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Sheltering wind power projects from tempestuous community concerns

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ABSTRACT

Although wind power is currently enjoying a boom period, maximizing development potential will be largely influenced by how well developers manage social and environmental issues. As more wind farms are developed, threats to both social and ecological endowments will increase. The intent of this paper is to provide a comprehensive literature review and analysis of social impediments to wind power development under two broad thematic areas—concerns over impairment of existing community endowments and concerns over impairment of existing ecosystems—in order to provide policy makers with insight into strategic approaches for reducing the propensity for social opposition to wind power development projects.

Introduction

In 2007, the Intergovernmental Panel on Climate Change (IPCC) released its Fourth Assessment Report which reflected a consensus opinion on the perils of climate change approved by 194 member countries. The report concluded that, in order for humanity to minimize the economic and ecological consequences associated with global warming, greenhouse gas (GHG) emissions would need to peak by 2015 and would thereafter decline to 50%–85% of 2000 levels by 2050 (IPCC, 2007). Given that CO_2 emissions from fossil fuel combustion amount to approximately 60% of anthropogenic GHG emissions, it should be apparent that GHG reductions of this scale require sweeping reductions in GHG emissions stemming from energy use. Unfortunately, as a further complication, under a business-as-usual scenario, global energy consumption is expected to increase by 50% between 2005 and 2030 (EIA, 2008) and the *proportion* of energy generated through fossil fuel sources is projected to remain virtually unchanged. Thus, despite indications that CO_2 emission reductions of up to 85% are needed to abate the worst impacts of global warming (IPCC, 2007; Stern, 2006), CO_2 emissions are actually projected to increase rather than decrease.

The dire nature of these amplified CO_2 emission projections and the threat that such levels pose to global climate security have catalyzed a number of pro-alternative energy initiatives in nations around the world, and globally, we are seeing amplified market growth profiles across many alternative energy technology platforms. Of the alternative energy technologies, the growth of installed wind power capacity exceeds all other alternative technologies in terms of aggregate growth, thanks in large part to the competitive economics of wind power (Morthorst and Awerbuch, 2009; WWEA, 2010). Since 2000, global wind power capacity has doubled every three years. In 2009, wind power capacity installed worldwide surpassed 150,000 MW (153,213 MW) which equates to 2% of global electricity consumption. Moreover, the World Wind Energy Association estimated that a 10-fold expansion of installed wind power technology is foreseeable by 2020 (WWEA, 2010), resulting in worldwide wind power capacity levels reaching 1,900,000 MW. The future indeed looks bright for wind power developers.

Unfortunately, there is also apprehension that the expansion of wind power capacity may begin to exhibit diminished growth potential due to social resistance. In an underdeveloped market, wind power project developers have relatively free reign in terms of site selection. Typically, this results in developers pursuing a strategy of prioritizing development of sites that possess the three attributes of site attractiveness (in terms of overall wind quality and development costs), proximity to the electric grid, and community acceptance. As priority sites become developed, developers will be increasingly forced to consider development of sites that may be more socially contentious (Wizelius, 2007). Social opposition can turn an economically beneficial wind power project into a political hot potato that can undermine completion of the project in question and influence prospects for future developments.

Given this conceptual backdrop, the intent of this paper is to provide a comprehensive literature review and analysis of social impediments to wind power development in order to provide policy makers with insight into strategic approaches for reducing the propensity for social opposition to wind power development projects. Simply put, policy makers rarely have the tools or time to consolidate knowledge in the manner represented by this paper. Furthermore, even if they did have time, policy makers rarely have the analytical capacity to translate theory from various academic fields into lessons for policy effectiveness. Accordingly, this paper has an applied contribution to make to the wind power development community.

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Research indicates that social impediments to wind power development fall under two broad themes—concerns over impairment of existing community endowments and concerns over impairment of existing ecosystems. Consequently, this paper proceeds by sequentially addressing both of these themes and translating existing knowledge to applied policy insight.

