

Article

Understanding Energy Citizenship: How Cultural Capital Shapes the Energy Transition

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Abstract: Community involvement and citizenship have been crucial drivers in energy transitions worldwide. To deepen our understanding of the energy transition and to further promote energy citizenship, we leverage Bourdieu's concept of cultural capital to shed light on the inequities in community-centered energy transition processes. More specifically, this study demonstrates that cultural capital is an important indicator of an individual's willingness to participate in renewable energy-related behavior and social movements. Using survey data in the Netherlands as a case study, it finds that depending on the type of energy citizenship, i.e., material participation (investments) or communicative participation (protest), different types of cultural capital are in play. The results of this study imply that a nuanced approach towards both concepts, namely energy citizenship and cultural capital, is needed. The scholarly and practical implications of this study are discussed, and the study concludes with pathways for more comprehensive community engagement.

Keywords: energy citizenship; cultural capital; energy transition; Netherlands



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1. Introduction

The energy transition calls for an in-depth understanding in how citizens relate to energy systems. A key consideration is the need for a wide range of solutions that are able to respond to the different demands of diverse energy systems [1], which in turn calls for some degree of bottom-up experimentation at the neighborhood and community level. Communities are transitioning away from unsustainable energy practices by involving energy users in key decisions and actions related to energy. In so doing, energy citizenship as a concept plays a central role. Given the central importance of energy citizenship to the literature on energy transitions, this study builds on the existing studies and theorizes two dimensions of this concept [2] (i.e., material and communicative forms of energy citizenship) and examines the relationship between communicative energy citizenship and cultural capital. In this sense, it provides a more nuanced view of energy citizenship.

Energy citizenship recognizes each individual's agency in relation to their socio-technical and political environment. Beyond being mere users of energy, citizens are seen as actors willing to employ social, material, and political resources in order to influence decision-making concerning energy [3–5]. Climate activism, prosumerism (citizen investments in energy production), and grassroots awareness-raising campaigns are all actions that have been linked to energy citizenship; they depict citizenship as being tightly bound to the transition towards renewables. Although the social and political dimensions of citizenship are recognized in the literature [6–8], over the last decade the emphasis has

largely been on citizens' material participation in the energy transition (e.g., DellaValle and Czako [9] and Ryghaug et al. [2]). This has resulted in scholarly attention being placed on material resources (namely economic capital) as the key barriers to bringing citizens into the fold of energy transitions. Furthermore, increasingly, technological innovations such as smart meters and smart grids have provided new forms of engagement with energy technologies, which have been privileged in the literature as an ideal form of citizenship (e.g., Nouri et al. [10] and Ryghaug et al. [2]).

As the notion of energy citizenship matures and becomes more established in academic and policy-making circles, the question of energy justice and social inclusion becomes salient. Critical scholars are increasingly making note of users who may lack the economic capital to engage in prosumerism [11] but have accumulated considerable social and cultural capital, which they can employ to improve energy policy and help co-create energy technologies [12,13]. This calls for a recalibration of the energy citizenship concept, one that considers different political and social acts and is informed by the diverse political cultures which are emerging around the energy transition [14]. Related to this, the link between energy citizenship and cultural capital—a key predictor of social status, which in turn predicts political participation—requires further elucidation.

Cultural capital encompasses a range of cultural experiences and competencies, which people can deploy to secure social status and standing [15]. A few studies [13,14,16,17] suggest that cultural capital can be deployed by energy communities in pursuit of energy transitions; however, the specific mechanisms through which they may stimulate desired change within these communities have not yet been specified. We hypothesize that energy citizenship may be that missing mechanism, which is the proposition examined in this paper using the Netherlands as the case study.

The Netherlands is a good starting place for the discussion of energy citizenship and cultural capital for two reasons. First, despite the country's heavy reliance on fossil fuels, natural gas in particular, there has been significant government- and community-led actions against fossil fuel use [16,18]. Consequently, there is an increasing interest in energy transitions and in renewable energy (RE) sources such as solar and wind [19]. Second, the Netherlands has been experiencing significant growth in community-led energy transitions [20–22], which makes the Dutch case relevant for countries with heightened interest in energy transitions and a useful case study for countries that aspire to strengthen citizen participation in the energy transition.

Recognizing that energy citizenship is a critical building block on the pathway to transforming energy systems, researchers have invested substantial effort into understanding energy citizenship, its many contours—from the political and the social to the material—and revealing the manifold ways in which citizens can contribute to building a new form of energy democracy. Until fairly recently, recognition of citizens' ability to potentiate the transition through their daily practices was circumscribed. Scientists have informed the current understanding of citizenship by demonstrating that leveraging material participation in energy production and/or use (e.g., by using smart meters in their homes), individuals are giving new meanings to energy citizenship. In this sense, material participation is recognized as a distinct form of energy citizenship [2]. However, lagging behind is research that emphasizes political and social dimensions. These “communicative forms,” which tend to be rooted in collective rather than individual action, are central to good governance and are the signs of a healthy and thriving democracy [9,23]. In this regard, our work here is of a corrective nature that, by highlighting and empirically testing the importance of communicative dimensions of citizenship, provides a more holistic understanding of what citizenship means in an energy democracy.

Energy citizenship is an increasingly prominent concept in the literature on energy transitions, which is rapidly evolving as the energy transition continues to generate new stimuli for citizen involvement [24]. In this study, we empirically show that energy citizenship is associated with cultural capital and that the impact of cultural capital will vary according to the forms of energy citizenship that are in play. Building on this line of

reasoning, we propose our research question: what is the relationship between cultural capital and energy citizenship? We understand energy citizenship as taking distinct forms, more specifically material and communicative.

The contributions we make in this paper are threefold. First, by dually considering two distinct forms of citizenship, we not only account for the different ways that citizens seek to exert their power and influence in the energy transition, we also reveal the different factors that contribute to citizens' choice to exercise one form of energy citizenship, rather than another. Citizens are increasingly being asked to actively engage in decision-making processes related to energy governance; however, citizens face important barriers in their participation [18]. By highlighting the non-material factors driving political participation by citizens, we are able to shine a light on new avenues for citizen empowerment.

