Microblogging the Environment:

How Generation Y Talks About Sustainability on Tumblr

Yeu Olivia Han

ABSTRACT

Environmental discourses represent how people understand complex environmental issues and create material consequences in policy, human behavior, and society. On microblogs, users exchange small amounts of content such as short sentences, individual images, or video links. Little research exists on the relationship between environmental discourse and microblogs, so I ask why environmental discourse takes the forms it does on the microblog Tumblr, by examining discursive content, form, and context. I coded 102 blog posts, conducted 3 interviews with bloggers, and performed discourse analysis on 8 posts. I identified environmental problem solving, which privileges human agency and seeks solutions within current political economic systems, as the most common form of environmental discourse on Tumblr. I found that Tumblr microblogs used little technical language, had many "shares" and "likes," and communicated in a subjective tone. These features make environmental discourse accessible to a wide audience, allowing for broad diffusion of environmental information and encouraging collaboration. In the neoliberal context we lack the correct frames for understanding environmental issues. Instead of arguing about whether the science is right or wrong, policy makers should determine what to do about these issues and when to act. Though Tumblr is a part of and reflects aspects of neoliberalism, it represents more progressive values, focusing on what we should be doing. This suggests Tumblr and social media can avert one-way communications by elites and encourage discussion for actual change.

KEYWORDS

critical discourse analysis, environmental discourse, neoliberalism, social media, weblog (blog)

INTRODUCTION

Environmental discourses are both a means of constituting and reflection of how people understand complex environmental issues that are interlaced with moral questions about human livelihood (Dryzek 1997). Defined as a shared way of apprehending the world, discourse is how people construct meanings or relationships within a set of assumptions to help determine legitimate knowledge (Dryzek 1997). How we define, interpret and address environmental affairs influences policy to produce material outcomes and power relations (Tuler 1998, Feindt and Oels 2005), ultimately impacting public health and livelihoods (Muhlhausler and Peace 2006). Until recently, traditional scientific texts, books, and news influenced popular understanding of environmental affairs, but new media platforms and other modern technologies are moving these discussions online.

Weblogs are valuable sources for environmental information because they can instantly transmit knowledge and ideas to a broad audience (Vieweg et al. 2012) and provide a real-time platform for environmental specialists to share their expertise (Ashlin and Ladle 2006). Weblogs circulate environmental discourse because they are easy to use, allowing people to connect and collaborate (Ashlin and Ladle 2006, Ebner and Scheifner 2008). Thus, blogs create a vehicle for enhanced civic involvement. The characteristics unique to new media are revolutionizing environmental discourse by giving individuals and local communities a voice in discussions dominated by journalists and institutional texts in the past (Oliver 2011). While weblogs are mainly used for expressing thoughts and short essays, people craving an even faster mode of communication can turn to the microblog for posting updates, ideas, or quick notifications (Ebner and Scheifner 2008, Java et al. 2007).

Microblogs are internet-based applications and a subset of weblogs, in which users exchange small amounts of content such as short sentences, individual images or video links (Kaplan and Heinlein 2011). Microblogging has a smaller time investment and higher update frequency than weblogging. Shorter posts reduce the thought investment required for content generation, and a microblogger may post several updates in a single day whereas bloggers may update his or her blog once every few days (Java et al. 2007). Research on microblogs is currently limited, but, given microblogging's recent popularity, it is important to understand why and how people use these tools (Java et al. 2007). Past research has found that microblogs give

Chinese citizens a say in public affairs (Pumin 2011), they can increase government transparency (Pumin 2011), they may expand social networks (Java et al. 2007), they were essential in broadcasting news in the 2010 Virginia Tech shooting (Vieweg et al. 2010), and they created situational awareness during the Red River flood of 2009 (Vieweg et al. 2010). Twitter creates a sense of community, shows potential for change in political contexts, and circulates news, and other microblogging sites such as Tumblr are geared towards building content and sharing ideas. Little research exists on the relationship between environmental discourse and microblogs. Researchers have not documented how a microblog represents environmental content. Analyzing sustainability and Tumblr as a case study may reveal that microblogs can shape environmental information.

My central research question is: why does environmental discourse take the forms it does on Tumblr? To answer, I ask the following sub-questions:

1. Content: What environmental content is represented in Tumblr?
2. Form: How does the technological medium shape environmental discourse on Tumblr?
3. Context: Are the ideas on Tumblr shifting environmental issues? How do these ideas fit in environmental discourse categories of: survivalism, environmental problem solving, sustainability, and green radicalism?

BACKGROUND

I based my study upon John Dryzek's *The Politics of the Earth* (1997), by using his categories and analysis of environmental discourse to organize what I saw on Tumblr. Environmental discourse is embedded in a history of industrialism. Industrialism's goals include growth, production of goods, and using goods to promote material well-being. Various competing ideologies have existed in industrialized societies, such as liberalism, Marxism, and fascism, and despite their differences, these ideologies share a history of ignoring or suppressing environmental concern. When the environment has been considered, it is seen as a mere input to industrial processes and most people still do not see our actions as making significant negative impacts on the environment (Dryzek 1997, Lakoff 2010).

Environmentalism and popular concern about environmental quality grew drastically in the 1960s, but the impacts of discourse were finally felt in the 1970s when industrialized

countries enacted environmental legislation (Gottlieb 2005). Whereas early environmentalism focused on pollution, population growth and natural resource depletion, more recent issues include animal rights or energy supply, showing that basic environmental concepts change dramatically over time depending on the dominant discourse. Although environmental discourses may be classified in many ways, Dryzek identifies four categories that I use for my study: survivialism, environmental problem solving, sustainability, and green radicalism. Each discourse differs in the basic entities recognized or constructed, assumptions about natural relationships, agents, and key metaphors or other rhetorical devices.

Survivalism is a popularized discourse from the 1970s, which asserts that continued economic and population growth will eventually hit the Earth's natural resource limits; ecosystems will reach their carrying capacity and no longer support human agricultural or industrial activity. Dryzek calls survivalism radical because it calls for a wholesale reorientation away from perpetual economic growth. Modern contexts would consider survivalism more conservative because it does not call for an end to capitalism, and is oriented towards limiting population growth through policy interventions. However, survivalism is prosaic and only sees solutions in terms of industrialism through giving responsible elites (for example, scientists or administrators) greater control of existing systems.

Environmental problem solving calls for using the current political-economic system through public policy to cope with environmental problems. For instance, liberal democratic governments may encourage sustainable action, markets may put price tags on environmental harms, or the state may institutionalize environmental expertise in its operations. There is disagreement within this discourse between pragmatic or aggressive reformist approaches, for example deciding whether administrative regulation or market incentives are appropriate for reducing pollution.

Sustainability emerged in the 1980s, building on the discourses of problem solving and survivalism. Sustainable thought redefined concepts of growth and development and is less focused on resource limits. Sustainability discourse attempts to dissolve conflicts between environmental and economic values through imaginative ideas, and it sees economic growth and environmental protection as complementary. Sustainable development often cannot be imposed in a top-down way, but is continuously contested in a struggle about its meaning, interpretation, and implementation (Hajer and Versteeg 2005).

