

Public opinion and communicative action around renewable energy projects

Stewart Fast

Thesis submitted to the
Faculty of Graduate and Postdoctoral Studies
in partial fulfillment of the requirements
for a doctoral degree in Geography

Department of Geography
Faculty of Arts
University of Ottawa

© Stewart Fast, Ottawa, Canada, 2013

Abstract

This thesis investigates how rural communities negotiate the development of renewable energy projects. Public and local community acceptance of these new technologies in rural areas around the world is uncertain and spatially uneven and represents an area of emerging public policy interest and one where scholarly theory is rapidly developing. This thesis uses Habermasian concepts of public sphere, communicative action and deliberative democracy, as well as the concept of “wicked problems” from the planning studies literature combined with geographical concepts of place and scale to advance theoretical and empirical understanding of how public opinion on renewable energy technologies is formed in place. It documents energy use patterns, attitudes and socio-political relations at a time when considerable state and business efforts are directed at the construction of solar, wind, biomass and small-hydro technologies in rural regions.

These concepts and theories are applied in a case study of rural communities in the Eastern Ontario Highlands, an impoverished area undergoing rapid restructuring driven by centralization of services and amenity migration but with abundant natural resources in form of forests, numerous waterways and open space which have attracted a broad range of new energy developments. Overall high levels of support for alternative energy development particularly for solar power were found, albeit for reasons of local energy security and not for reasons of preventing climate change. There was some evidence that seasonal residents are less supportive of hydro and biomass projects than permanent

residents possibly reflecting broader trends in rural economies away from productive uses of land to consumptive appreciation of rural landscapes.

The thesis suggests that collective action to advance energy projects in the case study area require agreement along three world-claims (truth, rightness and truthfulness) and that communication leading to discourse which uncovers hitherto hidden reasons for action is possible. These findings offer rare empirical evidence of the predictions of deliberative democratic theory in environmental planning settings. However, multiple barriers to communicative action were also identified and there is evidence that the state's reliance on market incentives may have long term costs in terms of diminished public reasoning around renewable energy.

Résumé

Cette thèse étudie la façon dont les communautés rurales négocient le développement de projets d'énergie renouvelable. L'acquiescement par le public et les communautés de ces nouvelles technologies dans les zones rurales à travers le monde est incertain. Cette thèse utilise les concepts Habermasien de l'espace public, de l'agir communicationnel et de la démocratie délibérative, ainsi que le concept de «wicked problems» provenant des études spécialisées en planification. Ces concepts combinés aux concepts géographiques du lieu et de l'échelle font progresser la compréhension théorique et empirique sur la façon dont l'opinion publique des technologies d'énergies renouvelables est formée dans un lieu. La thèse documente les modes d'utilisation d'énergie, les attitudes et les relations socio-politiques à un moment où des efforts considérables de la part des gouvernements et des secteur privé affaires sont dirigés vers la construction de l'énergie solaire, de l'énergie éolienne, de biomasse et de petits barrages hydroélectriques dans les régions rurales. Ces concepts et théories sont appliqués sur une étude des communautés rurales des Eastern Ontario Highlands, une région pauvre en restructuration rapide tirée par la centralisation des services et de la migration des néo-ruraux mais avec des ressources naturelles abondantes sous forme de forêts, de nombreux cours d'eau et des espaces ouverts qui ont attiré une liste de projets d'énergie nouvelles. J'ai trouvé des niveaux élevés de soutien pour le développement d'énergie alternative en particulier pour l'énergie solaire, mais pour des raisons de sécurité énergétique locale et pas pour des raisons de prévention des changements climatiques. Les résidents saisonniers étaient en général moins favorable envers l'hydroélectricité et les projets de biomasse que les

résidents permanents, ce qui reflète les grandes tendances dans les économies rurales: une plus grande appréciation pour la consommation des paysages ruraux plutôt que des utilisations productives de la terre.

Cette thèse suggère que l'agir collectif pour faire avancer des projets énergétiques dans la zone d'étude nécessitent un accord sur trois formes de revendication (exactitude, justesse et sincérité) et que la communication au discours qui découvre jusque-là cachés pour des raisons action est possible. Ces résultats offrent des preuves empiriques portant sur les prédictions de la théorie démocratique délibérative dans les paramètres dans le domaine de la planification environnementale. De nombreux obstacles à l'action communicative ont également été identifiés et il y a preuves que le recours de l'État aux incitations du marché peuvent avoir des coûts à long terme en termes de diminution de raisonnement public autour de l'énergie renouvelable.

Acknowledgements

Above all thank you to my wife Eleanor for your patience and support. I could not have done this without you. Being a student was a change in many ways for our family and I am so grateful to you my love.

I count myself very lucky to have to be supervised by Robert McLeman. Rob provided phenomenal support logistically, financially, professionally and academically. Rob's contribution to my development and journey as a PhD student is immense and I thank him. I am also very fortunate to have had the advice and friendship of Mike Brklacich throughout the course of my post-graduate studies. Luisa Veronis, André Viau and José Lopez make up the rest of an encouraging and talented supervisory committee. José thank you in particular for the guidance through Habermas' theories. Kes McCormick in Sweden and Australia offered kindness and a great collaboration at the wonderful IIIIEE, I hope to return the favour one day.

The friends and colleagues I have made in the Eastern Ontario Highlands are people that shared their region, their homes and their ideas. I am thankful to so many but in particular to Angela Bright, John Inglis, Marily Seitz, Tony Fritsch, John Kittle and the Hasler family especially Carolyn and Joel.

This project was supported by SSHRC through a doctoral scholarship.

List of Figures

Chapter	Figure	Pg
1	Figure 1 – Habermas' theoretical model (source, author)	21
1	Figure 2 – Eastern Ontario Highlands	22
2	Figure 1 - Number and type of social acceptance of renewable energy articles published between 1987 and 2012 (English language only) total =132	33
3	Figure 1 – Eastern Ontario Highlands	53
3	Figure 2 – Response to question “What are most important energy issues in the future?” from residents of Eastern Ontario Highlands surveyed February to May, 2011	61
3	Figure 3 – Levels of renewable energy “NIMBY” attitudes among residents of Eastern Ontario Highlands surveyed February to May, 2011	62
3	Figure 4 - Profiles of the participants of focus group #1	66
4	Figure 1 – Habermas’ theoretical model (source, author)	82
4	Figure 2 – Eastern Ontario Highlands	87
4	Figure 3 – Annual energy consumption in North Frontenac and Addington Highlands (total 426 PJ)	88
5	Figure 1 – Strategies for planning problems	144

List of Tables

Chapter	Table	Page
2	Table 1 - top 5 countries for analysis of renewable energy social acceptance issues , percentage of studies reporting on wind power and country ranking in terms of installed wind generation capacity	35
2	Table 2 - The roles reported to be taken by the public in social acceptance studies for renewable energy	36
2	Table 3 – Summary table of findings from review of social acceptance of renewable energy studies	40
3	Table 1 – Demographic characteristics of permanent residents of Addington Highlands and North Frontenac surveyed on energy use and energy attitudes in February to May 2011	57
3	Table 2 – Household heating sources in use in the study area and in Canada	59
3	Table 3 - Attitudes towards different sources and sizes of RET in the eastern Ontario Highlands	64
4	Table 1 – Degree to which EOH actors have pursued renewable energy production	85
4	Table 2 – Distinguishing between different validity claims in conversation (knowledge types)	92
4	Table 3 – Shared understandings observed during facilitated group discussions	98
4	Table 4 – Current and predicted degree to which actors pursue renewable energy production	111
5	Table 1 – Differences between “tame” and “wicked” problems	128

Table of Contents

Abstract.....	ii
Résumé.....	iv
Acknowledgements.....	vi
List of Figures	vii
List of Tables.....	viii
Table of Contents.....	ix
Chapter 1 - Introduction	1
Context.....	1
Research purpose and research questions	3
Organization of thesis	4
Situating the thesis within the literature	7
Geographies and trends of contemporary Canadian rural society.....	7
Renewable energy technologies and the problem of social acceptance.....	11
Public opinion, the public sphere, and Habermas’ communicative action theory.....	13
Approaches to environmental governance: place, scale and wicked problems.....	15
Methodology.....	20
Choice of study area.....	22
Methods	24
Comment on methods	26
Comment on community-based research	28
My positionality.....	28
Chapter 2 - Social Acceptance of Renewable Energy: Trends, Concepts and Geographies	32
Introduction	34
Methodology.....	35
Results.....	37
Geography’s contribution to the topic.....	42
Discussion and suggestions for future research	46
Bibliography	51
Chapter 3 - Attitudes towards new renewable energy technologies in the Eastern Ontario Highlands.....	52

Introduction	55
Overview of the study region.....	56
Methods	59
Survey.....	59
Results	62
Survey.....	62
Focus group findings	70
Discussion.....	75
Acknowledgements.....	80
Chapter 4 - Habermasian analysis of local renewable energy deliberations.....	81
Introduction	83
Habermas' social theory.....	85
Case Study: Renewable energy in the Eastern Ontario Highlands.....	88
Characteristics of the local public sphere	93
Three types of organizations in the EOH acting in the public sphere.....	94
The power of the groups acting in the public sphere	95
Spatial aspects:.....	96
Habermasian discourse analysis	96
Findings from discourse analysis.....	101
Evidence of communicative action in the Eastern Ontario Highlands.....	101
Communicative action	105
The public interest in climate change	106
Evidence of discourse.....	106
Practical discourse.....	107
Aesthetic and therapeutic critique	109
Theoretical discourse	110
Barriers to communicative action: colonization of the lifeworld and of the public sphere ..	112
Manipulation and prevention of discourse.....	113
Systemically distorted communication.....	114
Discussion.....	115
Insight into EOH renewable energy futures.....	115
Deliberative or agonistic processes for renewable energy planning?	118

Contributions to Habermas’ theory	120
Intersubjective understanding and formal pragmatics.....	120
The public sphere.....	122
The use of communicative action theory in renewable energy studies.....	124
Conclusion.....	126
Chapter 5 - Biofuels: From a win-win solution to a wicked problem?.....	128
Introduction	132
Background	134
Analysis.....	135
#1 No clear formulation of the problem.....	136
#2 No stopping rule.....	137
#3 Type of solution is ambiguous.....	139
#4 Time required to assess solution extends indefinitely.....	140
#5 Consequences of imperfect solution	141
#6 All solutions cannot be considered	143
#7 Transferability of solutions.....	144
#8 Symptoms of other problems	145
#9 World-views of discrepancies	146
#10 How actions are judged.....	147
Discussion.....	148
Conclusion.....	155
Future perspective:	156
Executive summary:.....	158
Acknowledgements:.....	159
Chapter 6 - Thesis conclusions.....	161
References.....	172
Appendices.....	185
Appendix 1 : Mail out Survey	185
Appendix 2: Background material for focus group meetings	191
Appendix 3 : Renewable Energy Expo.....	198
Appendix 4 : Full list of articles reviewed in chapter 1	200
Appendix 5 : example of coding system	210

Chapter 1 - Introduction

Context

The use of modern renewable energy technologies including wind turbines, solar panels, biomass pellets, small hydro and others is increasing rapidly. Globally half of all new electricity generation is from renewable sources of energy, and by 2015 renewables will become the second-largest source of power behind coal (IEA 2012). On a national level, Canadians have witnessed a 4-fold increase in wind-farms and solar farms in the last 5 years. “Renewables”, to use the policy-speak short-hand, are now big business. In 2011 global investment in renewable power and fuels increased 17% to over \$250 billion annually (UNEP- Frankfurt School 2012). They are embedded into formalized political targets including for example, the European Union’s 20/20/20 targets to increase the share of EU energy consumption from renewable sources to 20% by 2020 and in Ontario’s decision to replace coal-fired electricity generation plants with non-greenhouse gas emitting sources of power.

Thus, economic cost and state support are no longer the barriers they once were for renewables. Political and economic conditions are at the most favourable point they have been in generations. Yet the expansion of alternative energy systems is markedly spatially uneven. China, the United States and Germany account for 60% of the wind turbines installed world-wide (World Wind Energy Association 2012). Among the Canadian provinces, Ontario accounts for three-quarters of the installed solar photovoltaic capacity(Navigant Consulting 2012). In all regions, rural settlements are the predominant location for these alternative energy technologies. An unexpected and problematic barrier

affecting all forms of renewable energy development is social acceptance (IPCC 2011, OECD 2012). Rural publics are at the centre of the changes that renewable energy brings to landscapes, economies and social relations. Examining the responses of individuals and communities faced with such developments may help predict the future for renewables and contribute to more equitable forms of energy development.

The overarching problem for this study in general terms is “how are rural societies interacting with renewable energy development?” This study questions the desirability and form of renewable energy development from the perspective of individual members of a geographic community, and explores the social and political processes that organize individual values and interests into governance decisions. There are a growing number of studies into social acceptance issues around renewable energy primarily based on opposition to large scale wind farms in the United Kingdom and the Netherlands (Devine-Wright 2005, Wolsink 2000, Hagget 2008). These have provided a solid body of evidence of factors influencing opposition and important conceptual advances including critiques of the “Not-in-My-Backyard” (NIMBY) concept. Yet, there remains a persistent lack of empirical research advancing concepts able to analyse the social dynamics of public attitude formation (Devine-Wright 2010b, Walker et al. 2010) particularly in the North American rural context. The core questions of why some projects gain support and why others do not, lack definitive answers and continue to attract substantial academic and popular interest.

This thesis represents the first known study to bring together key geographical concepts of place and scale with Habermasian political philosophy and the ‘wicked problem’ concept from planning studies to advance a theoretical and conceptual approach to understanding

how renewable energy projects are negotiated in rural communities. The theories and concepts developed here have been tested empirically through a place-based analysis of individual attitudes and of group deliberation in a set of rural communities located in eastern Ontario, Canada that are undergoing rapid changes typical of rural communities in Canada and elsewhere.

Research purpose and research questions

The purpose of the research is to assess how people in one set of rural communities (Eastern Ontario Highlands “EOH”) identify, negotiate and respond to renewable energy developments and draw out wider implications for trajectories and governance. The study is organized around four specific and related research questions

- (1) What are the local energy use patterns and the attitudes of individuals towards renewable energy technologies in EOH?
- (2) How is intersubjective meaning produced and negotiated in EOH, and in turn how is public opinion formed?
- (3) What evidence exists for the role of communicative action as theorized by Habermas and others in renewable energy deliberations in EOH?
- (4) What lessons might be drawn from the case study that are relevant for wider research and understanding of social acceptance of renewable energy technologies in rural communities, and how might these lessons be relevant for planning and governance?

These questions are pursued using evidence gathered through a mixture of methods.

Quantitative analysis of energy use patterns and the attitudes of EOH residents are mixed with qualitative assessments of public spaces and public deliberation via participant observation and group interviews.

Organization of thesis

The thesis follows the ‘thesis by article’ format established by the Faculty of Graduate and Postdoctoral Studies and the Department of Geography. It is composed of 4 journal articles in various stages of peer-review (3 published articles, 1 manuscript in review) together with an introduction and conclusion chapter. Each article is a stand-alone contribution written for a specific journal audience but each is also connected to the overall purpose and research questions of the thesis. They are arranged logically proceeding from a literature review, to reporting of empirical results with preliminary analysis, then to a thorough interpretation of empirical data using the Habermasian conceptual framework established for the research and finally to a more general reflection on the challenges of energy planning and energy governance. Each of the article chapters (chapters 2 to 5) are prefaced by a short description of any co-author contributions, publication details and abstract. For ease of reading all references are cited at the end of the thesis. A brief overview of the thesis chapters follows below:

The **introductory chapter** is a guide for the thesis. Having presented the context for the research, overall research purpose, and specific research questions, this chapter continues

on to situate the thesis with four related research areas. It finishes with a description of the methods used, the rationale for choosing the EOH as a case-study site and comments on the social science practised in this thesis.

Chapter 2 is a systematic review of the last 25 years of English-language scientific literature on social responses to renewable energy. Titled *Social Acceptance of Renewable Energy: Trends, Concepts and Geographies*, it is under review by the journal *Geography Compass*. It applies the designation of types of social acceptance (public, market and community) from Wustenhagen *et al* (2007) and a typology of types of publics from Walker and Cass (2007) to organize the literature. In doing so, it identifies under-studied questions and potential avenues for geographers to expand upon. This chapter positions the thesis within its multidisciplinary context and provides support for the choice of case study area and choice of methodology pursued in the research.

Chapter 3 is an empirical article titled *Attitudes towards new renewable energy technologies in the Eastern Ontario Highlands* published in the *Journal of Rural and Community Development*. It documents results of a mail survey of EOH residents on their use of energy and their opinions on a range of renewable energy technologies, together with preliminary analysis of group interviews in which participants discussed the survey findings and their ideas on meeting energy needs. It serves an important part of the thesis by directly answering research question #1 and contributing to research question #4. This phase of the research also suggested (1) important group differences between the attitudes of seasonal and permanent residents (2) nuanced public arguments over the market incentives put in place by the State and (3) a comfort level with continued exploitation of

resources that have a tradition of use in the area. These themes were pursued in the later analysis.

Chapter 4 is the longest article of the four and contains the major theoretical contribution of the thesis. *A Habermasian analysis of local renewable energy deliberations* is published in the *Journal of Rural Studies*. The article is guided by the overall theory of society and politics from Jurgen Habermas. It presents a discourse analysis of several group discussions using the framework of universal pragmatics, and an assessment of the local public sphere based on participant observation in the EOH. This approach resulted in key findings related to all of the research questions notably #2 and #3. These findings include: (1) a tendency for public argument to deflect and re-orient particular individual or group interests towards shared interests; (2) despite this tendency, the values emerging from public debate had little governance power due to institutional and structural barriers; and (3) a discernable presence of reflexive discourse and communicative action around renewable energy planning, but also evidence of communication being threatened by larger scale processes.

Chapter 5 steps back from the EOH case study and, using some of the concepts concerning deliberation and governance developed in previous chapters, explores a specific form of alternative energy - liquid biofuels. Titled *Biofuels: from win-win to wicked?* and published in the journal *Biofuels*. It introduces a classic concept in planning studies of “wicked problems” and applies the 10 characteristics of wicked problems as a heuristic to the experiences of biofuels in North America and Europe. The audience for this article is biofuel planners and the article makes a number of recommendations including several focused on deliberation and collaborative-planning which have Habermasian origins and stress points

that were of importance in the EOH energy discussions. It contributes to answering research question #4.

A final **conclusion chapter** summarizes the major findings of the research, outlines the theoretical and applied contributions and suggests further research directions.

Situating the thesis within the literature

The research problem for this thesis concerns rural societies' interactions with renewable energy developments. Approaching this problem requires a working knowledge of the literature for several areas of research. These are examined in the literature review section of the article chapters to varying degrees. The purpose of this introductory literature review section is threefold, first to introduce these research areas, second to highlight how this thesis builds out from major findings and questions from within these literatures and third to provide an extended review of any areas of research that could not be thoroughly examined due to space constraints in the article chapters.

Geographies and trends of contemporary Canadian rural society

Contemporary definitions of rural society rely on a combination of spatial, functional and socio-cultural characteristics. Cloke's (1985) influential definition is of settlements with low population density featuring extensive land-uses and the existence of shared behavioural tendencies such as an attachment to the natural environment. This is the definition used in this thesis with a sensitivity to Cloke's warning against an over-emphasis on a rural-urban dichotomy that comes with this kind of functional and descriptive approach (Cloke 2006). Social science has long set up such a dichotomy whereby rural peoples live a stable, tight-

knit, and hierarchical life but, urban peoples have dynamic, unstable, and impersonal lives (Woods 2005). Major conceptual works on modern society from Weber and Durkheim rely on these dichotomies (see discussion in Bonner 1997, Woods 2005). However, it is widely accepted today that a strict conceptual distinction between rural and urban society is not tenable for a number of reasons: (1) the scope of influence of the city is expanding even in hinterland areas (Bryant and Johnston 1992); (2) globalization means increased mobility to and from rural areas as well as shared common cultural symbols in both rural and urban places (Woods, 2005); and (3) the influence of post-structural approaches which emphasize that “rural” has a socially-produced meaning not necessarily tied to rural spaces and one that may differ by gender, class and ethnicity (Halfacree 1993).

Primary sector resource extraction activities of agriculture, forestry, fishing and mining continue to be a major part of rural life in Canada but their influence is diminishing. In 1950 over 2/3rds of the rural Canadian population lived on-farm and was employed in agriculture, today it is less than 8% (Reimer and Bollman 2010). Most jobs are found in wholesale and retail trade, in manufacturing, and in service activities to do with health care and social assistance (Reimer and Bollman 2010). A growing proportion of the 6.2 million Canadian rural population is in close proximity (within 50 km) of census metropolitan areas (Bollman and Clemenson 2008). With advances in communication technologies many jobs that previously required residency in urban centres can now be performed in more remote locations. These developments, together with the in-migration of seniors looking to spend their retirement in countryside settings, have changed the demographic make-up of

Canada's rural communities. Fewer are employed in extractive natural resource activities, and more have made lifestyle choices to live in what is perceived as an idyllic setting.

Guimond (2012) has recently examined this growing trend of amenity migration in a study of two regions of Quebec. She finds gentrifying effects and inflation in house prices due to demand from in-migrants but prefers to stress the day to day importance of meeting places where newcomers and locals interact creating new forms of rurality. Guimond (2012) is careful to point out that the real-estate price inflation effect that comes with in-migration is not homogenous but centred on lakeshore properties. Halseth's study (1998) of Ontario and BC cottage developments calls these spaces, the "rural-recreational countryside" and highlights the social divisions between cottage owners and nearby residents. These divisions come to the fore in local politics and land-use decisions and scholars from the United Kingdom and the United States who have noted similar national rural restructuring trends have explored these implications. In the UK context, Ilbery and Bowler(1998) offer a Marxist argument that in-migrants of the "service-class" attain control over local development decisions and implement protection measures that conflict with agriculture or other extractive production activities. They suggest this is one facet of a broad shift in rural economies from productivism - oriented towards producing large amounts of food- to post-productivism characterized by reduced food-input, reduced government production subsidies and the expectation that rural areas meet multiple goals including landscape preservation and environmental stewardship goals, see also (Mather, Hill and Nijnik 2006). Others have emphasized instead the power of the rural "idyll" to gentrify rural regions in particular ways by attracting in-migrants seeking a less materialistic life and closer

connection to nature (Smith and Phillips 2001, Woods 2005). American cultural geographers now refer to a “New American West” (Phadke 2011, Robbins et al. 2009) characterized by socioeconomic differences between amenity migrant communities and long-term resident natural resource communities. Walker and Fortnam’s (2003) study of a California land-use conflict between ranchers and urban migrants over new suburban development in the landscape is a strong example of this literature.

Perhaps a more familiar theme in studies of rural Canada is of regions more distant from urban centres undergoing social transformation while adapting to severe challenges and population decline (Parkins and Reed 2013, Reimer 2013). It is uncertain if Canada’s rural communities can manage an increasing list of challenges arising from climate change, globalization, and high-levels of financial risk to compete in industrialized agriculture and forestry (Wallace and Brklachich 2010). Pointing to the loss of essential services as hospitals and schools are centralized, Troughton’s diagnosis is that “rural community self-determination has been eroded, if not obliterated.” (Troughton 2004: 257). In this context, outside investment to develop renewable energy projects may be hard for locals to pass up. Brannstrom *et al* (2011) and Mulvaney *et al* (2013) have shown that rural communities in decline in Texas and Indiana have looked favourably on wind-farm developments as a factor for keeping people in the region, keeping schools open and protecting farms from being lost.

In sum the literature on contemporary Canadian rural society hints at two issues which could be important as this research sets out to examine rural society’s interaction with renewable energy developments and selects a case study area. First, it is likely that rival

views will exist in rural communities on whether or not to use and alter landscapes, these will likely be split along newcomer and long-term resident lines, and the technologies with most visual impacts are likely to be the most controversial. Second, rural communities that are in economic and population decline will likely look more favourably on any kind of new economic development including renewable energy.

Renewable energy technologies and the problem of social acceptance

Before undertaking this study of social relations around energy production, it is useful to be reminded of the physical and technical aspects of the subject. Energy is “the ability to do work” (Cleveland and Morris 2006). It is the capacity to undertake movement, emit light or heat, undergo chemical reaction, move electrons and more. Energy is not oil, not wind, not wood, nor water. These are all prospective sources of useful energy that require technologies to be converted. Renewable energy comes from constantly regenerated sources including the sun, wind, water and biomass (Cleveland and Morris 2006). The phrase “renewable energy technologies” (RET) thus refers to various energy converting technologies including wind-turbines, hydro-dams, photovoltaic solar panels, biomass pellet making equipment and burners and more.

Since renewable energy comes from constantly regenerated sources it has economic and environmental advantages over fossil fuels (coal, natural gas, oil). First, renewable sources are essentially permanent and so avoid the problem of exhaustibility. Second, there are no combustion pollutants with renewable energy sources (except for burning biomass but even biomass combustion adds no new carbon to the atmosphere) meaning that problems of acid rain and smog are avoided with most technologies and climate change is mitigated

by all. For these reasons environmentalists have advocated for more renewable energy use for generations. This objective has been catalyzed by major geopolitical events; the OPEC crisis of the 1970s sparked visions of a “soft-energy path” (Lovins 1976), and more recently the many policies and targets associated with the UN Framework Convention on Climate Change to reduce greenhouse gases.

Thus there is a historical context in the efforts to increase the use of renewable technologies and this is reflected in the literature on social acceptance over the last 25 years. Chapter 2 reviews this literature and finds that a consistent question is how to account for what is seen as a paradoxical gap in high levels of public support for renewable energy but low levels of planning success (e.g., projects are cancelled due to local concern and protest) (Bell, Gray and Haggett 2005). It is important to note that the majority of case studies in the literature have been of wind farms and many have been based on examples from the United Kingdom. Geographical concepts of place and landscape have been used relatively widely in analyses to explain the emotional attachment of residents to bucolic vistas that then become controversial sites for wind farm development. At a methodological level, some suggest that opinion polling, economic modeling and other traditional socio-economic research methods are insufficient by themselves to explain opposition or to predict and plan for renewable energy pathways (Devine-Wright 2007, Fisher and Brown 2009, Mårtensson and Westerberg 2007). There is a need to develop and apply research methods that are appropriate for the social and dynamic (not individual, static) nature of public responses (Walker et al. 2010).

From this literature the thesis takes two methodological points. First, there is a gap in the study of multiple types of renewable energy technologies, and the case study should cover more than only wind based technologies. Second, measuring public opinion is only a first step; this thesis should also aim to analyze the social process of public opinion formation about renewable energy projects.

Public opinion, the public sphere, and Habermas' communicative action theory

The concept of public opinion is closely tied to the development of representative systems of government in which the legitimacy of government institutions and decisions is derived from how well they represent the opinion of a larger body of constituents (Calhoun 2002).

The first use of the modern term "public opinion" occurs in the 18th century and is linked to Enlightenment ideals of reasoned judgment over absolute power. Habermas (1989) traces the rise and fall of the political power of genuine public opinion in modern democracies. He argues that public debate has been replaced by opinion polling against pre-selected categories, by the lobbying of special interest groups and by the trend for individuals to consume culture instead of debating it. Notwithstanding these problems, he argues a public sphere with the potential for transformative political action based on coercion free deliberation still exists.

Habermas' concepts of the public sphere, deliberation and communicative action are one direction of current research on public opinion. A second direction influenced by political scientist Robert Dahl investigates the extent to which modern democracy is maintained by plural competing opinions from different social groups cumulatively acting to limit the power of political elites (Calhoun 2002, Blokland 2011). A third research direction is

quantitative analysis of survey data and polling techniques, which as stated above provides only an initial analysis of social responses to renewable energy developments. Habermas' theories are pursued in this thesis as they have provided major intellectual foundations for not only querying public opinion but also for a wider "deliberative" turn in theories of democracy in the 1990s, whereby "increasingly, democratic legitimacy came to be seen in terms of the ability or opportunity to participate in effective deliberation on the part of those subject to collective decisions" (Dryzek 2000: 1). Instead of governing by aggregating pre-existing preferences in opinion polls and during elections, deliberative democracy stresses collective discussion and revising of initial opinions to come to joint decisions (Meadowcroft 2004, Parkins and Mitchell 2005). Habermas' concepts start with the premise that language-use requires moments of shared intersubjective understanding between humans which coordinates social action. The social coordinating function of language attains a political function through the public sphere where citizens and governments are forced to consider public reasons during decision making. Habermas' theory of society and his approach to public opinion / public sphere provides the theoretical foundations for this thesis and are explored in more detail in chapter 4.

For geographers the public sphere can mean a variety of things. It has a commonplace meaning of the media or anything covered by the media (McKee, 2005). Feminists use the term to refer to all activities outside of the domestic or household sphere (Fraser 1992). It is closely linked to the term "public", a term that Staeheli and Mitchell (2007) have found is used in four possible senses, with notable differences in whether or not the economy is considered a private activity or a public activity. Geographers have contributed several

important refinements to the public sphere concept; notably that there is a cause and effect relationship with public space, the more restrictive public spaces are the more exclusive is the public sphere (Goheen 1998, Mitchell 1995). A second point made by geographers is that the public sphere can jump scale levels beyond and within the nation-state that is implied in Habermas' description. For example, Freidburgh (2004) shows how NGOs in the UK drove supermarkets to audit suppliers in Zambia; Brewer (2007) documented a very local public sphere of the back of pick-up trucks and kitchen tables for mediating access to a commonly held fishing resource in New England.

In terms of Habermas' broader body of work it is worth noting Miller's comment (2000) that despite obvious similarities between French urban sociologist and philosopher Henri Lefebvre's concepts of abstract space and social space and Habermas' concept of system and lifeworld, more geographers have been attracted to Lefebvre's work. Both emphasize the dehumanizing impact of capitalist system logic and of bureaucratic ambition to colonize everyday lived experience. While Lefebvre may offer a stronger spatial analysis, Habermas' theory offers explanations of intersubjective meaning production which are better positioned to develop the enlarged view of public opinion pursued in this thesis.

Unsurprisingly for such a broad theory Habermas' ideas have attracted criticism. Major criticisms that he overly relies on reasoned argument over other forms of communication, and naively expects consensus are reviewed in chapter 4.

Approaches to environmental governance: place, scale and wicked problems

Society's capacity to reconcile the different, and sometimes conflicting, values that each citizen brings to society's problems is a thorny topic. There are many explanations of how

this governance occurs. Governance here has two main meanings. First, as a system of governing that combines both state and non-state actors (Bulkeley 2005). Second, in terms of environmental governance, it suggests an ability for society to grasp and collectively address environmental problems (Cash et al. 2006, Bulkeley 2005). With my focus on a renewable energy case study the focus of this thesis is also on environmental governance. Environmental issues often involve uncertainties and contested knowledge claims which can place them in the category of “wicked problems” (Rittel and Weber, 1973). Planners argue there is a distinction between issues that are relatively straightforward to define, to design solutions for and to evaluate – which can be called tame problems – versus those that are ambiguous, value-laden and uncertain. The term wicked problem has been applied to many environmental issues including deforestation, climate change and environmental health risks (Batie 2008, Frame 2008, Kreuter et al. 2004, Ludwig 2001). The difficulties encountered during the development of renewable energy technologies may also fit the ten criteria of wicked problems (this is argued in chapter 5 for the specific technology of liquid biofuels). In any case, the continued intractability of traditional planning solutions to certain problems and high levels of public distrust in experts have led to expectations of a much greater role for citizens in planning and governance (Fischer 1993).

Greater involvement of citizens in environmental planning and governance is an established tradition in natural resource management. Canadian planners seek more citizen involvement first because they have to - there is no public consensus on appropriate natural resource use - and second, because lay and traditional knowledges can improve decision making (Parkins and Mitchell 2005). Yet, some question whether current public

participation processes in natural resource and environmental governance really do meaningfully involve the public (Meadowcroft 2004, Wesselink et al. 2011) or even possibly contribute to worse outcomes (Bradshaw 2003). Parkins and Mitchell (2005) observe that there has been a lack of attention to deliberative democratic theory in the natural resource management literature and argue that natural resource management can gain from deliberative democracy. In particular they argue for more attention to facilitating a process that encourages discussion rather than specific outcomes.

A persistent question for those that emphasize more space and power for citizen deliberation in environmental governance is: are there any guarantees that ecological arguments will be respected? In other words, by solely emphasizing the process of deliberation, are better environmental outcomes likely (Lövbrand and Khan 2010)? At a general level, Dryzek suggests that deliberation which is sensitive to the non-verbal signals from the natural world could theoretically lead to better environmental outcomes. Using acid rain and climate change as examples, he finds that the negative feedback from disruption of ecological processes act to transmit an “argument” to human actors (Dryzek 1987, Dryzek 2000). Skollerhorn (1998) has noted however that Habermas himself is skeptical of environmental reasons during communication and feels that they should not be put beyond politics. She suggests that this is due to Habermas’ critique of the German ENGO movement as reactionary conservatives rather than a fundamental dismissal of environmental values. Lovebrand and Khan (2010) conclude there is simply not enough empirical evidence of existing environmental deliberation to say whether better environmental outcomes are achieved using deliberative models.

This unanswered question of political theory has important implications for renewable energy governance models. Some political scientists argue that climate change is a special category of wicked problem; it is a “super-wicked” problem because time is running out for solutions (Levin et al. 2012) and that consensus oriented stakeholder deliberation over solutions (e.g., building more renewable energy infrastructure) leads to compromises that only delay solutions. On the other hand, others have provided evidence that citizen led deliberation processes have prioritized renewables in energy planning (Luskin et al. 2007a, Luskin, Fishkin and Hahn 2007b). This thesis contributes to filling a need for more empirical assessment of deliberation over wicked environmental problems, specifically social acceptance of renewable energy infrastructure. A key question to be answered is to what extent is agreement, or a “meta-consensus” (Dryzek and Niemeyer 2006, Niemeyer 2011), possible over the dimensions of renewable energy issues? In practise, does deliberation of experts and lay publics prioritize climate change or not? These fundamental questions will be assessed in this place-based study.

One of the difficulties faced by experts and citizens alike during deliberation is the issue of scale. The concept of scale is often used by human geographers in environmental governance discussions. Differences between the scale levels at which climate change occurs (global atmospheric) and traditional decision making structures exist (national, sub-national) suggest a fundamental challenge in addressing climate change (Wilbanks and Kates 1999). Cash, Adger *et al* (2006) bring in additional issues of temporal, jurisdictional and even knowledge scale levels to present two forms of scalar challenges that are particularly relevant for this thesis. First, a *mismatch* can exist between scale levels. The

spatial global - local mismatch between the local costs of installing RET in order to receive global greenhouse gas reduction benefits is an example. Second a *plurality* challenge may exist when actors choose to emphasize not only different scale levels but possibly also different levels when proposing action. For example, an incentive policy developed at the national jurisdiction scale level to meet national wind power targets may conflict with the values and priorities of local jurisdictions. Many avenues of study have been opened up by this multi-level, multi-scale framing of environmental governance and the one that is pursued in this thesis concerns knowledge scale levels. Cash *et al* (2006) portray knowledge scale levels as proceeding from local / traditional knowledge to generalized and universal scientific knowledge with consideration given to the challenge of making scientific knowledge salient, credible and legitimate for end users (Cash et al. 2006, Cash et al. 2003). Studies of place and of place-based politics offer additional ways to look at issues of scale in knowledge and meaning production. One view of place is to emphasize the emotional attachment that people have for particular locations. Originating with the humanist and phenomenological approach of Tuan (1974) this view of places emphasizes human experience and a sense of place as a fundamental part of human existence. Massey (1994) argues that this sense of place need not be reactionary and conservative but instead places are constructed over time with layers of meaning. Amin (2002) takes this further and suggests that local places are sites that continually juxtapose scale levels – individual, household, local, regional, global - and while meaning is constructed in local places it is not bound to only local influences.

A related theoretical development has been to recognize the social production of scale levels. A good example is Swyngedouw's (2007) study of the history of hydro-dam and reservoir construction in Spain as a political project that solidified a scale level of the nation-state while distributing water away from its regional boundaries. This kind of study emphasizes that there is no preordained nested hierarchy of scale (e.g., local-national – global). Marston *et al* (2005) even go so far as to advocate doing away with scale as an analytical concept in human geography because it presupposes vertical hierarchies rather than multiple entry points into politics. Others (e.g., Jonas 2006) argue that scale is an important epistemological tool that can reveal differences. Certainly, scale is a helpful concept when thinking about the differences between energy systems. Bridge *et al* (2013) point out that there are no preordained scales levels for energy systems. Whether they are organized at a household (e.g. off-grid solar power), municipal level (e.g. district heating), regional (e.g. Ontario's electricity grid) or a transnational level (e.g. North American natural gas pipelines) is a product of economic and political decisions. Indeed, renewables, with their basis in widely available resources, (e.g. the sun shines everywhere, some form of biomass grows everywhere) are less spatially constrained than traditional sources of energy; they can be organized at diverse scale levels (Walker and Cass, 2007).

Methodology

My review of the literature suggested the need for a theory that can query the social process of public opinion formation around renewable energy developments and went on

to identify Habermas' theories of the public sphere, of communicative action and a related literature around deliberative democracy as the conceptual basis to move forward with. Applying these ideas first required an overall sense of Habermas' theory of society. Figure 1 below maps out the connections between communicative action, strategic action, the public sphere and Habermas' colonization thesis. The connections between these ideas are outlined in more detail in chapter four. For the moment it is sufficient to point out that Habermas' theory predicts that communicative action occurs when speakers and hearers reach mutual understanding along three different dimensions; the objective world dimension of truth, the social world dimension of rightness and the subjective world dimension of sincerity. In other words, actors evaluate if others are speaking truthfully, if what they say meets their expectation of proper behaviour and if they are speaking sincerely (first assuming their statement is grammatically comprehensible to listeners). This provides a basis for an empirical analysis of "talk" that has been pursued by a few researchers (Cukier et al. 2009, Forester 2003, Hughes 2011, Ngwenyama and Lee 1997). Essentially speech can be analyzed and coded using the truth, rightness and sincerity categories and this is the direction that I pursued. The public sphere concept similarly had to be operationalized and extended beyond a normative ideal to an observable set of practices of how citizens' organize and communicate values into political decisions. The local media in the case study area, the venues for public discussion and the actions of organizations that attempt to influence public opinion were deemed to make up the local public sphere.

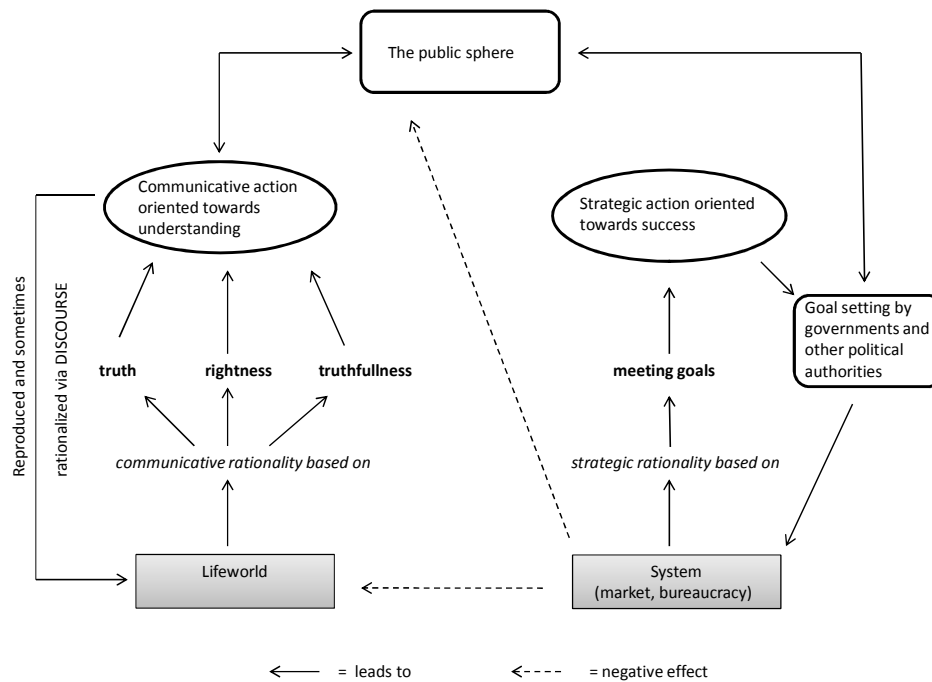


Figure 1 – Habermas' theoretical model (source, author)

Choice of study area

During my PhD studies I have been part of research team funded via a Social Sciences and Humanities Research Council grant led by my supervisor Robert McLeman titled *“Integrated assessment of population and critical resource vulnerabilities to climate risks, in support of community and regional adaptation policy-making and planning.”* The study region for this project is upland, forested area known colloquially as the Eastern Ontario Highlands (EOH). The boundaries of this region for my purposes corresponded to the jurisdictional borders of two lower-level municipalities: Addington Highlands (population 2,532) and North

Frontenac (population 1,842) (StatsCan, 2011) together covering an area of approximately 2,500 square km (figure 2).

