Visualizing Public Participation:
Wind Farm Development in Central Washington

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ABSTRACT

Washington State has seen a boom of industrial-scale wind farm construction over the past 10 years. The siting process for these projects has prompted conflict between those most directly impacted and those who favor broader community benefits.

The intent of this research is to develop an extensive geographic visual guide, which captures the political and geographic scales of this struggle and sheds light on who participates in the siting process and what that participation means for understanding broader policy questions about energy development, rural landscapes and public participation. Information on participating stakeholders was obtained by analyzing publicly available documents and media sources. Participants' names, physical locations, and stances on wind projects were then inputted into an online mapping platform alongside locations of approved wind turbines.

I believe that the research methods employed here will help inform future efforts in visualizing qualitative data and that the final map will highlight how inequalities manifest in large scale industrial development.

INTRODUCTION

Wind energy is the fastest-growing source of electricity in the world ("America's Wind," 2013; *Wind Energy*, 2014). Wind energy is a considerably cleaner energy source than heavily polluting non-renewable fossil fuels such as coal, oil, and natural gas and is most often promoted for its environmental benefits (Klass, 2003). At the national scale, wind power is seen as a stable source of energy which can help contribute to the idea of national energy independence. At a more local scale, developers tout large financial benefits to the communities in which the wind farms are located. Increased tax revenue from the leasing of lands can provide hundreds of thousands of dollars to neighborhood schools or to maintaining roads. The construction of the wind farms is a massive project which can provide an in-flux of short-term jobs and related patronizing of local businesses, to long-term jobs maintaining the turbines (Aitken, 2010).

Washington State has relatively progressive attitudes toward the environment and accordingly in the form of elected officials and established legislation. The Energy Independence Act, passed by ballot initiative in 2006, requires large state electric utilities to acquire 15% of their power from renewable sources by 2020 (WA Department of Commerce, 2009). Interestingly this initiative does not include existing renewable hydropower projects which already provide over 75% of the state's power at an extremely low-cost, showing that some of the motivation for this initiative is financially focused.

Christine Gregoire, Washington State's governor from 2005 to 2013, expressed the connection to economics and environment as an official priority:

"With one of the richest, most diverse and beautiful landscapes in the world, we have an important legacy to protect. The health of our environment must be protected as it is essential to our quality of life and to the strength of our economy"
(Gregoire, 2012)

In a speech on Washington environmental policy Gregoire (2009) highlights being both a top 5 ranked place to do business and a top 5 "green" state, encouraging investments in green energy and jobs. There is an obvious motivation for the governor to use her power to see that the ideals of the voting majority of the population are maintained. However, as my research will show, this push for the broad benefits of wind farm development is done at the expense of others.

The widespread benefits of these industrial projects are (at least partially) offset by the substantial localized environmental impacts. Each wind turbine rotor has a wingspan larger than that of a jumbo jet, and typically rises over 400 feet high in order to take advantage of wind speeds available at higher altitudes. Local ecosystems are disturbed by the addition these turbines; most frequently cited is how the deceptively fast-moving rotors can significantly increase bird mortality rates (Smallwood, 2007). Wind turbines can also directly affect neighboring human residents. The physiological harms of shadow-flicker (strobing effect of sunlight by rotors), and wind-turbine syndrome (infrasonic-induced stress) are well-documented (G. Harding, P. Harding, & Wilkins, 2008; Pierpont, 2009).

There are long-term consequences of turbine construction to consider as well. Turbines only have a 20-30 year lifespan, after which there tend to be imperfect plans for retiring them (Martinez, Sanz, Pellegrini, Jimenez, & Blanco, 2009). Even when a decommissioning agreement is made with the developer, it often neglects the massive foundations which can contain up to 16,000 cubic feet of concrete and 70 tons of steel reinforcing buried over 30 feet deep. It can take generations for the local environment to break down these remaining structures and return to its pre-development state (Johnson, 2013).

While there are significant impacts of a single wind turbine, these impacts are multiplied when scaled up to the industrial level. In order for wind energy development to be as economically lucrative as possible, turbines are clustered together in wind farm complexes of 50-150+ turbines (European Wind Energy Association, 2009). They also require the construction of considerable infrastructure (roads, drainage, underground cables, etc.) which run between each turbine and out to the nearest available high-capacity energy transmission lines.

Typically wind farm complexes are built in rural areas where they contrast significantly with the surrounding landscape. Many residents have lived in these areas for long periods of time and have become accustomed to its unique aesthetic qualities. They become deeply connected with the land; it becomes a core part of their identity (Pasqualetti, Gipe, & Righter, 2002). However the landscape becomes fundamentally altered when a large industrial complex suddenly appears; the presence of dozens of spinning mechanical rotors can figuratively sever personal connections to the land. (Chow & Healey, 2008; Mason & Milbourne, 2014; Zografos & Mart, 2009). Those who are unwilling to live with the change often express challenges with moving away, claiming that their properties have since decreased in value (Carter, 2011; Shumaker, 2014).

Virtually all of the negative consequences of wind farm development befall on the local landscape and its residents. Neighboring residents are unevenly forced to bear these burdens,

while benefits are more broadly distributed. In wind energy siting processes, arguments for global environmental benefits are leveraged against those of local conservation, often referred to as a "green vs. green" conflict where both sides are using rhetoric of environmental responsibility (Pasqualetti, 2011; Warren, Lumsden, O'Dowd, & Birnie, 2005). Those living in rural areas wish to keep them as natural as possible, while those located elsewhere believe the negative impacts of wind farms are a small price to pay for cleaner sources of energy. The same broad vs. local debate over reasonable tradeoffs occurs when comparing economic benefits for the community (increased tax revenue) vs. the negative economic impact for local landowners (property value decrease).

During the public siting process, wind supporters often apply the derogative label of NIMBY ("Not In My Back Yard") to opponents of the projects, insinuating selfish motives (Devine-Write, 2005); why else would someone be against community benefits? This NIMBY theory, which claims that most people are only pro-wind until it negatively affects them in some way, has been discredited by multiple studies (Burningham, Barnett, & Thrush, 2006, Ek, 2005). A more appropriate description of stakeholder motivations has been proposed by Bell, Gray, Haggett, & Swaffield (2013) who claims that the majority of opinions on wind farm siting are of the "qualified" variety. He claims that most of those people labeled as NIMBYs are actually qualified supporters of wind power, meaning that they are accepting of wind projects (at both local and broad scales) when they take local concerns under reasonable consideration.

In most siting processes however there is little room for productive dialogue on what "reasonable considerations" actually might entail. Most formal avenues of participation, as created by policymakers, are specifically designed to limit discussion. Participants submit written documents or give short, strictly-timed comments, for "consideration" by policymakers. This one-way communication results in almost no dialogue or deliberation; the atmosphere ends up becoming adversarial in nature project (Ottinger, Hargrave, & Hopson, 2014). Participants rarely change opinions during the process and thus are often inclined to more vehemently express their existing views.