Impairment of existing community endowments

Community opposition to wind power projects is widely known by the acronym NIMBY (not in my backyard). Reasons for opposing wind projects are varied. For example, in a survey related to a proposed wind energy project in Cape Cod in the United States, eight justifications for opposition were uncovered. Respondents were concerned about adverse impacts on aesthetics, community harmony, the local fishing industry, pleasure boating, property values, bird life, marine life, and tourism (Firestone and Kempton, 2007). Accordingly, developing effective community opposition mitigation strategies requires awareness of the varied motivations for opposition to a given project (Zamot et al., 2005). A starting point for enhanced understanding of community concerns is through public outreach initiatives (surveys, town hall meetings, etc.) to identify the nature of community concerns.

Separating perception from fact

Community concerns regarding wind energy projects have been shown to be based more on perception than fact (Thompson, 2005). For example, in tourist areas, there is a misperception that the erection of wind turbines will adversely affect tourism. Surveys conducted in tourist areas in Germany, Belgium, and Scotland indicate that such concerns are unfounded (Wizelius, 2007). Similarly, concerns over turbine noise, shadow flicker, and threats to bird life are not supported by actual data (NWCC, 2001; Wizelius, 2007; Zamot et al., 2005).

The trouble is that the general public rarely has ready access to information necessary to assess the pros and cons of wind power projects. Media reports tend to emphasize storylines that have popular appeal (i.e. famous figures who are opposed to a development, accusations of scandalous behavior, etc.) (Thompson, 2005). Consequently, media coverage often fails to provide the full information that the public needs to effectively evaluate the merits of a project (Thompson, 2005). Moreover, as one wind expert points out, a great deal of misinformation about wind power has been propagated by fossil fuel and nuclear power special interest groups (Wizelius, 2007).

The lesson for policy makers is that some forms of opposition can be mitigated by providing community members with complete information on a given project. In fact, not only will a more proactive media management strategy help mitigate opposition but it may also actually engender enhanced support.

Perceptions improve

Public perceptions generally improve after wind projects become operational (Rodman and Meentemeyer, 2006). Polls conducted with residents from communities that host wind energy developments in the United Kingdom, Scotland, France, the United States, and Finland have all demonstrated that wind farms which are properly planned and sited can engender positive project perceptions (Wizelius, 2007). In fact, wind energy projects, which have been planned to minimize adverse social and environmental impacts, have been shown to positively influence perceptions of wind energy once completed (Wolsink, 1988). From a policy perspective, it is noteworthy that positive perceptions are particularly strengthened when community members are offered opportunities to invest in the development (Wizelius, 2007).

Aesthetic concerns overshadow all others

Research indicates that local concerns trump global concerns and aesthetic impacts trump ecological impacts when community members evaluate the pros and cons of a wind energy project. Research by Thompson (2005) found that a wind energy project's contribution to global warming abatement will fail to mitigate project resistance associated with concerns that the project will adversely impact the aesthetics of a community. Moreover, a number of studies have found that the cause of public disenchantment over a given wind project is frequently centered on concerns over erosion of aesthetic values rather than concerns over degradation of ecosystems (Komor, 2004; Thompson, 2005; Wolsink, 2000). A caveat with these studies is that they were done in the United States and may not be representative of other advanced nations. However, it is highly likely that in any community, the perception that wind turbines represent aesthetic eyesores must be addressed either through technical solutions (improved siting, camouflaging turbine towers, etc.) or through better marketing of the community benefits associated with such projects.

Beyond NIMBY opposition

Research shows that NIMBY resistance to wind energy projects is not the only type of resistance. In attempting to understand opposing factions in greater depth, Wolsink (2000) identified four types of resistance as follows:

- Type A: Individuals who support wind energy but are opposed to developing a specific site (this is the classic NIMBY group).
- Type B: Individuals who are generally opposed to all wind power developments (NIABY—not in any back yard).
- Type C: Individuals who were initially positive toward a specific project but develop negative feelings as a project develops.
- Type D: Individuals who are opposed to a specific project due to poor planning or other technical reasons.

