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Key criteria for sustainable wind energy planning—lessons from an institutional perspective on the impact assessment literature

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ABSTRACT

An increasing number of researchers stress the importance of national planning institutions' role with respect to promoting an "effective" decision-making process in terms of bringing about sustainable energy. Impact assessment (IA) procedures are seen as having strong potential in supporting environmentally conscious energy production. This article discusses criteria for sustainable wind power planning and compares the centralised planning systems for wind energy in two countries – Norway and Scotland – as illustrating cases. We ask the following: What key criteria should be present to secure sustainable wind energy planning, and what are the critical institutional conditions to fulfil these criteria? A review of relevant IA literature reveals four key criteria for promoting sustainable wind planning: (i) clear and integrated political priorities, (ii) stakeholder involvement, (iii) strategic environmental assessment (SEA) and (iv) stringent permission and assessment requirements. We also determined that critical institutional conditions exist that effectively promote sustainable energy production: (a) coordinated energy policy institutions, (b) legitimate planning procedures, (c) that SEAs are followed in the decision-making process and (d) statutory planning regulations.

Contents

Abbreviations: (IA), Impact Assessment; (EIA), Environmental Impact Assessment; (SEA), Strategic Environmental Assessment; (SD), Sustainable Development; (ECDU), Energy Consents and Deployment Unit; (SNH), Scottish Natural Heritage; (SEPA), Scottish Environmental Protection Agency; (RSPB), Royal Society for Protection of Birds; (NVE), Norwegian Water Resource and Energy Directorate; (NEA),, Norwegian Environment Agency; (DCH), Directorate for Cultural Heritage; (TCA), Thematic Conflict Assessments; (EPI), Environmental Policy Integration

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1. Introduction

Although renewable energy generation, such as wind power, is widely regarded as an important contribution to the establishment of a sustainable low-carbon energy system, it is not entirely environmentally benign. Conflicts over concrete wind power projects often occur during the planning process and, in particular, are related to the local environmental impacts on the landscape and threats to wildlife. An increasing number of researchers stress the importance of the *planning institution's* role with respect to balancing the concern for renewable energy production and carbon reductions on the one hand and local environmental concerns on the other – bringing about sustainable energy projects [1–4]. The key regulatory mechanism used by a planning institution when considering the different concerns is impact assessments (IA). IA procedures are observed as playing an important role in supporting sustainable energy development. However, the planning process used in support of the development of environmentally acceptable energy projects is challenging. There is a call for a clearer definition of the criteria to be used in sustainable energy planning and to identify key institutional conditions required for IA regulations to effectively promote sustainable energy development in practice [1,4]. Based on a literature review of impact assessment procedures used during the energy planning process, this article asks the following:

1. *What key criteria should be present to "effectively" secure sustainable wind energy planning?*
2. *What factors represent the necessary planning institutional conditions required to fulfil the criteria?*

We argue that there are four particularly critical criteria for promoting the approval of sustainable and acceptable wind energy projects, which are dependent on institutional settings and mechanisms, such as coordinated and legitimate planning procedures and mandatory policies to be fulfilled:

- *Clear and integrated political priorities* from the central authorities
- *Stakeholder involvement* throughout the whole assessment and planning process
- *Strategic environmental assessment* (*SEA*) applied early in the planning process
- *Stringent* permission and assessment requirements

There has been an increasing tendency towards the centralised planning of large-scale wind developments, although this has proved to be challenging [5]. The wind planning performance of two countries with relatively centralised planning systems but different wind planning outcomes – Norway and Scotland – are applied as cases, illustrating how the key criteria for sustainable renewable energy planning work out in practice.

This article is organised as follows. Section 2 presents the theoretical framework, including a review of relevant IA literature and the development of key criteria for sustainable planning. Section 3 explains the methods and rationale for case selection, and data are presented. The ways in which the Norwegian and Scottish planning systems for wind energy perform are then described in Section 4, whereas theoretical implications for sustainable energy planning are discussed in Section 5. Finally, conclusions are presented in Section 6.

2. Theoretical framework

2.1. The challenge of balancing different values in sustainable renewable energy planning

Renewable energy generation is regarded as an important contribution in achieving a low-carbon energy system, reducing the dependence on fossil fuels and mitigating climate change. During the last decade, wind power has been the leading "new" (i.e., non-hydro) renewable technology – being the only one able to compete with conventional generation sources on economic grounds [6]. Welch and Venkateswaran [7] refer to the "dual sustainability" of wind energy, highlighting that wind energy is both environmentally benign and close to becoming financially self-sustaining. Another recent study by Yang et al. [8] concludes that wind power technology performs better than solar energy in terms of sustainability, without taking into account the environmental costs of wind farms' land occupation. Tabassum-Abbasi et al. [9], however, argue that with the trend of fast-increasing wind energy deployment, environmental concerns such as adverse impacts on wildlife are rising and likely to be much greater than reflected in most of the earlier research. In line with the latter study, we argue that providing environmentally acceptable development of any energy projects, including wind farms, is challenging. Conflicts related to both environmental and social impacts often occur in the wind planning process, which can influence the fate of specific wind power plants [10,11]. Community or individuals' attitudes towards wind farms are in particular strongly influenced by the visual impacts on the landscape and threats to wildlife [12,13]. One growing challenge relates to the cumulative impacts that may occur due to the decentralised and rapid development of wind farms over recent years. In countries such as Scotland, the most favourable locations for wind farm development are often upland areas valued for their scenic quality, which are frequently ecologically sensitive [14].

Moreover, while conflicts between development and conservation have traditionally revolved around how to balance socio-economic benefits with landscape, biological diversity, etc., the wind energy issue additionally sets opposing environmental goals. A central aspect of the debate called the "green on green" dispute represents the conflict between the need for climate change mitigation at a global level and local environmental conservation goals [15]. Such debates provoke fundamental dilemmas. For example, should the challenge of climate change force a reassessment of the priority given to protecting existing landscapes? Furthermore, at the heart of the debate are fundamental strategic dilemmas related to both *location* and the overall *scale* of wind energy in an area. For example, in total, how much wind energy should be deployed compared with other sustainable energy technologies and energy conservation? [5,16]. The debate does not just include objective "facts"; it also represents more complex