as well as scientific and technical information (AMFÖ, personal communication, June 25, 2013). In the following section I discuss how anti-shale activism is mediated and scaled-up through network ties.

Scaling-up anti-shale activism. The broker organization Heaven or sHell plays a key role in mediating information between the local scale to a transnational one. The organizations are not organized in a directly linear fashion in the path from Sweden to Brussels, meaning that the relations do not facilitate a linear scaling-up relationship from local groups to national ones and then to the regional European Union level. Rather, the network is organized such that Heaven or sHell has established a relationship to Friends of the Earth-Europe in Brussels, which is in turn connected to Food and Water Watch-Europe (see Figure 2.3). In turn, Heaven or sHell serves a brokering, or bridging function, being between the regional EU organizations and the hyper-local groups in Östergötland and on the island of Öland. The network is structured such that the hyper-local groups are linked to regional and global organizing through Heaven or sHell. The organization, in particular, has a regional, or more globalized, worldview. In the words of one of its leaders it is not a NIMBY group, "That it's that ground or that ground. It's a problem. You don't have to have it

in your garden to be concerned and say this is wrong" (Heaven or sHell 1, personal communication, June 18, 2013). Another member concurred:

We were very clear about that. We said we don't want it here and we don't want it anywhere. Because we are understand and we see the global aspect. We have been working about climate aspects. So it's the environmental concerns for the local people and for the globe, and I feel that's one of the aspects that has made us so successful because people who are, really understand and believe that we have understood that this is the normal way to go. We always stated very clearly that don't invest money into shale gas. Invest it into alternative energies instead. (Heaven or sHell 2, personal communication, June 18, 2013)

Since Heaven or sHell was one of the first organizations to take on a shale gas project within Europe in early in its fight against Shell it could only get information from the United States on shale gas. It is possible this has shaped their more global outlook. New media technologies power local groups like Heaven or sHell to bypass national environmental organizations and network with like-minded organizations on a transnational level.

Heaven or sHell members named Friends of the Earth-Europe as a central node in the European anti-fracking movement. They work together by exchanging information and according to Heaven or sHell Friends of the Earth-Europe serves as a filter. According to a Heaven or sHell member, "It's an exchange of information. We get information from Friends of the Earth; we provide them with information on what is going on here. I would see Friends of the Earth is like the center and all the other groups in Europe are circulating around them and so we can take part of each other's experiences" (Heaven or sHell 2, personal communication, June 18, 2013). So in connecting with regional ENGOs like Friends of the Earth-Europe and the hyper-local groups like those in Östergötland and on the island of Öland, Heaven or sHell is a key national hub and bridging actor between the local scale in Sweden and transnational activism against shale development in Europe and globally.

There is a division of labor within the Swedish anti-shale groups, with the longer established organization Heaven or sHell focused on national questions, as well as regional EU-level policy, and the other two local groups more focused on organizing against the ongoing Gripen Gas exploration in their respective local regions. In this division of labor, Heaven or sHell members seek to share the knowledge they have accumulated over the past five years with other more-locally focused groups in Sweden. According to one of the network's leaders, "We've been working now five years and we are not doing it just for ourselves and I think that, that gives us respect" ((Heaven or sHell 1, personal communication, June 18, 2013). According to another Heaven or sHell member the other two Swedish groups are very regionally-focused:

They are very regional and they can work on the island or around the lake but they have never reached as far as we have while we were working with the national politicians and on the other hand they know, of course, we have been doing this so they don't probably really see why they should do it. Since they know that we have the contacts. So they are fighting on their local areas and they leave the rest to us. (Heaven or sHell 2, personal communication, June 18, 2013)

According to Rädda Vättern members, they do not work at the European Union level because of limited resources, such as volunteer time and financial resources. In the perspective of the individual from AMFÖ, "Heaven or sHell has been in Brussels and Strasbourg to talk with the politicians in the EU. So I think that they have done, they have been doing a great job in [the] EU and we are so, our organization is so small. Heaven or sHell is much bigger than us and have more resources" (AMFÖ, personal communication, June 25, 2013). Thus, Heaven or sHell acts as a transnational bridging actor. Its members see their website, in Swedish, as a resource for other groups and interested individuals and as a platform to share information with others facing similar issues, as well as to show solidarity with international struggles against unconventional fossil fuels, such as projects in neighboring Poland.

The use of specific new media tools reflects the preferences of individual activists, movement scale, and resource constraints. On the local level, face-to-face organizing, helped by the use of social media tools to make initial connections, is the most important method for mobilizing opposition to shale projects. It is crucial to distinguish between internal and external use of tools. Regardless of scale, activists reported using traditional methods of press work to reach policymakers and other institutional actors, such as press releases and efforts to get radio and television coverage, along with new media tools, such as YouTube and websites, to reach local populations. For example, in the case of Heaven or sHell, it started with a Facebook page. According to one member, "It was not professional but it was a Facebook group, and we had our webpage and we used Twitter not very much but we did. We used newsletters, press releases. Then what else? You name it. YouTube, we have a YouTube channel. We can see that moving pictures are a very good way to transport a message so we subtitled two movies actually" ((Heaven or sHell 2, personal communication, June 18, 2013). The most useful tools for internal movement are ones that facilitate interpersonal information exchange more directly for internal movement coordination, as well as those which help activists generate new ties upon which they can then build relationships offline rather than more episodic, externally-focused ones.

Interestingly, activists consistently reported that the most important networking tools on a transnational scale are closed listservs. Private communications via listservs help movements like Global Frackdown to persist over time and space by enabling activists to enhance trust in diffused networks and maintain weak ties. In particular, listservs are a space for activists to mediate and make sense of complex scientific and technical information, as well as to connect with experts. According to a Heaven or sHell member, "We have these experts in all the countries and as you can imagine it is a flood of mails that is coming in but I know exactly if there is a mail from [U.S. activist] I just need to see what she is writing and by now I know I can rely upon her information" (Heaven or sHell 2, personal communication, June 18, 2013). In the words of one of the EU coordinators listservs are more important than social media:

Honestly, I do not see it [social media] as the most powerful tool of communication in that campaign. I mean the best way we have to share information is mostly to use internal listservs that representatives of national groups have joined over the last two years. So it is a really good way, and a really efficient way, to share information that we don't necessarily want the industry to be aware of. (Friends of the Earth-Europe, personal communication, June 17, 2013)

It is likely that since hydraulic fracturing and shale gas in particular has become such a highly controversial issue, that activists pay heightened attention to maintaining and relying upon private means of movement communication.

Activists' rationale for transnational movement building is based around the idea that in order to confront transnational corporations (TNCs) they themselves must organize transnationally. Through a national hub like Heaven or sHell, hyper-local groups are linked into a transnational social movement against shale gas. In the words of a Heaven or sHell activist, "We are an international network today, or an international movement if you want. That's a big change from the beginning 2008, 2009 when we were five lonely people in Skåne and Shell was entering" (Heaven or sHell 2, personal communication, June 18, 2013). Heaven or sHell members expressed that the struggle against Shell had made them strong, emphasizing global connections between localized movements. "The last movie I saw was the Polish movie from Lech Kowalski. Chevron was dealing in Poland and you could hear exactly the same arguments that you would hear from Gripen Gas when they have a meeting on Öland and that you have when Shell is speaking in Skåne or anywhere in the world" (Heaven or sHell 2, personal communication, June 18, 2013). The Food and Water Watch-Europe staffer echoed this sentiment: "It's an international struggle. It's international companies so I think we have to be organized also sort of internationally, share experiences and then the U.S. experiences are quintessentially demonstrating how this is a bad idea" (Food and Water Watch-Europe, personal communication, June 14, 2013). By linking into a transnational network against shale gas, local groups are able to share information and in a more traditional sense gain solidarity and international support from transnational advocacy networks.

While the two Swedish hyper-local groups, AMFÖ and Rädda Vättern, do not appear in the Global Frackdown hyperlink network they are indirectly linked into it through the broker organization Heaven or sHell. As I have shown, Heaven or sHell looks fairly marginal to the movement based on hyperlinking patterns but as a qualitative analysis indicates it is in a strategic position of linking the hyper-locals to the broader transnational movement. A focus on the international scale obscures the role of globally minded local groups in mediating global issues back to the hyper-local scale. While international ENGOs play a coordinating role, local groups with a global worldview can connect transnational movements to the hyper-local scale by networking with groups that are too small to appear in a transnational network.
Conclusions

Activism against unconventional fossil fuels brings together localized concerns about environmental risks associated with extractive industries with more abstract global concerns. Drawing on legacy environmental activism combined with grassroots organizing, centered around the rallying cry of banning fracking, Global Frackdown brought together a diverse range of organizations and activists, while appropriating tactics from earlier Internetmediated social movements. The movement faces challenges similar to those of traditional transnational advocacy networks, including the predominance of English, which presents barriers to participation for those who either do not speak the language or who have limited capacity to do so, limited resources such as volunteer time and money, a high bar to learning about the industry and regulatory frameworks, and keeping up with the latest science on issues such as methane emissions. In this area, listservs are particularly helpful by enabling activists to engage in group sharing practices, fostering a collective movement intelligence that builds on the synergies of networked connectivity and pre-existing formal organizational relationships. In addition, while organizations in 17 countries endorsed the 2012 Global Frackdown, the day of action in 2013 saw events planned in more than 25 countries, with an increase in representation from the Global South (Food and Water Watch, 2013). However, consistent with what I have shown, participation is weighted towards the United States, Canada, and Europe. At present is that the majority of linkages are between North American and European organizations. However, the movement's future development, in light of the predicted continued expansion of the shale industry, along with activists' ongoing efforts to strengthen North-South ties, remains to be seen.

The new configuration of environmental movements is that in order to be successful they need to win both in material and symbolic terms, meaning in physical places and also in digitally mediated spaces. The face of transnational environmental activism is changing; by necessity movements need to be active in both realms. This is where political ecology becomes a useful concept in focusing on both material and symbolic elements of contention over natural resource extraction (Bryant, 1998; Schmink & Wood, 1987). Movements like Global Frackdown are upending traditional notions surrounding the geopolitics of extractive industries such that more affluent communities in the United States and Europe are now the sites of, or potential sites of, shale exploration and commercial development, along with traditionally exploited post-colonial areas of the Global South and marginalized communities in the North. From the perspective of activists in the Global North natural resource extraction is no longer just something that happens in faraway places. This dynamic disputes the helper notion of transnational advocacy networks. Underlying this paradigm shift is that wealthier communities are now potentially affected areas too. Geography still matters a great deal, but with the realization that extractive industries are sited both there and here. This opens up the potential for activists to build network ties along the lines of affected-potentially affected connections, rather than a North-South dynamic. Places are traditionally on the aid-receiving end of transnational advocacy networks are locales where shale development is only now starting to get underway.

Based on the research discussed in this chapter, I theorize the emergence of a novel subset of natural resource movement, *translocal environmental movements*, drawing on scholarship in the area of New Social Movements (NSMs) (see Johnston & Klandermans, 1995). The key dimensions of this conceptualization are: bringing together material and

symbolic concerns, linkages across affected and potentially affected communities in at least two world regions, a sense of shared interests and goals (e.g. ban fracking, global solidarity), framing in terms of both local concerns (e.g. water, land use) and global ones (e.g. climate change, disrupting the power of transnational corporations). These movements are bringing the *local* back in with small networked cells interlinked with each other, loosely coordinated with the support of social movement organizations, interest groups, and in some political contexts, such as the European Union, left-leaning political parties. In its idealized typecasting, within a New Natural Resource Movement, local groups take the lead in driving activism forward, with minimal coordination by legacy ENGOs and larger civil society organizations.

Translocal environmental movements bring historically environmental justice concerns surrounding the siting of extractive industries to mainstream environmental activism and offer the potential for more equal exchanges between environmental organizations in United States, Canada and Europe with those in the Global South. They afford opportunities to bridge historical divisions between more wealthy ENGOs externallyfocused outside their nation-state of origin but who now find their home countries are also the sites of drilling interest.

Chapter 3. Hashtagging Politics: Transnational Environmental Movement Twitter Practices

The Twitter generation filters political activism through personal relationships. There are more than 500 million tweets sent every day, equaling an average of 5,700 tweets per second (Krikorian, 2013). The majority of Twitter users (77%) are located outside of the United States and use the service at least partly via a mobile device (78%) (Twitter, 2014). Most research on social movement uses of the social media platform has examined largescale movements, such as the 2011 Arab Spring revolutions in the Middle East (e.g. Papacharissi & Fatima Oliveira, 2012; Parmelee & Bichard, 2012; Meraz & Papacharissi, 2013). In the case of social movements that do not reach a wider tipping point, I argue Twitter functions as a performative, identity-building space, more than a means to reach external audiences. In this chapter, I examine a two-week window into an environmental movement trying to gain traction in the public sphere, centered on a transnational day of action calling for a ban on the oil and natural gas industry technology hydraulic fracturing, called Global Frackdown. I will show how this transnational movement mediates between local environmental issues and global organizing. I contend that Global Frackdown's Twitter practices function as a form of "organizationally-enabled connective action," as theorized by Bennett and Segerberg (2013). However, as I will show, Global Frackdown tweeters integrate personal action frames with collective action frames, as well as engage in hybrid framing practices, that I describe as transnational frame jumping. The episodic, looselycoordinated and often personalized, transnational framing practices of Global Frackdown tweeters support core organizers' goal of promoting the *globalness* of activism against hydraulic fracturing.

As I will show, Global Frackdown activists use Twitter as a tool to advance a transnational anti-fracking movement and to bolster the moral authority of the movement, as well as to forge linkages between localized groups on a transnational scale. Twitter enables activists in diverse geographical locations to connect in-the-moment and feel part of something larger. Thus, Global Frackdown tweeters use Twitter to enhance the globalness of the day of action and to quickly learn what is happening or has happened in other locales. This enhances a sense of solidarity and supports the development of a movement collective identity centered on banning fracking. This research extends past scholarship on digitally mediated activism by providing a case study of how activists use Twitter for in-the-moment internal movement communication (see Segerberg & Bennett, 2011).

Literature Review

Social technologies and the networked society. Social media and social networking sites are configured around the principle of convergence, a term which Jenkins (2006) applies to the technological and cultural changes enabled through new media content. New media enhance individual autonomy and enable collaboration between individuals across wide geographical distances (Benkler, 2006). Furthermore, social networking sites allow individuals to construct self-representations in reflexive interaction within their social networks (Papacharissi, 2011). Individuals pick and choose what messages, or frames, enhance their identities. Social networking sites afford both the development of communities and identity expression (Papacharissi, 2011). These changes underlie what Benkler (2006) has termed the "networked public sphere" and Castells (2009) calls the "network society" centered on "mass-self communication." Both formulations of this phenomenon are

predicated on the fundamental shifts in social relations and systems enabled by new and social media tools.

In particular, social media applications, such as Twitter, are making possible reconfigured and networked social relations. Twitter is a broadcast-like microblogging platform, as opposed to social networking sites such as Facebook where individuals generally know their contacts in the offline sphere and posts are usually to some degree private (Murthy, 2013). The platform is similar to older broadcast communication technologies, but according to Murthy (2013) has the following characteristics: public, multicast (many-tomany), interactive, and networked (p. 16). Thus, microblogging platforms like Twitter bring together functions of broadcast media with that of face-to-face communication and facilitate what Marwick and boyd (2010) term "context collapse." Twitter users can tweet to people they do not know offline, for example U.S. President Barack Obama (@BarackObama) in the hopes of getting their attention. This form of "directed interaction" makes the service distinctive (Murthy, 2013). Furthermore, hashtags and retweeting enable conversations (boyd, Golder, & Lotan, 2010; Honeycutt & Herring, 2009). Retweeting is a practice in which users forward or share the messages originating from other users, allowing frames to potentially to gain traction or momentum in the Twitter-sphere (Murthy, 2013). Hashtags, marked by the "#" symbol, allow for indexing of content, what Zappavigna (2012) calls "searchable talk," so that users can following discourse about specific topics and see what other users they do not themselves follow are saying about an issue.

Mass media-rooted gatekeeper roles are also shifting with social technologies. Traditionally, as Koopmans (2004) writes, discursive opportunities are afforded and constrained through mass media-dominated selection mechanisms of visibility, resonance,

and legitimacy. Within a media-oriented model of discursive opportunities, there are two types of actors: speakers of messages (e.g. social movement actors) and gatekeepers (e.g. media). Recent research has shown how Twitter permits users to challenge mass media gatekeeper functions (Papacharissi & Oliveira, 2012; Meraz & Papacharissi, 2013). Individual users can gain prominence through what Meraz and Papacharissi (2013) term "networked gatekeeping," the networked framing processes within hybrid and fluid information streams and with the collaborative crowdsourcing of information on events such as the Egyptian revolution of 2011. Papacharissi and Oliveira (2012) find that Twitter hashtag indexing (e.g. #egypt) functions as "affective" news streams, characterized by a mixture of emotion and opinion combined with information-sharing, which are often personalized. They suggest hashtags can function as frames and that the resultant news streams challenge traditional norms of objective journalism (Papacharissi & Oliveira, 2012). In related research, Christensen (2013) finds that in the case of the 2012 U.S. presidential election, the third-party candidate for the Green Party Jill Stein engaged in a practice he labels "hashtag jumping" to draw on the hashtag frames of preexisting social movements in an effort to build on preexisting discourses and conversations in disseminating a related message.

From collective action to connective action. Organizational structures and collective action processes alike are being reconfigured through new media technologies, which allow individuals to foster larger, more diverse networks of weak ties (Bennett & Segerberg, 2012; Chadwick, 2007; Karpf, 2012; Rainie & Wellman, 2012). Within networks weak—or more distant—ties are more likely to provide new information than one's strong, or close, ties (Granovetter, 1973). New media tools collapse space and time by allowing for

asynchronous communication removed from geographical constraints (Castells, 2009). While social movements have historically been networked, with digital tools such as social media and social networking platforms, they are now networked in more public and traceable ways (Latour, 2011). Digital tools open possibilities for movements to be simultaneously enacted on local and global scales, in offline places and online spaces, through the collapse of space and time (Castells, 2012). While networked connectivity and new media technologies allow activists to transcend movement scales, questions remain as to the specific spatial dynamics at play within these networks.