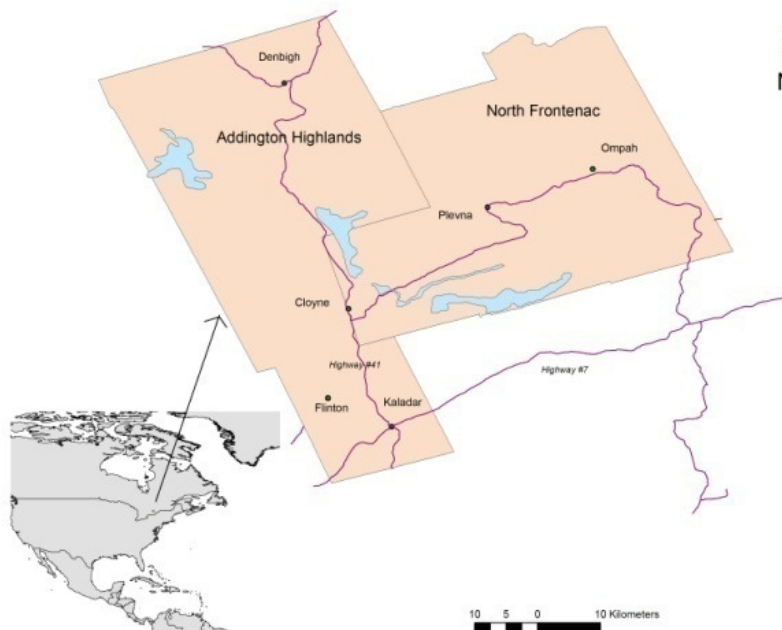


Figure 2 – Eastern Ontario Highlands

The EOH is highly suited for an assessment of rural interactions with RET. It has a broad range of new renewable energy developments under consideration or built thereby providing a wide scope for participant discussion and an opportunity to incorporate understudied roles of the public beyond that of “objectors” (Walker and Cass 2007). These energy developments are spurred on by a suite of provincial programs designed to “attract new investment, create new green economy jobs and better protect the climate”(Ontario 2009). These include a “feed-in-tariff” program paying high rates to any electricity produced from solar, wind, biomass or small hydro sources. It also includes a “green technologies” program which has installed a biomass boiler at the high school. Further details on the politics surrounding the provincial incentive programs are found in Chapter 2 and Chapter 3.

The EOH experiences both of the general trends facing rural Canadian communities discussed above. Approximately 150 km from Ottawa and 250 km from Toronto, the area is frequented by tourists drawn to the Bon Echo Provincial Park and there are significant numbers of cottage properties in the region's many lakes. The population of Addington Highlands triples in the summer time with seasonal residents (Cumming Cockburn Ltd 2003) and large numbers of urban retirees settle in the area usually after winterizing their cottage properties. This has given both townships the dynamic of a mixed amenity-migrant / locals community described earlier. However, it is a highly seasonal migrant community and during winter months the region is populated mostly with locals. Employment in the traditional natural resource industry of forestry is sporadic as nearby pulp mills frequently close and re-open and the industry is becoming more mechanized. One K-12 school serves the entire region apart from an elementary school that has less than 40 students located in the village of Plevna. The elementary school in Denbigh closed down for lack of pupils in the early 2000s. The County run library in Ompah was closed in 2011 and the County is debating closing the ambulance base in Denbigh. The region thus also faces similar challenges to those described above for other more remote rural communities in Canada.

Methods

The data for this thesis was collected over a two-year period from late 2009 to late 2011 with the majority of field work taking place during the spring and summer of 2011. Three strategies were used to collect data:

- (1) **A mail-out survey** titled *“Household Energy Use and Energy Attitudes in Addington Highlands and North Frontenac Region”* (Appendix 1) was sent to 836 permanent resident households in February 2011. This was supplemented with an on-line version of the same survey distributed to seasonal cottage property owners groups. The results of the survey provided baseline data on energy use and on individual opinions of various types of renewable energy technologies. The results also provided a basis for discussion during group meetings and a tangible set of information to offer to local governments and build relationships with local decision-makers.
- (2) **Group interviews / focus groups:** Six group meetings were held between March and June 2011. Two focus groups were held, one composed of a selection of citizens who had completed the survey and one composed of governance officials. Both groups were sent a one-page background document prior to the meeting (Appendix 2) and both participated in a moderated discussion. Three additional public meetings were held in the villages of Flinton, Denbigh and Ompah to report-back to the community the results of the survey and to collect further examples of group discussions. These five meetings provide the material for discourse analysis carried out in Chapter 4. A final wrap-up event brought in outside experts to answer persistent questions about local projects raised by community members during public meetings and to showcase local energy businesses (see Appendix 3 for local media reports of this event).

(3) **Participant observation and informal interviews:** Additionally I attended 14 public events and conducted approximately a dozen informal one-on-one interviews in the Eastern Ontario Highlands. The public events included town council meetings, all-candidates debates, a political fundraiser, a cancer cure fundraising evening, an AGM for a cottage association and meetings of a community group looking to repurpose the closed school in Denbigh. These events and other time spent in public spaces, including village halls, restaurants and sports grounds contributed to my understanding of the local public sphere. They also helped to provide me with a sense of the major concerns and lifestyles of EOH residents.

Comment on methods

For the survey results standard descriptive and analytical statistics were carried out using Excel (2007) and PASW (version 18). Further details are found in Chapter 3. In both the focus groups and survey sampling I chose to focus on the permanent resident population more so than the seasonal resident population for two major reasons: 1) the focus group sessions were conducted in March to maximize participation in this seasonal economy area where few locals are available in the summer; 2) as year-round members of a community, permanent residents arguably have more at stake in the future trajectory of renewable energy technologies than do seasonal residents whose interests are more recreational than livelihood in nature. Given that there were limited resources to conduct the study, I deemed it more important to focus on the voices of permanent residents. However, this is not to say that seasonal residents were excluded from the study, rather that any

conclusions regarding seasonal residents should be read carefully. There were several occasions to speak to and observe the seasonal population including: 23 survey responses from seasonal residents; the final public meeting occurring in late June included both seasonal and permanent residents; my attendance at a cottage association meeting; and, several informal interviews with cottagers.

The use of an on-line survey introduces some concerns about who is being sampled. As a web-based instrument it is susceptible to multiple responses by a committed user who might wish to distort the results. When surveying residents on perceptions of wind turbines in Ontario others have found this to be a concern (Christidis 2013). There were few technical safeguards to this occurring in this study; the main measure was that the software only permitted one completed survey per IP address. Yet the relatively low number of responses (23), the lack of a pulse of completed questionnaires at a particular time and the lack of uniformity in the demographic responses of respondents all suggest that survey manipulation did not occur in this study.

To analyze focus group and public meetings the discourse analysis pursued a coding scheme which first coded statements of participants to a truth, rightness or sincerity code and then a sub-code to reflect what was said. A second level of coding was used to mark agreement, disagreement or understanding between participants in order to isolate potential moments of communicative action and discourse. The program NVivo (version 9.2) was used and non-verbal communication such as nodding of heads, smirks, shrugs and smiles were also incorporated into the NVivo project record to supplement and verify moments of

disagreement and agreement. Appendix 5 provides a detailed sample of the coding procedure and additional discussion of the discourse analysis method is found in Chapter 4.

Comment on community-based research

Throughout the research I relied on residents and local governments in survey design, as end users of information that would be accumulated throughout the project, as participants in public meetings and as audiences during presentations to township council meetings and to other organizations. Repeatedly, I was told that the focus groups and public meetings provided a venue for sharing ideas and making connections that might not have occurred in the absence of the study. On Kindon's scale (2005:209) of participatory action research, my research falls between the "co-operation" and the "co-learning" categories where the researcher and researched group determine the priorities but responsibility lay with me to direct the process. The strongest example is the renewable energy expo (Appendix 3) organized by me with the support of the Green Energy Task Force and the Addington Highlands Economic Development Committee to answer persistent questions about two energy technologies in use in the area. I am confident that this study has helped community members identify both regional energy use patterns and some of the factors that influence residents' attitudes to this new form of natural resource use. Possibly this has provided the communities more control over energy development paths.

My positionality

My biases, personality, and social position have influenced the researching and writing of this thesis. It is not possible to attain a 'view from nowhere' in any research activity and this autobiographical statement is provided to help the reader assess why and how choices

were made throughout my research. I kept a journal throughout the research and here I offer some reflections on what the implications of my positionality were for the research process and findings. Such statements of autobiography are important to improve the rigour of qualitative research (Baxter and Eyles 1997).

I am a white, middle-class, heterosexual, atheist, father and husband. I grew up in on a farm in the country but chose to live in one city or another ever since graduating high school.

More than half of my life has been in an urban space, mostly in Canada but with significant periods of time living and working in five other countries. My family's farm flourished and was acquired by a Canadian headquartered multi-national pig and pork company. As both a witness and an acting agent of rural depopulation I have an interest in what attracts, keeps, or repels people to / from rural spaces and I have a complicated mixture of respect and bafflement for the born, raised and never left / quickly returned "locals" of rural communities. In this study I believe this has likely predisposed me to be skeptical of seasonal resident membership in rural communities despite acknowledging their contribution to both the EOH and to my own rural home region. My partial rural identity has undoubtedly influenced my choice to focus on rural communities. Prior to the study I had no personal, family or financial ties to the EOH region. Now, I consider several people in the EOH to be friends and I feel emotionally invested in their ongoing struggles for core services and I found myself acting as an advocate for community energy development.

This dual identity as both a researcher and as an advocate for community energy development requires some comments. I consider myself an environmentalist. During the research our own household became one of the 40,000 in Ontario that installed solar

panels under the microFIT program, I became a member of the Ottawa Renewable Energy Cooperative and have come to believe renewables offer both political and environmental benefits. This position was influenced by my research and also influenced my research decisions. For example in the choices made in designing the focus group and follow-up public meetings I invited people who had had positive experiences in constructing or overseeing small hydro, small solar and biomass energy. I balanced these views with people known to be opposed to renewables but I believe I constructed a more positive discussion environment for renewables in all of the meetings than another researcher with different biases would have done. This was not an automatic decision however, the early results of the survey and the first focus group showed very high support for renewables. If this had not been the situation I would like to think that the subsequent choices (e.g. the renewable energy expo) would have been different.

Finally, I call myself a social scientist with pride but some uncertainty. My early academic training is in natural science and my tendencies are to look for more “objective” methods of analysis including control groups and statistics. I came across Habermas in a sociology course in the first year of my PhD studies and was immediately attracted to the notion that actors are linguistically “hard-wired” for social coordination. In applying his concepts over the last three years I have been driven by a curiosity to see this in practice and not only as a normative ideal. My conclusions are sympathetic to the possibility of consensus. I cannot discount that this idealism is made possible because it does not threaten my own interests. After all I come from a class, gender, race and sexual orientation that controls the existing power structure. However, I believe my own position on renewables has become less

strident and more attuned to other rationalities; in other words it has deliberately changed.

Chapter 2 - Social Acceptance of Renewable Energy: Trends, Concepts and Geographies

Co-authors and contribution: N/A

Publication details: Proposal for the manuscript submitted to *Geography Compass* in November 2012 and accepted the same month. Full manuscript submitted January 14th 2013 and currently in review process.

Contribution to overall thesis: This manuscript is a systematic review of the last 25 years of English-language scientific literature on social responses to renewable energy. It applies the designation of types of social acceptance (public, market and community) from Wustenhagen *et al* (2007) and a typology of types of publics from Walker and Cass (2007) to organize the literature. In doing so, it identifies under-studied questions and potential avenues for geographers to expand upon. This chapter positions the thesis within its multidisciplinary context and provides support for the choice of case study area and choice of methodology pursued in the research.

Abstract: As global production of energy from renewable sources has grown over the last 25 years, so too has research on social acceptance of renewable energy. This article reports findings from a systematic review of peer-reviewed articles related to this subject. There has been a rapid increase in the frequency of these studies and a shift in orientation away from market and socio-political measures of securing policy support for renewables toward a sympathetic reporting of community opposition to wind turbines. Well-developed

conceptual and empirical critiques of the “Not-in-My-Backyard” concept have emerged based on Western European case studies, notably from the United Kingdom. Drawing from experiences across the globe with varied sizes and types of new energy infrastructure, researchers have documented complex social responses which go beyond simplistic designations of opponent or supporter. Although geographical concepts including place, landscape, distance-decay, territory and others are employed in this literature, geographers are under-represented in the relevant literature, suggesting an opportunity for greater contributions from the discipline to this area of growing popular and academic interest.

Keywords: social responses, energy, wind, solar, biomass, geography, community

Introduction

As renewable energy production has increased so has the reporting of conflicts (and of success stories) over placement and organization of wind, solar, biomass, hydro and other facilities (Devine-Wright 2010b, Wustenhagen et al. 2007). This research is broadly captured under the topic of “social acceptance”. Standard geographical concepts like place, landscape, space, distance and territory are fundamental elements of public and scholarly discussions of social acceptance of renewable energy. Yet, geographers have to date made relatively modest contributions to these discussions, which draw in scholars from a wide range of disciplines. This review therefore intends to identify the key concepts and trends in this literature and also bring to the fore the geographies that can be used to help interpret the findings of this area of growing interest.

Solar, wind and biomass resources are dispersed widely and unlike fossil and nuclear sources, cannot be stored (apart from biomass). This implies fundamental changes in the geography of energy production and distribution, roles for “the public” and in connections between places and regions (Bridge et al. 2012, Walker and Cass 2007). The recent significant growth in renewable energy infrastructure - for example the installed electrical generation capacity for wind power has increased by a factor of 10 over the last decade (World Wind Energy Association 2012) – has exposed increasing numbers of people to these alternative energy systems and the responses of these populations are in turn reshaping the deployment of renewable energy. Social acceptance research is thus an important topic of study for geographers for two major reasons. First, the responses of

individuals, communities and societies to alternative energy systems provide a window on future geographies. Second, geographers can provide fuller and more powerful applications of core geographic concepts including place, space and landscape currently being employed sporadically in this area of research.

Methodology

A systematic review of the literature directly related to questions of social acceptance of renewable energy was carried out using a methodology adapted from Berrang-Ford *et al*(2011), which has been applied elsewhere to a variety of human-environment research questions (e.g. Ford and Pearce 2010, McLeman 2011). The first step was to develop a set of specific questions to be answered, including;

- *What kind of social acceptance is being reported on?* Wustenhagen *et al* (2007) suggest there are three dimensions of social acceptance (“socio-political” which focuses on acceptance of technology by policy makers or the general public measured via opinion polls, “market” which focuses on willingness-to-pay models and the diffusion of new technology in households and corporate organizations, and “community” which focuses on local responses to the siting of wind farms and other infrastructure).
- *What form of the “public” is assumed to be acting?* Walker and Cass (2007) identified a tendency for social acceptance research to view the public solely as protestors or supporters when the new configurations possible in renewable energy systems were much more diverse. They point to ten different roles that people can have in energy projects (protestors, supporters, consumer - either active or captive- , service user,

financial investor, local beneficiary, technology host, energy producer, and project participant).

- *What geographical concepts are being used?* This recorded if, and how, different concepts were implied or explicitly mentioned in the articles.

All of these questions were iteratively refined as the review progressed and the types of questions that framed much of the reviewed research became clearer. It was also necessary to refine the questions to take into account the need for multiple designations of publics and social acceptance types within single articles.

After specific questions were set the next step was to create an inventory of peer-reviewed articles that contain information relevant to social acceptance of renewable energy. This was done by performing a keyword search using the ISI Web of Knowledge using the English language terms “renewable energy” AND “social” OR “public” AND “acceptance” or “opposition” or “attitudes”, or “support”. Research elsewhere has shown Web of Knowledge to be highly suitable for this purpose (Berrang-Ford et al. 2011, Jasco 2005). The search generated a list of 471 peer-reviewed English language articles from the last 25 years. The abstract of each of the 471 articles was read to isolate those that merited a full review. Articles that were excluded were technical reports that had turned up only because they included calls for public funding support; articles pertaining to carbon capture and storage; studies that contained no sustained discussion of social acceptance; and, articles or conference reports by the same author that were essentially duplicates. This left 127 articles in the inventory that were read in their entirety; in doing so an additional 5 relevant

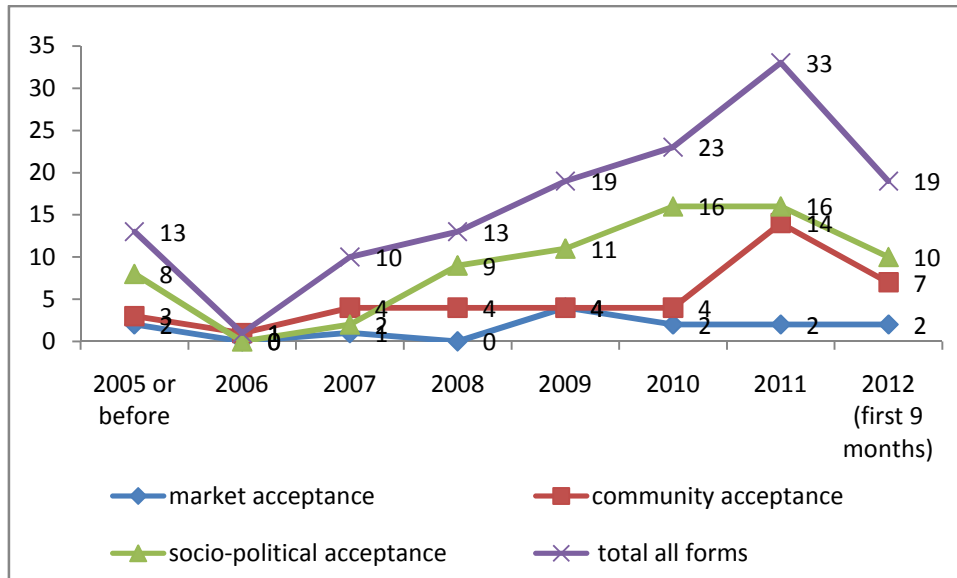
articles were identified. The majority of these were reports of case studies or applications of exploratory conceptual frameworks to secondary data.

A simple questionnaire and coding scheme was applied to each of the 132 articles. These questions included ones designed to record basic data for each article (e.g. year published, name of first author, journal, type of technology - wind, solar, biomass, tidal, etc, country of case study); the more qualitative questions listed above; and, a final category to identify the scale of energy production involved. The choices here were macro, meso and micro with household level technologies counting as micro, mid-sized projects such as district heating plants or up to 5 wind turbines as meso and large wind farms with more than 5 turbines or solar plants covering entire fields as macro. Extensive notes were taken on the methodology of articles, and their key findings.

Results

Since 2005 the number of social acceptance studies has steadily risen year over year (figure 1) and the type of social acceptance making up the new studies is changing. The predominant type of research found in the inventory consists of socio-political accounts that focus on the degree and effectiveness renewable energy incentives in government policy and levels of support by the general public as measured by opinion surveys. However, the number of “community acceptance” studies which report on siting conflicts or on local or community modes of organizing renewable energy infrastructure is increasing.

Figure 1 – Number and type of social acceptance of renewable energy articles published between 1987 and 2012 (English language only) total =132



Authors of all forms of analysis are frequently positioning their work as attempts to interpret and bridge what is seen as a paradoxical “social gap”(Bell et al. 2005) between high public support for green energy as measured by opinion polls but low success rates for planning applications (e.g., wind farms are proposed but cancelled due to local protests).The Bell *et al* influential article (2005) presents three explanations for cancelled developments – possibly a vocal minority dominates process, possibly there is qualified support for turbines in certain circumstances, and possibly a selfish local interest wins out that prefers turbines developed elsewhere. This last explanation is known as the ‘Not In My Back Yard’ (NIMBY) explanation and its use in research has shifted noticeably since 2005. As Haggett (Haggett 2011)- perhaps mischievously – observes “*it is usually taken as read that protest cannot be simply categorised as “NIMBY”: in a journal article an opening paragraph will mention and dismiss this formerly pervasive theory...*” The degree to which the NIMBY concept: - (1) is accurate or not, (2) is of primary or of little causal importance, or (3) is a

pejorative and obfuscating cover for developers - forms the background for all “community acceptance” research and a good amount of the “socio-political acceptance” and “market acceptance” research as well. For an overview of why studies have shifted away from NIMBY explanations of public responses see Aitken (2010). Her critical review of the literature argues that for too long renewable energy studies have positioned opposition to wind turbines as deviant behavior of uninformed groups that can simply be overcome with more information.

In terms of types of technologies studied, wind energy producing electricity is by far the most common subject in social acceptance research. Of the 100 articles that reported on a specific type of technology or combination of technologies 70 reported on wind energy. Energy from biomass either in liquid transportation fuel (i.e. biofuel) or as a solid fuel used to provide heat or electricity was the second most common technology appearing in 24 articles while solar energy either to produce electricity (photovoltaic panels) or to heat water was the focus of 14 articles. The leading region for study is the United Kingdom followed by the United States (Table – 1). The contrast between the relatively large amount of attention paid in the scholarly literature to wind siting cases in the UK compared to relatively low levels of installed generation capacity is striking. Some authors have compared the UK to other European countries suggesting that a uniquely British mythology of the countryside leads to high levels of protest (Toke, Breukers and Wolsink 2008). This review identified only one UK case study reporting unambiguous support for turbines (Warren and McFadyen 2010) within a total of 34 articles reporting on wind power. The other large sample of case studies in this review from the United States consists of more

mixed responses of local support or at least tolerance for wind farms (Brannstrom et al. 2011, Jepson, Brannstrom and Persons 2012) as well as reports of opposition leading to cancelled developments (Firestone, Kempton and Krueger 2009, Phadke 2011).

Table 1 – top 5 countries for analysis of renewable energy social acceptance issues , percentage of studies reporting on wind power and country ranking in terms of installed wind generation capacity*

Country of study	% of total studies reviewed	% of studies reporting on wind power	% of total global installed wind capacity (and rank)
United Kingdom	41%	80%	3% (8 th)
United States	21 %	52%	20% (2 nd)
Greece	7%	25%	1% (18 th)
Germany	5%	100%	12% (3 rd)
Netherlands / Denmark (tied)	4%	100%	2% (14 th and 11 th)

*(World Wind Energy Association 2012). Note that China is the leading country for wind power with 26% of global installed capacity.

Active support or active opposition towards new renewable energy projects are not the only attitudes or roles reported to be taken up by the public. As indicated earlier, Walker and Cass’ (2007) framework of different public roles including service users (who simply use the heat, electricity or other energy service and may not be proximate to the generation technology), technology hosts (own buildings or land upon which energy technology is built but not the technology itself), producers (those who directly own and operate energy technology) (see full list in summary table 3) was used in this review to isolate potential trends in the literature. Table -2 provides a comparison of the kinds of public interaction reported for wind-based, solar-based and biomass-based energy developments. For wind-

based technology the dominant choice for researchers was to describe wind farms as either protested or supported by the public (80% of studies). In contrast the majority of reports of solar based technologies are of individuals and groups producing or investing in production (71%) with biomass based technologies somewhere in the middle.

Most of the studies reporting public “energy producer” relationships are of micro-size technologies including household solar water heating or PV panels but more than a third are of mid-sized technology including wood-boilers to heat building complexes (Rogers et al. 2012), village wood gasification plants for cooking gas (Han et al. 2008) and small numbers of community owned wind turbines (Warren and McFadyen 2010). More than half of the studies that investigate a public as “financial investor” relationship report on citizen-ownership of wind farms are in Germany and Denmark. Generally, this kind of public as shareholder relationship is thought to lead to higher levels of support for new energy projects (Musall and Kuik 2011, Walker and Devine-Wright 2008).

Table 2 – The roles reported to be taken by the public in social acceptance studies for renewable energy

Role of public*	% of all wind studies	% of all biomass studies	% of all solar studies
Protestor	51	25	14
Supporter	29	13	14
Service user	13	25	36
Technology host	17	25	21
Investor	9	8	21

Producer	6	21	50
----------	---	----	----

*these categories are not mutually exclusive, up to two roles were recorded in the review

Geography’s contribution to the topic

Social acceptance research is approached from many different disciplines and this is reflected in the diversity of journal titles that contained articles. Forty-one (41) different journals were captured in this review; energy-specific journals including *Energy Policy* (34% of articles), and *Renewable and Sustainable Energy Reviews* (11%) were the most common outlets for publication. The next most common journal title was *Land Use Policy* (4%).

Geography journals are represented in the group by *Annals of the Association of American Geographers* (3%) and single articles in *Antipode*, *Area*, *Geoform*, *Regional Studies*, *Scottish Geographical Journal*, and *The Geographical Review*.

Summary table-3 reports on the geographic concepts identified in this review and some of the more provoking uses are discussed in more detail below. First, the notion of place as space with accumulated human meaning is found in over 10% of the articles with specific references to Tuan’s “topophilia”, (1974), Creswell’s (2004) “emplacement” , and Massey’s “global sense of place” (1994) appearing more than once. Authors generally use these concepts to try and interpret the attachment protestors have for certain places. Sometimes this is done in surveys and adopts the perspective of psychological models (Devine-Wright 2009, Devine-Wright 2011, Devine-Wright and Howes 2010). Sometimes it is done through the analysis of discourses (Hunold and Leitner 2011). Another perspective has been to interrogate how turbines have positively been incorporated into place-making activities.

Examples include Warren and McFadyen's report (2010) of locals naming a collection of turbine as "the three dancing ladies" and Marayuma, Nishikido and Iida's (2007) report of naming ceremonies in Japan in which those that have contributed to a national wind-power fund attend dedications of individual turbines pledged to the names of grandchildren or to marriages.

This review found landscape to appear in 21 (16%) of the articles and discussed at length in six (5%) of them. Pasqualetti (2011) and Wolsink (2007), both working out of geography departments emphasize the visual impact of renewable energy infrastructure on the landscape as the most important factor of social acceptance, and have opened avenues of study for identifying so-called high-value landscapes. A good example is Molnarova *et al* (2012) whose study asked respondents to react to images of turbines on different Czech countryside landscapes with the goal of finding the least offensive placement of turbines. Related research finds placing turbines offshore does not avoid the problem. Hagget (2008), Firestorm, Kempton and Krueger (2009) and Landenburg (2010) all provide evidence that views of open sea are just as contestation as views of open landscapes.

Like "place", "landscape" implies an emotional attachment to particular spaces. However, landscape refers to detached visual appreciation of landforms; landscapes are not "lived-in" (Cresswell 2004, Mitchell 2000). In this direction Allen and Jones (2012) offer a different approach noting that during their interviews wind-turbine opponents tended to see landscapes as 'visual backdrop' while supporters had a "visceral multi-sense engagement" with landscapes (Allen 2012, 218). Provocative observations have been raised by Phadke (2011) and Woods (2003) about how disputes over wind turbines aggravate social class

divisions between those that see rural areas as landscape and those that see it as a place of production.

Other geography concepts are used sparingly but intriguingly in this literature. The NIMBY concept suggests a distance-decay relationship whereby the further one's backyard is from a wind farm the less opposed one will be. Jones and Eiser (2010) found such a relationship for relative distance not Euclidian distance. In other words opposition decreased the harder it was to see turbines (e.g. behind hill, woods) and not simply the greater the absolute distance. A reverse distance-decay relationship is identified by Warren, Lumsden, O'Dowed and Birnie (2005) and van der Horst (2007) of increased opposition the closer one is to a proposed wind turbine but decreased opposition the closer one is to a constructed turbine. The explanation is that the anticipated risk from wind turbines is higher than the actual risk, and once turbines are in place and experience is gained residents have fewer reasons for opposition.

Finally, there are at least two ways that political dimensions of space are presented in this literature. One is of alternative governance models for energy production implied by more community involvement (e.g., Loring 2007, Walker 2011) and often coincides with suggestions to shift some power over siting decisions to smaller territorial units. The other dimension is found in reports from Austria and Switzerland of the popularity of movements towards autonomous "energy regions". The boundaries of these regions coincide with existing municipal or district boundaries but these are hardened by deliberate choices to become energy-autonomous and meet all energy needs with sources endogenous to the region (Musall and Kuik 2011, Spaeth and Rohrer 2010, Trutnevyte, Stauffacher and

Scholz 2011). Some remark on a new form of “energy citizenship” engendered by this process whereby citizens of these regions are empowered by higher levels of knowledge about technical energy systems and the environmental implications of their choices (Musall and Kuik 2011). For geographers, citizenship relates to the rights and duties of an individual’s membership in a political community (Mitchell 2009) the boundaries of which are usually those of the nation-state. This concept of energy citizenship implies membership in political communities at different scale levels.

A last point to make on geographical concepts in this literature is that some of the approaches to social acceptance research are very weak on spatial analysis. The “market acceptance” stream of literature involves willingness-to-pay surveys with the aim of quantifying public support through a dollar amount. The methodology treats all respondents as part of a general population and renewable energy as a tradeable commodity with no specific anchoring in space. The major theoretical question these studies try to address is “free rider” behaviour with the assumption that rational economic actors will choose to let others pay for the public benefits of renewable energy no matter the location.

Table 3 – Summary table of findings from review of social acceptance of renewable energy studies

Variable	No. of articles (%)	Variable	No. of articles (%)
What type of technology?		What type of public?	
Wind	70 (53)	Project protestor	51 (25)
Biomass	24 (18)	Project supporter	32 (16)
Solar	14 (11)	Service User	29 (15)
Tidal	4 (3)	Technology host	23 (12)
Wave	3 (2)	Active Consumer	21 (11)

Hydro (river)	4 (3)	Energy producer	13 (7)
Other (geothermal, smart grid)	5 (4)	Captive consumer Investor	12 (6) 9 (5)
What size of technology?		Local beneficiary	7 (4)
Micro	8 (6)	Project participant	3 (2)
Meso	21 (16)	Other (co-user of space, stakeholder)	8 (4)
Macro	74 (56)	What geographic concepts are used?	
What type of social acceptance?		Landscape	21 (16)
Socio-political	74 (57)	Place	16 (12)
Market	13 (10)	Territory / citizenship	5 (4)
Community	42 (33)	GIS for planning	4 (3)
		Distribution patterns	5 (4)
		Distance – decay	5 (4)
		Regional patterns	4 (3)

Discussion and suggestions for future research

Four key themes stand out in the existing body of literature

(1) There is a steady year-over-year increase in the number of studies of social responses to renewable energy production, trending toward place-based “community acceptance” studies that are often quite critical of renewable energy development. A consistent guiding question for much of the literature is how to account for what is seen as a paradoxical gap in high levels of public opinion for renewable energy but low levels of planning success (e.g., projects are cancelled due to local concern and protest) (Bell et al. 2005).

(2) The majority of case studies in the literature have been of wind farms and many have been based on examples from the United Kingdom. This has generated an impressive set of findings and concepts – notably interrogating the NIMBY concept. Other regions of the

world offer further opportunity for theory development. For example the ease with which wind energy has integrated with general energy related economic activity in Texas (Brannstrom et al. 2011, Jepson et al. 2012) and the guiding narrative of energy independent regions in Austria and Switzerland (Spaeth and Rohracher 2010, Trutnevyte et al. 2011).

(3) There is a tendency to report that people adopt either a *supporter* or *protestor* position regarding wind farms, but occupy a range of other roles including *energy producer* and *investor* for biomass based energy and solar based energy. It is not clear if academic research is organized in this fashion because wind energy is intrinsically more contentious than biomass or solar based energy or rather it is because wind – power technology is currently more often employed at a large corporate scale than are solar and biomass forms. In other words do fewer people invest and produce wind power than solar or biomass based energy because wind requires larger investments? Devine-Wright (2010a) calls for more attention by social scientists to forms of interaction with renewable power other than support or protest and the *investor* and *producer* roles appear a good starting point.

(4) Geography provides concepts and tools to interpret social responses to energy developments, even though geographers have played a minority role in the literature. Place and landscape are concepts signaling cultural and personal significance of specific spaces and have been used relatively widely in analyses of why wind turbines in certain places become controversial. Distance-decay models have helped to reveal spatial patterns of opposition. There are territorial and spatial implications to visions for regional energy

autonomy and in calls for a redistribution of decision making power to local residents over siting decisions.

At a fundamental level changes towards more renewable energy imply changing geographies. As Bridge, Bouzarovski, Bradshaw and Eyre (2012) have pointed out, the way in which societies obtain and use energy have long had a powerful influence on prosperity and geographic structure. European settlement of North America along waterways and European industrialization patterns coincident with coal deposits are examples. Renewable sources of energy have their own spatiality, they are disparate, widely available and apart from biomass – intermittent. New modes of owning and organizing energy are possible and geographers have a wide array of potential applications for their discipline within this topic of research. There are three areas where greater research attention might be usefully directed in the future, and provide opportunities for geographers to enter the discussion.

First, rural space is changing. In North America and Europe there is a demographic and economic shift away from natural resource extraction and towards service economies and amenity migration (Woods 2005). Conflicts over wind-farm siting are also conflicts over the changing value put on consumptive versus productive uses of rural landscapes. Opposition to turbines is often characterized as falling along local/newcomer lines where newcomers struggle to preserve the imagined rural idyllic landscape that attracted them to rural areas in the first place (Phadke 2011, Woods 2003). Phadke (2011) warns against the tendency to attribute opposition to the reactionary politics of an elite newcomer group. In any case there are strong links between rural place-making and wind-conflicts that could be pursued but many questions remain. Is the landscape a common property good appropriate for

group regulation? To what extent should landscapes portray the extraction of energy upon which society relies? How does scientific fact based argument interact with aesthetic cultural argument? Walker and Fortmann's (2003) analysis of the micropolitics of rural planning activities is a potential template for further work.

Second, while the market and socio-political approaches to social acceptance have generated important knowledge, it is increasingly obvious that opinion polling, economic modeling and other traditional socio-economic research methods are insufficient to explain opposition or to predict and plan for renewable energy pathways (Devine-Wright 2007, Fisher and Brown 2009, Mårtensson and Westerberg 2007). There is a need to develop and apply research methods that are appropriate for the social and dynamic (not individual and static) nature of social responses (Walker et al. 2010). The "community acceptance" stream of literature recommends dialogue between citizens, experts, developers and planners to help prevent and negotiate renewable energy disputes. Deliberation is widely assumed by political theorists to foster "green" choices, but as Lövbrand and Khan (2010) point out empirical evidence is limited. Authors are unsure if current planning practices can accommodate the value differences among the diverse set of stakeholders (Barry and Ellis 2010, Fisher and Brown 2009). The tension between local interests and national / global interests may be too great. Here the instrumental challenge of meeting renewable energy targets meets more normative critiques that planning efforts should better incorporate the views of local citizens. Is consensus on renewable energy implementation possible? or desirable? These questions point to knowledge gaps about processes of deliberation and of

reaching consensus to be pursued using focus groups and theoretically informed models of communication and deliberation sensitive to the context of place.

Finally organizing to produce and distribute renewable energy creates new political claims over space. I have suggested that movements in central Europe for energy autonomous regions (Musall and Kuik 2011, Spaeth and Rohrer 2010) act to bind residents more tightly to existing municipal or territories, in effect hardening these boundaries. Visions for local control over energy were also found to have strong organizing influences and motivations for energy attitudes in Sweden (Mårtensson and Westerberg 2007), and Canada (Fast and McLeman 2012). There are several possible lines of enquiry here. These include questions of how the discourse of energy security and energy sovereignty act at regional and other sub-national territorial compared to the national level it usually employed; and if there are insights to be gained from comparing local-energy movements with local-food or community forestry movements. McCarthy's (2006) review of community forestry and community fishery is a potential point of departure for initial comparisons. Since electricity grids and generation entities are often state-owned, one line of questioning might ask whether by opening up access to the grid for increased renewables through FIT programs to private suppliers (corporate entities as well as individual households) we are witnessing a democratization or corporatization of electricity? More studies from China, India and other countries with a range of political-economic systems and high levels of renewable energy production are needed to help clarify this research area.

This review has shown that geography has much to offer to social acceptance of renewable energy research. The placement and organization of energy systems based on renewable

sources is a fundamentally spatial activity involving a range of roles for individuals, communities and societies. Geography is well positioned not only to provide accounts of the spatial organization of renewable energy but in doing so advance broad questions of human-environment relations in a critical, thorough fashion, while highlighting the discipline in an area of growing academic and general interest.

Bibliography

The full list of the 132 articles reviewed for the review is found in Appendix 4.

Chapter 3 - Attitudes towards new renewable energy technologies in the Eastern Ontario Highlands

Co-authors and contributions: My supervisor Robert McLeman is a co-author of this article. He contributed approximately 20% to its final form primarily through development of the written introduction, revisions to the article, plus guidance and funding support for the data collection. I was solely responsible for the conception of the empirical methods, data collection, data analysis, and preparing the first draft of the full article. I presented the findings from this project to the Rural Research Workshop in Ottawa in May 2011, organized primarily by the Federation of Canadian Municipalities and the Canadian Rural Revitalization Foundation. I was responsible for submitting the article to the journal and revising it in response to reviewer comments.

Publication details: The paper is published as Fast S and R McLeman (2012) Attitudes toward new renewable energy technologies in the Eastern Ontario Highlands. *Journal of Rural and Community Development* volume 7 (3) 106-122

Contribution to overall thesis: This empirical article documents results of a mail survey of EOH residents on their use of energy and their opinions on a range of renewable energy technologies, together with preliminary analysis of group interviews in which participants discussed the survey findings and their ideas on meeting energy needs. It serves an important part of the thesis by directly answering research question #1 concerning local energy use patterns and the attitudes of individuals towards new RETs. This assessment of public opinion in the EOH from the perspective of the aggregation of individual attitudes is

an important first step towards developing the more robust understanding of public opinion advanced in later phases of the research (research question #2). This current phase of the research suggests (1) important group differences between the attitudes of seasonal and permanent residents (2) nuanced public arguments over the market incentives put in place by the State and (3) a comfort level with continued exploitation of resources that have a tradition of use in the area. This article also places the EOH case study within a context of rural planning and economic development (research question #4) and highlights some of the governance tensions that exist for this type of development.

Abstract: As governments seek to expand generation capacity from sources such as solar farms, wind turbines, hydroelectric and biomass generators, rural responses to renewable energy become increasingly important. In early 2011 we conducted a mail-out survey of permanent residents, a concurrent internet-based survey of seasonal residents and follow-up focus groups in two rural eastern Ontario municipalities to assess public attitudes and to project acceptance and potential uptake of various technologies. Survey participation was relatively high (n = 180, response rate 22%). One focus group included local and regional government decision-makers, the other for residents representing a range of socio-economic and demographic groups. Results showed strong support among residents to pursue alternative energy sources (89%), mostly out of concerns with rising energy costs, but also from a desire to use local energy sources. Support was highest for solar technologies (87%) and lowest for wind turbines (58%) and new hydroelectric dams (58%). There was little evidence of NIMBY views being prevalent among permanent residents. Seasonal cottage dwellers were less supportive of hydroelectric dams and a wood pellet

facility. Our findings suggest rural residents start with favourable attitudes towards alternative forms of energy production. Acceptance and uptake will likely be strengthened by locally relevant demonstration projects and by supporting citizen involvement in task groups, workshops or other venues for information sharing.