The importance of delineating opposition across the four typologies stems from the observation that each type of opposition demands a different strategic mitigation approach. As mentioned earlier, mitigating opposition from NIMBY opponents (Type A) involves a process that begins by seeking to understand the nature of the NIMBY concerns. Once the sources of concerns are identified, strategies can be developed to i) correct misperceptions, ii) negotiate solutions to appease any paramount concerns, or iii) attempt to dilute opposition by highlighting benefits that offset the areas of concern.

On the other hand, it is unlikely that Type B opposition can be fully eliminated because such opposition frequently stem from misperception caused by entrenched and opposing ideologies. Although NIABY factions are typically small (Wizelius, 2007), opposition by such factions can fuel opposition from other groups (such as Type C groups described in the next paragraph). Fortunately, as opposed to nuclear energy, NIABY opposition to wind power is rarely manifested in public protest (Wolsink, 2000). With that said, in some countries, there are well-organized, vocal groups in opposition to wind power, such as the Country Guardians in the UK, the Association for Protection of the Landscape in Sweden, and Windkraftgegner in Germany (Wizelius, 2007). Negotiation is typically the only way to mitigate opposition from such groups.

Opposition from Type C factions occurs when new information emerges which alters perceptions of a project. In some cases, negative perceptions are based on misinformation. Consequently, improved information dissemination may restore positive support. In other cases, negative perceptions are based on justifiable concerns which have emerged. In these cases, revisions to the project may appease outstanding concerns. In yet other cases, the source of negative perception may be both well-founded and irresolvable. In these cases, mediation efforts may at least help to dilute the strength of opposition. An effective strategy for restoring support from Type C opponents is to first identify why negative perceptions have emerged and craft solutions accordingly.

Opposition from Type D factions can stem from either real or perceived problems. Therefore, mitigating opposition from Type D factions can be approached in a similar manner to mitigating opposition from Type C factions: i) correct misperceptions that fuel opposition, ii) amend real problems that can be viably resolved, and iii) employ mediation to defuse emotions when full resolutions are not possible.

Overall lessons in regard to community opposition

Overall, improved communication can temper emotions and attenuate local opposition (Wizelius, 2007). Public forums, community mailings, media management strategies, and opinion surveys present opportunities for creative dialogs to take place. Often, interaction with stakeholders generates creative solutions (Neely et al., 2002). Even when full resolutions are not possible, public interaction allows citizens to vent and express their opposition. While this may not fully appease dissatisfied factions, research indicates that allowing dissenters to voice concerns diminishes the excessive emotional response that often underlies public protest (Wizelius, 2007).

In addition to ongoing discourse with community stakeholders, applying five other principles can help mitigate opposition to wind energy projects. First, sufficient distance between the project site and residential areas should be preserved in order to minimize disruption caused by noise and shadow flicker. Second, in inhabited areas, turbines with noise dampening devices should be mandated. Third, a project which financially benefits the local community garners improved support. Therefore, initiatives to encourage project participation from local firms and to entice community ownership over wind power projects can help endear projects within communities (Komor, 2004). Fourth, if participants in the development have social ties to the area, the propensity for community opposition diminishes. Last, providing avenues for ongoing community feedback purportedly diminishes extreme forms of resistance that can cause project delays (Wizelius, 2007).

Government agency opposition

One final form of opposition that can derail a proposed wind project comes from government agencies that have project veto power. Two illustrative areas of conflict are concerns over disruptions to military installation operations and airport communications (Wizelius, 2007).