Despite failures in current iterations of siting processes, it has been shown that including citizens has many benefits, most notably: the advancement of social justice, better informing of the public, and the production of higher quality policies (Bryson, Quick, Slotterback, & Crosby, 2013). In the environmental justice literature, including citizen "non-expert" viewpoints is a key requirement of meaningful public participation (Schlosberg, 2008; Zavestoski, Shulman, & Schlosberg, 2006). Despite the obvious benefits, actually motivating citizens to engage in the policy process can be a challenge. Participants desire a feeling of empowerment, that their opinions are actually being considered and there are consequences to their actions (Bailey, Grossardt, 2010; Devine-Wright, Howes, 2010; Martin, 2004; Wolsink, 2007).

A truly empowering structure of participation would create a sense of trust among those involved, and result in collaborative decision-making scenarios (Koontz, 2004; Van Der Horst, 2007). Individual connections to the local landscape could be actively considered in collective siting discussions. The concept of 'landscape justice' as presented by Mason & Milbourne (2014), would be a more ethically-grounded way in which to deliberate these processes. In this concept he insists that true consensus in decision-making should not be a goal (as it's virtually impossible to attain), but instead there should be a greater appreciation of how people value the

landscape. In this way, participants can feel empowered, but still have reasonable expectations as to how fully their opinions may affect eventual policy decisions.

Despite the benefits to collaborative decision-making, it is not realistic to assume that the current structure of siting policy is going to be radically transformed in the near future. In the meantime, how can citizens become more empowered within the confines of the existing system?

Numerous studies have shown that broad feelings of empowerment can be generated when communities collaboratively discuss the potential concerns they may be experiencing (Aitken, 2010; Fraser, Dougill, Mabee, Reed, & McAlpine, 2006; Hindmarsh, 2010; Lange & Hehl-Lange, 2005). During these discussions, concerns can become more solidly defined, a simple act that can bring a community together in ways it previously had not been. People bond as they begin to discover the common values they share with one another (Manzo & Perkins, 2006). If done early enough in the siting process, acquiring a better collective understanding of concerns can reduce overall conflict within the community and enhance their shared political voice (Koontz 2003; Lange & Hehl-Lange, 2005). Perhaps the most empowering benefit to community collaboration is how it allows for more effective communication of issues to policymakers. Being able to articulate concerns in a coordinated manner is crucial to successfully navigating the political process. As Bryson, Quick, & Slotterback (2013) observes in his review of public participation processes; the most effective participation occurs when existing power dynamics are subverted and information sharing between actors is most unobstructed.

One of the most potent ways of narrating/describing complex issues is through the use of mapping. The creation of a visual methodology and tool allows subjective material to be contextualized in a more concrete way. As soon as something is added to a map, it becomes defined as a specific thing that exists in a specific place (Krygier & Wood, 2011). Maps portray a particularly influential representation of truth, often much more persuasive than other simple texts. As Wood (2012) articulates, "once a map has been published, it is pretty much taken for a description of the way things actually are. And if this is the way things are, what's the point of resistance?" (p. 4). The process of constructing these maps can therefore be considered one that empowers the creator. Through the collaborative defining and mapping of local boundaries, communities are able to frame concerns however they wish (Cowell, Bristow, & Munday, 2011; Hopfer & MacEachren, 2007; Howell & Baylis, 2014). With a unified voice and the capability of being able to more effectively illustrate their concerns, citizens negotiate with policy actors on a more even level (Hopfer & MacEachren, 2007, Jung 2011).

In environmental justice literature, one of the most tangible injustices is the uneven distribution of man-made harms onto specific populations (Schlosberg, 2008). Issues of scale are particularly well-suited to being portrayed through the use of mapping techniques (Briggs et al., 1997; Dolinoy & Miranda, 2004; Maantay, 2002). Tracking the dispersal of pollutants into disadvantaged neighborhoods is a one common example of how mapping tools can portray environmental injustices (Blodgett, 2006; Maantay, 2002/2007; Schlosberg, 2008). In the case of wind farms, the majority of publically-accessible mapping is development-focused; cataloguing the most favorable locations for new wind projects (Baban & Parry, 2001; "Wind Maps," 2014).

In order to convey a more complete picture of the true effects of wind farms, a more flexible form of mapping would be beneficial. Geographical visualization or "geovisualization" allows for a more interactive form of visualizing things that prioritizes the generation of knowledge over

the production of straightforward maps. This allows for the mapping of less defined topics, such as things that might be socially constructed with multiple meanings. Collaborative mapping projects that allow different stakeholder groups to influence map creation and share information are some typical examples of geovisualization techniques (Lange & Hehl-Lange, 2005; Simao, Densham, & Haklay, 2009; Yu & Cai, 2009).

There are abundant online geovisualization processes which offer unique ways in which to better explore geographic data, such as: open source/free mapping services (Crampton, 2009), collaborative value generation for planning purporses (Hopfer & MacEachren, 2007), finding ways to organize community interests (Jung, 2011), or even just collaborating in a specifically virtual environment (MacEachren, Brewer, & Steiner, 2001). Most relevant to the topic of wind research discussed in this paper are "public participation geographic information systems", or PPGIS, which are designed to assist the general public in producing new forms of visual information (Chambers, 2006; Corbett & Keller, 2005; Jankowski, 2009). Sieber (2006) states that PPGIS can help visualize a variety of subjects, including: pollution distributions, real estate trends, facility siting, and countless others.

One of the most familiar PPGIS systems is the online Google Maps program. Although it may lack the more powerful processing abilities of some more expensive professional mapping programs, it is the most commonly used public mapping system in the world. The familiar interface, lack of cost, and simple online entry mean that the barriers to access are relatively low (Bailey & Grossardt, 2010; Crampton, 2009). This gives it the benefit of being one of the most well-established ways for non-expert users to begin creating geovisualization projects and telling their stories (Koble, Steinrücken, & Plümer 2003).