New media are enabling a shift from traditional forms of collective action to what Bennett and Segerberg (2013) term "connective action." In seminal literature, Olson (1965) showed how collective action is not an inevitable outcome of shared grievances or collective interests. Social movement theorizing post-Olson, particularly by U.S. scholars, has focused on the role of organizations, starting with the attempt to explain the U.S. Civil Rights Movement through the development of Resource Mobilization Theory (McCarthy & Zald, 1973; 1977) and later the political opportunities approach, attentive to the opportunities and constraints afforded by political structures (McAdam, 1982). The use of technology to coordinate and manage movements is not a new phenomenon, but as Bennett and Segerberg (2013) argue, while organizations are still important they are now less so. Rather they conceptualize an emerging form of "organizationally-enabled" connective action with the following dimensions: loose coordination in diffused networks, with individuals able to customize social technologies for their own purposes, and the rise of personal action frames (Bennett & Segerberg, 2013). They propose a second type of connective action in "crowdenabled networks," characterized by little or no formal organizational coordination (p. 47).

My research focuses on the "organizationally-enabled" form of connective action and is unique in dealing with a set of demonstrations that are explicitly transnational in nature. In addition, my research addresses an issue that integrates local and global aspects of a controversial environmental issue.

Past research has examined the ways in which activists use social media and social networking sites to organize and coordinate demonstrations (Hanna, 2013; Segerberg & Bennett, 2011). In research on two climate change protests, Segerberg and Bennett (2011) show how Twitter feeds reflect the "crosscutting networking mechanisms" of protest ecologies, "crowd-as-gatekeeping" processes in real time Twitter streams, and evolve over the course of protest events. They suggest the need to analyze social media as serving internal organizing functions for movements and also as reflections of organizational progresses. In related research, using Facebook data on the Egyptian April 6 youth movement, Hanna (2013) examines mobilization patterns prior to and following a preplanned protest event, showing that messages about mobilization increased near to the events themselves. In this study, I seek to build on this past scholarship by examining activist Twitter practices in a movement centered on a pre-planned set of loosely coordinated protest events and that is explicitly transnational in nature. The qualitative nature of this study allows me to look in greater detail at the content of the data than the large-scale big data analysis of chapter four. This iterative nature of qualitative research gives a more nuanced understanding of the communicative processes embedded within the content. Thus, I ask:

 RQ_1 : What Twitter strategies do Global Frackdown activists use to mobilize for the October 19, 2013 day of action?

I conceptualize of "Global Frackdown activist" to include core organizers working in a sustained manner, beyond episodic participation in Global Frackdown day of action events, at the local, national, or transnational level to promote moratoria or bans on the use of hydraulic fracturing in the oil and natural gas industry.

Social movement framing in digital networks. Part of the power of advocacy networks and movements derives from their ability to draw on themes of justice and develop a sense of moral authority, what Beck (2011) refers to as the "power of public awareness." Activists build movements based around common, shared meanings. Rooted in symbolic interactionism, these "frames" are interpretative devices that give meaning to situations and make certain elements of a narrative more prominent (Blumer, 1969; Entman, 1993; Goffman, 1974). Movements generate what scholars refer to as collective action frames (Gamson, 1992). These shared meanings provide a framework for movement activities (Benford & Snow, 2000). They are culturally-bounded and can be studied as the properties of social movement organizations (Snow, 2004). Collective action frames are adversarial and depend on a clear target that is responsible for the injustice upon which a collective "we" can take action (Gamson & Meyer, 1996). "Master frames" are collective action frames which have expanded to encompass the activities of multiple movements, such as global justice (Snow, 2004). Collective action frames help movements construct collective identities, which Melucci (1995) defines as the outcome of interactive processes through which groups of individuals co-construct shared definitions of social relations and actions. Olesen (2011) argues that social movement framing on a transnational scale needs to be studied within the context of discursive opportunity structures. Furthermore, Olesen he defines transnational activist frames as those concerning transnational topics (e.g. climate change), issues in

nation-states other than that of the one promoting a given frame, or those that explicitly call on the attention of activists in other countries (Olesen, 2011, p. 14).

With the rise of digitally-mediated activism, recent scholarship has examined the shift to more personalized forms of political action (see Bennett & Segerberg, 2013; Castells, 2012; Papacharissi, 2011). Communication itself is a form of organization (Bennett & Segerberg, 2013). For example, Fuster Morell (2012) argues that new information communication technologies enable "self-mobilization" by providing individuals a "common framework" upon which to take action. In a similar vein, Castells (2012) argues that horizontal, multimodal communication networks allow for individuals to engage in autonomous forms of "mass self-communication," outside of the control of governmental and corporate actors. Within this context, Bennett and Segerberg (2013) propose the concept of "personal action frame"—as opposed to collective-identity and organizationally-rooted collective action frames-with the dimensions of: technological openness and spreading through social media, symbolic inclusiveness (e.g. the Occupy movement's "We are the 99%" meme), inclusive and easy to share. These personalized frames do not require an individual to buy into an in-group collective identity, but rather they are action-centric. Within this reformation of activist framing processes, organizations take a backseat to individuals. Even in cases of organizationally propagated frames, frames are often personalized.

Thus, this shift presents a fruitful area of research in which to examine the relationship between collective and personalized framing practices with the messages activists put forth within digitally mediated discursive spaces. Specifically in this study, I

explore the framing practices of a transnational, cross-linguistic movement that develop in the diffused discursive space of the Twitter-sphere. Thus, I ask:

*RQ*₂: How do Global Frackdown tweeters frame protest against hydraulic fracturing?

I define "Global Frackdown tweeter" as individual and organizational Twitter users who tweet at least once in the Global Frackdown dataset in favor of the movement, for example by sharing information about events, declaring support for the movement, calling on others to join the movement in general or specific events.

The website globalfrackdown.org serves as an organizing platform for the movement, as well as a Global Frackdown listserv, according to a Food and Water Watch staff member (personal communication, August 8, 2013). In a toolkit available on the Global Frackdown website, organizers suggest planning events that target elected officials, build the movement around the goal to ban fracking, and raise the visibility of the movement, such as: collecting petitions and photo petitions, passing out flyers, hosting a potluck, holding a rally or flash mob, or screening the movie *Gasland* (Global Frackdown, 2013). Movement tactics include: advancing ballot measures, advocating for bans, moratoria, and local referenda, as well as pressuring policymakers to study the impacts and risks associated with the shale industry. The movement's overarching goal is to build a global anti-fracking movement and global solidarity across widely dispersed local anti-fracking groups. This raises questions about how their specific Twitter communication practices do or do not move them towards achieving that goal.

Methods

Data collection. The social media data for this project comes from a dataset of 9,449 tweets containing the main Global Frackdown movement hashtag #globalfrackdown. The data was collected between October 13 and 27, 2013, using the software DiscoverText.¹ The online platform enables the gathering of a range of new media content, including from social media services such as Facebook, Google+, and Twitter, as well as for human coding and computer-assisted classification. Data collection was restricted to publicly available Twitter posts for a two-week time period, spanning one week before and one week following the October 19, 2013, Global Frackdown day of action. DiscoverText contracts with GNIP, the first licensed Twitter data provider, which provides Twitter posts to the Library of Congress, as well as for other research and commercial applications. This enables researchers to collect data from Twitter's public application programming interface (API). Thus, the dataset of #globalfrackdown tweets can be considered complete and comprehensive for the two-week time period under study.

In addition, I conducted in-depth semi-structured interviews with three transnational activists working for organizations that took part in Global Frackdown in order to triangulate my analysis of the movement's Twitter practices and learn about their other uses of new media tools to organize against hydraulic fracturing on a transnational scale. Interviewees were selected for their involvement with the movement as transnational coordinators. I transcribed each interview and then coded them thematically, iteratively developing a set of working themes employing a grounded theory approach (Saldaña, 2009).

¹ The DiscoverText platform is available from Texifer, LLC at http://www.discovertext.com/.

Data analysis. Texts need to be studied with attention to the sociocultural context and practices in which they were created. My grounded-thematic analysis coding was rooted in a rich understanding of the movement developed through a year and a half of background research, including studying of publicly available websites and online documents, as well as interviews with movement organizers. I also paid attention to the structural constraints of Twitter's 140-character limit.

To analyze the Twitter data I went through a two-step coding process. I first coded the full dataset for language. Within the dataset, 79% of tweets are in English, followed by 14% in Spanish. The remaining seven percent of tweets are in: Basque, Bulgarian, Catalan, Dutch, French, German, Polish, Romanian, Russian, Swedish, and Turkish. After coding for language, I restricted my subsequent analyses to the English (n=7,678) and Spanish (n=1,314) language tweets.² Following Gamson (1992), in the second step of the coding process I iteratively developed a set of working themes for content and process (see Table 3.1: Working Themes). The unit of analysis is the individual tweet. Each tweet could be coded for more than one theme. Retweets are included in the corpus of data.

² The Spanish language tweets were coded and analyzed by the researcher.

Theme	Description
Alternative Futures	Advocating for renewables and clean energy; to get off fossil fuels.
Astroturf	Prefabricated messaging put forth by core organizations; text of organizationally- suggested tweets.
Call to Action	Requests to join the movement in general or specific events; tweeting itself as action.
Declarative	Stating why a user is taking part; contextualized in terms of personal identity.
Emotion	Use of exclamation points and feeling.
Informational	Providing information about event logistics; background and issue context.
In the Moment/Event Reporting	Live, in the moment sharing of photos and other media from events; links to media coverage of Global Frackdown events.
Movement Convergence	Mention of other social movements (e.g. Elsipogtog and Idle No More, Power Shift).
Multilingual	Containing more than one language, including hashtags.
Refute Movement	Tweets that seek to undermine the movement, show support for shale industry (e.g. emphasis small size of demonstrations). Language that mocks movement and/or activists.
Risk	Mention the possibility of harm or negative impacts of hydraulic fracturing.
Solidarity	Messages of support to other activists (general and event specific); emphasis on globalness, e.g. not here, not anywhere.
Targeted Engagement	@mention of elected officials, other activist users with appeals to take specific actions, e.g. ban fracking.
Urgency	Emphasis on the need for swift action and breaking nature of events.

 Table 3.1: Working Themes

In order to assess the validity of the coding method, I created a random sample (n=250) of the English language tweets and employed a second coder to independently code the sample in addition to myself. The two coders coded the sample for the final themes included in this write-up of the findings (see Table 3.2 for the descriptions provided to the second coder).

Theme	Description
Call to Action	Requests to join the movement in general or specific events; tweeting itself as a form of action.
Declarative Engagement	Stating why a user (individual or group account) is taking part; contextualized in terms of personalized identity (e.g. a users tweeting about being on their way to a demonstration, making a sign for Global Frackdown, etc.) Use of "I" or personalized, declarative "we" language.
Event Reporting	 Live, in the moment sharing of photos and other media from events; links to media coverage of Global Frackdown events. Reporting from or about Global Frackdown events, either a single event or multiple events, such as ongoing live news reporting or a user sharing a picture or image from an event. Can include sharing of images/pictures the user may not have taken themselves.
Informational	Providing information about event logistics; background and issue context, can include news sources.
Movement Convergence and Solidarity	Mention of other social movements (e.g. Elsipogtog and Idle No More, Power Shift). Messages of support to other activists (general and event specific); emphasis on globalness, e.g. not here, not anywhere.

 Table 3.2 (part 1): Final Themes

Containing more than one language,
including hashtags, e.g. #FrackingEZ is
Basque for "no fracking" or #FrackingNo is a
Spanish hashtag.
Prefabricated messaging put forth by core
organizations; text of organizationally-
suggested tweets (refer to the list on the next
page for the text to watch for). Use this code
when the text of a tweet is exactly or in part
the same as the organizationally-suggested
messages.
@Mention of elected officials, media outlets,
other activist users with appeals to take
specific actions, e.g. ban fracking, or to share
information among users about event
logistics, etc.
Tweets that seek to undermine the
movement, show support for shale industry
(e.g. emphasis small size of demonstrations).
Language that mocks movement and/or
activists.

Table 3.2 (part 2): Final Themes

While there is not a definitive standard for acceptable levels of intercoder reliability, levels above 0.80 are generally considered to be sufficient (Lombard, Snyder-Duch, & Campanella Bracken, 2002). Two measures of intercoder reliability were used to assess agreement between the coders. The scores for both measures were slightly lower than desired, Krippendorff's Alpha (0.749) and Fleiss' Kappa (0.73). The problematic category was that of "multilingual tweeting," with a score of 0.00, measured in Krippendorff's Alpha. This is partly because of a low occurrence of this theme in the English language tweets (one coder coding 1 item in this category and the other coder 3). In order to resolve this issue, I created a new random sample of the English language tweets (n=200) and provided the second coder with clarification on what constituted "multilingual" text in terms of hashtags (#manifencours, #gazdeschiste, #schaliegas, #steenkoolgas, #handelsabkommen) in addition

to those originally provided. In addition, the two coders also coded the new reliability sample for two other themes with Krippendorff's Alpha reliability scores below 0.70: "movement convergence and solidarity" (0.63) and "targeted engagement" (0.66). The second coder was provided additional clarification on these two codes. For "movement coverage and solidarity" the second coder was told "keep in mind that it includes references to worldwide, globalized action or action that is collective in nature, transcends single locality. As in 'we're all in this together...' type language. Also references to specific other movements, such as #INM, #IdleNoMore, #Elsipogtog and #Powershift." For "targeted engagement" the second coder was told "keep in mind that it includes @mentions of other users to share information and cite them, as in something like '@XX is having this demonstration on Saturday...' or 'people from @XX organization held a Global Frackdown protest on Saturday."

For the second round of intercoder reliability coding, the scores for Krippendorff's Alpha (0.78) and Fleiss' Kappa (0.87) improved. For the individual items, the Krippendorff's Alpha scores were: movement convergence and solidarity (0.74), multilingual tweeting (0.89), and targeted engagement (0.82).

In the following sections, I first provide an overview of the data and then discuss the major Global Frackdown Twitter practices in greater detail. While the data included in this study is in the public domain, user names for accounts held by individuals have been redacted. User names for organizational accounts are included, e.g. @350 and @foeeurope, in the subsequent discussion.

Results

Tweet language and frequency. English is the lingua franca, or bridging language, used to share information transnationally, followed by some degree to Spanish (see Figure

3.1). The vast majority of tweets in the dataset are in English, even tweets about events in non-English speaking countries. For example, tweets about a protest of reportedly around one thousand people in the Romanian village of Pungesti against plans by Chevron to start shale gas exploration in the area are predominately in English (AFP, 2013).



Figure 3.1: Tweet Language

In terms of the tweet frequency for the two-week time period, the volume of tweets is low until the 17th of October 2013, two days prior to the main day of action, supporting past research on movement social media usage surrounding pre-planned demonstrations (Hanna, 2013). On this date in New Brunswick, Canada, arrests took place in a regional dispute over shale gas exploration. The Royal Canadian Mounted Police (RCMP) enforced an injunction by SouthWestern Natural Resources, a company conducting seismic testing in the area, against a blockade by members of the Elsipogtog Mi'kmaq First Nations tribe contesting the project through litigation and direct action. More than 40 people were arrested when the RCMP enforced the injunction against a blockade that had been ongoing for several months prior to the Global Frackdown day of action.

There is another jump in the tweet volume on the official day of action, when the majority of events took place, October 19, 2013, followed by a steep drop-off on the subsequent day and in the week that followed. This pattern holds for both the English and Spanish language tweets (see Figure 3.2), although the Twitter discourse about the #Elsipogtog blockade and subsequent arrests is restricted primarily to the English language tweets.



Figure 3.2: Tweet Frequency

The trend toward mobile, on-the-go communication is changing activism, further enabling connective action and in-the-moment sharing from demonstrations. In fact, according to Twitter, 78% of the platform's users are active on mobile devices (Twitter, Inc., 2014). This is particularly relevant for a diffused movement like Global Frackdown with more than 200 events planned to take place in 27 countries across time zones and continents (Food and Water Watch, 2013). As I will discuss in subsequent sections, the use of mobile devices enables activists to engage in information and importantly, image sharing practices which heighten movement solidarity and convergence.

Tweet content type. In terms of the content of the data in the corpus, there are interesting differences between the English and Spanish language tweets (see Figure 3.3). In the case of the English tweets, there is a higher volume of in-the-moment event reporting. In addition, there are a few, less than one percent, of tweets refuting Global Frackdown or against the movement. Of the tweets refuting the movement, the majority of them call attention to the size of individual demonstrations. This suggests that movement size as a key point of contention between Global Frackdown activists, who have a vested interest in the movement appearing large and supporters of the shale industry, who seek to show the movement as marginal and small. In the case of the Spanish language tweets, 20% are multi-lingual, especially those from Spain. In Spain, drilling projects are centered in Basque and Catalan-speaking regions of the country. A tweet could, for example, have text in Spanish but include the hashtag #frackingEZ, which means "No Fracking" in Basque. The Spanish tweets are also higher in informational content, as opposed to event reporting. This is likely because the majority of events took place in English-speaking locales.



Figure 3.3: Tweet Content Type





As Figure 3.4 shows, 21% of the English language tweets included photos, as did 9% of the Spanish language tweets. While these figures are relatively low, combined with the data on device source discussed above, they are suggestive of an important trend in the real time mediation of physical demonstrations in online spaces and the amplification of dissent

to potentially global audiences. In addition, given that the majority of events took place in English-speaking locales, the discrepancy between the proportions of English and Spanish tweets with photos is as expected. In terms of most frequently used hashtags, six of the top hashtags for the English tweets are related to other related social movements, for example the Canadian Idle No More movement (see Table 3.3). In the case of the Spanish tweets, several of the top hashtags are in other languages, e.g. "StopFracking" in English and "FrackingEZ," which means "No Fracking" in Basque.

English	Spanish
1. Fracking	1. Fracking
2. Elsipogtog	2. FrackingNo
3. Banfracking	3. StopFracking
4. IdleNoMore	4. FrackingEZ
5. PowerShift	5. BanFracking
6. ElsipogtogSolidarity	6. 190
7. BanFrackingNow	7. SiSePuede19O
8. Mikmaqblockade	8. Castelló
9. Cdnpoli	9. GlobalFrackdo
10. NYC	10. Chevron

 Table 3.3: Global Frackdown Top Hashtags³

Analysis and Discussion

I analyzed the #globalfrackdown Twitter data from a transnational social movement framing perspective. Recall Olesen (2011) conceptualizes "transnational social movement framing" to deal with transnational topics (e.g. climate change), issues in nation-states other than that of the social movement actors promoting the frame, or those that explicitly call on the attention of activists in other countries. My goal was to discern the collective and personal action framing practices of Global Frackdown tweeters, and to what extent these

³ Excluding #GlobalFrackdown, which is the inclusion rule for the dataset and thus the top hashtag for both English and Spanish language tweets.

practices may support core organizers' goal of developing a globalized movement to ban fracking. Five broad themes emerged in the data in terms of collective action frames, personal action frames, and hybrid framing practices: (1) movement convergence and solidarity, (2) declarative engagement, (3) targeted engagement, (4) prefabricated messaging, and (5) multilingual tweeting.