Relatedly, and second, in considering cultural capital we move the question of citizenship beyond the market (and market-driven solutions) and situate it in the societal domain, one that understands society and culture as emerging from the interaction between people and their more than human counterparts (i.e., technologies) [25]. We acknowledge that through their impact on culture, energy technologies have societal implications beyond their immediate impact on individual investors.

Finally, we introduce new measures for cultural capital specific to the energy transition. Although studies have implied that cultural capital is a useful concept for understanding energy citizenship [13,14,26], there has not yet been a concrete measure of cultural capital for energy citizenship in the literature. We review the empirical metrics of cultural capital in social reproduction studies, where cultural capital has been most extensively studied, and we develop a metric of our own specifically for energy transition studies.

2. Literature Review

Energy citizenship emphasizes membership in a collective that finds meaning in its effort to redefine its relationship to energy systems [18]. A group of studies focus on how consumers participate in energy transition by adopting new energy-related technologies such as smart meters and electric cars [2,10] and others discuss the importance of prosumerism whereby individuals become both producers and consumers of energy [23] and by investing in smart grids enable the distribution and exchange of local energy [27,28]. More recently, citizens have built communities around the question of how energy components are sourced, and how energy waste is managed (e.g., Neessen et al., [29], Roversi et al., [24]). Furthermore, studies have expanded on the concept of energy citizenship to account for institutional innovations, legislative frameworks, variations in promotion methods, implementation and planning, transformative policy-making processes, climate transitions, and introductions of new themes such as energy democracy, justice, and sustainable development [24,30–35]. In short, by actively participating and engaging in these transitional processes related to energy, climate change, and sustainability, citizens reaffirm and reenergize their citizenship within the energy transition movements [33]. The concept of energy citizenship is becoming more established in the literature, and the time is ripe to examine its distinct manifestations: material energy citizenship and communicative energy citizenship.

2.1. Material and Communicative Energy Citizenship

Citizens deepen their relationship with energy through a number of actions, which can be categorized into one of two forms: material and communicative citizenship. The existing studies show that these concepts touch on different dimensions of citizenship and locate it in different spaces [2,36–38]. Material citizenship takes place in energy communities and emphasizes citizens' role in reshaping the energy systems and their power to generate new imaginaries of what is possible with the long-term goal of building an energy democracy, one in which citizen choice and agency are emphasized. It refers to the ways where objects shape political concerns, interests, and publics, which increases their visibility within energy systems [2,36]. As a mode of engagement, material participation organizes

people in terms of roles that are assigned to, “things, people, issues, settings, technologies, and institutions” [37]. Under this view, the experience of energy technologies creates and reinforces an awareness of the need for active participation in the reformation and transformation of current energy systems [38].

In more communicative forms of citizenship, individuals engage in political acts (e.g., through protests or petitions) to exercise their voice as citizens. Through this communicative dimension, individuals and communities make claims on formal political institutions, asking for recognition and consideration in the process of policy-making and implementation. The transformation of energy systems is creating new concerns, such as fluctuating energy production, storage, and risk of disruption [38]. Mobilizations around these concerns are also part of claims-making by citizens who seek recognition of their needs and concerns in the transition. Although citizens may be largely supportive of the need for RE and more flexible energy distribution and delivery systems, they may raise concerns of its implications for their specific lived contexts. For instance, Thomas and co-authors [39] found that while supporting flexible energy, members of the local communities they studied objected to the burdens and impositions it placed on citizens who lacked the means to invest in and use flexibility technologies. Increasingly, these objections are manifesting in political acts such as protests and petitions. Such political participation is an important precursor to democratic representation [40,41] and a central tenet of democratic governance.

Scholars have addressed factors influencing both material and communicative forms of citizenship [21,42–45]. On the one hand, a group of studies show the importance of material citizenship and found that the rate of citizenship increases with better financial status and having an interest in investing money tends to increase citizens’ likelihood of engaging in material energy citizenship [2,46]. On the other hand, some contextual factors have been discussed in relation to communicative forms of citizenship. For example, Fischer et al. [46] found that personality characteristics such as altruism and patience also increase the likelihood of citizen participation in energy; similarly, Karytsas and Theodoropoulou [47] found contextual factors particularly important such as interpersonal trust, social recognition for participating in energy transition, policy support, and social barriers.

For communicative citizenship specifically, one important discussion regards how the institutional context wherein citizenship unfolds critically shapes how it is exercised. Ringholm [33] places these contexts on a continuum ranging from top-down governmentally stimulated processes on one end to bottom-up energy communities situated and driven within the grassroots. Clearly, the level of citizenship engagement (e.g., whether citizens are described as unaware or advocates [24]) will be shaped, at least in part, by these contexts. Energy communities are important contexts within which citizenship unfolds in relation to energy, but—aside from being highly variegated—they are not the only one. Citizens engage with energy even outside of purposive communities, and it is important to also account for these realities within the transition in order to ensure inclusion and energy justice. Here, we take a step in this direction by building on the existing studies that explore communicative citizenship of the energy transition and exploring the importance of the concept cultural capital introduced by Pierre Bourdieu as one of the driving factors of communicative energy citizenship.

2.2. Exclusion and Inclusion within the Concept of Energy Citizenship

In extending energy citizenship to account for communicative dimensions, we link up to wider discussions on energy justice and just transitions. The emphasis on prosumers, although it creates new avenues for users to participate in the energy transition, also neglects a whole assemblage of citizens who resist the current trend of the energy transition for a variety of reasons. Many of these citizens agree that there is a need for more sustainable and reliable energy production; where they disagree is on the means being taken to pursue these ends [39]. These citizens are, in our view, just as likely to engage in acts of citizenship albeit the types of action they take (e.g., communicative rather than participatory) may be

different. For instance, in their critique, Lennon and co-authors [48,49] observe that overemphasizing material participation and behavior change pigeon-holes energy as an economic rather than political concern. Thus, it disregards political participation by those who are critical of RE investments and does not view these types of citizen action as legitimate forms of political expression in the energy transition. However, these critical citizens cannot be left behind in the transition. In order to engage them in the transition, it is important also to understand both why and how they exercise their rights and responsibilities as citizens.