PURPOSE OF STUDY

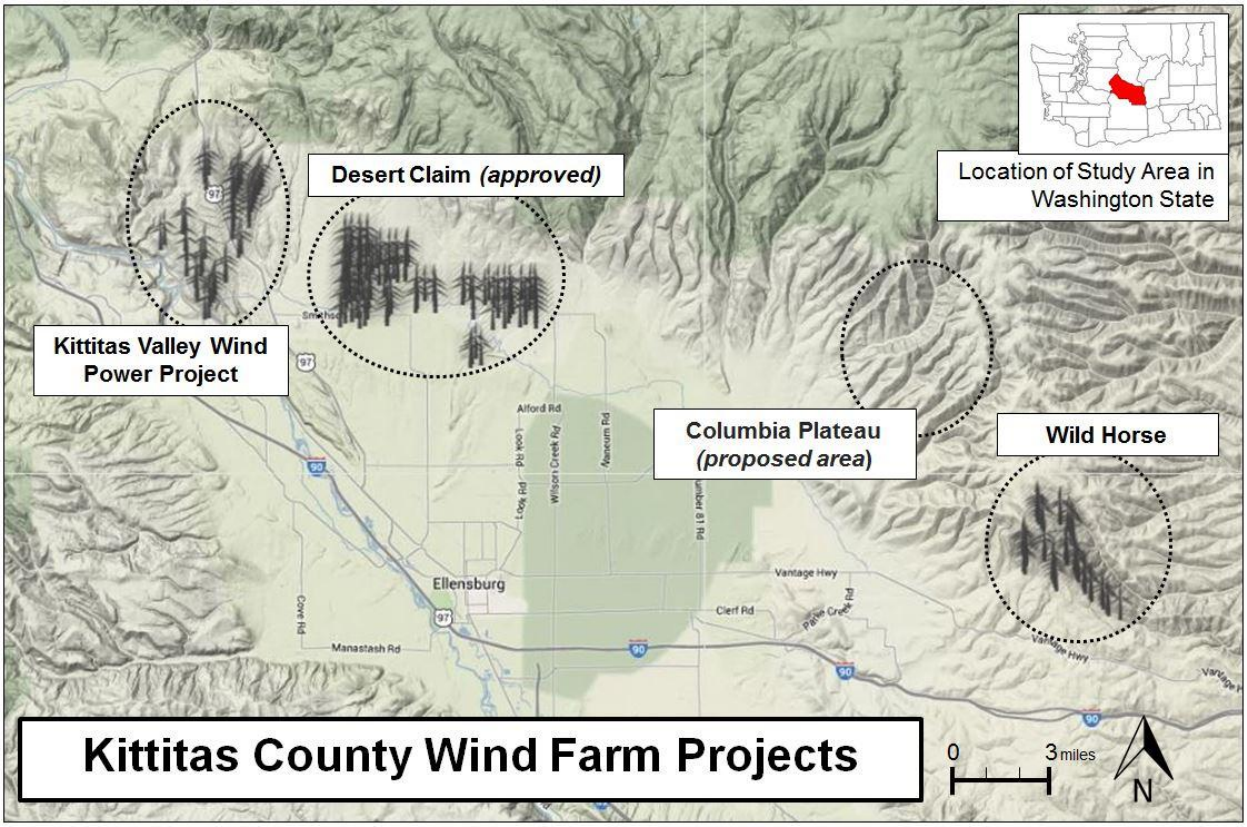
The purpose of this research is to better understand how citizens in Kittitas County, Washington participate in the siting of wind farm projects. As the localized negative effects of wind turbines have already been thoroughly documented, I believe gathering information on the perspectives of those citizens directly affected provides a positive contribution to the academic literature. My research and work in the MA in Policy Studies program have led to my hypothesis that areas in close proximity to the wind farms (and consequently having the most uneven distributions of negative effects) will contain significantly more anti-wind participants than pro-wind participants. I argue that the degree to which these participant opinions are actively considered in the siting process depends on the scale at which the decision-making occurs. In the case of Kittitas Valley, local officials rejected the projects deemed harmful to their community, while state officials prioritized broader state interests in their final decisions.

By creating a map to visualize the distribution of active participation efforts in relation to locations of approved wind turbines, I am able to show that local concerns have not adequately been considered during the siting process. I believe that it is an injustice when those individuals who are most directly affected by a project, and have participated in the policy process to the best of their ability, are not able to have a meaningful influence on the siting of that project. This map further raises questions about scale and at which policy level (community, local, state, etc.)

should siting decisions be made; at what point is it acceptable to disregard individual opinions for the "common good"?

In addition to highlighting areas of industrial development and its related injustices, I intend that the methodologies developed here towards data collection and visualization will be a model for future citizen empowerment through community-led collaborative mapping techniques.

AREA OF STUDY



Map 1: Kittitas County Wind Farm Projects.

This research focuses on wind power development in the Kittitas Valley region of Kittitas County, in central Washington State, where an ensuing rural/urban conflict has been ongoing since 2001. Located about two hours East of Seattle, Kittitas County has a population of approximately 41,000, with over 18,000 located in the city of Ellensburg (*Kittitas County*, 2014). It is located in a valley, surrounded by mountains and is considered one of windiest places in the state ("Wind Maps," 2014).

There have been three separate wind farm projects approved in the county: Kittitas Valley Wind Power Project, Wild Horse, and Desert Claim (approved but not yet built). A forth wind project, Columbia Plateau, is currently in the siting process and not addressed further in the scope of this

paper. The timelines of the three approved projects are interwoven in a complex storyline spanning over seven years.

Of specific interest to this research, is that the Kittitas Valley Wind Power and Desert Claim projects went through a very contentious siting process. Despite the overwhelming negative local attitudes towards the projects (including those of county officials), both projects were ultimately approved by State policy-makers. Reasoning for this decision was made on arguments of benefitting the "common good", that the benefits to many would far outweigh the costs to a few. Contrasting this is the Wild Horse wind farm, which was located in a more remote area and widely accepted by the citizens (Phadke, 2013). This project appears to partially support the idea of residents being "qualified supporters" of wind, those who support wind energy in the county when it's properly sited (Bell, Gray, Haggett, & Swaffield, 2013).

While involved with previous research on this region I was able to witness the intense depth of participation that residents underwent to contest this project (Ottinger, Hargrave, & Hopson, 2014). Affected residents put forth considerable effort to educate themselves on reasonably technical topics and in many cases spent years participating at every possible opportunity: public hearings were crowded, submitted documents were plentiful, and their efforts regularly made the front page of the local newspaper. Despite their determination, it was difficult to find much direct evidence of officials directly considering these outside opinions. The official process for collecting public input did not allow for any of the deliberative back-and-forth discussion necessary for meaningful participation to occur, it was instead set up to be adversarial in nature; everyone individually tried to prove why they were right and why others were wrong. We ultimately concluded that while the local county process was more attentive to public involvement than the state process, neither process could be considered procedurally just. Those that were being directly affected by the wind farm developments were not able to have a fair say in the siting process.

METHODS

In order to explore local issues of distribution, I collected participating stakeholder information and plotted it to a Google Maps project so it could be contrasted with locations of wind turbines. I broadly define "participating stakeholder" or "participant" in this example as anyone taking part in some way in the siting process for any of the Kittitas County wind farm projects. This participation could be in the form of, but not limited to: attending meetings, submitting public comments, or being interviewed in the local newspaper. My intent is to observe evidence of individuals putting forth effort to participate in the process, and ultimately show that their opinions were not fully considered.

Using a mixed-methods approach, I developed a database of participants in the Kittitas County wind farm siting processes. I began by gathering all relevant news articles from the local Daily Record newspaper which covered the developments extensively. Their internal search engine was searched with simple queries of "wind", "turbine", and "wind farm". Over 500 results were found. After verifying which stories were legitimately about the local wind projects, generally by noting usage of the official wind project names (Wild Horse, Desert Claim, Kittitas Valley Wind Power Project), I created a "news database". Entries in the news database included: date of

publication, type of article (opinion, news, letter to editor), inclusion of pictures/maps/diagrams, author of article, main themes, identifiable stakeholders, and URL addresses of the article. All mentions of public meetings or other opportunities to participate were included in a timeline of events.

