



Wind power, regional development and benefit-sharing: The case of Northern Sweden [☆]



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ARTICLE INFO

Article history:

Received 20 November 2014

Received in revised form

12 February 2015

Accepted 8 March 2015

Available online 30 March 2015

Keywords:

Wind power

Regional development

Community benefits

Sweden

ABSTRACT

This paper addresses the question of how investments in wind power can promote regional development and employment, as well as how different benefit-sharing instruments (e.g., community funds etc.) can be used to strengthen the positive impacts. The objectives of the paper are to provide: (a) a survey of previous regional-economic assessments of wind power projects; as well as (b) a quantitative assessment of the employment impacts of an ongoing wind farm investment in the Swedish county of Norrbotten under different benefit-sharing scenarios. Our model-based input–output analysis confirms many of the findings of previous research, such as significant construction work impacts, especially in the presence of local manufacturing. The analysis also illustrates that in the absence of any benefit-sharing mechanism, the employment impacts for Norrbotten during the operating phase will be modest (with an employment multiplier of 1.4). However, even if a relatively low share of the wind power revenues is assumed to accrue to the local government this would have significant positive impacts on employment rates. For this reason, additional research on various types of benefit-sharing instruments is called for, including studies of the associated challenges and trade-offs.

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[☆]Financial support from the Swedish Energy Agency (AES research program) is gratefully acknowledged, as are valuable comments from two anonymous reviewers. Any expressed opinions and remaining errors, however, reside solely with the authors.

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1. Introduction

1.1. Background and motivation

The desire to reduce the use of fossil fuels in electric power generation has motivated policy makers to implement a range of incentives for investments in renewable energy technology. One of the most prominent forms of renewable energy technologies is wind power, which harvests the kinetic energy in wind and converts it to electricity. As noted by, for instance, Slattery et al. [32], wind power is recognized as one of the most environmentally benign sources of power generation (see also [33]). It is also one of the fastest growing power generation sources in the world. Within the European Union, some 11 percent of the installed power generation capacity consists of wind power as of 2012; this is enough to supply more than 6 percent of EU electricity consumption during a normal year ([15]). In the United States, the installed wind power capacity is estimated to amount to over 4 percent of the electricity demand [43].

Continued investments in wind power are of interest at the national level as a means of reducing fossil fuel dependency and achieving carbon dioxide emission reductions. However, wind power investments also give rise to the coveted green jobs, providing prospects for economic development also in rural areas with declining population trends. The regional development impacts of renewable energy projects, especially in rural and isolated areas, are emphasized also at the policy level (e.g., the EU Renewable Energy Directive (2009/28/EC)).

Still, while there is an extensive research literature on different obstacles to the establishment of renewable energy projects, such as the role of public attitudes, legal rules and licensing procedures, the cost of grid extensions, weak support schemes etc., this work generally comprises few references to the relationship between renewable energy diffusion on the one hand and regional economic growth and employment opportunities in rural areas on the other. Moreover, a few studies do shed light on the potential employment impacts of wind power projects in the USA and in part in other countries (see further Section 2), but in general these do not devote much attention to the potential role of different benefit-sharing mechanisms that can be used to strengthen these positive impacts (e.g., local ownership, taxation and community funds, encouraging local contracting, benefits-in-kind etc.).

1.2. Objectives and approach

The objectives of this paper are to: (a) provide a survey of the existing empirical literature investigating the regional development (employment) impacts of wind power projects; and (b) assess the potential employment impacts of an ongoing wind farm investment in the north of Sweden under different benefit-sharing scenarios.

Specifically, in addressing the second purpose we identify long-term wind power scenarios for the county of Norrbotten in Sweden following the so-called Markbygden wind power project, involving investments in up to 1101 wind mills over the period 2012–2019. With a planned capacity of 4 GW it may become the largest onshore wind farm in Europe. The scenarios include one with no benefit-sharing mechanisms, as well as four scenarios in which certain shares of the wind power revenues are channeled back to the local government budget. We also comment on how the regional-economic impacts may be influenced through the presence of local manufacturing of some of the needed wind power components (i.e., blades and towers). The quantitative assessment builds on the regional impact model rAps, which addresses labor market and income impacts, including how the different sectors of the regional economy are affected (see Section 3). In this paper we focus on the employment impacts, while devoting more limited attention to, for

instance, land rents and ownership issues (see Phimister and Roberts [28] for an assessment of the role of ownership).

1.3. The wind power supply chain and the role of benefit-sharing

In practice the regional-economic impacts of wind power projects are likely to vary depending on whether local manufacturing of wind turbines and other essential inputs (e.g., concrete for the foundation) takes place or not. Denmark is an apt example of this; here a world-class wind turbine industry has been established (e.g., [6]). The Danish Wind Industry Association [9] reports that in 2009 the Danish wind turbine industry accounted for over 8 percent of total Danish exports, and it employed about 24 700 persons. Another large wind turbine producer is Germany, where the export-oriented renewable energy technology sector employs more than 370 000 people. For instance, in 2009, 70 percent of the German wind turbine industry's turnover came from the export market [22].

In the USA, domestic wind turbine and component manufacturing has increased during the last decade, and trade data show that a growing percentage of the equipment used in wind power projects is being sourced domestically. Wisser and Bolinger [43] report that among the top-ten wind turbine producers in the U.S. market in 2011, at least eight had one domestic manufacturing facility. In 2004, only one active wind turbine manufacturer was assembling nacelles in the USA. The American Wind Energy Association [2] estimates that in 2011, the U.S. wind energy sector employed about 75 000 workers (either directly or indirectly).

Most regional and local communities hosting new wind power projects will not, though, be able to benefit from the presence of large-scale manufacturing plants where turbines and/or components are produced locally. The opportunities for local economic development driven by wind power activities are often limited to those created by the installation and operation of the actual wind farms. Brown et al. [5] note that wind power plants are often constructed in rural areas, which have otherwise often seen declines in new investment, earnings growth and employment opportunities. The benefits to local communities consist of new jobs, tax revenues, lease payments to land owners and opportunities for local businesses, to name a few.

Wind power projects may also have adverse impacts on the local community, including the displacement of alternative land uses, as well as negative visual and noise impacts [25]. This raises a demand for local compensation. The demand for more inclusive wind power projects has also emerged from the perception of the wind resources as a common good, which no particular person or company owns ([7].¹ Previous studies highlight a number of measures that can be undertaken in order to increase the public's acceptance of wind power projects even in the presence of such impacts [41]. Some of these measures are directly related to the ability of the local and regional economy to capture some of the economic benefits that are generated by these projects [1]. For instance, land lease payments and property taxes have sometimes been critical in securing local support for specific projects (e.g., [20]), and local ownership has been shown to substantially enhance the positive regional-economic impacts of wind power (e.g., [21,28]).

Another potentially important benefit-sharing mechanism is to recoup a share of the revenues from the wind power project, and inject these into the local and regional economy. One way to achieve this is through the provision of so-called community benefit funds (e.g., [4]). This approach is analyzed in more detail in this paper, and

¹ A wind mill may often affect also other land owners negatively, e.g., by restricting wind conditions for other developers in adjacent areas. For this reason many wind project developers do not only pay a lease for the land where the mill is placed, they also compensate other land owners within the relevant so-called wind catchment area (e.g., Liljenfeldt, 2013).

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