Military agencies, airport authorities, and telecommunication authorities may block wind power projects due to concerns that wind turbines can adversely influence radar surveillance and communication systems. Although studies show that interference is negligible, misperceptions can pose intractable barriers for project developers because often, these bodies have veto power over neighboring developments. With adequate buffer zones, such threats can be entirely negated. For planning reference, guidelines regulating minimum distance and maximum heights of wind turbines are often available through national civil aviation authorities (Wizelius, 2007).

Mitigating opposition from government agencies shares the same basic precepts as mitigating public opposition. The threat of opposition can be minimized by seeking to understand concerns, rectifying misperceptions, working with stakeholders to develop agreeable mitigation measures when necessary, and engaging proactively with officials from government agencies who may be concerned about the impact of a proposed wind energy project.

As wind power projects expand in scale and scope, managing public perception will become increasingly important (McKinsey, 2007; Wolsink, 2000). Wind power projects will increasingly encroach upon locations that communities value for aesthetic or environmental reasons. A degree of public resistance is unavoidable because scenic spots such as hilltops, ocean bluffs, and wide sweeping plains are often ideal locations for wind power projects (Komor, 2004). Accordingly, a degree of re-education may also be required in many communities in order to entrench understanding that a transition away from carbon-based electricity generation requires a degree of community commitment to accepting necessary trade-offs. As Dismukes et al. (2007) point out, "*success of radical innovation (such as wide scale wind adoption) requires much of the community it affects: resolution of technical debates about approach, write-down of existing investments, unlearning and relearning of organisational behaviours and practices, creation of new businesses or even industries, perhaps even cultural change. These processes can take years.*"

Impairment of existing ecosystems

Although the concerns over impairment of existing community endowments outlined to this point in the paper are typically the strongest impediment to wind power development, there are cases when concerns over impairment of existing ecosystems can also result in amplified levels of social opposition to wind power developments.

Many attractive wind power sites are located in ecologically sensitive areas (Wolsink, 2000). Rural sites which are often richer in biodiversity compared to suburban sites appeal to wind project developers, thanks to lower land costs and lower risks of public opposition (Firestone and Kempton, 2007). Although coastal areas, mountain ridges, and mountain passes all present attractive siting options due to superior wind quality (Zamot et al., 2005), they are often among the most ecologically precious. In many countries, coastal areas are extensively developed and few undeveloped sites remain. Erecting wind farms in such areas can close off important migration corridors for keystone species that bridge coastal and inland habitats (Miller, 2004). Similarly, mountain passes are often attractive wind sites due to wind channels found in such passes; unfortunately, wind channels also serve as avian flight paths (Zamot et al., 2005).

Bird mortality

Bird mortality is perhaps the most notorious of the ecological threats that wind farms pose. It is not uncommon for wind project developers to be confronted with public concern or even active protest over threats to the avian population (Firestone and Kempton, 2007).

Statistically, as Table 1 illustrates, pollution, electrocution, and collisions with electricity infrastructure associated with conventional power grid operations as well as collisions with cars or buildings cause far more bird deaths than do collisions with wind turbines (Firestone and Kempton, 2007; McKinsey, 2007). A study in 2001 conducted by the US National Wind Coordinating Committee estimated that there were 6400 bird fatalities associated with 3500 wind turbines covered by the study (Wizelius, 2007). Generally, research indicates that it is not the absolute number of bird kills but rather the rarity or ecological sensitivity of specific avian species that fuels the staunchest opposition to wind energy projects.

Despite low avian mortality rates, misperceptions fuelled by planning flaws associated with wind farms of the 1970s and 1980s can still fan the flames of protest. Early turbine models were erected on lattice towers which provided an ideal nesting ground for birds (Boyle,

Table 1
Bird mortality from anthropocentric causes in the United States.

Object	Mortality (birds per year)
Power grid	130–174 million
Cars and trucks	60–80 million
Buildings	100–1000 million
Telecom towers	40–50 million
Pesticides	67 million
Wind turbines	6400

Source: Wizelius, 2007.