Whenever a stakeholder name was mentioned I added them to a "participation database" and noted their names, addresses, date(s)/type(s) of participation, discernable opinions, and quotes of interest. To further enhance data collection efforts, I obtained public records (hearing transcripts, submitted documents, etc.) from the Kittitas County Public Records Department and analyzed them for stakeholder information. Of specific interest were "sign-in" sheets for public hearings where individuals wrote names, addresses, if they were going to speak, and (surprisingly) their opinion on the wind project.

I made a single "pro wind" and "con wind" designation for each stakeholder entry. I did not differentiate between stakeholder opinions to specific projects due to their complex overlapping timelines, and the fact that I could not find a single stakeholder who held dissimilar opinions between the projects, In the very rare occasion when individuals did not clearly or strongly state their opinion toward a projects, I excluded them from being added to the eventual map.

One of the greatest challenges in reviewing the public records was transcribing hand-written information, especially on the sign-in sheets. I made best judgments on determining names and addresses which were often illegible and incomplete. Through the continued cross-examination of documents, stakeholder information was continually enhanced with new information.

I acquired a 40 page petition containing over 400 additional stakeholders from the Kittitas County Public Records department. The petition was conducted by Kittitas "C.A.R.E.S (Citizens Alliance for Renewable Energy Solutions) who were looking for generic support for wind energy, so there is an obvious bias here and proper survey methodology cannot be confirmed. However, it is assumed due the nature of the petition and the high amount of publicity wind projects were getting the community, that the large majority of signees understood the context of the petition. Signing the petition was by proxy showing support for specific wind projects in the county. Due to the more passive nature of this participation and potential biases, I consider this petition as more of a "light" form of participation and would caution readers in inferring too much from the data.

Names and addresses from the petition were hand-written and so the accuracy of transcription cannot be assured. There were many instances of consecutively numbered addresses being listed, which indicates that someone had at times gone door-to-door to collect signatures. Petition data was not cross-checked with the main participation roster for overlaps. Any potential double-listing of stakeholder information should not skew any final visualization due to repeat addresses only able to appear as a single point on the map.

In order to address the previous concerns with accessibility (ease of use, shareability, low barriers to entry, etc) I chose Google Maps as the mapping program for this project. The interface allows for georeferenced points to be added to a maneuverable map with zooming/scrolling functionality. Unique icons can be chosen for each plotted point which itself can contain additional forms of qualitative data (text, images, video). However, in this initial iteration of the project I decided to plot names, addresses, and pro/con project opinions only.

From the list of over 300 stakeholders on the participation database, 167 valid addresses were derived and mapped. From the petition database, 365 stakeholder locations were derived and mapped. 47 petitions were discarded due to lack of viable addresses. Initially points were plotted individually by hand to the map, but it was later discovered that addresses could be bulk imported in spreadsheet form. Once added to the map, some addresses required minor corrections to be displayed corrected on the map (e.g. changing “Rd” to “Road”).

Stakeholder locations on the map were originally designated by ambiguous human-shaped icons. As the number of points increased, it became overly cluttered and simple dots were chosen instead to represent each participating stakeholder. Red circles were chosen to signify those who expressed dissenting opinions towards the wind farms (con), dark green was chosen for those who expressed positive feelings (pro), and light green was chosen for those who signed the pro-wind petition (pro).

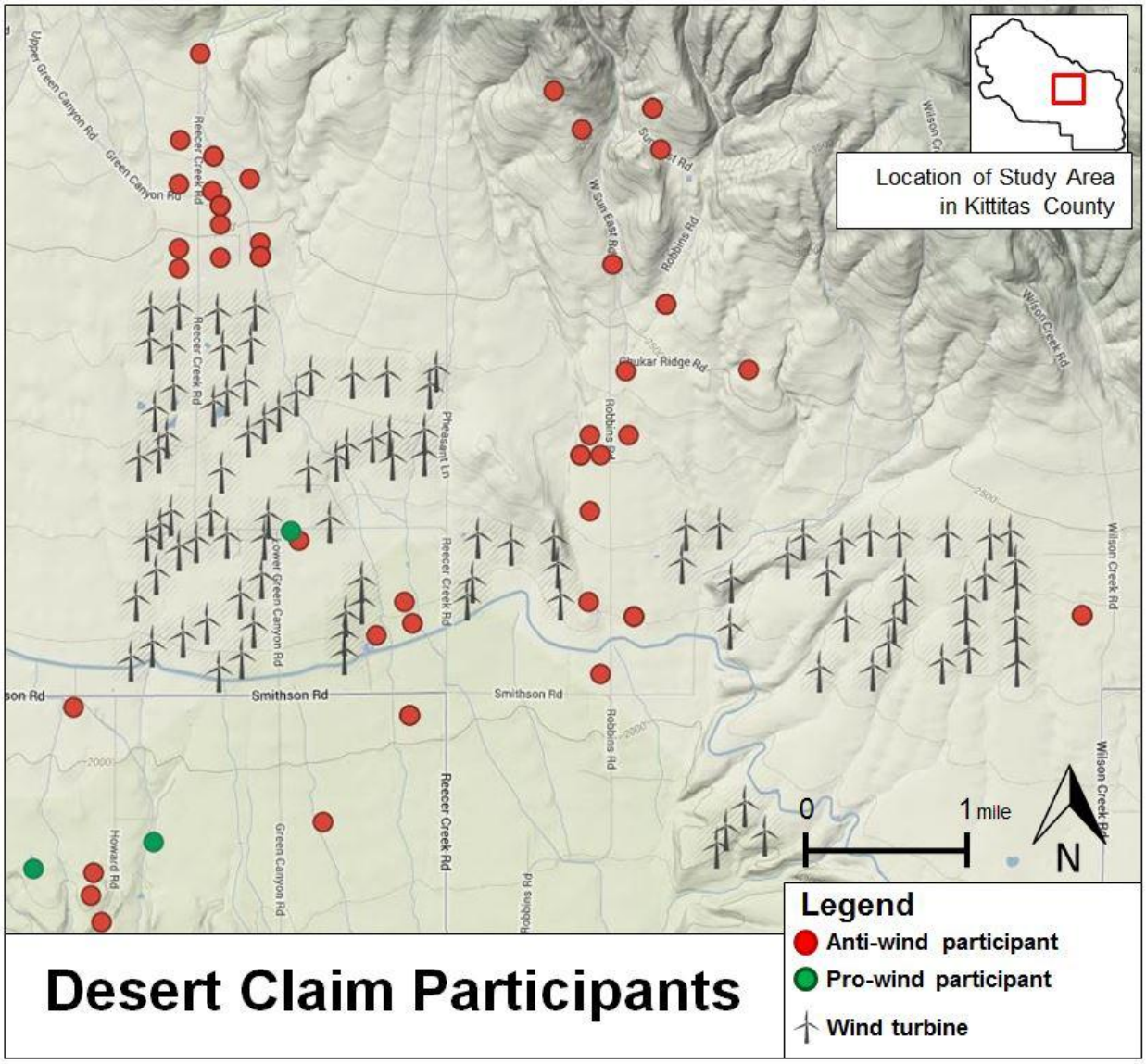
Locations of the 195 plotted wind turbines were determined by the most recent developer maps available. Data on these maps were compared with the topographic information present in Google Maps to manually plot each turbine. In some cases the plotting was enhanced by viewing aerial images of the existing turbines on Google Maps satellite images. To enhance the overall narrative of the map, each point was represented by an icon of a wind turbine.