Green radicalism is both a radical and imaginative approach that rejects the basic structure of industrial society and how the environment is conceptualized. This discourse seeks alternative interpretations of humans, society, and human roles in the world. Deep divisions reside in *green radicalism,* for example between green romantics and green rationalists, as well as between social ecologists with pastoral visions and deep ecologists preferring landscapes without humans.

METHODS

Study subject and research design

To understand how environmental discourse takes specific forms on microblogs and how the medium shapes discourse, I analyzed sustainability as a topic on Tumblr, a microblogging platform founded in 2007 and currently based in New York City (Tumblr Inc. 2012). Tumblr hosts over 50.7 million blogs and has 13.4 million distinct U.S. viewers, with an average age of 18-24 (Van Grove 2011, Alexa 2012), and United States residents comprising 34.3% of its visitors (Alexa 2012). My study population is drawn from the 17 blogs featured in the "Spotlight" section on sustainability (Table 1). I studied microblogging and environmental discourse in these posts through content analysis, interviews with bloggers, and discourse analysis (Oliver 2011). I used microblog posts for content analysis and discourse analysis. Interviews provided a blogger's perspective about running a microblog.

Table 1. Names of the Microblogs Analyzed.

Microblogs Analyzed	
A Smarter Planet	Berlin Farm Lab
Buy Nothing New for a Year	Climate Adaptation
Gerd Leonhard, Green Futurist and Keynote Speaker	Human Scale Cities
Imagine The Blog	Mother Nature Network
NRDC	Permaculture and the Internet
Planted City	Revkin dot net
Secret Republic	The Green Urbanist
Think Outside the Bin	This Big City
Unconsumption	

Coding

To get quantitative data and find overall trends or distributions in content categories, I randomly sampled and coded 6 microblog posts from 17 blogs, totaling 102 microblog posts. By following the blog URL with "/random," a blog visitor views a random post from the blog's archive. I coded post content by reading each article to document incidence of my preconceived coding categories (Lombard et al. 2002), which included government representation; agency; individual vs. large-scale change; post popularity; and personal voice (Oliver 2011). My first set of questions included the following (Table 2):

Table 2. Initial Coding Questions and Descriptions.

Coding Questions	Question Clarification
What is posted: text, photo, quote, link, audio, video or a combination?	1-2 sentence captions do not count as "text."
Agency, lack of control, both or neither?	Does the post present anyone as taking control, lacking of control, both of these, or neither of them?
Is the content presented objectively or subjectively?	Does the post speak objectively in a factual manner (no "I" or "we") or does it speak subjectively by using pronouns such as "I," "me", or "we"?
Small scale change, large scale change, or neither?	Small scale change: individual, group, small organization or company, up to the city scale. Large scale change: entire practices, institutions, societies, people in multiple cities, large companies.
Discusses future event, reaction to a recent event, both or neither?	Does the post talk about something that could happen, something that has happened, or both?
Does the content intend to inform like news Y/N?	Does the post present recent information that is meant to update its reader on important matters or does it give readers interesting, but relatively unimportant information?
"Sustainability" Y/N?	Does the post have the word "sustainability" or "sustainable" anywhere?
"Government" Y/N?	Any reference to government (agencies, officials, efforts, policies)?

After collecting my first set of blog posts, I refined my content categories by coding the first 17 posts in my sample set and seeing how well my questions applied. For example, I had to redefine some terms in my questions (such as changing "Precaution towards future risk" to say

"Discusses future event"), remove some questions (got rid of "Government Y/N?" because no posts fell under the yes category), and added some questions (under the agency question, I added "Who was shown as having or lacking agency?"). Before coding my second sample of 17 posts, I skimmed the posts and formed new questions that seemed to represent the data. Then, I used both old and new questions and coded the second sample set. I went back to the first sample set and recoded the data using my modified term definitions and new questions. I added the categories after initial coding (Table 3).

Table 3. Additional Coding Questions and Descriptions.

Coding Question	Question Clarification
Is the post about an individual, organization, company, institution, society, etc?	Who does the post write about? I have included scientists or any professions under the category "institution" and the military falls under "government." Society would talk about people broadly.
Original content Y/N?	Did the blogger create a new post (original content) or was it reblogged from another user?
Does the post include links to outside sources?	Does the post include links to other websites, such as social media networks, to the organizations or individuals talked about, or newspaper sites?
Is the post about nature, humans, or both?	Does the post talk about animals, plants, or environmental conditions? Or does it only talk about people?
Does the post inform like news or share personal experience like a diary? Both?	Typically objective posts are like news, while subjective posts share personal experiences. However, content can be "Both" by informing in a factual manner and talking about personal experience in the meeting.
Does the author connect with the reader through text Y/N?	Does the post say "you"?
About animals?	Does the post talk about animals, even indirectly?
Year posted?	What year was the content posted?
Number of notes?	How many notes ("likes" and reblogs) does the post have?
Category?	What category (I created these) does it fall under?

The post's general topic, content type, and subject were not mutually exclusive categories. For example, a post discussing polluting car emissions would fall under the topics of Transportation and Climate change, and it could have a picture of a car followed by text discussing car use statistics across the United States. All other coding categories were mutually exclusive.

Interviews

To get a blogger's personal viewpoint on Tumblr and environmental issues that neither content nor discourse analysis provides, I conducted interviews. I used Tumblr's internal messaging system to contact the bloggers for all 17 sites. I heard back from 3 bloggers and interviewed each of them through email. I took a structured approach to interviews and had the interviewees answer the questions given. The interview questions I asked are shown below (Table 4).

Table 4. Interview Questions for Tumblr Bloggers.

Question Number	Question
1	Would you briefly introduce yourself, give education, and occupation?
2	How did you become interested in environmental blogging?
3	Could you describe the processes involved in maintaining a microblog?
4	How do you choose what to post? Are there certain fields or issues you prefer to write about?
5	What are some of your primary sources of information for environmental posts?
6	What do you think is blogging's role or relationship to the broader environmental movement? Do you believe it can inform or is informing people on a larger scale?
7	What makes Tumblr valuable compared to print media (books, newspaper) or online news sources?
8	Did you have any goals when starting this blog? Is there anything you hope to achieve by continuing this blog (inspiring people to live more sustainably or updating readers on interesting sustainable-related news)?
9	How do you define sustainability or sustainable living?

To organize the textual data, I found common interview themes. Though I did not have a strict analysis method planned for doing interviews when I began, I kept common coding categories in mind, including how respondents define themselves in relation to a topic; respondents' perspective; respondents' ways of thinking about people and objects; and processes or methods used to organize content (Bogdan and Biklin 1998). I identified common themes in how bloggers produced environmental posts such as understanding what the bloggers thought made Tumblr valuable and what they hoped to achieve through the blog. With this information, I aimed to understand why environmental discourse takes the content-rich, diverse, but short forms it does on Tumblr.