Keywords

Renewable energy, attitudes, NIMBY, acceptance, feed-in-tariff

Introduction

As governments seek to expand capacity to generate electricity and to heat buildings from “green” sources (i.e. non-fossil-fuel, non-nuclear), interest and investment in renewable energy technologies (RETs) have grown. RETs, including photovoltaic installations, wind turbines, hydroelectric generators and biomass combustion facilities, are new forms of land use largely situated in rural areas. RETs are often promoted as a means of environmentally and economically sustainable development for rural communities (Fitzgibbon 2010, Scheer 2007). However, some projects – wind farms in particular - have received mixed responses from rural populations in North America and Europe (Devine-Wright 2005, Devine-Wright et al. 2009, van der Horst 2007, Warren et al. 2005, Woods 2003, Hill and Knott 2010). The key concern from the energy policy perspective is that without taking into account the social responses to RETs it may prove difficult for targets for RETs to be reached. From a rural studies perspective, there is a parallel interest in avoiding conflict and ensuring that benefits from RETs accrue to the rural communities that are the sites for these new technologies (Fitzgibbon 2010).

In Ontario, there has been a rapid increase in the number of RET projects approved for development (currently 108 solar farms, 51 wind farms and 47 hydroelectric) and more than 33,000 applications have been submitted for small (less than 10 KW) solar photovoltaic installations (OPA 2010, OPA 2011). This growth is due to a “Feed-in-Tariff” (FIT) program of the *2009 Green Energy Act* which offers high rates and access to the grid for electricity generated from renewable resources. The roll-out of the *Green Energy Act* has

been controversial and a province wide debate has emerged in media and among political parties with concerns raised that RETs are expensive, unreliable, possibly unsafe, that the siting process is undemocratic and the landscape of rural regions is being tarnished (Deweese 2010, Flaming 2009, Merriam 2011, Paperny 2010, Radwanski 2011, Wente 2010).

The lively public discussion about the *Green Energy Act* provides a useful opportunity to study in a systematic fashion the formation of public attitudes towards new RETs.

The Eastern Ontario Highlands region has significant potential for solar and wind farms, small-scale hydro and conversion of unutilized biomass to fuel. While its population is one of Ontario's poorest on average, the region is rich in natural resources and a number of government initiatives have been created there to demonstrate and incent new RET developments. This paper describes early findings from an ongoing investigation into public attitudes, responses and potential uptake of RETs in the region, drawing upon results from a mail-out survey and follow-up focus groups meetings. Through this project we hope to gain insights into potential future energy trajectories in the region and by extension in other similar rural communities. In this paper, we identify those RETs that are most likely to be supported by residents, and the factors that may influence these responses.

Overview of the study region

The term Eastern Ontario Highlands refers to an upland region of mixed forest that encompasses the headwaters of the Skootamatta-Moira, Mississippi, Salmon and Tay river watersheds (Figure 1). The study region is south of Algonquin Park and north of provincial highway 7, and straddles the counties of Lanark, Frontenac and Lennox & Addington. Our study focuses on two municipalities found within this region: Addington Highlands and

North Frontenac. The permanent, year-round population of these townships are 2532 and 1842 respectively (Statistics Canada 2011), but during the summer months the region's population is tripled by an influx of seasonal residents (Cumming Cockburn Ltd 2003).

This area is characterized by a rugged, heavily glaciated terrain, with extensive lake and river systems. Approximately 70% of the region is forested Crown-owned land, supporting a mix of land-based economic activities, including forestry, outdoor recreation, and subsistence hunting, fishing and trapping (McLeman 2010). Permanent settlements consist primarily of small village nodes spread along four main roads. While the average age of residents is over fifty and rising, the population is kept stable by an influx of retirees attracted by the relatively low-priced waterfront properties. Census figures show 30% of the population has moved within the last 5 years (Statistics Canada, 2006) many from nearby urban centres of Toronto and Ottawa. Employment and population trends are consistent with patterns elsewhere in rural eastern Ontario (Sander-Regier et al. 2009). Natural resource based activities of forestry and mining employ fewer people and many jobs are now found in servicing tourists and seasonal residents. Seasonal homes outnumber permanent homes and as cottage dwellers have come to contribute a larger portion of the municipal tax base they have, at times, exercised growing political power. For example, in the past 5 years logging plans and a proposal for development of a lakeside lodge have been either modified or dropped amidst concerns expressed by different local cottage associations.

The permanent population experiences employment rates and median incomes (45%; \$37,789) that are considerably lower than the provincial average (67%; \$69,156), while

government contributions (e.g., old age pension, employment insurance) as a proportion of income are higher (29% versus 9.8%) (Statistics Canada 2006). Household and social activities are tied to the landscape – e.g., chopping firewood and snowmobile club – and, as in other rural Canadian communities, people struggle to retain schools and attract health care providers (McLeman 2010, McLeman and Gilbert 2007).

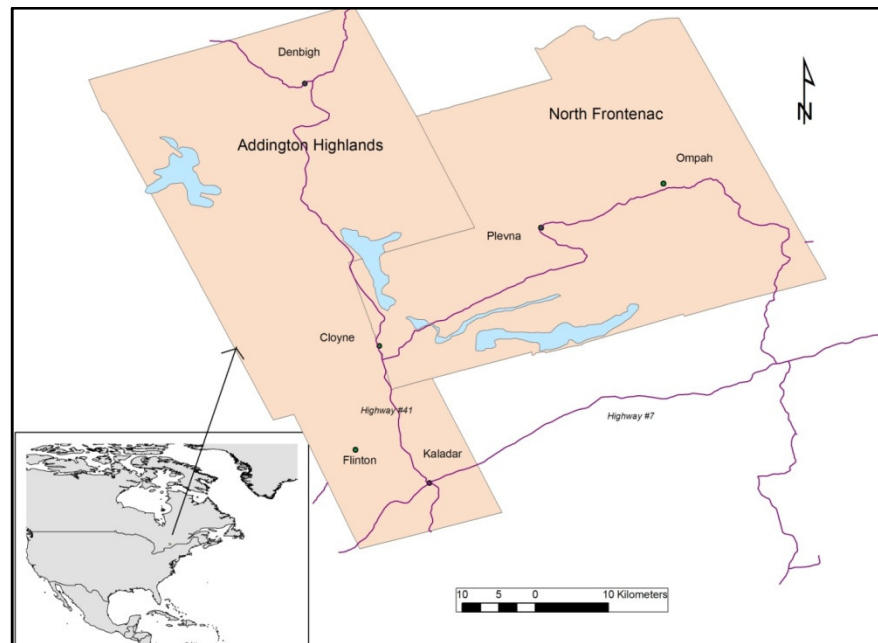


Figure 1 - Eastern Ontario Highlands

A number of RET projects have been proposed or initiated in the study area by various government, private sector actors and individuals. The high school has been selected by the school board as a site to pilot test a biomass heating system. Instead of heating oil, wood pellets will be used. Boiler installation and maintenance are paid for by the “Green Schools Pilot Initiative”(Ontario Ministry of Education undated). Several homeowners and businesses have installed solar panels under the FIT/ microFIT program mentioned earlier,

and one of the municipalities has committed to installing panels on a municipally owned building. Three private wind development companies have expressed interest in developing wind farms along ridges in the northern part of the study area, where test turbines have shown promising conditions. Finally there are dozens of former mill dams and water control structures with the potential to generate hydro-electricity. These latter are overseen by a Conservation Authority who manage water levels for flood control, drinking water, recreational and wildlife habitat needs. These four examples represent the best-known RET developments in the region. Residents are also aware of developments elsewhere, such as large solar farms to the south and a wind farm on Wolfe Island adjacent to the city of Kingston and south of highway 7.

Methods

Survey

A self-administered questionnaire titled “Household Energy Use and Energy Attitudes in Addington Highlands and North Frontenac Region was sent by mail in February 2011 to households along selected rural routes and general delivery mail boxes in four sections of the region, two in Addington Highlands and two in North Frontenac. Different coloured paper was used to track geographical origin of responses. The mail out included a cover letter, a form to provide contact information if respondents were interested in follow-up discussions and a stamped self-addressed return envelope. Advance notice of the survey was done by commissioning a local reporter to write an article in the local paper (an unsolicited story also appeared in another lesser-read paper). A fortuitous public reminder

was provided when a respondent wrote a letter to the editor commenting on the survey. A separate on-line version of the survey was made available over the period February to August 2011 to solicit responses from seasonal cottage residents and allow any permanent residents whose mail box was not selected to receive the mail-out a chance to respond. Ten different cottage associations provided assistance in contacting seasonal residents through newsletters, web-site postings and attendance of the first author at an Annual General Meeting.

The questionnaire consisted of four main sections: types of fuels used and quantities; level of agreement with different statements about energy issues; level of agreement with hypothetical RET projects, proponents and locations; and, background demographic information. Wording and layout were selected after pre-testing with selected local residents. The data was analyzed using Excel (2007 version) and PASW (version 18).

Two focus groups were subsequently held in March 2011 lasting between 2.5 and 3 hours each. Recruitment for the first group was from individuals who completed the questionnaire. From 20 individuals who indicated potential interest, twelve were invited and eight showed up on the day of the meeting. An effort was made to select a diversity of opinion on renewable energies based on their survey responses, and participants included a mix of newcomers and long-time residents. A one-page backgrounder was sent to participants prior to the meeting to explain the format and advise of general topics for discussion.

Participants in the second focus group were selected for their being active participants in governance structures in the region. The eight participants included three township councilors, and representatives from the two Conservation Authorities and the two Counties with jurisdiction in the region, the provincial Ministry of Natural Resources, the local regional forest management company, and the local regional tourism association. Participants were also sent the one-page backgrounder prior to the meeting.

Meetings were moderated by the first author and held in a village hall. A research assistant took notes and audio-recorded the meetings. Both groups opened with the same question: “How will people in Addington Highlands and North Frontenac meet their energy needs 20 years from now?” which initiated a broad-ranging, lightly moderated discussion of energy options, opportunities and barriers in the region. After a break, preliminary findings from the survey were presented and discussed. A final exercise entailed a guided discussion of the four examples of local RET projects described in section 2 above, during which participants commented on their views of each, and their opinion of which types of RETs would be most successful in the region in the future.

Our study has several potential limitations that should be kept in mind when reading the following results and discussion sections. First the response rate (22%) to the survey adds a possibility of response bias. Second the survey findings may not be generalizable to other rural settings where forest biomass is less prevalent. Third, the focus group discussion is unique to the group of individuals at the table and would have been different with a different set of participants.

Results

Survey

We distributed 836 questionnaires of which 180 (22%) were returned representing 9.4% of the total number of permanent households (1,920) in the townships. Those who completed the survey tended to be close to community characteristics reported in the 2006 census in terms of age, employment status, and income, but had higher levels of formal education.

The demographic characteristics of the respondents are shown in table 1.

Table 1 – Demographic characteristics of permanent residents of Addington Highlands and North Frontenac surveyed on energy use and energy attitudes in February to May 2011

Characteristic	Number of responses to question and %
Gender	n = 172
Male	54%
Female	46%
Education	n = 157
High school completed	71 (45%)
Apprenticeship	9 (6%)
College or university	77 (49%)
Household income	n = 141
Under \$20,000	20 (14%)
\$20 – \$39,000	42 (30%)
\$40 – \$59,000	31 (22%)
over \$60,000	48 (34%)
Occupation (top 4)	n = 160
Retired	83 (52%)
Construction	19 (12%)

Business operator	13 (8%)
Health care	11 (7%)
Village	n = 175
Flinton	60 (34%)
Denbigh	54 (31%)
Ompah	35 (20%)
Cloyne	26 (15%)

Our efforts to obtain responses from seasonal cottage dwellers yielded 23 completed on-line questionnaires. Seasonal respondents had higher levels of formal education (91% with college or university) and higher income levels (84% over \$60,000) than the permanent resident population. We consider the responses from seasonal residents as a separate sample and do not include them in our reporting of general trends for the population of the eastern Ontario Highlands region. There are two reasons for this: first, collection methods differed for each population and second, seasonal (i.e., second home) residents make up a distinct, more affluent and highly mobile population whose interests and experience in the region inherently differ from permanent residents in many ways (McLeman 2010). However, their views are important to future energy developments and seasonal resident survey responses, are compared to those of the permanent resident population in several places in the following discussion.

Household energy use patterns

Use of wood for household heating is widespread in this region, 71% use wood as either primary or secondary heating source, another 12% use wood pellets. This is a unique energy

pattern for planners if we consider that the Canadian average for heating with wood is 4% as the primary heating source and 6% as a primary or secondary source, see more in Table 2. Three quarters of residents use 3 or more bush cords annually (a unit of split firewood stacked to be four feet high, four feet deep and eight feet deep - 1.3 m x 1.3 m x 2.6 m) and over half (56%) cut their own wood.

Table 2 – Household heating sources in use in the study area and in Canada

Heating source	% of residents in study area using (n = 180)	% of all Canadians using as primary heating source (SHEU 2007)
Wood	71%	4%
Heating oil	40%	8%
Electricity	31%	38%
Wood pellets	12%	Reported with wood
Propane	14%	1%
Natural gas	N/A	44%

In terms of other household energy use, 57% of residents spend more than \$200 on gasoline or diesel per month and most residents (60%) spend between \$100 and \$200 per month on electricity. Only one respondent reported no gasoline or diesel use and only four respondents (2%) were “off-grid” (obtaining electricity from their own generation and not the provincial electricity distribution system).

Views on energy

More than 90% of residents agreed that costs and reliability are important energy issues for the future (figure 2). Support was also high for using local energy sources (83%) but residents were less sure of there being a need to avoid fossil fuels (51% agree). A high proportion of residents (89%) think it is important to look for alternative ways to use and obtain energy. In terms of personal habits 92% indicated they find ways to reduce use of energy to save money while 75% indicated they do so to help the environment.

Responses were solicited on a Likert scale (1 = strongly agree, 5 = strongly disagree), allowing for statistical comparison of mean values and insight into possible group differences. Views on energy are consistent across permanent residents in the region with a few minor exceptions. Lower income individuals attributed more importance to keeping energy costs low (household income less than \$20,000 \bar{x} = 1.28, \$20,000 – \$39,000 \bar{x} = 1.55, \$40,000 - \$59,000 \bar{x} = 1.62, >\$60,00 \bar{x} = 1.62, ANOVA P=.027) and those with apprenticeship level of education felt less strongly about the need for alternative energy (\bar{x} = 2.44 compared to \bar{x} = 1.49 for high school education and \bar{x} = 1.57 for college education, ANOVA P=.009). No significant differences exist in the views of residents living in different villages, or between male and female respondents or between those that are raising children or not. Seasonal residents felt that looking for alternative ways to produce energy was less important than did permanent residents (\bar{x} = 2.86 vs. 1.58, $p < .001$, Welch T-test) and expressed less concern with keeping energy costs low (\bar{x} = 2.00 vs. 1.31, $p < .001$, Student T-test).

Many (28%) of the respondents added comments to help explain their responses. The quotations below illustrate the types of energy-related concerns residents expressed.

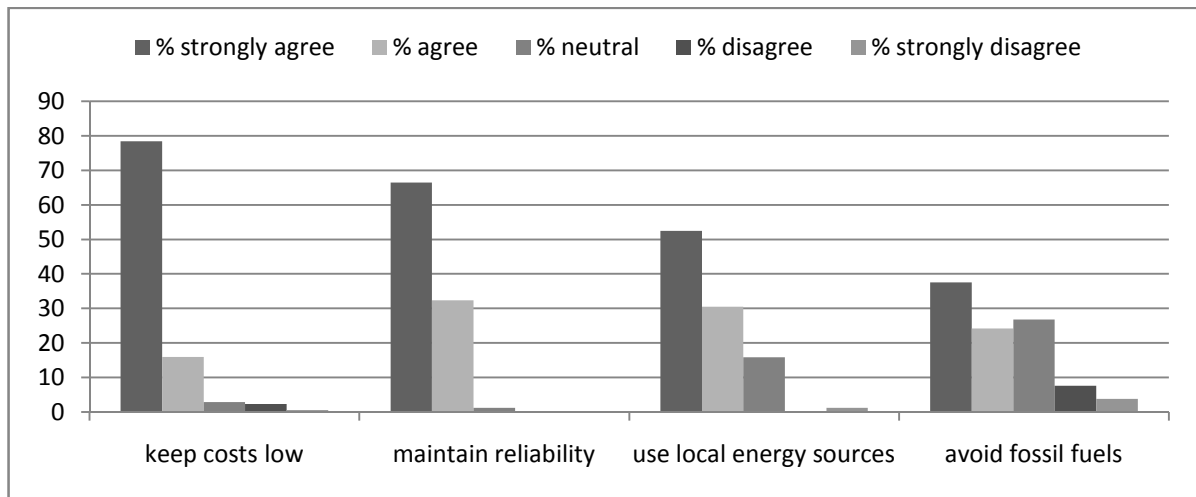
“Something should be done about hydro charges going up constantly.”

“Living in an underprivileged area, with declining youth population (under 40 yrs) it is imperative that any green technologies that could produce and maintain economy is[sic] beneficial.”

“A lot of people in our area cannot afford the continually rising costs of hydro.”

“I would think that most people would like to be off the grid mainly for reliability as there have been numerous outages and most have a generator as back up.”

Figure 2 – Response to question “What are most important energy issues in the future?” from residents of Eastern Ontario Highlands surveyed February to May, 2011



When asked if they would like to see more renewable energy produced in their township, 88% of respondents were supportive and 97% were supportive or neutral (Figure 3). When a NIMBY element was added to the scenario slightly more opposition emerged and 11% of residents said they would prefer to support RET only if it occurred outside the region. ANOVA and T-tests reveal no statistical difference between the responses of residents with different income or education levels, those living in different villages or those raising children or not. Seasonal residents are slightly less likely to desire renewable energy

production in the region ($\bar{x} = 2.09$ vs. $\bar{x} = 1.56$, $P < .1$, Welch T-test) but no more likely to have NIMBY attitudes than are permanent residents.

Figure 3 – Levels of renewable energy “NIMBY” attitudes among residents of Eastern Ontario Highlands surveyed February to May, 2011

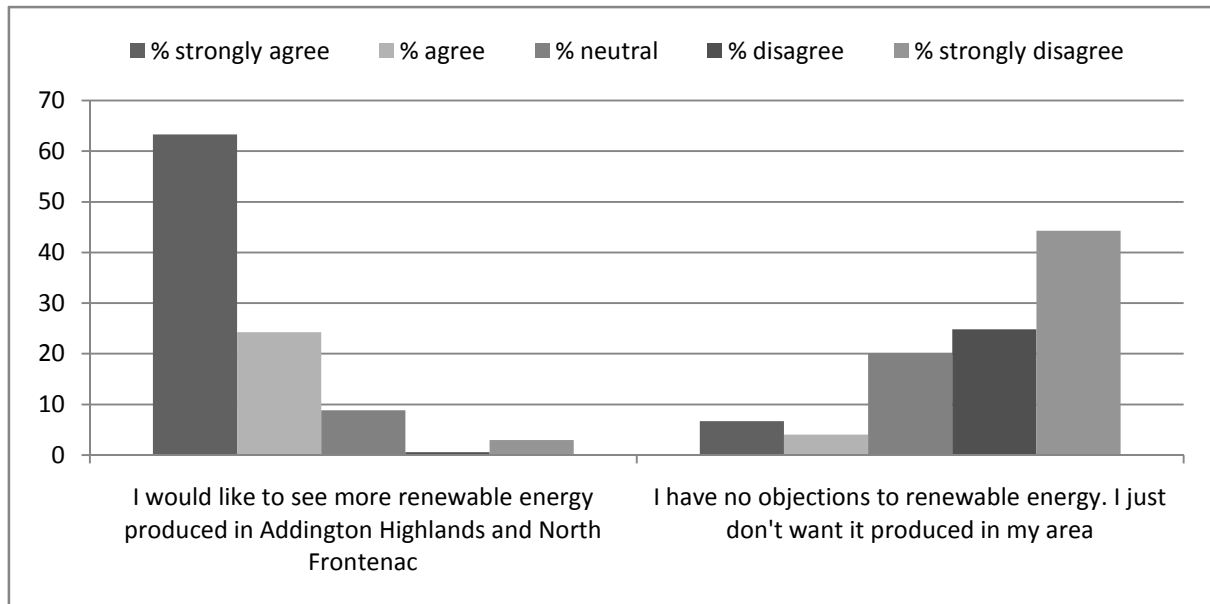


Table 3 reports attitudes towards nine renewable energy options for the region including differences in attitudes associated with various socio-economic factors. Support was strongest for rooftop solar panels, and all of the solar options presented in the survey ranked highly relative to other technologies. Older residents without children expressed less support for rooftop solar panels than did residents with children. The least preferred options are a wind farm or a new hydro dam. Support for a new hydro dam is lowest among permanent residents with no children; seasonal residents also indicate low levels of support, bordering on outright disagreement, to a dam. Support for a new dam is very high among respondents residing in the village of Flinton, where there already exists an aging dam on the Skootamatta River. The option of renovating an existing dam receives greater support among permanent residents, with seasonal residents being less supportive.

Support for a wind-farm is mixed, with respondents earning less than \$20,000 /yr significantly more likely to approve of such a development. Wind farms and a new dam appear to be the most polarizing options given the relatively high number of people disagreeing or strongly disagreeing with them as compared with other RET options.

New uses of forest resources in the form of a pellet plant or a wood chip boiler receive moderate levels of support. These options had large proportion of respondents who were unsure or neutral of these technologies. This could indicate respondents were ambivalent about these options or that more information was needed before declaring a position.

Seasonal residents had statistically lower support for a pellet plant than did permanent residents. Not surprisingly those that heat with pellets were more likely to support a local pellet plant than those heating with oil, electricity, propane or firewood ($p < 0.05$, t-test, not reported in Table 3).

Table 3 - Attitudes towards different sources and sizes of RET in the eastern Ontario Highlands

	Rooftop solar	Solar farm	Scattered panels	Renovate dam	Pellet plant	Wood chip boiler	Scattered wind turbines	New dam	Wind farm
% support	87	79	73	72	67	63	63	58	58
% opposed	5	11	9	13	14	11	18	21	25
% neutral	8	11	19	15	19	26	19	21	17
Likert scale (1 = strongly agree, 5 = strongly disagree) mean values									
Standard error of mean (2 SE)	1.46 – 1.76	1.63 – 2.00	1.71 – 2.07	1.78 – 2.19	1.94 – 2.33	1.93- 2.31	2.10- 2.53	2.14- 2.60	2.20-2.66
gender									
male	1.58	1.94	1.94	2.17	2.32	2.28	2.33	2.37	2.44
female	1.63	1.76	1.88	1.79	2.04	2.06	2.38	2.32	2.51
child rearing									
yes	1.29*	1.58	1.62	1.68	2.21	2.06	2.29	1.85*	2.28
no	1.71*	1.89	1.96	2.07	2.08	2.15	2.32	2.51*	2.50
village									
Cloyne	1.50	1.46	1.48	2.05	1.96	2.14	2.16	2.50	2.42
Denbigh	1.78	1.75	2.02	2.27	1.92	1.98	2.19	2.74	2.28
Flinton	1.60	1.94	2.08	1.72	2.27	2.30	2.22	1.75**	2.53
Ompah	1.53	2.00	1.75	2.00	2.57	2.15	2.53	2.79	2.45
income									
under 20 k	1.21	1.20	1.38	1.33	2.23	1.91	1.67	1.77	1.44*
20 to 39 k	1.45	1.65	1.94	2.06	2.20	2.17	2.63	2.39	2.75
40 to 59 k	1.88	1.89	1.88	1.48	1.79	1.88	2.29	1.80	2.32
over 60 k	1.71	1.89	2.04	2.08	1.98	2.15	2.21	2.50	2.64
residence status									
seasonal	1.52	1.90	1.76	2.73*	2.78*	2.52	2.00	3.41**	2.64
permanent	1.61	1.82	1.89	1.99*	2.13*	2.12	2.32	2.37**	2.43

Bold indicates difference at $p < 0.1$, * indicates difference is significant at $p < 0.05$, ** indicates difference is significant $p < 0.01$, for 2 factors (gender, child-rearing, residence status) the Student T-test is used, for 3 and 4 factors (village, income) a one-way ANOVA with Tukey-b post-hoc test is use

Focus group findings

Consistent with the findings from the survey, participants in both focus groups generally supported RETs, and suggested that wind farms would likely be the most contentious technology. Residents expressed concern that seasonal residents or residents who had relocated from urban areas would be concerned with aesthetic impacts on the scenery. These expectations were not supported by survey data which show similar levels of support for wind farms between seasonal residents and permanent residents and no significant differences between long-term and newcomer residents. Some quotations from focus group participants to illustrate the types of concerns identified with wind technology include:

"I sure as hell know they aren't going to put one of those wind farms on my property."

"I wouldn't make this an urban / rural issue but in some respects I think it is. Rural people might be more used to seeing towers, because a lot of old farms had wind machines that pumped water...we are talking two generations ago but if you grew up in that situation....it is a different type of wind energy but it still involves a tower and blades and so I think people are more used to seeing that in the country."

"You go to Wolfe Island, and it is almost a disgusting insulting thing when you look at the beauty and then this thing is just clustered with (...)it is producing nice energy but you have a huge challenge and I think it will continue wherever you go with 'not in my backyard'"

"If you talk about two or three turbines on _____ Lake, there would certainly be a very different perspective from people that come up on only on weekends"

"I think it is being maligned...it is popular to believe it is bad."

Participant A – male retiree long-time resident, active in local hunting and fishing organization Participant B – male, business owner, has solar panels under microFIT program, moved to area

from urban centre

Participant C – male retiree active member of County-level “green energy task force”, moved to area from urban centre

Participant D – female long-time resident, active in community organizations, lives off grid

Participant E – male, long-time resident, volunteer firefighter, lives off grid

Participant F – male retiree active in lake association moved to area from urban centre

Participant G – male retiree long-time resident active in local organizations

Participant H – male retiree, long-time resident active in local organizations

Figure 4 - Profiles of the participants of focus group #1

Although the survey results suggest strong support for solar panels on rooftops, there were several concerns that emerged in the focus group discussion. One participant provided a possible explanation for greater support seen in the survey by those in child-rearing families. He described the relevance of the microFIT incentive program for older residents thus:

“This is turning into a retirement community. When you have someone coming in at the age of 65 and take a look at solar, which you get your return back in 10 or 12 years, and it costs you \$70,000 to do, I don’t think at 65 I’d be willing to put out the \$70,000 to maybe live long enough to see some return on it”

The costs of the microFIT subsidy to taxpayers also generated discussion. In one of the exchanges one participant described his rooftop solar panels as a “*damn good investment*” but another felt the costs were too high to the Ontario taxpayer at which point several participants discussed if the costs of the nuclear alternatives were just as high. The argument that subsidizing RET is driving up electricity rates turned out to be a prominent criticism from opposition political parties during the run-up to the fall 2011 election and it is worth exploring the public perceptions of this argument in the EOH

during the study period. It is made even more relevant by the fact that advocacy groups and national media claim that green energy concerns caused the governing party to lose seats in rural areas (Howlett K and Ladurantye 2011, Wind Concerns Ontario 2011). As reported above, focus group participants considered and discarded the argument that RET subsidies should be abandoned to avoid raising the price of electricity. The survey comments provide an additional measure of attitudes. Of the specific comments on electricity costs, seven blamed mismanagement of the provincial utility Hydro 1, five indicated there should be continued subsidies for installing solar or other forms of renewable energy and four said microFIT subsidies should be abandoned altogether. Below is a sample of the comments.

“I would like the debt taken off of the Hydro bills as well as the HST. No one pays our debts so why should we have to pay Hydro's debt”

“I have vacant land suitable for solar panels, but find it too costly to install. These should be made more available to people who want to assist the energy problem”

“Power should be generated where it will be used without requiring subsidies reminiscent of Soviet Union fantasy economics. Personally I don't want to fund or suffer the consequences of Mcguinty's [Premier of Ontario] green dream simply so the provincial liberals can get a few more ridings in the Golden Horseshoe ridings”

Several participants in both focus groups expressed scepticism that solar panels would continue to be installed if there were changes in provincial policy after the election. The election completed in October 2011 saw the governing party returned to power albeit with fewer seats. At the time of writing the microFIT program remained intact but lower rates are expected for new solar installations.

When asked about the hydro-electric option participants in both focus groups were generally in favour of the technology but expressed a great deal of concern about the number of approvals required from oversight bodies for water-ways. In the second focus group one participant recounted the seven year wait their hydro-electric project took between decision to go ahead and to producing electricity; *“there is not just one approval, there are 10 approvals.”* Flinton is one village that has seen officials from the Conservation Authority enter into agreements with private parties to develop hydro-electric power in the river running beside town but these plans have floundered for lack of expertise and start-up capital. Despite this, support for a hydro dam remains high in Flinton as seen in the survey responses and expanded on in survey comments such as *“At one time Flinton generated its own power plant at the Flinton Dam Why not now??”* Some participants expressed doubt that municipalities would lead projects to convert existing dams to produce electricity. Some quotations that reflect the discussion are:

“They will struggle with the long-term commitment.”

“If some municipal government says yes we are going to do this, they aren’t going to see the benefit during their period of power so it is difficult for them to champion a project like that.”

“We have so much potential for water and one of the biggest obstacles I see is the red tape.”

Diverting water to generate power, even in the case of a pre-existing dam, raised concern among some participants in the first focus group that water levels for recreational activities and for fish habitat would be compromised, a reality also recognized by officials in the second focus group. Concerns about water levels may be behind the significantly

less enthusiastic responses to hydro-electric options from the survey sample of seasonal residents, most of whom own water-front property.

The discussion of the biomass energy option brought out some enthusiastic responses from both groups. Unlike the wind, solar and hydro examples no negative opinions were expressed in the first focus group, while the only concern expressed in the second focus group was uncertainty over the ease with which forestry operators could change from existing tree removal practices to providing for pellet production. Participants saw a wood pellet factory as a logical follow-up to the planned installation of a wood pellet boiler at the region's school. The following quotations reflect the discussion:

"We've got just incredible amounts of sawdust and bark and trimmings and wood....to me this is an ideal opportunity for somebody to come along and open a pellet plant somewhere within easy distance."

"I love the concept over in North Addington[i.e. at the school - North Addington Education Centre]. I think that is great, now if we only can get the pellets here"

"This could be a product that has many many other spinoffs"

Participants in the focus group for residents shared ideas on actions that might promote greater uptake of local renewable energy production, and in doing so, some reflected on how everyday conversations connect to political decisions. One participant related a story of people knocking on his door to ask him about the outdoor wood boiler on his property, and concluded by saying, *"I think that is the kind of thing that promotes it [a move towards renewable energy]"* He picked up on the language used by another participant to say *"You have to keep highlighting that there are alternatives to the cord from the pole"*

and put forth the idea of “diversification workshops.” A different participant welcomed this and added the idea of tours of local hydro dam sites, solar panels, geothermal heating or other renewable energy technologies. Another participant was supportive of this idea, and gave the example of a community-owned, ground-mounted solar farm from a neighbouring county as an example to learn from. Near the conclusion of the first focus group, one participant observed *“if you don’t attend something like this [focus group] you get so damned insulated that you can’t see the forest from the trees.”*

Discussion

Our findings suggest residents of the Eastern Ontario Highlands have a strong level of support for alternative ways to generate energy. This is true when the question is framed generally and when specific types different RET in their own backyard are provided as examples. The biggest reason to support alternatives appears to be a general dissatisfaction with rising electricity prices, but there is also a strong interest in harnessing local energy sources. Comments from survey respondents and from focus group discussion show that some see RETs as economic development in an area that is struggling; others see it as part of being well-prepared for disruptions to conventional energy supplies.

In a region where a high proportion of residents use wood to heat their homes, it is perhaps unsurprising that support for wood-based RET was high. There was unanimous agreement in the focus groups for a wood pellet factory, and 68% agreement from survey respondents with those that currently use wood pellet stoves the strongest supporters.

For many residents, wood is simply the cheapest and most readily available option, and this fact seems to translate into higher levels of support for biomass energy than has been identified in existing scholarly research, particularly studies coming out of the United Kingdom (Upham and Shackley 2006, Upham and Waterman 2007). Wood-pellets garnered a high level of “neutral” responses in the survey. It is unclear if the neutral stance is because few have experience with what a wood pellet factory might look like, or because people are unsure what the pellets would be used for. When the opportunity to discuss the example was given in the focus groups, participants were very enthusiastic about the installation of a wood-pellet boiler at the school. Concerns were raised about the fact that the School Board that manages the installation is assessing wood pellet supply tenders from seven bidders across southern Ontario and into Quebec, none of which manufactures pellets in the study region. If no local pellet supplier emerges in coming years, local attitudes towards this project could quickly change, given how much raw wood product is locally available, and given the large number of residents engaged in forestry.

Residents also strongly supported solar RETs. Positive opinion was high for rooftop installations (87%) and for solar farms (79%), indicating that the technology itself is seen as benign even when prominently visible and taking up a large area (one solar farm south of the study area takes up 40 ha). Early adopters of the microFIT program have been publicized in the local paper, and the technology is easily visible on many roofs along highways in the region. This likely contributes to the high public awareness of the

technology, and possibly contributes to the high levels of support with a technology people have become familiar with.

There is some underlying concern related to the price being paid by the provincial power authority for electricity generated by solar photovoltaic technology. Several focus group participants and survey respondents expressed views that the FIT incentive program is wasteful, echoing views often given in mainstream media and by political opposition parties. On the other hand, even with the arguments against solar subsidies circulating in the public sphere, some residents call for even further subsidies to support local RET developments. It was also interesting to observe that wasteful subsidy opinions tended to become moderated in the focus groups when the cost of the nuclear energy option was raised. This may have been due to the high sensitivity and public awareness of Japan's Fukushima nuclear power plant disaster, which was still in its early stages when the focus groups were held and referenced by several participants. This would imply that at least some residents would accept higher priced electricity if it came from "safe", "local" sources. This finding must be regarded as tenuous however as EOH residents show a very strong preference for keeping costs of electricity low. A longitudinal survey of EOH residents with sampling periods that incorporate future changes in electricity rates and in government incentive programs would provide better evidence to fully assess public perceptions of the costs of RET incentives.

One concern about the FIT incentive program that is not widely expressed in media is how the 10 year payback period maybe too long for many older residents. Given that rural populations like those in the Eastern Ontario Highlands tend to have higher average ages,

this may warrant further reflection by policymakers seeking to incent renewable energy production in these communities.

Residents were in favour of using falling water to generate electricity, but more so for existing dams versus constructing new dams (73% versus 58%). The greatest barrier that came through in the focus groups was a perceived excessive number of regulatory approvals required to get at the water. There was also concern about changing water levels on recreational activities and fish habitat. Potential hydro project proponents should be prepared to mitigate these concerns with clear communication with residents.

From the second focus group there was great deal of discussion about what would motivate a municipality to pursue a hydro-electric project. Having a partner like a Conservation Authority which has the in-house capacity to perform environmental impact assessments was deemed important, as was creating a number of working demonstration projects in the area to attract risk-averse investors (both public and private) to hydroelectric RETs.

The NIMBY response is a favourite explanation for those who suggest people will oppose any new buildings or new technology close to their property. Relatively few survey respondents expressed the classic NIMBY response (11%). It was indicated most frequently with respect to wind turbines. The higher level of support expressed by lower income individuals is consistent with explanations from van der Horst (2007) and Brannstrom et al. (2011) who find depressed areas in economic decline are more likely to host wind-farms. The proportion of those disagreeing with a wind farm in the region (25%)

is in line with the review of surveys carried out by Devine-Wright (2007) who suggest 20% opposition is common. Prior opinion surveys for eastern Ontario are rare. One was carried out for Ontario bird-watchers, a group that is highly sensitive to the impact of wind turbines on birds, and found 22% disagreed with wind energy (Cheskey and Zedan 2010). Another measure of public response to wind farm development comes from Hill and Knott (2010) who document an increase from 20 to 45 in the number of local groups across Ontario joining the provincial anti-wind organization Wind Concerns Ontario between 2008 and 2010.

Results from both the focus group discussion and the survey suggest seasonal residents of the Eastern Ontario Highlands are a group that resists change to the environmental amenities that directly influence the enjoyment of their properties, specifically lakes and forests. Any development of RET in the region may face opposition from this group, particularly for hydro-electric power and possibly a wood pellet plant. This tension is characteristic of trends towards post-productivism in rural areas like the Eastern Ontario Highlands whereby tourism generates capital tied to idyllic rural representations of landscapes and less wealth is generated from “productive” use of the land such as forestry and mining (Bryant and Johnston 1992, Ilbery and Bowler 1998, Woods 2003). It is a reality that planners should address especially considering the large numbers of seasonal and recreational properties in other rural regions of Ontario experiencing RET developments (e.g. Huron and Bruce Counties) and the strong likelihood of RET expansion elsewhere in North America. However, it would be inaccurate to portray all seasonal residents as anti-RET development. Many cottages are remote and off-grid due to lack of

electricity lines; some cottage owners use solar, wind and geothermal power and contribute to an expanding knowledge base of alternative energy production in the EOH region and elsewhere. Further case studies focussed on the views of seasonal residents in rural regions in Ontario and elsewhere could contribute more detailed advice to rural planners.

Overall our findings suggest that residents in the Eastern Ontario Highlands generally hold a positive attitude towards all new RETs and that, at least with respect to solar installations, this positive attitude endures even after RET infrastructure is built. Our suggestion is that planners may be able to foster this attitude by engaging rural residents through participatory planning, through demonstration and with regular consultation of residents (including seasonal cottage owners) during project proposals. Residents are particularly enthusiastic when local resources are used in the development of non-conventional energy options.

Acknowledgements

The authors would like to thank the residents of Eastern Ontario Highlands for sharing their time and expertise during this study. Special thanks to Angela Bright for research assistance. This paper benefitted from two anonymous reviewers. Financial support was provided by the Social Sciences and Humanities Research Council.

Chapter 4 - Habermasian analysis of local renewable energy deliberations

Co-authors: N/A

Publication details: The paper is published as Fast S (2013) Habermasian analysis of local renewable energy deliberations *Journal of Rural Studies* 30 (1) 86-98

Contribution to overall thesis: This article contains the major theoretical contribution of the thesis. It operationalizes Habermasian concepts of the public sphere and of communicative action in an analysis of group discussion together with observations and analysis of the activities of individuals and organizations presenting public arguments. The findings include: (1) a tendency for public argument to deflect and re-orient particular individual or group interests towards shared interests; (2) despite this tendency, the values emerging from public debate had little governance power due to institutional and structural barriers; and (3) a discernable presence of reflexive discourse and communicative action around renewable energy planning, but also evidence of communication being threatened by larger scale processes.

The article directly answers research question #3 concerning evidence for the role of communicative action. By investigating the process and conditions surrounding intersubjective meaning production it also contributes to answering research question #2. Finally, the article presents implications of the Habermasian analysis - not only on the

prospects and likely form for renewable energy development in the EOH - but also for broader questions about deliberative democracy and environmental planning (research question #4).

Abstract: This study pursues a Habermasian analysis of citizen discussions and of the local public sphere to shed light on renewable energy futures in rural east-central Canada. Using data from group discussions, it pursues an investigation of utterances, validity claims and of discourses. The analysis is supplemented by participant observation of publicly acting organizations, and together these form the evidence to arrive at some predictions for energy developments. This case study finds governance officials tended to negotiate solar, wind, biomass and small hydro projects with fact-claims, but citizens operated mainly with norm-claims and this along with other factors creates a distortion in communication and in social coordination with implications for the future of various energy types. More generally it also suggest the state's strong reliance on market incentives may have long term costs in terms of diminished public reasoning over renewable energy. Working through Habermas' concepts in this way also pointed towards potential contributions to the theories of communicative action and the public sphere.

Keywords: renewable energy, futures, opposition, Habermas, communicative action, communicative rationality, deliberative democracy, public sphere,

Introduction

Planning for renewable energy is complicated. Despite general public support for alternatives to fossil fuels (Angus-Reid 2007, EC 2011), many areas experience social conflict over renewable energy implementation. Wind farm disputes are prominent in the literature (Burningham, Barnett and Thrush 2006, Devine-Wright et al. 2009, van der Horst 2007, Woods 2003) but this does not indicate a general rule. Some wind developments proceed with little conflict (Brannstrom et al. 2011), and implementation of other renewable sources like biomass and solar experience equally mixed social responses (McCormick and Kaberger 2005, Pasqualetti and Schwartz 2011, Upham and Shackley 2006). Opinion polling, economic modeling and other traditional socio-economic research methods are insufficient to explain opposition or to predict and plan for renewable energy pathways (Devine-Wright 2007, Fisher and Brown 2009, Mårtensson and Westerberg 2007). Researchers are increasingly turning to interpretive methods to gain deeper understandings of the positions of local actors. These include content and discourse analysis of texts (Barry, Ellis and Robinson 2008, Hagget and Toke 2006, Senger, Raven and Venrooij 2010), case study comparisons (Mårtensson and Westerberg 2007, McCormick and Kaberger 2007), and ranking exercises designed to encourage reflection by respondents such as Q-methodology (Brannstrom et al. 2011, Ellis, Barry and Robinson 2007, Fisher and Brown 2009) and multiple criteria analysis (Trutnevyte et al. 2011, Upham and Waterman 2007). There is considerable interest in the development and application of additional research methods that are appropriate for the social and

dynamic (not individual and static) nature of social responses to increased renewable energy implementation (Devine-Wright 2010b, Walker et al. 2010).