RESULTS

Out of those stakeholders with complete profiles (name, address, opinion), 109 were found to be against the wind farm projects (con), 58 were found to be in favor (pro), and 365 had signed the pro-wind petition (again there may be possible overlap in this petition).

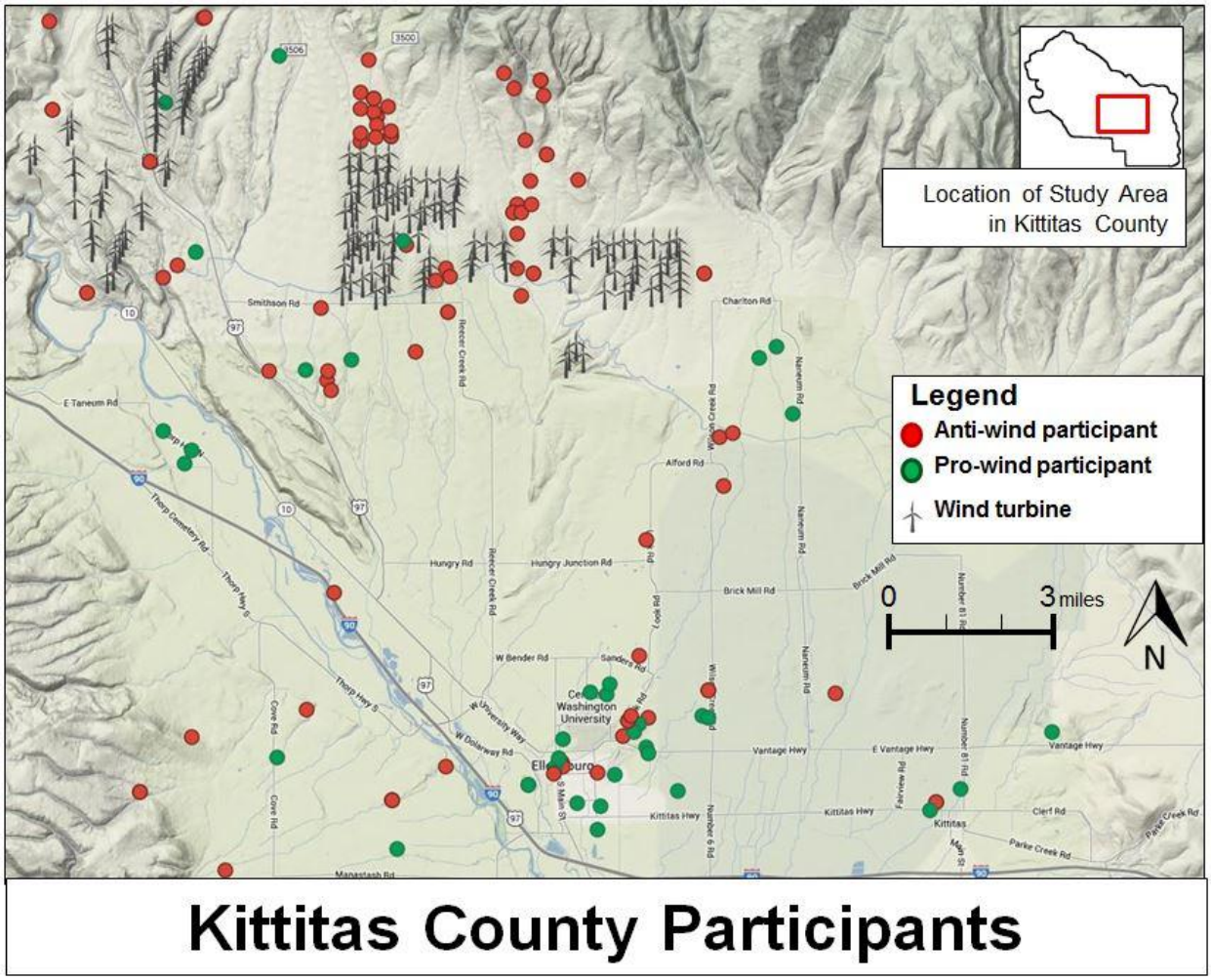
The resulting map of this stakeholder participation appears to support the hypothesis that areas in close proximity to the wind farms (and consequently having the most uneven distributions of negative effects) will contain significantly more anti-wind participants than pro-wind participants.

In order to more accurately present the results, three different versions of the final map have been produced.



Map 2: "Desert Claim Participants". Approximately 42 square mile area.