Discourse analysis

I used discourse analysis methods to understand the microblogs post themselves, the discursive practices that create and shape interpretation of posts, and the post's broader environmental context (Huckin 1997). I analyzed specific posts to show which environmental discourse categories are represented on Tumblr and to understand how environmental issues were being presented to readers. I used the same posts from my content analysis method and chose 8 posts to analyze. I used my coding category of objective versus subjective tone to choose 4 subjective and 4 objective posts. Within subjective and objective categories, I chose interesting posts and tried to diversify genres. I then looked for trends. My goal was to find social and discursive practices. The strategies I used from Huckin's texts are listed below (Table 5).

Table 5. Huckin's Strategies for Critical Discourse Analysis.

Whole Text	Paragraph and Sentence	Words and Phrases
Genre	Topicalizing	Connotations
Manipulation	Agent-patient relation	Labels
Framing	Deletion or omission	Register
Visual Aids	Presupposition	Modality
Foregrounding	Insinuation	
Backgrounding		
Omission		
Discursive differences		

To analyze the discursive elements of Tumblr posts, I used Huckin's (1997) guide to critical discourse analysis and characterized the text based on Dryzek's (1995) different types of environmental discourse. I followed a "General Strategy" of first reading the post as a regular viewer, and re-reading it more critically. Then I analyzed texts as a whole, sentences, and individual words or phrases. I went through each analytical category identified by Huckin (1997) (for example, foregrounding, presupposition, labels, and metaphors), and saw if these strategies emerged in the post's writing. I based my analyses on Huckin's newspaper examples and personal experience with the genres of texts in the posts (for example, blog posts, infographics, or opinion articles).

Dryzek (1995) categorizes the different ways people discuss the environment into groups of thought with similar entities, assumptions, views on agency, motives, and rhetorical devices. I used Dryzek's survivialism, environmental problem solving, sustainability, and green radicalism as discourse categories for my study. Though Dryzek creates sub-categories, I did not think it was useful because the resulting broad typology could hide any connections or relevance within broader environmental discourses. To place these posts within broader social frameworks, I fit my analysis into neo-liberalism and free market contexts.

RESULTS

Coding

I found that most sustainability-themed Tumblr posts were from 2012, contained an image, presented content objectively, discussed individual people, were original posts, and included links to outside sources. I coded 6 posts from each of the 17 blogs, totaling 102 Tumblr posts.

Over half of the posts I sampled were from 2012, and 2% of posts were from before 2010 (Table 6). I found that the topics most represented were DIY and Reuse (17%), Climate Change (15%), Technology (15%), and Food (14%). I found that 65% of the posts included images and 41% contained more than three sentences of text. Videos, links, and quotes were

underrepresented. Individuals were most often the primary post subject (43%). Posts addressing society as a whole or practices also appeared frequently at 21% and 20%, respectively.

Table 6. Coding Results (Part 1).

Coding Category			Number of Posts	Percent of Total
Year	2008		1	1%
	2009		1	1%
	2010		12	12%
	2011		35	34%
	2012		52	51%
Topics	DIY/Reuse		17	17%
	Climate	Change	15	15%
	Technology		15	15%
	Food		14	14%
	Transportation		13	13%
	Cities		12	12%
	Art/Design		9	9%
	Animals		6	6%
	Economy		6	6%
	Energy		5	5%
	Policy		5	5%
	Recreation		5	5%
Content Type	Image		66	65%
	Text		42	41%
	Video		16	16%
	Link		16	16%
	Quote		7	7%
Subject	Individual		44	43%
	Society		21	21%
	Practice		20	20%
	Company		18	18%
	Institution		17	17%
	Organization		15	15%
	Government		12	12%

Slightly over half the analyzed posts spoke in an objective manner at 51%, and 49% spoke in a subjective manner by using the words "I," "me," or "we" (Table 7). I found that 69% of posts were original posts that were not non-reblogged. Over half (57%) of the analyzed posts did not make a connection to its reader by using the word "you." Many, 77% of posts, included links to non-Tumblr websites.

Table 7. Coding Results (Part 2).

Tone	Objective	52	51%
	Subjective	50	49%
Original Post	Yes	70	69%
	No	32	31%
Connects with reader	Yes	44	43%
	No	58	57%
Links to other websites	Yes	79	77%
	No	23	23%

I found that each post had an average of 325 notes ("likes" and reblogs). However, 55% of posts had 0-20 notes and only 1 post had over 1,000 notes. The minimum number of notes was 0 and maximum number of notes was 26,737 (Table 8).

Table 8. Distribution of notes per post.

Notes	Number of Posts	Percent of Total
0-20	56	55%
21-50	19	19%
51-100	6	6%
101-200	9	9%
201-500	8	8%
501-1000	3	3%
1000+	1	1%
Min	**Max**	**Average**
0	26737	325

Interviews

In my interviews, I found that bloggers were well-educated, often used Tumblr to supplement another website, enjoyed the Tumblr community, valued the short length of posts, and wanted their readers to choose more sustainable options rather than being too idealistic about sustainability (Table 9). Instead of trying to develop a grand idea of sustainability that everyone should believe in, the bloggers agree people should be aware of their connection to the environment and actively choose what would make a smaller impact or carbon footprint.

Table 9. Interview responses.

Blogger for:	This Big City	The Green Urbanist	Climate Adaptation
Background	• Masters degree in Sustainable Communities & Creative Economy • Business Consultant • Editor of sustainable cities website & business, This Big City	• BA in Public Policy • Transportation advocate	• 2 Masters degrees in Environmental Law, Urban Planning • Environmental Consultant
How or why did you start using Tumblr?	• Supplements his main website	• Was an easier way to follow several blogs	• Better outlet for sharing ideas than Facebook • Less of a commitment than a solo blog
What do you like to post about?	• Economic, environmental, & social sustainability	• Green urbanism & environmental policy	• Posts about disasters, weather, & the ecosystem
What do you think makes Tumblr valuable?	• Tumblr's community & "unique culture" • The short (in length & time) nature while still "provid[ing] people with a way to find out more."	• The Tumblr community & its wide knowledge base • Tumblr is "brief, colorful, & updated" to match a young generation's attention span	• It is pleasant, welcoming, and encouraging of conversation • Microblogs can inform on a large scale & highlight solutions to environmental issues

What do you hope to achieve through this blog?	• Encourage sustainable cities & individual ideas • Showcase sustainable ideas around the world, • Believes you can spark environmental interest through Tumblr	• Increase reader connection to & understanding of the environmental movement • To inform, connect individuals at a larger scale, and create a space for sharing ideas	• Show readers they can prevent disasters through government participation • Illustrate weaknesses in environmental or urban planning policies
How do you define sustainability?	• Avoids defining "sustainability" • More important to know what is *more* sustainable	• Living within your means, understanding your actions' connections to the environment, and actively acting to reduce emissions	• "Unconvinced by the theory of sustainability" • Adapting to & meaningfully managing changes is more important for environmental & human health

Discourse Analysis

I analyzed 8 posts, 4 of which spoke in an objective manner that established authority through factual tones and assertive (Table 10). The remaining 4 spoke in a subjective manner and expressed author's thoughts, opinions, or voice. Of the "objective" posts, I found that 1 post was based on a longer blog post, 2 posts were based on a news article, and 1 was an infographic. Of the subjective-sounding posts, I found that 2 were based on longer blog posts, 1 post was based on a news article, and 1 was a petition. I found that everyday citizens were presented as powerless agents against the effects of another party in 5 posts, and 2 posts presented humans with an ability to change or take charge of their actions. The post falling under "Neither" did not refer to everyday citizens.

