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Citizens' willingness to participate in local renewable energy projects: The role of community and trust in Germany

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ABSTRACT

Citizen participation can be an important means for energy transitions at the local level. However, little is known about citizens' willingness to engage in community-based renewable energy projects, and its determinants. This paper analyzes how community identity, social norms, trust and environmental concern foster or constrain citizens' willingness to take part in community energy schemes. We survey individuals who are in charge of energy-related and financial decisions in their households, and owners of renewable energy systems. We find that the general attitude toward community energy is positive. Willingness to volunteer is higher than willingness to invest money. Regression analyses show that social norms, trust, environmental concern and community identity are important determinants of willingness to participate in community energy. However, using mediation analyses we find that the effect of community identity occurs through changes in social norms and trust. Both ownership of a renewable energy system and living in a rural, rather than urban community, increase the likelihood of participation. This study helps to understand the principles underpinning the willingness to participate in community energy and underlines its potential. Our insights emphasize the importance of social, rather than merely environmentally motivated aspects, and extend literature on pro-environmental behavior.

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1. Introduction

In order to successfully manage energy transitions, the acceptance and support of citizens is essential. Community energy projects are “an emergent phenomenon” [1, p. 674] and provide the opportunity for citizens to actively engage in the community and the local energy system. Rather than participating as mere energy consumers, members of the public are currently able to assume a number of different roles within the energy system, as they are able to influence the ways and the extent to which energy is produced [2]. Along with these new roles new possibilities to engage and participate have developed [3,4]. The importance of civil society groups for transformations toward an environmentally friendly energy system in countries such as the UK, Germany and the USA has been highlighted [5–7].

Community energy projects are “organisations, initiated and managed by actors from civil society, that aim to educate or

facilitate people on efficient energy use, enable the collective procurement of renewable energy or technologies or actually provide (i.e., generate, treat or distribute), energy derived from renewable resources for consumption by inhabitants, participants or members” [8, p. 298]. Energy cooperatives are a prominent example of community energy in Germany. They are an essential force within the German energy transition, with a growing number of members and investments [9]. Germany is a forerunner toward an energy system based on renewables [9], has opted for a “regime shift” [10, p. 154], and decided to increase the share of electricity generated from renewables to 55–60% of gross electricity consumption by 2035 and phase out all nuclear power plants by 2022 [11,12]. The German case is of particular interest for analyzing transitions at the local and regional level due to the fact that this national transition is a “highly decentralised phenomenon” [13, p. 258] with support of individuals and larger local initiatives [13–16].

Various aspects of community energy have been studied in the last few years [13,17–19]. Most papers on community energy have employed a qualitative approach in their examination, analyzed the concept theoretically [13,17–20] or focused on the legal framework [21]. Recently, Bamberg et al. [22] tested willingness to participate in community-based pro-environmental projects using different theoretical models. However, quantitative research on the partic-

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ipation of citizens is lacking, and little is known about citizens' attitudes toward local energy and their willingness to engage in community-based renewable energy projects. It is unclear which factors influence citizens' willingness to volunteer for a community energy project or invest financial resources and the need for such research has been highlighted by Aylett [5] and Wandersman et al. [23]. In response to this need, the current study investigates citizens' willingness to participate in community energy projects, in terms of volunteering and investment of financial resources. These two types of participation have been mentioned [24], but their joint analysis has been neglected in earlier studies.

In this article, we focus on community identity and trust as determinants for willingness to participate in community energy projects. We consider contributing to a community energy project a pro-environmental behavior [25]. Research on the tendency toward collective action—in particular pro-environmental behavior [26]—can help to better understand citizens' willingness to actively engage in community energy and the underlying dynamics toward more sustainable consumption. To develop effective strategies to encourage active participation and financial investment in community energy it is important to understand which factors influence the willingness to participate. This understanding can be utilized to induce a desired behavior [27], e.g., in order to reduce emissions [28].