A general prescription coming out of this stream of interpretive research is for dialogue between citizens, experts, developers and planners to help prevent and negotiate renewable energy disputes. Deliberation is widely assumed by political theorists to foster “green” choices, but as Lövbrand and Khan (2010) point out empirical evidence is limited. Authors are unsure if current planning practices can accommodate the value differences among the diverse set of stakeholders (Barry et al. 2008, Ellis et al. 2007, Fisher and Brown 2009). The tension between local interests and national / global interests may be too great. Here the instrumental challenge of meeting renewable energy targets meets more normative critiques that planning efforts should better incorporate the views of local citizens. Is consensus on renewable energy implementation possible or desirable? Should planning instead strive for an “agonism” model recognizing deep differences in values (Mouffe 1999 cited by Ellis et al 2007). These questions point to further knowledge gaps about processes of deliberation and of reaching consensus.

This study pursues both challenges. It brings a methodological contribution to what Fisher and Brown (2009) call the “discursive turn” in renewable energy planning studies and it explicitly engages the theoretical concepts of deliberative forms of decision making. It develops and applies tools from Habermas’ communicative action theory to an empirical case of renewable energy planning in east-central Canada. The paper examines how

citizens in ordinary rural communities identify, discuss and negotiate the prospect of renewable energy production in their territory. It pursues three main questions: (1) What are the conditions of the local public sphere that enable and/or limit deliberation around renewable energy issues? (2) what kinds of knowledge - specifically what claims of truth, rightness and truthfulness theorized by Habermas to be present in all discussions - underpin shared understandings? (3) What evidence exists for the coordinating role of communicative action as it is theorized by Habermas and others?

The paper proceeds in four steps. I begin by mapping out the elements of Habermas' social theory guiding the case study and then describe the case with special attention to the local public sphere. The next section lays out Habermasian discourse analysis as a method to analyze "talk". The third section gives results of this analyses and the final section pursues implication of findings for renewable energy futures in these communities, and the role of citizen deliberation in these issues more generally.

Habermas' social theory

Jurgen Habermas(1984, Habermas 1987, Habermas 1989, Habermas 1992, Habermas 1996, Habermas 2004) seeks to explain how human activities are coordinated, especially how collective interests emerge and are legitimated through public use of reason. At the core of his understanding (figure-1) is the theory of **communicative action** which stresses the pragmatic function of language. When actors speak we unavoidably provide and evaluate reasons (this is the meaning of **rationality**). Actors use three types of reasons to support / explain their actions (1) "facts" grounded in the objective world providing

reasons based on “**truth**”, (2) norms grounded in the social world providing reasons based on “**rightness**” and (3) feelings and desires grounded in our subjective worlds providing reasons based on “**sincerity**” or “**truthfulness**.”

Reasons come from the **lifeworld**— our shared set of taken-for-granted knowledge providing each individual the resources to interpret social situations and to evaluate the three types of claims. When two or more actors reach mutual understanding of a situation it forms the basis for **communicative action**. In modern society, the three forms of lifeworld knowledge accumulate and are transmitted via scientific theories (facts), legal and moral representations (norms) and art (truthfulness) but continue to rely on communicative encounters to be reproduced. Topics of communication can become subject to rational argument and **discourse** (i.e., conscious debate rather than evaluation via inherited reasons) when the background knowledge of the lifeworld differs slightly between individuals, or new information becomes available. Pseudo-rational **strategic action** occurs when two or more actors pursue individual goals through independent calculation of another’s interests. Strategic action is more likely to involve deception and concealing of true intent but is also highly effective in meeting goals. It is the rationality of the coordinating **systems** of the modern world (the market economy and bureaucratic administration). With no communicative rationality checks these are open to abuse and act to **colonize** the lifeworld, disrupting communicative action and dehumanizing society. Habermas finds hope in the **public sphere** connecting the social coordinating function of language, through the rationalizing process of discourse into a modern political function. His theory of **deliberative democracy** argues that the testing and refining of norms

through communicative action gives law their legitimacy. Figure 1 map out the connections between these concepts and serves as a guide for the remainder of the paper.

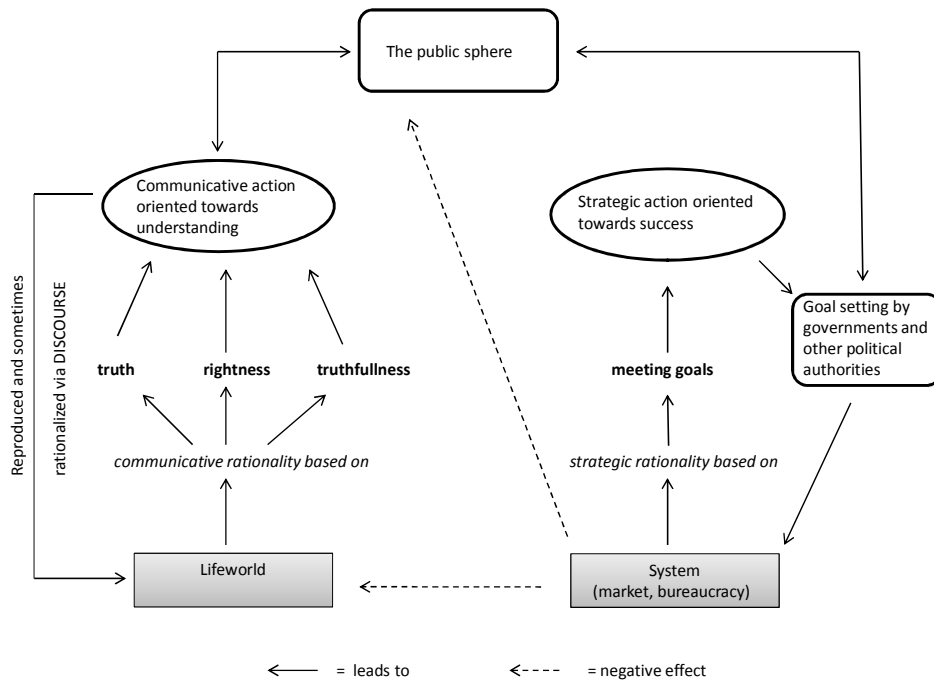


Figure 1 – Habermas' theoretical model (source, author)

The significance of Habermas' theories for empirical studies is not obvious. His concepts are highly abstract and his use of ideal-types has attracted criticism for obscuring context. Three major critiques are relevant for the concepts of communicative action and public sphere employed in this paper. First, by focusing on serious speech acts and calm, reasoned discussion over humour, irony and wit, Habermas creates a false standard of transparency in communication (Dryzek 2000, Gardiner 2004, Thomassen 2010). This leads into a separate critique that in presupposing a universal orientation for actors to

search for agreement and consensual problem-solving he relies on an abstract faith that humans are rational when in fact what most often counts as “rational” is defined by power and the interests of those with power (Flyjberg 1998, Martin and Rutagarama 2012, Tewdwr-Jones and Allmendinger 1998). A third critique is that his notion of the public sphere is not sufficiently sensitive to the contexts of place (Howell 1994) or to what Nancy Fraser calls “sub-altern” publics (Fraser 2007, Roberts and Crossley 2004).

Yet, those who have attempted to operationalize Habermas’ core concept of communicative action have enjoyed some success in revealing the threats and strengths of planning practices (Dryzek 1995, Forester 2003, Kemp 1985, Forester 1985). Given the current emphasis on increasing public participation in renewable energy decision and “analytical-deliberative” planning (Devine-Wright 2010a) it is timely to re-examine these tools. Rural scholars are at the forefront of a renewed empirically-grounded critical examination of communicative rationality in the context of rural governance (Martin and Rutagarama 2012, Taylor 2010) and this study builds on that momentum.

Case Study: Renewable energy in the Eastern Ontario Highlands

In 2009 the province of Ontario, Canada established programs to develop renewable energy production. The overall policy goal is to “attract new investment, create new green economy jobs and better protect the climate” (Ontario 2009). Under a “feed-in-tariff” (FIT) program the Province offers 20 year contracts paying high rates and guaranteeing access (or a “feed- in”) to the electrical grid for any electricity produced from renewable

sources (wind, solar, biomass, small hydro). It further promotes economic development by requiring that new projects have 50% of components made in Ontario (for more see Yatchew and Baziliauskas 2011) . A complementary program purchases and installs biomass boilers, solar panels and other “green” technologies in public schools (Ontario 2011). The feed-in tariff program is based on similar programs present in 19 of 27 EU countries. Ontario’s politicians proudly cited Al Gore’s description of the policy as “the single best green energy program on the North American continent” (Yuen 2009). Yet, this technically elegant program has been marred by administrative problems in dealing with the 45,000 applications for contracts, critiques of green power subsidies from free market think tanks (Wood 2011) and by a highly politicized backlash from some rural communities hosting wind farms. Advocacy groups somewhat credibly claim these concerns caused the government to lose seats in the legislature in the 2011 elections (Howlett K and Ladurantye 2011, Wind Concerns Ontario 2011).

A region for study within Ontario was selected on the basis of its having a broad range of new energy scenarios providing a wide scope for participant discussion and an opportunity to incorporate under-studied roles of the public beyond that of “objectors” (Walker and Cass 2007). The Eastern Ontario Highlands (EOH) is a forested, upland rural region of the province under pressure to develop renewable energy projects. A number are in various stages of development initiated by various government, corporate and individual actors. The high school is the site of demonstration biomass heating system installed and paid for by the Province. Instead of heating oil, wood pellets will be used.

Dozens of individuals and businesses have installed electricity-generating solar panels under the FIT/ microFIT program mentioned above. Three private wind development companies have expressed interest in developing wind farms along ridges in the northern part of the study area. Finally there are dozens of former mill dams and water control structures with the potential to generate hydro-electricity. These latter are overseen by a Conservation Authority delegated by the provincial government to manage water levels. These four examples represent the best-known renewable energy developments in the region and are summarized in table 1. Informal interviews revealed that residents are also aware of developments elsewhere, such as large solar and wind farms to the south which are in close proximity to regularly visited regional urban hubs. Note that in the EOH case there are no demonstrations or overt conflicts over renewable energy projects unlike other cases examined in the literature (e.g., Fisher and Brown 2009, Woods 2003).

Table 1 – Degree to which EOH actors have pursued renewable energy production

Renewable energy opportunity	Current status in the EOH
Solar	Increasing presence via individual ownership of micro-size projects
Wind	Unrealized
Biomass	Traditional forms of use high, new forms of use emerging
Small hydro	Unrealized

I focus on two municipalities of the Eastern Ontario Highlands: Addington Highlands and North Frontenac (figure 2). The permanent, year-round population of these townships are 2532 and 1842 respectively (Statistics Canada 2011), but during the summer months the region’s population is tripled by an influx of seasonal residents (Cumming Cockburn Ltd

2003). Early on in the research project an energy inventory of the region was prepared from a sample of 176 permanent households to create a baseline for discussion. Total regional energy use is estimated at 426 Petajoules/year, over 30% of this from firewood (figure 3). Approximately three quarters of residents use firewood or pellets for heating their homes which is typical of sparsely populated forest communities in Canada and elsewhere (Ericsson et al. 2004). Wood is plentiful and 40% of residents reported using more than 6 cords/yr (i.e. 12 tonnes of wood) which helps explain why household energy use in the EOH is higher than the Canadian average (153 GJ/yr vs. 109 GJ, SHEU 2007). Electricity use is close to the Canadian average, many households have small generators as back-ups for power outages which can last 48 hours or more in the northern parts of the study area. Approximately 1% of permanent households are not connected to electricity grid, a few of these use solar panels or small wind turbines. Many seasonal cottages, not included in the inventory, are off-grid.

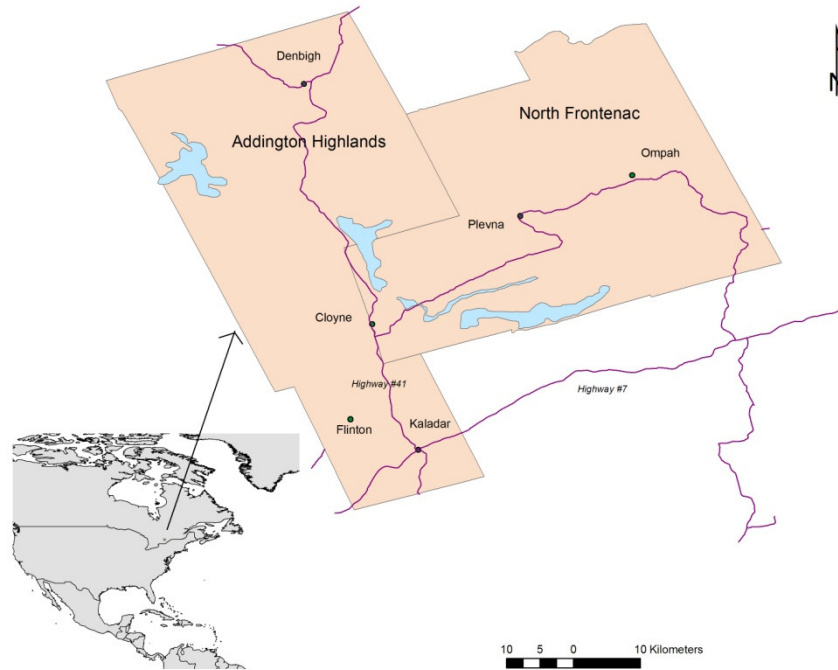


Figure 2 – Eastern Ontario Highlands

Population trends are consistent with patterns elsewhere in rural eastern Ontario; aging and with little or no growth in overall numbers (Sander-Regier et al. 2009). Employment rates and median incomes (45%; \$37,789) are considerably lower than the provincial average (67%; \$69,156), (Statistics Canada 2006). Most jobs are found servicing the tourists and seasonal residents. As in other rural Canadian communities, people struggle to retain schools and attract health care providers (McLeman 2010, McLeman and Gilbert 2007).

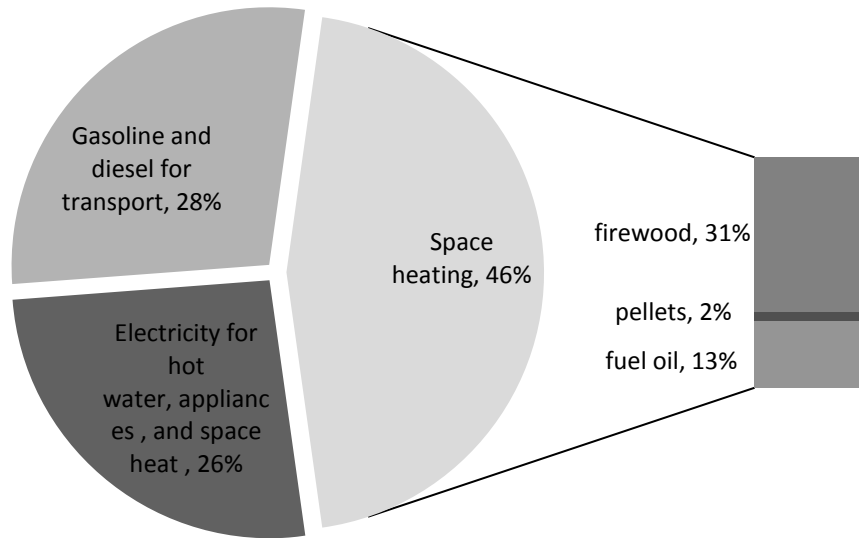


Figure 3 – Annual energy consumption in North Frontenac and Addington Highlands (total 426 PJ)

Characteristics of the local public sphere

The public sphere commonly refers to the media or anything covered by the media (McKee 2005). In Habermas’ model of society (figure 1), the media is one component of a public sphere which converts the social coordinating function of language into a critical check on political decisions (figure 1). Thus the public sphere is a normative ideal but also an observable set of practices of how citizens’ organize and communicate values into political decisions. The local media in EOH, the venues for public discussion and the actions of organizations that attempt to influence public opinion make up the local public sphere. It is described below and analyzed later in the paper. This description also provides context for the upcoming discourse analysis. It is based on observations accumulated through attendance at fourteen public gatherings in 2010/2011 including

town council and cottage association meetings, all candidates' debates, charity fundraising events and a "Renewable Energy Expo and Tour" organized by the author (Druker 2011). It is further based on informal interviews and close attention to local media reports.

Three types of organizations in the EOH acting in the public sphere. The first are grassroots groups defending against changes in state delivered services. Faced with the threat that the ambulance base would be moved to a more southern location, residents of the northern village of Denbigh formed a committee, established a web-site and sent a delegation to county council to argue against the move. A similar response was seen for residents of Ompah when their library branch was closed by authorities. These responses incorporated individuals diverse in gender, income, age and both locals and newcomers. These publics came together to test and develop their arguments and develop highly rational responses to policy decisions. For example, the Denbigh Ambulance Network presented a position paper critiquing the County's assessment of predicted reduction in ambulance waiting times.

The second type of publicly acting associations derives from one social group looking to advance its interests. One such group is the seasonal residents. There are more than two dozen cottage owners groups active in the region. Their concerns are often routine and administrative; road maintenance and garbage collection, but they sometimes engage in public argumentation and try to influence policy. Faced with proposed logging around their lake, one association showed remarkable sensitivity to public reasons for logging. For

example members were asked if they would be willing to pay higher property taxes to offset the potential loss in logging revenue if logging were halted.

The last driver to organize and present arguments in the public sphere is by direct establishment or strong facilitation by the state. For example there is a provincial legislative requirement for a local citizens committee to advise forest management plans. Also municipal government facilitated a public organization committed to renewable energy interests in the EOH; the County of Frontenac's Green Energy Task Force is composed of members of Council and private citizens. Its mandate is to further county energy goals including reduced per capita energy use and increased production of energy from renewable sources.

The power of the groups acting in the public sphere: The state affiliated associations with close connection to authorities, i.e., the County's Green Energy Task Force and the local citizens' forestry committee, theoretically have a large influence on administrative decisions. However in practice officials restrict the kinds of acceptable advice. For example, County officials attempted to prevent the Green Energy Task Force from commenting during a consultation exercise on changes to the microFIT payment terms.

The influence of other groups acting within the public sphere groups varies. The ambulance network will likely stop any closure of the ambulance base but will have to continually organize as population trends of more residents to the south and fewer to the north continue. As the number of seasonal homes has grown to outnumber permanent

residences, cottage associations have increasing influence with local municipal governments due to their large contributions to the tax base.

Spatial aspects:The physical spaces for discussion of public concerns in the EOH are restaurants and coffee shops, stores and other businesses, the schools, community halls for events such as all-candidates meetings, town and county council offices and kitchen tables in households. These are all relatively accessible to any citizen. Coffee-shops tend to be male dominated but it was not uncommon to see single women using these spaces. Some residents indicated that they do little socializing of any kind. A new development is that physically distant individuals are now connecting on-line which provides year-round communication of EOH events for the many part-time residents that have internet access. For example, the Denbigh Ambulance Network used a website to petition seasonal residents and collect comments for a position paper.

Habermasian discourse analysis

To study the ways in which citizens understand and negotiate renewable energy developments a Habermasian discourse analysis was used. Those familiar with the use of discourse analysis in environmental studies will note a difference between this concept of “discourse” and Hajer’s notion of discourse-coalition and other Foucault inspired analyses where discourses are treated as storylines (Dryzek 2005, Hajer and Versteeg 2005) with an ordering or rule-making effect allowing or disallowing certain representations of the world with implications for who maintains power and control in society (Fairclough 2003). A

Habermasian discourse analysis is less concerned with uncovering hidden meanings and more concerned with how speakers coordinate their actions through language. Discourse refers to specific moments in communication when speakers are pragmatically forced to argue public reasons for their actions. Since much renewable energy conflict and discussion involves disagreement over public benefits (global climate change mitigation, local jobs and investment) and public costs (potentially unwanted land –use, costs of subsidies) this type of analysis is well-placed to explore these tensions.

The conceptual basis for the analysis can be understood by referring back to figure-1; communicative action operates when speakers and hearers reach mutual understanding along three dimensions; the objective world dimension of truth, the social world dimension of rightness and the subjective world dimension of sincerity (first assuming that the utterance is grammatically comprehensible to listeners). This lays the foundation for an empirical analysis of conversation and text. A few researchers have pursued this, notably (Cukier et al. 2009, Forester 2003, Hughes 2011, Ngwenyama and Lee 1997). Essentially they propose a framework for coding speech and text using the truth, rightness and sincerity categories. A first step is to recognize that different forms of speech refer to different validity claims (table 2).

Table 2 – Distinguishing between different validity claims in conversation (knowledge types)

Characteristic types of speech	Knowledge type	Examples from EOH utterances
ASSERTORIC Asserting, contesting,	Truth	“we have lots of water, lots of power situations available, from the one in Flinton to others on the Mississippi, we’ve got several river systems in our area that could be used”

explaining, reporting		"I uh generated 11,000 kilowatts of power which means 8,800 dollars so my return is 7 to 8 years right, that is on a 63,000 dollar investment"
REGULATIVE Promising, prohibiting, ruling, refusing, encouraging, admonishing	Rightness	"...energy may be way too cheap, we are all used to cheap energy." "I mean I've got 175 acres on my property, stick some towers up in there and nobody would ever see them right?"
EXPRESSIVE Wishing, feeling, justifying, sentiments, stressing	Truthful- ness	"being a forester I am obviously interested in wood that is where lies my interest in renewable energy" "I would definitely, I would definitely like to support local power"

The materials used for coding are transcripts of four group discussions organized and moderated by the author in March –April 2011. These meetings occurred in settings that are relatively close to the ideal speech situation formulated by Habermas (participants have equal chance to speak, any assertions can be introduced or questioned, participants are free from coercion). The first two discussions were organized as focus groups. They were held in a village hall and lasted between 2.5 and 3 hours. Recruitment for the first group was from residents of EOH who completed an energy survey. Twelve individuals were invited and eight showed up on the day of the meeting. An effort was made to select a diversity of opinion based on their survey responses, and participants included a mix of newcomers (2) and long-time residents (6). A one-page backgrounder was sent to participants prior to the meeting to explain the format and advise of general topics for discussion.

Participants in the second focus group were selected for their being active participants in governance structures in the region. The eight participants, half of whom were EOH residents, included township councilors (3), a representative from the two Conservation Authorities (1) and from the two Counties with jurisdiction in the region (1), the provincial Ministry of Natural Resources (1), the local regional forest management company (1), and the local regional tourism association (1). A research assistant noted non-verbal communication and audio-recorded the meetings. Both groups opened with the same question: “How will people in Addington Highlands and North Frontenac meet their energy needs 20 years from now?” which initiated a broad-ranging, lightly moderated discussion of energy options, opportunities and barriers in the region. After a break, preliminary findings from the energy survey were presented and discussed. A final exercise entailed a guided discussion of participants views on the four examples of local energy projects described in table-1.

Additional group discussion occurred during three “information evenings” held in Flinton, Denbigh and Ompah (figure 2) organized by the author to report back to residents findings of the energy survey. The meetings lasted approximately one hour and began with a 10 minute presentation by the author followed by a question and answer period. In each of the meetings all audience members contributed to the discussion but to varying degrees; the Ompah and Denbigh meetings featured numerous exchanges among audience members, but the Flinton meeting attracted only three residents and no transcripts were produced. Overall 27 people from the EOH participated in these events, six of whom also

took part in one or another of the focus groups. Participants included newcomers (3), people with an official governance capacity (2) and locals (22).

The utterances of participants in these four meetings were coded first to a truth, rightness or sincerity code and then to a sub-code reflecting the content of the utterance. Note that the term “utterance” comes from linguistic study and encompasses statements, questions and other types of speech. It is defined as a complete unit of talk bounded by a speaker’s silence (Loos 2003). A second level of coding was used to mark for instances of agreement, disagreement or understanding between participants in groups discussions in order to isolate potential moments of communicative action. Follow-up interviews with several participants were conducted to confirm the outcome of any actions planned during the discussion. A third type of code was applied when speakers made references to societal structures including public opinion (the public sphere), the market, urbanization and rural context. Each transcript was read once in hard copy while making detailed notes and developing codes. The text was then introduced into the NVivo coding program (version 9.2)¹. Notes on non-verbal cues such as nodding of heads, smirks, shrugs and smiles were also incorporated into the NVivo project record and used to supplement and verify moments of agreement or disagreement. Each transcript was coded manually in the software program and a second round of coding was then done to consolidate repetitive groupings and improve consistency between coding of each group discussion. Appendix A provides a detailed sample of the coding procedure.

¹NVivo was used because of prior familiarity with the program. It proved suited to the task although other programs likely could have been used instead.

Findings from discourse analysis

Evidence of communicative action in the Eastern Ontario Highlands

Coding of the transcripts from the four group discussions resulted in a list of 1640 utterances assigned to one or more knowledge claims (truth, rightness, sincerity) and other thematic codes. Only a fraction of the utterances could clearly be assigned as mutual understanding between two or more participants. These were part of exchanges that include outright agreement (61 times), disagreement (99 times), or other indications of understanding (229 times). For example, moments when speakers finish each other's sentences or preface their own utterances with "another way of looking at that is..." Table 3 provides a summary of these observations.

Within-group talk of governance officials differed from within-group talk of private citizens. Mutual understanding between officials tended to arise over physical, technical and financial facts. This group described social world relations from a more economic and profit-motive perspective than did citizens. Citizens also spoke of physical and technical facts to some extent but a greater portion of their mutual understandings arose through talk of norms like local self-sufficiency and of learning from neighbours. Governance officials, on the other hand, tended to cite private companies acting with a profit motive agreement as the best actors to pursue renewable energy projects. One additional

difference is that residents trusted non-professional observations of natural resource facts more so than did officials.

Analysis of the information evenings provided an opportunity to assess talk **between** the social groups (locals, newcomers, governance officials). Mutual understanding between individuals of different groups arose through talk of financial facts concerning details of the microFIT program and technical details about wood pellet stoves. Additional norm-based understanding arose over the rightness of regional self-sufficiency in energy production and in a general complaint about over-regulation of hydro-dams. All groups raised the topic of wind turbine protest outside the region and expressed a respect that emotions of protestors were authentic and valid.

Table 3 – Shared understandings observed during facilitated group discussions

Type of knowledge	Details	Social groups	
		Private citizens	Governance officials
Truth / Facts (objective world relations)	<i>Physical:</i> height and location of dams, quantities of gasoline consumed, number of houses an electricity generation site can power, available forest biomass , seasonal water levels	** ↔	*** ↔
	<i>Technical:</i> composition of wood pellets and associated machinery , whether or not wood stove sufficient to heat home, electrical connections between grid and new generation sites, electrical storage technologies,	*** ↔	*** ↔
	<i>Spatial :</i> firewood as local resource and fossil fuels not local, local energy use patterns compared to urban or other rural areas, off-grid living details	**	
	<i>Political :</i> provincial targets for wind and solar power,	* ↔	* ↔
	<i>Financial:</i> 1) price of solar panel components, payment terms of microFIT incentive program, price of wood pellets, 2) costs of hydro dam and of wood pellet factory	*** ↔	*** ↔ ***
	<i>Demographic:</i> age of residents		*
Rightness / Norms (social world relations)	<i>Self-sufficiency:</i> village or region producing electricity for own use, inappropriateness of importing wood pellets	** ↔	
	<i>Best agents of change :</i> grassroots citizens Private companies with profit motive	**	***
	<i>Legal /contractual:</i> ownership of hydro dams, liability concerns over hydro dam safety	*	*
	<i>Unwarranted incursions into private life:</i> dictated low and high price periods for electricity consumption (Time of use billing), Too much red tape for hydro projects, regulations and consultants collude	* * ↔	* * ↔
	<i>Livelihood:</i> employability of newly trained renewable energy tradespeople,	**	*
	<i>Expected segregation:</i> locals can't afford microFit incentive only rich older/ younger newcomers	**	
	<i>Experimentation:</i> Cost of technology will decrease with more use / incenting and publicizing alternative energy projects makes next ones easier	* ** ↔	* ↔
	<i>Keeping up with others:</i> energy from waste, European carbon tax,	*	
	<i>Financial sense:</i> if there was a good “business case” hydro dams or other energy projects would	↔	*** ↔

	naturally proceed, Renewable energy avoids an externalized environmental cost of fossil fuel		* ↔
Truthfulness / sincerity (subjective world relations)	<i>Empathy with emotion of other publics</i> : protests over wind turbines in other regions	*** ↔	*** ↔
	<i>Aesthetic</i> : comparable ugliness of wind turbines and other electricity infrastructure, unobtrusiveness of rooftop solar panels		*
	<i>Dependable witness</i> : 1) first-hand experience respected, for example those living close to water affected by hydro generation, those with history of off-grid living 2) professional qualification respected, first-hand experience from non-experts downplayed	***	*

(* = seldom, **=occasional, *** = frequent understanding among participants where seldom = occurred briefly in only one of the 4 discussions, occasionally = occurred often in one discussion or at least briefly in more than one discussion, frequently = occurred often in more than one discussions. “↔” indicates understanding between groups and ↔ indicates frequent intergroup understanding, **bold text** indicates exchanges which resulted in coordinated action, see text for details)

Communicative action

At this point the discourse analysis has provided us with a rough idea of the relative proportions of truth, rightness and sincerity claims in certain discussion by members of certain social groups. It has also provided an indication of the extent to which mutual understanding occurs. Communicative *action* however goes further, it occurs when “actors coordinating their plans of action with one another by way of linguistic processes of reaching understanding” (Habermas 1998: 325). In table-3 the topics of understanding marked in bold are linked to the following plans of action.

(1) One town councilor initiated a wood pellet factory scoping study with the township economic development committee (2) Several community leaders are pursuing the Conservation Authority official to explore an agreement on hydro-electric development of the Flinton Dam (3) the forestry official and Conservation Authority official have identified new prospective sources of thinning for fuel (4) the renewable energy expo organized by the author emerged from the group discussions. In each case it is a combination of fact-understanding and norm-understanding that appear to be required to coordinate action. For example, it is not enough to reach understanding on the fact that the region has a large enough quantity of forest biomass to support a pellet plant, an equally important discussion concerned norms of local resources use and local economic development.

The public interest in climate change

The discussion of climate change in the EOH is of special interest since it is a major rationale of the green energy policy and because the literature often portrays local actors as unable to rationally assess climate change mitigation (Aitken 2010). In the case of the EOH there were very few utterances and only this one exchange - between two new residents and a town councilor- about greenhouse gases or climate change in any of the recorded discussions.

Phil*: they want to bring in a lot more wind up to 10 or 11% that would be huge, they want to use natural gas up to about 30%, nuclear is about 50% coal zero, the whole point of this exercise from OPGs [Ontario Power Generation is a state owned corporation] point of view is to get rid of coal

Margaret: Is it not an extraordinarily expensive way to do it? Wind power and solar

Phil: It is expensive in dollars but it is considered more expensive of course to the air to create carbon dioxide, that is the cost we are trying to get rid of

Roger: but there is so much, there is a lot of pushing back on um wind turbine power.... with the coal fired stations, with the coal operations, they have go the scrubber to push some of the efficiency up quite high so that you're cutting your pollutants down substantially

*pseudonyms are used for all quotes

Evidence of discourse

Recall from figure 1 that in Habermas' theory, communicative action can enter a new phase called discourse. This occurs when a speaker's utterance is challenged and she is forced to supply reasons for the utterance that go beyond existing taken-for-granted

lifeworld knowledge. In moving to more general and abstract reasons speakers are forced to make certain pragmatic presumptions; namely that their reasons would, in principle, be agreed to when argued openly and without time limits by all those affected. For claims of objective world facts and of social world norms the hypothetical audience for these arguments is universal. Discourse involving facts occurs using theories adjusted by empirical findings (*theoretical* discourse). Discourses involving norms occurs using moral principles and legal rules (*practical* discourse). For claims of subjective experience the hypothetical audience is more limited. It can refer to two types of audience: one, those that can directly assess whether or not an individual sincerely pursues actions as intended (*therapeutic* critique) and two, those that share the individuals cultural values allowing for assessments of the reasons behind evaluative statements (*aesthetic* critique).

Discourse is a critical concept for Habermas for two reasons. First, when particular concerns are argued in more and more general terms it can provide a legitimate basis with which to find ethically correct choices. Second it provides a mechanism with which to uncover and challenge hitherto hidden interests. Three examples, one of each of the types of discourses / critique, follow and illustrate occasions where mutual understanding proceeded to discourse:

Practical discourse

Dominic: So if I had a million dollars to invest personally...

Phil: you are saying if hehheh

Dominic: no if I had a million dollars to invest, I mean that is what it comes down to.

Ryan: yea

Dominic: for the municipality, for any private individual, if I can make money at that site why wouldn't I be lined up at the door?

Gus: the return on investment I would imagine

Dominic: well that's exactly what I am getting at

Gus: how many years to get your money back

Dominic: as I can make more money going somewhere else

Ryan: Well uh you would get probably 15% return on investment

Dominic: goodness sakes, then why wouldn't people be lined up at the door?

Ryan: you need certain, you need a certain uh uh skill set to line up and do that, uh

Dominic: Well no, I don't want to be involved in it, I just have a million dollars to invest, so if I can get 15%

Phil: There is obviously a better place to put your million dollars

Dominic: that is what I am getting at, I just want to understand why for all these small hydro potential sites (.) why people aren't lined up at the doors trying to exploit.

This extract is part of a discussion amongst governance officials. Dominic's argument relies on a set of assumptions that the market will naturally produce hydro-electric projects if the financial cost-benefit analysis is favourable. The behavior of the state (municipalities) and of private individuals is presumed to be equally bound by rational economic laws. There is wide understanding and sympathy from other participants of the mechanics of this assumption (e.g. familiarity with % return on investment and opportunity cost of putting money elsewhere). Initially participants assess the rightness of the hypothetical action (investing 1 million \$ in a hydro-dam) against the norm of cost-benefit analysis. However further argumentation begins to scrutinize the norm itself. This is when the argument turns to the next level of practical discourse.

Lucas... if you are starting in completely virgin type of environment the risk appears to be much higher, there is no expertise, there are no people around you can draw on so there is this kind of local expertise and so on and all these other things. And I believe that they work together and then something emerges from nothing and until you have that it is not as simple as saying 'how much? 15%, good, go for it' because you may probably run higher risk eventually

Terry: Sorry can I just come in on that. You said the million dollars, I think one of the things Ryan is saying is that it has to be a millionaire from Flinton involved as well for that social network to make sure that you don't get vandalism or site destruction, you have to have the community buy-in as well I think, or it would be very helpful. It is not enough even for the township or municipality to be partner, the village of Flinton has to have a vested stake in it as well I think is a component

Lucas and Terry's comments raise problems with sole reliance on rational economic actor assumptions. Predicting that hydro dams will be built involves other social factors like perceived risk and legitimacy of ownership. This example shows the ways in which discourse can uncover new reasons for action, bringing in new moral principles and thereby act as a reflexive coordinating force between actors.

The next example shows how subjective world knowledge claims are deliberated.

Aesthetic and therapeutic critique

Margaret: who wants a whole field of wind turbines in their backyard?

Phil: fine with one

Margaret: but do you want a hundred?

Phil: I wouldn't want a hundred but I wouldn't mind one across the yard

Linda: I LOVE them, I think they're fabulous.

Jane: I agree

Linda: because they're not putting anything into the air that I have to breathe or that anybody else has to breathe

In the extract above from an information evening we see subjective claims potentially developing into both therapeutic and aesthetic critique. When Margaret issues a rhetorical challenge to the sincerity of those that might support wind and Phil accepts the challenge, but only for one wind turbine and not 100, their arguments take on a potentially therapeutic effect of revealing hitherto hidden assumptions (i.e. does wind energy mean hundreds of structures or one single structure). Later in the exchange Linda makes an emotional and evaluative statement of love which is argued in a different fashion, she refers to a complex mixture of both local cultural values (cleanliness of her air) and of norms (responsibility to not pollute another's air). The degree to which those present agree that local clean air is an important value worthy of changing their perception of wind turbines is an example of the aesthetic critique type of argumentation. However, this example also reveals a difficulty in singling out only one type of discourse / critique in discussions as Linda's statement could also be considered a normative claim.

Theoretical discourse

Phil: what is the energy balance of pellets?

Lucas:I don't want to be quoted with on that if I recall the information is somewhere around 1 to 15, you gain 15 times on your energy input, for energy output relative to energy input .

Phil: and direct fuel is probably 1 to 100 or 1 to 200, that's what I am trying to figure why would you create pellets rather than just burn it as fuel wood

Lucas: Oh I see, I see well that was my question a year ago but now I understand better, pellets are simply (.) much more ah versatile they are much more concentrated energy you can store it

Phil: mmm hmmm

The final example above is of a fact-based exchange that quickly passes to theoretical

discourse. There are two context points to make immediately: 1) for reasons of space an earlier statement from Phil that he thinks wood pellets require more energy to make than they release is not included, 2) Phil's claim that firewood (direct fuel) has a 1:100 return on energy invested (EROEI) is incorrect. Instead, firewood has an EROEI closer to 1:30 while wood pellets are approximately 1:12 (Katers and Kaurich 2006) as Lucas had suggested. Notwithstanding the factual error on the claim regarding firewood, this exchange demonstrates the ease with which objective world descriptions of particular facts can pass to generally agreed upon ones. When Phil asks about the energy balance of pellets his question - and Lucas' answer - presumes that a certain value exists for this characteristic and that all observers could - if required - verify that value and agree upon it. The outcome of the exchange is only a partially correct interpretation of facts among participants and the potential manipulative effect of the error is taken up in the following section.

Each of the three preceding examples is an example of individual actors reaching mutual understanding of a particular situation through language. Habermas' "force of the better argument" is visible in these examples as is the tendency to enroll more general and abstract forms of knowledge. The ability for discourse to refer to a particular situation while also pointing to a more generalizable rule is especially relevant considering the scale issues associated with renewable energy debates. Before pursuing this there is one more concept from Habermas' theory that can be used to analyze the EOH case. That is his colonization thesis.

Barriers to communicative action: colonization of the lifeworld and of the public sphere

Thus far I have analyzed the energy discussions of a sample of EOH citizens for tendencies towards different types of validity claims and for evidence of communicative action and discourse. These activities are discernible in EOH discussions and identifying them provides one part of a picture of how citizens discuss and negotiate acceptable renewable energy activities. However it is also important to highlight any barriers that hamper deliberation and prevent communicative action as well to query how exactly communicatively reached positions may or may not have political influence.

Habermas suggest barriers to communicative action occur when communication appears to be authentic to actors but is conducted in a concealed strategic manner by one of the participants (1984:333). He suggests this is sometimes done consciously by actors and it is sometimes done unconsciously. The former is termed **manipulation** and the latter is given the name of **systematically distorted communication**. These problems are related to the tendency for the goal oriented logic of the systems of the market or the bureaucracy (1987:180-187) to replace the social coordination attained via communicative action. Instead of mutual understanding around “truth”, “rightness” and “truthfulness”, it is the attainment of profit (market system) or the design of rules (bureaucracy system) that coordinate ever increasing parts of society and have “colonized” the background knowledge of our lifeworld and the public sphere (refer to the dashed lines in figure -1).

Manipulation and prevention of discourse was frequently observed in the EOH.

Systematically distorted communication was a more difficult concept to apply but one possible example is provided below.