Collective action framing.

Movement convergence and solidarity. Global Frackdown tweeters use the platform to promote global solidarity and to forge linkages with like-minded social movements. In addition, they use Twitter to enhance the sense of globalness of the day of action and to quickly learn what is happening, or has happened, in other participating locales. This sense of solidarity supports the development of a movement collective identity centered on banning fracking. The theme focuses on the cross-flow of information between aligned social movements, with an emphasis on commonalities and is often engaged in during moments of crisis. Tweeters from each movement utilize the hashtags of both movements.

In the case of Global Frackdown, as discussed above, a series of events starting with the arrests of First Nations demonstrators on October 17, 2013, two days before the official day of action, in New Brunswick, Canada galvanized the two movements' convergent Twitter activity. Global Frackdown and Elsipogtog tweeters alike used the hashtags of both movements to spread information with a sense of urgency about the events as they unfolded. For example:

@NoTarSands: Live updates – tense standoff btw #Elsipogtog FN
#AntiFrackers & RCMP follow @XXXX reporting from front line #INM
#globalfrackdown
9:29 AM - 17 Oct 2013

Based on breaking events, Global Frackdown tweeters appropriated and adapted #Elsipogtog as a frame to promote the Global Frackdown day of action along with showing solidarity with the First Nations demonstrators. In a sense, repression of the movement promotes tweeting. For example:

@RisingTide604: 16+ #Elsipogtog #fracking blockade solidarity actions planned! http://www.wearepowershift.ca/stand_with_elsipogtog_actions ... #climatejustice #climate #350ppm #GlobalFrackdown 4:50 PM - 17 Oct 2013

@XXXX: #Elsipogtog protest adds fuel to #GlobalFrackdown fire http://www.canadians.org/blog/elsipogtog-protest-adds-fuel-global-frackdownfire ... #banfracking 5:43 PM - 23 Oct 2013

As shown by the tweets above, movement convergence is based on unity between

movements and emphasizes mutual support. Elsipogtog supporters also took advantage of the

proximity of the arrests to the pre-planned Global Frackdown events, by using the

#globalfrackdown hashtag to spread information about the events in New Brunswick and

branch out seeking solidarity and support. For example:

@lastrealindians: Mi'kmaq lawyer XXXX showing bruises inflicted on her by RCMP during their raid on #Elsipogtog #GlobalFrackdown 7:31 AM - 21 Oct 2013

This use of the two movements hashtags by tweeters from both movements facilitates the

cross-flow of information between the movements. Tweeting is also a way to cross-promote

movements and engage in solidarity. For example:

@XXXX: Let's get #Elsipogtog #mikmaqblockade #mikmaqblockde
 #IdleNoMore #GlobalFrackdown trending. Don't RT. Steal and repost to
 trend. #redrising
 1:09 PM - 17 Oct 2013

Global Frackdown tweeters and activists used the platform to spread information about events, show support for the First Nations demonstrators and the Global Frackdown movement itself, and spread calls to action. For example:

@marcellus_SWPA: 10/19/13 #GlobalFrackdown CANADA Join today in Pittsburgh @ 2 Convention Center anti #fracking march & rally 10:19 AM - 19 Oct 2013

@XXXX: It's #GlobalFrackdown day today. Text FRACKDOWN to 69866 and add your voice to the global movement!9:18 AM - 18 Oct 2013

@XXXX: Heading back to the #Elsipogtog protest site. Happy day of #GlobalFrackdown! Support support!7:07 AM - 19 Oct 2013

As the examples above show, Global Frackdown tweeters use Twitter as a tool to advance the transnational social movement anti-fracking movement and to bolster the moral authority of movement, as well as to forge linkages between localized groups transnationally. In this way, tweeting itself is a form of diffused political action. In the next section, I will describe the personalized framing practices of Global Frackdown tweeters and the ways in which they support core activists' goal of fostering a globalized anti-fracking social movement.

Personal action framing practices.

Declarative engagement. This theme centers on individuals personal declarations of support for the movement and day of action. It embodies the act of making public the action an individual, or collective of individuals, plans to engage in, or is engaging in, to support the movement. For example, individuals tweeted:

@XXXX: Putting the final touches to our drilling rig today ahead of #GlobalFrackDown day tomorrow at 12 prompt Perth Concert Hall 3:35 AM - 18 Oct 2013

@XXXX: In Cape Town to join various organisations in opposing #fracking #GlobalFrackdown
3:45 AM - 18 Oct 2013

@XXXX: Off to Blackburn for the first of many fracking events happening in the north west this weekend #GlobalFrackdown #FrackFreeLancashire 11:14 AM - 18 Oct 2013

As the tweets above show, individuals personalize their involvement with Global Frackdown day of action events by publicly stating what they are doing to support the movement. In addition, the movement to ban fracking, particularly in the United States, has been successful in gaining celebrity support. For example, Maggie Grace, best known for her role as Shannon Rutherford on the television series *Lost* tweeted:

@MaggieGrace: I'm from Ohio, so #globalfrackdown day means protecting home to me! Good job today guys! #banfracking http://www.globalfrackdown.org/events/#ohio 9:33 PM - 19 Oct 2013

Thus, in this declarative form of personal action framing, Global Frackdown tweeters announce the action that they personally are going take part in. This can be considered a form of expressive political participation. In this sense, action is *performative* in digital spaces, while being simultaneously enacted in physical places.

Targeted engagement. Global Frackdown tweeters used the Twitter @mention function for two purposes. On the one hand, they are trying to gain traction in the public sphere, functioning as what Fraser (1992) refers to as a "subaltern counterpublic," which is attempting to reach external audiences. Leading up to the day of action and in-the-moment they want to reach beyond core activists and movement supporters. For example, in a form of directed interaction (Murthy, 2013), Global Frackdown tweeters made appeals to elected officials to take action to ban fracking. For example: @XXXX: Overwhelmed by the worldwide activity today for
#GlobalFrackdown and you should be too @BarackObama #banfracking
NOW!
6:53 AM - 19 Oct 2013

@foe_ni: Great response across Northern Ireland for #GlobalFrackdown Day.
Will @niexecutive listen to the public? #fracking
7:36 AM - 19 Oct 2013

@foodandwater: We're sending a message to you, @JerryBrownGov - ban fracking now! #globalfrackdown Oakland 3:16 PM - 19 Oct 2013

There is little evidence within the dataset that the targeted elected officials, either in

the United States or internationally, responded via Twitter to the Global Frackdown tweeters

calls for them to take action to ban fracking. Furthermore, Global Frackdown tweeters also

used @mentions to appeal to media outlets to cover the day of action. For example:

@XXXX: Guess you missed it? @bbcnews @skynews @Channel4News #skynews #bbcnews #c4news #Fracking #GlobalFrackdown http://on.rt.com/x8910f 11:09 AM - 19 Oct 2013

It is likely that these forms of targeted engagement would be most effective as part of a

combined advocacy campaign utilizing multiple channels, rather than a stand-alone strategy.

Secondly, Global Frackdown tweeters also make use of @mentions to make contact

with other movement activists and supporters, for example by sharing information about

specific events and to request retweets from other Twitter users. In an example of targeted

engagement from one environmental NGO to another:

@FOEYoung: @ukycc Please RT! #GlobalFrackdown action with
@FOEYoung - meet by Next by Bond Street tube station, London at 11am on Saturday
4:03 PM - 17 Oct 2013

Building on the discussion in the previous section on declarative tweeting, individual tweeters also made use of @mentions to express their support directed towards specific organizational users. For example:

@XXXX: @EnvNY Can't wait for the #GlobalFrackdown! #ohfrackno 11:54 AM - 18 Oct 2013

@XXXX: Hey @WeArePowerShift! Wait for me! Apparently I was on the wrong side of the state but I'm on my way #powershift #GlobalFrackdown 6:44 PM - 19 Oct 2013

In this way @mentions can serve as endorsements of those mentioned.

In addition, several individual Global Frackdown tweeters in the dataset engaged in

the practice of correcting the tweets of other users. For example, a tweeter based in Sweden,

who was also one of the most prolific tweeters within the dataset, is shown in the exchange

below adding the #globalfrackdown hashtag to a tweet about the day of action:

@YYYY: 2013-10-19 - GLOBAL FRACKDOWN, WORLD PREPARES FOR PROTEST AGAINST SHALE GAS PRODUCTION http://ow.ly/pYoBs

@XXXX: @YYYY use the hashtag #GlobalFrackdown please. The world has started since long 6:07 AM - 19 Oct 2013

Individuals filter activism through their personal identities and engage in a merging of

expressive online participation in digital spaces, like Twitter, and in physical places simultaneously. Global Frackdown tweeters use the platform as a mechanism to affirm and build both personal identities but also a sense of in-group affirmation and collective identity of a movement aimed at banning hydraulic fracturing. Thus, tweeting can be considered an emerging and distinctive form of mediated and personalized political action.

Hybrid framing practices.

Prefabricated messaging. There is a mixed history of advocacy organizations employing pre-prepared messaging, most notably in the form of "sample letters," for supporters to send to public officials or newspaper letter to the editor sections. By the early 2000s, the term "astroturf," originally used to describe artificial grass in sporting fields, was being applied to this type of messaging on the part of advocacy organizations and public relations campaigning (Reader, 2008). Journalists and newspaper editors have generally viewed the practice negatively as weakening public discourse and distorting public opinion, while advocates content the practice has the potential to broaden public participation (Reader, 2005; 2008). Past research has shown that letters to the editor have influence on the content of newspapers front and editorial pages (Pritchard & Berkowitz, 1994). In an online content analysis, Reader (2005) found that almost a third of special-interest groups, defined as those promoting ideological goals, provide "sample text" for supporters to copy and submit as letters to the editor in their own name.

More recent research has documented this phenomenon in social media social media environments as "political astroturfing," and in some cases spam messaging, particularly in the electoral contexts (e.g. Ratkiewicz et al., 2011; Ratkiewicz et al., 2012; Metaxas & Mustafaraj, 2012). Lee, Caverlee, Cheng, and Sui (2011) identify five major types of what they term "free text campaigns" in social media: spam, promotion, template, news, and celebrity. Global Frackdown activists provided a set of prefabricated tweets on the "Social Media" page of the main website globalfrackdown.org prior to the day of action and encouraged supporters to spread the word.⁴ The suggested tweets included:

On 10/19 I'm joining the #globalfrackdown to secure a future free from #fracking and dirty fossil fuels.

Get down with the #globalfrackdown! Join us on October 19 at an event near you by signing up here: http://bit.ly/1esBsZ9

#Fracking affects rural communities worldwide. Time to#banfracking! #globalfrackdown

Ratkiewicz et al. (2011) define *political astroturf* as "political campaigns disguised as spontaneous 'grassroots' behavior that are in reality carried out by a single person or organization" (p. 297). Additional attributes of astroturf include: often machine-generated, designed to promote the presence of widespread support for a particular viewpoint or cause, the idea that messages coming from a source known to the receiver will be viewed more favorably (Ehrenberg, 2012; Ratkiewicz et al., 2012).

Global Frackdown activists' prefabricated tweets were similar to astroturfing in the sense that they appear personalized but are organizationally-promoted frames. However, there is not evidence in the dataset of so-called "fake" or spam accounts actively being used to spread the frames. Rather, the pre-fabricated tweets were available on the Global Frackdown website and amplified through organizational and individual supporter accounts, as well as the crowd-sourcing application Thunderclap.it. The practice of astroturfing had a mixed impact and the amplification of these frames depended on the prominence and influence of the specific user adopting the frame. For example a celebrity's use of the suggested tweet text got 62 retweets and 38 favorites:

⁴ These tweets were available at the page http://www.globalfrackdown.org/social-media/ and collected by the researcher before they were removed from the page following the day of action events.

@MarkRuffalo: Get down with the #globalfrackdown! Join us on October 19 at an event near you by signing up here: http://bit.ly/1esBsZ9
2:50 PM - 18 Oct 2013

On the other hand, a representative use of the generic personalized message shown below by a non-celebrity individual user did not get retweets or favorites:

@XXXX: Today I'm joining the #GlobalFrackdown to stand united against #fracking & dirty fossil fuels. Join me http://bit.ly/18dZAbL @foodandwater 3:49 AM - 20 Oct 2013

In addition to providing a list of suggested tweets on the Global Frackdown "Social Media" page, the coordinating organization Food and Water Watch used the online "crowd-speaking" application Thunderclap.it on October 17, 2013 to promote Global Frackdown with the personalized message, "I'm down with the #GlobalFrackdown. Join me on 10/19 to call for a ban on #fracking + a future lit w/ clean energy!" The frame was shared 138 times via social media, with an estimated social reach of 219,282 people (Thunderclap, 2013).

On the whole, the impact of this type of hybrid framing is mixed. The prefabricated messages were often personalized, yet at the same time generic. Given that the detection and identification of this type of messaging is a growing empirical issue (Lee et al., 2011), the use of suggested texts could negatively impact a movement's credibility in ways that outweigh potential benefits of frame amplification.

Multilingual tweeting. Lastly, Global Frackdown tweeters engaged in a hybrid framing practice of multilingual tweeting and hashtag indexing, facilitating the cross-flow of frames between linguistic spheres to enhance a sense of solidarity and globalness of the movement. For example, the following tweet is in English but also includes the Basque hashtag #FrackingEZ:

@XXXX: The Basque Country is also taking part in the #GlobalFrackdown initiative. #FrackingEz
7:11 AM - 19 Oct 2013

And, in this subsequent example, the text of the tweet is also in English and the tweet

includes the hashtag of the location of the Romanian demonstration, as well as a hashtag in

French, #gazdeschiste, for "shale gas":

@XXXX: #GlobalFrackdown MT @Kowalski_Lech: #fracking
#occupychevron #pungesti #balcombe one bus made it through and is
20minutes away #gazdeschiste
7:17 AM - 19 Oct 2013

Global Frackdown tweeters also included translations of content, along with multilingual

hashtagging, as the following example from Spain shows:

@AntifrackingCom: #19oct Día Internacional contra la Fractura Hidràulica
#stopfracking "@gaslandmovie: The #GlobalFrackDown is Global!
http://youtu.be/wDH9ghBtV3I"
12:38 AM - 19 Oct 2013

What is at issue is the consistency of framing across countries and the extent to which the concerns about hydraulic fracturing are shared across geographically disparate localities. On the whole, my findings show a high level of uniformity between the framing of Global Frackdown tweeters in the English and Spanish language tweets. My findings show that Global Frackdown framing practices are both collective and personalized. Thus, a diffused transnational movement can include both newer forms of *connective* action while at the same time develop a sense of collectivity based around shared goals.

Conclusions

The framing of Global Frackdown's on Twitter draws on transnational topics (e.g. climate change) but it is also often very localized, as in a local activists group taking on a specific project to be sited in their community and the potential for impacts on their daily

lives. There is the synergy of local-global framing, which is transnational but also localized. I term this process *transnational frame jumping*. The use of multilingual hashtag indexing facilitates the cross flow of information between multiple languages. So, for example a local organization that is promoting their own event but at the same time contextualizing the "local" within what is happening concurrently in other countries and world regions. Interestingly, the proportion of tweets with multiple languages is more than double for the Spanish tweets than for the English language tweets. This could indicate that activists in Spanish-speaking locales are more outward looking or by necessity feel a need to share information beyond their linguistic sphere. Furthermore, many of the local events in Spain took place in Basque and Catalan regions of the country, so the Spanish multilingual tweets were not always in a the "Spanish-English" language combination.

Locality and place are very important within the movement. Global Frackdown frames are both transnational and also personalized and draw on local concerns. The diffused, episodic, loosely coordinated, and often personalized transnational framing practices of #GlobalFrackdown tweeters support the core organizers' goal of promoting the globalness of activism against hydraulic fracturing. Twitter enables activists in diverse geographical locations to connect in-the-moment and feel part of something larger. As a public sphere, the Twitter-verse gives individuals not physically present at a demonstration a sense of being there and for those attending a physical demonstration, a feeling that others know that is happening, in other words, an embodiment of the popular social movement refrain "the whole world is watching." Global Frackdown activists use Twitter as a tool to advance a transnational social movement anti-fracking movement and to bolster the moral authority of the social movement, as well as to forge linkages between localized groups transnationally. Furthermore, Global Frackdown tweeters use Twitter to enhance the globalness of the day of action and to quickly learn what is happening or has happened in other localities. This sense of solidarity supports the development of a movement collective identity centered on banning fracking and aids activists in mediating between local environmental issues and global concerns. These practices are supported through the usage of mobile phones and applications. For both the English and Spanish tweets, more than 40% of the tweets were sent from mobile devices and/or applications. Additionally, 21% of the English tweets included photos, while 9% of the Spanish ones did. Individuals are increasingly able to share information about events as they happen and for movements like Global Frackdown where events are simultaneously taking place, or nearly simultaneously taking place factoring in time zone differences, the use of mobile phones allows individuals to both quickly share what is happening where they are and learn quickly in real time about events going on in other locales.

The movement is successful in leveraging Twitter to bolster intra-group collective identity and linking to aligned movements but seems to have limited "success" at reaching external actors. Activists look to social media for evidence of movement success, for example images from demonstrations around the world. However, the movement is fairly insular and its actual external impact is questionable. In the case of Global Frackdown, the platform functions less as a singular "networked public sphere" as was theorized by Benkler (2006) before the ubiquitousness of social media and social networking. Rather, Twitter serves to bolster in-group affirmation among supporters as what Fraser (1992) termed a "counter-public" by enhancing the sense of globalness but in terms of a response to appeals to elected officials and mainstream media it is more limited. Within the #globalfrackdown

dataset there is a minimal response from industry supporters, with less than 0.5% of the English language tweets and none of the Spanish ones being from industry supporters.

