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Integrating acceptance-relevant factors into wind power planning: A discussion

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ABSTRACT

In this paper, a framework is proposed which aims at including social acceptance as an integral component of planning of large scale technologies. To date, social acceptance is often considered only in the final stage of the planning process, if at all. It will be argued that acceptance-relevant factors should be integrated during the whole process in order to include the public and coordinate acceptance and planning in combination. In order to achieve this, a social gap in the planning of complex energy infrastructure needs to be closed. The social gap presents itself in a twofold manner: one issue is the critical analysis of the general measurability of acceptance factors referring to the question if it is possible to operationalize and predict social acceptance reliably. The second "gap" refers to the lack of integration of results from acceptance research into current planning procedures. Taking wind farm planning as an example, the two gaps are discussed and a new, integrative planning model is advocated. Finally, requirements for a user-centered planning procedure are derived.

1. Introduction

Social acceptance of novel technologies has been a popular research topic for more than a quarter of a century. While former technology acceptance research concentrated mostly on technological artefacts in the work context (e.g., Davis, 1989), reacting to personal computers entering the work space, today, large scale technologies are prominent within acceptance research, especially in the context of energy supply. It has been shown that understanding public perception and acceptance factors are important issues with respect to sustainable technology diffusion and efficient adoption within communities. Especially in the light of the turn towards renewable energies, social acceptance of the associated infrastructure such as wind power (WP) plants (on-/offshore) (Devine-Wright, 2005; Zaunbrecher, Kowalewski & Ziefle, 2014), geothermal energy (Dowd, Boughen, Ashworth & Carr-Cornish, 2010; Kowalewski et al., 2014; Zaunbrecher, Kluge, & Ziefle, 2016 in press) as well as transmission lines (Devine-Wright & Batel, 2013; Atkinson, Day, Mourato & Palmer, 2004; Soini, Pouta, Salmiovirta, Uusitalo & Kivinen, 2011) received attention. For infrastructures such as WP plants or transmission lines, the knowledge about technology acceptance is rich; for others, e.g., storage technologies, detailed analyses about perceived benefits or barriers are still scarce (Zaunbrecher, Bexten, & Ziefle, 2016).

What is missing in most approaches, however, is a specific call to action on how to finally put the results from social acceptance research into practice. Although there is a rich knowledge base about potential acceptance drivers and resistance patterns from academic research, persons in charge in communes or technical planning bureaus are left alone when it comes to the practical questions of *how* and *when* to integrate the public in the planning process. This paper, therefore, presents a framework which integrates a conscious public opinion in the planning of energy infrastructure, specifically wind energy. The aim of this framework is to include known acceptance-relevant parameters apart from environmental, legal, and financial ones into the planning during early stages of the process, as well as actively involving the public in the selection of sustainable scenarios. By this, the framework could represent a blueprint of a holistic planning procedure that might assist policy makers and persons in charge in communes during the planning and realization of successful infrastructure deployment.

WP plants are chosen in this paper as a case study for two main reasons:

(1) For WP plants, a sound research basis exists, providing a rich pool of acceptance-relevant factors. (2) Wind farms

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currently being planned still face considerable public resistance, showing that the planning process can still be improved (e.g., Ontario Wind Resistance, (http://ontario-wind-resistance.org); "People over Wind" (www.Peopleoverwind.com), "Wind opposition online" (windkraftgegner.de)).

The first step towards the development of the framework was a literature analysis on the social acceptance of wind power plants (see Appendix A). This way, the major factors that have been found to influence the acceptance of a wind power plant project were gathered and categorized into critical dimensions. The summary presented extends the framework proposed by Devine-Wright (2005) and Graham, Stephenson, and Smith (2009) by adding more acceptance-relevant factors from the literature. The results of the literature analysis reveal that not only is it known how the physical appearance of wind power plants influences acceptance (size, color, distance) but also how the relation between investors and operators and the local community can help foster support for new wind parks. Further findings refer, e.g., to effects on nature and the particular landscape in which the wind power plant is sited and how this can lead to support for or opposition against the wind park. Based on the research on wind power plant acceptance conducted so far, the framework can thus draw on a rich scientific basis for acceptance-relevant factors that need to be integrated.