Manipulation and prevention of discourse

A simple example of manipulation occurred during the renewable energy expo when an individual made repeated long-winded statements to which others respectfully listened but only for a short time. The arguments of this individual were then excluded by other participants in various ways including pretending not to hear, interrupting or changing the subject. Another example is the bracketing off of acceptable topics for discussion by speakers. During one of the focus groups a speaker asserted that First Nations groups were extending land claim negotiations solely to extract more money. Others confided later they felt uncomfortable with the assertion and quickly changed the subject, in effect bracketing off this topic from further discussion. A final example is Phil's uncontested error over the EROEI of firewood. These tendencies in conversation suggest limits to the ability of citizens to spontaneously engage in discussion approximating Habermas' ideal speech situation (i.e. participants do not have equal chances to speak, some assertions cannot be introduced or questioned, participants may be subtly coerced, erroneous claims may remain unchallenged).

Barriers to communication can also be traced to discourse being blocked indirectly by powerful groups. Seasonal residents are presumed to value different aspects of life in the EOH than do locals, in particular a desire to preserve an idyllic recreation space.

Gus: the syndrome is that this cottage is the last one on the lake, its mine nobody else and they don't want to change and that's our tax base it really is....they don't want to change the landscape, they want to keep it as it is

Locals expressed the view that seasonal residents would be highly opposed to any wind turbine development, more so than locals and for this reason some felt any discussion of wind development should be avoided. This despite evidence that attitudes towards wind turbines are not statistically different for the two groups (Fast and McLeman 2012).

Systemically distorted communication

Trying to identify systemically distorted communication requires identifying instances of unconscious pursuit of strategic goals by participants. It is highly subjective. This exchange from the citizens' focus group is one possible example. Despite interest in the technical constraints of regional electricity distribution, participants could not pursue this deliberation and were forced to refer back to bureaucratic policy. Systematic distortion results because their discourse is limited to the rules of the policy (system logic) which "colonizes" any ability to reach other understandings.

Jason: How big a project Eric would it be then that you would not be able to use the regular lines?

Eric: I am not sure uh

Jason: because the electricity you know flows both ways

Reggie: I see it your way too I mean how much does this generate this little mill, a couple of little mills

Eric: What I do know is anything um above 10 KW becomes a FIT project and not a microFIT and a FIT now brings in a whole bunch of other requirements like this economic something test... and there is other, capacity allocation doesn't actually kick in until 500 KW so if you stay in the 10 to 500 you are ok in that regard but you do as soon as you exceed the 10 KW which is why most people sell 9.99 KW systems to make sure they are under the 10

Discussion

Insight into EOH renewable energy futures

What insight does this Habermasian analysis provide to the picture presented at the beginning of the paper of four different renewable energy opportunities in the EOH?

First, it suggests that any tendency for collaboration needs to overcome the tendency for governance officials and citizens to talk past each other. The officials' have a

preponderance for objective-world claims and fact based discussion of technical details and financing mechanisms while local citizens are more inclined to operate with social-

world claims including the degree to which renewable energy projects contribute to a

stronger community and involve their neighbours. It also suggests that of the four specific

actions to come out of the discussions (scoping study for a pellet plant, preliminary

negotiation of hydro-electric dam, preliminary negotiation for use of wood thinning, and

the renewable energy expo) it is the pellet plant and hydro dam actions that have the best

chance for long-term success since the reasons supporting the actions come from both

facts (quantity of biomass, layout and cost of dam) and norms (make pellets locally,

community buy-in creating a social network to prevent vandalism at the dam), but most

importantly are understood as valid by both locals and officials. Table-1 introduced earlier in the paper of the status of four different renewable energy planning examples can now be extended to include a prediction (table-4).

Table-4 – Current and predicted degree to which actors pursue renewable energy production

Renewable energy opportunity	Status in the EOH	Predicted future status
Household solar electricity	Increasing presence via individual ownership of micro-size projects	Unequal abilities to pursue incentive slows adoption and creates tensions
Wind farm	Unrealized	Remain unrealized
Biomass pellets	Traditional forms of use high, new forms use emerging	Traditional use will remain but adoption of new forms will not proceed without greater effort for local supply of wood resource
Small hydro	Unrealized	Formal scoping efforts will provide sustained interest

The wind farm opportunity is slightly different. It will remain unrealized because of power imbalances in the EOH. There will be no further attempts from officials to attract wind developers partly for fear of angering the seasonal resident “tax base”. The resulting discussion about wind turbines is a case of what Habermas terms *manipulation* because citizens strategically give more credence to certain opinions, not because of the force of a better argument, but because of the force of political power - in this case, financial dependence on seasonal residents. Distortions at the level of interpersonal communication can often be traced to distorting effect at the level of social and political-economic structures (Forester 1985).

There was a remarkable absence of environmental reasons in the discussions of citizens and local governance officials. At the state level, mitigating climate change and moving away from fossil fuels are at the core of justifications for the green energy policy and programs. These concerns, while expressed by some individuals do not appear to be publicly validated in the EOH. The Habermasian discourse analysis with its emphasis on looking for three different claims helped isolate this point. Without local social testing of the environmental reasons underpinning programmes like microFIT and the Green Schools programme, citizens appear to judge success or failure only on the merits of their technical features. For the microFIT this is about favourable financial rate of return to solar or hydro project owners. For the Green Schools programme it is whether or not wood pellets heat the school to the same level and for the same cost as does heating oil. This raises two tentative broad interpretations. First that the province's green energy policy is illegitimate; the rationales underpinning the policy do not pass Habermas' general discourse principle of being agreeable to all those concerned with an opportunity to discuss. However, if we consider that citizens and governance officials in the EOH overwhelmingly use the logic of the market and of the bureaucracy to negotiate renewable energy projects in their region, another interpretation is possible. The pseudo-rational logics of the market system and bureaucracy have diminished the terms of public reasoning over renewable energy. In Habermasian terms, there has been a colonization of the lifeworld and of the public sphere. While tentative, these two interpretations of "illegitimate policy" or "colonized policy" for renewable energy in rural Ontario likely

overlap and could be explored further with additional local case studies of deliberations and more focus on the public sphere represented by broadcasting media.

Deliberative or agonistic processes for renewable energy planning?

Deliberative processes are assumed to result in better environmental outcomes in much green political theory despite varied empirical support (Lövbrand and Khan 2010). To date analysis of renewable energy deliberations have suggested that deliberation in the strong Habermasian sense of actors finding consensus and changing behaviour as a result of the better argument is unrealistic and even impossible. Instead it is better to strive for agonistic processes which assume irreconcilable differences and the need for settlements (Barry and Ellis 2010, Ellis et al. 2007, Fisher and Brown 2009). On the other hand, there is a growing body of work analysing environmental discussions showing that actors change positions after deliberation (Ashworth et al. 2010, Hobson and Niemeyer 2011, Niemeyer 2011) moving towards a “meta-consensus” (Niemeyer 2011).

The EOH case generally supports this latter view. While it is important to note that there is not a current energy dispute in the region polarizing opinions, there are some deeply held differences in attitudes towards wind farms and hydro-electric dams which aggravate existing class and social faultlines (e.g., seasonal resident opposition and permanent resident interest) (Fast and McLeman 2012). However, these differences do not show signs of being irreconcilable in the way other renewable energy studies have concluded. Instead the emergence of new discourses during focus group discussion helped participants to identify four collective actions around energy. A movement towards a

collective action discourse was also seen in (Hobson and Niemeyer 2011) larger analysis of climate change adaptation options.

The relative absence of climate change discussion in this case also suggest a refinement may be needed in characterizing of renewable energy disputes as (among other things) an active conscious tension between global climate change benefits against a local cost (Barry et al. 2008, Ellis et al. 2007, Wolsink 2000). In the EOH case the tension is only there in principle, local actors have not included global environmental reasons in their reasons. Any agreement or disagreement over specific renewable energy projects is more about technical merits or absence/ presence of local benefit. Global climate change aspects were absent rather than actively deliberated and found lacking. This was not due to an insensitivity towards global events as the Fukushima nuclear plant disaster featured in pro-renewables arguments during group discussions (Fast and McLeman 2012) (see also (Truelove 2012) for discussion of the potential influence of Fukushima on North American energy source attitudes).

Instead of intrinsically irreconcilable differences, the EOH case suggests a capacity for collaboration that is threatened by larger social processes. There is demographic and political-economic change arising from amenity migration and powerful property-based organizations with strict interests in recreational land-use. A market system entrenched by the choice of the State to use financial incentive programs like microFIT shapes discussions towards a return-on-investment logic to the exclusion of environmental reasoning. As discussed below the mass media dominate public sphere expresses views and values

which do not reflect local discussions. All of these forces distort not only communicative rationality to use Habermas' term but also visions for "agonism." Indeed if the key feature of an agonistic approach is the notion that energy decisions and policy directions can be "*re-examined afresh, re-argued and renegotiated in the light of new circumstances, scientific evidence or normative claims*" (Ellis and Barry, 2010:35), then there is very little to distinguish it from communicative rationality.

The real challenge is designing planning processes that are sensitive to how communication is distorted and suggesting remedies. For example, in the EOH citizens faced a disadvantage in their inability to enter into extended fact based *theoretical* discourse. Discussion faltered around uncertainty of the operation of the electricity grid (e.g. what is the capacity of the wires? where is electricity produced actually used?). This type of distortion can be remedied. Others (Ashworth et al. 2010, Luskin et al. 2007a, Niemeyer 2011) have shown that day-long briefings are sufficient to arm citizens with enough technical information to deliberate complex technical topics. Improving the standing of participants like this is a better measure of public participation than counts of the number of people attending public meetings (Parkins and Mitchell 2005). This principle goes both ways; as technical experts become familiar with local cultural values and norms this extends their ability to enter into extended *practical discourse* and *aesthetique critique* aiding deliberation.

Contributions to Habermas' theory

Intersubjective understanding and formal pragmatics

There are only a few examples in the literature of an utterance by utterance analysis of actual communication using the truth, rightness and sincerity framework of validity claims. Forester's 12-line analysis of a city planning staff discussion (Forester 2003) is one while other examples rely solely on written text and not spoken utterances. Thus this study's application of the framework to hundreds of utterances over a total of 8 hours of discussion in 4 different meetings breaks new ground in an empirical direction that Habermas himself advocated for (1984: 139). Two contributions come out of this exercise:

(1) It is difficult to clearly isolate moments of shared understanding or what Habermas, following Austin, calls "successful speech acts". As an observer of communication during and after the group discussions it is impossible to see inside the perspective of participants to know if and what parts of an utterance are accepted as valid. Some, arguing from conceptual examples assert that it is impossible for two persons' understandings to match exactly and that this is a fatal flaw of Habermas theory (Thomassen 2010, Wright 2010). What this study finds is that it is straightforward to isolate understanding between participants, particularly when they express disagreement or agreement with others' utterances. Mutual understandings over an utterance are also observable when participants incorporate and/ or elaborate other speakers' points (e.g., "As Eric was saying..."). The more subtle and important observation is that understanding is a separate communicative step that may or may not proceed to agreement or disagreement between speakers.

(2) Habermas' formal pragmatics originally stated that listeners evaluate all three validity claims (truth, rightness, sincerity) simultaneously for every utterance. He has since modified this to say that one type of claim is prioritized while the others remain underemphasized but are still "redeemable" (Heath 2003). In the talk analyzed for this project, the latter understanding appears correct. Speakers' utterances were usually made and received in relation to one validity claim (e.g. truth) but sometimes listeners chose to pursue alternative interpretations (e.g., rightness or sincerity).

The public sphere

Habermas' theory puts strong emphasis on the public sphere but does little to locate the public sphere spatially (Howell 1993) or to detail the actual practices connecting it to democratic institutions. The EOH offers an example with which to work through his concepts.

Publicly acting organizations including the Denbigh ambulance committee, and cottage associations showed tendencies towards communicative action by considering opposing views and putting forth arguments that, in principle, could be challenged by any interested party. In other words, by being forced to justify their particular interests in a public arena, these groups adopt a position oriented towards coordination on the basis of shared reasons. This fits with Habermas' emphasis on the public sphere as the site for communicative testing and generating of public values to guide political decision (figure-1). Furthermore, Habermas sees the public sphere as "*an arena for the perception, identification and treatment of problems affecting the whole of society*" composed of

many public spheres which “cling to locales” but ultimately become abstracted from local context (1996: 359-362). One illustration of this process is the way the Denbigh Ambulance committee publicly argues against closure of their specific station by insisting on equal rights to emergency treatment regardless of location.

However there are also important limits to the ability of the local public sphere to generate public values accepted freely by all. Notably the public pressure of these groups acting in the public sphere was not due to the strength of rational arguments alone. These groups make strategic alliances and use flattery or coercion in presenting their public positions. For example, the Ambulance Network enrolled the support of citizens of a neighbouring County to raise the threat of authorities having to pay for more costly trans-boundary ambulance calls if the Denbigh base was closed. These more strategic measures are considered appropriate ways to reach decision makers and few in the EOH would rely only on reasoned critique of policy decisions as suggested by an ideal-type public sphere.

A second barrier to public sphere interventions in specific political questions is a lack of participants. The existing strong public sphere organizations in EOH are interest-based groups that do not consider energy issues and would require a change in mandate and purpose to do so which is unlikely to happen. While there is an energy group established by one of the county governments it has the problem of very little citizen involvement as its four citizen members are energy professionals, it includes no locals born and raised in the region and it performs little outreach activities. It is what Habermas (1996: 375) calls a “mere user” of the public sphere and not an “indigenous” actor.

Thus there are several implications for a Habermasian vision of the public sphere. First, a tendency for the public sphere to deflect and re-orient particular interests towards communicatively agreed positions is confirmed. But this is only part of the story. Strategic action also plays an important role and communication does not approximate ideal conditions. Second, sustained public deliberation over a specific topic (in this case renewable energy) requires committed citizens and the existence of sympathetic organizations connected to a wider public. These are not pre-existing. While others have pointed out that discussing topics in the public sphere serves to clarify and constitute social groups (Calhoun 1992, Fraser 1992), a corollary is that once constituted, social groups active in the public sphere retain specific interests to the exclusion of other topics. In the example from this study, the more general province-level discussion of green energy that takes place in provincial media (highlighted in section 2.2) may be offsetting vigorous local debate. In interviews, the local newspaper editor suggested that province-wide narratives spread of “waste-of-money / irresponsible government” dominate local municipal politician discussions. These kinds of concerns were low on the list of items discussed by citizens sampled in this project raising a final point, and one stressed in Habermas original public sphere work (Habermas 1989). A modern mass-media dominated public sphere runs the danger of “re-feudalizing” public opinion to the point that the ostensibly public values transmitted to decision makers are ones that that local publics have been unable to criticize or influence.

The use of communicative action theory in renewable energy studies

Overall, the value of a Habermasian approach to analyzing specific renewable energy developments is as a diagnostic focussed on the social process of understanding problems and constructing solutions (Forester 1989, Forester 2003). This study does not pretend that the ideal speech situation could ever exist in the EOH but takes seriously Habermas' simple (and often misunderstood) point that for language to mean anything to users, users must communicate as though it could exist and this endows communication with a rational (e.g., problem solving) potential. Habermas' theory of language use provides tools to interpret how arguments are presented and responded to by officials and citizens. By holding up communicative action and the public sphere as templates, the study was able to identify deviations from the ideal and hypothesize on the forces that prevent communicative action and constrain deliberation over renewable energy. The contributions of Habermasian concepts of communicative action and communicative rationality are much more empirically based and revealing of factors that distort social coordination than critics Flyjberg (1998) and Tewdr-Jones and Allmendinger (1998) give credit for.

Within the context of a "discursive turn" in renewable energy studies, Habermas' theory remains highly relevant. The dominant approach is tending towards q-methodology to analyze shared beliefs of citizens around energy issues (Brannstrom et al 2008, Fisher and Brown 2009) but a Habermasian account can provides a more realistic (if less statistically rigorous) picture. By observing the public testing of arguments the analyst is more closely attuned to the social construction of values than if the analyst focuses solely on the

correlation between individual's private responses to a set of statements. Finally, the thorough and critical view of society posed by Habermas offers important concepts and ways to think about the role and the practice of policy and planning in a democracy.

Conclusion

This paper has presented a Habermasian analysis of the response in citizens of the Eastern Ontario Highlands to planning efforts for renewable energy. It has shown how an investigation of utterances, communicative action, discourse and the public sphere can arrive at some tentative predictions for the future of specific renewable energy developments in the region. Unrecognized by governance officials, there are normative claims around solar electricity from citizen concerns about unequal access to incentive programs. The biomass project suffers from a lack of attention to desire for use of local biomass and may fail. Wind-turbine projects will also fail not because the technology has been extensively argued but because unchecked credence is given to a perceived position of the powerful seasonal resident population. There is some chance of success for small hydro projects. All of the renewable energy projects lack the legitimacy assumed by the state of being understood by locals as environmentally beneficial, instead other reasons dominated discussion including costs, local production and the rules of the incentive program.

Working through an analysis of utterances and discourses in this way also contributed to the theory of communicative action. Understanding between actors along the three dimensions of facts, norms and sincerity is at the crux of Habermas' theory but there have

been little empirical attempts to gauge this process. This study successfully operationalized the fact / norm / sincerity framework to identify moments of understanding along each dimension between individuals in group discussions. Moments of discourse whereby individuals and organizations argue in universal and public terms could also be isolated. These findings provide some support for Habermas' notion of a communicative rationality and a public sphere active in society. However, there was also much evidence of barriers to ideal-type communication.

Acknowledgements

I would like to thank above all the citizens and officials of Addington Highlands and North Frontenac who participated in group discussions. Two anonymous reviewers provided incisive comments. Dr. José Lopez, Dr. Jamil Khan, and Dr. Robert McLeman provided valuable feedback on early drafts of this manuscript. Funding came from the Social Sciences and Humanities Research Council of Canada.

Chapter 5 - Biofuels: From a win-win solution to a wicked problem?

Co –authors and contribution: Kes McCormick, assistant professor at the International Institute for Industrial Environmental Economics at Lund University in Sweden co-authored this paper, and his contribution was approximately 20%. We worked together from January to May 2012 while I was a visiting researcher at the Institute. I contributed the original idea for the paper and prepared the first-draft. Dr. McCormick revised several sections notably the discussion of evidence for wicked problem characteristic #2 and #3. I was responsible for submitting the article and responding to reviewer comments.

Publication details: This article is published as Fast S and K McCormick (2012) Biofuels: From a win-win solution to a wicked problem? *Biofuels* 3 (6) 737-748

Contribution to overall thesis: steps back from the EOH case study and, using some of the concepts concerning deliberation and governance developed in previous chapters, explores a specific form of alternative energy - liquid biofuels. Titled *Biofuels: from win-win to wicked?* and published in the journal *Biofuels*. It introduces a classic concept in planning studies of “wicked problems” and applies the 10 characteristics of wicked problems as a heuristic to the experiences of biofuels in North America and Europe. The audience for this article is biofuel planners and the article makes a number of recommendations including several focused on deliberation and collaborative-planning

which have Habermasian origins and stress points that were of importance in the EOH energy discussions. It contributes to answering research question #4.

The link between the EOH case study and this chapter is that the local renewable energy deliberations described in previous chapters offers a microcosm to explore one of the key recommendations of the wicked-problem planning literature; that deliberative processes are required to provide lay public peer-review of technical solutions and reorient potential solutions along publicly agreed upon social values. This paper explores i) why social acceptance of renewable energy (biofuels) is a wicked problem; and ii) why deliberative and “post-normal” approaches have come to be favoured for wicked problems. The potential and shortcomings of relying on deliberative settings are explored elsewhere in the thesis (chapter 4 and in the conclusion chapter).

Abstract: Current and recent struggles encountered in the development of the transport biofuels sector indicate a significant change in the perception of biofuels. Instead of a win-win solution, transport biofuels have become a major planning challenge. In fact, biofuels can be labeled a wicked problem. The planning studies literature offers some tools to interpret this change and guide future actions. First, by assessing recent experiences of biofuels in the EU and US against the ten characteristics of wicked problems we find biofuels “fit” the profile of such issues. Second, we observe that differentiated strategies will suit the different challenges facing biofuels development. We argue that without recognition and engagement of multiple perspectives on transport biofuels they will

remain a wicked problem and we therefore advocate for strengthened approaches to communication and engagement.

Key Terms:

Wicked problem: Public policy problems for which no agreed-upon solution is identifiable can be called “wicked”. Pursuing solutions is more of a political than a technical exercise. Examples of wicked problems include climate change and sustainability.

Tame problem: Widely agreed upon problems for which the most efficient solution can be identified and pursued can be labeled as “tame”. Problems of natural sciences and engineering often fall into this category, for example, choosing methods of treating wastewater. Some social and public policy problems are also tame, for example, installing sewer lines. Pursuing solutions is more of a technical than a political exercise.

Post-normal science: This refers to methods of inquiry for phenomena which are uncertain and contingent on many possible perspectives. Conventional science – traditionally seen as a problem solving exercise whereby repeatable experimental results progress to theory and provide an adequate base from which to make public policy decisions – is insufficient to deal with problems of complex natural and social systems. Post-normal science envisions a peer review role for non-scientists and favours dialogue over proofs.

Win-win solution: This idiomatic phrase indicates that a solution can contribute to solving more than a single problem. Thus biofuels can contribute to mitigating climate change (a “win”), developing the agricultural economy (a “win”), and improving energy security (a “win”).

Introduction

In the early 2000s, biofuels for transport were promoted as a sustainable alternative to fossil fuels to reduce greenhouse gas (GHG) emissions, break dependence on oil and thereby improve energy security, and create jobs and opportunities for the agricultural sector. In this way biofuels were said to meet multiple goals and provide a “win-win solution”. However, over the past decade concerns about the production of biofuels have increasingly been voiced with a particular focus on impacts on food production and land use change as well as debates on energy balances and GHG emissions (Govinda and Shrestha 2011, Rohracher 2010). The international biofuels debate is now characterized by a spectrum of positions; at one end are optimistic proponents who continue to argue that biofuels can further be expanded in a sustainable way (World Bioenergy Association 2009) and at the other end those that call for an immediate stop to the production and utilization of biofuels (Greenpeace 2010) with a variety of distinguishable positions in between (Landerweerd, Osseweijer and Kinderlerer 2009, Senger et al. 2010, Upham, Tomei and Dendler 2011).

How can one explain the shift that biofuels have undergone? And what does this mean for the biofuels sector? Our efforts to try and understand have taken us to the concept of a “wicked problem” put forward by Rittel and Webber (1973) in 1973 to describe the challenge of planning solutions to societal problems. They argued there is a distinction between issues that are relatively straightforward to define, to design solutions for, and to evaluate – which can be called a “tame problem” – versus those that are ambiguous,

value-laden and uncertain. They provide the example of installing running water and sewage systems to homes and argue that this is easier than solving problems of crime or poverty. The term wicked problem has since been applied to many issues including deforestation, climate change, and environmental health risks (Batie 2008, Kreuter et al. 2004, Ludwig 2001) as well as other more positive concepts such as sustainability (Frame 2008). In this paper we turn to the wicked problem framework as a heuristic to help analyze if biofuels occupy a new contested, controversial, wicked position and if so, what can be done about it.

We start our analysis by introducing the ten characteristics of wicked problems as defined by Rittel and Weber (1973). Next we map current knowledge and debates around biofuels against these characteristics to support the argument that biofuels have moved from a win-win solution to a wicked problem. This is based on experiences with biofuels from Europe and North America. Finally, we draw on the planning literature and that of other disciplines which have applied the wicked problem framework to provide a new perspective on biofuels. We suggest there is particular value in the notion of “post-normal science” which embraces a role for politics and dialogue in the practice of science (Batie 2008, Funtowicz and Ravetz 1993, Ravetz 2006). Overall, this paper concludes that transport biofuels have moved markedly from a win-win solution to a wicked problem, which means the biofuels community needs to adopt new approaches to communication and planning that emphasize dialogue amongst diverse perspectives.

Background

Rittel and Weber (Rittel and Webber 1973) originally outlined ten features of wicked problems. Subsequent authors have adapted these, each emphasizing different aspects (Batie 2008, Frame 2008, Kreuter et al. 2004). In this paper we include the original ten characteristics (see Table 1). It is helpful to think of tame problems as those amenable to the scientific or engineering method, for example, pinpointing the location of food contamination, designing a more fuel-efficient vehicle or correlating a rise in atmospheric gases with global temperature change. These may be very complicated problems to solve but can be made tractable through normal scientific methods of hypothesis testing, observation and experimentation. Wicked problems, on the other hand, are “messy” (LaChapelle, McCool and Patterson 2003) , characterized by uncertainty, value judgments and disagreements over allowable evidence.

Table 1 – Differences between “tame” and “wicked” problems

Characteristic	“Tame” problem	“Wicked” problem
No clear formulation of the problem	Problem singular and easy to describe. Formulation of problem suggests solution.	Multi-faceted problem, in reality a multiplicity of problems. The process of imagining the problem is critical.
Stopping rule	Planners and policy makers stop when problem is solved.	Planners and policy makers stop when time, money or patience run out.
Type of solution	Unambiguous, can be independently said to be true or false.	Ambiguous, more subjective judgments of “good” or “bad”.
Assessing solution	Impact of solution can be assessed immediately.	Impacts measured over a long time scale, repercussions hard to measure.

Consequences of imperfect solutions	Consequences do not alter the problem.	Consequences change the problem, require new problem formulation.
All solutions cannot be considered	A finite list of alternatives exists.	New alternative solutions appear constantly. Choice of solution is a judgment.
Transferability of solutions	Fall into classes of problems for which methods of analysis and potential solutions exist.	May share some features with other problems but essentially unique.
Symptomatic of other problems	Can be treated in isolation.	Frequently connected to “higher” problems.
World-view determines explanations of discrepancies	When results of action are unclear the rules for explaining discrepancies are bounded.	Determination of an effect from actions can be disputed using arguments outside of scientific discourse.
Judging actions	Unforeseen consequences of actions treated as valid data for new hypothesis testing.	Consequences of actions “matter” to the public and are judged by citizens and powerful stakeholder groups.

Source: adapted from (Rittel and Webber 1973)

Analysis

Biofuels in this discussion refer to the conversion of plant biomass to a liquid fuel used in transportation. This includes 1st generation biofuels derived from the starch, sugar or oil content of agricultural grain and root crops including corn, wheat, sugarbeet, and sugarcane converted to ethanol through fermentation, and oilseeds such as rapeseed or soybeans converted through esterification to biodiesel. It also includes future generation transport biofuels not currently produced on a commercial scale derived from the lignin (wood) and cellulose content of plants (e.g. non-food leaves and stalks), and potentially biofuels from algae.

A careful delineation between liquid transport biofuels and other forms of bioenergy is important to avoid attributing features of one type of biomass production chain to all biofuels. For example, biodiesel derived from rapeseed involves different supply chains, sectors and legal frameworks as does wood chips from forests used in district heating or biogas from municipal waste. The bioenergy sector includes an array of different feedstocks, supply chains and different final energy uses which complicates understanding and communication around biofuels (McCormick 2010, Rohracher 2010). Defining the object at the heart of a problem is a key step in the planning process (Rittel and Webber 1973) and wicked problems resist even this fundamental step. This initial characteristic of the wicked problem formulation is where we begin the analysis.

#1 No clear formulation of the problem

From the outset the objective of biofuels support programs from governments in Europe and North America have been towards multiple goals. Three main objectives are frequently cited in government rationales; mitigating climate change, improving energy security and promoting rural development (Canada Gazette 2006, Environmental Protection Agency 2009, European Commission 2009, Food and Agricultural Organization 2007). The construction of biofuels as a win-win proposition for this variety of problems is understandable given the political need for governments to appeal to broad constituencies. However, the breadth of such policy unavoidably forgoes an in-depth treatment of particular issues. The original problem has been poorly defined in the sense that biofuels have been presented as a solution to multiple complex challenges. While

biofuels can provide many benefits, they are in no way an overall solution to these societal challenges.

As biofuels production has expanded, biofuels themselves have taken on the dimension of a problem. There has been a shift in stakeholder views of biofuels as a win-win solution to an issue demanding careful management and even calls for a complete “stop” until strong sustainability safeguards are enacted. This change has occurred in the media (Senger et al. 2010), among formerly supportive civil society organizations (Earley and McKeown 2009, World-wide Fund for Nature 2012), in the academic literature especially that of the natural and environmental sciences (Fargione et al. 2008, Hill et al. 2006, Searchinger et al. 2008, Tilman et al. 2009) and in government appointed reviews (Renewable Fuels Agency 2008). The way in which biofuels shifted towards a planning and governance problem has been documented and analyzed by many authors and organizations (Bailis and Baka 2011, Florin and Bunting 2009, Govinda and Shrestha 2011, Howarth et al. 2009, Landerweerd et al. 2009, Levidow, Papaioannou and Birch forthcoming, Rohrer 2010, Schouten and Glasbergen 2011, Senger et al. 2010). The shift from solution to problem is emblematic of the foremost challenge that Rittel and Webber (Rittel and Webber 1973) describe for wicked problems. Essentially, when it comes to biofuels there is no universally agreed upon problem formulation, and no objective way to distinguish symptom from cause.

#2 No stopping rule

There is no final solution to wicked problems, no point at which the matter is settled. We suggest the experience of North American and European regulators dealing with calculations of GHG emissions from indirect land use change (ILUC) exemplifies this characteristic. The ILUC concept attempts to quantify the changes in land use and resulting loss of stored carbon that could occur with relocation of agricultural production to forest or grassland for biofuels. This goes beyond trying to account for direct conversion of previously uncultivated land to crops for biofuels production and refers to attempts to allocate indirect emissions resulting from predicted overall expansion of cultivated area around the globe. In the Energy Independence and Security Act the US Congress specifically mandated the Environmental Protection Agency (EPA) to include consideration of indirect GHG emissions during rule-making. Upon completion of the Renewable Fuel Standard 2 (RFS2), the EPA indicated that, while it was required by law to reach a decision on ILUC in the RFS2 regulation, the solution to the ILUC question was incomplete. *“As scientific knowledge continues to evolve in this area, the life cycle assessments for a variety of pathways will continue to be enhanced...This new assessment could lead to new determinations of threshold compliance compared to those included in this rule”* (Environmental Protection Agency 2010: 6). Rittel and Weber (Rittel and Webber 1973) suggest that wicked problems stop because of considerations outside the problem, rather than final solutions. In the case of RFS2 the rule had to be promulgated because planners ran out of time, not because a definitive answer was reached on ILUC effects.

The European experience is similar. The Renewable Energy Directive (RED), which sets out biofuels targets, gave the European Commission (EC) a deadline to review the ILUC issue and make recommendations. In late 2010, the EC issued its review which did little more than announce further study (Palmer 2011, European Commission 2010b). New modelling studies now completed have extended earlier findings (European Commission 2011, Laborde 2011) and, in doing so, identify a new focus: *“the real challenge is to promote better land use practices for agriculture widely”* (Debusquet 2011: p 51). It remains to be seen how the EC will incorporate these recent studies into biofuels policy, particularly the RED, and if there is patience and political will to extend towards new focus areas. Again there is no stopping rule. In the end, the EC efforts to quantify ILUC effects have been a prolonged affair with little sign of a definitive answer.

#3 Type of solution is ambiguous

Wicked problems do not have definitive solutions; instead solutions are ambiguous and are considered good or bad, not true or false. This aspect of the biofuels situation has changed over time. In the early 2000s biofuels were widely considered a win-win solution with little ambiguity. Indeed there was no need for solutions. Biofuels replaced fossil fuels and this was seen as an ample and sufficient reason for support. However, as concerns have mounted, various solutions have been proposed. Requirements for proof of minimal GHG savings were introduced into later versions of the US Renewable Fuel Standard and the EC Renewable Energy Directive. The EC also introduced “sustainability criteria” to avoid cultivation of biofuels on high conservation value land and set in legislation

requirements to monitor impacts of biofuels on food security and land use rights (European Commission 2009).

Where there was once clarity now there is ambiguity regarding the best ways to develop biofuels. There is no one best solution, only different options. Which is better, the US rules that require biofuels to reduce GHG emissions by 20% or those of the EU which require 35% reduction but do not allocate an indirect land use emissions penalty? There is no definitive answer. It depends on who is doing the judging. Given the wide difference between actors such as Greenpeace, who judge biofuels worse than the fossil fuels they were designed to replace (Greenpeace 2010), and bioenergy industry associations like the World Bioenergy Association who envision biofuels meeting global energy demands (World Bioenergy Association 2009), solutions will remain contested and ambiguous. We can expect intensified debate as the production and trade of biofuels continue to expand.

#4 Time required to assess solution extends indefinitely

Tame problems have solutions that can be assessed on the spot, while wicked problems require longer time periods to assess the effectiveness of solutions. As suggested, the issue of ILUC suggests that biofuels have shifted markedly to the wicked side of this characteristic. The ILUC concept attempts to account for the loss of stored carbon anticipated from the increased demand to farm more feedstock to produce biofuels (Fargione et al. 2008, Searchinger et al. 2008). This can only be assessed by predictive modelling which in turn requires regular monitoring to assess if land use has changed as predicted. Furthermore as Rittel and Weber (Rittel and Webber 1973) suggest, as the time

horizon for assessment expands, the scope of consequences to be assessed also expands. One logical response to the incorporation of ILUC in biofuels assessments is to expand the boundary of petroleum assessments as well. A provocative suggestion has been to include even the indirect military GHG emissions produced to secure oil supplies (Liska and Perrin 2009). In theory, an unlimited amount of time is needed to fully assess indirect GHG emissions.

Assessing biofuels is further complicated by the ever-evolving nature of the industry. Take for example the new considerations that will be part of any scaling up of algae biofuels technology. Early predictions are that water management issues will be central and include some novel challenges such as monitoring municipal wastewater streams for algae pathogens (Mata, Martins and Caetano 2010, United States Department of Energy 2010). The arrangement and lay-out of algae production infrastructure is not yet known but questions are being raised about public support and local community acceptance of production sites (United States Department of Energy 2010). With the wide array of feedstocks and technological pathways possible for biofuels there will be an ongoing need for assessment on an increasingly wider set of considerations.

#5 Consequences of imperfect solution

Attempts to solve wicked problems change the nature of the problem, they leave “traces” and new problems appear. Again the biofuels example shares this feature. As biofuels production has expanded to solve one environmental problem of reducing GHG emissions from transport fuels, several new problems have begun to appear. Initially these remained

more or less contained within predictable parameters, for instance there were complaints from EU Member States that GHG reductions through biofuels use were marginal and unsuitable costly methods to combat climate change leading to gaps in Member States implementation of EU biofuels targets (Di Lucia and Nilsson 2007). However, further problems emerged: we learned that the replacement of gasoline with E85 (85% ethanol, 15% petrol) is anticipated to increase ozone emissions leading to a rise in ozone related hospitalizations and mortality in the US (Jacobson 2007); that production of biodiesel from palm oil is likely to exacerbate loss of biodiversity as palm oil agriculture is known to replace forests and decrease biodiversity (Koh and Wilcove 2008); and that biofuels contributed to the spike in grain prices during the 2008 food crisis. Although it should be stressed that there is no consensus on the last point; according to a recent review of twelve analyses biofuels may have accounted anywhere from a relatively modest impact of 4% to a much more significant 75% of the rise in corn, wheat and rice prices (Govinda and Shrestha 2010).

Thus, while biofuels appeared to be a solution to the problem of GHG emissions, the solution is short-lived. As new issues emerge they complicate efforts. Any one of the issues mentioned above changes the context of planning efforts for biofuels and introduces new problems which require new solutions. To take one example, partly in response to concerns with deforestation associated with palm oil, the EC designed specific sustainability criteria for biofuels producers (European Commission 2009, European Commission 2010a). To ease reporting requirements, officials accredited seven different

certification schemes (European Commission 2010a). The area of sustainability criteria and international trade is particularly problematic for biofuels as the schemes applied to biofuels producers need to also ensure that the administrative burden and economic costs do not become a barrier to the production and trade of biofuels (Pacini and Assuncao 2011). At the same time, there are also some people and organisations that simply do not believe such sustainability schemes can work, and so they do not see a future for any biofuels (Friends of the Earth Europe 2011, Upham et al. 2011).

#6 All solutions cannot be considered

When problems are wicked they can have any number of solutions. There is no list of alternatives that planners can rely on to be sure all solutions have been assessed or attempted. We argue that the significant literature distinguishing between “good” and “bad” biofuels (Earley and McKeown 2009, McCormick 2010, The Royal Society 2008, Tilman et al. 2009) are evidence of this characteristic. Prescriptions to avoid problematic side effects vary, some observers emphasize a need for less intensive agricultural practices to grow feedstock (Earley and McKeown 2009), others push for the integration of biofuels with broader policies for transport including high efficiency vehicles (Earley and McKeown 2009, The Royal Society 2008), a few emphasize nurturing public perception of biofuels and promoting “bio-literacy” (McCormick 2010), and many favour accelerated development of cellulosic technology to make biofuels from residues (Earley and McKeown 2009, The Royal Society 2008, Renewable Fuels Agency 2008).

These solutions are all plausible and no single one will objectively ensure “good” biofuels and prevent the development of “bad” biofuels. They are all permissible. The wicked aspect is that planners have no finite list of solutions. If the solution fails, is it because of a failure in implementation or because of a failure to identify the appropriate alternative solutions in the first place? As Rittel and Webber (Rittel and Webber 1973) note “anything goes” and it is more a matter of trust and credibility between actors as to what solutions to attempt, and if the attempted remedies help to resolve problems, make them worse or fall somewhere in between these positions

#7 Transferability of solutions

Wicked problems are distinguished from tame ones by their uniqueness. They do not fall into a class of problems for which lessons on previous solutions can be easily transferred. Biofuels conceivably fall into three increasingly narrow categories, including: energy; renewable energy; and bioenergy. If this wicked characteristic is true for biofuels we should not be able to identify any unique feature of overriding importance for biofuels within these classes. From the broad perspective of energy, biofuels are distinct from other energy carriers like fossil fuels because of their origin in renewable biomass. This is a crucial and unique feature of biofuels.

If we move to the narrower classification of renewable energy, biofuels share a renewable resource quality with other sources such as wind, solar and water, but these sources can only be used to power vehicles if first converted to electricity or used to create hydrogen. Again this is a feature of overriding importance as biofuels can be stored and used when

needed and they are compatible with the vast majority of vehicles in use today with internal combustion engines (Agarwal 2007). Finally, for the narrowest classification, biofuels share many features with other forms of energy based on biomass but their origin in agricultural crops is a distinct difference. This is viewed by some observers (The Royal Society 2008, Tilman et al. 2009) as a feature of “bad” biofuels. If future generation biofuels from straw and wood become commercialized, then the similarities between biofuels and biomass used for heat and electricity production will become closer. Until that point, biofuels remain unique, and therefore wicked.

#8 Symptoms of other problems

Rittel and Weber (Rittel and Webber 1973) suggest there is no natural level to a wicked problem. They can always be formulated as a symptom or a solution to another problem. Biofuels are connected to other problems by their origin as an “ill-defined” solution. As pointed out previously, biofuels are an attempt to mitigate climate change, improve energy security and contribute to rural economic development and as such are symptomatic of these problems. Yet the debates over biofuels suggest additional connections to further high level problems including land use competition, energy and chemical intensive agriculture (Hill et al. 2006) and a distrust of the public towards promises of technological fixes (Landerweerd et al. 2009).

Recent developments by the EU to rely on sustainability certification standards (European Commission 2012) designed by non-state actors have been described as emblematic of broad shifts in environmental governance. In this context, biofuels connect to very deep

challenges of democratic arrangements and the accountability of novel rule-setting bodies (Bailis and Baka 2011). Thus from a variety of angles, biofuels appear connected to a wide array of problems and they can be approached from any one of these positions. No entry point is definitively correct and the way forward depends on which problem is prioritized, and therefore political questions of who is doing the prioritizing are very important.

#9 World-views of discrepancies

When problems are wicked, the types of knowledge used to explain discrepancies between intended and actual outcomes expand beyond scientific discourse. Hypotheses are defended using explanations that conform more to worldviews than to strictly empirical interpretations. This feature is most clearly present in dire criticisms that biofuels caused the 2008 food crisis. These claims were made with much rhetoric despite mixed evidence (Earley and McKeown 2009, Govinda and Shrestha 2010, Upham et al. 2011). A more subtle example of how biofuels judgments rely on values as much as – if not more than – strictly empirical facts, can be found in the following example. A high-profile group of scientists wrote in *Science* in 2009 without irony: *“The recent biofuels policy dialogue in the United States is troubling. It has become increasingly polarized, and political influence seems to be trumping science. The best available science, continually updated, should be used to evaluate the extent to which various biofuels achieve their multiple objectives and policy should reward achievement....those who have invested in first-generation biofuels should have a viable path forward.”* (Tilman et al. 2009)

The last statement is entirely normative and based on (culturally-contingent, subjective) views that it is only fair to allow early investors to recoup their investment. While this position may have wide support it has to be recognized for what it is in reality. A position based on norms and moral values not an argument arrived at using the scientific method. Several recent studies have explored how the world-views of key actors influence judgments of biofuels. Senger *et. al.* (2010) measure trends in media discourses and Hansen (Hansen 2012) links different biofuels discourses to disciplinary differences between biochemical scientists and life cycle assessment scientists. It is very important that the biofuels community remains alert to these issues.