I found that 4 posts used a problem-solution frame, which presents a problem followed by a possible solution or way to reduce the problem (Table 10). Only 1 post posed a problem but no solution and 3 posts framed their story using change over time. I found that 4 posts foregrounded and topicalized negative aspects, 2 posts foregrounded positive aspects, and 2 posts gave a fair, balanced account of both positive and negative arguments. Dryzek's environmental discourse categories of Survivalism, Environmental Problem Solving, and Sustainability were represented

in the analyzed posts (1997). I found that 2 posts represented Survivalism. Most posts (4 out of 8) represented Environmental Problem Solving. Another 2 posts represented Sustainability. No posts represented Green Radicalism**.**

Table 10. Discourse Analysis Results.

Analytic Categories		Number of Posts
Genre		
	Blog post	3
	News article	3
	Petition	1
	Infographic	1
Agency	Everyday citizens have agency	2
	Everyday citizens lack agency	5
	Neither	1
Frames	Provides a solution	4
	Problem without solution	1
	Change over time	3
Foregrounding	Positive aspects	2
	Negative aspects	4
	Balance of both positive and negative	2
Environmental Discourse	Survivalism	2
	Environmental Problem Solving	4
	Sustainability	2
	Green Radicalism	0

DISCUSSION

My questions provide an analysis of environmental discourse on Tumblr, focusing on (1) types of environmental content represented, (2) forms of environmental discourse, and (3) how these discourses fit into a broader context of neo-liberalism and free market ideologies today. Environmental problem-solving was the dominant discourse in posts. Dryzek (1997) suggests that in environmental problem solving discourses, people have agency in discussing environmental issues and nature is subordinate to human problem-solving. Today, environmental problem solving discourse continues to be characterized by external policy interventions.

However, Dryzek's definitions are limited because local actors still are pictured as victims of degradation or exploitation, and skepticism continues to surround environmental issues. The use of colloquial language in microblog posts, interviewee agreement on valuing the Tumblr community, and attempts to connect with the reader suggest that microblogs are an effective medium for diffusing informationbecause they make environmental discourse accessible to wider audiences, generate a multitude of perspectives, and encourage evolving discussions. Dominating free market ideologies pose significant challenges to implementing environmental change, preventing civic engagement and public dialog. Economic and political institutions have the agency to prevent or reduce environment-protecting policies because unregulated free markets are believed to be natural and moral under neo-liberalism. Such frames delay action regarding environmental issues, but microblogs can act as new form of democratic, public sphere that circumvents one-way communication by elites. Below, I analyze each environmental discourse category, consider how microblogs present an alternative means of talking environmental issues., and discuss how environmental issues are difficult to address in a neo-liberalist context but may lead to action in microblogs.

Content: Environmental discourse categories on Tumblr

Survivalism

On Tumblr, posts representing survivalist discourse assumed Dryzek's hierarchical social relationships and employed metaphors of unmaintained life-support systems leading to population doom. Survivalist discourse today still looks similar to Dryzek's vision, which argues economic and population growth will eventually hit the Earth's natural resource limits, and ecosystems will reach their capacity to no longer support human activity (1997). However, survivalist discourse is not dominant as it was in the 1970s. Recently, it has begun to explore broader ranges of limits such as un-renewable resources. In this category, the only solution is a wholesale reorientation away from perpetual economic growth (Dryzek 1997).

Survivalist discourses assume a relationship of hierarchy and control in natural relationships, in which elites are responsible for the world and human populations lack agency (Dryzek 1997). Michael Cote from the Tumblr blog, Climate Adaptation, writes in a post:

> 50% of Australians feel genetically modified foods are safe to eat. The argument of necessity is changing public opinion. With more people on the planet, coupled with more natural disasters crippling farmers and infrastructure, the case for GMOs is established… There's also a degree of ambivalence—this stuff is in the food system and we can't do anything about it.

The quote makes it seem as if GMOs are necessary to keep up with human need, and no other option exists. As with Dryzek's description of survivalist discourse, there is a tone of defeat and grudging acceptance. Human populations are presented as simply monitored and controlled by government policy. The GMO post also reflects how environmental discourse has diversified to examine a broader range of "natural boundaries" (Mcgrail 2011)—in this case how modifying food can possibly "save" us from emerging growth trajectories. The neo-Malthusian argument in this post suggests that institutional and policy failures are the ultimate cause of uncontrollable global population size and increasing consumption (Adger et. al 2001). By saying "we can't do anything about it" people are seen as lacking the agency to remove GMOs, and that big corporations can continue determining what is in the food system. The only solutions are seen in terms of science. So long as survivalist discourse assumes that science helps avert global catastrophe and that development can never be sustainable, science will continue having authority (Adger et. al 2001).

Survivalist discourse posts also employed a key metaphor of "spaceship Earth," in which if the life-support systems of the spaceship are not maintained, the crew dies (Dryzek 1997). Blog, Revkin.net, quotes a climate scientist's reaction to unrecovered Artic sea ice stating:

> I think we still need to be open to the possibility that natural variability has played a role in the recent warming of the Arctic, but with each year that goes by without a return to the pre-2007 summertime Arctic climatology it seems more likely that the remarkable change that we have witnessed will prove to be irreversible.

The scientist focuses on signs of "irreversible" climate change and suggests that changes need to be made soon, or else the Arctic will continue to decline, along with the Earth's ability to sustain life. Resources are only seen as threatened with exhaustion (Dryzek 1997) and there is a coupling of terms such as "global warming" and the "rise of sea level" in disaster narratives. The focus often becomes flooding of densely populated low-lying areas and reflects "apocalyptic" themes (Mulhausler and Peace 2006). In the current context, survivalism is "back in vogue" through the issue of climate change, and we continue to see frames of a "sacred" nature against inherently destructive industrial societies (Mcgrail 2011). The quote makes a romantic reference to "pre-2007 summertime Arctic climatology" that seems ideal or sacred compared to conditions today.

Dominance of the term "climate change" over "global warming" is a recent development, with "climate" connoting images of swaying palm trees and ''change,'' naturalizing the process and absolving humans form causal culpability (Adger et al. 2001). If climate is simply "changing," there is no one to blame (Adger et al. 2001). Such apocalyptic rhetoric is a mediating frame in global warming discourse, which posits warming as fated. This makes it difficult to hold humans accountable for pumping greenhouse gases into the atmosphere (Foust and Murphy 2009).

