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A turbine is not only a turbine: The role of social context and fairness characteristics for the local acceptance of wind power

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ABSTRACT

To gain acceptance for renewable energy production sites, it is not sufficient to develop the appropriate technology without taking the social context and fairness concerns into account. Using a factorial survey experiment, we investigate the influence of both on the local acceptance of wind turbine developments in Germany and Poland–two countries differing in installed wind power capacity. Respondents were surveyed with hypothetical situations describing the construction of wind farms varying in the opportunity to participate in the planning process (participatory justice), the distribution of turbines across regions (distributive justice), and ownership, among other characteristics. We find higher acceptance levels in Poland than in Germany. Respondents in both countries are willing to accept new turbines in their vicinity if they can participate in decision making, the turbines are owned by a group of citizens, and if the generated electricity is consumed in the region instead of being exported. Overall, participatory justice is more important than distributive justice. Confirming previous results, we also find that respondents who already have turbines in their vicinity show higher acceptance levels than those who are not yet affected. Thus, the negative externalities are likely to be overestimated in the planning and implementation process.

1. Introduction

Resistance to wind turbines can result in the foundation of a new political party. In the German state Mecklenburg-Vorpommern, the party “Free Horizon” (Freier Horizont) was founded at the beginning of 2016 and participated in the state's election in the same year. The main issue of the party is the destruction of the landscape by a high level of wind power generation in Mecklenburg-Vorpommern. While the foundation of that party is an extreme example, across Germany there are many initiatives where citizens protest against the construction of new turbines in their vicinity. In Poland, the expansion of wind farms in recent years has produced numerous protests among local populations, which has led to the creation of several associations opposing the development of wind energy. In both countries, the extension of wind power is an important topic, and developing new projects can meet strong resistance.

On the other hand, given the unrestricted technical potential of both countries for onshore wind energy (estimates are for Germany approximately 4000 TWh and for Poland approximately 3800 TWh; EEA, 2009), and policy objectives such as combating climate change and increasing independence from foreign energy resources, both countries could generate a much larger share of electricity from onshore wind energy than they do today. For example, in Germany, the Federal German Environment Agency (UBA, 2016) assumes that in order to achieve climate policy objectives, 100% electricity generation from renewables will be needed in 2050. This would require, due to the agency's calculations, that 2.5 GW in wind power capacity are added on a yearly basis. In Poland, the restricted technical potential of onshore wind energy is estimated at 31.5 GW in 2030 (IRENA, 2015). Reaching this level would imply an average annual increase of wind power capacity equal to 1.8 GW. These goals, even with modern turbines having large generation capacities, would need tens of thousands of new turbines across Germany and Poland. If this potential should be fully realized, then a much better understanding of the conditions of local acceptance of wind turbines would be crucial because, as Aitken (2010) is arguing, the social aspects of wind power are still not well understood. Solely pointing out the advantages of turbines, such as a CO_2-free generation of electricity, will probably not be sufficient (Wolsink, 2007a, 2007b).

The recent literature suggests that social context is crucial, and a

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turbine is therefore not only a turbine, but rather a technology that's acceptance is socially embedded and affected by fairness concerns (see Wolsink, 2013 for an overview). Important questions are, for example, who will own the turbines, who can participate in decision making, and what the benefits are for local communities. The majority of studies investigating the influence of these factors on local acceptance of turbines in peoples' vicinities combine qualitative interviews with standardized questionnaires comprising attitudinal items (e.g., Zoellner et al., 2008) or simply use standardized questionnaires comprising sets of attitudinal items (e.g., Musall and Kuik, 2011). While responses to attitudinal items are informative, they only focus on a single aspect and are more prone to socially desirable response behavior (Liebig et al., 2015).

Another method that has recently been used to assess local acceptance of wind power developments are discrete choice experiments (DCE) (see e.g. Dimitropoulos and Kontoleon (2009); García et al. (2016)). DCE use an experimental setup to elicit the preferences of respondents through choices among mutually exclusive alternatives. This way, the respondents are also less prone to socially desirable response behavior. However, a limitation for the measurement of local acceptance might be that DCE typically use a monetary attribute that often comes as a discount or rebate on the electricity bill. Respondents who are, for example, not willing to make a trade-off between a lower electricity bill and the acceptance of wind turbines in their community might not be in a position to express their opposition towards wind power development accordingly.

In this study, we use a factorial survey experiment (FSE), also called a vignette experiment, to investigate local acceptance of new turbines in Germany and Poland. To our knowledge, this is the first time that FSEs are used in this context; FSEs have mainly been used in sociology for the study of justice concerns and social norms. Similar to DCEs, FSEs are multifactorial and make it more difficult for respondents to not answer "truthfully". Compared to simple measurements in surveys, FSEs also allow for the identification of causal effects due to the experimental setup (Auspurg and Hinz, 2015; Liebig et al., 2015). In contrast to DCEs, however, they do not use money as a common metric; respondents can express their level of agreement or disagreement on a rating scale.