In conclusion, Twitter usage is itself increasingly a form of political action that serves to amplify or enhance an individual's actions in the physical realm. With mobile technologies there is a blurring of offline-online forms of action, e.g. tweeting photos from a demonstrations. The action takes place simultaneously in both digitally mediated and physical spaces. Global Frackdown's Twitter practices indicate the movement is based on a form of "organizationally-enabled connective action," as theorized by Bennett and Segerberg (2013), but integrates a hybrid of personal action framing and collective action framing practices. Global Frackdown is a social movement trying to gain traction in the public sphere as a counter-public. In the moment and leading up to the event Global Frackdown tweeters want to reach beyond core activists and supporters. Twitter serves as more of a *performative*, identity-building space, than a mechanism to reach external audiences. However, as a public medium the hashtag stream is open and accessible to external audiences. In this sense, the Twitter stream is public but serving a niche internal movement communication function to build movement transnational collective identity.
Chapter 4. Discourse over a Contested Technology on Twitter: A Case Study of Hydraulic Fracturing

As discussed in chapter one, hydraulic fracturing, a drilling simulation technique commonly referred to as "fracking," is a contested technology. Hydrofracking sits at the juncture of democratic decision-making over the application of science and technology in societies around the world, with implications for global energy policy and environmental governance. The energy industry is investing into the development of "unconventional" fossil fuel shale oil and natural gas drilling at an unprecedented rate. Yet, the technology's reception globally has been mixed, with governments of countries such as Poland and Argentina favoring development, while others such as France and South Africa instituted moratoria or bans on the practice (Krauss, 2013). Within this context, social movements can serve as challengers to the dominant paradigms within science and technology by contesting official notions of safety and risk to emerging technologies (Hess, Breyman, Campbell & Martin, 2008). Participation is increasing channeled through non-institutional social movement mobilization around scientific issues (Bucchi & Neresini, 2008). In addition, with the advent of new media technologies transnational activists working in networks can facilitate the maintenance of strong and weak social ties internationally, develop movement messages and spread information more quickly than ever before. The social media platform Twitter has more than 255 million active users monthly, 77% of which are outside of the United States (Twitter Inc., 2014). With Twitter users sending an average of 500 million tweets each month (Twitter Inc., 2014), the platform is an important sphere for discourse on contemporary issues and could function as a "networked public sphere" for discourse and dialogue on contemporary political and policy topics such as those surrounding shale

development. In this chapter, I explore discourse over hydraulic fracturing and the shale industry on the social media platform Twitter during a period of heightened contention regarding the application of the technology in order to study valence of sentiment and degree of certainty across five social movement, industry, and contested hashtags.

Traditionally environmental activists have depended on mainstream media to transmit their messaging to broader publics (Hutchins & Lester, 2006). However, with the rise of social media tools, such as Twitter, the media landscape is rapidly changing with the potential for social movements and civil society actors to disrupt traditional power structures in novel ways. The goal of this chapter is to provide a broader view of the overall sentiment about hydraulic fracturing and shale development on Twitter during the period of time during which Global Frackdown day of action events took place. In this chapter I will present data that contextualizes the discourse of the Global Frackdown social movement in relation to other stakeholders on the issue. Using data collected from five hashtags related to shale development (#fracking, #globalfrackdown, #natgas, #shale, and #shalegas), I examine the valence of sentiment about the issue and the degree of certainty in Twitter posts. In addition, I include analysis of the top actors who posted with the main hashtag in the dataset, #fracking, as well as the top @mentioned actors for this hashtag.

Communication Processes in Debates over Science and Technology

How we view the natural world is the result of complex dialectic processes (Cantrill & Oravec, 1996). Communication serves to not only mirror human relations with the natural world but also to normalize these interactions (Milstein, 2009). Communication is therefore at the core of contests over how we define environmental problems (Cox, 2006; Milstein, 2009). Underlying ideological constructs give meaning to how we both perceive and use

resources, with very real material environmental consequences (Sklair, 1994). Definitions of nature and the environment have been a major area of research within science and technology studies over the past 15 years, seeking to understand "how to know nature authoritatively," with climate change and genetically modified organisms (GMOs) and the resulting policy implications as major foci (Yearley, 2008, p. 939). Analyzing how humans culturally define the natural world informs a broader understanding of the ways in which policymakers can alter the political conditions that contribute to environmental crises, which in turn are socially defined.

Each policy issue has its own culture as defined through these "interpretive packages" (Gamson & Modigliani, 1989). Frames are interpretative devices that give meaning to situations and make certain elements of a narrative more prominent (Entman, 1993; Goffman, 1974). Each policy issue has its own culture as defined through these "interpretive packages" (Gamson & Modigliani, 1989). Past research has shown that media coverage educates audiences about environmental problems, as well as serves agenda-setting functions (Cox, 2006). Social science research on hydraulic fracturing has examined state-level framing and "agenda change" (Davis & Hoffer, 2012), "state legislative framing" in Rocky Mountain states (Kear, 2011), factors contributing to variance in public acceptance at the state level (White, 2012), and the rhetorical elements in a video advocating for a moratorium in Quebec (Brière, 2011). Research by Jaspal and Herlich (2014) on the representations of shale gas in the UK press indicated competing social representations of the issue. While these studies highlight the importance of social science research into the social meanings associated with hydraulic fracturing, my research will be unique in its focus on the dynamics of discourse over a contested technology on social media.

Communication processes are at the center of debates over the function of science and technology in society. New media technologies afford activists the potential to organize collective actions on a more global scale in innovative ways through transnational advocacy networks. In their seminal work on transnational advocacy networks Keck and Sikkink, write that they function as: communication channels for access to the international system, new international resources available for domestic movements, push for the adoption of new norms, need to be understand as "political spaces" in which actors (NGOs, nation-states, multinational organizations, media, etc.) negotiate meanings with the goal of transforming international norms and the behavior of nation-sates (1998, pp. 2-3). They define transnational advocacy networks as, "[T]hose relevant actors working internationally on an issue, who are bound together by shared values, a common discourse, and dense exchanges of information and services" (Keck & Sikkink, 1998, p. 3). Information exchange is at the heart of the activities of transnational advocacy networks (Keck & Sikkink, 1998, p. 3). Past research has shown, through a "boomerang effect," that TANs can act to enable local social movement actors, in alliance with transnational partners, to apply pressure from outside a nation-state with a closed political opportunity structure and in the development of new transnational linkages based around shared identities and ideologies (see Keck & Sikkink, 1998; Rothman & Oliver, 1999; Smith, 2002).

Science, Contested Technologies, and Social Media

According to research by the Pew Research Center and *Smithsonian* magazine, a majority of adults in the United States believe that technology will have a positive impact of future quality of life (Smith, 2014). Given that in the United States 74% of adults use social networking sites, it becomes crucial to study the representations of science and technology on

these platforms (Pew Research Internet Project, 2014). In fact, 30% of U.S. adults get news through the social networking platform and 8% get news through the social media platform Twitter (Matsa & Mitchell, 2014). Furthermore, on Facebook 37% of those who reported news exposure saw news about science and technology (Matsa & Mitchell, 2014). As science communication scholars Brossard and Scheufele (2013) write, a paradox of new media is that while the Internet makes information on scientific topics more accessible to broader publics, these tools could also limit knowledge gain through algorithms and self-reinforcing search results. Therefore, given that new media are increasingly where people are getting information on science and technology, it is critical to study mediated representations of scientific and environmental issues on social platforms.

A rigorous understanding the dynamics of mediated communication about science and technology in online environments is thus necessary to understand the factors that contribute to making a technology "contested." As Runge et al. (2013) point out in research into discourse about nanotechnology on Twitter, communications scholarship does not yet fully address the evolving dynamics of exposure to scientific information in online and social media environments. In this study, I adapt the dimensions studied by Runge et al. (2013) to research discourse on hydraulic fracturing and shale development. I was interested in the discourse around a "contested technology," high-volume hydraulic fracturing. As discussed in chapter one, technologies are intertwined with scientific innovations and have become sites of struggle in late modernity (McNally & Wheale, 1995). Controversies over technological adoption are at their core about scientific uncertainty, risk perceptions, and public participation (Hennen, 1995). I conceptualize of "contested technology" to mean a "technology about which there is not scientific consensus regarding its environmental, health,

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and social impacts, which are debated by competing stakeholders in the public sphere and regulatory areas."

Past research has examined the mediation of political issues on Twitter and shown evidence of segmentation and varying degrees of discourse across political groups (Colleoni, Rozza, & Arvidsson, 2014; Yardi & boyd, 2010). Yet, there has been little research to-date on what differences may exist between related hashtags for an issue and whether or not hashtags for a given topic represent a cohesive networked public or sets of distinct publics, and counter-publics, as theorized by Fraser (1992). Therefore, in addition to examining overall sentiment across hashtags, I also investigated the potential for differences in the proportions of pro-shale and anti-shale sentiment and levels of certainty across hashtags. Given the level of heightened contention over hydraulic fracturing and shale development, I predicted there would be statistically significant differences between hashtags:

 H_{1a} : There will be a statistically significant difference in the valence of opinion about shale development between hashtags, such that the social movement hashtag #globalfrackdown will display a greater degree of anti-shale sentiment.

 H_{1b} : There will be a statistically significant difference in the valence of opinion about shale development between hashtags, such that the industry hashtag #natgas will display a greater degree of pro-shale sentiment.

 H_{1c} : There will be a statistically significant difference in the valence of opinion about shale development between hashtags, such that the industry hashtag #shalegas will display a greater degree of pro-shale sentiment.

Given the general, cross-cutting nature of the other two hashtags included in this

study, #fracking and #shale, I ask:

 RQ_1 : What is the opinion valence in #fracking and #shale tweets about hydraulic fracturing?

I also predict their would be a difference in the degree of certainty between

social movement, industry and cross-cutting hashtags:

 H_{2a} : There will be a statistically significant difference in the degree of certainty between hashtags, such that the social movement hashtag #globalfrackdown will display a greater degree of certainty.

 H_{2b} : There will be a statistically significant difference in the degree of certainty between hashtags, such that the industry hashtag #natgas will display a greater degree of certainty.

 H_{2c} : There will be a statistically significant difference in the degree of certainty between hashtags, such that the industry hashtag #shalegas will display a greater degree of certainty.

As stated above, given the cross-cutting nature of the other two hashtags included in

this study, #fracking and #shale, I ask the following research question:

 RQ_2 : What is the level of certainty in tweets about hydraulic fracturing for the #fracking and #shale hashtags?

In the subsequent section, I present a model for the discursive interaction of

competing social movement and shale industry actors followed by a conceptualization of the

key concepts, which provides a framework for this research.

Modeling Controversy over Hydraulic Fracturing

While the majority of this dissertation deals with the network structure, tie content, and Twitter practices of the anti-hydraulic fracturing social movement Global Frackdown, in this chapter study of the valence and certainty of sentiment about hydraulic fracturing and shale development on Twitter, in order to contextualize the movement in relation to pro-shale industry actors. Figure 4.1 presents a model for discursive interactions about hydraulic fracturing in the mediated, networked, public sphere (see below).



Figure 4.1: New Media Ecology of Claim-making over Hydraulic Fracturing

An assumption underlying this model is that industry, civil society, scientific, and governmental actors interact within the mediated—or networked—public sphere, making competing scientific claims about protecting the environment and human health. Each actor type puts forth claims that are in competition with each other. I hypothesize that a disjuncture between competing claims of pro-and anti-shale industry actors, which increases contention over risk and controversy over technological development. I assume that all associations are social, with controversies being defined by actors in interaction with each other (Latour, 2005). The content of stakeholder claims, between them make up a relational feedback loop in which interactions are mediated by the claim-making of other actors. I will now turn my attention to defining the key concepts.

Networked public sphere. I conceptualize *networked public sphere* as: the mediated deliberative public space between formal governmental institutions and the private life of

citizens in which the social and political processes of complex societies are legitimatized (see Friedland, Hove, & Rojas, 2006).

New media technologies. I define *new media technologies* as: "Digital and mobile communication technologies, such as the Internet, mobile phones, email and Skype, which facilitate rapid interpersonal and mass communication across geographical and linguistic regions." In the case of this research, I focus my analysis on the social media platform Twitter, a microblogging platform used to send short, up to 140-character updates. Furthermore, the platform is a form of social media, enabling broadcast-like one-to-one communication, as opposed to social networking sites which enable users to communicate primarily with those they know also in the offline realm (Murthy, 2013).

Conceptualizing model actors. In this model, I include four sets of actors: citizens, industry, science, and governmental. A key concept in social network analysis is *actor*. According to Wasserman and Faust, "Actors are discrete individual, corporate, or collective social units" (1994, p. 17). To purposefully allow for a broad conceptualize of key actors that may participate in the discourse about hydraulic fracturing and shale development on Twitter, I define *citizen actors*, in terms of organizations and other groups working together for a collective goal, as "Formally and informally organized sets of individuals and civil society representatives engaging in collective actions to raise public concern surrounding the health and environmental impacts of hydraulic fracturing."

I define *industry actors*, in terms of organizations and other sets of individuals as, "Formally and informally organized sets of corporations, trade groups, and individuals promoting the use of hydraulic fracturing in the oil and gas industry, either on a nation-state or international scale." I conceptualize *scientific actors* as "Organizations and sets of individual scientists, which comprise an internationally-recognized academy, with technical expertise in the area of environmental, geoscience, and related scientific fields."

Lastly, I define *governmental actors* as those who are, "The internationallyrecognized representatives of sovereign populations, whose vested interests may include, but not be limited to, economic development, as well as the protection of human health and the environment within a given territory."

For the final part of this study, I examine the top actors for the main hashtag in the dataset, #fracking, in order to gain a greater understanding as to who is driving the discourse on the issue during a period of heightened contention. Thus I ask:

 RQ_3 : Who are the top actors for the #fracking hashtag in terms of number of tweets?

 RQ_4 : Who are the top @mentioned twitter users by actor type for the #fracking hashtag?

Methods

Data collection. The data was collected using a cloud-based textual analytic software called DiscoverText. The program allows researchers to collect data from the Twitter "firehose" through the social data provider GNIP.¹ This enabled me to collect a full corpus of all tweets for the hashtags under study during a two-week window of heightened contention over the shale industry and hydraulic fracturing technology, from October 13 to October 27, 2013. This date range was selected to cover one week prior to and one week following the day of action against hydraulic fracturing Global Frackdown. Data was collected for five hashtags: #fracking, #globalfrackdown, #natgas, #shale, and #shalegas. The first of these,

¹ The data was collected before Twitter acquired GNIP in April 2014.

#fracking, is a general term used to refer to the technology, which has been employed by both supporters and opponents of the technology. The second, #globalfrackdown, is a hashtag of the name of the anti-fracking movement and one promoted by organizers to share information about events affiliated with the day of action. The third, #natgas, is a hashtag associated with the oil and natural gas industry. The last two, #shale and #shalegas, are more general terms used to refer to the industry and the shale gas resources themselves. A total of 72,195 tweets were collected. The sample was then narrowed to the English language tweets (n=64,973) for further analysis. For a timeline of the frequency of English language tweets by hashtag, refer to Figure 4.1.



Figure 4.2: Frequency of Tweets by Hashtag October 13 to 27, 2013

As Figure 4.2 shows, #fracking had the highest number of tweets (44,548), followed by #globalfrackdown (7,565), #natgas (5,040), #shale (5,063), and #shalegas (2,757). In terms of the tweet frequency for the two-week time period, the largest spike in tweet volume for the #fracking hashtag is on the 17th of October 2013, two days prior to the main Global Frackdown day of action. On this date in New Brunswick, Canada, the Royal Canadian Mounted Police (RCMP) enforced an injunction by SouthWestern Natural Resources, a company conducting seismic testing in the area, against a blockade by members of the Elsipogtog Mi'kmaq First Nations² tribe, who were contesting the project through litigation and direct action. More than 40 people were arrested. As discussed in chapter three, there is a jump in the tweet volume for the #globalfrackdown hashtag on the official day of action, October 19, 2013, followed by a steep drop-off on the subsequent day and in the week that followed.

As Table 4.3 shows, there is a degree of overlap between the hashtags. For the purposes of these analyses, hashtags are treated as mutually exclusive of each other.

#Fracking		#Globalfrackdo	own	#Natga	IS	#Shal	e	#Shale	egas
Elsipogtog	7505	Fracking	2042	Oil	880	Fracking	1566	Fracking	855
Cdnpoli	2239	Elsipogtog	1152	Fracking	697	Oil	708	Elsipogtog	530
IdleNoMore	2160	Banfracking	579	Energy	655	Energy	510	Romania	394
GlobalFrackdown	1954	IdleNoMore	347	Shale	414	Gas	438	Rexton	222
Shale	1579	PowerShift	298	LNG	314	Natgas	409	Chevron	201
Canada	1281	ElsipogtogSolidarity	195	NYMEX	152	Naturalgas	200	Natgas	170
RCMP	1240	BanFrackingNow	165	Shalegas	145	LPG	199	Energy	159
Mikmaqblockade	1157	Mikmaqblockade	148	Naturalgas	134	Ohio	92	NB	125
Rexton	1149	Cdnpoli	105	EIA	114	Utica	85	Cdnpoli	118
Indigenous	1001	NYC	85	CNG	106	Eagleford	68	Idlenomore	111

 Table 4.1: Top Additional Hashtags Mentioned in Hydraulic Fracturing Tweets by

 Hashtag³

² The term "First Nations" refers to aboriginal and indigenous peoples, nations, and tribes in Canada.

³ Note that for each list, the decision rule hashtag, e.g. #fracking for the #fracking list of top cooccurring hashtags, is not included.

Data analysis. The goal of this analysis was to measure the relative frequency of tweets across hashtags along two dimensions. Modeled on the analytical frame developed by Runge et al. (2013), the first dimension identified support or opposition to the shale industry as pro-shale – neutral – anti-shale. The second dimension captured certainty and uncertainty valence (see Table 4.2). "Pro-shale" is conceptualized as language indicating the positive or beneficial outcome related to the industry and hydraulic fracturing technology, or positive commentary on the technology and industry. "Neutral" is conceptualized as language indicating no judgment relative to a positive or negative outcome or judgment on the industry or technology (e.g. informational or event reporting tweets that only state an action is happening or has happened but do not include language suggesting a positive or negative judgment.) "Anti-shale" is conceptualized as language indicating a negative or harmful outcome related to the shale industry or hydraulic fracturing technology, or negative commentary on the technology and industry. This code also includes language that is positive towards and/or indicates support for the anti-shale industry social movement. "Certainty" is conceptualized as language indicating clear or known consequences and/or the firm conviction in the positive or negative aspects of hydraulic fracturing technology and the shale industry. "Uncertainty" is conceptualized as language indicating unclear or unknown consequences and/or doubt about the positive or negative aspects of hydraulic fracturing technology and the shale industry. Lastly, a final code of "N/A" was used for tweets that did not reference hydraulic fracturing and/or the shale industry.