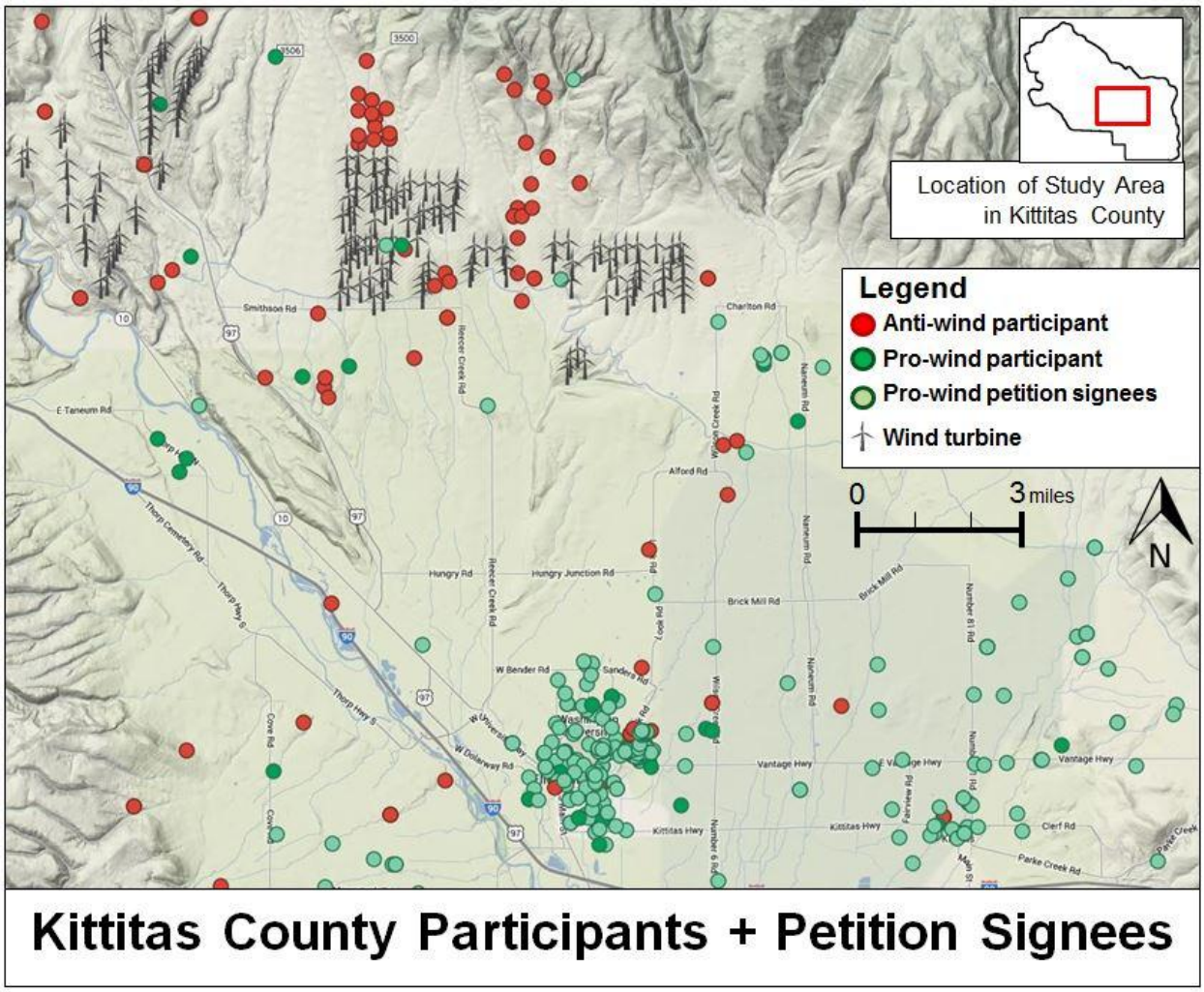
Map 2 focuses on the area surrounding the Desert Claim wind power project. This was discussed as being the most controversial of the three wind projects in the county. The distribution of participants in the area is overwhelmingly anti-wind, with 40 against it, and only 3 for it. The single pro-wind participant located in the middle of the wind farm area is a rancher who had agreements in place to eventually lease his land to the wind-farm developer.



Map 3 – Kittitas County Participants. Approximately 260 square mile area.

Map 3 focuses on the broader Kittitas County area. Desert Claim is located in the top/North, Kittitas Valley Wind Power Project is in the Northwest, the town of Ellensburg is located in the bottom/North. The Wild Horse wind farm is located approximately 5 miles to the East of this area.

This map contrasts the strong anti-wind cluster of participants around Desert Claim with the more mixed clusters near Ellensburg. Outside of those two groups, it appears there may be some evidence that anti-wind participants, while more spread out, make up the majority in other rural areas as well (Southwest in particular).



Map 4 – Kittitas County Participants + Petition Signees

This map contains the same information as Map 3, but with the addition of 365 "pro-wind petition signee" points. These participants are very strongly clustered around the city of Ellensburg, and also fairly evenly distributed in the Eastern areas of the map.

DISCUSSION

The results of this mapping show that geovisualization techniques can be an effective way to help better understand issues of scale and the interests associated with them. Even though the participation efforts, even at the most local scale, were not incorporated in a truly procedurally just way, they were still considered to some degree in the process. Including these non-expert viewpoints is a necessary aspect of environmentally and socially-just policymaking. But at what scale are these viewpoints considered? The plotting of participating stakeholder information to these maps highlight issues of scale and how competing interests play out at different levels.

If a policymaker had only the Desert Claim area to consider in a siting decision (Map 2), it seems fairly obvious they would accept the overwhelming majority anti-wind opinion and reject the development. At the larger county-level scale of things (Map 3), the story becomes somewhat less clear, there are definitely more pro-wind participants than at the Desert Claim scale. Overall though, there is still a discernable anti-wind majority that would likely lead to the development being rejected. The inclusion of the pro-wind petition data on Map 4 complicates the issue by highlighting the local (Desert Claim area) vs. urban (Ellensburg area) conflict. One could imagine a policy-maker being inclined to use this last map to support a pro-wind policy decision.

In the case of Kittitas County however, the county commissioners originally in charge of overseeing the siting of these projects ended up rejecting them. Those who actively participated in the policy process (Map 2 & Map 3), and therefore were most visible to the county commissioners, were overwhelmingly anti-wind. In the original decisions to reject these two projects, the commissioners regularly stated that the public outcry was a primary determinant in their eventual decision. On the other hand, a lack of public outcry towards the more secluded Wild Horse project was cited as a primary determinant in its eventual acceptance.

The Desert Claim and Kittitas Valley Wind Power Project were eventually approved by state policymakers, disregarding the opinion of the county commissioners. Those at the state-level have financial and policy interests in seeing more wind farm developments approved. Furthermore, if one were to zoom this map out to the state-level and plot the opinions of all citizens towards these wind farm projects, it would likely result in a very significant majority being in favor of their approval. However at what scale does it become acceptable to ignore public opinion for something deemed to be a common good?

There is always a risk in the development of new projects that some individuals will be overlooked. It is virtually impossible to make everyone happy with a policy decision, and as Mason & Milbourne have argued, consensus should not be the goal (2014). Nevertheless we should still make concerted efforts to understand the values of everyone directly involved and take these values into account when making a decision.

CONCLUSION

Through the mapping of public participation in Kittitas County wind siting process, related issues of scale in policymaking have been made clearer.

At the individual/neighborhood scale there are very limited benefits to the wind farms but considerable costs. At the local/county scale the previous neighborhood costs are still present and might have some spillover effect for the wider landscape, but now the financial benefits to the broader community become more appreciated. At the state scale those original neighborhood costs *still* exist, but they are miniscule when compared to the vast economic, political, and cultural benefits of wind development that are perceived by the broader population. Harms don't disappear or go away at different scales; their meaning and significance change. This research can help policy makers, activists, and community members better define what justice might look like in the context of scale.

Through the collection and organizing of this qualitative data, I gained a great deal of respect for those involved; the sheer amount of time spent on this by participants was astonishing. I've come to understand the issue in more depth and I believe I can explain the situation more effectively to others. Most important to this capacity are the maps; the quote "A picture is worth a thousand words" is of particular relevance here. Instead of trying to tell the whole complex story and all that the people went through, I can show a map of the turbines and the participants and it becomes instantly clearer. Once this map was created, the objects mapped become more defined and real.

The methodology developed here cannot directly overcome the limitations present in the existing policy process, but it can be used in the future to help raise important questions about how policy is being done, and hopefully lead to more inclusive policy making practices.

LIMITATIONS/BIAS

Prior to the start of this research, I had limited knowledge in geovisualization techniques, something I had to develop during the course of this project.

