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Gender matters: Women, renewable energy, and citizen participation in Germany



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ABSTRACT

This study investigates how the larger social, cultural, and political context fosters and constrains citizens' agency to take part in citizen participation schemes in renewable electricity production (RES-E). Based on a comprehensive review of research on gender and energy, hypotheses about gender differences in involvement in citizen participation schemes in RES-E are derived. These are tested statistically on the basis of data gathered in the context of a pilot study. The results reveal differences between women and men in the average ownership rate of citizen participation schemes, the average investment sum and decision-making bodies. In contrast, findings on gender differences in the amount of capital assets invested per capita are inconclusive. This study gives an indication that beyond individual preferences and investment attitudes, cultural, social and political factors also influence an individual's agency to participate in RES-E operated by citizens' associations.

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1. Introduction

The article analyzes how the larger social, cultural, and political context fosters and constrains people's agency to take part in citizen participation schemes in renewable electricity production (RES-E) by exploring differences in women's and men's involvement in ownership, investment sum and decision-making bodies. The article shows that these differences cannot be explained alone by individual preferences and attitudes but have to be traced back to social conditions like gender, wealth gap, occupational segregation, or tax legislation.

Against the background of climate change and energy security concerns, governments across the globe face the challenge of transforming their national energy systems [1]. Albeit not undisputed in terms of feasibility, RES-E is assumed to be a key technology to meet this challenge, especially in Europe [2]. In this respect, citizen participation schemes within RES-E have gained political as well as academic attention, since these are considered to overcome infrastructural and economic path dependency of large fossil energy systems ([3], p. 1). Moreover, citizen participation schemes are discussed as funding sources of transformations beyond

government and business [4,5] as well as an instrument to foster energy transformations by enhancing public acceptance [6–8].¹

Citizen participation schemes in RES-E are characterized by both decentralization and the congruence of investment and possession. Ideally, local citizens are the driving force in each step of the plants' realization: planning, mobilization of resources and its operative implementation ([4], p. 573; [3], p. 2). Therefore, citizen participation in RES-E serves as a reference point of energy transformations defined as "significant transformations in socio-energy systems" ([15], p. 32). The control of the energy sector changes from some large private or government-owned utility companies to a more heterogeneous group of producers [9,10].

These transformation processes stress the need for social science's energy research for its own sake and not for being "adjutants in the introduction of new energy technologies" ([11], p. 24). Social science research on energy has a long tradition. Early research assumed that socio-economic progress is dependent on methods and techniques of energy supply [12]. Post-war research

¹ Although both terms transition and transformation are used as near-synonyms, slight differences in content exist. Transformation research usually analyses energy-related changes against the background of broader social processes. Transition research in contrast is often focused on energy as the dominant topic. Moreover, these analyses often originate from normative concerns about sustainability ([66], p. 720; [69]). Against this background, the term transformation is used within this paper.

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abandoned this deterministic assumption and started to ask about social influence on the development of energy supply [13,14]. Shove and Walker [83] show how research diversified according to the factors that both determine and are determined by the evolution of energy systems – for example the economic system or politics. Against this background, they criticize current energy research for not being able to grasp the complexity of energy-society relations since most of the approaches are focused on one factor, e.g. technological innovation or economic progress [83]. Sovacool provides an overview of current social science energy research and argues likewise for an integrated interdisciplinary research in order to advance energy analysis [61].

Miller, Richter and O’Leary [15] recently pointed out that more attention has to be paid to the dynamics and interdependencies within socio-energy systems since energy transformations are not only about changing technologies but about changing society ([15], p. 31). Referring to both current demand for consolidating social sciences’ energy research as well as current findings, this paper argues that research on citizen participation schemes in RES-E needs to integrate a social science perspective since the larger social, cultural, and political context shape individuals’ agency to participate and thus social outcomes. Basic assumptions of research about citizen participation schemes have so far been public support of RES-E as a matter of principle, independent of country-specific contexts [16] as well as the egalitarian democratic ideal assuming “that citizens from different social groups – such as men and women, the rich and poor, and the highly and less well educated – are equally likely to participate in associational life” ([17], p. 302). Some empirical evidence refutes this assumption. Individuals participating in RES-E differ in regard to sex, education, age, etc. [4,18,19].