The same authors caution that the current market-driven and statist definitions of “good citizens” marginalize community members who historically have lower means for economic investment but are reliant on energy supply. They write, “official discourses that push responsibility for the energy transition onto the ‘citizen-as-consumer’ effectively remove agency from citizens, leaving them largely disconnected and disempowered. Consequently, energy citizenship needs to be reconceptualized to incorporate more collective and inclusive contexts for action” [49]. To that end, it is important to extend the current understanding of energy citizens beyond participatory citizenship (e.g., investing in solar panels) and the particular set of skills and resources (e.g., time, abilities, and financial slack) associated with it. More specifically, participatory citizenship is highly individualized, and in this regard, economic capital (i.e., having the financial means to invest) has been shown to be an important predictor of energy citizenship [2]. However, communicative citizenship is social rather than individual, thus beyond resources, and it also hinges on social interactions and psychological motivations [50]. We argue in this paper that this latter factor relies heavily on culture, more specifically, on cultural capital.

2.3. Bourdieu’s Theory of Cultural Capital

The forms of capital is a sociological theory that is situated within Pierre Bourdieu’s larger understanding of field theory that attempts to explain class and status. The theory distinguishes social positions based on multi-dimensional factors rather than just income and financial assets alone [15,51,52,52–54], which is what many Marxist theories tend to argue [55,56]. The strategic deployment of different capitals (economic, cultural, social, and symbolic), which can be understood as resources that one may leverage to maneuver one’s social status and standing, can determine one’s social and economic class. The literature on political participation has long shown that social and economic class are key predictors of citizen action, e.g., voting, protest, and co-creation [50,57], ergo cultural capital is central to the idea of citizenship. Bourdieu’s theory shows that class and the individual decisions that may reflect class status come from intricate and complex relations of social and political factors.

Among the four forms of capital specified by Bourdieu [15,52–54], in this paper, we specifically examine cultural capital, which arguably has been the most important and contentious form of capital in the literature [13]. Cultural capital refers to the experiences of culture itself—or more eloquently put by Bourdieu himself, the “instruments for the appropriation of symbolic wealth worthy of being sought and possessed” [15]. As the concept is understood to embed too many notions and aspects that can determine one’s class status, Bourdieu [52] further divided the concept into two: (1) incorporated cultural capital, which refers to an individual’s dispositions, mannerisms, and taste, and (2) institutionalized cultural capital, which refers to education received and academic titles that one possesses.

2.4. Cultural Capital and Energy Transition

The role that cultural capital plays in the energy transition is yet to be fully understood. Some studies in the energy transitions literature use cultural capital as a passing concept that provides slightly more depth in explaining citizens’ role in energy transitions [16,17]. Other studies use the concept as a central argument in understanding why grassroots-based social innovation happens and how energy transition communities are formed [13,14]. To elaborate, Süsser et al. [14] argued that local social and cultural capitals are integral parts of collective experiences that communities experience and share in energy transitions. To

quote, "...a high social and cultural capital structuring the system as a whole: collective engagement and individual participation are only possible context of this prerequisite and consequently bear a considerable impact on the acceptance of RE technologies" [14].

Although the need for further elaboration continues, it is becoming increasingly clear that cultural capital is a useful theoretical and conceptual framework in promoting and understanding energy transitions. To begin, Quaglione et al. [26] found that individuals who participate in cultural activities (i.e., archaeological site attendance, number of books read, cinema attendance, reading newspapers, classical and other music concert attendance, and theater attendance) and thus possess cultural capital show a higher likelihood of adopting electricity-saving behaviors. Furthermore, culture emerges in energy systems through the relationship, and the affordances it offers the individual and communities [58–60], and recognizing its importance is key to promoting energy transitions [25]. Beyond education, the presence of energy infrastructures—e.g., solar panels and wind turbines—is thought to give rise to energy cultures, that is, a language and set of practices which emerge around the use and production of energy. For example, Retnanestri and Outhred [61] claimed that renewable technologies can lead to the resemblance of possession of cultural capital (or even ostentation). Although this is not the most ideal motivation for participating in energy transition movements, activists and technology experts can leverage this finding to increase the rate of RE technology adoption. Furthermore, new technologies and practices may also lead to the formation of communities that embrace them, or reject them. In terms of the latter, these protest communities begin to form a common language and system of sense-making, which is both cultural and political. Understanding such counter-movements is also key to scaling RE-driven transitions up by accounting for the question of energy justice [62] and finding ways to transition from communicative to material citizenship [63].

Although the literature on cultural capital and energy transition is still in its infancy, these studies offer strong indications that the possession of cultural capital leads to positive behavior/behavioral change. This trend indicates that cultural capital can be a meaningful framework in understanding energy transition and energy citizenship. Therefore, in this paper, we propose our research question: what is the relationship between cultural capital and energy citizenship? We do not use hypotheses to minimize repetition. Due to the number of our dependent and independent variables, we would have 12 hypotheses.