Environmental problem solving

Tumblr posts representing environmental problem solving discourse privileged human problem-solving over nature and assumed people had agency in environmental issues. Today, environmental problem solving has become one of the dominant discourses. It is characterized by external policy interventions as Dryzek (1997) identified, but also features collective action and some personal responsibility. Existence or severity of environmental problems is also questioned. Environmental problem solving discourse, as defined by Dryzek, continues to use the current political-economic system to address issues, but seeks adjustments to cope with environmental problems, especially in public policy (1997). Examples include influencing markets by putting price tags on environmental harms or implementing protective policies.

Posts representing environmental problem-solving discourse assumed that nature is rightfully subordinated to human problem-solving (Dryzek 1997). The blog, A Smarter Planet, states:

> There is now about 100Gb stored per person on the planet and it is doubling every year…There is a move from models being assumption heavy to being data rich thanks to the number of visitors and the amount of information. From knowing about transactions (enough for recommendation) to knowing interactions (enough for targeting) and ultimately relationships (can move to a long term relationship basis).

The quote establishes scientific and technical expertise as the top priority when solving environmental problems (Dryzek 1997). It seems to imply that current data capacities will be able to reduce the number of assumptions we currently make in models and relationships. It seems to suggest that with accurate data and without needing to assume, we can know more than ever. The post suggests that through having large data capacities, humans will create opportunities that were impossible before, and the "relationships" that can benefit from this technological expertise includes all human relationships.

Posts also contain popular democratic human agency, even though their motives may range from selfish material interests to public interest (Dryzek 1997). University students petitioning for more bike racks write:

> We propose that the City of Chicago make the following improvements for bicycle parking: 1) Double the amount of bike racks throughout the city due to lost parking meters; 2) Create bike rack standards… Providing strong incentives for bicycling in Chicago with abundant and secure bicycle parking throughout the city is one link in the chain of a bicycle-friendly city.

Opinion writer, Emily Badger also speaks up about loitering and criminalizing a leisurely pursuit embraced in European streets:

> Anti-loitering ordinances (designed with aging hippies, gang members and bums in mind) have been created by communities over the years with varying degrees of dubious legality… Lingering, on the other hand, is both a means to an end and a desirable end in itself. People who linger create vibrant public places and welcoming streetscapes… And leisurely foot traffic can lead to more street commerce, more connected communities, and spontaneous exchanges.

In the first quote, college students are active agents trying to make changes in their community rather than simply being acted upon or having policies chosen for them. Badger also speaks as an individual against the policies she believes should be changed. Both of these scenarios represent individual citizens and non-elites having agency, unlike survivalist discourse which only gives power to those at the top of political or corporate hierarchies (Dryzek 1997). Public interest is defined in plural terms because not every group has the same goals, but compromises are encouraged (Dryzek 1997)

Today, environmental problem solving discourse and technological innovations have merged to better address environmental issues. Policy has become the main form of human problem-solving and represents a technocentric worldview by which external policy interventions can solve environmental dilemmas (Adger et. al 2001). Although more groups now have a voice in environmental discussions and collective action is present (McGrail 2011), there is still a sense that local actors are victims of external forces. These forces bring about degradation and exploitation because the policy makers are distanced from resource users (Adger et. al 2001). Dryzek's characterization of environmental problem solving is limited today because the existence or severity of environmental problems is still questioned. The lack of agreement could be attributed to both the existence of many conflicting opinions and static public policy. Despite the controversy, skepticism, or uncertainty surrounding environmental issues (Adger et. al 2001, McGrail 2011), there is one consensus: consumerism and

industrialization must be reduced (Lakoff 2010). Without tackling the controversy and skepticism around environmental issues, humans cannot do more to solve these problems.

Sustainability

Tumblr posts representing environmental sustainability discourse featured metaphors of self-conscious improvement and assumed complementary relationships between environmental protection and economic prosperity. Today, sustainability has seemed to merge with environmental problem solving to become one of the dominant discourses. However, its focus has shifted away from traditional resource conservation concerns and towards sustainable living in one's everyday life (Gottlieb 1994, Hays 1999).

Posts representing sustainability discourse featured key metaphors of organic growth and development, which highlight self-conscious improvement (Dryzek 1997). Buy Nothing New for a Year is a blog committed to re-use and posted an image saying:

> Beware when you are told you need something (even if its just you telling yourself you need something). A) You probably don't really need the thing. B) You can probably borrow from a friend or improvise with something you already have.

For Dryzek, self-improvement is "enabling the individual to negotiate his or her social environment in more effective fashion (1997)," encouraging such behavior by lowering excess consumption. Instead of purchasing something new, we have more environmentally conscious alternatives that encourage reuse and going green. Sustainability discourse also assumed environmental protection and economic prosperity proceeding hand-in-hand (Dryzek 1997), as seen in the scientists' response to Canadian navies running dangerous sonar exercises. The blog, National Resources Defense Council posts:

> Now a group of sixteen scientists – representing much of the Northwest killer whale research community – have come out with a simple message for both the Canadian and U.S. Navies: keep high-intensity sonar out of the whales' critical habitat.

In a sustainability discourse, governments, businesses, environmentalists, and scientists cooperate to restructure the economy along more environmentally defensible lines (Dryzek 1997). The Tumblr post shows the scientists and navy on equal ranks, with neither party subordinate to the other. Though science and government works are not yet restructuring the economy on more environmentally defensible lines, they are working together towards better solutions. This represents progress in making sustainable changes to our economy and markets.

Today, the sustainability discourse has merged with environmental problem-solving. Whereas older concerns focused on resource conservation or wildlife related issues, sustainability discourse has been broadened and shifted to focus on individual actions in everyday life. Today's sustainability discourse requires consumer or individual action and responsibility (McGrail 2011). What "enables an individual to negotiate his or her social environment in more effective fashion" can be defined as a more progressive moral system that emphasizes empathy, responsibility, and an ethic of excellence (Lakoff et. al 2001). Today's vision of self-improvement is less of a choice than it is a requirement of each individual due to necessity. Choosing not to act sustainably creates a negative impression and acting sustainably is assumed to be the "right" or only choice. Alternative groups have become fanatical about sustainability unlike before, and using the internet to connect with like-minded users may have contributed to the movement seen today. Dryzek states that sustainability discourse attempts to resolve conflicts between environmental and economic values but does not identify how. However, it seems that technology may be the key factor facilitating this process, as ecology and technological modernity can be made to flow together through green technology development, business, and government (McGrail 2011). Rather than positing nature as a pure system separate from human life, forms of direct ecological management have also emerged (McGrail 2011). Of the four environmental discourses, sustainability seems most open to using technology for remedying environmental issues. If we are able to use technology to produce with less pollution or reduce using unrenewable resources, technology may be our best way of reducing environmental harm within free markets because it simply creates a better way of doing something without massive changes to the system.