While both Germany and Poland have large potentials for renewable energy production (EEA, 2009), they differ significantly with respect to the current use of wind power generation; this is an ideal situation for comparing local acceptance in countries with both high and low densities of turbines. The use of the FSE also allows avoidance of what Wolsink (2013) calls one of the main common sense biases in the debate about social acceptance. According to Wolsink (also McAdam and Boudet, 2012), the focus is too much on the potential objectors of wind power development, neglecting the supporting side, i.e. which factors lead to backing wind power developments. In this regard, fairness concerns seem to be especially relevant (Wolsink, 2007a, 2007b). In our study, we specifically consider two fairness aspects which are well grounded in the literature on environmental and social justice (Schlosberg, 2007): distributive justice (how the number of wind turbines is distributed across regions and social groups) and procedural justice (to what extent citizens can participate in decision making processes).

With respect to the comparison of Germany and Poland, we expect significant differences due to the fact that Germany can be described as a country where people frequently encounter wind turbines, although the turbines are unevenly distributed across the country, while in Poland people are less likely to encounter wind turbines. These differences across both countries can translate twofold into differences in acceptance levels. First, following a simple exposure-acceptance argument, it can be expected that a higher exposure to wind power plants leads to lower acceptance of new power plants. The reason is that there is a saturation point regarding the number of wind turbines that citizens are prepared to accept in their vicinity. Every new power plant is accordingly perceived as more disturbing than the previous one and is perceived as closer to the saturation point. If this holds true, the overall acceptance should be higher in Poland than in Germany. However, previous studies also suggest a U-shaped pattern of attitudes towards wind power developments over time (Wolsink, 2007a: 1197). Before a wind turbine project is planned in a region, the attitudes are positive. When a project is announced, the attitudes become more negative. After the project has been realized, the attitudes are at least as positive as before the planning process has started. Because in Germany, citizens are, in general, more likely to encounter wind turbines than in Poland, their acceptance levels regarding the construction of new turbines might be higher than in Poland, where the announcement of new turbines might lead to lower acceptance levels. Our results will show which of these explanations better describes people's stated acceptance levels.

The paper proceeds as follows. In the next section, we introduce the wind power sector in both Germany and Poland, highlighting some differences that are meaningful for the subject of our study. Subsequently, FSE as a method to elicit acceptance toward renewable energy production sites is presented before the design of our survey is introduced. Next, the descriptive statistics regarding both samples are reported, followed by the multivariate results from the FSE. Finally, we discuss our main findings.

2. Wind power in Germany and Poland

At the end of 2015, the installed wind energy capacity in the European Union (EU) was estimated to be 142 GW. While Germany's share of this capacity was about 32% (about 45 GW, see Table 1), Poland's share was about 3.6% (about 5.1 GW; EWEA, 2016). From these figures, Germany is the EU country with the largest installed capacity, while Poland is in 7th place among EU members.[1] Although the wind power potential is comparable in both countries (EEA, 2009), the figures reveal a large gap concerning the installed capacity. One reason[2] for this gap is that each country started promoting the expansion of renewable energies at different points in time. Germany began in the early 1990s with the renewable energy act and with feed-in-tariffs. Poland, in contrast, implemented its system to support renewable energy, using certificates, not before 2005.

At the end of 2015, electricity from renewable energy sources was an important part of the energy mix in Germany, with wind taking the largest share of 12.3% (79.2 TWh; 70.9 TWh onshore, 8.3 TWh offshore). The share of electricity generated from wind in Poland is about half of the share in Germany. However, it is worth noting that the number of wind power installations in Poland has recently increased rapidly. In 2015, with 1.3 GW new wind capacity installed, Poland was the second in the EU in terms of wind energy development, after Germany. In that year, wind farms in Poland also broke a record by generating 10 TWh electricity – an increase of 40% compared to 2014 (PWEA, 2016).

Following the significantly different amounts of installed capacity, exposure to turbines is very different in both countries (Table 1). This is indicated by the density measurement of turbines per 100 km^2. While in Germany there have been 7.3 turbines per 100 km^2 at the end of 2015, this density for Poland is 0.8 turbines per 100 km^2. Thus, people in Poland are, on average, less likely to encounter turbines in their vicinity. The latest figures concerning the ownership structure of wind power in Germany are from 2012 (trend: research & Leuphana Universität Lüneburg 2013). According to this study, about 25% of the installed capacity was owned by citizens (single owners and citizen-owned energy companies). If trans-regional citizen-owned wind power

[1] Countries placed between Germany and Poland are: Spain (23GW), UK (13.6GW), France (10.4GW), Italy (9GW) and Sweden (6GW).

[2] For a review of the regulatory framework and how it promotes the expansion of wind power across EU countries, see González and Lacal-Arántegui (2016).