The DiscoverText program includes a computer-aided content analysis "ActiveLearning" function to combine human-coding with machine-classification of data (see Grimmer & Stewart, 2013; Hopkins & King, 2010). Employing supervised machine learning, I first randomly generated a training set (n=650) equal to approximately one percent of the total number of tweets. The training set was created from a dataset combining all five of the hashtags, so that all hashtags would be included in the training set in proportion to their representation in the total dataset. Each tweet could be assigned only one of the seven mutually exclusive codes discussed above.

	Certain	Uncertain
Pro-shale	@ShaleMarkets: Increased Shale	RT @TheFrackingTrap: Will
	Development Is Good For Ohio	Europe pass on a shale gas
	Workers - TY @EnergyInDepth for	revolution? http://t.co/JD79txVR8x
	Article http://buff.ly/19Gc3Yz	#fracking #shale
	#Shale #Fracking @XXXX	
	8:25 AM - 14 Oct 2013	@EnergyCollectiv: Will #shale
		#gas revolution actually benefit
	@EnergyfromShale: You shouldn't	#climate? http://ow.ly/pZGJ9
	fear #fracking — @CrainsChicago	9:16 AM - 23 Oct 2013
	explains why:	
	http://bit.ly/19Mo9kL	
	5:34 PM - 21 Oct 2013	
Neutral	NRDC Youth @NRDCYouth:	@XXXX: #Fracking Chemicals
	Standing on a #fracking pad in	May Be Unknown, Even To Gas
	Dimock #EEI	Drillers, Lawsuit Documents
	5:32 PM - 13 Oct 2013	Suggest > http://huff.to/18uafkz
		(via @HuffPostGreen) #shalegas
	@Osmich: NB judge rules #SWN	11:57 AM - 15 Oct 2013
	injunction against anti #fracking	
	protests will not be extended,	@BloombergNRG: South Africa
	ending today.	may see legal battle over #fracking
	12:06 PM - 21 Oct 2013	regulations
		http://bloom.bg/1bxLO5P by
		@pburkhardt
		9:10 AM - 16 Oct 2013
Anti-shale	@XXXX: Outdoor air poll. Causes	@XXXX: Why is @nprnews
	cancer; Co. oil/gas fight #fracking	shilling for #Fracking? Tell @NPR
	bans w/\$; LA residents fuming over oil field	#donteventhinkabout repeating
		@ANGAus lies: http://npr-dont-
	http://insideclimatenews.org/	even-thinkaboutit.org/ via
	todaysclimate-headlines	@enviroaction
	QVVVV. Wow After watching	3:00 PM - 13 Oct 2013
	@XXXX: Wow. After watchingthe two Gasland documentaries, I'm	@SierraClubPMC: Whore is the \$
	pretty disappointed with our	@SierraClubRMC: Where is the \$ Going? Home Buyers Kept in Dark
	government #fracking #Gasland	as Builders Retain Mineral Rights
	#sacj100	w/ Eye on #Fracking Revenue
	9:57 PM - 21 Oct 2013	@AllGov http://bit.ly/H1JLwG
	<i>7.57</i> 1 1 v 1 - 21 Oct 2015	1:41 PM - 15 Oct 2013
		1.71 1 IVI - 13 OCI 2013

 Table 4.2: Examples of coded hydraulic fracturing and shale-related tweets expressing opinion on Twitter from October 13 to 27, 2013

Two coders independently coded the training set. While there is not a definitive standard for acceptable levels of intercoder reliability, levels above 0.80 are generally considered to be sufficient (Lombard, Snyder-Duch, & Campanella Bracken, 2002). Two measures of intercoder reliability were used to assess agreement between the coders. The scores for both were within acceptable ranges, Krippendorff's Alpha (0.87) and Fleiss' Kappa (0.86). For the two categories with low reliability scores, measured in Krippendorff's Alpha, neutral and uncertain (0.494) and pro-shale and uncertain (0.686), after supplementary discussion and training both coders coded additional items within a second random sample training set of n=200. With the additional coding, the averaged Krippendorff's Alpha intercoder reliability scores for these two categories reached acceptable levels, neutral and uncertain (0.75) and pro-shale and uncertain (0.73).

After classifying the data, the author then manually reviewed the data in order to adjust misclassifications. All frequencies remained within three percent of the original classification (see Table 4.3).

Chi-square tests for independence. In addition to examining the opinion valence and levels of certainty expressed regarding hydraulic fracturing and shale development across Twitter hashtags, I was interested in testing whether or not the differences in proportions across the five hashtags were statistically significant on the two dimensions of opinion valence and level of certainty. In order to do this I conducted two chi-square tests for independence. Chi-square is a non-parametric test, meaning that it does not assume a normal distribution in the population of interest, assumes random sampling and independent observations (Pallant, 2005). The chi-square test for independence allows a researcher to compare the frequencies of cases across two categorical variables (Pallant, 2005). In this study, I conducted two separate chi-square tests. In the first of these tests, I compared the independent variable of "hashtag" with the dependent variable of "valence of opinion about shale development." For this test, the null hypothesis (H₀) was that there would be no statistically significant difference between the valences of opinion about shale development between the five hashtags included in this study. The alternative hypothesis (H₁) was that there would be a statistically significant difference in the valence of opinion about shale development across the hashtags. For the second of the chi-square tests, I compared the independent variable of "hashtag" with the dependent variable of "certainty of opinion about shale." For this test, the null hypothesis (H₀) was that there would be no statistically significant difference in the levels of certainty about shale development between hashtags. The alternative hypothesis (H₁) was that there would be no statistically significant difference in the levels of certainty about shale development between hashtags. The alternative hypothesis (H₁) was that there would be no statistically significant difference in the levels of certainty about shale development between hashtags. The alternative hypothesis (H₁) was that there would be a statistically significant difference in the levels of certainty about shale development between hashtags.

In the case of both chi-square tests, the data was weighted by count, meaning the numbers of tweets in each category. The chi-square test shows whether or not there is a relationship between two variables but does not test the strength of a relationship (Hayes, 2005). Therefore, I also examined Cramer's V test statistics, which denotes a value between 0 and 1, in order to show the strength of the association between variables. A higher value signifies a stronger association between the two variables (Hayes, 2005). The Cramer's V test can be used for crosstabulation tables of any size and the measure is symmetrical, meaning that the researcher does not need to designate a dependent variable (Hayes, 2005).

Top tweeters and @mentioned users. Lastly, in order to test the model outlined above, I selected the hashtag #fracking for further analysis of the users who tweeted the most in the dataset, as well as those who were retweeted and @mentioned in posts most

frequently. The hashtag #fracking comprised the highest volume of tweets, making up 69% of the total sample. In addition, given that "fracking" has become a widely used colloquial term to refer to hydraulic fracturing, it is likely that both pro and anti-shale development actors may use the hashtag #fracking to influence the wider Twitter discourse on the issue. The hashtag included a total of 16,144 users tweeting at least once, with 69% posting only once with the hashtag and only one percent tweeting 25 times or more. For the #fracking hashtag, a total of 6,051 Twitter users were @mentioned at least once, including retweets and @replies. Of these users, 41% were @mentioned only once. In order to examine prominent actors in the discourse on hydraulic fracturing-related issues within this contested hashtag, I selected the top 200 tweeters and @mentioned users for further analysis. The top 200 tweeters in terms of number of tweets posted 13,608 tweets, making up 31% of the total for the #fracking hashtag and all users who tweeted at least 25 times with the hashtag. The top 200 @mentioned users were @mentioned at least 50 times with the hashtag.

To code for "actor types" I used an iterative process, adapting the coding frame used by Lotan et al. (2011) and Vis (2012; 2013) to study breaking news on Twitter. Two coders (the author included) independently coded all of the accounts. In cases of disagreement, the coders discussed the discrepancies to reconcile coding until agreement was reached. The coders used the Twitter users' profile bios, recent tweets, and any linked websites to classify the data. The categories are as follows:

- Mainstream media (MSM): News outlets with a both offline and online presence.
- Mainstream media (online only): News outlets that are web-based and only provide online content.

- Alternative media: Social justice-focused news outlets.
- Alternative media (online only): Social justice-focused outlets that are web-based and only provide online content.
- Journalists (mainstream): Journalists who are employed by, or regularly freelance for mainstream news outlets.
- Journalists (alternative): Journalists who are employed by, or regularly freelance for alternative news outlets.
- Activists (organization/group): Social movement organizations and organized collectives of activists, including anti-fracking specific as well as broader social justice, first nations, and/or environmental concerns.
- Activists (individual): Individual activists who state support for the anti-fracking movement and/or other social justice causes.
- Activists (bloggers): Blogs covering hydraulic fracturing and shale-related issues, which are maintained by activist organizations or individuals.
- Celebrities: Individuals who are famous and widely known for reasons unrelated to anti-fracking activism.
- Political actors (organization): Government agencies and/or political parties.
- Political actors (individual): Individual elected officials or political party actors.
- Industry (organization/company): Organizational actors supporting the shale industry, such as trade groups and corporations.
- Industry (individual supporter): Individuals stating support for the oil and natural gas industry.

- Researcher/scientists: Individuals who state their academic and/or scientific credentials, such as having a Ph.D.
- Members of the public: Individuals who are not clearly identifiable as activists or industry supporters.
- Fake/spoof account: Parody accounts and others that appear fake.
- Bots: Accounts that appear to be automated, such as a high number of semantically consistent and regular intervals of posts.

Codes were also included for "unclear" accounts, as well as "defunct/suspended" accounts and "other" for spam accounts that did not fit within any of the above categories.

Results

Opinion valence and level of certainty. My first research question addressed the opinion valence in tweets about hydraulic fracturing during a period of heightened transnational contention. The results show that for the #fracking hashtag, 13% of tweets were pro-shale, 11% were neutral, and 76% were anti-shale. For the #globalfrackdown hashtag, 0% of tweets were pro-shale, 2% were neutral, and 98% were anti-shale. For the #natgas hashtag, 61% of tweets were pro-shale, 19% were neutral, and 20% were anti-shale. For the #shale hashtag, 69% of tweets were pro-shale, 10% were neutral, and 20% were anti-shale. For the #shalegas hashtag, 24% of tweets were pro-shale, 17% were neutral, and 59% were anti-shale (see Table 4.3).

#Fracking						
	% Pro-shale	% Neutral	% Anti-shale	Total		
% Certainty	9	7	66	82		
% Uncertainty	4	4	10	18		
Total	13	11	76	100		
#GlobalFrackdown						
% Certainty	0	2	97	99		
% Uncertainty	0	0	1	1		
Total	0	2	98	100		
#NatGas						
% Certainty	51	12	15	78		
% Uncertainty	10	7	5	22		
Total	61	19	20	100		
#Shale						
% Certainty	52	8	14	74		
% Uncertainty	17	2	6	25		
Total	69	10	20	99		
#ShaleGas						
% Certainty	20	13	54	87		
% Uncertainty	4	4	5	13		
Total	24	17	59	100		

 Table 4.3: Valence of shale industry-related tweets expressing opinion on Twitter from

 October 13 to 27, 2013 (Some totals do not equal 100% due to rounding.)

My second research question addressed the level of certainty in tweets about hydraulic fracturing and shale development. Across all hashtags, the majority of tweets expressed certainty. For the #fracking hashtag, 82% of tweets expressed certainty and 18% expressed uncertainty. For the #globalfrackdown hashtag, 99% of tweets expressed certainty and 1% of tweets expressed uncertainty. For the #natgas hashtag, 78% of tweets expressed certainty and 22% expressed uncertainty. For the #shale hashtag, 74% of tweets expressed certainty and 25% expressed uncertainty. Lastly, for the #shalegas hashtag, 87% of tweets expressed certainty and 13% expressed uncertainty. Refer to Table 4.3 for a summary of the results.

Chi-square tests for independence. In order to test for association between hashtags and the valence of sentiment regarding hydraulic fracturing and shale development, as well

as between hashtags and certainty of opinion about the industry, I conducted two chi-square tests for independence. First, I hypothesized that there would be a significant difference in the valence of opinion about shale development between hashtags. A chi-square test was conducted and a significant relationship was found between hashtag and valence of opinion about shale development, X^2 (df = 8, N = 64,417) = 18,632.95, $p = .000.^4$ For the hashtags #fracking and #globalfrackdown, the observed values of pro-shale tweets were lower than would be expected by random chance and the proportions of anti-shale tweets are higher that would be expected by chance. In contrast, for the hashtags #natgas, #shale, and #shalegas the proportions of pro-shale tweets were higher than would be expected by chance and the observed values of anti-shale tweets of anti-shale tweets are higher that

The relationship between hashtag and valence of opinion about shale development is fairly strong, indicating statistically significant differences in the proportions of pro-shale, neutral, and anti-shale tweets across the five hashtags (Cramer's V = .380, p = .000). Hypotheses 1_a and 1_b are supported, while hypothesis 1_c is not (see Table 4.4).

Hashtag	Valen	Total		
	Pro-shale	Neutral	Anti-shale	
#Fracking	5,796 (13.1%)	5,028 (11.4%)	33,341 (75.5%)	44,165
	22 (0.3%)	138 (1.8%)	7,342 (97.9%)	7,502
#GlobalFrackdown				
#NatGas	3,112 (61.9%)	950 (18.9%)	968 (19.2%)	5,030
#Shale	3,467 (69.7%)	520 (10.4%)	990 (19.9%)	4,977
#ShaleGas	652 (23.8%)	471 (17.2%)	1,620 (59.1%)	2,743
Total	13,049 (20.3%)	7,107 (11%)	44,261 (68.7%)	64,417 (100%)
X^{2} (df = 8, N = 64,417) = 18,632.95, p = .000				
Cramer's $V = .380, p = .000$				

Table 4.4: Valence of Shale-related Tweets by Hashtag

⁴ The 555 tweets coded as "not applicable," which totaled less than 1% of the total number of English language tweets, are excluded from the chi-square analysis.

Secondly, I hypothesized that there would be a statistically significant difference in the degree of certainty in opinion about hydraulic fracturing and shale development between hashtags. A chi-square test was conducted and a significant relationship was found between hashtag and valence of opinion about shale development, X^2 (df = 4, N = 64,417) = 1,888.29, p = .000. In terms of explaining the variance of observed proportions of certainty compared to uncertainty, only the activist hashtag #globalfrackdown showed a higher degree of certainty than expected by random chance. In contrast, the rest of the hashtags, #fracking, #natgas, #shale, and #shalegas, had a lower proportion of certainty than expected by chance.

In addition, the association between hashtag and certainty of opinion about shale development is significant, indicating statistically significant differences in the proportions of certain and uncertain tweets across the five hashtags (Cramer's V = .171, p = .000). Thus, hypotheses 2_a and 2_b are supported, while hypothesis 2_c is not (see Table 4.5).

Hashtag	Certainty of Sha	Total			
	Certain	Uncertain			
#Fracking	36,026 (81.6%)	8,139 (18.4%)	44,165		
	7,461 (99.5%)	41 (0.5%)	7,502		
#GlobalFrackdown					
#NatGas	3,913 (77.8%)	1,117 (22.2%)	5,030		
#Shale	3,702 (74.4%)	1,275 (25.6%)	4,977		
#ShaleGas	2,375 (86.6%)	368 (13.4%)	2,743		
Total	53,477 (83.0%)	10,940 (17.0%)	64,417 (100%)		
	X^{2} (df = 4, N = 64,417) = 1,888.29, p = .000				
	Cramer's $V = .171, p = .000$				

 Table 4.5: Certainty of Shale-related Tweets by Hashtag

Top tweeters. Unlike past research examining top Twitter users for specific issue publics (Lotan et al., 2011; Vis, 2103), using the DiscoverText platform I was able to separate out the users who posted the most tweets using the #fracking hashtag from the users who were @mentioned the most using the hashtag. I will first address the top actors in terms

of the 200 users who posted the most tweets within the dataset using the #fracking hashtag. In total, the top 200 users out of 16,144 posted 13,608 tweets, comprising 31% of the total #fracking tweets. The distribution of Twitter users followed a power law distribution, with 69% of users tweeting only once; only 17 users tweeted more than 100 times and 135 tweeted more than 25 times with the #fracking hashtag. As Figure 4.3 shows, tweets from activists comprised the majority of the top actor tweets, with 35% coming from individual activists and another 19% coming from activist organizations and groups. In contrast, individual supporters of the shale industry posted 5% of the tweets and industry organizations another 3%. Other categories that warrant mention are alternative media (online only), which made up 11% of tweets, bots (10%) and defunct or suspended accounts (5%). In addition, it is notable that the categories for mainstream media journalists, both mainstream media and online mainstream media, as well as individual political actors had no tweets among the top 200 tweeters.



Figure 4.3: Top 200 Twitter Accounts Tweeting with #Fracking Hashtag

Of the top ten accounts, six are activist accounts including @marcellus_SWPA, an anti-fracking alliance based in Pennsylvania, as well as three individuals.⁵ In addition, the top ten tweeters include one individual industry supporter and a bot. The highest ranking organizational industry supporters were @ShaleMarkets (#14), a news and advertising group, and @EnergyfromShale (#23), a project of Energy Tomorrow, which is affiliated with the American Petroleum Institute (API), a national trade group in the United States representing the oil and natural gas industry. An important issue raised by the coding of this data is the identification of bots, which are automated feeds often designed to interact with human users.⁶ It must be noted that bots which share news links related to a specific topic, such as

⁵ In accordance with the IRB approval for this research, I am not identifying individual Twitter users who are not public figures (e.g. elected officials, journalists, celebrities).

⁶ The identification of bots is a growing issue within social science research, with projects like "Bot or Not?" (http://truthy.indiana.edu/botornot/) from Indiana University seeking to develop metrics to screen for automated Twitter feeds, which often appear human-like (Truthy Project, n.d.).

hydraulic fracturing, could be seen as providing audiences with relevant information, while others are more spam-like in nature, such as the user @WGYBMovie.