Within the RES-E literature, investors have been characterized as rational, rent-seeking agents [2,5]. More recently, this assumption has been challenged. The relevance of non-financial factors like personal characteristics and attitudes as well as influence of peers or consultants affecting investment decisions has been discussed [4,2]. The aim of this paper is to enhance this research by explaining how the larger social, cultural, and political context fosters and constrains citizens’ agency to participate in RES-E. Thus, the paper is not focused on the individual investor’s decision-making process but starts one step before and explores the impact of the larger context on individuals’ agency and capabilities to participate.² The starting point of investigation is empirical evidence showing that an overwhelming majority of participants are men ([19], p. 64). In referring to gender and energy literature the paper points out that this unequal gender ratio can be explained by regulation and norms, i.e. the gender regime [20,21,67].

A pilot study on women’s and men’s participation in German citizen participation schemes in RES-E is conducted in order to explore the influence of regulations and norms on the gender ratio. Within the domain of research on citizen participation schemes, Germany is often chosen as a reference point in academia as well as in politics [3,9,19,22–24,81]. Compared to other countries, the German government not only subsidized citizen participation schemes in RES-E at an early stage, but was and still is quite successful in implementing high installed RES-E capacity as well as in developing citizen participation as a source of funding. The specific outcomes of the interdependencies between the institutional and cultural contexts and the gender ratio in citizen participation schemes are of course only valid in the German context. But the causal mechanisms

between context and individuals’ agency and capabilities to participate remain valid for all contexts. Thus, in principle the paper’s argument could be applied anywhere.

The article proceeds as follows. First, the methodological approach will be explored. Therefore, the scope and aim of a pilot study will be discussed. Moreover, the choice of *t*-tests for analyzing the empirical results will be reasoned. In order to explain case selection as well as conditions of data gathering, characteristics of citizen participation schemes in RES-E in Germany will be presented. Then, details of data gathered will be outlined. Afterwards, the analytical approach will be developed by reviewing research on gender and energy. Against the background of this review, hypotheses about gender differences in involvement in citizen participation schemes in RES-E will be advanced and statistically tested. Finally, the results will be discussed in light of the cultural, social and political context of citizen participation schemes in RES-E.

2. Research methods and country background

The aim of this paper is to identify causal mechanisms between the gender regime and women’s and men’s involvement in citizen participation schemes in RES-E. In order to analyze causal mechanisms, hypotheses are derived by presenting a review of the literature on gender and energy. These hypotheses are tested on the basis of empirical evidence generated by a pilot study of gender relations within citizen participation schemes in RES-E in Germany. A pilot study, as understood in this paper, has many features in common with a case study [25]: in choosing Germany as a case for citizen participation schemes in RES-E, a single-unit analysis is conducted with citizen participation schemes operating wind or solar power plants representing cases. The term pilot study indicates that the case represented is of a rather exploratory nature since a new phenomenon [26] or a new perspective on existent evidence [27] is presented. The pilot study conducted in this paper belongs to the latter group.

In order to determine if women’s and men’s participation rates in citizen participation schemes are statistically significant *t*-tests are conducted. Due to difficulties in the context of data collection that will be explained in more detail in Section 2.2, the sample is rather small. The sample size influences the unambiguous interpretability of significant and non-significant results. In general, a significance level of 0.05 is applied in *t*-tests (Type I error probability). This rather conservative significance level might implicate that in terms of small samples the null hypothesis is confirmed erroneously (Type II error probability). In order to prevent misjudgment, power *t*-tests are also applied to those results that are significant only on a 0.1 level. In general, a level of type II error probability of 0.1 is accepted, thus a power of test level falling below the 0.9 level is not accepted (Power of test = 1 minus Type II error probability). If both the level of significance and power of test are not accepted, the results could not be interpreted reliably [28]. Within these cases, results have to be interpreted in terms of the broader content and the other results.

T-tests are based on the comparison of the mean of different subsamples. Hence relying only on the mean may lead to misjudgments because the empirical distribution is not considered. Especially in small-*n* designs, the identification of outliers and the proportional distribution of the quartiles are regarded as crucial. Therefore, boxplots are used to visualize the results of the *t*-tests.

The aim of this study is not to prove a causal relationship between gender regime and gender ratio in citizen participation schemes but to explore causal mechanisms between gender regimes and the unequal gender ratios within citizen participation schemes. Moreover, this pilot study indicates that further gender

² The term capabilities is applied in reference to the capability-approach developed by Sen. According to this approach capabilities represent an individual’s freedom to choose between alternative ways of living ([82], p. 95).

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