If this map is eventually shared more wildly, it could provoke further division in the local community. Perpetuating the contentious storyline may have limited benefit. In addition, those included on the map may be apprehensive and wish to be removed. I will likely remove name identifiers before more broadly sharing the information. If an eventual goal of the project is to maximize the audience, there may be individuals unable to access this digital format, the computer aspect of the map might be a barrier for the less tech savvy.

I chose public documents primarily for the sake of convenience and they may not fully capture the opinions of citizens. I did not conduct any interviews or consult with anyone that had expertise in this region.

FUTURE RESEARCH

Due to the vast amount of data already collected and that can be potentially collected on this region alone, there is a great deal more work that could be done.

A discourse analysis could be performed on the participant data. Core themes could be added to the points on the map. Other forms of data could also enhance the experience of the map. Photographs, images, and other documents could be added by participants. These… informers… on the landscape itself could be added to gain a more complete "feel" for the region itself.

Examining the temporal scale of this participation could be informative. Seeing how long people participated could show the amount of resources were required. Having something like this development process looming over individuals for 7+ years could be considered an unfair burden. It is not reasonable to expect individual citizens to compare resources against a developer or policymakers who may have a rotating/replaceable cast. This could potentially help motivate for a more reasonable timeline and expedited siting process. The quantity of participation could be examined, simply looking at the sheer number of times people participated, or how much they contributed at each instance.

Data could be analyzed to help better understand participant's views and major themes. There are a multitude of topics: adversarial/deliberative/collaborative tones of discussions, framing of issues, identifying conflicting definitions of terms, potential misinformation that is circulating, etc. Exploring whether opinions ever changed towards the projects during the course of the participation would be fascinating to me, especially since in all my in-depth reading of all these comments, I could find no instance of it occurring.

Information could be fairly easily imported into more robust mapping programs. Demographics of participants could be examined to better understand their beliefs… including ages, income, employment status, length of residency, etc. Enhanced parcel information such as property lines and other topographic information could better define the locations in conflict. More comprehensive analytical software could better examine the data and create higher level reports.

Perhaps the most exciting future potential for this project would be to apply it to a future siting process. Incorporating geovisualization systems into the discussion at an earlier time could greatly enhance its potential to affect eventual outcomes. There is almost no limit to the number of projects that could be chosen. Of immediate interest would be the Columbia Plateau project in Kittitas County.

POLICY IMPLICATIONS

This research has the potential to strengthen community voice and provide a more accessible/shareable narrative of the local situation.

The research methods developed here could also be used to find gaps in participation. When looking at the map observers can locate where there is a lack of plotted points and consider if these were accidentally looked over, or perhaps they specifically chose to not participate. On the other hand, clusters of strong involvement could be questioned as to whether they showed an over-representation of participation; should those who speak the loudest necessarily have their opinions heard the most? If over 90% of those negatively affected by something vote against it, shouldn't it matter?

Finally, my geovisualization example can help provide clarity as to how the costs and benefits of projects change depending on the scale in which they're considered. This can be of benefit to multiple stakeholders, including policymakers and affected citizens, as they attempt to determine what concessions (if any) should be made towards reaching fair and reasonable outcomes in siting decisions.

BIBLIOGRAPHY

Aitken, M. (2010). Wind power and community benefits: Challenges and opportunities. *Energy policy*, *38*(10), 6066-6075.

America's Wind Industry Reaches Record Highs. (2013). In *Energy.gov*. Retrieved June 3, 2014, from http://energy.gov/articles/americas-wind-industry-reaches-record-highs

Baban, S. M., & Parry, T. (2001). Developing and applying a GIS-assisted approach to locating wind farms in the UK. *Renewable energy*, *24*(1), 59-71.

Bailey, K., & Grossardt, T. (2010). Toward structured public involvement: Justice, geography and collaborative geospatial/geovisual decision support systems. *Annals of the Association of American Geographers*, *100*(1), 57-86.

Bell, D., Gray, T., Haggett, C., & Swaffield, J. (2013). Re-visiting the 'social gap': public opinion and relations of power in the local politics of wind energy.*Environmental Politics*, *22*(1), 115-135.

Blodgett, A. D. (2006). An analysis of pollution and community advocacy in 'cancer alley': Setting an example for the environmental justice movement in St James Parish, Louisiana. *Local Environment*, *11*(6), 647-661.

Briggs, D. J., Collins, S., Elliott, P., Fischer, P., Kingham, S., Lebret, E., ... & Van Der Veen, A. (1997). Mapping urban air pollution using GIS: a regression-based approach. *International Journal of Geographical Information Science*,*11*(7), 699-718.

Bryson, J. M., Quick, K. S., Slotterback, C. S., & Crosby, B. C. (2013). Designing public participation processes. *Public Administration Review*, *73*(1), 23-34.

Burningham, K., Barnett, J., & Thrush, D. (2006). The limitations of the NIMBY concept for understanding public engagement with renewable energy technologies: a literature review.

Carter, J. (2011). The effect of wind farms on residential property values in Lee County, Illinois. *Illinois State University*.

Chambers, R. (2006). Participatory mapping and geographic information systems: whose map? Who is empowered and who disempowered? Who gains and who loses?. The Electronic Journal of Information Systems in Developing Countries, 25.

Chow, K., & Healey, M. (2008). Place attachment and place identity: First-year undergraduates making the transition from home to university. *Journal of Environmental Psychology*, *28*(4), 362-372.

Corbett, J. M., & Keller, C. P. (2005). An analytical framework to examine empowerment associated with participatory geographic information systems (PGIS). Cartographica: The International Journal for Geographic Information and Geovisualization, 40(4), 91-102.

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*(4), 539-557.

Crampton, J. W. (2009). Cartography: maps 2.0. *Progress in Human Geography*, *33*(1), 91-100.

Devine-Wright, P. (2005). Beyond NIMBYism: towards an integrated framework for understanding public perceptions of wind energy. *Wind energy*, *8*(2), 125-139.

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*(3), 271-280.

Dolinoy, D. C., & Miranda, M. L. (2004). GIS modeling of air toxics releases from TRI-reporting and non-TRI-reporting facilities: impacts for environmental justice. *Environmental health perspectives*, *112*(17), 1717.

Ek, K. (2005). Public and private attitudes towards "green" electricity: the case of Swedish wind power. *Energy Policy*, *33*(13), 1677-1689.

European Wind Energy Association. (2009). *Wind energy--the facts: a guide to the technology, economics and future of wind power*. Earthscan.

Fraser, E. D., Dougill, A. J., Mabee, W. E., Reed, M., & McAlpine, P. (2006). Bottom up and top down: Analysis of participatory processes for sustainability indicator identification as a pathway to community empowerment and sustainable environmental management. *Journal of environmental management*,*78*(2), 114-127.

Gregoire, C. (2009). Green jobs. Retrieved from http://epw.senate.gov/public/index.cfm?FuseAction=Files.View&FileStore_id=d8fc8aee-8ba7-42c5-858a-6bb6bb3e6a79,

Gregoire, C. (2012). Environmental & Energy. Retrieved from www.digitalarchives.wa.gov/GovernorGregoire/priorities/environment/default.asp

Harding, G., Harding, P., & Wilkins, A. (2008). Wind turbines, flicker, and photosensitive epilepsy: Characterizing the flashing that may precipitate seizures and optimizing guidelines to prevent them. *Epilepsia*, *49*(6), 1095-1098.