Top @mentioned users. Between the top 200 tweeters and top 200 @mentioned and retweeted accounts, there is an overlap of 70 accounts (35%). The top 200 @mentioned accounts had 31,247 mentions (56% of the total for the #fracking hashtag). Similar to the top users in terms of tweets posted, the most @mentioned categories were activist organizations and groups (27% of @mentions) and individual activists (23% of @mentions). Activists' blogs about fracking and shale-related issues comprised another 4% of the @mentions (see Figure 4.4). The top actor results indicate that the #fracking agenda is largely driven by activists, as well as directed at and in response to other activists.

What is striking about these results is the way in which these results diverge from related research on top Twitter actors for larger-scale breaking news events, Arab Spring in the case of research by Lotan and colleagues (2011) and on the 2011 riots in the United Kingdom (Vis, 2013). In both of those cases, the agenda was largely driven by and directed to mainstream media, journalists, and bloggers. In the case of this dataset, an anti-shale protest which took place in New Brunswick and the resulting crackdown by Royal Canadian Mounted Police in Rexton, N.B. on Elsipogtog First Nation activists, in which more than 40 individuals were arrested, was a key topic and coincided with pre-planned Global Frackdown day of action against hydraulic fracturing and the shale industry set to take place the following weekend. In this case, Global Frackdown activists, along with Idle No More.⁷

⁷ First Nations activists in Saskatchewan, Canada started the Idle No More movement in December 2012 with teach-ins. The movement started centered on stopping a national legislative bill, C-45, which included revisions to the Canadian Indian Act and Navigable Waters Act, and has grown to include promoting democracy and respect for First Nations sovereignty (Idle No More, n.d.). In



Figure 4.4: Top 200 @Mentioned Accounts for #Fracking Hashtag

While mainstream media outlets and journalists do not appear in the top user results, they do appear among the top @mentioned users. The mainstream media category accounted for 7% of the @mentioned tweets, mainstream media (online only) another 1%, and journalists (mainstream) with 7%. A video journalist for the Canadian network APTN (@Osmich) ranked second in terms of @mentions. Mainstream news organizations in the top @mentioned Twitter users included: @nprnews (#12), @NPR (#15), @APTNNews (#27), @RT_com (#38), @guardian (#39), and @CBCAlerts (#71). The categories of industry (organization/company) and industry (individual supporter) combined accounted for five

addition, the movement has developed linkages to movements to oppose "extreme" energy projects, such as pipelines and hydraulic fracturing (Idle No More, 2014).

percent of the @mentions. The highest ranked industry actor in terms of @mentions was the trade group America's Natural Gas Alliance (@ANGAus), which ranked eleventh.

Lastly, individual elected officials and a few governmental agencies appeared within the top 200 @mentioned users. The category for political actors (organization) made up 1.5% of the @mentions, while political actors (individual) made up an additional 5%. While these numbers are low, it is relevant to note that individual political actors did not make up any of the top actors sending tweets using the #fracking hashtag. This indicates that while individual elected officials are not actively participating the twitter discourse they are receiving tweets about the issue, as an emerging form of political engagement directed toward those in power. Among the individual political actors, New York Governor Andrew Cuomo (@NYGovCuomo) ranked sixth for top @mentions as the recipient of 650, followed by U.S. President Barack Obama (@BarackObama), ranked #33, with 267 @mentions, Canadian Prime Minister Stephen Harper (@pmharper), ranked #51, with 177 @mentions, Green Party member of the British Parliament Caroline Lucas (@CarolineLucas), ranked #52, with 175 @mentions. In addition, a few governmental agencies also received @mentions, including the U.S. Environmental Protection Agency (@EPA), ranked #32, with 272 @mentions and the Obama Administration's White House account (@WhiteHouse), ranked 193, with 42 @mentions.

Discussion

In this chapter I have sought to contextualize the Twitter practices of the Global Frackdown social movement in relation to other groups of stakeholders. In order to do so, I have examined the valence of Twitter discourse about hydraulic fracturing and the shale industry across five hashtags, #fracking, #globalfrackdown, #natgas, #shale, and #shalegas. The results indicate differences across hashtags, with some hashtags being more anti-shale than expected by chance (#fracking and the social movement hashtag #globalfrackdown), while others (#natgas, #shale, and #shalegas) were more pro-shale in overall sentiment that would be expected by random chance. These results are important in that they indicate that, as the general public increasingly gets news about a range of topics including science and technology issues from social media platforms, discourse is segmented such that the valence of pro-shale, neutral, and anti-shale opinion audiences are exposed to varies significantly across hashtags related to the same issue. In addition, the level of certainty of opinion varied significantly across hashtags, with the activist hashtag #globalfrackdown having a higher level of certainty that would be expected by random chance. This suggests a degree of segmentation of opinion on the part of those opposed to the shale industry, with potential implications for both the incidental informational exposure of non-activist audiences, agenda setting within social media environments, and constructive dialogue between stakeholders as to possible energy futures and surrounding contested technologies.

Contrary to my expectations, industry actors appeared within the top 200 tweeters and top 200 @mentioned Twitter users for the #fracking hashtag to a low degree. There are several possible explications for this finding. First, given that the hashtags #natgas and #shale were more pro-shale in sentiment, it is likely that industry actors, both organizational and individuals, are in their majority using other more neutral terminology to index their Twitter posts. However, it must be noted that the #fracking hashtag comprised the majority of the overall sample, making up 69% of the tweets send during the time period under study. The discourse for the #fracking hashtag was driven largely by activists, both organizational and individual actors, and directed primarily to other activist accounts, in terms of @mentions. There did not appear to be a coordinated effort on the part of activists, at least not a widespread one, to target specific elected officials, governmental agencies, or companies. The one notable exception is New York Governor Andrew Cuomo who, as of mid-2014, had been under intense pressure from anti-fracking activists to maintain a statewide moratorium in New York on hydraulic fracturing. For example, CREDO Action, a project of the mobile phone company CREDO Mobile, ran a comment campaign targeted at Cuomo, "Tell Governor Cuomo: Don't encourage fracking by lifting New York's ban on liquefied natural gas infrastructure," that was promoted partly through Twitter during the period of time under study (CREDO Action, n.d.).

My original model presented earlier in this chapter assumes a single discursive space, in which interactions take place between industry, civil society, governmental, and scientific stakeholders within a networked public sphere. That my results show differences between hashtag in terms of opinion valence and certainty suggests hashtags can act as cohesive spheres within and of themselves. Thus, hashtags can be thought of as reflective of, and formative of, distinct "hashtag publics." Take for example the contrast between the two hashtags "#natgas" and "#shalegas." Based on background research, I hypothesized that the two would function similarly as "industry" hashtags. However the results indicate contrasting, almost exactly opposite valence in their sentiment about shale issues. While both hashtags have similar levels of certainty and neutral tweets, the results for the #natgas hashtag are in line with my expectations, being in their majority "pro-shale" (61%). However, the #shalegas hashtag was opposite of my expectation, with a similar degree but opposing sentiment, weighted to the anti-shale side (59%). In fact, the definition of #*natgas* in the online database #TagDef.com reads: "*Shale* gas is natural gas produced from shale" (emphasis added).⁸ So, these two hashtags, with similar meanings, function as markedly distinct networked public spheres.



Figure 4.5: Hydraulic Fracturing Hashtags as Publics⁹

The significance of these findings comes with the challenge to the notion of networked public spheres as deliberative spaces (see Figure 4.3). If hashtags form distinct publics, then what is the extent of the overlap between them and the interactions that take place at the intersections? We must also consider the ways in which publics enacted through hashtags are not equal in terms of political, economic, and social resources. Future research should examine what happens at the intersections of these publics, where hashtags overlap (e.g. a Twitter user posting on both the #fracking and #shale hashtags) or when hashtags are

⁸ #TagDef can be accessed at https://tagdef.com/.

⁹ In Figure 4.3, purple signifies anti-shale valence and gold signifies pro-shale valence. The degree of shading represents a greater degree of certainty.

"contested" as is the #fracking one in this case study. Are interactions that take place within these networked spaces constitutive of deliberative dialogue and supportive of democracy processes, or are they polarizing and mobilizing of a particular group of stakeholder's base, such as anti-fracking activists?

As scholars we must ask two fundamental questions about the evolution and adoption of specific new media technologies: 1) What things stay the same? and 2) What things change? Each "new" medium is linked to what has come before. As discussed in chapter three, social media platforms fuse media broadcast-like and gatekeeping functions embedded within, and generative of, social ties and networks. The specific affordances and constraints of each platform affect the interactions taking place within them and shape identities and audiences in complex ways (Baym & boyd, 2012). The information shared within hashtag publics is often personalized. In the context of a social movement hashtag, such as #globalfrackdown, a high degree of certainty expressed in tweets could have mobilizing effects and amplify or reinforce movement diffusion processes. On the other hand, uncertainty could have demobilizing effects. Furthermore, high certainty within a hashtag public could reinforce a sense of moral authority or of being "correct" about contested issues, in this case either in favor of shale development or opposed to it.

While the results of this study are significant in charting new areas for Twitter research, specifically on the use of hashtags, there are several limitations. First, Twitter users are not representative of overall public opinion. As of November 2013, 16% of U.S. adults used the platform (Mitchell & Guskin, 2013). Individuals who report getting news from Twitter are younger, more educated, and use mobile devices to a greater degree than the general U.S. public (Mitchell & Guskin, 2013). While Twitter is a platform conducive to

discourse on current events and breaking news, past research has shown that opinion on Twitter is not a reliable indicator of broader public opinion and also can vary over the course of a specific news event (Matsa & Mitchell, 2014). Furthermore, the period of time during which the data used in this study was collected was one of heightened contention over the issue, surrounding the Global Frackdown day of action events. Therefore, the findings of this study are not generalizable as in anyway reflective of overall public opinion on hydraulic fracturing and shale development. It does provide a case study of the synergistic effects of activists' use of Twitter to share information about pre-planned events on a transnational scale, in combination with responses to breaking news events, such as the arrests of First Nations anti-shale demonstrators in New Brunswick, Canada.

Chapter 5. Conclusions

This dissertation project has dealt with the new logics of transnational environmental activism and the potential for new sources of power afforded by the "networked society" within an era marked by globalization and hybrid media ecologies (see Castells, 2009; Chadwick, 2013). The core question I have sought to address with this research is: In what ways are environmental activists using new media technologies to challenge socio-political *power structures*? To do so I have used hydraulic fracturing and opposition to the fossil fuel industry as a case study of the mediation of contested technologies in new media environments, both in terms of social movement structure and framing, as well as the valence of discourse about hydraulic fracturing and shale issues on Twitter during a period of heightened contention. In this chapter I draw together the findings of the three empirical chapters, while offering some closing comments on the ways in which scholars of communication can theorize how discourses on-and activism against-contested technologies are shaped in interaction with the affordances of new and social media tools. In addition, in order to move beyond descriptive analysis I offer terminology that I hope will help to better conceptualize of, and understand, the new logics of transnational environmental activism in a networked, participatory media landscape.

My overall goal for this project was to understand and model the structure and content of networked communicative processes through the lens of activism against the drilling technology hydraulic fracturing and the shale industry. I chose this specific issue given the increasingly transnational nature of shale development and corresponding transnational activism across local to international scales to ban the use of high-volume hydraulic fracturing in the oil and natural gas industry by a loosely affiliated set of environmental and civil society actors under the rubric of a day of action called Global Frackdown.

This work contributes to the field of communication, specifically the sub-fields of environmental and political communication. Given the current policy discourse in the United States and internationally on climate change and the use of fossil fuels more generally, this analysis of activism against shale development and discourse about shale issues serves to contribute to a more holistic understanding of the dynamics at play in contention over energy futures, as well as public participation in environmental governance and debates over contested technologies. The three empirical chapters of this dissertation are designed to complement each other by providing macro-level and micro-level analyses of the structure and content of transnational environmental activism. Additionally, I analyzed Twitter discourse on shale development more broadly to situate social movement actors in relation to other industry, media, and governmental stakeholders. In addition to providing data on a contemporary political and environmental issue of relevance to global energy policy and environmental governance, the major theoretical contribution of this dissertation is to model and conceptualize of an emerging form of environmental activism, which I term translocal environmental movements. This theorizing brings locality into focus and emphasizes the ways in which the local is embedded in globalized communication processes (see Castells, 2012).

In this chapter, I first provide summative theoretical comments regarding this set of studies and explicate the translocal environmental movement concept more fully. I then provide comment on the mixed method study design and the utility of combining qualitative and quantitative approaches, whereas a goal of this study has been to contribute to a more

nuanced and holistic understanding of networked communicative processes. I then address some of the limitations inherent to the mixed method study design. Lastly, I conclude with my thoughts on what stakeholders can learn from this research and conclude with suggestions for future research.

Key Empirical Contributions

Digital media enable political—and by extension environmental—activists to maintain and develop weak ties in new ways. In this dissertation I have taken a two-pronged, mixed method approach to examine the network structure and tie content of the anti-fracking movement Global Frackdown. This mixed methods study design afforded analysis of the synergy of online and offline movement dynamics. I argue that in order to develop models reflecting the realities of networked communicative processes scholars must examine network structure, in addition to the content of social ties. Doing so will help scholars address the gap between theorizing on networked communicative practices with how these emerging technologies are being actually used, such as by environmental activists in the case of my research.

Movement actors share similar concerns across movement scales. However, they have divergent roles based on their positionality within the transnational network. In chapter two, I identified and explicated three actor types: coordinator, broker, and hyper-local. I showed that activists share common concerns across movement scales. In chapter three, I analyzed the collective, personal, and hybrid framing practices of Global Frackdown tweeters directly preceding, during, and following the day of action events. The episodic, looselycoordinated and often personalized, transnational framing practices of Global Frackdown tweeters support core organizers' goal of promoting the globalness of action against the shale
industry, centered on a shared collective goal of banning hydraulic fracturing technology in the oil and natural gas industry.

The major contribution of this research is to provide empirical case studies that support theorizing on the shifting dynamics of political activism, and more specifically environmental organizing, in the networked society. Reconfigured networked relations combined with the diffused nature of unconventional shale exploration and extraction have given rise to an emerging form of natural resource movement, which I term *translocal environmental movements*. I theorize that these movements fuse the identity-based dynamics of new social movements (NSMs) with environmental justice concerns typical of natural resource struggles in post-colonial contexts, upending the traditional model of transnational advocacy networks.

The term "translocal" has its roots in migration studies coming out of the disciplines of geography and anthropology. It was developed in response to scholarship theorizing transnationalism in terms of deterritorialized identities (see Brickell & Datta, 2011). Scholarship on translocality focuses on "local-local connections" as a form of "grounded transnationalism" (Brickell & Datta, 2011, p. 3). This approach brings locality and place to the forefront. "Place" can be thought of as a multiplicity of *processes* of opening space for political discourses (Massey, 1994). Furthermore, "places" are constituted through social relations (Massey, 1994) and through *connective* action within loosely constituted networks of weak ties between social movement actors in the case of a movement like Global Frackdown. Thus, discourses and identities are embodied in places (Nelson, 2003). Furthermore, spatial relations are socially constructed (Crane and Ashutosh, 2013; Massey, 1994). As Smith (2011) theorizes it, translocality gets at "situatedness both *here* and *there*"

(p. 182). Importantly, Smith also notes that transnational and translocality are not mutually interchangeable, not all translocal connections are transnational and vice versa.

I conceptualize *translocal environmental movements* to include the following dimensions: the fusing of material and symbolic concerns, linkages across affected and potentially affected communities in at least two world regions, a sense of shared interests and goals (e.g. ban fracking, promoting global solidarity), the framing of opposition to shale development in terms of both local concerns (e.g. water, land use) and global ones (e.g. climate change, disrupting the power of transnational corporations). The last of these dimensions gets at the concepts of "scale" and "scale-shift," which have been explicated in previous literature and about which I will go into more detail below. This type of movement brings to the forefront localized concerns in transnational activism with small networked cells interlinked with each other, supported by the loose coordination of national and international social movement organizations, interest groups, and in some political contexts, such as the European Union, left-leaning political parties. In its idealized typecasting, within a translocal environmental movement, local groups take the lead in driving activism forward, with minimal coordination by legacy environmental organizations and larger civil society organizations.

In chapter four, I presented results showing statistically significant differences in the sentiment about hydraulic fracturing and shale development across a set of five hashtags (#fracking, #globalfrackdown, #natgas, #shale, and #shalegas) associated with hydraulic fracturing and the oil and natural gas industry. I also show that the discourse on the main contested hashtag #fracking is dominated by activists, both individual activists and organizations. Interestingly, the highest proportion of tweeters, those posting messages using

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the hashtag #fracking were individual activists, while the highest proportion of @mention references went to activist organizations. This is a particularly relevant finding, given recent scholarship on a shift away from traditional forms of collective action to more fluid and less organizationally-driven forms of connective action (Bennett & Segerberg, 2013). In sum, my research provides a set of empirical case studies dealing with anti-fracking activism and discourse about the shale industry which support Bennett and Segerberg's (2013) theorizing on hybrid "organizationally enabled" connective action. As I have shown, activist organizations play an important role in supporting anti-fracking activism, while also promoting personalization of framing of shale issues.

Modeling Translocal Environmental Movements Scaling-out Processes

"Scale" is a concept that has been widely applied to theorizing in geography. It has also been used in social movement studies within political sociology, in terms of "scale-shift" in movement diffusion processes. In geographical literature, scale has alternatively been viewed as something that is fixed, material, and the result of political and social processes or as a frame through which to view other processes, e.g. "regional" or "national" as frames to study physical or social systems (Herod, 2009). Smith's (1984) work on the "politics of scale" problematized static notions of scale. One way that is useful to think about "local" and "global" scales for this research is treating the concepts as processes which produce hybrids that are a mix of both (Gibson-Graham, 2002, as cited in Herod, 2009, p. 224). Visually, there are several ways in which "scale" has been illustrated in geographical literature, from that of a ladder with "local" as the lowest rung to evoke the climbing up to the "global" rung, or scale as a set of embedded circles with "local" at the core (Herod, 2009). Analysis of how scales are "jumped" or "shifted" is crucial to understanding power relations (Goodman, Boykoff, & Evered, 2008).

