Environmental Impact Assessment Review 38 (2013) 142–150

Contents lists available at SciVerse ScienceDirect

Environmental Impact Assessment Review

journal homepage: www.elsevier.com/locate/eiar

A quantitative method to analyze the quality of EIA information in wind energy development and avian/bat assessments

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ARTICLE INFO

Article history:
Received 25 May 2012
Received in revised form 29 July 2012
Accepted 30 July 2012
Available online 1 September 2012

Keywords:
Environmental impact assessment
Quality
Renewable energy
Wind energy

ABSTRACT

The environmental impact assessment (EIA) has been a tool for decision makers since the enactment of the National Environmental Policy Act (NEPA). Since that time, few analyses have been performed to verify the quality of information and content within EIAs. High quality information within assessments is vital in order for decision makers, stake holders, and the public to understand the potential impact of proposed actions on the ecosystem and wildlife species. Low quality information has been a major cause for litigation and economic loss. Since 1999, wind energy development has seen an exponential growth with unknown levels of impact on wildlife species, in particular bird and bat species. The purpose of this article is to: (1) develop, validate, and apply a quantitative index to review avian/bat assessment quality for wind energy EIAs; and (2) assess the trends and status of avian/bat assessment quality in a sample of wind energy EIAs.

This research presents the development and testing of the Avian and Bat Assessment Quality Index (ABAQI), a new approach to quantify information quality of ecological assessments within wind energy development EIAs in relation to avian and bat species based on review areas and factors derived from 23 state wind/wildlife siting guidance documents. The ABAQI was tested through a review of 49 publicly available EIA documents and validated by identifying high variation in avian and bat assessments quality for wind energy developments. Of all the reviewed EIAs, 66% failed to provide high levels of preconstruction avian and bat survey information, compared to recommended factors from state guidelines. This suggests the need for greater consistency from recommended guidelines by state, and mandatory compliance by EIA preparers to avoid possible habitat and species loss, wind energy development shut down, and future lawsuits.

1. Introduction

The National Environmental Policy Act (NEPA) was enacted in 1973 to address the nation's environmental concerns related to development. This landmark legislation sought to address the growing public discontent regarding the environmental consequences of economic development, and the failure of existing decision making tools (Petts, 1999). The act established the Environmental Impact Assessment (EIA) process, a generic term that refers to the decision tool that identifies and evaluates the probable environmental consequences of proposed development actions. Since its inception, EIA procedures have been formally adopted by state and county agencies, lenders and funding agencies, and over 100 nations (Petts, 1999; Wood, 1995).

From an applied science framework, an EIA is a process in which scientific knowledge and expertise identifies the likely positive and/or negative influence a potential project may have on the human environment through its construction or operation. Effectiveness of the EIA depends on the identification and evaluation of baseline data to predict the biological, social, and physical impacts of development proposal prior to any environmental disturbance. Therefore, information disseminated through an EIA provides vital knowledge for decision makers.

The utility of the EIA in informing decisions depend on the quality of the science underlying the process. Limitations in the EIA process may include missing information (about potentially significant impacts); incomplete information (insufficiently studied relationships, poor or incomplete science/investigations); biased information (produced from a limited perspective or based on too brief a time frame); or untimely information (studies produced after a decision or commitment) (Bartlett and Kurian, 1999). Therefore, the quality of information presented is critical for the EIA process to be successful in providing a full scope of potential impacts resulting from development.

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http://dx.doi.org/10.1016/j.eiar.2012.07.005

1.1. Current standards and methods of evaluating EIAs

Critics assert that the majority of impact studies within EIAs are poorly prepared (Haug et al., 1984). Many EIAs fail to solve a number of problems such as accurately predicting the environmental impacts of the proposed action or communicating information intelligibly to decision makers and stakeholders (Elkin and Smith, 1988). This raises the question, "what is an adequate EIA?" Hirji and Ortolano (1991) describe the adequacy of an EIA depends on its completeness and the appropriateness of the methods used in conducting the assessment. Given this definition, a number of authors have proposed methodological elements that constitute an ideal EIA and introduce the concept of an environmental assessment review process using qualitative factor identification and scoring (King and Nelson, 1983; Lee et al., 1999; Samarakoon and Rowan, 2008; Whitney and Maclaren, 1985). Gray and Edward-Jones (1999) state that a good review procedure should allow the reviewer to: (1) ascertain the completeness of the environmental assessment; (2) assess the accuracy and validity of the information presented; (3) rapidly become familiar with the project and location, and be in a position to determine whether any part of the assessment required further input; and 4) assess the significance of the environmental effects of the proposed development.