3. Materials and Methods

3.1. Data Collection

To better understand the concept of energy citizenship in relation to cultural capital, we conducted a survey study and context analysis in fifteen energy communities throughout the Netherlands (see Table 1). These energy communities were characterized by citizens living in neighborhoods near a wind turbine, solar park, or both. Only the people residing close (<5 km) to RE sites were surveyed because of their relationship with RE technologies. They have experienced both the implementation process and actual experience of RE technologies (i.e., wind turbines and solar parks), which is relevant for communicative participation. Furthermore, most RE sites offer residents who live nearby the possibility to invest in them, which is relevant for material participation. Table 1 shows that energy communities with different characteristics were included. We aimed for a diverse sample of communities with characteristics that might influence material and/or communicative participation. We included communities in which an energy cooperative was present or that had an active protest group, as well as communities that had both an active protest group and an energy cooperative and the communities that had neither. Furthermore, communities in both rural and urban environments were selected as well as both from the Randstad (the central region of the Netherlands consisting of the four largest Dutch cities) and the periphery (all regions outside the Randstad) to control for geographical dynamics. Our sample was drawn from cities and villages of different sizes, ranging from 1000 to 100,000 inhabitants. It should be noted that only the people residing within 5 km of RE technologies received the questionnaire. Within each community a diverse sample in terms

of demographic characteristics (i.e., social economic status, types of families, both rental and owned properties, etc.) was included. More details are available in Table 1.

Table 1. Characteristics of the energy communities included in this study.

No.	Renewable Energy Technology	Urban/ Rural	Central/ Periphery	Energy Cooperative	Protest Group	Approx. Size *	No. of Respondents
1.	Wind turbines	Rural	Central	Yes	Yes	Small	115
2.	Wind turbines	Urban	Central	Yes	No	Small	26
3.	Wind turbines	Rural	Periphery	Yes	No	Medium	31
4.	Wind turbines	Rural	Periphery	No	No	Medium	53
5.	Wind turbines	Rural	Periphery	Yes	No	Small	37
6.	Wind turbines	Rural	Periphery	Yes	Yes	Small	113
7.	Wind turbines	Rural	Periphery	No	Yes	Medium	12
8.	Wind turbines	Rural	Periphery	Yes	No	Small	2
9.	Wind turbines and solar park	Rural	Central	Yes	Yes	Small	159
10.	Wind turbines and solar park	Urban	Central	Yes	No	Large	66
11.	Wind turbines and solar park	Urban	Periphery	Yes	Yes	Large	42
12.	Wind turbines and solar park	Rural	Periphery	No	No	Medium	27
13.	Wind turbines and solar park	Urban	Periphery	No	No	Large	133
14.	Wind turbines and solar park	Urban	Periphery	No	No	Large	32
15.	Solar park	Rural	Periphery	No	No	Medium	32

* The size of the community is based on an estimation of the number of inhabitants: small is <10,000, medium is 10,000–25,000, and large is >25,000.

The aim of the survey was to explore citizens' relation with RE and energy behavior by asking about their awareness of the energy transition, supportive behavior (i.e., energy investments), and opposing behavior (i.e., protest against RE projects). Furthermore, additional demographic questions were asked such as the level of education, 6-digit postcode, age, gender, residential status (tenant or homeowner), and family composition. Based on the postcode and context analysis we could identify the neighborhoods in which the respondents were living and thereby their living distance from wind turbines and solar parks and characteristics of their energy community. The characteristics include whether or not an energy cooperative and protest group against RE projects are present. We conducted a survey in the Netherlands from September to October, 2021. Residents in neighborhoods within a distance of 5 km from the wind turbines and/or solar parks received the questionnaire in their mailboxes. They could fill it in either on paper and return it by a reply envelope or by scanning a QR code that was published on the front page of the questionnaire, which guided them to the digital version of the questionnaire in Qualtrics. On the front page of the questionnaire respondents were told that this research was conducted by researchers of the University of Twente, with the aim to explore their attitudes towards wind turbines and solar parks. In total, 15,000 questionnaires were distributed of which 931 were filled in and could be used for analysis; 404 were filled in online and 527 were returned on paper.

3.2. Variables

3.2.1. Energy Citizenship

In this study, energy citizenship is the overarching dependent variable, which we operationalized using the following variables: investing in RE (material participation) and protest against RE projects (communicative participation). Thus, we measured not only the supporting of RE (investing), but also voicing concerns and taking a stance against RE (protesting). Both types can be seen as a form of energy citizenship as shown in a number of studies [3,64–66]. Therefore, we used two survey questions as the dependent variable.

RE Participation. For this dependent variable, we counted the number of RE-related behaviors that respondents have participated in. There are four options, which are “I have

a solar panel on my roof,” “I invest/co-invest in wind energy,” “I invest/co-invest in solar energy,” and “I purchase sustainable (green) energy from my energy supplier.” We added the number of RE activities participated in per respondent. For example, if a respondent participated in three of the four activities, they were given a score of 3. The minimum score is 0, having participated in none of the RE-related behavior, and the maximum score is 4, which indicates that the respondent has participated in all four RE-related behaviors.

RE Protest. This dependent variable is related to the survey question: “Have you ever protested against wind turbines and/or solar farms (e.g., by signing a petition or by putting up a sign in the garden)?” There were four options for the question, “Yes, I have protested against wind turbines,” “Yes, I have protested against solar farms,” “Yes, I have protested against both,” and “No, I have not protested.” As we were interested in the participation itself rather than the type of participation (i.e., whether the respondents protested against solar or wind), we merged the “Yes” responses together. Consequently, we had a binary variable that is coded 1 for having protested either against solar or wind or both, and 0 for not having protested at all.

3.2.2. Cultural Capital

Cultural capital as an overarching concept is the independent variable of this paper. However, despite the importance of cultural capital, measuring cultural capital is difficult because it has a number of hidden and implied facets that we need to take into account [67–69]. Cultural capital has been mostly empirically studied in the social reproduction literature and has been used to gauge individuals’ class status and educational attainment. As whether one possesses the “right” education and taste to be considered upper class can vary widely depending on (1) what constitutes the “right” education and taste, (2) the form of possession (i.e., do we just possess them, or do we use cultural capital as an instrument to possess power), and (3) cultural and contextual differences. As a result, there is no general agreement on how to measure this concept, with a few studies putting forward different quantitative metrics to operationalize it. For example, some studies used educational outcomes as a measure for cultural capital [70–72] with the underlying assumption that a greater possession of cultural capital yields better educational outcomes. Other studies have used parental resources [73], the number of books possessed during teenage years [74], the number of books currently owned [67,75], familiarity or knowledge [70,76,77], or reading habits [78]. A common thread among these studies is their focus on social reproduction and educational inequalities. Thus, these metrics of cultural capital were exhaustively studied and were found to be useful in understanding how classes are reproduced and how educational inequalities persist.