In social movement studies, the concept of "scale-shift" has been used to model movement diffusion processes. In early work on scale-shift, focused on the spread of localized collective action, McAdam, Tarrow, and Tilly (2001) define the concept as "change in the number and level of coordinated contentious actions leading to broader contention involving a wider range of actors and bridging their claims and identities" (p. 331). In further work on the concept, Tarrow and McAdam (2005) explicate three separate scale-shift mechanisms: non-relational diffusion through mass media channels, relational diffusion through preexisting ties, and brokerage generating new ties (p. 127). It is well established that individuals are drawn into activism by those they know and that new movements spread along pre-established lines of information exchange (McAdam, 2003, p. 287). The structural analysis that I present in chapter two supports this premise, showing that the strongest connections are between organizations with pre-established ties that exist outside of issue specific activism surrounding shale development. What is most interesting in my qualitative findings is the role suggested by anti-fracking and anti-shale development specific groups, such as the Swedish organization Heaven or sHell. Groups such as these generate new ties within the movement and connect hyper-local groups into the transnational network. In terms of scale-shift, McAdam describes the concurrent processes, which is worth quoting at length, as follows:

Localized collective action spawns broader contention when information concerning the initial action reaches a geographically or institutionally distant group (through either *diffusion* or *brokerage*) which, on the basis of this information, defines itself sufficiently similar to the initial insurgents (*attribution of similarity*) as to motivate *emulation*, leading ultimately to *coordinated action* between the two sites (2003, p. 294).

New media technologies, such as the social media platform Twitter, collapse space and time, affording both new opportunities and also speeding up traditional movement diffusion mechanisms (see Castells, 2009; Earl, 2010). For example, in the case of Global Frackdown, information—along with dramatic visual images—about the arrests of First Nations activists at an anti-shale demonstration in New Brunswick in the days prior to the pre-planned Global Frackdown day of action spread rapidly through activist networks on Twitter (i.e. using the #globalfrackdown hashtag and to a lesser extent others such as #banfrackingnow) and more general hashtag channels (e.g. #fracking). This event quickly galvanized a synergy of collective and connective action processes, in which both individuals and aligned activist organizations employed frames of movement convergence and solidarity with the Elsipogtog First Nation in their own actions in the days that followed.



Figure 5.1: Translocal Environmental Movement Scaling-out Processes

I offer a model of what I term "scaling-out" processes of diffusion and innovation within this type of social movement (see Figure 5.1). I call it a model of movement "scalingout" scale-shift processes, as opposed to "scaling-up" mechanisms, in order to highlight processes of localized groups coming together, with a degree of higher-level coordination by national and transnational actors, and movement diffusion expanding out with the emphasis remaining with localized groups. My research suggests these processes within translocal environmental movements do not function as "scaling-up" in a traditional sense of scale-shift processes but rather "scale-out" mechanisms that are more horizontal in nature. However, national and transnational NGOs still play an important coordinating role within the network. Analysis of hyperlinking patterns between Global Frackdown partner organizations' websites indicates that national and international organizations are prominent within the network in terms of betweenness centrality. Furthermore, interviewees from transnational civil society organizations reported that activism and concerns about the impacts of hydraulic fracturing started locally, with their member groups asking them to work on the issue. So, leading federated organizations got involved *after* their member organizations started localized campaigns on shale issues. These interviewees also stressed the importance of keeping the focus and locus of action on the local level, as well as their role in supporting the activism of volunteers working in local communities.

So what is key is that within these processes activism originates locally. Localized organizing starts to emerge independently, with activists then seeking out information online and through other channels, and connecting with like-minded individuals and groups at the national and transnational levels. For example, in the case of the Swedish group Heaven or sHell, one member described seeking information at the start of organizing, "From the beginning it was Google and the only information we could get was from the United States because there was no other countries. Now we have a team of experts working on each of these topics. And this goes via the network in Brussels... We are an international network today, or an international movement if you want. That's the big change from the beginning 2008, 2009 when we were five lonely people in Skåne and Shell who was entering" (Heaven or sHell 2, personal communication, June 18, 2013). In this model of translocal activism, hyper-local groups are linked into the transnational network through *brokers*, groups that are rooted locally but are transnationally-orientated like Heaven or sHell. In the case of the

broker organization Heaven or sHell, the node looks fairly marginal in at the macro-level of social network analysis but as my qualitative case analysis shows, it plays an important role in mediating between the transnational scale and the hyper-local groups. A crucial component in movement diffusion is the widespread nature of shale drilling and deposits. This is why translocality in particular is a useful concept for making sense of the Global Frackdown movement.

Because of the diffused nature of shale extraction, more communities are either affected or potentially affected by oil and natural gas drilling than with conventional fuel extraction methods. For example, according to industry data, as of early 2014 there were more than 1.1 million active oil and natural gas wells in the United States, with an estimated approximately 32,000 of these having been hydraulic fractured (Kelso, 2014). While the number of fractured wells may seem low, this estimate does not include wells in Texas or Colorado, both states with ongoing drilling in major shale plays (Kelso, 2014). It must also be noted that this estimate does not include the states of Wisconsin and Minnesota, where mining for frac sand, silica sand which is used to prop open the fissures in shale rock once it has been fractured, has become an point of public contention. While these states are not home to shale wells themselves they are secondarily affected by the boom in shale production as the source for silica sand used in the industrial process (Pearson, 2013). According to the U.S. Department of Energy shale gas production is taking place in 16 states, or in other words one third of the lower 48 states (Office of Fossil Energy, 2013).

As discussed above, local organizing starts to emerge at least somewhat independently, with local activists then seeking out information and connecting with likeminded individuals and groups, as was suggested by my conversations with European antishale activists. The key point is that localized activism against shale emerges patterned on the distribution of shale plays. However, it must be noted that in the case of early Global Frackdown activism, partner organizations were heavily weighted to the United States, Canada, and European countries. The diffusion processes then develop as follows: local concern, reaching out and networking with like-minded groups, diffusion and the development of loosely coordination by national and transnational civil society actors of joint actions, and fueling the continued spread to new locales (see Figure 5.1). What distinguishes the anti-fracking movement is the widespread nature of shale drilling and deposits.

Methodological Considerations for Using Mixed Methods in Communications Research

The "networked society" can be considered both as a useful theoretical construct for making sense of communication processes mediated through new and social media tools, as well as a methodological approach. It is one that I argue is best suited to the application of mixed methods research. A challenge currently facing media researchers is that of adapting our methods to the rapidly changing media landscape in order to more holistically make sense of the synergistic effects of preexisting social ties with emerging technologies that also enable the generation of new ties. To undertake this task, I have used a mixed methods approach in this dissertation project, combining social network analysis with in-depth interviews and computer-assisted content analysis. As researchers we can fully understand the nature of digitally-networked movements without considering *interdependent* effects of network structure, individual relationships (informal ties), and formal organizational linkages on political contention. This however has proven to be no easy, nor clear-cut or bounded task. Mixed methods research presents a unique set of methodological challenges. Conducting mixed methods research requires the researcher to be proficient in multiple methods, which is

time consuming and slow, at a time when scholarly productivity is often measured by quantity of publications.

However, that said I am happy with how this dissertation project came together. The opportunity to collect data from Twitter was fortuitous and as a scholar, an excellent learning experience. In addition, the combination of qualitative and quantitative approaches enriched my analyses and allowed me to develop a more holistic, nuanced picture of the communication processes behind the Global Frackdown movement and position this analysis relative to the discourse of industry stakeholders within a social media environment, leading to some interesting and innovative findings about differences in discourse about hydraulic fracturing across hashtags. In addition, the communications field as a whole is experiencing the advent of hype over "big data" methods, and requires of scholars methodological innovation and boundary pushing. To be a communications researcher in this era of "big" data and social media requires the innovation of methods, methodological creativity, and adaptability. This need for creativity is reminiscent of C. Wright Mills' (1959) treatise on the sociological imagination. Scholars need new forms of such methodological imagination to grapple with the rapidly shifting media ecologies of today and those of tomorrow, which we can now only imagine.

My core methodological argument is that macro and micro-level views of communication processes each tell scholars something unique about the underlying communicative mechanisms. A mixed method approach can bring together the strengths of both qualitative and quantitative traditions to the study of these processes. What is at risk of being lost with the hype surrounding big data is the detailed attention and closing reading of how people actually use new media tools, which we can learn about when we talk to people,

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be it in surveys or in-depth interviews. For example, a key finding that emerged over the course of my conversations with activists was the role of listservs as semi-closed spaces to for activists to organize outside the public eye and coordinate transnational organizing. This kind of so-called "dark data" is not readily available to researchers scrapping the web for digital network traces.

While there may appear to be a disconnect between the methods employed in this study, conducting interviews thus allowed me a window into the backend coordination processes not accessible through analysis of hyperlinking patterns and social media data alone. For example, had I not included in-depth interviews in my study I would not have learned that activists view closed listservs to be the most important tool for longer-term coordination of the movement. In turn, network analysis of hyperlinking patterns between Global Frackdown partner organizations provided an overall sense for the network structure of the social movement and the networks inlinks and outlinks between the organizations. The network findings highlighted the formation of shale issue-based activism along the lines of pre-existing formal organizational alliances and relationships. The quantitative methods I used for chapter four provided a macro-level view of discourse over shale development, situating the discourse of activists in relation to that of other stakeholders. In sum, the combination of methods greatly enriched my analyses. The combined insights of qualitative and quantitative methods aided in moving beyond descriptive analysis to explaining underlying processes and mechanisms. They also strengthen the validity of my research findings.

The use of mixed methods has its limitations. The findings of this study are suggestive of—and in line with—broader trends in activism within the networked society.

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However, the findings may not be generalizable to activism on other issues. As discussed above, shale exploration and extraction presents situated and very material circumstances in its diffused nature, which could serve to galvanize opposition and serve as a basis for fostering connections between like-minded sets of activists not present for other issues. In addition, as noted in chapter four, the findings regarding the valence of sentiment about shale issues on Twitter is not generalizable to an ordinary time period. The Twitter data was collected during a two-week period of heighted contention over shale development and must be understood within that context. Additionally, future research should include in-depth interviews with a wider set, or sets, of activists working to oppose hydraulic fracturing and shale development, as well as those working on issues related to other emerging, contested technologies. This study included interviews with ten individuals, which was sufficient to illustrate the processes discussed in this dissertation, in combination with the other methods. However, as stated above the application of the model I have developed to other environmental movements warrants additional research and as it stands, these results are limited to hydraulic fracturing and shale development.

Policy Implications and Directions for Future Research

The continued dependence, or not, on fossil fuels and the transition to clean energy systems in the United States and globally will have profound impacts on climate policy and the livability of societies around the world. What role shale fuels may play in this transition is a hotly debated topic. In short, the stakes are high. Following in the tradition of science and technology studies, this dissertation research brings to the forefront that energy systems embedded within socio-political systems. They cannot be developed, nor redeveloped, without the buy-in of the residents of affected communities and favorable public opinion more broadly. Meaningful public participation is crucial in decision-making over the siting of wells. Industry and governmental stakeholders alike would do well to pay closer attention to the concerns of local communities in which extraction projects are sited, as well as general public discourse on shale in relation to clean energy systems, climate change, and the development of alternative fuel sources.

As the results of chapter four suggest, the shale industry is facing significant public relations challenges. It would serve industry actors to engage to a greater extent in the dialogue in contested spaces, such as the #fracking hashtag on Twitter. Furthermore, scientific, governmental, and industry actors researching and advancing other forms of emerging energy technologies (e.g. bioenergy applications) would do well to learn from the experiences of the shale industry. It is critical to prioritize community engagement and participation in decision-making early on in the process of siting any energy projects. In addition, emerging energy sectors should develop sets of best practices at the onset of technological development and transfer, as well as engage in greater transparency and public disclosure. The success of any project requires meaningful pathways for public participation, discourse, and dialogue. Industry actors should also recognize that regulation in the public interest could benefit industry. A lack of transparency and effective governmental oversight of industry practices has been shown in the case of the shale industry to create conditions at times in which the industry cannot operate at all, such as in the case of moratoria or bans on the use of hydraulic fracturing technology at local, state, and national scales.

In this study, I have focused my analyses on network structure and content. Future research should examine the interactions between pro and anti-shale partisans and Twitter as a platform at the intersection of public discourse on political and scientific policy issues. For

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example, when pro-shale individuals are using the #fracking hashtag to engage with antifracking activists, and visa-versa, are these interactions engaging in debate and deliberation or are they mobilizing through being dismissive to partisans on other sides of the issue?

This research highlights a growing trend in the blurring on offline-online political action and engagement. A key affordance of a social media platform such as Twitter is that it allows users to easily share in-the-moment, real time updates for mobile devices. The trends in mobile media consumption and self-production of socially-shared content stand only to increase over time. As I have shown for a diffused social movement like Global Frackdown, this function allows activists to connect on-the-fly across wide geographies, collapsing space and time divisions. In this way, tweeting is growing as a form of political engagement. A common practice is sharing photos from demonstrations, which are then re-shared and remediated as a form of solidarity by other activists, bridging aligned social movements. Practices such as these raise important questions for future research and theorizing into what it means to be an activist in a social media realm like Twitter. Does an individual necessarily need to also be active in physical, offline spaces? Furthermore, my research showed a relatively small but interesting trend of directed communication towards public elected officials. More research is needed on the impact of this form of targeted engagement. Changes to the Twitter user interface design that allow a user to filter the @replies and retweets they see as "all" or limited to "people you follow" could significantly limit the impact of this practice.

In closing, it is my hope that this research will inform the future communication strategies of civil society and industry actors alike. Critical reflection on communication practices within hybrid media systems is crucial to understanding the mediation of contested technologies within these digital spaces. It is my hope that in the future there will be a greater extent of dialogue and cross-pollination of the research traditions of climate change communication and the more critical political ecology perspectives in which analysis of extractive industries are situated. Climate issues cannot be fully addressed without addressing questions of fossil fuel systems and likewise, future directions in energy systems are integral to addressing climate challenges.

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Appendix A: IRB Approval and Continuing Review



Submission ID number: 2013-0305

Title:

Negotiating Scientific and Environmental Claim-making in the New Media Ecology: A Cross-National Study of Hydraulic Fracturing

Principal PATRICIA LOEW Investigator:

Point-ofcontact: IRB Staff Reviewer:

An SBS IRB sub-committee conducted an expedited review of the above-referenced initial application. The study was approved by the IRB for the period of 12 months with the expiration date of 4/24/2014. The study qualified for expedited review pursuant to 45 CFR 46.110 and, if applicable, 21 CFR 56.110 and 38 CFR 16.110 in that the study presents no more than minimal risk and involves:

Category 7: Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, or quality assurance methodologies

To access the materials approved by the IRB, including any stamped consent forms, recruitment materials and the approved protocol, if applicable, please log in to your ARROW account and view the documents tab in the submission's workspace.

If you requested a HIPAA waiver of authorization, altered authorization and/or partial authorization, please log in to your ARROW account and view the history tab in the submission's workspace for approval details.

Prior to starting research activities, please review the Investigator Responsibilities guidance (<u>http://go.wisc.edu/m0lovn</u>.), which includes a description of IRB requirements for submitting continuing review progress reports, changes of protocol and reportable events.

Please contact the appropriate IRB office with general questions: Health Sciences IRBs

at 608-263-2362 or Education Research and Social & Behavioral Science IRBs at 608-263-2320. For questions related to this submission, contact the assigned staff reviewer.



Submission ID number: <u>2013-0305-CR001</u>

Title:Negotiating Scientific and Environmental Claim-making in the New
Media Ecology: A Cross-National Study of Hydraulic Fracturing

rrincipal Investigator: Point-ofcontact: IRB Staff Reviewer: PATRICIA LOEW JILL HOPKE LILLIAN LARSON

A designated ED/SBS IRB member conducted an expedited review of the abovereferenced continuing review progress report form. The study was approved by the IRB member for the period of with the expiration date of 3/11/2015. The study qualified for expedited review pursuant to 45 CFR 46.110 and, if applicable, 21 CFR 56.110 and 38 CFR 16.110:

Category 7: Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, or quality assurance methodologies

To access the materials approved by the IRB, including any stamped consent forms and recruitment materials, please log in to your ARROW account and view the documents tab in the submission's workspace.

Please review the Investigator Responsibilities guidance (<u>http://go.wisc.edu/m0lovn</u>.), which includes a description of IRB requirements for submitting continuing review progress reports, changes of protocol and reportable events.

Please contact the appropriate IRB office with general questions: Health Sciences IRBs at 608-263-2362 or Education and Social/Behavioral Science IRB at 608-263-2320. For questions related to this submission, contact the assigned staff reviewer.



Submission ID number: <u>2013-0305-CR002</u>

 Title:
 Negotiating Scientific and Environmental Claim-making in the New Media Ecology: A Cross-National Study of Hydraulic Fracturing

rimcipal
Investigator:PATRICIA A LOEWPoint-of-
contact:JILL E HOPKEIRB Staff
Reviewer:LILLIAN LARSON

A designated ED/SBS IRB member conducted an expedited review of the abovereferenced continuing review progress report form. The study was approved by the IRB member for the period of 12 months with the expiration date of 2/23/2016. The study qualified for expedited review pursuant to 45 CFR 46.110 and, if applicable, 21 CFR 56.110 and 38 CFR 16.110:

Category 7: Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, or quality assurance methodologies

To access the materials approved by the IRB, including any stamped consent forms and recruitment materials, please log in to your ARROW account and view the documents tab in the submission's workspace.

Please review the Investigator Responsibilities guidance (<u>http://go.wisc.edu/m0lovn</u>), which includes a description of IRB requirements for submitting continuing review progress reports, changes of protocol and reportable events.

Please contact the appropriate IRB office with general questions: Health Sciences IRBs at 608-263-2362 or Education and Social/Behavioral Science IRB at 608-263-2320. For questions related to this submission, contact the assigned staff reviewer.
Appendix B: Sample Consent Forms

UNIVERSITY OF WISCONSIN-MADISON Research Participant Information and Consent Form

Title of the Study: Negotiating Scientific and Environmental Claim-making in the New Media Ecology: A Cross-National Study of Hydraulic Fracturing

Principal Investigator: Patricia A. Loew (phone: +1-608-262-0654; email: paloew@wisc.edu)

Student Researcher: Jill E. Hopke (phone: +1-608-262-1464; jehopke@wisc.edu)

DESCRIPTION OF THE RESEARCH

You are invited to participate in a research study about the environmental and scientific controversies surrounding the use of the drilling extraction technology hydraulic fracturing, commonly referred to as "fracking."