Numerous studies evaluate EIAs using a variety of methodologies. One of the most accepted and often cited is the Environmental Statement Review Package (ESRP) developed by Lee et al. (1999), which utilizes hierarchically-based review categories (e.g. methodology of assessment, timing of assessment) and a simple qualitative four-point scale of A to D to assess quality for each category. Though this method allows for variations within the literature for "good" data quality and allows subjective scoring for the reviewer based on their experience, it is limited in its ability to repeat similar outcomes from the analysis across reviewer. Furthermore, the qualitative nature of the ESRP system produced different scores based on an individual's background understanding of the specific action's impact on an environment (Badr et al., 2011). Sandham et al. (2008) notes this issue as a source of bias in the review and also cites an evident limitation with the weighting of review criteria. In some cases, specific review factors have greater value to a decision maker and stakeholder than others, but are equally weighted in scoring to all other review factors. This discrepancy may rank an EIA with a relatively high score in quality, yet it may fail to meet key categories that are critical knowledge for understanding potential impacts of the proposed action (Elkin and Smith, 1988; Riffat and Khan, 2006). Therefore, a new review quantitative methodology is needed to better consistently evaluate EIAs, to ensure that high quality information is communicated (Badr et al., 2011; Peterson, 2009).

This study uses existing frameworks for EIA quality review and develops a new quantitative scoring index to address the shortcomings of the above mentioned method of a qualitative review analysis. In formulation of a protocol, avian and bat assessments at wind energy developments were used as a case study to provide a specific direction for assessment review. The short history of wind energy development and uncertainty associated with wind energy development impacts on birds and bats has resulted in a number of conflicts involving incomplete environmental assessment. Using this case study, a new index based on a hierarchical review category structure was created and tested to determine the viability for a quantitative quality analysis of EIAs.

1.2. Wind energy developments

Early experiences with wind energy developments highlight the consequences of information quality and subsequent siting decisions based on information found in EIAs. Over the last decade, observations of mortality among avian and bat species populations prompted numerous studies on the ecological impact of wind developments (Arnett et al., 2008; Kunz et al., 2007). Orloff and Flannery (1992) observed a significant number of golden eagle collision incidents in the Altamont Pass wind farm that raised serious management concerns due to the species' federal listing. Thelander et al. (2003) determined that the Altamont Pass wind farm had the highest incidence of bird of prey mortality in North America with a recorded 24 golden eagles killed annually. A follow-up report stated that even after improvements to reduce impacts, 65 golden eagles are still taken annually, demonstrating the importance of the pre-site selection process and post-construction monitoring of the EIA (Smallwood, 2010). Mortalities of birds and bats attributed to wind farms have created controversy in the United States around wind development. Since 2008, the growing number of lawsuits includes Wyoming, West Virginia, New York, and California (Arnett et al., 2008; Thompson, 2009). Numerous wind sites may face possible closure due to potential for avian and bat impacts. In 2009, a court case in West Virginia halted the construction of a $300 million wind project due to possible impacts on the endangered Indiana bat (AWI v. BRE, 2009). The court cited limited and incomplete information presented in the environmental impact assessment as a critical factor deciding this case. This setback demonstrated decision-making regarding wind farms development was driven by limited information and low quality of the EIA. In response to these challenges, several states, industry associations, and the federal government have developed guidelines for wildlife assessment and monitoring at potential wind developments. However, no studies have demonstrated the effectiveness of these guidelines to improve EIA quality and address shortcomings.

Ongoing agency implementation and monitoring of mitigation measures are limited and in need of improvement (CEQ 1997, National Environmental Policy Act, NEPA, 1970). Gray and Edward-Jones (1999) state that there is little benefit in implementing a comprehensive system of environmental assessment if no check is made on the validity and impartiality of the data presented to the decision maker. This represents a failure in the EIA process given that the information disseminated in these reports should reflect accurate, unbiased, and appropriate data. Fairweather (1994) criticizes EIAs because many are not peer reviewed or evaluated by knowledgeable scientists, and fail to be evaluated for information quality before reaching decision makers. A means of evaluating EIAs for quality biological data is essential not only to allow for better decision making, but also in order to prevent future law suits and avoid impacts on critical wildlife habitat.

This article reviews the development and application of an Avian and Bat Assessment Quality Index (ABAQI), a novel methodology for reviewing the comprehensiveness of quality of avian and bat assessments in wind development EIAs. We define "quality", in reference to the measurable completeness of the environmental review and visible application of the best available practices/science. For the remainder of the article, the term "quality" will be used to be synonymous with the term "quality of avian and bat assessments". Although analysis of EIA quality has been performed in numerous studies, none have used an objective quantitative index. The ABAQI represents a quantitative weighted scoring rubric built on critical factors derived and weighted from literature and existing local/state guidelines. This methodological research represents the first study to attempt to quantify wind EIA information quality and demonstrate a feedback mechanism in the EIA process for adaptive improvement in the assessment and decision making process.

2. Methods

2.1. Developing a rubric of quality

Over the last ten years, 23 public voluntary state guidelines regarding wind energy developments have been published in the U.S. that describe specific analysis that should be performed during the biological assessment process of an EIA. Although these state guidelines are not mandatory, they provide wind energy developers with a roadmap for the proper assessment of wildlife and determination of