However, it is of interest not only which factors influence acceptance, but also when and with which methods acceptance can be measured and integrated in the planning process. Concerning the role of the public in the technology acceptance discussion, two contradicting positions generally meet. One is the public's wish to be included in the planning process, arguing that residents are the ones that "suffer" from the infrastructure in the end and therefore requesting participation as an inherent "right." The other traditional (expert) position is that laypeople's knowledge is too restricted to make reasonable or reliable decisions. Also, it is often assumed that public opinions are fuzzy so that they can neither be patterned nor predicted. However, attempts have been made to explain public opinions, for example, by showing that facility siting conflicts are, to a large extent, due to the different roles and perspectives of persons and organizations involved (Takahashi & Gaber, 1998). Meanwhile, it is also known that participation can improve the effectiveness of the decision process for large scale technologies by forming a public understanding (Enserink & Koppenjan, 2007) and that shared social values in line with communities and policies (Klijn & Koppenjan, 2002; Pelletier, Kraak, McCullum, Uusitalo, & Rich, 1999) can also contribute to a positive planning outcome.

In addition, it is often claimed that the more room for discussion is given to the citizens in early stages of the developmental process, the more space for developing a contradictory position will be created (Parker, 1999). Thus, the challenge of integrating citizens in the planning process is not only a question of *how* but (even more importantly) *when*. In the following, we point out that for the integration of acceptance-relevant factors in the planning process, two types of – what we term – "social gaps" and the "closing" of these have to be addressed:

(1) It is to be clarified what is understood by the notion of "acceptance" as well as how and if it can be reliably measured or even predicted (Social Gap I).
(2) It is to be determined how social factors are taken into account in current planning policies (Social Gap II) and
(3) It is to be established at which stage in the planning process social acceptance should be integrated and in what manner ("closing" the gaps).

These questions will be discussed against the background of wind farm planning and acceptance thereof, as to give concrete examples of acceptance-relevant factors and milestones of the planning process. As the basic idea of the integration of the public's wishes in the planning process is adapted from the mobile communication context (Kowalewski, Arning, Minwegen, Ziefle & Ascheid, 2013), it will be critically discussed in how far the derived framework is transferrable within the context of renewable energies.

2. Social gap I: can acceptance of complex infrastructure be reliably measured?

Acceptance deals with the approval, positive reception, and sustainable implementation of technology. Acceptance research thus explores the relation of usage motives and perceived barriers as well as the attitudes towards the respective technology and the technological impact assessment. Especially large-scale technologies are viewed critically or at least ambivalently by the public (Renn, 1998). They often escape from perceived comprehensibility and controllability of people, which in turn produces insecurity, fear, or even adverse aloofness (Siegrist, Keller & Cousin, 2006; Ziefle & Schaar, 2011). It has been shown that the perceived risk of a novel technology and the probability of disapproval are negatively correlated with the familiarity, the knowledge, and information depth about a technology (Kowalewski et al., 2013; Arning, Kowalewski & Ziefle, 2013). Also, it was found that individual factors (age, gender, technology generation, personality) have a considerable impact on risk perceptions associated with the integration of those technologies, and, as a consequence, also on (non-)acceptance of large scale technologies (Arning et al., 2013; Zaunbrecher et al., 2014; Zaunbrecher, Arning, Özalay, Natemeyer, & Ziefle, 2015). Beyond individual factors that impact the acceptance of large-scale technologies, humans also tend to avoid changes and unknown risks that are associated with technologies in general (Douglas & Wildavsky, 1983) and large scale technologies in particular (Arning et al., 2013). Characteristical for acceptance phenomena in novel technologies is the observation that people seem to overestimate the assumed risks even though they do see the benefits of the technology (Douglas & Wildavsky, 1983; Ziefle & Schaar, 2011). Thus, social acceptance must be modeled as a "product" of usage motives that militate for and against technology as well as situation-specific evaluations, driven by individual needs and demands. In short: Acceptance research has to reflect the fragile trade-off between individual benefits and barriers ascribed to a technology.

The concept of social acceptance, its measurement as well as measurability have been debated in the literature, also in the context of energy technologies. Specifically, two aspects are prominent: one refers to the term *acceptance* and its implications, the other refers to the way acceptance can be reliably assessed.

Regarding the terminology, Batel, Devine-Wright, and Tangeland (2013) argue that *acceptance* should be clearly distinguished from *support*, the former implying a passive reaction to a top-down decision while the latter is more "action-oriented." According to Batel et al. (2013), *acceptance* then represents a top-down legitimation in which acceptance is used as a more or less final stage "cosmetics and marketing instrument" after the planning is already done, without including the attitudes of the public. In this context, Rowe and Frewer (2005) differentiate between "public communication," "public consultation," and "public participation." All three types have in common that information is communicated from the planning authority to the public. However, only in the participation type, the public and other stakeholders have all information available and therefore the chance to effectively contribute to the process as equals, "combining it to an accurate composite" (Rowe & Frewer, 2005; p. 263).

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