#10 How actions are judged

Failed attempts to solve tame problems are treated as hypotheses which generate valid data for future attempts. Few actors outside of the problem solvers themselves are aware of failed attempts. For wicked problems there is no such “immunity”. Biofuels fall into the latter category as the consequences of efforts to develop biofuels “matter” to a wider audience and thus challenge the role of biofuel experts as the only appropriate arbiters of successful or unsuccessful actions. When *Rolling Stone* magazine called ethanol “*a scam*” and “*one of America’s biggest boondoggles*” in 2007 (Goodell 2007) it both created and confirmed a wider audience for biofuels developments. Today, it is not uncommon for national media to ascribe the real motivation for US biofuels policies as the pandering of presidential candidates to the first-in-the-nation voters from corn rich Iowa (Oppel 2011).

A different example – and one that is less driven by the need for eye-catching headlines – may be the raising of biofuels to the status of an ethical issue. In the EU, the Nuffield Council on Bioethics proposed six moral values to guide biofuels development, including human rights and solidarity and the common good (Nuffield Council on Bioethics 2011). The attention from the Nuffield Council on Bioethics on biofuels shows that the sector is not just being scrutinized from environmental and socio-economic perspectives but also from an ethical viewpoint. When the consequences of biofuels are judged by core ethical values it is a good indication that efforts to develop biofuels are attracting a very wide audience.

Discussion

We have presented arguments that the biofuels case exhibits all of the wicked problem characteristics. We recognize that it is difficult to disentangle where biofuels end as a solution to other major problems such as climate change and where they start to take on the characteristics of their own unique problem. We suggest that the range of side effects incurred during biofuels development makes it correct to consider them as a unique problem. As we have shown, their side effects include not only unforeseen indirect GHG emissions, but also questions of health effects, impacts on international grain markets and food security, habitat loss, and ethical concerns over small landholder rights. In other words they are not only connected to one single higher problem or one single lower problem. Furthermore, Rittel and Webber (Rittel and Webber 1973) tell us that this very characteristic of confusion between a solution and a problem, between a symptom and a

cause is a key characteristic of a wicked problems, and connections to other higher and lower order problems is another feature. Therefore we propose that there is enough affinity between the ten characteristics and the biofuels case that it could be instructive to start to look more deeply at lessons already learned for planning for other types of wicked problems.

Planning is a broad term and the term “planners” encapsulates a wide range of future-oriented actors including project managers, both corporate and public, policy analysts working for governments or civil society groups, and regional, state and federal level government agency planners and in Europe, the EU and its various bodies (Forester 1989). In the biofuels case we consider planners as those working in government, industry, and civil society engaged in designing regulation and incentive schemes but also those making business decisions on production facilities and choosing directions for research and innovation. All of these are future-oriented actors planning around biofuels. There are obvious differences in the roles of such individuals and the aspect of biofuels development that they deal with, but they are all affected by biofuels turning towards a wicked problem. Consider for example, biofuels producers entering into negotiation with NGOs and farmers under schemes such as the Roundtable on Sustainable Biofuels (Roundtable for Sustainable Biofuels 2010). Such an activity would not have been anticipated five or ten years ago.

In reaching the status of a wicked problem biofuels are at a point whereby political questions of “what ought to be” are more important than scientific questions of “what is”.

The policy studies literature provides some tools for understanding how to approach this type of situation. Most important is to use differentiated strategies for different parts of the problem. When the means for obtaining a solution are clear and the goal known then conventional scientific procedures are appropriate to follow. For example, further studies of ozone emissions from burning E85 (85% ethanol, 15% petrol) fuel have refined earlier findings (Jacobson 2007) and suggest that the health effects of emissions are greatest at colder temperatures (Ginnebaugh, Liang and Jacobson 2010). Through a traditional scientific process, planners now have some information to consider a set of options for this sub-problem, for example implementing seasonal or cold region rules for E85 use. This situation of broad agreement on the goal to be reached and on the processes to reach that goal corresponds to the upper left-hand box of the matrix developed by Christensen (1985) (see Figure 1), which suggests a planning strategy of “programming” or what Funtowicz and Ravetz (1993) call “applied science”.

Figure 1 – Strategies for planning problems

		Goal (ends)	
		Agreed	Not agreed (post-normal science conditions)
Process to reach goal (means)	Known	<u>Programming</u> Compare options and optimize solution.	<u>Bargaining</u> Identify and accommodate multiple interests. Extended peer review.
	Unknown	<u>Experimentation</u> Trial and error. Build database of options.	<u>Chaos</u> Discover or create order. Look to different knowledge types.

Source: adapted from (Christensen 1985)

Other aspects of the biofuels problem have an agreed upon goal but unknown means to get there, which is depicted in the lower left-hand box of the matrix. These are more amenable to experimentation strategies. For example, many agree that biofuels should reduce GHG emissions compared to conventional fuel options; there is even agreement that Life Cycle Analysis (LCA) is the appropriate method to make measurements (Environmental Protection Agency 2010, European Commission 2009, Nuffield Council on Bioethics 2011). However, there is disagreement over methodology, over how best to calculate indirect land use emissions (Nuffield Council on Bioethics 2011, Palmer 2011) and the best way to attribute agricultural emissions (Fast, Brklachich and Saner 2011). A relevant strategy in this case is to facilitate sharing of methods and LCA calculation factors, which is done by the National Renewable Energy Laboratory in the US through the sharing and publication of the Greenhouse Gases, Regulated Emissions, and Energy Use in Transportation (GREET) model developed at the Argonne National Laboratory (Wang, Wu and Elgowainy 2007). This GREET model builds a database of information that can validate other models and contribute to more robust and trusted LCA outputs. We would also place support for research and testing oriented towards technical and yield advances in algae and other advanced biofuels in this quadrant. However, we suggest that even if advanced biofuels become technically feasible, planners should avoid automatically instituting production incentives or setting mandates without involving a broader public. The social feasibility of advanced biofuels is no longer automatic; implementation of future generation biofuels is firmly within the right-hand side of the matrix where goals are not agreed upon.

The right-hand side of the matrix is the realm of politics and where wicked problems and post-normal science meet or perhaps collide. The post-normal science concept developed in the early 1990s (Funtowicz and Ravetz 1993, Turpenny, Jones and Lorenzi 2011) embraces a role for politics in science and it is therefore a useful, if somewhat “fuzzy”, source of ideas for ways forward. Its emphasis is on dialogue over proof, where evidence derived from common-sense knowledge is equally required to properly inform decisions about political problems. Scientific material is not to be treated as incontrovertible fact, it has a context (e.g. it may or may not be applicable to the question at hand, or it may rest on uncertain assumptions) which is open to critique (Batie 2008, Ravetz 2006). A central goal of post-normal science is to extend the peer review role to non-scientists and by doing so insert a quality check on scientific findings. It is said that only by enrolling cultural and moral knowledge can evidence of a high enough quality to address wicked problems be found. In contrast to normal science, the emphasis is more on establishing relevant information for uncertain situations than on falsifying hypotheses (Turpenny et al. 2011). Post normal science is quite an abstract concept and its application is usually expressed in ideas of expanding citizen participation in defining policy directions and research goals (Turpenny et al. 2011) often under the umbrella of activities such as alternative future scenario workshops (Frame 2008, Frame and Brown 2008).

The notion that scientific findings can be trumped by political process or social values is, of course, well-known and considered appropriate in many contexts. The upper right-hand box of the matrix corresponds to common planning dilemmas, for example when city

planners face conflicting goals such as conserving green space or zoning land for residential development. There are often agreed upon mechanisms to achieve each goal but disagreement on which goal to follow. Bargaining between interest groups or between competing planners is then used to select the goal. This process is susceptible to co-option by powerful interests (Flyjberg 1998) and efforts should be taken to recognize the voice of the less powerful (Forester 1989, Forester 1999). The concepts of collaborative planning (Healey 1997) and deliberation between a full range of stakeholders are important here (Fischer 1993, Sherman and Peterson 2009). Some suggest legitimacy can only be achieved when planners give up their decision-making power, by-pass interest groups and participate with citizens to define and solve problems (Fischer 1993). Examples of how this can work is the use of deliberative polling (polls combined with facilitated workshops) to guide energy choices (Luskin et al. 2007a, Luskin et al. 2007b). A key part of this is providing training to citizens to grasp technical complexities. In the deliberative polling experience, enough fluency can be gained in a workshop (Luskin et al. 2007a). There may be other ways to communicate and nurture “bio-literacy” to facilitate deliberation over biofuels issues among the general public (McCormick 2010). A key challenge is implementing such efforts on a wide scale and in convincing decision-makers of the value of non-expert knowledge.

The lower right-hand box of the matrix shows situations when neither ends nor means are agreed upon. At this stage – even more than in the previous stage of bargaining – values become more important than facts in determining appropriate solutions. The challenge is

how to incorporate insights into the social world of norms and values (what some social theorists define as “practical” knowledge as distinct from scientific “theoretical” knowledge (Habermas 1984, Habermas 1998)) to biofuels governance. This could involve efforts on two fronts. First, an expanded role for research from the interpretive social sciences and from the humanities, examples include: studies using methods of discourse analysis which have helped reveal how and why different groups of people choose different representations of biofuels (Hansen 2012), how traditional scientific framing of issues can close down biofuels debates (Palmer 2011), and how imagined bio-economy futures empower certain policies to the exclusion of alternatives (Kean forthcoming). Second, by providing venues for “extended peer review” of biofuels technical knowledge. The multi-stakeholder biofuels certification schemes, like the Roundtable on Sustainable Biofuels (Roundtable for Sustainable Biofuels 2010), are one example.

In summary, our perspective on the lessons from wicked problems in other sectors is that differentiated planning strategies are required. Some of the challenges that have emerged for transport biofuels can continue to be tackled by the traditional separation between scientific knowledge production and politics whereby scientists and engineers provide better and better models or equipment and it is left to planners to devise the most effective means of implementing that knowledge. The challenge of minimizing negative effects of tailpipe emissions may be one example of such a traditional challenge where planning strategies of “programming” and “experimentation” will be effective. However for many biofuels challenges we suggest a strict separation between science and politics is

untenable. For challenges such as ILUC, or appropriate governance of trade in biofuels there is simply not enough certainty in any scientific knowledge produced on these issues to warrant a separation between scientists, planners and the public. Negotiation and bargaining are one strategy to follow. For pragmatic as well as idealistic reasons this should be done in an as equitable and coercion-free atmosphere as possible. Rittel and Webber (Rittel and Webber 1973) and Sherman and Peterson (Sherman and Peterson 2009) tell us that wicked problems are never permanently solved, instead solutions must be continually posed to meet changing conditions. This is also true of biofuels because their impacts will continue to change affected by a diversity of drivers and constraints. There will be no permanent solution because the types of issues that biofuels touch upon such as resource allocation, climate change, and globalization are social ones and they are endemic. Finally, there needs to be a concerted planning effort by the biofuels community to explore the values that underpin support and opposition keeping in mind different contexts and situations.

Conclusion

In this paper we have introduced some tools from the planning literature to diagnose some of the difficulties facing the expansion of biofuels. We label biofuels as a wicked problem because we suggest there is a need to recognize the complex social and political issues that surround what was once only considered a technical solution. We suggest the idea of differentiated planning strategies is important to future biofuels action and advocate for a wider role of the public in biofuels decision-making. The wicked problem

concept reminds us not to expect permanent solutions. However, the wicked nature of a problem can be minimized by finding ways of assessing and incorporating social value arguments into decisions (Sherman and Peterson 2009). Post-normal approaches to science that enroll more perspectives and more knowledge types may be relevant to working through wicked problems. At the very least we need to recognize that when proponents of biofuels try to promote them it is not just about what “facts” they can present but also about broader visions and ideas. As a ready alternative to petroleum, we believe biofuels can be part of a sustainable future. However, this is not automatic and it is no longer a question of simply “getting the science right.” Rather, it is a question of how to accommodate conflicting values and uncertainty. These are difficult questions that require a willingness on the part of scientists, engineers and planners to share authority and establish fora for external peer review.

Future perspective:

Ultimately, the planning context for biofuels depends on forces which are difficult to predict. Progress on an international framework to reduce GHG emissions would change the context for the importance of biofuels GHG savings. Technological breakthroughs of future generation biofuels or of non-conventional sources of fossil fuels like shale gas or methyl hydrates will alter the energy security context. However, it is very likely that there will continue to be significant public and stakeholder scrutiny of biofuels developments in the near and medium term no matter the wider context (McCormick, Bomb and Deurwaarder 2012, Rohracher 2010). Minor setbacks in the commercialization of algae or

cellulosic biofuels will be magnified. To some degree this could be remedied with efforts like deliberative polling of citizens by public authorities in candidate production sites. However, there is little indication that officials are pursuing this kind of “extended peer review” approach. Instead the efforts of the EC and the EPA in the US to commission ever more technical advice on the ILUC issue suggests that any future controversies will be managed by searching for traditional scientific advice instead of knowledge from post-normal science approaches.

The endorsement of non-state produced sustainability certification schemes by the EC is a significant development and may indicate that part of the future for biofuels can be predicted by referring to other examples of non-state rule making efforts. The case of forest certification may be instructive (Cashore, Auld and Newsom 2004). In forestry, certification schemes with strong support from NGOs competed with those initiated by industry and landowners throughout the late 1990s and early 2000s. The amount of forest products certified to the industry-backed schemes rose more rapidly, but the legitimacy of this certification was contested by NGOs who staged protests and lobbied major wood purchasers to commit to purchasing wood certified under their preferred scheme. Certification of biofuels could follow a similar path with a large proportion of biofuels certified, but mostly to schemes that NGOs find illegitimate. If this occurs the EC will be under pressure to reconsider its endorsement. An improbable outcome is that NGOs attempt to increase their leverage by working with biofuels purchasers (petrol and diesel

companies with filling stations selling fuels blended with biofuels) as was done with wood purchasers.

Finally, another possible biofuels future is one shaped by Brazil and tropical regions. Our analysis has been focused on the North American and European experience. The Brazilian experience has been different where sugarcane based ethanol makes up a majority of domestic fuel use and exports are rising (Nass, Pereira and Ellis 2007, Valdes 2011). High sugar content allowing for rapid fermentation to ethanol and favourable growing conditions mean ethanol production is more energy and GHG efficient than in the US or EU (Nass et al. 2007). Furthermore, sugar is not a staple food and impacts on global grain prices are minimal. These natural advantages suggest the possibility of continued biofuels production in tropical regions of the world for growing domestic populations and exports. However, exports to the US and EU will likely be subject to continued trade barriers both explicit such as tariffs on Brazilian ethanol (Valdes 2011) and implicitly in the form of sustainability certification requirements. All of which underline the wicked problem of biofuels.

Executive summary:

- **Introduction:** Wicked problems have ten characteristics - they cannot be clearly formulated, no stopping rule, ambiguous solutions, assessment of solution extends indefinitely, imperfect solutions reformulate problem, no list of solutions, unique, symptomatic of other problems, discrepancies explained with non-scientific knowledge, and actions judged by many.

- **Analysis:** Experiences from the EU and US suggest that biofuels meet all of the characteristics of wicked problems.
- **Discussion:** Key lessons from planning studies in other sectors when responding to wicked problems are to use differentiated strategies for different levels of uncertainty, different sub-parts of biofuels problems may benefit from this approach.
- **Conclusion:** As a wicked problem transport biofuels are no longer a question of “getting the science right” but of accommodating conflicting values and perspectives. The concept in post-normal science of extended peer review may help the biofuels sector but it requires new attitudes from scientists, engineers and planners and new decision-making fora.

Acknowledgements:

We thank Dr. Kean Birch and Dr. Terry McIntyre for constructive comments on an early draft of this paper. The paper was improved by incisive comments from three anonymous reviewers. We also acknowledge the Canadian Social Sciences and Humanities Research Council (SSHRC) Michael Smith travel grant and the Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning (FORMAS) for enabling this research collaboration.

Financial & competing interest disclosure:

The authors have no affiliations or financial involvement with any organization or entity with a financial interest in or financial conflict with the subject matter or materials

discussed in the manuscript. This includes employment, consultancies, honoraria, stock ownership or options, expert testimony, grants or patents received or pending, or royalties, apart from those disclosed. No writing assistance was utilized in the production of this manuscript.

Chapter 6 - Thesis conclusions

The future for new renewable energy technologies in rural societies is uncertain and a source of sustained interest to policy-makers, scholars and of course, rural publics themselves. Rural people are at the centre of the changes that renewable energy brings to landscapes, economies and social relations and their responses to new renewable energy technologies have been markedly uneven. The research presented in this study helps fashion a more complete understanding of rural societies' interactions with renewable energy production and makes significant theoretical and applied contributions to energy and environmental governance models that emphasize deliberation.

Broad scholarly contributions

This thesis has made the argument that the concept of public opinion can be linked to energy planning decisions and governance in a much more revealing way than simply as a limited indicator of eventual social acceptance or unacceptance of RET. Instead it builds out from Habermas' view that the existence of public opinion is predicated on the existence of a public sphere. The public sphere is theorized as a (imperfect and colonized) discussion space within which citizens find common interests and criticize state and market decisions. In this view, public opinion measured via surveys provides a narrow view of public sentiment; providing only an aggregate snapshot measure of individual opinions and nothing on individual and public opinion *formation*. This thesis demonstrated that the public sphere can be located in a set of observable practices and thus can be used to query public opinion formation. For the EOH the public sphere

included the local media, the physical spaces used for public discussion and the actions of organizations that attempt to influence the ideas of others in the local community.

Citizens are most visibly active in the EOH public sphere when pursuing joint interests, defending against reductions in state delivered services or when they are directly enrolled in advisory bodies by government.

With its focus on public opinion and deliberation around a specific issue in a specific place the case also permits some reflections on the scalar architecture of the public sphere.

Traditionally the public sphere is seen as a national scale-level phenomenon which historically emerged with the aid of national presses supporting discussion of national interests. Geographic emphasis on place as particular context structuring human experience might even be seen as being in contradiction to the possibility of public opinion which implies uniformity in human experience through the space of the nation-state. Yet, geographers have explored public spheres both beyond and within the nation-state and this thesis builds on these findings by providing a place-based study of local discussions that juxtapose trans-local, national and global public interests. EOH was the site for deliberation, and production of shared meaning (a step to identifying a common shared / public interest and ultimately public opinion) and often this took the form of a very local context (e.g., history of power production at Flinton Dam) and oriented towards local interests. However, residents simultaneously argued global trends and events (e.g., catastrophic nuclear risk) or affinity with translocal rural political action (e.g. community power ownership in neighboring communities, or wind-turbine protests). In other words,

this case advances the understanding that shared meaning production, public opinion and the public sphere are place-based but not place-bound.

In terms of renewable energy governance this thesis offers two additional findings / arguments. On a process level for individual projects it suggests technical briefings of citizens and cultural briefings of professionals to facilitate their abilities to enter into extended discourse and to overcome some of the barriers to communicative action. On a conceptual level it argues for more robust attention to the cross-level conceptions that are assumed when environmental knowledge is depicted as having scalar levels. Current conceptions equate locally held knowledge as contextual and specific while scientific knowledge is general and universal. This encourages a hierarchical relationship between the holders of scientific knowledge (planners, experts) and the holders of local knowledge (citizens, local residents).

Yet when we draw out the insight from communicative action theory that three types of reasons are used by actors when communicating (facts, norms, truthfulness) the assumed scalar levels are less plausible. First, norms are just as generalizable and universal as facts, since both norms and facts are argued before a hypothetical universal audience. The types of knowledge involved are different but the scalar levels are similar. Holders of social world knowledge (any citizen) have the capacity to evaluate normative claims - for example that renewable energy development should only proceed if it provides a financial return investment - within broader general moral frameworks. Just as scientists have the capacity to evaluate fact claims – for example calculations of the net carbon flows when

biomass is burned for fuel – within broader general theories of atmospheric chemistry. In other words local scale level residents are broaching general knowledge scale level claims. Furthermore, this thesis has argued that the identification of generalizable social values is essential in navigating wicked problems, including renewable energy dilemmas.

In practical terms this means that renewable energy developments most likely to be socially acceptable and deployed widely are those that are based in both facts and norms. In EOH the pellet plant and hydro dam options have the best chance of long-term success because the reasons for support come from facts (availability of biomass) and norms (make pellets locally, tradition of extractive use of forest). Other rural communities will have different specific reasons but this study has shown that agreement (and therefore acceptance) is shaped by reasons relating to three world dimensions of truth, rightness and sincerity. Yet the study also finds several barriers to idealized communication that disrupt agreement and are likely to exist in other settings. These include : troublesome individuals were excluded from discussion, certain topics were bracketed off as taboo, factual errors were promulgated, specialized knowledge was lacking, and challenges to the assumed interests of powerful groups was avoided. All of these act to prevent intersubjective understanding and collaboration. The most pervasive barrier however was the overwhelming use of the logic of the market or the bureaucracy by residents to interpret renewable energy projects in their region. This systemic tendency suggests a colonization by the market and bureaucracy systems of lifeworld reproduction processes and ultimately a diminishing of the capacity for public reasoning.

Empirical contributions

On an empirical level this thesis has generated evidence of energy use patterns and individual attitudes within a rural region of east-central Canada facing pressures to develop RETs amidst profound changes from amenity migration, the centralizing of core services and the loss of traditional employment opportunities. When asked if they would like to see more renewable energy produced in their region, residents of the Eastern Ontario Highlands 88% were supportive and 97% were supportive or neutral. The type of resource used, local context and familiarity with the technology, income, and residency status all were found to be associated with differences in attitudes. Support for rooftop solar PV projects at 87% of respondents was much higher than the level of support seen for a new hydroelectric dam (58%) or wind farm (58%) with significantly more favourable views towards wind power from those with lower incomes or towards hydro dams from permanent residents. The overall high support for further renewable energy development in the Eastern Ontario Highlands gives the case a rare quality for two reasons: first a rare Canadian example to complement more frequently published case studies from the UK and USA; and second a relatively rare example of RET support within a literature tilted towards case studies of protests.

NIMBY attitudes were present but at a level of approximately 10% of the population and NIMBY characterizations are not good descriptions of the EOH situation or of the status of public deliberation in the region. Instead the link between local public deliberation around renewable energy and specific political or planning decisions in this case study are

more subtle. First it is important to point out that unlike many social acceptance cases explored in the literature, there were no protests or controversial developments galvanizing public discussion in the region and challenging planning processes. Partly this was due to the fact that the predominant form of RET in EOH are private household decisions to install small (<10 Kw) solar photo-voltaic panels and so are relatively immune to planning oversight. Partly it was due to the fact that the topic of renewable energy was not part of the mandate of the groups already active in the public sphere. Partly it was due to the absence of formal mechanisms for public consultation (despite high levels of community interest) for the one major project that did affect a public space; the pellet boiler at the school. In any event, it is in the discussions organized during the research that we can find evidence of political effects from deliberation around renewable energy. Agreement to pursue four collective actions emerged from these discussions: scoping study for wood pellet factory; exploratory discussions on hydro-power development of the Flinton Dam; exploratory discussions on new sources of wood thinning for biomass fuel; the renewable energy expo.

Several factors contribute to why the biomass and hydro options were favoured for discussion and became items for collective action. Most importantly and as emphasized above the reasons for support were based in both facts and norms allowing for intersubjective meanings and understandings to be reached. More practically there were local examples of both that were in advanced stages of development, more so than for wind turbines for example, which made discussion of the biomass and hydro options more

concrete. A final reason has to do with the people in the focus groups. One individual had extensive experience overseeing the renovation of a hydro dam and was eager to speak about this particular example which contributed to it being favoured in the discussion. The lesson for relying on deliberative processes in planning is to pay close attention to the prior expertise and knowledge areas of participants as these will influence discussion topics and orient others. The holding of training workshops or multiple consecutive meetings events could likely take advantage of participant expertise as well as provide opportunity for other topics to be broached in discussion.

In terms of the political role of public opinion in the EOH, there was evidence during the case study that activities carried out in the local public sphere have influence over political and planning decisions; for example decisions on the location of an ambulance base. This is not in itself particularly noteworthy, much more interesting to observe was the tendency for particular interests (e.g. cottagers against logging close to scenic lakeshores) to feel compelled to adopt positions that considered opposing views before making arguments within the public sphere. A tendency for interest groups to expand their interests and so identify truer public interests is an expected outcome in concepts of deliberative democracy and this thesis provides some empirical support for the theory.

Thus the research found that communicative action as theorized by Habermas and others could be observed in both group discussions and in the tendencies of activities carried out in the local public sphere. This is an important contribution as it provides a certain level of confirmation that the theoretical assumptions of Habermas and of deliberative democrats

concerning social interaction are valid. Of particular significance was the evidence of communication proceeding to discourse reported in chapter four. As theory predicts, this was accompanied by a questioning of hitherto hidden assumptions and a reflexive uncovering of new reasons for action. A finding of high relevance to those interested in the fate of environmental reasons during deliberation, was the almost complete absence of climate change or fossil fuel replacement reasons in EOH discussions. Given that these reasons appear prominently in state rationales for RET incentive programs one would have expected their presence. Their absence detracts from the view that there is an inherent public interest in ecological reasons that will automatically endure in deliberative settings.

Finally, this thesis makes significant methodological and empirical contributions by developing and applying a Habermasian discourse analysis to hundreds of utterances in multiple discussions. No other study has engaged with universal pragmatics - the theoretical foundation for communicative action - in this way. The use of this method has provided evidence of expanded reasoning oriented towards shared interest as is suggested by theory. This is not only a significant application of Habermasian theory, but also an indication of the validity of a major principle of deliberative democracy. While other methods have compared individual attitudes pre and post deliberation to test for movement towards a common interest, this thesis research developed a different approach focussed on moments of agreement, disagreement and discourse in discussion.

Limitations of current study and promising future directions

Several limitations in the research design and data collection deserve comment. First the response rate of 22% in the mail-survey introduces the possibility of response bias. This limitation is partly compensated for by the knowledge that respondents were close in socio-economic characteristics to the general population profile. It is quite likely however that the survey findings may not be generalizable to other rural settings where forest biomass is less prevalent. Secondly, the focus group discussions were unique to the group of individuals at the table and would have been different with a different set of participants. For example, the presence of an individual with experience overseeing the renovation of a hydro dam to produce power directed the second focus group discussion towards reflection on that particular technology.

Holding four public meetings partly compensated for this by providing a wider selection of participants and participant views in discussions. However another limitation is that only one of these meetings included seasonal residents. There is conflicting evidence in the EOH between an assumed preference for seasonals to protest energy developments, particularly wind turbines and the evidence of non-difference between seasonal and permanent residents on this issue coming out of the survey (admittedly small sample). This difference could have been better assessed by a larger sample of the seasonal resident population. Finally, to provide another measure of deliberation and communicative action the focus group participants could have been more directly asked how their opinions / worldviews changed after their discussion with the use of formal exit

surveys. As it happened, they were only asked verbally to reflect on what they had learned at the end of the meetings.

Several promising future research directions come out of this thesis. One hypothesis generated here is that market-based incentive programs end up encouraging citizens to use the logic of the market to interpret the validity of renewable energy development to the exclusion of deliberating on environmental reasons. Is this a tendency found in other market-based incentives, for example do time-of-use electricity meters encourage financial reasoning to the exclusion of the reasons for conservation? Analysis of media reports of time-of-use electricity meter programs and the holding of group interviews could contribute to testing this hypothesis. The coding procedure developed here to assess truth, rightness and sincerity claims of discussants has the potential to help isolate the influence (and potential dominance) of cost-benefit factual claims in discussions of time-of-use-meters or in discussions of other market-based environmental policies (e.g. carbon tax, emission trading).

An overarching limitation to the research is that the thesis relies on a case study and the results summarized above are a reflection of the EOH context. While general theoretical concepts about deliberation and rural societies interaction with RET development can be validly examined with this approach, a lingering question is whether or not the capacity for collaboration and the evidence of tendencies towards finding shared interests seen in the EOH would be found in settings where opinions were more polarized, for example in a rural community where some are protesting wind-farms or other developments. A

comparison with such a setting would help to answer questions about the relevance and possibility for intersubjective meaning production in diverse places. Finally, while it is tempting to see wind-farm protests as a rural-urban split issue particularly with recent evidence in Ontario of allegiance between major wind-farm protests groups and political parties with a strong rural base, this study has shown that rural communities are not intrinsically opposed to new renewable energy technologies. The degree to which solar, wind, and other new forms of energy development are “out-of-place” in contemporary rural identities could be explored through comparative studies of rural places that rely heavily on tourism and amenity migration versus those that are more heavily natural resource extraction based. Within that spectrum, the EOH case studied here offers an example of set of communities undergoing a transition from a natural resource based economy to a tourism/ amenity migrant based economy.

References

- Agarwal, A. (2007) Biofuels (alcohols and biodiesel) applications as fuels for internal combustion engines. *Progress in Energy and Combustion Science*, 33, 233-271.
- Aitken, M. (2010) Why we still don't understand the social aspects of wind power: a critique of key assumptions within the literature. *Energy Policy*, 38, 1834-41.
- Allen, J. & S. P. Jones (2012) Tilting at Windmills in a changing climate: a performative walking practice and dance-documentary film as an embodied mode of engagement and persuasion. *Ride-the Journal of Applied Theatre and Performance*, 17, 209-227.
- Amin, A. (2002) Spatialities of Globalization. *Environment and Planning A*, 34, 385-399.
- Angus-Reid. 2007. Canadians Favour Energy Sources That Are Better for the Environment. Angus Reid Poll.
- Ashworth, P., A. Littleboy, P. Graham & S. Niemeyer. 2010. Turning the heat on: Public engagement in Australia's Energy Future. In *Renewable energy and the public: From NIMBY to participation*, ed. P. Devine-Wright, 131-147. London: Earthscan.
- Bailis, R. & J. Baka (2011) Constructing Sustainable Biofuels: Governance of the Emerging Biofuel Economy. *Annals of the Association of American Geographers*, 101, 827-838.
- Barry, J. & G. Ellis. 2010. Beyond Consensus? Agonism, Republicanism and a Low Carbon Future. In *Renewable Energy and the Public: From NIMBY to Participation*, ed. P. Devine-Wright, 29-42. London: Earthscan.
- Barry, J., G. Ellis & C. Robinson (2008) Cool Rationalities and Hot Air: A rhetorical approach to understanding debates on renewable energy. *Global Environmental Politics*, 8, 67-99.
- Batie, S. (2008) Wicked problems and applied economics. *American Journal of Agricultural Economics*, 90, 1176-91.
- Baxter, J. & J. Eyles (1997) Evaluating qualitative research in social geography: Establishing "rigour" in interview analysis. *Transactions of the Institute of British Geographers*, 22, 505-525.
- Bell, D., T. Gray & C. Haggett (2005) The 'Social Gap' in Wind Farm Siting Decisions: Explanations and Policy Responses. *Environmental Politics*, 14, 460-77.
- Berrang-Ford, L., J. Ford & J. Paterson (2011) Are we adapting to climate change? *Global Environmental Change*, 21.
- Blokland, H. 2011. *Pluralism, Democracy and Political Knowledge*. Farnham, Surrey UK: Ashgate Publishing.
- Bollman, R. & H. Clemenson. 2008. Rural and Small Town Canada Analysis Bulletin : Structure and Change in Canada's Rural Demography: An Update to 2006. ed. S. Canada. Ottawa.
- Bonner, K. 1997. *A great place to raise kids*. Montreal - Kingston: McGill - Queen's University Press.
- Bradshaw, B. (2003) Questioning the Credibility and Capacity of Community-Based Resource Management. *Canadian Geographer*, 47, 137-150.
- Brannstrom, C., W. Jepson & N. Persons (2011) Social perspectives on wind-power development in west Texas. *Annals of the Association of American Geographers*, 101, 839-851.
- Brewer, J. 2007. Governing the fishing commons: Institutions, ecosystems and democracy in the co-management of Maine lobster and groundfish. In *Geography*, 290. Worcester,,: Clark University.
- Bridge, G., S. Bouzarovski, M. Bradshaw & M. Eyre (2013) Geographies of Energy Transition: space, place and the low-carbon economy. *Energy Policy*, 53, 331-340.

- Bridge, G., S. Bouzarovski, M. Bradshaw & N. Eyre (2012) Geographies of energy transition: Space, place and the low-carbon economy. *Energy Policy*, <http://dx.doi.org/10.1016/j.enpol.2012.10.066>.
- Bryant, C. & T. Johnston. 1992. *Agriculture in the City's countryside*. Toronto: University of Toronto Press.
- Bulkeley, H. (2005) Reconfiguring environmental governance : towards a politics of scales and networks. *Political geography*, 24, 875-902.
- Burningham, K., J. Barnett & D. Thrush. 2006. The limitations of the NIMBY concept for understanding public engagement with renewable energy technologies: a literature review. 20 School of Environment and Development, University of Manchester.
- Calhoun, C. 1992. Introduction. In *Habermas and the public sphere*, ed. C. Calhoun, 1-48. Cambridge, Mass.: MIT Press.
- . 2002. *entry for Public Opinion in the Dictionary of the Social Sciences*. London: Oxford University Press.
- Canada Gazette. 2006. Notice of intent to develop a federal regulation requiring renewable fuels. Canada Gazette.
- Cash, D., W. Clark, F. Alcock, N. Dickson, N. Eckley, D. Guston, J. Jager & R. Mitchell (2003) Knowledge systems for sustainable development. *Proceedings of the National Academy of Science*, 100, 8086-8091.
- Cash, D. W., N. W. Adger, F. Berkes, P. Garden, L. Lebel, P. Olsson, L. Pritchard & O. Young (2006) Scale and Cross-Scale Dynamics: Governance and Information in a Multilevel World. *Ecology and Society*, 11.
- Cashore, B., G. Auld & D. Newsom. 2004. *Governing through markets: Forest certification and the emergence of non-state authority*. New Haven: Yale University Press.
- Cheskey, E. & A. Zedan (2010) What do birders in Ontario think about wind energy in relation to birds? *Ontario Birds*, 28, 114-126.
- Christensen, K. (1985) Coping with uncertainty in planning. *Journal of the American Planning Association*, 51, 63-73.
- Christidis, T. 2013. Perceptions of Renewable Energy and Reported Health Effects: Results from a Pilot Study near Chatham-Kent. In *Ontario Network for Sustainable Energy Policy Workshop April 23, 2013*. Alliston, Ontario: <http://onsep.org/?p=404>.
- Cleveland, C. & C. Morris. 2006. *Dictionary of Energy*. Amsterdam: Elsevier.
- Cloke, P. (1985) Wither Rural studies. *Journal of Rural Studies*, 1, 1-9.
- . 2006. Conceptualizing rurality. In *Handbook of Rural Studies*, eds. P. Cloke, T. Marsden & P. Mooney. Sage.
- Cresswell, T. 2004. *Place: A Short Introduction*. Malden: Blackwell.
- Cukier, W., O. Ngwenyiman, R. Bauer & C. Middleton (2009) A critical analysis of media discourse on information technology: preliminary results of a proposed method for critical discourse analysis. *Info Systems Journal*, 19, 175-96.
- Cumming Cockburn Ltd. 2003. The official plan of the township of Addington Highlands. <http://www.addingtonhighlandstwp.ca/draft-OP-2.pdf>.
- Debuquet, D. 2011. Land use change and European Biofuel Policies. 52. EC stakeholder meeting presentation 18.11.11: International Food Policy Research Institute.
- Devine-Wright, P. (2005) Beyond NIMBYism: towards an Integrated Framework for Understanding Public Perceptions of Wind Energy. *Wind Energy*, 8, 125-39.
- . 2007. Reconsidering public attitudes and public acceptance of renewable energy technologies: a critical review. In *Beyond Nimbyism: a multidisciplinary investigation of public*

- engagement with renewable energy technologies*, 15. Manchester: University of Manchester.
- (2009) Rethinking NIMBYism: The Role of Place Attachment and Place Identity in Explaining Place-protective Action. *Journal of Community & Applied Social Psychology*, 19, 426-441.
- . 2010a. Conclusions. In *Renewable energy and the public: From NIMBY to participation*, ed. P. Devine-Wright, 316-321. London: Earthscan.
- . 2010b. *Renewable Energy and the Public: From NIMBY to Participation*. 368. Routledge.
- (2011) Place attachment and public acceptance of renewable energy: A tidal energy case study. *Journal of Environmental Psychology*, 31, 336-343.
- Devine-Wright, P., K. Burningham, J. Barnett, H. Devine-Wright, G. Walker, D. Infield & B. Evans. 2009. *Beyond Nimbyism: Project Summary Report*. 2. Manchester: University of Manchester.
- Devine-Wright, P. & Y. Howes (2010) Disruption to place attachment and the protection of restorative environments: A wind energy case study. *Journal of Environmental Psychology*, 30, 271-280.
- Deweese, D. 2010. Sustainable Pricing for Sustainable Electricity. In *Ontario Network for Sustainable Energy Policy*. Niagara - on - the - Lake: ONSEP.
- Di Lucia, L. & L. Nilsson (2007) Transport biofuels in the European Union: The state of play. *Transport Policy*, 14, 533-543.
- Author. 2011. Renewable energy expo highlights economic options and opportunities. *Frontenac News*.
- Dryzek, J. 1987. *Rational Ecology: Environment and Political Economy*. Oxford: Basil Blackwell.
- . 1995. Critical theory as a research program. In *The Cambridge companion to Habermas*, ed. S. White, 97-119. Cambridge: Cambridge University Press.
- . 2000. *Deliberative Democracy and Beyond*. Oxford: Oxford University Press.
- . 2005. *The Politics of the Earth: Environmental Discourses*. Oxford: Oxford University Press.
- Dryzek, J. & S. Niemeyer (2006) Reconciling pluralism and consensus as political ideals. *American Journal of Political Science*, 30, 634-649.
- Earley, J. & A. McKeown. 2009. *Smart Choices for Biofuels*, Worldwatch Institute and Sierra Club. 16. Washington DC: Worldwatch Institute and Sierra Club.
- EC. 2011. *The Europeans and Energy*. Eurobarometer. 27. Brussels. Directorate General for Communication.
- Ellis, G., J. Barry & C. Robinson (2007) Many ways to say 'no', different ways to say 'yes': Applying Q-Methodology to understand public acceptance of wind farm proposals. *Journal of Environmental Planning and Management*, 50, 517-51.
- Environmental Protection Agency. 2009. Notice of Proposed Rule-Making: Regulation of Fuels and Fuel Additives: Changes to Renewable Fuel Standard Program; Proposed Rule. ed. Federal Register, 24904 -25143. United States Environmental Protection Agency,.
- . 2010. EPA Lifecycle Analysis of Greenhouse Gas Emissions from Renewable Fuels. Report no. EPA-420-F-10-006. available online at <http://www.epa.gov/otaq/renewablefuels/420f10006.htm> Accessed May 30 2011.
- Ericsson, K., S. Huttunen, L. Nilsson & P. Svenningsson (2004) Bioenergy policy and market development in Finland and Sweden. *Energy Policy*, 32, 1707-1721.
- European Commission. 2010a. Commission sets up system for certifying sustainable biofuels. In *MEMO/10/247*. Brussels.
- . 2010b. Report from the Commission on indirect land-use change related to biofuels and bioliquids. In *52010DC0811*. Brussels.