However, the understanding and operationalization of cultural capital in energy studies are still limited. In order to address the complex understanding of cultural capital specifically in the context of energy citizenship, we adopt 6 independent variables.

Education. Education is one of the most prevalently used cultural capital variables. The survey question asked, “What is your highest level of completed education?” The Dutch education system has an applied track (similar to apprenticeship in the United States or the United Kingdom) and an academic track. In order to address this difference, the survey question provided options for elementary education (Basisonderwijs), applied elementary education (Lbo/vbo/vmbo), secondary education (Middelbaar beroepsonderwijs (mbo)), applied secondary education (Hoger voortgezet onderwijs (havo/vwo)), applied higher education (Hoger beroepsonderwijs (hbo)), or academic higher education (universiteit (WO)). Because we were interested in whether the respondents have cultural capital, which is more about distinguishing those that have received higher education from those who have not [79,80], we coded this variable into two binary outcomes. The respondents that have received applied or academic higher education were coded 1, and those that did not receive higher education were coded 0. Another reason for this binary coding was to reduce the degrees of freedom that would be used up by this variable.

Energy Cooperatives' Presence. An energy cooperative is an association that is initiated bottom-up by local communities and citizens to promote the production and consumption of RE. Energy cooperatives' presence is an important aspect of cultural capital. Having an energy cooperative nearby is similar in terms of cultural capital for energy transition studies as having many books in social reproduction studies. Having an energy cooperative nearby can lead to easier access to information, energy transition movements, and energy transition participation. Furthermore, having an energy cooperative nearby can also dictate the political drive of the neighborhood, which can provide a distinct characteristic to the neighborhood. The data for this variable were collected using the "lokale energie monitor" (local energy monitor) in 2021 [81]. The respondents that resided less than 5 km from one or more energy cooperatives were coded 1, and those that did not have the presence of energy cooperatives close to their residence were coded 0.

Energy Protest Presence. We add energy protest presence to the analysis for the same reason as adding energy cooperatives' presence. This variable refers to the presence of a formal protest group against the implementation of one or more RE projects in the neighborhood. Whereas energy cooperatives tend to support energy transition and the use of RE, energy protest presence is a form of cultural capital that may not support RE. The data for this variable were collected using desk research, including internet sources (websites and Facebook pages of protest groups), media articles, and policy documents that made a reference to a protest group. The respondents that resided less than 5 km from one or more energy protest groups were coded 1, and those that did not have the presence of energy protest groups close to their residence were coded 0.

Close to Wind Turbines. We also included a variable that measured whether the respondents live close, within a distance of 1 km, to wind turbines. This is to measure the geographical proximity to RE sites among the respondents of the survey, and it is included because of the same underlying assumption as the energy cooperatives' presence and energy protest presence—that the respondents who have wind turbines close by tend to possess cultural capital that is pertinent to energy transition because of ease of access to information, energy transition movements, and energy transition participation. Distance to RE sites measures the same aspect of cultural capital that social reproduction studies measure using the number of books in the house—proximity to and availability of resources. Various studies have tried to understand the role of proximity in (the lack of) support for wind turbines. Although mixed results were found on the effect of proximity on attitudes, scholars agree that proximity increases the contact and experiences with wind turbines, and thereby provides residents with specific knowledge and experiences on physical aspects (e.g., noise, drop shadow, operational time) of the technology [82–84]. Therefore, we consider the proximity to wind turbines to be a factor in communicative citizenship as it empowers citizens to form an opinion. Furthermore, living close to wind turbines can also lead to material aspects of energy citizenship. Most commonly, wind turbines tend to negatively affect property value, especially in communities that are unwilling to host wind turbines [85]. However, in this study we control for material aspects of wind turbines by adding control variables such as homeownership and income. This variable was calculated based on the respondents' postcodes. If the respondents resided within 1 km or closer to wind turbines, they were coded 1, otherwise, they were coded 0.

Close to Solar parks. In addition to residing close to wind turbines, we also included a variable that indicates whether the respondents reside close to solar farms. This variable was calculated based on the postcodes of the respondents as well. If the respondents resided within 1 km or closer to solar farms, they were coded 1, otherwise, they were coded 0.

Climate and RE Awareness. This variable shows how much the respondent is aware of the on-going climate crisis, energy use and sustainability, and the relationship between climate change and energy use. This variable is comparable to the "familiar and knowledgeable" aspect of cultural capital [70,76,77], but the variable specifically focuses on the familiarity and knowledge related to the energy transition. We used five items to measure

people's climate and RE awareness, which are (1) "I think it is important to use sustainable energy," (2) "Renewable energy is an important solution to the climate crisis," (3) "Fighting climate change is something we all have to contribute to," (4) "We don't have to worry about the climate," and (5) "Humans seriously abuse the Earth." The question provided seven ordinal options as possible responses, namely, "Completely disagree," "Disagree," "Disagree a little," "Neutral," "Agree a little," "Agree," "Completely Agree." Each option was scored with "Completely disagree" receiving the lowest score of 1 and "Completely agree" receiving the score of 7, which was the highest. The item that stated "We don't have to worry about the climate" was reverse coded. The responses were then averaged across the five items. The Cronbach's alpha of this construct is 0.833.

3.2.3. Control Variables

We also included seven control variables in the analysis. We included these control variables to increase the internal validity and to limit the influence of confounding and extraneous variables.