Green Radicalism

Green radicalist discourse was rarely seen in the Tumblr posts, but one post appealed to reason in individuals and suggested that society is capable of greater rationality. While romanticized forms of society, deep ecology, and Marxist ideas exemplified green radicalism decades ago (Merchant 2007, O'Connor 1998), this discourse is largely diminished. Dryzek defines green radicalism as a radical, imaginative approach that rejects the basic structure of

industrial society and how the environment is conceptualized (1997). It seeks alternative interpretations of humans, society, and human roles in the world (Dryzek 1997).

The post representing green radicalist discourse featured appeals to reason and potential rationality of social structures (Dryzek 1997). Blog, The Green Urbanist, shares a post concerning pollution and global warming:

> I hope we can all resolve (and actually do it) to make one thing hot in 2011—calling that icky stuff pouring out of our economy 'pollution' instead of 'emissions'… Climate terms that use 'emissions' are way more common than terms using 'pollution,' and that's a problem for communicating how serious climate change is.

In asking that people use the term pollution, the author argues a simple change can better address climate change and global warming. In addition to individuals, rationality is ascribed to collectivities such as political and economic systems as they interact with nature (Dryzek 1997). This post suggests that if each person changes his or her choice of terms, we can make an impact as a collective, and though humans are not rational yet, we are capable of a greater rationality (Dryzek 1997)

Although green radicalist discourse is much diminished today, the idea that social systems are capable of analysis, redesign, and learning are pertinent today (Dryzek 1997). Today, radical thought involving romanticized, pre-modern forms of society are argued to be inappropriate because the world's population is too big and we have already done too much ecological damage (McGrail 2011). Others argue the anti-modernist mindset of "eco-radicalism" restricts the search for solutions (McGrail 2011, Lewis 1992). The result of these forces has created a modified form of green radicalist discourse that sees sustainable global civilization and prosperity as possible, but changing only individual lifestyle responsibility and personal virtue will be insufficient (McGrail 2011). Under neo-liberalism and Dryzek's other discourses, the market is the context in which change happens, but green radicalism offers a break from free market ideologies and offers a range of alternatives.

Form: How microblogs and technology affect environmental discourses

Public accessibility and diffusion

Tumblr's more colloquial language compared to academic texts and large number of notes per post seems to be an effective medium for disseminating environmental discourses, making them more accessible or appealing to particular audiences. In addressing the complex subject of genetically modified foods and how 50% of Australians believe they are safe to eat, the Tumblr blog, Climate Adaptation, writes:

> The argument of necessity is changing public opinion. With more people on the planet, coupled with more natural disasters crippling farmers and infrastructure, the case for GMOs is established. Also, there have been no widespread doom-day disasters despite decades of GMO uses.

The post does not require background knowledge of GMOs, has no technical terms, and a typical adult can understand the article's argument without doing extra research. The quote is representative of most Tumblr posts, which make information digestible to people of varying educational backgrounds. An advanced education is no longer needed to gain a critical perspective on environmental issues. Information is condensed to the most important elements, but often the blogger will link his or her reader to resources to find out more. The blog This Big City reached over 100,000 followers in 3 years, and the Tumblr posts I coded had an average of 325 notes per post with the most popular post having 26,737 notes. For a single microblog, 100,000 is a large following and not every person likes or reblogs posts so the number of views per post is actually higher than the note count.

Studies have found that most environmental knowledge is acquired from commercial and interpersonal media rather than through formal education, but news media poorly communicate the long term, progressive issues (such as climate change) because they are difficult to convey through traditional news cycles (Adams and Gynnild 2013). Environmental reporting has a limited appeal because environmental issues tend to be drawn out and lack large visible changes needed to draw reader interest (Mulhausler and Peace 2006). Online media may be more effective at communicating big picture aspects, but making these messages captivating and interesting has posed a major communication challenge (Adams and Gynnild 2013). Tumblr however, seems to overcome the greatest barriers in communicating environmental issues. As a

form of social and interpersonal media, Tumblr involves communication among peers and can enhance learning. While mass media is good at spreading knowledge, communication among peers is crucial because it is more effective for convincing and sharing opinion. Users are more likely to listen to the opinions of their friend or colleague than a detached news article or impersonal advertisement. Tumblr has a low time commitment and is aesthetically pleasing, suggesting it can effectively present environmental in a captivating and interesting way as well. Microblogs are not subject to constraints traditional news media has: time, space, specific biases, or a limited number of reporters. The multimedia quality of Tumblr makes the platform dynamic and live, continuous feeds are able to instantly disseminate. However, depth of understanding, context, and nuance can be lost on microblogs. Although the general public is embracing microblogs and view them to be highly credible, many scientists are concerned about the association with leisure-reading or intellectual property theft (Ashlin and Ladle 2006). Information on blogs is more likely to be inaccurate a peer-review mechanism has not been implemented, nor is it likely to be in the near future because of blogging's inherent spontaneity and interactivity (Ashlin and Ladle 2006). Users should recognize that technical experts and scientists still have enhanced understandings and should seek out informed opinions when possible.

Participatory information sharing and collaboration

Interviewee agreement on the value of Tumblr's community, subjectively presented posts, and establishing a connection to readers suggest Tumblr can evolve environmental discourse in a collaborative way because it is open to various opinions and represents a more participatory form of information sharing unavailable fifteen years ago. Bloggers for This Big City and The Green Urbanist revealed in interviews that Tumblr's community is what makes the platform valuable. Blogger for Climate Adaptation said Tumblr was "encouraging of conversation." In addition, 49% of posts presented information subjectively by saying "I," "we," or "us," and 43% established a connection to its reader by saying "you." Unlike academia or traditional news reporting, almost half of Tumblr posts do not take an objective, detached position when writing.

While environmental knowledge used to be generated from a limited number of scholars who shared similar knowledge and were trained in specific discourses, Web 2.0 has created a cultural shift allowing audiences to do more than simply receive or consume mass media (Meyers 2012). Web 2.0 is characterized by sharing, with users creating content as well as reading it. Participation in this endeavor is part of a conversational approach to information circulation (John 2013, Allen 2013). The line separating media producers and media consumers has blurred, allowing non-professionals to create content and influence the cultural production of meaning (John 2012, Meyers 2012). With microblogs being easy tools to learn and use, Tumblr and the Internet have allowed non-scientists to participate in environmental discussions and evolve these discourses. Everyday citizens from different backgrounds and ideologies interested in significant or local environmental issues can offer a new perspective to scientists trained professionally. They may help in brainstorming new concepts, generating ideas, or even finding solutions to existing problems (Ashlin and Ladle 2006). Blogging, citizen journalism, and social news sites yield new possibilities for citizen participation at various points along those chains of sense-making that shape news (Goode 2009).