- . 2011. Estimate of GHG emissions from global land use change scenarios. DG Joint Research Centre.
- European Commission. 2009. Directive 2009/28/EC of the European Parliament and of the Council on the Promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC. ed. European Parliament, 47. Brussels: EU.
- . 2012. Memo: Certification schemes for biofuels. Brussels.
- Fairclough, N. 2003. *Analyzing discourse: textual analysis for social research*. London: Routledge.
- Fargione, J., J. Hill, D. Tilman & S. H. Polasky, P (2008) Land clearing and the biofuel carbon debt. *Science*, 319, 1235-38.
- Fast, S., M. Brklachich & M. Saner (2011) A geography-based critique of new US biofuels regulations. *GCB Bioenergy*, DOI: 10.1111/j.1757-1707.2011.01131.x.
- Fast, S. & R. McLeman (2012) Attitudes towards new renewable energy technologies in the Eastern Ontario Highlands. *Journal of Rural and Community Development* 7, in press.
- Firestone, J., W. Kempton & A. Krueger (2009) Public Acceptance of Offshore Wind Power Projects in the USA. *Wind Energy*, 12, 183-202.
- Fischer, F. (1993) Citizen Participation and the Democratization of Policy Expertise: From Theoretical Inquiry to Practical Cases. *Policy Sciences*, 26, 165-187.
- Fisher, J. & K. Brown (2009) Wind energy on the Isle of Lewis: implications for deliberative planning. *Environment and Planning A*, 41, 2516-2536.
- Fitzgibbon, J. 2010. Resources, Environment and Community: Conflict and Collaboration. In *Rural Planning and Development in Canada*, ed. D. Douglas, 151-178. Toronto: Nelson.
- Flaming, H. 2009. Ontario rural council views on renewable energy. ed. S. Fast, personal communication with Executive Director of The Ontario Rural Council. November 13, 2009. Ottawa.
- Florin, M. V. & C. Bunting (2009) Risk governance guidelines for bioenergy policies. *Journal of Cleaner Production*.
- Flyjberg, B. 1998. *Power and Rationality: democracy in practice*. London: University of Chicago Press.
- Food and Agricultural Organization. 2007. A Review of the Current State of BioEnergy Development in G8 + 5 countries. 292. Rome: Food & Agricultural Organization of the United Nations and the Global Bioenergy Partnership.
- Ford, J. & T. Pearce (2010) What we know, do not know and need to know about climate change vulnerability in the western Canadian Arctic: a systematic literature review. *Environmental Research Letters*, 5, 9.
- Forester, J. 1985. *Critical theory and public life*. Cambridge, MA: MIT Press.
- . 1989. *Planning in the face of power*. Los Angeles: University of California Press.
- . 1999. *The Deliberative Practitioner: Encouraging participatory planning processes*. Cambridge, Mass: MIT Press.
- . 2003. On fieldwork in an Habermasian way: Critical ethnography and the extra-ordinary character of ordinary professional work. In *Studying Management Critically*, eds. M. Alvesson & H. Willmott, 46-65. London: Sage.
- Frame, B. (2008) 'Wicked', 'messy', and 'clumsy': long-term frameworks for sustainability. *Environment and Planning C*, 26, 1113-1128.
- Frame, B. & J. Brown (2008) Developing post-normal technologies for sustainability. *Ecological Economics*, 65, 225-241.

- Fraser, N. 1992. Rethinking the public sphere: a contribution to the critique of actually existing democracy. In *Habermas and the public sphere*, ed. C. Calhoun, 109-43. Cambridge, Mass: MIT Press.
- (2007) Transnationalizing the Public Sphere: On the Legitimacy and Efficacy of Public Opinion in a Post-Westphalian World. *Theory, Culture and Society*, 24, 7-30.
- Freidberg, S. (2004) The ethical complex of corporate food power. *Environment and Planning D: Society and Space*, 22, 513-531.
- Friends of the Earth Europe. 2011. European Commission expected to approve seven certification schemes for biofuels without public scrutiny In *press release*, eds. Client Earth, Corporate Europe Observatory & FERN, 2. Brussels.
- Funtowicz, S. & J. Ravetz (1993) Science for the post-normal age. *Futures*, 739-755.
- Gardiner, M. E. 2004. Wild publics and grotesque symposiums: Habermas and Bakhtin on dialogue, everyday life and the public sphere. In *After Habermas: New perspectives on the public sphere*, eds. N. Crossley & J. M. Roberts 28-49. Oxford: Blackwell Publishing.
- Ginnebaugh, D., J. Liang & M. Jacobson (2010) Examining the temperature dependence of ethanol (E85) versus gasoline emissions on air pollution with a largely-explicit chemical mechanism. *Atmospheric Environment*, 44, 1192-1199.
- Goheen, P. (1998) Public space and the geography of the modern city. *Progress in Human Geography*, 22, 479-96.
- Goodell, J. 2007. Ethanol Scam: Ethanol Hurts the Environment And Is One of America's Biggest Political Boondoggles. In *Rolling Stone*.
- Govinda, R. & A. Shrestha (2010) How much hope should we have for biofuels? *Energy*, DOI: 10.1016/j.energy.2010.08.023.
- (2011) How much hope should we have for biofuels? *Energy*, 36, 2055-69.
- Greenpeace. 2010. Europe's biofuels plans driving social and environmental destruction. New research warns of massive increase in carbon emissions and land conversion. In *press release*.
- Guimond, L. 2012. Lorsque les nouvelles populations rurales rencontrent les plus anciennes : l'expérience géographique au coeur de la nouvelle ruralité au Québec. In *Geography*, 224. Ottawa: University of Ottawa.
- Habermas, J. 1984. *The theory of communicative action: Volume 1 Reason and the Rationalization of Society*. Boston: Beacon Press.
- . 1987. *Theory of Communicative Action volume 2 : Lifeworld and System: A Critique of Functionalist Reason*. Beacon Press.
- . 1989. *The structural transformation of the public sphere : an inquiry into a category of bourgeois society*
- . 1992. Further reflections on the public sphere. In *Habermas and the public sphere*, ed. C. Calhoun. Cambridge, Mass.: MIT Press.
- . 1996. *Between Facts and Norms*. Cambridge, Mass.: MIT Press.
- . 1998. Some further clarifications of the concept of communicative rationality. In *On the pragmatics of communication*, ed. M. Cooke, 307-343. Cambridge, Mass: MIT Press.
- (2004) Public space and political public sphere - the biographical roots of two motifs in my thought. *Commemorative Lecture*, 10.
- Hagget, C. (2008) Over the sea and far away? A consideration of the planning, politics and perceptions of offshore wind farms. *Journal of Environmental Policy and Planning*, 10, 289-306.

- Hagget, C. & D. Toke (2006) Crossing the great divide - using multi-method analysis to understand opposition to windfarms. *Public Administration*, 84, 103-120.
- Haggett, C. (2008) Over the Sea and Far Away? A Consideration of the Planning, Politics and Public Perception of Offshore Wind Farms. *Journal of Environmental Policy & Planning*, 10, 289-306.
- (2011) Understanding public responses to offshore wind power. *Energy Policy*, 39, 503-510.
- Hajer, M. & W. Versteeg (2005) A decade of discourse analysis of environmental politics: Achievements, challenges, perspectives. *Journal of Environmental Policy and Planning*, 7, 175-84.
- Halfacree, K. (1993) Locality and Social Representation: Space, Discourse and Alternative Definitions of the Rural. *Journal of Rural Studies*, 9, 23-37.
- Halseth, G. 1998. *Cottage Country in Transition: A Social Geography of Change and Contention in the Rural-Recreational Countryside*. Montreal: McGill-Queens University Press.
- Han, J., A. P. J. Mol, Y. Lu & L. Zhang (2008) Small-scale bioenergy projects in rural China: Lessons to be learnt. *Energy Policy*, 36, 2154-2162.
- Hansen, J. (2012) Coupling epistemic and politico-economic claims in the Danish biofuel debate *Science as Culture*, forthcoming.
- Healey, P. 1997. *Collaborative planning: shaping places in fragmented societies*. UBC Press.
- Heath, J. 2003. *Communicative action and rational choice*. Cambridge, Mass: MIT Press.
- Hill, J., E. Nelson, D. Tilman, S. Polasky & T. D (2006) Environmental, economic, and energetic costs and benefits of biodiesel and ethanol biofuels. *Proceedings of the National Academy of Sciences* 130, 11210-16.
- Hill, S. & J. Knott (2010) Too Close for Comfort: Social Controversies Surrounding Wind Farm Noise Setback Policies in Ontario. *Renewable Energy Law and Policy*, 2, 153-168.
- Hobson, K. & S. Niemeyer (2011) Public responses to climate change: The role of deliberation in building capacity for adaptive action. *Global Environmental Change*, 21, 957-971.
- Howarth, R., S. Bringezu, M. Bekunda, C. de Fraiture, L. Maene, L. Martinelli & O. Sala. 2009. Rapid Assessment on Biofuels and the Environment: Overview and Key Findings. In *Biofuels: Environmental Consequences and Interactions with Changing Land Use*, eds. R. Howarth & S. Bringezu, 1-13. Scientific Committee on Problems of the Environment (SCOPE) of International Council for Science.
- Howell, P. (1993) Public space and the public sphere: political theory and the historical geography of modernity. *Environment and Planning D: Society and Space*, 11, 303-22.
- (1994) The Aspiration Towards Universality in Political Theory and Political Geography. *Geoforum*, 25, 413-27.
- Author. 2011. How McGuinty's green-energy policy cost him a majority in Ontario. *Globe and Mail* October 7, 2011.
- Hughes, B. 2011. Jane Austen's Conversational Pragmatics: Rational Evaluation and Strategic Concealment in Sense and Sensibility. In *200 Years of Sense and Sensibility, Jane Austen Conference*, 13. St. Andrews University.
- Hunold, C. & S. Leitner (2011) 'Hasta la vista, baby!' The Solar Grand Plan, environmentalism, and social constructions of the Mojave Desert. *Environmental Politics*, 20, 687-704.
- IEA. 2012. *World Energy Outlook, 2012*. Paris: International Energy Agency.
- Ilbery, B. 1998. *The Geography of Rural Change*. Longman.
- Ilbery, B. & I. Bowler. 1998. From agricultural productivism to post-productivism. In *The Geography of Rural Change*, ed. B. Ilbery, 267. Longman.

- IPCC. 2011. IPCC Special Report on Renewable Energy Sources and Climate Change Mitigation. Prepared by Working Group III of the Intergovernmental Panel on Climate Change. 1075. Cambridge, United Kingdom: IPCC.
- Jacobson, M. (2007) Effects of ethanol (E85) versus gasoline on cancer and mortality in the United States. *Environmental Science and Technology*, 41, 4150-4157.
- Jasco, P. (2005) As we may search - comparison of major features of the Web of Science, Scopus, and Google Scholar citation based and citation-enhanced databases. *Current Science*, 89, 1537.
- Jepson, W., C. Brannstrom & N. Persons (2012) "We Don't Take the Pledge": Environmentalism and environmental skepticism at the epicenter of US wind energy development. *Geoforum*, 43, 851-863.
- Jonas, E. (2006) Pro scale: further reflections on the 'scale debate' in human geography. *Transactions of the Institute of British Geographers*, 31, 399-406.
- Jones, C. R. & J. R. Eiser (2010) Understanding 'local' opposition to wind development in the UK: How big is a backyard? *Energy Policy*, 38, 3106-3117.
- Katers, J. & J. Kaurich. 2006. Heating fuel life-cycle assessment 54. Green Bay: University of Wisconsin.
- Kean, B. (forthcoming) Self-fulfilling prophecies of the European knowledge-based bio-economy: The shaping of institutional and policy frameworks in the bio-pharmaceuticals sector. *Journal of the Knowledge Economy*, 15.
- Kemp, R. 1985. Planning, Public Hearings, and the Politics of Discourse. In *Critical Theory and Public Life*, ed. J. Forester, 177-201. Cambridge, Mass.: MIT Press.
- Koh, L. & D. Wilcove (2008) Is oil palm agriculture really destroying tropical biodiversity? *Conservation Letters*, 1, 60-64.
- Kreuter, M., C. De Rosa, E. Howze & G. Baldwin (2004) Understanding Wicked Problems: A Key to Advancing Environmental Health Promotion. *Health Education and Behaviour*, 31, 441-454.
- Laborde, D. 2011. Assessing the Land Use Change Consequences of European Biofuel Policies - Final Report. In *International Food Policy Research Institute*, 111. International Food Policy Research Institute.
- LaChapelle, P., S. McCool & M. Patterson (2003) Barriers to Effective Natural Resource Planning in a "Messy" World. *Society and Natural Resources*, 16, 473-90.
- Ladenburg, J. (2010) Attitudes towards offshore wind farms-The role of beach visits on attitude and demographic and attitude relations. *Energy Policy*, 38, 1297-1304.
- Landerweerd, L., P. Osseweijer & J. Kinderlerer (2009) Distributing Responsibility in the Debate on Sustainable Biofuels. *Science and Engineering Ethics*, 15, 531-543.
- Levidow, L., T. Papaioannou & K. Birch. forthcoming. Neoliberalising Technoscience and Environment: EU Policy for Competitive, Sustainable Biofuels. In *Neoliberalism and Technoscience: Critical Assessments*, eds. L. Pellizzoni & M. Ylonen. Ashgate.
- Levin, K., B. Cashore, S. Bernstein & G. Auld (2012) Overcoming the tragedy of super wicked problems: constraining our future selves to ameliorate global climate change. *Policy Science*, 45, 123-152.
- Liska, A. & R. Perrin (2009) Indirect land use emissions in the life cycle of biofuels: regulations vs science. *Biofuels, Bioproducts and Biorefining*, 3, 318-329.
- Loos, E. 2003. *Glossary of Linguistic Terms*. available on-line <http://www.sil.org/linguistics/GlossaryOfLinguisticTerms/> accessed 3.8.12: SIL International.

- Loring, J. (2007) Wind energy planning in England, Wales and Denmark: Factors influencing project success. *Energy Policy*, 35, 2648-2660.
- Lövbrand, E. & J. Khan. 2010. The deliberative turn in green political theory. In *Environmental politics and deliberative democracy*, ed. K. Bäckstrand, 47-64. London: Edward Elgar.
- Lovins, A. (1976) Energy Strategy: The road not taken. *Foreign Affairs*, 55, 65-97.
- Ludwig, D. (2001) The age of management is over. *Ecosystems*, 4, 758-764.
- Luskin, R., D. Crow, J. Fishkin, W. Guild & D. Thomas. 2007a. Report on the Deliberative Poll® on "Vermont's Energy Future". 158. Center for Deliberative Opinion Research, University of Texas
- Luskin, R., J. Fishkin & K. Hahn. 2007b. Consensus and Polarization in Small Group Deliberations. In *American Political Science Association*. Chicago, IL.
- Marston, S., J. Jones & K. Woodward (2005) Human geography without scale. *Transactions of the Institute of British Geographers*, 30, 416-432.
- Mårtensson, K. & K. Westerberg (2007) How to transform local energy systems towards bioenergy? Three strategy models for transformation. *Energy Policy*, 35, 6095-6105.
- Martin, A. & E. Rutagarama (2012) Just deliberation: Can communicative rationality support socially just environmental conservation in rural Africa? *Journal of Rural Studies*, 28.
- Maruyama, Y., M. Nishikido & T. Iida (2007) The rise of community wind power in Japan: Enhanced acceptance through social innovation. *Energy Policy*, 35, 2761-2769.
- Massey, D. 1994. A global sense of place. In *Splace, Place and Gender*, ed. D. Massey, 146-156. Minneapolis: University of Minnesota Press.
- Mata, T., A. Martins & N. Caetano (2010) Microalgae for biodiesel production and other applications: a review. *Renewable and Sustainable Energy Reviews*, 14, 217-232.
- Mather, A. S., G. Hill & M. Nijnik (2006) Post-productivism and rural land use: cul de sac or challenge for theorization? *Journal of Rural Studies*, 22, 441-55.
- McCarthy, J. (2006) Rural geography: alternative rural economies - the search for alterity in forests, fisheries, food and fair trade. *Progress in Human Geography*, 30, 803-11.
- McCormick, K. (2010) Communicating bioenergy: a growing challenge. *Biofuels, Bioproducts and Biorefining*, 4, 494-502.
- McCormick, K., C. Bomb & E. Deurwaarder (2012) Governance of biofuels for transport: lessons from Sweden and the UK. *Biofuels*, 3, 293-305.
- McCormick, K. & T. Kaberger (2005) Exploring a pioneering bioenergy system: The case of Enköping in Sweden. *Journal of Cleaner Production*, 13, 1003-1014.
- (2007) Key barriers for bioenergy in Europe: Economic conditions, know-how and institutional capacity, and supply chain co-ordination. *Biomass and Bioenergy*, 31, 443- 452.
- McKee, A. 2005. *The public sphere: an introduction*. Cambridge: Cambridge University Press.
- McLeman, R. (2010) Impacts of population change on vulnerability and the capacity to adapt to climate change and variability: a typology based on lessons from "a hard country". *Population and Environment*, 31, 286-316.
- (2011) Settlement abandonment in the context of global environmental change. *Global Environmental Change*, 9, s108-s120.
- McLeman, R. & G. Gilbert. 2007. Adapting to Climate Change in Addington Highlands: A Report to the Community. 36. Ottawa: University of Ottawa.
- Meadowcroft, J. 2004. Deliberative Democracy. In *Environmental Governance Reconsidered: challenges, choices and opportunities*, eds. R. Durant, D. Fiorino & R. O'Leary, 183-? : MIT Press.

- Merriam, J. 2011. Liberals keep shoving wind down farmers' throats: Merriam. March 21, 2011. Toronto Sun.
http://www.torontosun.com/comment/columnists/jim_merriam/2011/03/18/17669911.html.
- Miller, B. 2000. *Geography and Social Movements: Comparing Anti-Nuclear Activism in the Boston Area*. University of Minnesota Press.
- Mitchell, D. (1995) The end of public space? People's park, definitions of the public and democracy. *Annals of the Association of American Geographers*, 85, 108-33.
- . 2000. *Cultural Geography: a critical introduction*. Oxford: Blackwell.
- Mitchell, K. 2009. Citizenship. In *The Dictionary of Human Geography*, eds. D. Gregory, R. Johnston, G. Pratt, M. Watts & S. Whatmore, 84-85. Chichester: Wiley and Sons.
- Molnarova, K., P. Sklenicka, J. Stiborek, K. Svobodova, M. Salek & E. Brabec (2012) Visual preferences for wind turbines: Location, numbers and respondent characteristics. *Applied Energy*, 92, 269-278.
- Mouffe, C. (1999) Deliberative democracy of agonistic pluralism? *Social Research*, 66, 745-758.
- Mulvaney, K., P. Woodson & L. Prokopy (2013) A tale of three counties: Understanding wind development in the rural Mid-Western United States. *Energy Policy*.
- Musall, F. D. & O. Kuik (2011) Local acceptance of renewable energy-A case study from southeast Germany. *Energy Policy*, 39, 3252-3260.
- Nass, L., P. Pereira & A. Ellis (2007) Biofuels in Brazil: an overview. *Crop Science*, 47, 2228-2237.
- Navigant Consulting. 2012. Sector profile for solar photovoltaics in Canada. 101. Toronto: prepared for Natural Resources Canada.
- Ngwenyama, O. & A. Lee (1997) Communication richness in electronic mail: critical social theory and the contextuality of meaning. *MIS Quarterly*, 21, 145-167.
- Niemeyer, S. (2011) The Emancipatory Effect of Deliberation: Empirical Lessons from Mini-publics. *Politics and Society*, 39, 103-40.
- Nuffield Council on Bioethics. 2011. Biofuels: ethical issues. 226. London.
- OECD. 2012. Linking renewable energy to rural development. In *OECD Green Growth Studies*, 352. Paris: Organization for Economic Cooperation and Development.
- Ontario. 2009. Ontario Legislature Passes Green Energy Act. Ministry of Energy and Infrastructure.
- . 2011. Green Schools Pilot Initiative. Ministry of Education.
<http://www.edu.gov.on.ca/eng/parents/greenSchools.html> accessed March 31, 2011.
- Ontario Ministry of Education. undated. Green Schools Pilot Initiative.
<http://www.edu.gov.on.ca/eng/parents/greenSchools.html> accessed March 31, 2011.
- OPA. 2010. FIT Contracts Awarded April 8th. on-line.
- . 2011. FIT Contracts Offered February 24, 2011 <http://fit.powerauthority.on.ca> accessed September 12, 2011.
- Author. 2011. In Iowa, Ethanol Can Still Trip Up a Candidate. *New York Times* 7.10.11.
- Pacini, H. & L. Assuncao (2011) Sustainable biofuels in the EU: the costs of certification and impacts on new producers. *Biofuels*, 2, 595-598.
- Palmer, J. (2011) Risk governance in an age of wicked problems: lessons from the European approach to indirect land-use change. *Journal of Risk Research*, DOI:10.1080/13669877.2011.643477.
- Paperny, A. 2010. Green energy project gives cottage country the blues. In *The Globe and Mail*, A1. Toronto. August 1, 2010.
- Parkins, J. & R. Mitchell (2005) Public Participation as Public Debate: A Deliberative Turn in Natural Resource Management. *Society & Natural Resources*, 18, 529-40.

- Parkins, J. & M. Reed. 2013. *Social Transformation in Rural Canada: Community, Cultures and Collective Action*. Vancouver: UBC Press.
- Pasqualetti, M. & C. Schwartz. 2011. Siting solar power in Arizona: A public value failure? In *Renewable Energy and the Public*, ed. P. Devine-Wright, 167-185. London: Earthscan.
- Phadke, R. (2011) Resisting and Reconciling Big Wind: Middle Landscape Politics in the New American West. *Antipode*, 43, 754-766.
- Radwanski, A. 2011. Is McGuinty's green-energy answer just blowin' in the wind? In *Globe and Mail*. January 25, 2011, <http://www.theglobeandmail.com/news/politics/adam-radwanski/is-mcguintys-green-energy-answer-just-blowin-in-the-wind/article1882825/>. Toronto.
- Ravetz, J. (2006) Post-Normal Science and the complexity of transitions towards sustainability. *Ecological Complexity*, 3, 275-284.
- Reimer, B. 2013. Rural -urban interdependence: Understanding our common interests. In *Social Transformation in Rural Canada: Communities, Cultures and Collective Action*, eds. J. Parkins & M. Reed, 91-110. Vancouver: UBC Press.
- Reimer, B. & R. Bollman. 2010. Understanding Rural Canada: Implications for rural development policy and rural planning policy. In *Rural Planning and Development in Canada*, ed. D. Douglas, 10-53. Toronto: Nelson Education.
- Renewable Fuels Agency. 2008. The Gallagher Review of the indirect effects of biofuels production. 92.
- Rittel, H. & M. Webber (1973) Dilemmas in a general theory of planning. *Policy Sciences*, 4, 155-169.
- Robbins, P., R. Meehan, H. Gosnell & S. Gilbertz (2009) Writing the new American West: a critical review. *Rural Sociology*, 74, 365-82.
- Roberts, J. M. & N. Crossley. 2004. Introduction. In *After Habermas: New perspectives on the public sphere*, eds. M. E. Gardiner & N. Crossley. Oxford: Blackwell.
- Rogers, J. C., E. A. Simmons, I. Convery & A. Weatherall (2012) Social impacts of community renewable energy projects: findings from a woodfuel case study. *Energy Policy*, 42, 239-247.
- Rohracher, H. (2010) Biofuels and their publics: the need for differentiated analysis and strategies. *Biofuels* 1, 3-5.
- Roundtable for Sustainable Biofuels. 2010. RSB Principles and Criteria for Sustainable Biofuel Production. 29. Roundtable for Sustainable Biofuels.
- Sander-Regier, R., R. McLeman, M. Brklachich & M. Woodrow (2009) Planning for climate change in Canadian rural and resource-based communities. *Environments*, 37, 35-58.
- Scheer, H. 2007. *Energy Autonomy: The economic, social and technological case for renewable energy*. London: Earthscan.
- Schouten, J. & P. Glasbergen (2011) Creating legitimacy in global private governance: The case of the Roundtable on Sustainable Palm Oil. *Ecological Economics*, 79, 1891-1898.
- Searchinger, T., R. Hemlich, R. A. Houghton, F. Dong, A. Elobeid, j. Fabiosa, D. Tokgoz & T.-H. Y (2008) Use of U.S. croplands for biofuels increases greenhouse gases through emissions from land use change. *Science*, 319, 1238-40.
- Senger, F., R. Raven & A. Venrooij (2010) From riches to rags: Biofuels, media discourses, and resistance to sustainable energy technologies. *Energy Policy*, 38, 5013-5027.
- Sherman, J. & G. Peterson (2009) Finding the win in wicked problems: lessons from evaluating public policy. *The Foundation Review*, 1, 87-99.
- SHEU. 2007. Survey of Household Survey of Energy Use. ed. NRCan, 248. Government of Canada.

- Skollerhorn, E. (1998) Habermas and Nature: The Theory of Communicative Action for Studying Environmental Policy. *Journal of Environmental Planning and Management*, 41, 555-573.
- Smith, D. & D. Phillips (2001) Socio-cultural representations of greentrified Pennine rurality. *Journal of Rural Studies*, 17, 457-69.
- Spaeth, P. & H. Rohracher (2010) 'Energy regions': The transformative power of regional discourses on socio-technical futures. *Research Policy*, 39, 449-458.
- Staheli, L. & D. Mitchell (2007) Locating the public in research and practice. *Progress in Human Geography*, 31, 792-811.
- Statistics Canada. 2006. Community Profiles for Addington Highlands and North Frontenac.
- . 2011. Census of population.
- Swyngedouw, E. (2007) Technonatural revolutions: the scalar politics of Franco's hydro-social dream for Spain, 1939–1975. *Transactions of the Institute of British Geographers*, 32, 9-28.
- Taylor, B. (2010) Between argument and coercion: Social coordination in rural environmental governance. *Journal of Rural Studies*, 26, 383-393.
- Tewdwr-Jones, M. & P. Allmendinger (1998) Deconstructing communicative rationality: a critique of Habermasian collaborative planning. *Environment and Planning A*, 30, 1975-1989.
- The Royal Society. 2008. Sustainable biofuels: prospects and challenges. In *Royal Society policy documents*, ed. T. R. Society, 90. London.
- Thomassen, L. 2010. *Habermas: A guide for the perplexed*. London: Continuum.
- Tilman, D., R. Socolow, J. Foley, J. Hill, E. Larson, L. Lynd, S. Pacala, J. Reilly, T. Searchinger, C. Somerville & R. Williams (2009) Beneficial Biofuels—The Food, Energy, and Environment Trilemma. *Science*, 325, 270-271.
- Toke, D., S. Breukers & M. Wolsink (2008) Wind power deployment outcomes: How can we account for the differences? *Renewable & Sustainable Energy Reviews*, 12, 1129-1147.
- Troughton, M. 2004. Agriculture and rural resources. In *Resource and Environmental Management in Canada*, ed. Mitchell, 600. Don Mills: Oxford University Press.
- Truelove, H. (2012) Energy source perceptions and policy support: Image associations, emotional evaluations, and cognitive beliefs. *Energy Policy*, 45, 478-89.
- Trutnevyte, E., M. Stauffacher & R. Scholz (2011) Supporting energy initiatives in small communities by linking visions with energy scenarios and multi-criteria assessment. *Energy Policy*, 39, 7884-7895.
- Tuan, Y. 1974. *Topophilia: A study of environmental perception, attitudes and values*. New York: Columbia University Press.
- Turpenny, J., M. Jones & I. Lorenzi (2011) Where now for post-normal science? A critical review of its development, definitions and uses. *Science, Technology and Human Values*, 36, 287-306.
- UNEP- Frankfurt School. 2012. Global trends in renewable energy investment, 2012. 79. Frankfurt: Frankfurt School of Finance and Management.
- United States Department of Energy. 2010. National algal biofuels technology roadmap. ed. U.S. Department of Energy Office of Energy Efficiency and Renewable Energy Biomass Program, 140. Washington: US Department of Energy.
- Upham, P. & S. Shackley (2006) The case of a proposed 21.5MWe biomass gasifier in Winkleigh, Devon: Implications for governance of renewable energy planning. *Energy Policy*, 2161-2172.
- Upham, P., J. Tomei & L. Dendler (2011) Governance and legitimacy aspects of the UK biofuel carbon and sustainability reporting system. *Energy Policy*, 39, 2669-2678.

- Upham, P. S., S & H. Waterman (2007) Public and stakeholder perceptions of 2030 bioenergy scenarios for the Yorkshire and Humber region. *Energy Policy*, 35, 4403-4412.
- Valdes, C. 2011. Brazil's Ethanol industry: Looking forward. United States Department of Agriculture. In *A Report from the Economic Research Service, BIO-02.*, 47.
- van der Horst, D. (2007) NIMBY or not? Exploring the relevance of location and the politics of voiced opinions in renewable energy siting controversies. *Energy Policy*, 35, 2705-2714.
- Walker, G. (2011) The role for 'community' in carbon governance. *Wiley Interdisciplinary Reviews-Climate Change*, 2, 777-782.
- Walker, G. & N. Cass (2007) Carbon reduction, "the public" and renewable energy: engaging with socio-technical configurations. *Area*, 39, 458-69.
- Walker, G. & P. Devine-Wright (2008) Community renewable energy: What should it mean? *Energy Policy*, 36, 497-500.
- Walker, G., P. Devine-Wright, J. Barnett, K. Burningham, N. Cass, H. Devine-Wright, G. Speller, J. Barton, G. Edwards-Jones, B. Evans, Y. Heath, D. Infield, J. Parks & K. Theobald. 2010. Symmetries, expectations, dynamics and contexts: a framework for understanding public engagement with renewable energy projects. In *Renewable Energy and the Public: From Nimby to Participation*, ed. P. Devine-Wright, 1-14. London: Earthscan.
- Walker, P. & L. Fortmann (2003) Whose landscape? A political ecology of the 'exurban' Sierra. *Cultural Geographies*, 10, 469-91.
- Wallace, I. & M. Brklachich. 2010. Agriculture and Rural Resources. In *Resource and Environmental Management in Canada*, ed. B. Mitchell. Oxford: Oxford University Press.
- Wang, M., Y. Wu & A. Elgowainy. 2007. Operating manual for GREET version 1.7. Argonne: Argonne National Laboratory: US Department of Energy.
- Warren, C. R., C. Lumsden, S. O'Dowd & R. V. Birnie (2005) Green on green: public perceptions of wind power in Scotland and Ireland. *Journal of Environmental Planning and Management*, 48, 853-75.
- Warren, C. R. & M. McFadyen (2010) Does community ownership affect public attitudes to wind energy? A case study from south-west Scotland. *Land Use Policy*, 27, 204-213.
- Wente, M. (2010) When it comes to power in Ontario, we're in the dark. *Globe and Mail*, October 12.
- Wesselink, A., J. Paavola, O. Fritsch & O. Renn (2011) Rationalities for public participation in environmental policy and governance: practitioners' perspectives. *Environment and Planning A*, 43, 2688-2704.
- Wilbanks, T. J. & R. W. Kates (1999) Global Change in Local Places: How Scale Matters. *Climatic Change*, 43, 601-28.
- Wind Concerns Ontario. 2011. Green Energy Act Dramatically Reduces McQuinty Government to Minority. Canada News Wire <http://www.newswire.ca/en/story/855177/green-energy-act-dramatically-reduces-mcquinty-government-to-minority> Accessed 8.3.12.
- Wolsink, M. (2000) Wind power and the NIMBY-myth: institutional capacity and the limited significance of public support. *Renewable Energy*, 21, 49-64.
- (2007) Wind power implementation: The nature of public attitudes: Equity and fairness instead of 'backyard motives'. *Renewable & Sustainable Energy Reviews*, 11, 1188-1207.
- Wood, J. 2011. "Feed-in" tariffs in Ontario: UnFIT energy policy. ed. Fraser Institute, 31-35. Fraser Forum.
- Woods, M. (2003) Conflicting environmental visions of the rural: windfarm development in Mid Wales. *Sociologia Ruralis*, 43, 271-88.
- . 2005. *Rural Geography*. Sage.

- World-wide Fund for Nature. 2012. WWF: The Energy Report. 256.
- World Bioenergy Association. 2009. WBA Position Paper on Global Potential for Bioenergy Sufficient to meet Global Energy Demand. 4. World Bioenergy Association.
- World Wind Energy Association. 2012. 2011 Annual Report. 23. Bonn, Germany.
- Wright, E. 2010. Habermas as lacking in faith? In *Beyond Universal Pragmatics: Studies in the philosophy of communication*, ed. C. Grant, 1-22. Oxford: Peter Lang.
- Wustenhagen, R., M. Wolskink & J. Burer (2007) Social acceptance of renewable energy innovation: An introduction to the concept. *Energy Policy*, 35, 2683-2691.
- Yatchew, A. & A. Baziliauskas (2011) Ontario feed-in tariffs. *Energy Policy*, 39, 3885-3893.
- Author. 2009. Gore green with envy *Toronto Sun*.

Appendices

Appendix 1 : Mail out Survey

Cover letter

Household energy use and energy attitudes in Addington Highlands and North Frontenac

February 18, 2011

Dear resident:

I am a researcher from the University of Ottawa trying to learn about energy use in the Addington Highland and North Frontenac region. Your thoughts on existing and new technologies and your current experiences with using energy will provide useful information that will help predict what technologies might be acceptable to people in the region.

This is a voluntary, anonymous survey which means that you do not have to complete it and you should not write your name on the questionnaire. Your answers are private and unidentifiable. However, if you are interested in participating in face to face discussions with other members of the community then write your name and contact information on the back of this page in the space provided and send it back to us along with the completed questionnaire. The results of the survey will be presented in evening sessions planned for Denbigh, Cloyne, and Plevna in the spring.

Please read through and consider answering the questions. Use the postage-paid self addressed envelope that is enclosed to return the questionnaire at your earliest convenience. If you have any questions about this study please contact me or any of the other contacts listed below.

Information is also available from the on-line community research portal at <http://www.addington.uottawa.ca/>

Thank you in advance for your help. Look forward to hearing from you!

Yours sincerely,

Stewart Fast
PhD Candidate
Department of Geography, University of Ottawa

P.S. The pictures on the envelope show local examples of new renewable energy technologies. Starting from the left *wood pellet bin* at the North Addington Education Centre, former *hydroelectric site* at the Flinton Dam, and electricity generating *solar panels* for sale along Highway #7

Contacts for questions or concerns about this study:

Contact details removed for thesis distribution

Only fill and return out if you wish to be contacted to participate in further discussions about energy use and energy production in the region:

NAME _____

PHONE NUMBER _____

E-MAIL _____





Household energy use and energy attitudes in Addington Highlands and North Frontenac Region



uOttawa

CURRENT EXPERIENCES WITH USING ENERGY

How do you heat your home? (tick more than one box if you use a combination of fuels)

-  wood
  heating oil
  electricity
  wood pellets
 Other, _____

Why do you use this fuel? (You can tick more than one box if you like)

- cheap
 home has always used it
 available and convenient
 easy to use
 Other, _____

For users of wood



Approximately how much wood do you use per year?

- 1 bush cord or less (4' high x 4' wide x 8' long)
 between 1 and 3 cords
 between 3 and 6 cords
 6 cords or more

Where do you get your wood from?

- cut it ourselves
 from somebody local
 from the sawmill

Other, specify _____

For users of heating oil



Approximately how much do you spend on oil per year?

- Less than \$2,000
 Between \$2,000 and \$2,500
 Between \$2,500 and \$3,000
 More than \$3,000

For users wood pellets



Approximately how many pellets per year?

- Less than 50 bags (40 lb each)
 Between 50 and 100 bags
 More than 100 bags

Approximately how much do you spend a month on electricity?

- less than \$100
 \$100 to \$200
 \$200 to \$400
 more than \$400
- on off-the grid and use _____ Kwhr per month

Approximately how much do you spend on gasoline or diesel a month for all transport (including automobiles, snowmobile, ATV and boats)

Less than \$100 to 150\$ 150\$ to 200\$ 200\$ to 250\$ more than 0\$

WHAT DOES ENERGY MEAN TO YOU?

Please mark your level of agreement with the following statements on a scale of 1 to 5

1= strongly agree 2 = agree 3 = neutral 4 = disagree 5 = strongly disagree

I don't think about energy often. It is just something that I use _____

I try to find ways to reduce my use of energy to save money _____

I try to find ways to reduce my use of energy to help the environment _____

I think it is important to look for alternative ways to use and obtain energy _____

Did your parents grow up in the Addington Highlands and North Frontenac region? Yes No

Is the way that your parents use and obtain energy different than your own use? Yes No

If Yes, how is it different? _____

What are the most important energy issues in the future? Please mark your level of agreement with the following statements on a scale of 1 to 5

1= strongly agree 2 = agree 3 = neutral 4 = disagree 5 = strongly disagree

Keeping cost low _____

Maintaining reliability _____

Using local energy sources _____

Avoiding fossil fuels _____

Other _____

Do you think other people in the region share your views? Yes No

If no, what is different about your views? _____

RENEWABLE ENERGY GENERATION

Please mark your level of agreement with the following statements on a scale of 1 to 5

Note: renewable energy is any electricity, heating or fuel from sources that regenerate naturally such as wind, water, sun and wood.

1= strongly agree 2 = agree 3 = neutral 4 = disagree 5 = strongly disagree

I would like to see more renewable energy produced in Addington Highlands and North Frontenac _____

I have no objections to renewable energy, I just don't want it produced in my area _____

Would you support the development of any of the following types of renewable energy projects in your area? Mark your level of agreement on a scale of 1 to 5 with 1 = strongly agree and 5 = strongly disagree

(Please note this is a hypothetical question – we are not advocating any of these developments)

multiple wind turbines in a single area (wind farm) _____ rooftop solar panels _____

single turbines scattered around the region _____ set of panels scattered around the region _____

a wood-pellet factory _____ new hydro-electric dam on local river _____

wood chip boilers to heat large buildings _____ convert existing dams to hydro-electric dam _____

multiple solar panels in a large area (solar farm) _____ Other, _____

Who are the best people for developing renewable energy projects? (You can tick more than one box if you like)

homeowners township, county or other governments Private companies All None

Which buildings, are best suited for a renewable energy project? (You can tick more than one box if you like)

Community buildings e.g. village hall Institutional buildings e.g. school, nursing home

Privately-owned houses Businesses All None

BACKGROUND INFORMATION

How long have you lived in Addington Highlands or North Frontenac? _____

What kind of work do you do?

Retail and service Construction Forestry Health care Business owner Driver
 Administration Tourism Home maker Retired Other _____

Please mark your level of formal education

High school completed Apprenticeship College or university diploma

Are you: Male Female

How many people are there from each age group in your household?

Under 16	16 – 24	25 – 44	45 – 64	65 -74	75 or over
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

What is your approximate annual household income?

Prefer not to say	Under \$20,000	\$20-39,000	\$40-59,000	\$60,000 or over
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

IS THERE ANYTHING ELSE YOU WOULD LIKE TO ADD:

THANK YOU !



Appendix 2: Background material for focus group meetings

Sent prior to meeting:

Future energy production in Addington Highlands and North Frontenac

A focus group to share ideas and start conversations

Date and time: March 23rd 9:30 am to 1:30 pm , Barrie Hall, Cloyne

Purpose: Bring together influential individuals to imagine future energy production in the Addington Highlands and North Frontenac region. We will use four local real examples of new renewable energy technology projects that are at various stages of development to provoke your ideas and feelings and encourage discussion with other group members. The four examples are:

- 1) Use of wood pellets to heat the North Addington Education Centre
- 2) Including rooftop solar panels at the Ompah Fire Hall
- 3) Renovating the Flinton Dam to produce hydroelectric power
- 4) Wind turbines along ridges near Denbigh.

Preliminary results from our regional survey on energy use and attitudes towards renewable energy generation projects will also be available for you to interpret and discuss.

Format : Meeting to run no longer than four hours including refreshment break. Held at the Barrie Hall in Cloyne. Meeting will be audio recorded.

Participants: between 6 and 10 individuals. Confirmed: Ken Hook, Land of Lakes, Fred Perry Councillor North Frontenac, Tony Fritsch Councillor Addington Highlands, Jan Smigielski, Forester Mazinaw Lanark Forest Inc, Joe Gallivan, Manager of Sustainability Planning, County of Frontenac, Paul Lehman, General Manager, Mississippi Valley Conservation Authority, invited: Representative from Quinte Conservation Authority, Representative from Ontario Ministry of Natural Resources, Representative from County of Lennox and Addington,

Meeting organizer: Stewart Fast, Addington Highlands Climate Project / Public attitudes towards new renewable energy technologies, University of Ottawa
www.addington.uottawa.ca (contact details removed for thesis dissemination)

What do we hope to get out of the meeting? For participants, we hope to start conversations and support planning around future energy pathways. For the research project, we hypothesize that the sharing and testing of your opinions in a group setting will provide valuable information about what is influencing public attitudes towards renewable energy, and hint at the likelihood that new forms of energy production will (or will not) be adopted in the region. After a detailed look at the recordings we will report back findings to the participants.