Homeownership. Homeownership is one of the most important variables that indicate whether a person installs solar panels on their roof [86–88]. Furthermore, homeowners have stronger needs to be engaged in RE projects than tenants [20]. Tenants often do not have the permission or do not wish to spend money on their rental property, and although they are interested in sustainable energy, they tend to put it off until they own a house. The questionnaire asked whether the respondents lived in a rental house or an owner-occupied home. The homeowners were coded 1, and the tenants were coded 0.

Income. Income is another important indicator that can predict whether a person participates in RE movements [86,88]. Households with higher income may find sustainability a good motivation to participate in RE, whereas households with lower income may prioritize their livelihoods more than RE. As the questionnaire did not specifically ask for income data for privacy reasons, we used the postcodes provided by the respondents to obtain data on their neighborhood income from CBS Open Data StatLine, which is a government-published demographic databank [89].

Gender. Gender has been a variable of contention in the energy transition literature. A study conducted in Germany indicates that due to lower income and occupational segregation, women are less likely to invest and participate in RE movements compared to men [90], a finding which resonates with critiques of the materialist perspective on energy citizenship. In the United States, women are more likely to be employed in the renewable sector compared to the fossil fuel energy sector. Yet, they are less likely to be employed in RE industries that require particular skills and training [91]. However, other studies show that due to the increased number of women in politics, their role has become salient in understanding RE consumption and electricity access [92]. Therefore, we included gender in our models as a control variable that can potentially impact the dependent variables. The survey asked, "What is your gender," and the options were "Man," "Woman," "Other, please state," and "I would rather not say." The third option "Other" had one response, and three respondents chose the fourth option "I would rather not say." Due to their small number, we decided to code them as missing data instead of coming up with a separate category that would consume the degree of freedom of the models. Partially, this decision was also made based on the statistical understanding that four responses would not make any statistically significant changes. Women are coded 1, and men are coded 0.

Age. Age is another demographic variable that has been found to be relevant in determining whether an individual participates in energy citizenship, with younger generations more likely to be interested in climate change and RE than older generations [93,94]. In the survey, we asked the respondents to choose an age group: 18–24, 25–34, 35–44, 45–54, 55–64, 65–74, and 75 or older. The 18–24 group only had 8 responses, so we decided it would best to merge the first six age groups into three. Therefore, we used four age groups in the analysis: 18–34, 35–54, 55–74, and 75 or older.

Children. The presence of children also has an impact on energy transition participation and energy flexibility. Studies have shown that households with children tend to be more interested in RE [95], but they also tend to be less flexible on when they consume electricity. Nicholls and Strengers [96] found that a family's (with children) peak energy use is tightly routinized and tends to involve many persons and is less likely to change even if there are sustainability and monetary benefits. We asked the respondents about their family composition, to which they answered, "Single," "Single with child(ren)," "Living together without child(ren)," "Living together with child(ren)," and "Other." We coded the responses into a binary variable to indicate the presence of children in a household. The respondents with children were coded 1, and the respondents without children were coded 0.

Urban. An important geographical characteristic of energy communities to take into account is if individuals are located in an urban or rural area. Research has shown that citizens living in a rural community are more likely to participate in RE projects [97,98]. The respondents that resided in urban areas were coded 1, and those that lived in rural areas were coded 0. The division is based on the postcode. An urban area refers to neighborhoods situated in cities and larger towns (>30,000 inhabitants) and a rural area refers to neighborhoods of smaller towns and villages.

Central. Another geographical characteristic that is relevant is the central-peripheral division, which is typical for the Dutch context. The central region, also called the "Randstad," consists of the four largest Dutch cities (Amsterdam, Rotterdam, The Hague, and Utrecht), their suburbs and the towns in between, and the periphery consists of all regions outside the Randstad. Citizens from the periphery often experience a gap between the Randstad and the rest of the Netherlands. They assume that the national Dutch government (situated in The Hague) is more oriented towards the central region; consequently, they may feel less represented by the national government [99]. This might positively influence their engagement in protests. The respondents that live in the central region were coded 1, and the respondents that lived in the periphery were coded 0.

3.3. Data Analysis

We used two types of regression analysis. First, for the dependent variable, "RE participation," we used negative binomial regression analysis because it is a count variable. We considered using Poisson regression for RE participation, but the data did not meet the assumption of Poisson of the equality of the mean and the variance. Second, for the dependent variable, "RE protest," we used binary logistic regression analysis because we had a binary dependent variable. We used R to run the analyses, and for missing data, we used Bayesian multiple imputation (Hmisc package in R). We followed Harrell's [100] argument that conducting Bayesian multiple imputation for missing data provides more robust coefficients compared to listwise deletion. Another reason for using Bayesian multiple imputation is a relatively high missing rate for one of the dependent variables, RE protest, which has approximately 28.2% missingness. Bayesian multiple imputation has been argued to be particularly useful for discrete variables with high missing rate—as high as 40% [101]. Therefore, we appropriately handled missing data to provide the most robust outcome of the statistical models.

We ran robustness tests for the models. The variance inflation factors (VIFs) for both models stay under 3.4, which is lower than the generally accepted threshold of 5. Furthermore, we used Nagelkerke pseudo R squared to measure the amount of variance that the two models explain. The first model that uses RE protest as its dependent variable has the R squared value of 0.221, which indicates that we explain 22.1% of the variance of the dependent variable. The second model that uses RE participation as its dependent variable has the R squared value of 0.138.

4. Findings

4.1. Descriptive Statistics

Table 2 provides the descriptive statistics of the variables used in this paper. Most variables have missing data, but the difference between mean and the imputed mean and the difference between the standard deviation and the imputed standard deviation are relatively minute. This is because the rate of missingness is fairly low across the data frame, and it indicates that Bayesian multiple imputation is a useful method for this particular dataset.

Table 2. Descriptive Statistics.