2004). However, newer turbine models are mounted on pylon-style towers which are not conducive to nesting (Wizelius, 2007). Unfortunately, although the primary causes of avian fatalities have been significantly mitigated by improved tower construction, larger rotor blades which spin at a slower pace and improved siting strategies, the stigma that wind turbines threaten avian population remains. Community engagement supported by avian impact assessments can help diffuse community dissonance.

The challenge of estimating bird mortality

One common method for assessing the impact of a wind energy project on the avian population is to estimate "bird mortality" which is often expressed as the number of birds killed in a given area (i.e. bird kills per square kilometer per year). Separate bird mortality estimates are often calculated for any endangered species inhabiting an area.

When evaluating bird mortality studies, policy makers should be aware that data can be misleading or altogether inaccurate due to a number of confounding factors. Firstly, many bird mortality estimates use data from other "proxy" wind power sites to generate rough estimates of bird kills. However, species, migration, and scavenging behavior of birds as well as the characteristics of each wind farm differ. Accordingly, estimates that are based on benchmark data from other sites will never be directly transferable. Secondly, bird mortality is usually calculated by counting the number of bird carcasses found within the proxy site area. However, the number of carcasses found is dependent on the number of birds migrating through an area. Studies which fail to account for seasonal migration variations are unrepresentative. Thirdly, counting bird carcasses found within a site boundary produces underestimates of true mortality. Birds that are injured by wind turbines can fly off to other areas where they perish. Furthermore, bird carcasses that fall to the ground are frequently carried off by scavengers (Miller, 2004). In fact, bird mortality statistics are only truly reliable when they are conducted at the site in question over at least a full year. Unfortunately, post-project completion bird mortality studies undermine the value of this tool for planning mitigation strategies.

Even when bird mortality estimates are relatively representative, absolute mortality numbers tell only part of the story. A thousand birds killed per year within the boundary of a wind site represent a significant mortality rate if ten thousand birds pass through the site each year. However, if ten million birds pass through the site each year, the mortality rate is less significant. In order to evaluate the bigger picture, a statistic known as *bird risk* is commonly used. Bird risk is defined as the number of bird fatalities as a percentage of the total number of birds observed in the area (Zamot et al., 2005).

Unfortunately, this metric exhibits all of the potential problems associated with estimating bird mortality plus a host of other confounding threats associated with estimating the number of birds passing through an area. Firstly, birds migrate into and out of habitats. Accordingly, bird numbers are rarely consistent throughout the day, month, or year. Secondly, some birds are nocturnal. This poses obvious enumeration challenges. Thirdly, different birds fly at different heights and so the threat posed is not the same for all species. Finally, as stated earlier, avoiding fatalities of endangered birds should take priority. Therefore, enumeration activities should ideally endeavor to separate endangered species from commonly found species. In practice, this is hard to accomplish (de Lucas et al., 2007).

Lessons for policy makers

There are two useful lessons to draw from these observations. Firstly, mortality studies can provide insight into the potential for public opposition from groups that are concerned about avian welfare. However, such studies are only useful if they avoid the threats to validity outlined earlier. Secondly, policy makers who reference avian mortality studies in order to gain insight into the threat that a wind energy project poses to the avian population should do so with a critical mindset. The methodology supporting the data should be clearly understood in order to ascertain the limitations associated with the study's conclusions.

Degradation of animal habitat

Disruptions to animal habitats associated with construction and operation of a wind facility can significantly influence foraging patterns and undermine the continued viability of the area to support resident species (Magoha, 2002). As the next few paragraphs demonstrate, more effective planning can significantly mitigate threats to ecosystem integrity at the site preparation, construction, and operation stages.