You have been asked to participate because of your involvement with the issue as part of a civil society organization, government agency, scientific body or industry with a stake in the application of the technology.

The purpose of the research is to understand the social meanings associated with hydraulic fracturing across cultural and regulatory environments, as well as the ways in which stakeholders are using new media technologies to communicate about the issue.

This study will include adult participants engaged with the issue.

The research will be conducted in three national case studies in Sweden, Colombia and the United States.

Audio tapes will be made of your participation.

Audio recordings of will be made of your interview(s), with your permission. If you agree to be audio recorded please initial the statement at the bottom of this form. The recordings will be used to verify the contents of your interview. Jill Hopke, the co-investigator will hear the audio recordings and have access to them. The principal investigator and other key personnel will also have access to the audio recordings and may hear them. The audio recordings will be retained until the completion of this project before they are destroyed. A transcription will be made of the audio from your interview and will be kept for at least seven years.

WHAT WILL MY PARTICIPATION INVOLVE?

If you decide to participate in this research you will be asked to talk about your opinions and/or concerns about hydraulic fracturing, as well as how you use new media technologies to communicate about the technology.

Your participation will last approximately 1 hour per session and will require up to 2 sessions which will require up to 2 hours in total.

ARE THERE ANY RISKS TO ME?

We anticipate minimal risks to you from participation in this study. There is a risk that confidentiality could be breached due to an unanticipated event, such as the theft of the co-PI's laptop computer or audio recording equipment while traveling to and from field sites. In addition, there is a risk that you may reveal personal, sensitive or identifiable information during the interview.

In order to minimize these risks the audio recording and transcriptions of interviews will be kept in an encrypted, password protected format. In addition, a key containing interview subjects names will kept separately from the audio recordings and transcriptions. You will be identified in transcriptions and audio recording (including file names) by only a numerical code. In addition, participant consent forms will be kept separately from other study material. Any personal, sensitive or identifiable information will not be included in any publications resulting from this research.

ARE THERE ANY BENEFITS TO ME?

We don't expect any direct benefits to you from participation in this study.

HOW WILL MY CONFIDENTIALITY BE PROTECTED?

While there will probably be publications as a result of this study, your name will not be used. Only group characteristics will be published.

If you participate in this study, we would like to be able to quote you directly without using your name. If you agree to allow us to quote you in publications, please initial the statement at the bottom of this form.

WHOM SHOULD I CONTACT IF I HAVE QUESTIONS?

You may ask any questions about the research at any time. If you have questions about the research after you leave today you should contact the Principal Investigator Patricia A. Loew at +1-608-262-0654 or reach her via email to paloew@wisc.edu. You may also call the student researcher, Jill E. Hopke at +1-608-262-1464 or reach her via email to jehopke@wisc.edu. In Colombia you may also contact Diego Mazorra at +57-1-3419900, ext 1454.

If you are not satisfied with response of research team, have more questions, or want to talk with someone about your rights as a research participant, you should contact the University of Wisconsin-Madison Education Research and Social & Behavioral Science IRB Office at +1-608-263-2320.

Your participation is completely voluntary. You may decide not to participate or to withdraw from the study at any time by notifying the study investigators.

Your signature indicates that you have read this consent form, had an opportunity to ask any questions about your participation in this research and voluntarily consent to participate. You will receive a copy of this form for your records.

Name of Participant (please print):

Signa	ature
-------	-------

Date

I give my permission to be quoted directly in publications without using my name.

I give my permission to have an audio recording made of my interview.

Université de Wisconsin-Madison Renseignements sur le participant à la recherche et formulaire de consentement

Titre de l'étude: La négociation scientifique et environnementale de la revendication de décision dans l'écologie des nouveaux médias: une étude multinationale de la fracturation hydraulique.

Chercheur principal: Patricia A. Loew (Téléphone: +1-608-262-0654; paloew@wisc.edu) Étudiant chercheur: Jill E. Hopke (Téléphone: +1-608-262-1464; jehopke@wisc.edu)

DESCRIPTION DE LA RECHERCHE

Vous êtes invités à participer à une étude de recherche sur les controverses environnementales et scientifiques liées à l'utilisation de la technologie de forage d'extraction dans la fracturation hydraulique, communément appelée «fracturation».

Vous êtes invités à y participer en raison de votre collaboration à la question dans le cadre d'une organisation de la société civile, un organisme gouvernemental, un organisme scientifique ou industriel ayant un intérêt dans l'application de la technologie.

Le but de cette recherche est de comprendre les conséquences sociales associées à la fracturation hydraulique dans des cadres culturels et réglementaires, ainsi que les façons dont les acteurs utilisent de nouvelles technologies de médias pour communiquer la question.

Cette étude comprendra des participants adultes engagés à la question.

La recherche sera menée dans trois études de cas nationaux en Suède, en Colombie et aux Etats-Unis.

Votre participation sera enregistrée.

Avec votre permission, des enregistrements audio de vos entrevues seront effectuées. Si vous acceptez d'être enregistré, merci de recopier la déclaration figurant à la fin de ce formulaire. Nous utiliserons les enregistrements pour vérifier le contenu de votre entrevue. Jill Hopke, le co-investigateur, écoutera les enregistrements audio et y aura toujours accès. Le chercheur principal ainsi que d'autres membres clés du personnel y auront également accès et pourront les écouter. Nous les conserverons jusqu'à l'achèvement du projet, puis ils seront détruits. Nous ferions une transcription audio de votre entrevue qui sera conservée pendant au moins sept ans.

En quoi consiste ma participation?

Si vous décidez de participer à cette recherche, vous serez invité à parler de vos opinions et de vos préoccupations à propos de la fracturation hydraulique, ainsi que la façon dont vous utilisez les nouvelles technologies des médias pour communiquer au sujet de la technologie.

Votre participation durera environ 1 heure par session; deux séances seront nécessaires, c'est-à-dire deux heures au total.

Quels sont les risques pour moi?

Nous nous attendons à un risque minimal pour vous de participer à cette étude. Il existe un risque que la confidentialité pourrait être violé en raison d'un événement imprévu, tel que le vol de l'ordinateur portable du cochercheur principal ou de l'équipement d'enregistrement audio lors d'un voyage vers et à partir des sites sur le terrain. En outre, il existe un risque que vous pourriez révéler des renseignements personnels, sensibles ou identifiable lors de l'entrevue.

Afin de minimiser ces risques, l'enregistrement audio et les transcriptions des entrevues seront conservées sous une forme cryptée, format protégé avec un mot de passe. En outre, une liste des noms des sujets d'entrevue seront tenus séparément des enregistrements audio et transcriptions. Vous serez identifiés dans les transcriptions

et les enregistrements audio (y compris les noms de fichiers) par un code numérique. En outre, les formulaires de consentement des participants seront conservés séparément de matériel d'étude des autres. Tous les renseignements personnels, sensibles ou identifiables ne seront pas inclus dans les publications issues de cette recherche.

Est-il avantageux pour moi de participer à cette étude?

Il n'y aura pas bénéfices directs pour vous suite à votre participation.

Ma confidentialité sera-t-elle protégée?

Des publications feront probablement suite à cette étude, mais votre nom ne sera pas mentionné, seules les caractéristiques du groupe seront publiées.

Si vous participez à cette étude, nous aimerions être en mesure de vous citer directement, sans l'aide de votre nom. Si vous nous permettrez de vous citer dans les publications, merci de recopier la déclaration figurant à la fin de ce formulaire.

Qui contacter si j'ai des questions?

Vous pouvez poser toutes vos questions quant à la recherche à tout moment. Si vous avez des questions au sujet de la recherche après votre départ aujourd'hui, nous vous recommandons de vous adresser au chercheur principal, Patricia A. Loew, au +1-608-262-0654 ou de la contacter par courriel à paloew@wisc.edu. Vous pouvez également contacter Jill E. Hopke au +1-608-262-1464 ou par courriel à jehopke@wisc.edu.

Si vous n'êtes pas satisfait de la réponse de l'équipe de recherche, si vous avez d'autres questions, ou si vous voulez parler à quelqu'un au sujet de vos droits en tant que participant à la recherche, merci de vous adresser à l'Université du Wisconsin-Madison Education Research and Social & Behavioral Science IRB Office au +1-608-263-2320.

Votre participation est entièrement volontaire. Vous pouvez décider de ne pas participer ou de se retirer de l'étude à tout moment, en notifiant les investigateurs de l'étude.

Votre signature indique que vous avez lu ce formulaire de consentement, que vous avez eu l'occasion de poser des questions au sujet de votre participation à cette recherche, et que vous consentez volontairement à participer. Vous recevrez une copie de ce formulaire pour vos dossiers.

Nom du participant (Ecrivez votre nom en toutes lettres dans l'espace prévue):

Signature

Date

_____ Je donne mon accord pour être directement cité dans les publications, sans que mon nom apparaisse.

Je permets que mon entrevue soit enregistrée.

UNIVERSITY OF WISCONSIN-MADISON Information till försöksdeltagare, samt formulär om samtycke

Undersökningens namn: Negotiating Scientific and Environmental Claim-making in the New Media Ecology: A Cross-National Study of Hydraulic Fracturing (Vetenskaps-och miljöanspråk i det nya medielandskapet: en tvärnationell studie om hydraulisk spräckning)

Ansvarig forskare: Patricia A. Loew (tel: +1-608-262-0654, e-post: paloew@wisc.edu)

Doktorand: Jill E. Hopke (tel: +1-608-262-1464, e-post: jehopke@wisc.edu)

BESKRIVNING AV FORSKNINGSPROJEKTET

Du är inbjuden att delta i ett forskningsprojekt som handlar om miljömässiga och vetenskapliga meningsmotsättningar vid användningen av hydraulisk spräckning (så kallad "fracking") för utvinning av naturgas.

Du har blivit ombedd att delta som representant för det civila samhället, berörda myndigheter, en vetenskaplig organisation eller ett företag som berörs av frågan.

Undersökningen syftar till att nå insikt om de sociala betydelserna av hydraulisk spräckning i olika kulturer och regelsystem och ta reda på hur aktörerna utnyttjar nya medier för att kommunicera.

Undersökningen består av av myndiga deltagare som är involverade i frågan och kommer att utföras i form av tre nationella fallstudier i Sverige, Colombia och USA.

Under förutsättning att du ger ditt samtycke kommer intervjuerna att spelas in. Om du godkänner detta markerar du rutan på nästa sida. Jill Hopke kommer att ha tillgång till inspelningarna och lyssna på dem i kontrollsyfte. Även ansvarig forskare och övriga berörda parter kommer att ha tillgång till ljudinspelningarna. Dessa sparas fram tills projektet har slutförts och kommer sedan att förstöras. En transkription kommer att göras av ljudinspelningen från din intervju och den kommer att sparas i minst sju år.

VAD INNEBÄR MITT DELTAGANDE?

Om du bestämmer dig för att delta i studien kommer du att bli tillfrågad om dina synpunkter på hydraulisk spräckning, samt om hur du använder ny medieteknik för att kommunicera dina åsikter.

Varje intervju kommer att ta cirka en timme och det kan krävas två intervjuer. Den sammanlagda tiden kan alltså uppgå till två timmar.

FINNS DET NÅGRA RISKER?

Vi räknar med minimala risker för dig vid deltagandet i denna studie. Det finns (dock) en risk för att sekretessen kan brytas på grund av en oförutsedd händelse, till exempel om en medarbetare blir av med sin (bärbara) dator eller att ljudinspelningsutrustningen blir stulen när hon reser till och från försöksplatserna. Dessutom finns det en risk att du kan avslöja personlig, känslig eller identifierbar information under intervjun.

För att minimera dessa risker kommer ljudinspelningen och transkriptioner av intervjuer att sparas i ett krypterat, lösenordsskyddat format. Dessutom kommer en nyckel som innehåller intervjupersonens namn att bevaras separat från ljudinspelningarna och transkriptionerna. Du kommer endast att kopplas till transkriptioner och ljudinspelning (inklusive filnamn) via en sifferkod. Dessutom kommer deltagarnas blanketter för samtycke att hållas avskilda från

annat material som rör studien. Ingen personlig, känslig eller identifierbar information kommer att ingå i några publikationer som härrör från denna forskning.

MEDFÖR DELTAGANDET NÅGRA FÖRDELAR FÖR MIG?

Deltagande i studien är inte förenad med några speciella fördelar.

HUR KOMMER MIN IDENTITET ATT SKYDDAS?

Studien kommer att leda till publikationer, men inga namn kommer att anges. Det är endast gruppuppgifter som publiceras.

Om du deltar i studien skulle vi vilja ha möjlighet att citera dig utan att använda ditt namn. Du ger ditt samtycke till detta genom att fylla i rutan längst ned.

VEM SKA JAG KONTAKTA OM JAG HAR FRÅGOR?

Om du har frågor eller funderingar om studien kan du när som helst kontakta oss. Hör i så fall av dig till ansvarig forskare Patricia A. Loew på telefonnummer +1-608-262-0654 eller via epost på paloew@wisc.edu. Du kan även kontakta doktorand Jill E. Hopke på +1-608-262-1464 eller via jehopke@wisc.edu.

Om du inte är nöjd med de svar du får eller vill diskutera dina rättigheter som deltagare bör du kontakta University of Wisconsin-Madison Education Research and Social & Behavioral Science IRB på telefonnummer 1-608-263-2320.

Ditt deltagande är helt frivilligt. Du kan välja att inte alls delta eller att lämna studien när som helst, genom att meddela ansvarig för studien/försöksledaren.

Din namnteckning innebär att du har läst igenom detta dokument, haft möjlighet att ställa frågor och har beslutat dig för att ge ditt samtycke. Du kommer att få en kopia av dokumentet.

Deltagarens namn (v.g. texta):

Namnteckning

Datum

Jag ger mitt samtycke till att direktciteras utan att mitt namn anges i vetenskapliga publikationer.

Jag ger mitt samtycke till att intervjuerna spelas in.

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http://www.citizenscampaign.org	https://www.schiste911.org

Date	Organization Name	Role	Interview Location
June 10, 2013	Foros Think Tank	Paid Staff Member	Stockholm, Sweden
June 12, 2013	Sveriges geologiska undersökning (Geological Survey of Sweden)	Geologist	Uppsala, Sweden
June 14, 2013	Food and Water Watch- Europe	Paid Staff Member	Brussels, Belgium
June 17, 2013	Friends of the Earth- Europe	Paid Staff Member	Brussels, Belgium
June 18, 2013	Heaven or sHell	Volunteers (two individuals)	Tomelilla, Sweden
June 19, 2013	Sveriges geologiska undersökning (Geological Survey of Sweden)	Geologist	Lund, Sweden
June 25, 2013	Aktionsgruppen Mot Fossilgasutvinning på Ölands (AMFÖ) (Action Group Against Fossil Gas on Oland)	Volunteer	Oskarshamn, Sweden
June 27, 2013	Jordens Vänner (Friends of the Earth-Sweden)	Paid Staff Member	Gothenburg, Sweden
July 2, 2013	<i>Rädda Vättern</i> (Save Vattern)	Volunteers (two individuals)	Ödeshög, Sweden
August 8, 2013	Food and Water Watch	Paid Staff Member	Washington, D.C.

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Appene	dix D:	List	10	Interviews

Appendix E: Interview Protocol

Jill E. Hopke Interview Protocol - REVISED May 29, 2013

Good day. Thank you very much for taking the time for an interview about hydraulic fracturing and new media.

This is an open-ended, loosely structured interview. Additional questions may arise from the flow of the interview. It should last less than one hour and if, at any time, you would like to stop the interview or not answer a specific question, please just let me know.

[ISSUE FRAMING]

Thank you for taking the time to talk with me today. I would like to start by asking you some background questions.

-Please explain to me what hydraulic fracturing is.

-Please tell me about the mission of [organization] as it relates to hydraulic fracturing. What are the overarching values of the organization, aside from work on this particular issue? -What do you think are the strategic goals of [organization]?

[ASSUMPTIONS and BACKGROUND]

I'd like to begin by having you tell me a little bit about your involvement with the issue of hydraulic fracturing.

-Please tell me about your involvement with the issue of hydraulic fracturing, or "fracking"? -What attracted you personally to work on this issue? How long have you been involved?

[AREAS OF CONCERN]

I'd now like to ask you about some specific areas of concerns over the application of hydraulic fracturing technology in the oil and natural gas industry.

-What are the most important environmental issues surrounding hydraulic fracturing? -What are the most important potential concerns for human health related to hydraulic fracturing?

-What are the most important social issues surrounding hydraulic fracturing?

-What are the key areas of scientific debate over hydraulic fracturing, in your opinion? -What is the main scale of the problem? And, why?

-Lastly, where do you see the use of hydraulic fracturing in 20 years?

[ORGANIZATIONAL OBJECTIVES and TACTICS]

I'd like next to tell me a little bit about the goals of your organization.

-Do you try to communicate these concerns to various publics? How?

-Who are you trying to reach? What do you want people to do?

-What are you major mobilization objectives? What tactics (online and offline) help you reach these goals? How?

-What is the role of technology in helping you achieve your goals?

-How do these goals and tactics relate to national [REGIONAL] energy policy? International energy policy?

[NETWORKS]

-How does your organization work with others on hydraulic fracturing?

-How is what you do similar or different from the work of others on the issue?

-How do you identify and reach out to potential partner organizations?

[MEDIA^{USE}]

I'd like to focus for a few moments on your media use related to environmental issues and science.

-How do you get information about science and environmental issues?

-Do you use new media technologies to share information about hydraulic fracturing? If so, how? What motivates you to engage in these activities?

[PERSONAL BACKGROUND]

Now, I'd like to ask you about your value system.

-What is the most important scientific issue facing the world today? -What is the most important environmental issue facing the world today? -What is your opinion of climate change?

Before we finish the interview, I would like to ask you some demographic questions.

-What is your highest level of education?

-What was your age on your last birthday?

-How long have you lived in this community [FOR LOCAL ACTIVISTS]?

To conclude:

-Is there anything else that is important about this topic that we have not discussed?

Is there someone else you know who might be willing to talk with me about this topic? If so, would you be so kind as to put me in touch with them?

Thank you for allowing me to interview you as part of my study on the environmental and scientific issues surrounding hydraulic fracturing.