Variable	Mean	SD	Imputed Mean	Imputed SD	Number of Missing
RE Participation	0.859	0.762	NA	NA	0
RE Protest	0.314	0.466	0.271	0.446	263
Higher Education	0.474	0.500	0.476	0.499	12
Energy Cooperatives' Presence	0.667	0.471	0.683	0.466	50
Energy Protest Presence	0.544	0.498	0.566	0.496	50
Close to Wind Energy Sites	0.132	0.339	0.133	0.339	8
Close to Solar Energy Sites	0.395	0.489	0.393	0.489	14
Climate and RE Awareness	4.883	0.756	4.881	0.777	33
Homeowner	0.901	0.298	0.901	0.299	9
Income	35.325	4.510	35.381	4.541	51
Gender	0.317	0.466	0.319	0.466	13
Age *	2.658	0.808	2.662	0.808	9
Children	0.373	0.484	0.371	0.484	6
Urban	0.343	0.475	0.330	0.470	50
Central	0.416	0.493	0.901	0.299	50

* The variable age is a categorical variable with 4 possible responses: (1) 18–34; (2) 35–54; (3) 55–74; or (4) 74 or older. In showing descriptive statistics, the numbers indicate the assigned group number shown in parentheses, not the actual age of the respondents.

4.2. Renewable Energy Participation and Renewable Energy Protest

Renewable Energy Participation. Model 2 of Table 3 shows the results of the negative binomial model with RE participation as the dependent variable. In Model 2, climate and RE awareness is the only independent variable that is statistically significant. It shows that the more climate and RE aware the respondent is, the expected log count of RE participation increases by 0.346.

Table 3. Binary Logistic and Negative Binomial Regression Estimates of Energy Citizenship.

	Dependent variable:			
	RE Participation negative binomial		RE Protest logistic	
	Model 1	Model 2	Model 3	Model 4
Constant	−0.119 (0.323)	−1.881 *** (0.432)	−0.858 (0.691)	0.756 (0.900)
Education		0.107 (0.074)		0.478 ** (0.170)
Energy Coop		0.031 (0.120)		−1.434 *** (0.298)
Energy Protest		0.148 (0.117)		0.036 (0.304)
Close to Wind		0.095 (0.116)		0.718 ** (0.276)
Close to Solar		0.057 (0.080)		−0.533 ** (0.190)

Table 3. Cont.

Climate RE Awareness		0.069 *** (0.011)		−0.074 *** (0.021)
Homeowner	0.317 * (0.140)	0.294 * (0.142)	0.801 ** (0.307)	0.914 ** (0.321)
Income	−0.006 (0.008)	−0.008 (0.009)	−0.030 (0.017)	−0.014 (0.019)
Gender	−0.115 (0.079)	−0.121 (0.079)	0.302 (0.166)	0.251 (0.173)
Age: 35–54	−0.102 (0.120)	−0.172 (0.123)	0.302 (0.251)	0.473 (0.264)
Age: 55–74	−0.180 (0.098)	−0.127 (0.098)	0.046 (0.204)	−0.063 (0.212)
Age: 75 or older	−0.072 (0.073)	−0.049 (0.073)	0.087 (0.158)	0.124 (0.165)
Children	−0.031 (0.093)	−0.054 (0.094)	0.183 (0.208)	0.095 (0.216)
Urban	−0.090 (0.078)	−0.070 (0.090)	−1.183 *** (0.202)	−1.583 *** (0.240)
Central	−0.195 ** (0.074)	−0.275 ** (0.092)	0.684 *** (0.159)	1.558 *** (0.261)
Observations	931	931	931	931
Log Likelihood	−1054.167	−1027.245	−495.543	−465.853
Akaike Inf. Crit.	2128.334	2086.490	1011.085	963.706

Note: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Two control variables are statistically significant in Model 2, which are central residence and homeownership. Central residents are less likely to participate in RE behavior compared to those that live in the periphery, but homeowners are more likely to participate compared to non-homeowners.

Renewable Energy Protest. Model 4 of Table 3 shows the binary logistic regression estimates that use RE protest as the dependent variable. The table shows that the respondents with higher education are 0.478 log odds more likely to protest compared to those without a higher education. Individuals that reside close to an energy cooperative have lower log odds of protesting by -1.434 compared to people who do not live close to an energy cooperative. People that live close to wind turbines are more likely to protest by 0.718 log odds compared to people who live farther away from wind turbines. This is notably different from those people that live close to solar parks, where the relationship is flipped: those who do have -0.533 lower log odds to protest against RE compared to people who do not live close to solar. The findings also indicate that those with greater climate and RE awareness are less likely to protest by -0.369 log odds.

Some of the control variables were also found to be statistically significant. Homeowners and residents living in the central area of the Netherlands (Randstad) are more likely to protest and the respondents who live in urban areas are less likely to protest. It is also interesting to note that the demographic variables that have been in contention in the literature such as gender and the presence of children are not statistically significant in predicting whether a person protests against RE or not.

5. Discussion

Overall, the findings show that for protesting against RE, a complex mix of cultural capital plays a role. Regarding our operationalization of material energy citizenship (RE participation), namely, having solar panels, investing or co-investing in wind and solar energy, and purchasing green energy, awareness and familiarity around RE and climate change is the only statistically significant factor. This shows that for material energy citizenship, other components of cultural capital such as education, living close to energy cooperatives or energy protests, and residence close to wind turbines or solar farms are all statistically insignificant variables. The differences in these findings with communicative

participation can be explained by the high threshold for material participation, which has already been noted in the literature on energy citizenship [9,49,62], and was also seen in a recent study of energy citizenship in the Netherlands [18]. Whereas any citizen can engage in communicative participation without any considerable risks, material participation is influenced by economic means, such as an owned house (for placing solar panels on the rooftop) and money to invest, which comes with financial risks. More generally, our finding of awareness and familiarity around RE being an important factor for explaining RE-related behavior is in line with previous studies [102,103]. This factor might stimulate an intrinsic motivation for RE-related action against climate change that goes beyond an economic calculation of risks in terms of time and efforts that need to be taken.