Site preparation issues

Ecosystem-friendly site design requires a reassessment of the traditional approach to site development, which typically begins by clearing all vegetation from a site and leveling the site with bulldozers. Clearing a site in this manner creates ecologically barren wastelands that uproot animal habitats, disrupt foraging patterns, and fragment animal populations (Ackermann and Soder, 2002). This is true even if new vegetation is planted once construction is completed. The level of comfort that an animal has with its habitat is dependent on the familiarity it establishes with its environs. Changes to physical features of the environment or even to scent patterns attached to flora can severely disrupt foraging patterns (Begon et al., 2006). A better way of developing sites is to clear only those areas of land which will be built upon. This will leave some of the original flora in place and provide a level of familiarity that will induce animals to return to the area after construction is completed. Moreover, careful attention should be given to selection of any vegetation to be replanted. Efforts should be made to ensure that new vegetation mirrors the type of vegetation lost (Harrop and Nixon, 1999). Furthermore, the ecological intrusiveness of wind tower foundations can be significantly reduced by recovering foundations with soil and vegetation (Wizelius, 2007).

Another flaw with traditional site development concerns fencing which is often erected around a site, often in adherence to public safety regulations. Utilizing traditional chain-link fencing prevents larger species from returning to the site. Construction standards that require access holes to be installed at various intervals along the fence to facilitate animal migration can resolve this problem (Harrop and Nixon, 1999).

It is worth noting that ecologically sensitive site design should not stop at site boundaries. One of the greatest threats associated with wind energy developments stems from the clearing of pristine lands for access roads and transmission line towers (Denholm et al., 2005). Not only do such access roads potentially hinder animal migration, they also facilitate human access to ecologically sensitive areas. Again, the process of designing the project with these threats in mind can produce cost-effective solutions. Migration corridors can facilitate improved animal migration and entry gates at the mouth of service roads can help regulate unauthorized access.

Construction phase issues

Different species of animals respond differently to external commotion. During the construction stage, noise and commotion from construction activities can either scare off predators or prey, and in doing so, unintentionally upset the ecological balance (Begon et al., 2006). Identifying the types of animals native to a site—"resident animal profiles"—and developing impact assessment and mitigation strategies for the identified species can help minimize the disruptive impact of construction activities. It is particularly important in the development of resident animal profiles that endangered species and keystone species are prioritized to ensure that a given project does not cause irreparable ecological damage (Harrop and Nixon, 1999).

Operational phase issues

Unfortunately, ecological disruption caused by wind farms does not entirely disappear upon completion of construction (Ackermann and Soder, 2002; Ardente et al., 2008). Rotor noise which was a problem with older wind systems has been more or less attenuated through technological advances (Magoha, 2002; Zamot et al., 2005). However, the impacts that the continual "swishing" of modern rotors and shadow flicker caused by the oscillating blades have on wildlife are not yet fully understood. In the absence of better understanding, wind development planners should avoid developments in areas that are inhabited by endangered species.

Offshore wind farms and ecological concerns

Threats to habitat viability apply to offshore wind power developments as well. Moreover, the contention that ecologically sensitive site planning can avert many ecological problems is true for offshore wind developments as well (Ardente et al., 2008; Magoha, 2002; McKinsey, 2007). Mitigation measures can be designed to avoid damaging the health of reefs, marine breeding grounds, and aquatic foraging areas. With that said, the marine habitat can be highly resilient. For example, research indicates that, although the noise emitted and the turbidity caused during the process of tower construction can scare off marine mammals, post-construction, mammals tend to return to the area (DONG Energy, 2008). Research also indicates that the base of wind turbine towers can potentially act as artificial reefs for benthic fauna, and as such, positively contribute to the marine habitat (DONG Energy, 2008).

Overall, extant research in regard to ecosystem management of offshore wind energy developments generally indicates that informed environmental planning can avert most threats to the marine habitat. However, as is the case with onshore developments and animal habitats, more research still needs to be done on the effect of operational noise and vibrations on aquatic creatures.