Background material distributed at meeting

Renovating existing dams to produce power: Flinton Dam as one example

Who is responsible

Quinte Conservation Authority and/or any private company that has agreement with Quinte Conservation Authority.

Note :There are dozens of dams in the region. Many are owned and operated by Quinte Conservation Authority (QCA) or Mississippi Valley Conservation Authority and used to meet recreational, drinking water and wildlife habitat needs.



Costs

At least \$1 million to build.

Benefits

Approximately 450 MWhr electricity could be produced per year. If sold under FIT program this would generate revenues of \$55,000. Equivalent to 94 tonnes of greenhouse gases avoided.

Other considerations

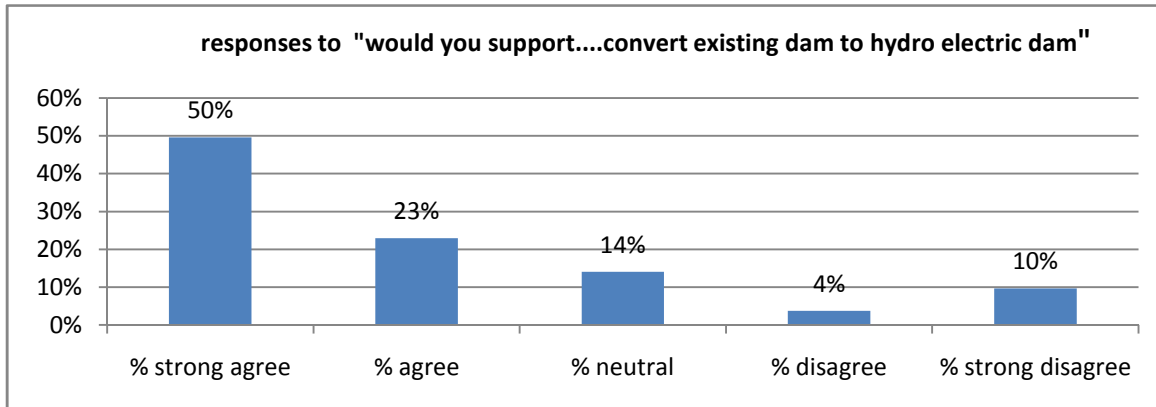
The dam provided electric power to buildings in Flinton village 80 years ago.

Dam portion re-constructed 1979, remnants of original turbine structure still in place, also a picnic and swimming area.

Quinte C.A. and private company signed an “intent to develop” the dam for power production in 2009.

Amount of power produced at hydro dams depends on water flow and difference in elevation (“head”). Flinton site estimates are mean flow 4.8 m³/s, difference in elevation (“head”) 5 metres with capacity to produce 79 KW of power.

Public opinion



Source: Household energy use and energy attitudes in Addington Highlands and North Frontenac Region Survey. February/March 2011 (n=152 margin of error +/-7.6)

Producing electricity from the sun: Solar panels on roof of Ompah Fire Hall/EMS base

Who is responsible

North Frontenac township.

North Frontenac Council passed resolution to support Frontenac County led initiative "... to install at least one roof-top microFIT project in each participating Township..." (July 15, 2010)

Costs

\$80,000 for 80 square feet of panels with 10 KW generating capacity



Benefits

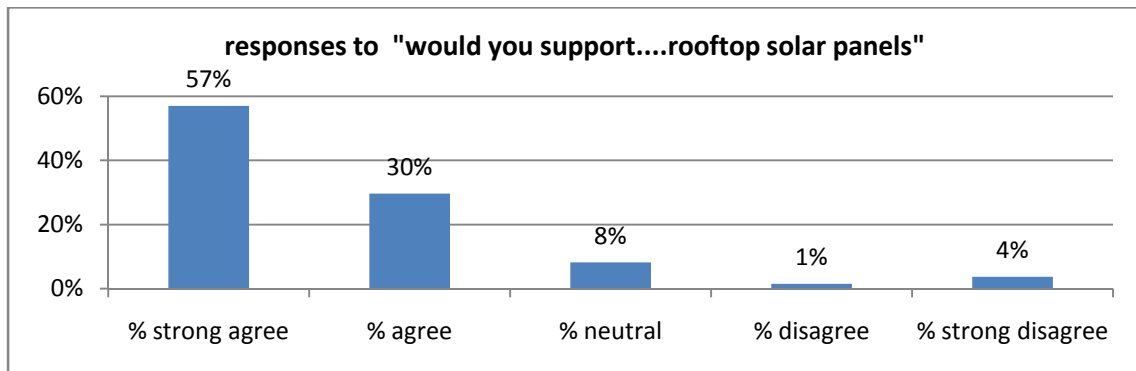
Approximately 12,000 KWhr electricity could be produced per year. If sold under microFIT program this would give revenues of approximately \$9600. Equivalent to 2.4 tonnes of greenhouse gases avoided.

Other considerations

Panels would help the fire hall building meet environment and energy building standards, which increases costs but the County requires to co-fund construction.

Construction of Fire Hall / EMS building is stalled over lack of agreement between County and Township over costs.

Public opinion



Source: Household energy use and energy attitudes in Addington Highlands and North Frontenac Region Survey. February/March 2011 (n=152 margin of error +/-7.6)

Electricity from wind : Wind turbines near Denbigh

Who is responsible

Private companies.

Note: Test towers show wind speeds strong enough to generate power. Starting 5 years ago several companies expressed interest in putting up turbines. There appears to be no active proposal at the moment

Costs

Reported to be \$200 million +



Photo: Wolfe Island. Linda Thomas-Fisher .National Post

Benefits

Approximately 275,000 MWhr electricity could be produced per year, \$3.7 million dollars with FIT price, 55,000 tonnes of greenhouse gases avoided.

Local construction jobs. Lease revenue for landowners. Tax revenue for township.

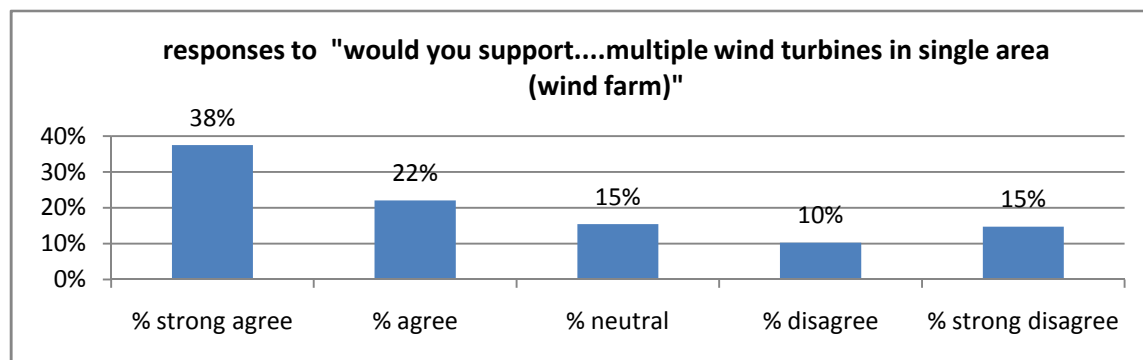
Other considerations

Would cover 25 square km of land.

Interest has been for turbines on private land and / or Crown Land. Algonquin land claim means any new use of Crown land proceeds cautiously.

One company indicated distance to high voltage transmission wires as reason proposal did not proceed.

Public opinion



Source: Household energy use and energy attitudes in Addington Highlands and North Frontenac Region Survey. February/March 2011 (n=152 margin of error +/-7.6)

New ways to use wood: Biomass pellet boiler at North Addington Education Centre

Who is responsible

Limestone School Board under a Ministry of Education and Ministry of Research and Innovation program.

School is one of 150 in Province selected to pilot test green technologies.

Costs

Installation cost not yet known probably several hundred thousand dollars. Pellet boiler will require 200 tonnes of pellets per year.



Benefits

60% of heating needs at school to be met from wood pellets instead of heating oil. Avoid greenhouse gas emissions and use local resource from forest industry.

Other considerations

No pellet making facility within Addington Highlands or North Frontenac.

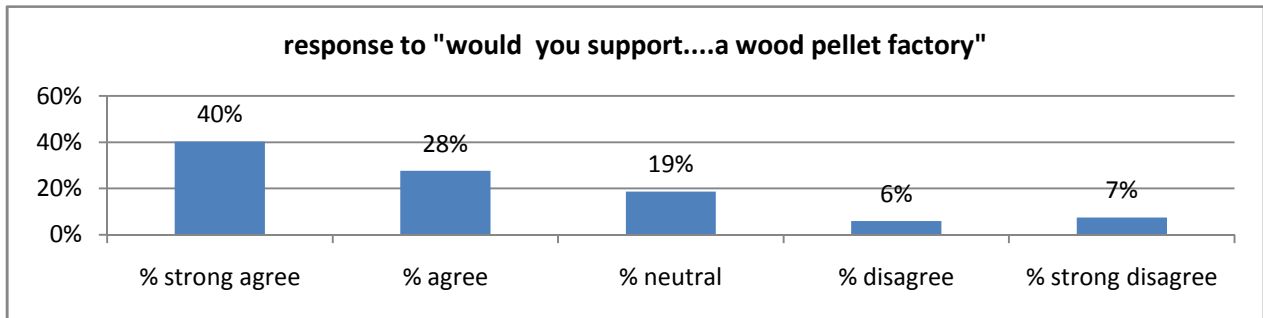
Installation of boiler behind schedule

Mazinaw Lanark Forestry Inc. conducting trials on the amount of non-lumber, non-pulp woody material (“slash” and “thinnings”) available annually in the region. Estimate enough available to make 10 – 15,000 tonnes of pellets.

Taking slash and thinnings requires changes and additional steps during cutting. Most changes for selective cutting, fewest for clear-cutting.

Newspaper reports of sawmill in Bracebridge building 50,000 tonne / yr pellet factory for \$15 million and supply does not appear to be slash / thinnings. Smaller and cheaper pellet mills possible.

Public opinion



Source: Household energy use and energy attitudes in Addington Highlands and North Frontenac Region Survey. February/March 2011 (n=152 margin of error +/-7.6)

Appendix 3 : Renewable Energy Expo



[Back to Home](#)

Feature Article - June 23, 2011

Renewable Energy Expo Highlights Economic Options And Opportunities

by Julie Druker

Photo: John Smigielski of Mazinaw Lanark Forest Inc., John Kittle, Paul Lehman, Stewart Fast and Joe Hendry at the Renewable Energy Expo in Cloyne

Experts and suppliers of renewable energy and equipment gathered at the Barrie Hall in Cloyne on June 18 to share their knowledge with the public. Stewart Fast, a PHD student at the University of Ottawa, who is presently working on a project looking at public attitudes towards renewable energy in rural Ontario, said the Expo resulted from people wanting to know about different renewable energy options. "Our goal here is to provide a venue for information sharing."



That sharing included a presentation by Joe Hendry, the environmental energy technologist for the Limestone District School Board, who spoke about the new biomass boiler that is currently being installed at the North Addington Education Centre in Cloyne. The wood pellet boiler will offset fuel oil costs by using renewable fuel (wood pellets) to heat the school, thereby reducing the school's carbon footprint and greenhouse gases.

Funded by the ministries of Education, and Research and Innovation, the system will be operational this fall. This is the first project of its kind in the LDSB, and Hendry said he had to travel to New Hampshire to see the closest unit like this in operation. Three other similar projects are underway: one in Nippissing, one in Bancroft and one near Ottawa. NAEC was chosen because the systems require a large amount of space. How does it work? Essentially, wood pellets will be burned to supply the hot water that will run through the boiler system. Both oil and wood pellets will be working together to heat the school. The new system required the construction of a 30 x 60 foot building at the north end of the school to house the biomass boiler, which has underground pipes feeding into the school. Also constructed was a 35 foot silo that will hold 100 tonnes of the pellets.

The Ministry of Education has allotted a total of \$2 million to the four Ontario school projects, whose aim is to introduce renewable carbon-neutral green energy technologies into Ontario schools. Hendry rolled out the funding applications for all four projects and has been watching over the NAEC project since it began in October

The Expo also included a tour of the Mazinaw Lake control dam located at the bottom end of Mazinaw Lake on the Mississippi River. It is one of about 30 dams on the river. Paul Lehman, general manager with the Mississippi Valley Conservation Authority, and North Frontenac councilor, Fred Perry, led the tour. Lehman said the purpose was to show the green energy potential of these river waterways and also to show property owners who have running water on their properties how they might harness that energy to produce hydro. "These kind of control dams, due to the variance in water levels above and below them, have the potential through the installation of turbines to create energy, which is one of the things we are very interested in looking at. We have undertaken feasibility studies and now we have to look at the possible number of ways of making these type of potential projects viable."

John Kittle, deputy chair of the Frontenac Green Energy Task Force, was also in attendance at the Expo since his group is interested in both new biomass fuel systems as well as water power potential. "What we are trying to encourage is economic development based on renewable energy and there is lot of potential here and a lot to be learned. I learned today that the Ontario Power Generation (OPG) is looking at pellet boilers, which could translate into opportunities for pelletization here. This could be a very exciting development." Regarding water power Kittle said, "Water power is the greenest of green energy sources and is absolutely constant. Right now we are very interested in the new fish-friendly run of river micro hydro technologies as well."

Stewart Fast hopes to use information gained from the Expo for his project and hopes to share that information with the community, the townships and county governments. He foresees it including some recommendations to help the community adapt to the new renewable energy economy that looks to be looming ahead.

Appendix 4 : Full list of articles reviewed in chapter 1

Agterbosch S, Meertens RM, Vermeulen WJV (2009) The relative importance of social and institutional conditions in the planning of wind power projects. *Renewable & Sustainable Energy Reviews*, 13, 393-405.

Aitken M (2010) A three-dimensional view of public participation in Scottish land-use planning: Empowerment or social control? *Planning Theory*, 9, 248-264.

Aitken M (2010) Why we still don't understand the social aspects of wind power: A critique of key assumptions within the literature. *Energy Policy*, 38, 1834-1841.

Aitken M, McDonald S, Strachan P (2008) Locating 'power' in wind power planning processes: the (not so) influential role of local objectors. *Journal of Environmental Planning and Management*, 51, 777-799.

Alexander KA, Janssen R, Arciniegas G et al. (2012) Interactive Marine Spatial Planning: Siting Tidal Energy Arrays around the Mull of Kintyre. *Plos One*, 7,

Allan G, McGregor P, Swales K (2011) The Importance of Revenue Sharing for the Local Economic Impacts of a Renewable Energy Project: A Social Accounting Matrix Approach. *Regional Studies*, 45, 1171-1186.

Allen J, Jones SP (2012) Tilting at Windmills in a changing climate: a performative walking practice and dance-documentary film as an embodied mode of engagement and persuasion. *Ride-the Journal of Applied Theatre and Performance*, 17, 209-227.

Alvial-Palavicino C, Garrido-Echeverria N, Jimenez-Estevéz G et al. (2011) A methodology for community engagement in the introduction of renewable based smart microgrid. *Energy for Sustainable Development*, 15, 314-323.

Arabatzi G, Myronidis D (2011) Contribution of SHP Stations to the development of an area and their social acceptance. *Renewable & Sustainable Energy Reviews*, 15, 3909-3917.

Bailey I, West J, Whitehead I (2011) Out of Sight but Not out of Mind? Public Perceptions of Wave Energy. *Journal of Environmental Policy & Planning*, 13, 139-157.

Barry J, Ellis G, Robinson C (2008) Cool rationalities and hot air: A rhetorical approach to understanding debates on renewable energy. *Global Environmental Politics*, 8, 67-+.

Batley SL, Colbourne D, Fleming PD et al. (2001) Citizen versus consumer: challenges in the UK green power market. *Energy Policy*, 29, 479-487.

Bell D, Gray T, Haggett C (2005) The 'Social Gap' in Wind Farm Siting Decisions: Explanations and Policy Responses. *Environmental Politics*, 14, 460-477.

Bergek A (2010) Levelling the playing field? The influence of national wind power planning instruments on conflicts of interests in a Swedish county. *Energy Policy*, 38, 2357-2369.

Berry R, Higgs G (2012) Gauging levels of public acceptance of the use of visualisation tools in promoting public participation; a case study of wind farm planning in South Wales, UK. *Journal of Environmental Planning and Management*, 55, 229-251.

Bollino CA (2009) The Willingness to Pay for Renewable Energy Sources: The Case of Italy with Socio-demographic Determinants. *Energy Journal*, 30, 81-96.

Brannstrom C, Jepson W, Persons N (2011) Social Perspectives on Wind-Power Development in West Texas. *Annals of the Association of American Geographers*, 101, 839-851.

Bridge G, Bouzarovski S, Bradshaw M et al. (2012) Geographies of energy transition: Space, place and the low-carbon economy. *Energy Policy*, <http://dx.doi.org/10.1016/j.enpol.2012.10.066>,

Bronfman NC, Jimenez RB, Arevalo PC et al. (2012) Understanding social acceptance of electricity generation sources. *Energy Policy*, 46, 246-252.

Burton J, Hubacek K (2007) Is small beautiful? A multicriteria assessment of small-scale energy technology applications in local governments. *Energy Policy*, 35, 6402-6412.

Cass N, Walker G, Devine-Wright P (2010) Good Neighbours, Public Relations and Bribes: The Politics and Perceptions of Community Benefit Provision in Renewable Energy Development in the UK. *Journal of Environmental Policy & Planning*, 12, 255-275.

Colbourne D, Lorenzoni I, Powell J et al. (1999) Identifying social attitudes to assist urban energy planning in Leicester. *International Journal of Sustainable Development and World Ecology*, 6, 265-280.

Coleby AM, Miller DR, Aspinall PA (2009) Public attitudes and participation in wind turbine development *Journal of Environmental Assessment Policy and Management*, 11, 69-95.

Cope MA, McLafferty S, Rhoads BL (2011) Farmer Attitudes Toward Production of Perennial Energy Grasses in East Central Illinois: Implications for Community-Based Decision Making. *Annals of the Association of American Geographers*, 101, 852-862.

Corscadden K, Wile A, Yiridoe E (2012) Social license and consultation criteria for community wind projects. *Renewable Energy*, 44, 392-397.

Cowell R, Bristow G, Munday M (2011) Acceptance, acceptability and environmental justice: the role of community benefits in wind energy development. *Journal of Environmental Planning and Management*, 54, 539-557.

Culley MR, Carton AD, Weaver SR et al. (2011) Sun, Wind, Rock and Metal: Attitudes toward Renewable and Non-renewable Energy Sources in the Context of Climate Change and Current Energy Debates. *Current Psychology*, 30, 215-233.

Dalton GJ, Lockington DA, Baldock TE (2008) A survey of tourist attitudes to renewable energy supply in Australian hotel accommodation. *Renewable Energy*, 33, 2174-2185.

Delshad AB, Raymond L, Sawicki V et al. (2010) Public attitudes toward political and technological options for biofuels. *Energy Policy*, 38, 3414-3425.

Devine-Wright H, Devine-Wright P (2009) Social representations of electricity network technologies: Exploring processes of anchoring and objectification through the use of visual research methods. *British Journal of Social Psychology*, 48, 357-373.

Devine-Wright P (2005) Beyond NIMBYism: towards an integrated framework for understanding public perceptions of wind energy. *Wind Energy*, 8, 125-139.

Devine-Wright P (2009) Rethinking NIMBYism: The Role of Place Attachment and Place Identity in Explaining Place-protective Action. *Journal of Community & Applied Social Psychology*, 19, 426-441.

Devine-Wright P (2011) Enhancing local distinctiveness fosters public acceptance of tidal energy: A UK case study. *Energy Policy*, 39, 83-93.

Devine-Wright P (2011) Place attachment and public acceptance of renewable energy: A tidal energy case study. *Journal of Environmental Psychology*, 31, 336-343.

Devine-Wright P (2011) Public engagement with large-scale renewable energy technologies: breaking the cycle of NIMBYism. *Wiley Interdisciplinary Reviews-Climate Change*, 2, 19-26.

Devine-Wright P, Howes Y (2010) Disruption to place attachment and the protection of restorative environments: A wind energy case study. *Journal of Environmental Psychology*, 30, 271-280.

Devine-Wright P, McAlpine G, Batley-White S (2001) Wind turbines in the landscape: An evaluation of local community involvement and other considerations in UK wind farm development. 133-137 pp

Dowd A-M, Boughen N, Ashworth P et al. (2011) Geothermal technology in Australia: Investigating social acceptance. *Energy Policy*, 39, 6301-6307.

Dusyk N (2011) Downstream Effects of a Hybrid Forum: The Case of the Site C Hydroelectric Dam in British Columbia, Canada. *Annals of the Association of American Geographers*, 101, 873-881.

Ek K (2005) Public and private attitudes towards "green" electricity: the case of Swedish wind power. *Energy Policy*, 33, 1677-1689.

Eltham DC, Harrison GP, Allen SJ (2008) Change in public attitudes towards a Cornish wind farm: Implications for planning. *Energy Policy*, 36, 23-33.

Erbil AO (2011) Social acceptance of the clean energy concept: Exploring the clean energy understanding of Istanbul residents. *Renewable & Sustainable Energy Reviews*, 15, 4498-4506.

Ertor-Akyazi P, Adaman F, Ozkaynak B et al. (2012) Citizens' preferences on nuclear and renewable energy sources: Evidence from Turkey. *Energy Policy*, 47, 309-320.

Evans B, Parks J, Theobald K (2011) Urban wind power and the private sector: community benefits, social acceptance and public engagement. *Journal of Environmental Planning and Management*, 54, 227-244.

Firestone J, Kempton W, Krueger A (2009) Public Acceptance of Offshore Wind Power Projects in the USA. *Wind Energy*, 12, 183-202.

Gerpott TJ, Mahmudova I (2010) Determinants of green electricity adoption among residential customers in Germany. *International Journal of Consumer Studies*, 34, 464-473.

Graham JB, Stephenson JR, Smith IJ (2009) Public perceptions of wind energy developments: Case studies from New Zealand. *Energy Policy*, 37, 3348-3357.

Groesche P, Schroeder C (2011) Eliciting public support for greening the electricity mix using random parameter techniques. *Energy Economics*, 33, 363-370.

Haggett C (2008) Over the Sea and Far Away? A Consideration of the Planning, Politics and Public Perception of Offshore Wind Farms. *Journal of Environmental Policy & Planning*, 10, 289-306.

Haggett C (2011) Understanding public responses to offshore wind power. *Energy Policy*, 39, 503-510.

Halder P, Pietarinen J, Havu-Nuutinen S et al. (2010) Young citizens' knowledge and perceptions of bioenergy and future policy implications. *Energy Policy*, 38, 3058-3066.

Han J, Mol APJ, Lu Y et al. (2008) Small-scale bioenergy projects in rural China: Lessons to be learnt. *Energy Policy*, 36, 2154-2162.

Heras-Saizarbitoria I, Cilleruelo E, Zamanillo I (2011) Public acceptance of renewables and the media: an analysis of the Spanish PV solar experience. *Renewable & Sustainable Energy Reviews*, 15, 4685-4696.

Higgs G, Berry R, Kidner D et al. (2008) Using IT approaches to promote public participation in renewable energy planning: Prospects and challenges. *Land Use Policy*, 25, 596-607.

Hindmarsh R, Matthews C (2008) Deliberative Speak at the Turbine Face: Community Engagement, Wind Farms, and Renewable Energy Transitions, in Australia. *Journal of Environmental Policy & Planning*, 10, 217-232.

Hunold C, Leitner S (2011) 'Hasta la vista, baby!'The Solar Grand Plan, environmentalism, and social constructions of the Mojave Desert. *Environmental Politics*, 20, 687-704.

Iniyani S, Suganthi L, Jagadeesan TR et al. (2000) Reliability based socio economic optimal renewable energy model for India. *Renewable Energy*, 19, 291-297.

Iniyani S, Suganthi L, Samuel AA (2001) A survey of social acceptance in using renewable energy sources for the new millennium. *Renewable Energy*, 24, 657-661.

Jepson W, Brannstrom C, Persons N (2012) "We Don't Take the Pledge": Environmentalism and environmental skepticism at the epicenter of US wind energy development. *Geoforum*, 43, 851-863.

Johnson DM, Halvorsen KE, Solomen BD (2011) Upper Midwestern U.S. consumers and ethanol: Knowledge, beliefs and consumption. *Biomass & Bioenergy*, 35, 1454-1464.

Jones CR, Eiser JR (2009) Identifying predictors of attitudes towards local onshore wind development with reference to an English case study. *Energy Policy*, 37, 4604-4614

Jones CR, Eiser JR (2010) Understanding 'local' opposition to wind development in the UK: How big is a backyard? *Energy Policy*, 38, 3106-3117.

Kaldellis JK, Kapsali M, Katsanou E (2012) Renewable energy applications in Greece-What is the public attitude? *Energy Policy*, 42, 37-48.

Kilinc A, Stanisstreet M, Boyes E (2009) Incentives and disincentives for using renewable energy: Turkish students' ideas. *Renewable & Sustainable Energy Reviews*, 13, 1089-1095.

Kostakis I, Sardianou E (2012) Which factors affect the willingness of tourists to pay for renewable energy? *Renewable Energy*, 38, 169-172.

Kraxner F, Yang J, Yamagata Y (2009) Attitudes towards forest, biomass and certification - A case study approach to integrate public opinion in Japan. *Bioresource Technology*, 100, 4058-4061.

Krohn S, Damborg S (1999) On public attitudes towards wind power. *Renewable Energy*, 16, 954-960.

Kwan CL (2012) Influence of local environmental, social, economic and political variables on the spatial distribution of residential solar PV arrays across the United States. *Energy Policy*, 47, 332-344.

Ladenburg J (2010) Attitudes towards offshore wind farms-The role of beach visits on attitude and demographic and attitude relations. *Energy Policy*, 38, 1297-1304.

Li H, Jenkins-Smith HC, Silva CL et al. (2009) Public support for reducing US reliance on fossil fuels: Investigating household willingness-to-pay for energy research and development. *Ecological Economics*, 68, 731-742.

Loring J (2007) Wind energy planning in England, Wales and Denmark: Factors influencing project success. *Energy Policy*, 35, 2648-2660.

Malesios C, Arabatzis G (2010) Small hydropower stations in Greece: The local people's attitudes in a mountainous prefecture. *Renewable & Sustainable Energy Reviews*, 14, 2492-2510.

Mallett A (2007) Social acceptance of renewable energy innovations: The role of technology cooperation in urban Mexico. *Energy Policy*, 35, 2790-2798.

Maruyama Y, Nishikido M, Iida T (2007) The rise of community wind power in Japan: Enhanced acceptance through social innovation. *Energy Policy*, 35, 2761-2769.

McKeown C, Adelaja A, Calnin B (2011) On developing a prospecting tool for wind industry and policy decision support. *Energy Policy*, 39, 905-915.

McLachlan C (2009) 'You don't do a chemistry experiment in your best china!': Symbolic interpretations of place and technology in a wave energy case. *Energy Policy*, 37, 5342-5350.

Menegaki AN (2012) A social marketing mix for renewable energy in Europe based on consumer stated preference surveys. *Renewable Energy*, 39, 30-39.

Menges R, Traub S (2009) An Experimental Study on the Gap between Willingness to Pay and Willingness to Donate for Green Electricity. *Finanzarchiv*, 65, 335-357.

Michalena E, Angeon V (2009) Local challenges in the promotion of renewable energy sources: The case of Crete. *Energy Policy*, 37, 2018-2026.

Moller B (2010) Spatial analyses of emerging and fading wind energy landscapes in Denmark. *Land Use Policy*, 27, 233-241.

Molnarova K, Sklenicka P, Stiborek J et al. (2012) Visual preferences for wind turbines: Location, numbers and respondent characteristics. *Applied Energy*, 92, 269-278.

Monroe MC, Oxarart A (2011) Woody biomass outreach in the southern United States: A case study. *Biomass & Bioenergy*, 35, 1465-1473.

Musall FD, Kuik O (2011) Local acceptance of renewable energy-A case study from southeast Germany. *Energy Policy*, 39, 3252-3260.

Muylaert de Araujo MS, Vasconcelos de Freitas MA (2008) Acceptance of renewable energy innovation in Brazil - case study of wind energy. *Renewable & Sustainable Energy Reviews*, 12, 584-591.

Nadai A, van der Horst D (2010) Wind power planning, landscapes and publics. *Land Use Policy*, 27, 181-184.

O'Keeffe A, Haggett C (2012) An investigation into the potential barriers facing the development of offshore wind energy in Scotland: Case study - Firth of Forth offshore wind farm. *Renewable & Sustainable Energy Reviews*, 16, 3711-3721.

Pasqualetti MJ (2001) Wind energy landscapes: Society and technology in the California desert. *Society & Natural Resources*, 14, 689-699.

Pasqualetti MJ (2011) Opposing Wind Energy Landscapes: A Search for Common Cause. *Annals of the Association of American Geographers*, 101, 907-917.

Pasqualetti MJ (2011) SOCIAL BARRIERS TO RENEWABLE ENERGY LANDSCAPES*. *Geographical Review*, 101, 201-223.

Phadke R (2011) Resisting and Reconciling Big Wind: Middle Landscape Politics in the New American West. *Antipode*, 43, 754-776.

Pidgeon N, Demski CC (2012) From nuclear to renewable: Energy system transformation and public attitudes. *Bulletin of the Atomic Scientists*, 68, 41-51.

Ribeiro F, Ferreira P, Araujo M (2011) The inclusion of social aspects in power planning. *Renewable & Sustainable Energy Reviews*, 15, 4361-4369.

Richards G, Noble B, Belcher K (2012) Barriers to renewable energy development: A case study of large-scale wind energy in Saskatchewan, Canada. *Energy Policy*, 42, 691-698.

Rogers JC, Simmons EA, Convery I et al. (2008) Public perceptions of opportunities for community-based renewable energy projects. *Energy Policy*, 36, 4217-4226.

Rogers JC, Simmons EA, Convery I et al. (2012) Social impacts of community renewable energy projects: findings from a woodfuel case study. *Energy Policy*, 42, 239-247.

Sanders DJ, Roberts MC, Ernst SC et al. (2010) Digesters and demographics: Identifying support for anaerobic digesters on dairy farms. *Journal of Dairy Science*, 93, 5503-5508.

Sauter R, Watson J (2007) Strategies for the deployment of micro-generation: Implications for social acceptance. *Energy Policy*, 35, 2770-2779.

Savvanidou E, Zervas E, Tsagarakis KP (2010) Public acceptance of biofuels. *Energy Policy*, 38, 3482-3488.

Schweizer-Ries P (2008) Energy sustainable communities: Environmental psychological investigations. *Energy Policy*, 36, 4126-4135.

Shamsuzzoha AHM, Grant A, Clarke J (2012) Implementation of renewable energy in Scottish rural area: A social study. *Renewable & Sustainable Energy Reviews*, 16, 185-191.

Sherry-Brennan F, Devine-Wright H, Devine-Wright P (2010) Public understanding of hydrogen energy: A theoretical approach. *Energy Policy*, 38, 5311-5319.

Slattery MC, Johnson BL, Swofford JA et al. (2012) The predominance of economic development in the support for large-scale wind farms in the U.S. Great Plains. *Renewable & Sustainable Energy Reviews*, 16, 3690-3701.

Solomon BD, Johnson NH (2009) Valuing climate protection through willingness to pay for biomass ethanol. *Ecological Economics*, 68, 2137-2144.

Spaeth P, Rohracher H (2010) 'Energy regions': The transformative power of regional discourses on socio-technical futures. *Research Policy*, 39, 449-458.

Stefanovich MAP, Ieee (2011) Does concern for global warming explain support for wave energy development? A case study from Oregon, USA. In: 2011 Ieee - Oceans Spain. (eds

Stephens JC, R and GM, Melnick LL (2009) Wind Energy in US Media: A Comparative State-Level Analysis of a Critical Climate Change Mitigation Technology. *Environmental Communication-a Journal of Nature and Culture*, 3, 168-190.

Toke D, Breukers S, Wolsink M (2008) Wind power deployment outcomes: How can we account for the differences? *Renewable & Sustainable Energy Reviews*, 12, 1129-1147.

Trutnevyte E, Stauffacher M, Scholz RW (2011) Supporting energy initiatives in small communities by linking visions with energy scenarios and multi-criteria assessment. *Energy Policy*, 39, 7884-7895.

Tsagarakis KP, Bounialetou F, Gillas K et al. (2011) Tourists' attitudes for selecting accommodation with investments in renewable energy and energy saving systems. *Renewable & Sustainable Energy Reviews*, 15, 1335-1342.

Upham P (2009) Applying environmental-behaviour concepts to renewable energy siting controversy: Reflections on a longitudinal bioenergy case study. *Energy Policy*, 37, 4273-4283.

Upham P, Shackley S (2006) The case of a proposed 21.5 MWe biomass gasifier in Winkleigh, Devon: Implications for governance of renewable energy planning. *Energy Policy*, 34, 2161-2172.

Upreti BR, van der Horst D (2004) National renewable energy policy and local opposition in the UK: the failed development of a biomass electricity plant. *Biomass & Bioenergy*, 26, 61-69.

van der Horst D (2007) NIMBY or not? Exploring the relevance of location and the politics of voiced opinions in renewable energy siting controversies. *Energy Policy*, 35, 2705-2714.

Walker G (2011) The role for 'community' in carbon governance. *Wiley Interdisciplinary Reviews-Climate Change*, 2, 777-782.

Walker G, Cass N (2007) Carbon reduction, "the public" and renewable energy: engaging with socio-technical configurations. *Area*, 39, 458-469.

Warren CR, Birnie RV (2009) Re-powering Scotland: Wind Farms and the 'Energy or Environment?' Debate. *Scottish Geographical Journal*, 125, 97-126.

Warren CR, McFadyen M (2010) Does community ownership affect public attitudes to wind energy? A case study from south-west Scotland. *Land Use Policy*, 27, 204-213.

West J, Bailey I, Winter M (2010) Renewable energy policy and public perceptions of renewable energy: A cultural theory approach. *Energy Policy*, 38, 5739-5748.

Whelan B, Muchapondwa E (2011) Enhancing consumers' voluntary use of small-scale wind turbines to generate their own electricity in South Africa. *Journal of Energy in Southern Africa*, 22, 13-21.

Wiser RH (2007) Using contingent valuation to explore willingness to pay for renewable energy: A comparison of collective and voluntary payment vehicles. *Ecological Economics*, 62, 419-432.

Wiser RH, Fowlie M, Holt EA (2001) Public goods and private interests: understanding non-residential demand for green power. *Energy Policy*, 29, 1085-1097.

Wolsink M (2000) Wind power and the NIMBY-myth: institutional capacity and the limited significance of public support. *Renewable Energy*, 21, 49-64.

Wolsink M (2007) Wind power implementation: The nature of public attitudes: Equity and fairness instead of 'backyard motives'. *Renewable & Sustainable Energy Reviews*, 11, 1188-1207.

Wolsink M (2010) Contested environmental policy infrastructure: Socio-political acceptance of renewable energy, water, and waste facilities. *Environmental Impact Assessment Review*, 30, 302-311.

Wolsink M (2010) Near-shore wind power-Protected seascapes, environmentalists' attitudes, and the technocratic planning perspective. *Land Use Policy*, 27, 195-203.

Wolsink M (2012) The research agenda on social acceptance of distributed generation in smart grids: Renewable as common pool resources. *Renewable & Sustainable Energy Reviews*, 16, 822-835.

Woolley O (2010) Trouble on the Horizon? Addressing Place-based Values in Planning for Offshore Wind Energy. *Journal of Environmental Law*, 22, 223-250.

Wuestenhagen R, Wolsink M, Buerer MJ (2007) Social acceptance of renewable energy innovation: An introduction to the concept. *Energy Policy*, 35, 2683-2691.

Yuan X, Zuo J, Ma C (2011) Social acceptance of solar energy technologies in China-End users' perspective. *Energy Policy*, 39, 1031-1036.

Zhai P, Williams ED (2012) Analyzing consumer acceptance of photovoltaics (PV) using fuzzy logic model. *Renewable Energy*, 41, 350-357.

Zoellner J, Schweizer-Ries P, Wemheuer C (2008) Public acceptance of renewable energies: Results from case studies in Germany. *Energy Policy*, 36, 4136-4141.

Zografakis N, Sifaki E, Pagalou M et al. (2010) Assessment of public acceptance and willingness to pay for renewable energy sources in Crete. *Renewable & Sustainable Energy Reviews*, 14, 1088-1095.

Appendix 5 : example of coding system

Examples of analysis (extracted from group interview held March 23, 2011)

#	Speaker	Utterance	reasons emphasized	Coding	Explanation for coding	Other coding or other comments
1	Phil	If we had a storage system for electricity, I think that renewable energy would have a whole different future.	Truth	Truth: technological fact	Phil's utterance refers to objective-world facts of physical characteristics of electricity. His utterance may also refer to the social-world and different ways to arrange electrical infrastructure	Phil attributes technology as a force that determines and coordinates broader changes. The statement has also been coded as coordinating force
2	Todd	What is the potential for that?	Sincerity	Understanding: sincere	Todd appears to accept that electricity storage is a relevant fact, but asks Phil for clarification and to tell Todd (and the rest of the audience) why they should believe him and trust his assessment.	By questioning Phil in this way, Todd could be doing several things. He could be showing deference or skepticism of Phil or sympathy with the need for attention to electricity storage.
3	Phil	Well there is batteries, there is pump storage, there is flywheels there is hydrogen ...	Truth	None	To keep the analysis manageable only new claims from speakers or utterances that indicate understanding / agreement / disagreement with fellow participants are coded.	Phil's list of techniques for storing electricity emphasizes his initial technological truth claim without introducing a new knowledge claim or reacting to Joe's question in other ways (such as invoking his authority as an engineer)
4	Ryan	Capacitors	Truth	Understanding : truth	A new participant Ryan understands and contributes to the factual contents of Phil's list.	
5	Phil	(.) capacitors, yea there are technologies there is just no money going into tremendous research	Rightness	Rightness : experiment	Having demonstrated the basis for the facts of utterance #1 (and seemingly validated by Ryan), Phil's moves to a new claim that society should invest, research and experiment in this area.	Phil is trying to shape the attention of listeners to a particular solution to advancing renewable energy. This is also coded for coordinating force for the reference to money
6	Ryan	And large efficiency losses when you start storing.	Truth	Disagreement : truth Understanding : ignored emphasized claim	Two codes are used here to track the two consequences of Ryan's utterance. First he disagrees (or complicates) Phil's truth claim that storage automatically would enable more renewable energy and second, he ignores the social world rightness claim about devoting resources to research.	Here we can clearly see a key aspect of Habermas' theory that is often mischaracterized by critics. The achievement of mutual understanding between Ryan and Phil ≠ consensus between these individuals, only understanding of a common reference point to enter into further argumentation / discourse.
7	Phil	Not with a flywheel system I wouldn't think.	Truth, Sincerity	Disagreement: truth	Phil challenges the truth of Ryan's general statement on efficiency loss.	Phil's use of the personal pronoun "I" during a technical exchange with Ryan signals Phil's own subjective reflection on received "facts"
8	Ryan	(.) Well, pump storage is the one I think of.	Truth, sincerity	Understanding : sincere	Ryan and Phil seem to reach understanding that they have each have sincere subjective interpretations of the facts of storage informed by their own experiences	Until this point the facts of storage were overtly argued only from a factual basis

9	Phil	There must be technologies but they just have not been explored because energy is too cheap.	Rightness	Rightness: financial sense	Phil's statement refers to an earlier utterance (not part of this extract) of the same theme and is again coded for this.	
10	Lucas	The forest is your storage of solar energy basically	Truth	Understanding : true	Lucas enters the discussion with his own contribution to the list of energy storage technologies	By reframing the forest as an energy storage technology Lucas' utterance show how taken-for-granted understandings of the world (i.e. forests normally thought of as collection of trees or lumber or recreation) can be examined differently during communication. Coded as examination of life world assumptions