Although energy cooperatives try to stimulate investments in RE and provide opportunities to invest in communal energy projects [21], our findings seem to indicate that the presence of an energy cooperative is not enough. One reason is that energy cooperatives are most likely to attract people who are already knowledgeable and familiar with RE, which has been found by a previous study in the Netherlands [21]. Another additional explanation could be that respondents prefer individual rather than collective types of investments, such as solar panels on their rooftops, than in communal projects, i.e., solar parks and wind turbines. This is also illustrated in our data: respondents hardly invested in communal projects ($N = 52$) in comparison with investments in solar panels on their own rooftops ($N = 495$). An explanation that education is not a significant component is that RE investments require technical and practical knowledge (e.g., on how to install solar panels) rather than theoretical knowledge. Respondents with vocational education (lower education) might have just as much of this specific knowledge as theoretically (more highly) educated respondents.

Regarding communicative participation, labeled as RE protest, education, energy cooperatives' presence, residence close to wind turbines or solar farms, and awareness around RE and climate change are found to be statistically significant. Those with higher education are more likely to protest, which aligns with the existing studies that showed that those with educational attainment tend to have greater political confidence and are more likely to protest [50]. Those that live close to wind turbines are more likely to protest, but those that live close to solar parks are less likely to protest. This also supports the existing studies that argued wind turbines and wind farms tend to be more prone to protest due to noise and aesthetics [4,104]. Furthermore, we find that energy cooperatives lead to a lower likelihood of joining a protest, which supports the existing studies that show local energy cooperatives can increase social acceptance of wind turbines [105].

Some findings regarding the control variables are also interesting. Homeowners are more likely to protest, which is in line with Jansma et al. [20], who found that homeowners have a higher need to be engaged in the energy transition. Additionally, those that live in the central region of the Netherlands (Randstad) are more likely to protest. This is an interesting finding as one might expect that people living in the periphery, who feel less represented by the national government and are also more likely to live near contested RE technologies such as wind turbines, would be more inclined to protest. An explanation might be that citizens hold regional and local governments accountable for the implementation of RE technologies, rather than the national government.

Altogether, the findings show that energy citizenship should be approached as a multi-dimensional concept based on both communicative and material participation. This is in line with Lennon et al. [49] who emphasized that focusing solely on material participation creates a blind spot for other types of engagement that are legitimate as well, but which might be based on different rationales. Indeed, our findings show that communicative and material participation are influenced by different factors, including different aspects of cultural capital. These findings align with the existing studies that the theory of cultural capital developed by Bourdieu is a useful concept in understanding energy citizenship [14,26,61]. A recent article by Husu [13] hypothesized that Bourdieu's central concepts would be

useful in understanding the energy transition. We empirically show that cultural capital is indeed an important variable in understanding the energy transition.

We also show a way to operationalize cultural capital that is specific to energy transition studies. To date, cultural capital as a concept has been widely used in education and social reproduction literatures [67,68,70,75–77] but to our knowledge no other papers have shown a way to operationalize cultural capital in an energy transition study. The findings indicate that our operationalization of cultural capital is both useful and needed in predicting energy citizenship behavior.

6. Conclusions

In answering our research question, “what is the relationship between cultural capital and energy citizenship,” we find that the relationship is nuanced and that a careful examination of the type of energy citizenship is required. To elaborate, we find that for protesting against RE, most components of cultural capital had statistically significant associations with energy citizenship. However, for RE participation, the findings show that only climate and RE awareness is an important cultural capital in understanding energy citizenship. Based on these findings, we argue that although there is a statistically significant relationship between cultural capital and energy citizenship, it is nuanced and the composition of cultural capital can vary depending on how energy citizenship is measured and operationalized. As concerns over energy justice continue to be raised by local communities and energy researchers, we expect that the question of culture and cultural capital will become central to both understanding and promoting energy transitions.

This paper makes several contributions to the literature. We make a theoretical contribution to the field of energy citizenship by engaging with material and communicative forms of energy citizenship, which accounts for power dynamics, institutional settings, and contextual variations. Furthermore, by including cultural capital into the framework of energy citizenship, we place the concept beyond the market and situate it in the societal domain. Our methodological contribution is that we introduce new measures for cultural capital that are specific to energy transition studies, which promotes a transdisciplinary lens in developing the concept of energy citizenship.

The findings of this study have salient policy implications. We show that in promoting energy citizenship, multiple factors that relate to cultural capital must be taken into account. To publicize and gain momentum for the energy transition through energy citizenship, local and national governments should provide financial and policy support for local workshops to increase knowledge and awareness around climate change and renewable energy and empower citizens in communicative participation. Furthermore, to communicate with the public about RE and why they are opposing or protesting against RE, their contextual and communicative citizenship must be taken into account (i.e., proximity to RE sites and the presence of energy cooperatives). Increasing the familiarity with RE technologies (i.e., solar parks) and the presence of energy cooperatives may reduce RE protests, which can be carried out through national RE subsidies, local government support, and regional or local energy-related workshops and seminars.

We hypothesize that Bourdieu’s other concepts such as economic, social, and symbolic capital, habitus, and field can also be useful concepts in further understanding the energy transition. We plan to incorporate these concepts in our future studies, which we believe will expand the acceptance of the energy transition and further promote energy citizenship. We are particularly interested in the role of cultural capital when other types of capitals are included in the model. One of the research questions that we can explore in the future is “is cultural capital still important in understanding energy citizenship when we also include economic, social, and symbolic capitals in the models?” In order to answer this research question, extensive research on how to measure social and symbolic capitals within energy citizenship would also be needed.

Furthermore, we find the discussion between habitus and energy citizenship particularly relevant. Habitus is a concept that explains people’s ways of thinking and behaving

that are grounded in personal habits and dispositions. Habitus is also strongly related to cultural capital because factors associated with cultural capital such as mannerisms and taste are also included as a form of habitus. A further theoretical and empirical exploration is needed, and we believe that habitus would be a useful theoretical tool in further promoting energy citizenship.

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