Context: Relating Dryzek's environmental discourse categories to issues today

With environmental issues only beginning to move to the forefront of social concerns, the rhetorical frameworks for these issues are still evolving. Complex new issues that are both ambiguous and large-scale have been emerging in addition to traditional concerns like wilderness preservation and resource depletion (McGrail 2011). Currently, most people have the wrong frames for understanding "the real crisis," and do not understand how our actions are making significant negative impacts on the environment. Instead they have frames that either contradict the correct frames or lead them to ignore relevant facts (Lakoff 2010). These frames continue to be seen in US press coverage describing climate change in terms of controversy, skepticism, or uncertainty, and even the U.S. Environmental Protection Agency perceives framing as a short-term messaging issue rather than a long-term challenge (Lakoff 2010). However to work toward a solution, dominant narratives must change from "eco-tragedy" stories and uncertainty, to new ones with positive frames that promote an understanding of environmental issues (McGrail 2011). In many cases, effective discursive approaches to understanding and developing policy

have not been figured out, and Tumblr reflects these conservative values and ideologies. But compared to traditional news or policies, the subjective localized voices on Tumblr generally feature a more progressive moral perspective characteristic of democratic change, which emphasizes empathy, responsibility, and an ethic of excellence (Lakoff 2010). Tumblr and other microblogs contain a live-stream of consciousness, personalized voices, and democratic production of knowledge, which can act as a new public sphere along with other social media technologies. However, these bright possibilities are limited in our current context of neo-liberalism and domination by elites.

Although society focuses on sustainability issues and seeks solutions to key issues such as climate change, we have not effectively addressed environmental issues because they are often caught in the midst of deterministic free market and state policy dynamics. Under neo-liberalism, political and economic institutions prevail over citizens, constraining policies within market-driven imperatives (Brulle 2010). For the market, this imperative requires maximizing return and continuous economic expansion; for the state, the priorities are providing security, ensuring economic growth, and maintaining political legitimacy (Brulle 2010). Market and policy have become so intertwined that making changes to one, which has proven difficult enough, seems ineffective unless the other reinforces it. For example, few corporations dispute prevailing scientific conclusions about climate change, and many have embraced market-based solutions such as emission trading, self-regulation, and new technology (Ihlen 2009). However, their rhetoric assumes a type of economic instrumentality that seems ill-suited to the systemic criticisms and changes that are needed (McGrail 2011). Even changes like limiting corporate emissions become problematic because neo-liberalism and unregulated free markets are believed to be natural and moral, so when attempts at environmental regulations or government subsidies are made, they are seen as government interference in the market and thus immoral (Mcgrail 2011). Such framing allows for U.S. federal policy actors to defray responsibility and delay action regarding environmental issues (Foust and Murphy 2009). So far, elite-led one-way communications have failed to allow civic engagement and public dialog. This has undermined the creation of a democratic process of change (Brulle 2010), but perhaps Tumblr, social media, and other collaborative platforms can be one of many possible solutions to averting these dominant, one way communications. Rather than seeing the natural world as a resource for short-term private enrichment, we need to assume the same of environmentalism: the natural world is

being destroyed and we have a moral imperative to preserve and reconstitute as much of it as possible, as soon as possible (McGrail 2011).

Limitations

Study design limitations such as being the only coder, interviewing over email, and having a broad research question may limit the level of inference of my findings. Researchers typically intercode with at least two other coders and calculate intercoder reliability to assure recorded characteristics are relatively objective (Nuendorf 2002, Lombard et al. 2004). However, I was the only coder and cannot assure my results are reproducible. I only was able to complete 3 interviews, which limited my data. My interviews were done over email and reduced the interviewee's range of discussion to the questions asked. Email interviews reduce the chance of a spontaneous answer offering data richness and should not be used as an alternative to face-to-face interviews in all circumstances (Opdenakker 2006, Hunt and McHale 2007). My research question could have been more focused, and I could have effectively designed my study to include just discourse analysis, without coding or interviews. My study site was Tumblr, so I can extend my findings to other microblogs but cannot extend my content or form findings to non-microblog sites.

Future directions

The fields of social media and sustainability are ripe for investigation and will not be going away any time soon, so future studies could consider using different environmental discourse typologies or determining whether microblogs will continue to be popular in future years. I analyzed posts using Dryzek's environmental discourse categories, but would the results be similar if a different set of categories were used? The decline of traditional blogs was foreshadowed as early as June 2009, and was only confirmed when Tumblr became more searched on Google than the term "blog" as of December 2012 (Arthur 2009, Alfonso 2013). Since microblogs are similar to traditional blogs, are microblogs a fad that will also decline in the near future or is their unique quality of being short in time and content generation enough to keep microblogs popular for more than five years? Even if microblogs are no longer popular, it is

worthwhile exploring how ideas are circulating between different forms of media. Different versions of the Internet exist and we are currently in Web 2.0, which is participatory, easy to use, requires little coding knowledge, and is focused on social media (Agarwal 2009). However, Web 3.0 is emerging as a new version that has been described as "mobile" and is distinguished by being always connected with an individual, location aware, and driven by user experience similar to an iPhone (Jamison 2012). What will living sustainably look like with Mobile Web 3.0? Will these technologies make choosing sustainable options easier?

Conclusion

While green radicalism discourse has greatly diminished and survivalism has focused on issues of climate change, the environmental problem-solving and sustainability discourses have merged to represent dominant environmental discourse on Tumblr. They are characterized by privileged human problem-solving over nature, agency for more groups, self-conscious improvement, along with co-development of environmental protection and economic prosperity. Dryzek's categories remain applicable today but have experienced slight shifts, especially with recent technological development. Environmental discourses and the language used to describe pertinent issues are important to analyze because they ultimately create material consequences in policy, what counts as legitimate sustainable behavior, and our futures.

Although controversy, skepticism, and uncertainty continue to surround environmental issues, technology may help us reduce conflicts between environmental and economic values. Tumblr and blogs make environmental discourse more accessible to a general public, allowing for a multitude of opinions and evolution of discussion rather than being limited to information from a small number of scientists trained the same discourse. A college degree is no longer needed to gain critical perspectives on the environment and its politics. Millions of young viewers who visit Tumblr are being exposed to sustainable thought and interested users can be a part of how we define key environmental issues. Users should be aware that context and nuance may be lost on microblogs, and that information will not always be accurate if not coming from a scientist or technical expert. Though the proper frameworks for understanding environmental concerns have not yet been created, Tumblr and Internet technologies are creating collaborative

platforms that act as a new public sphere, encouraging a live-stream of consciousness, personalized voices, and democratic production of knowledge.

The context of neo-liberalism, free market ideologies, and one-way communications from elites has made addressing environmental issues incredibly difficult. Debate has wrongly focused around whether the science behind environmental issues is right or wrong. Instead, we should be asking what is to be done about current problems, when to act, and how many resources to divert towards fixing them. Attempts at imposing regulations has been seen as immoral because it interferes free market ideologies, thus allowing federal policy actors to delay action and defray responsibility. These collaborative platforms have promising futures in becoming one way to circumvent dominant, one-way communications and create a space for undeveloped frames to develop. Our goal should be to encourage these democratic discussions and participation to produce actual change.

ACKNOWLEDGEMENTS

REFERENCES

Adams, P. C. and A. Gynnild. 2013. Environmental messages in online media: the role of place. Environmental Communication 7:113-130.

Adger, W. N., T. A. Benjaminsen, K. Brown, and H. Svarstad. 2001. Advancing a political ecology of global environmental discourses. Development and Change 32:681-715.