Hindmarsh, R. (2010). Wind farms and community engagement in Australia: a critical analysis for policy learning. *East Asian Science, Technology and Society*, *4*(4), 541-563.

Hopfer, S., & MacEachren, A. M. (2007). Leveraging the potential of geospatial annotations for collaboration: a communication theory perspective. *International Journal of Geographical Information Science*, *21*(8), 921-934.

Howell, J. P., & Baylis, D. L. (2014). Mapping Energy: Cartographies of Energy Into The Twenty-First Century. *Geographical Review*, *104*(2), 209-228.

Jankowski, P. (2009). Towards participatory geographic information systems for community-based environmental decision making. Journal of Environmental Management, 90(6), 1966-1971.

Johnson, S. (2013). Old wind farm bases 'could be left in countryside'. In The Telegraph. Retrieved from www.telegraph.co.uk/news/uknews/scotland/10142126/Old-wind-farms-bases-could-be-left-in-countryside.html

Jung, J. (2011). Participatory and Collaborative Geovisualization in the Masten District Neighborhood Planning Process in Buffalo, New York: Making Geovisualization Together. *Journal of Korea*, *11*(3), 35-51.

Kittitas County, Washington. (2014). In State & County QuickFacts. Retrieved from http://quickfacts.census.gov/qfd/states/53/53037.html

Klass, D. L. (2003). A critical assessment of renewable energy usage in the USA. *Energy Policy*, *31*(4), 353-367.

Kolbe, T. H., Steinrücken, J., & Plümer, L. (2003, August). Cooperative Public Web Maps. In *Proceedings of the International Cartographic Congress (ICC)*.

Koontz, T. M. (Ed.). (2004). *Collaborative environmental management: What roles for government?*. Resources for the Future.

Krygier, J., & Wood, D. (2011). 11 Ce n'est pas le monde (This is not the world). *Rethinking Maps: New frontiers in cartographic theory*, 189.

Lange, E., & Hehl-Lange, S. (2005). Combining a participatory planning approach with a virtual landscape model for the siting of wind turbines. *Journal of environmental planning and management*, *48*(6), 833-852.

Maantay, J. (2002). Mapping environmental injustices: pitfalls and potential of geographic information systems in assessing environmental health and equity.*Environmental Health Perspectives*, *110*(Suppl 2), 161.

Maantay, J. (2007). Asthma and air pollution in the Bronx: methodological and data considerations in using GIS for environmental justice and health research.*Health & place*, *13*(1), 32-56.

MacEachren, A. M., Brewer, I., & Steiner, E. (2001, August). Geovisualization to mediate collaborative work: Tools to support different-place knowledge construction and decision-making. In *20th International cartographic conference*(pp. 6-10).

Manzo, L. C., & Perkins, D. D. (2006). Finding common ground: The importance of place attachment to community participation and planning.*Journal of planning literature*, *20*(4), 335-350.

Martin, W. (2004). *The best liberal quotes ever: Why the Left is right*. Sourcebooks, Inc..

Martinez, E., Sanz, F., Pellegrini, S., Jimenez, E., & Blanco, J. (2009). Life cycle assessment of a multi-megawatt wind turbine. *Renewable Energy*, *34*(3), 667-673.

Mason, K., & Milbourne, P. (2014). Constructing a 'landscape justice' for windfarm development: The case of Nant Y Moch, Wales. *Geoforum*, *53*, 104-115.

Ottinger, G., Hargrave, T. J., & Hopson, E. (2014). Procedural justice in wind facility siting: Recommendations for state-led siting processes. Energy Policy,65, 662-669.

Pasqualetti, M. J., Gipe, P., & Righter, R. W. (Eds.). (2002). *Wind power in view: energy landscapes in a crowded world*. Academic Press.

Pasqualetti, M. J. (2011). Opposing wind energy landscapes: a search for common cause. *Annals of the Association of American Geographers*, *101*(4), 907-917.

Phadke, R. (2013). Wild Horse Wind - Details. Wind Energy Details. Retrieved June 5, 2014, from http://www.macalester.edu/windenergy/casestudies/wildhorse/WHdetails.html

Pierpont, N. (2009). *Wind turbine syndrome: A report on a natural experiment*. Santa Fe, NM, USA: K-Selected Books.

Schlosberg, D. (2008). *Defining environmental justice*. Prescott College.

Shumaker, D. (2014). Field Guide to Wind Farms & Their Effect on Property Values. Retrieved June 5, 2014 from National Association of Realtors, http://www.realtor.org/field-guides/field-guide-to-wind-farms-their-effect-on-property-values

Sieber, R. (2006). Public participation geographic information systems: A literature review and framework. *Annals of the Association of American Geographers*, *96*(3), 491-507.

Simao, A., Densham, P. J., & Haklay, M. (2009). Web-based GIS for collaborative planning and public participation: An application to the strategic planning of wind farm sites. *Journal of Environmental Management*, *90*(6), 2027-2040.

Smallwood, K. S. (2007). Estimating Wind Turbine-Caused Bird Mortality. *The Journal of Wildlife Management*, *71*(8), 2781-2791.

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*(5), 2705-2714.

Warren, C. R., Lumsden, C., O'Dowd, S., & Birnie, R. V. (2005). 'Green on green': public perceptions of wind power in Scotland and Ireland. *Journal of environmental planning and management*, *48*(6), 853-875.

Washington Department of Commerce. (2009). Energy Independence I-937. Retrieved from http://www.commerce.wa.gov/site/1001/default.aspx

Wind Energy. (2014). In Bureau of Land Management. Retrieved June 3, 2014 from http://www.blm.gov/wo/st/en/prog/energy/wind_energy.html

Wind Maps. (2014). In *Dynamic Maps, GIS Data, & Analysis Tools*. Retrieved from www.nrel.gov/gis/wind.html

Wolsink, M. (2007). Wind power implementation: the nature of public attitudes: equity and fairness instead of 'backyard motives'. *Renewable and sustainable energy reviews*, *11*(6), 1188-1207.

Wood, D. (2012). *Rethinking the power of maps*. Guilford Press.

Yu, B., & Cai, G. (2009, June). Facilitating participatory decision-making in local communities through map-based online discussion. In *Proceedings of the fourth international conference on Communities and technologies* (pp. 215-224). ACM.

Zavestoski, S., Shulman, S., & Schlosberg, D. (2006). Democracy and the Environment on the Internet Electronic Citizen Participation in Regulatory Rulemaking. *Science, Technology & Human Values, 31*(4), 383-408.

Zografos, C., & Mart, J. (2009). The politics of landscape value: a case study of wind farm conflict in rural Catalonia. Environment and Planning A, 41(7), 1726-1744