The importance of environmental impact assessments

Ecological threats and appropriate mitigation measures are site-specific because flora and fauna profiles vary. Accordingly, to fully anticipate the impact of wind power projects on a given ecosystem, environmental impact assessments (EIAs) should be undertaken. EIAs are detailed assessments of ecological impacts associated with specific projects (Harrop and Nixon, 1999; Lawrence, 2003).

The first step of an EIA is to establish the baseline. The baseline represents the state of the ecosystem prior to any development. The next step is to conflate ecological and engineering principles to predict and evaluate impacts that will occur at the site preparation, construction, and operation stages. Finally, the EIA typically concludes by recommending mitigation measures that will minimize the impact of the project on the ecosystem (Harrop and Nixon, 1999). In short, EIAs are site-specific blueprints for mitigating ecological damage associated with wind energy projects.

If the intention to ensure ecological damage is minimized, it is imperative for the EIA to be a part of the project approval process (Brown and Escobar, 2007). Furthermore, the development of standardized EIA templates helps to ensure that every project site is evaluated according to the same criteria with the same depth of analysis (Magoha, 2002). Almost counter-intuitively, as opposed to an absence of standards, research indicates that regulatory standardization of EIA criteria is greatly appreciated by environmental and corporate stakeholders alike (McKinsey, 2007). This is because standardization allows environmental watchdog groups to influence what goes into an EIA through political lobbying and to more effectively evaluate EIA submissions from project developers. Standardization also insulates project development firms from public criticism that the EIAs they carry out lack an acceptable standard of rigor (McKinsey, 2007).

Caveats associated with EIA legislation

There are three caveats associated with the management of EIA policy. Firstly, projects which have been planned in an ecologically sensitive matter should not be delayed by red tape associated with an inefficient EIA review process because unpredictability deters investment (McKinsey, 2007). This implies that authorities that are responsible for vetting the assessments and granting approval must have the resources, competencies, and operational obligation to expediently carry out effective, timely evaluation of submissions (Lawrence, 2003).

Secondly, a degree of flexibility should be built into the EIA process in order to allow amendments to be made to EIAs as characteristics of projects change, new technology emerges, and project finances fluctuate (McKinsey, 2007; Wizelius, 2007). Mechanisms should exist to allow project developers to make minor amendments to project designs and have these amendments approved in a fast track manner without the entire EIA being resubmitted. An EIA should be an advisory tool which helps to make wind energy projects more environmentally sound; it should not be used to delay or derail projects that are beneficial to the community (Lawrence, 2003). In order to achieve economic and environmental balance, many nations draw a distinction between small and large wind energy developments. Larger developments require more detailed EIAs. In Germany, projects involving 20 turbines and more require significantly more due diligence and preparation of a mandatory EIA. In Sweden, any installation over 25 MW requires a comprehensive EIA (Wizelius, 2007).

Thirdly, mandatory EIA standards should ensure that EIAs are prepared and disseminated for stakeholder evaluation and input well before project approval is given (Wizelius, 2007). For wind energy project developers and civic sponsors, one of the main purposes of preparing an EIA is to minimize the threat of public protest caused by poor planning. Without giving stakeholders a voice, EIAs created with even the best intentions may still fuel protest (de Lucas et al., 2007). This caveat may seem like a trite observation; however, all too often, EIAs are prepared in isolation from stakeholders and appended to projects as afterthoughts (Lawrence, 2003).

Concluding thoughts

It is perhaps no exaggeration to say that the realizable potential of wind power depends on how well developers manage social and environmental issues (McKinsey, 2007). As more wind farms are developed, threats to both social and ecological endowments will increase (DONG Energy, 2008). As available sites become more scarce, the impetus to build wind farms on socially and ecologically sensitive areas will also increase (Markevicius et al., 2007). However, by developing and overseeing improved standards for managing threats to social and ecological endowments, policy makers can play a role in ensuring that the benefits derived from wind energy are not realized at the expense of a community's natural habitat.

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