A sense of community and trust are needed, in order to achieve a high acceptance and willingness to participate in community energy projects [29]. The importance of trust, community, and social norms has been stressed by various studies [29–33], e.g., Greenberg [32] highlights the impact of trust and its “under-appreciation” in the energy sector. However, the influence of the mentioned factors on citizen participation in energy projects remains unknown. Therefore, we suggest that community identity, trust, social norms and environmental concern are fundamental determinants of the willingness to participate. We thereby address the following questions:

1. Are citizens willing to participate in community energy projects?
2. How does community identity influence the willingness to participate in community energy projects?
3. How does trust influence the willingness to participate in community energy projects?
4. How do social norms influence the willingness to participate in community energy projects?

We answer these research questions by analyzing data from Germany. In order to examine the determinants of the willingness to participate in community energy projects multiple regression analyses and mediation analyses are applied.

2. Literature review and hypotheses

2.1. Community energy, participation and pro-environmental behavior

2.1.1. Community energy

Community energy involves energy production, collective procurement, distribution or conservation initiatives [8,34,35]. In addition, solutions such as energy storage could be part of community energy initiatives. Community energy projects are defined by, but also differ in, governance structure and participation, ownership, technology and local consumption [19]. Various forms of community energy currently exist, such as groups of local individuals investing in renewable energies, citizen wind parks or cooperatives in the field of electricity or heating [19,21,129]. Community projects within the energy sector are characterized by the

involvement of stakeholders from the local communities, assuming roles such as investors or contributors [19,36]. Boon and Dieperink [8] found that involvement, participation and the possibility of co-ownership are important factors for the support of community energy. Depending on the particular type of project, a range of positive outcomes can be expected such as energy savings or a climate-friendly energy system. Moreover, community energy projects are able to foster the psychological engagement with renewable energies [20], promote “energy responsibility” [37,p. 102], raise awareness or support the local economy [21,38], foster energy transitions toward renewables [19], avoid opposition and implementation problems [29] and provide a playground for “social innovations” [39,p. 7545]. Frantzeskaki et al. [37] and Mattes et al. [13] emphasize the relevance of individuals and cooperatives for energy transitions at the local level (see also Ref. [9]). Motivations for collective energy action have economic, environmental and social grounds, and are also concerned with energy policy considerations, such as the decentralization of the energy system and energy self-sufficiency [1,3,38,40,41]. Among the factors that positively influence the initiation of local renewable energy organizations are environmental awareness and energy autarky intentions [8].

Community energy and citizen participation are fundamental components of the German energy transition [24]. More than 970 energy cooperatives are registered in Germany [9,42], most of them focusing on energy production from renewable sources and investment in renewables [43]. Solar energy, onshore wind as well as bioenergy are commonly viewed as dominant within the field of community energy in Germany [44]. Fraune describes the German case of community energy as “a reference point in revealing the impact of the larger social, cultural and political context on citizens' capabilities to participate and thus to benefit from citizen participation schemes” [24,p. 57]. Several recent studies provide in-depth information on community energy in Germany [9,21,24].

2.1.2. Participation and pro-environmental behavior

Community projects rely on their members' involvement and participation, e.g., as volunteers and investors [33,45,46]. Citizen participation has been defined as “a process in which individuals take part in decision making in the institutions, programs and environments that affect them” [47,p. 339]. Different kinds of initiatives and different degrees of participation exist [18,19]. Community projects, just like social movements, need not only active members, but also other supporters [24,48]. The impact of citizen participation in communities is discussed in various studies [49–51]. Recently, Sovacool and Brown [52] as well as Shaw et al. [53] highlighted participation in energy issues.

Community energy projects represent collective action toward renewables. The relevance and efficacy of collective action and citizen activism to tackle climate change has been highlighted [54–56]. However, research on and knowledge of the effective involvement and collective pro-environmental action is lacking [55]. In general, involvement depends on the risks and costs, and the outcome for the individual and the society [57,58]. Willingness to participate in local energy projects is generally low, since positive outcomes, such as environmental benefits, are distributed among participants as well as non-participants—representing a free-riding behavior [3]. Local engagement, sustained participation and financial resources as well as expertise and governmental support are needed for the mobilization and success of community energy [3,39]. Participation in community energy is promoted by contacts at the local neighborhood level [19]. Hoffman and High-Pippert [19] argue that sustained participation is motivated by community benefits rather than personal benefits.

We take these findings into account and analyze the general attitude toward community energy, and the active participation by volunteering (e.g., organizing and managing the projects) and

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