Alexa. 2012. Visitors by country for Tumblr.com. <http://www.alexa.com/siteinfo/tumblr.com> (Version 04/06/2012).

Alfonso, F. 2013. "Tumblr" now a more popular Google search than "blog". The Daily Dot. <http://www.dailydot.com/news/tumblr-blog-google-search-rankings/> (Version 03/15/2013).

Allen, M. 2012. What was Web 2.0? Versions as the dominant mode of internet history. New Media & Society 15:260-275.

Argawal, A. 2009. Web 3.0 concepts explained in plain English. Digital Inspiration. <http://www.labnol.org/internet/web-3-concepts-explained/8908/> (Version 03/15/2013).

Arthur, C. 2009. The long tail of blogging is dying. Guardian. <http://www.guardian.co.uk/technology/2009/jun/24/charles-arthur-blogging-twitter> (Version 03/15/2013).

Ashlin, A. and R. J. Ladle. 2006. Environmental science adrift in the blogosphere. Science 312:201.

Bogdan, R. C. and S. K. Biklen. 1998. Qualitative research in education: an introduction to theory and methods. Allyn & Bacon, Needham Heights, MA, USA.

Brulle, R. J. 2010. From environmental campaigns to advancing the public dialog: environmental communication for civic engagement. Environmental Communication: A Journal of Nature and Culture 4:82-98.

Brummett, B. 2006. Rhetoric in popular culture. Sage Publications, Inc., Thousand Oaks, CA, USA.

Dryzek, J. S. 1997. The politics of the earth: environmental discourses. Oxford University Press, Oxford, UK.

Ebner, M. and M. Schiefner. 2008. Microblogging – more than fun? Proceeding of IADIS Mobile Learning Conference 2008. Algarve, Portugal, 2008.

Feindt, P. H. and A. Oels. 2006. Does discourse matter? Discourse analysis in environmental policy making. Journal of Environmental Policy & Planning 7:161-173.

Foust, C. R. and Murphy W. O. 2009. Revealing and reframing apocalyptic tragedy in global warming discourse. Environmental Communication: A Journal of Nature and Culture 3:151-167.

Goode, L. 2009. Social news, citizen journalism and democracy. New Media & Society 8:1287-1305.

Gottlieb, R. 1993. Forcing the spring: the transformation of the American environmental movement. Island Press, Washington, DC, USA.

Hajer, M. and W. Versteeg. 2005. A decade of discourse analysis of environmental politics: Achievements, challenges, perspectives. Journal of Environmental Policy & Planning 7: 175-184.

Hays, S. P. 1999. Conservation and the gospel of efficiency: the progressive conservation movement, 1890-1920. University of Pittsburgh Press, Pittsburgh, PA, USA.

Hochman J. 1997. Green cultural studies: an introductory critique of an emerging discipline. Mosaic 30:81–97.

Huckin, T. N. 1997. Critical discourse analysis. T. Miller, editor. Functional approaches to written text: classroom applications. TESOL France, France.

Hunt, N. and S. McHale. 2007. A practical guide to the e-mail interview. Qualitative Health Research 17:1415-1421.

Ihlen, O. 2009. Business and climate change: the climate response of the worlds 30 largest corporations. Environmental Communication: A Journal of Nature and Culture 3:244-262.

Jamison, J. 2012. Web 3.0: the mobile era. TechCrunch. <http://techcrunch.com/2012/08/11/analysis-web-3-0-the-mobile-era/> (Version 03/15/2013).

Java, A., X. Song, T. Finin, and B. Tseng. 2007. Why we Twitter: understanding microblogging usage and communities. Proceedings of the Joint 9th WEBKDD and 1st SNA-KDD Workshop. San Jose, CA, 2007.

John, N. A. 2013. Sharing and Web 2.0: the emergence of a keyword. New Media & Society 15:167-182.

Kaplan A. M., M. Haenlein. 2011. The early bird catches the news: nine things you should know about micro-blogging. Business Horizons 54:105-113.

Lakoff, G. 2010. Why it matters how we frame the environment. Environmental Communication: A Journal of Nature and Culture 4:70-81.

Lombard, M., J. Snyder-Duch, and C. C. Bracken. 2002. Content analysis in mass communication: assessment and reporting of intercoder reliability. Human Communication Research 28:587-604.

Lombard, M., J. Snyder-Duch, and C. C. Bracken. 2004. Practical resources for assessing and reporting intercoder reliability in content analysis research projects. <http://www.slis.indiana.edu/faculty/hrosenba/www/Research/methods/lombard_reliability.pdf> (Version 11/12/2012).

McGrail, S. 2011. Environmentalism in transition? Emerging perspectives, issues and futures practices in contemporary environmentalism. Journal of Futures Studies 15:117-144.

Merchant, C. 2007. Ecology. Humanity Books, Amhearst, NY, USA.

Meyers, E. A. 2012. 'Blogs give regular people the chance to talk back': rethinking 'professional' media hierarchies in new media. New Media & Society 6:1022-1038.

Muhlhausler, P. and A. Peace. 2006. Environmental discourses. Annual Review of Anthropology 35:457-479.

Neuendorf, K. A. 2002. The content analysis guidebook. Sage Publications, Thousand Oaks, CA, USA.

O'Connor, J. 1998. Natural causes: essays in ecological Marxism. Guilford Press, New York, NY, USA.

Olausson, U. 2011. "We're the ones to blame": citizens' representations of climate change and the role of the media. Environmental Communication: A Journal of Nature and Culture 5:281-299.

Oliver, N. 2011. Engulfed: Exxon Valdez, Deepwater Horizon, and journalism's changing tides. CNR Honors Thesis, University of California, Berkeley, California, USA.

Opdenakker, R. 2006. Advantages and disadvantages of four interview techniques in qualitative research. Forum Qualitative Sozialforschung 7.

Pumin, O. 2001. Micro blog, macro power. Beijing Review: 20-21.

Sharp, L. and T. Richardson. 2010. Reflections on Foucauldian discourse analysis in planning and environmental policy research. Journal of Environmental Policy & Planning 3: 193-209.

Tribe, L., C. Schelling, and J. Voss. 1976. When values conflict: essays on environmental analysis, discourse, and decision. Ballinger Publishing Co., Cambridge, MA, USA.

Tuler, S. 1998. The politics of the earth: environmental discourses reviewed by Seth Tuler. Human Ecology Review 5:65-69.

Tumblr, Inc. 2012. About us. <www.tumblr.com/about> (Version 04/06/2012).

Van Grove, J. 2011. Tumblr tops 13 million U.S. uniques in July.
    <http://mashable.com/2011/08/31/tumblr-record-uniques/> (Version 04/06/2012).

Vieweg, S., A. L. Hughes, K. Starbird, and L. Palen. 2010. Microblogging during two natural
    hazards events: what Twitter may contribute to situational awareness. Proceedings of the
    ACM 2010 Conference on Computer Human Interaction. Atlanta, GA, 2010.