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Citizen participation in local energy communities: A social identity and pro-environmental behaviour joint perspective

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ABSTRACT

Local energy communities present great potential in changing the current energy paradigm, contributing to a more decarbonized and decentralized system aligned with the sustainable development goals. Given this, it is highly relevant to understanding the antecedents of citizens' intention to participate in these communities. Therefore, this work focuses on two main elements of these communities – social and environmental. Hence, citizen behaviour is analysed in light of the social identity and pro-environmental behaviour theories. Moreover, the knowledge dimension is assessed as a moderator of those relationships. The model is tested using a sample of 400 individuals from Greece using structural equation modelling. The work uncovers the relevance of community commitment, trust, and pro-environmental behaviour. Additionally, knowledge is found to be a strong moderator. These findings are especially relevant for practitioners to comprehend better and boost citizens' willingness to participate in local energy communities.

1. Introduction

Nowadays, several strategies have been developed contributing to the energy transition process and, therefore, to the mitigation of environmental problems [1]. Aligned with the fast increase of distributed energy resources in residential buildings, citizens have been transformed into prosumers who can consume, produce, and later share the energy with other neighbours or the system operator [2]. This has led to the development of local energy initiatives, namely, local energy communities, allowing citizens to take on more active roles in energy production and consumption.

Although relatively recent, these communities are starting to spread in many countries, proving to have great potential to contribute to renewable energy production and create a more flexible energy system [3]. Nevertheless, the success of this community is highly dependent on its citizens' participation and commitment [1]. Though this may be considered a behaviour strongly led by environmental motivations, it is also attached to the community behaviour [4]. Therefore, this work intends to study this phenomenon from a new perspective by understanding the role of community and pro-environmental behaviour on the citizens' participation behaviour. We address this research objective by drawing on the social identity and the pro-environmental behaviour theories. The model is tested using the structural equation modelling technique on a sample collected from Greece. This country has become relevant given the government's focus on implementing reforms in the energy sector toward decarbonization, having exceeded the European Union's target for energy production [5].

The contributions of this paper are as follows. First, it extends the current knowledge on local energy communities, focusing on a joint perspective on social identity and pro-environmental behaviours and reinforcing these community initiatives in contributing to the energy system's decarbonization, transition, and flexibility. Second, it contributes to a better understanding of how the community network and its dynamics influence these local energy initiatives, understanding that these are not solely dependent on a single individual but are a shared responsibility [6]. Thirdly, it examines how the citizen knowledge levels can truly affect its behaviour regarding local energy communities, accentuating the need to create more informed citizens on sustainability and energy matters. Finally, the study's findings contribute to practitioners' better understanding of the main citizen motivations for them to participate in local energy communities and, therefore, better formulate policies and strategies that can help in the successful implementation of these communities.

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2. Theoretical background and hypothesis development

2.1. Local energy communities

In light of the Sustainable Development Goals (SDG), the European Commission has proposed to place the citizens as central actors in the energy transition process [7]. Therefore, citizens should be able to consume, produce, and sell energy [8]. Due to the increase in distributed energy resources, such as solar panels, microturbines, electric vehicles, and batteries, citizens can become active energy citizens [9], and local energy initiatives can present significant environmental benefits. Overall, citizens can participate in a local energy community in several ways. Some examples are the collective purchase of renewable energy systems, the production of renewable energy, energy awareness and education activities [3]. Despite the benefits of these communities, previous research has identified several barriers to implementing these initiatives, such as the centralized design of most energy systems, regulations, or lack of equipment or knowledge [3]. Therefore, most studies have focused on these practical implementation factors and identifying measures to surpass these, such as access to financial incentives and raising awareness with informational policies [10]. Nevertheless, Goedkoop [11] found that while these practical, regulatory, and technical barriers are essential, policymakers need to better understand citizens' attitudes, given their substantial impact on the community's success. Table 1 summarizes prior research on the topic, identifying several practical and attitudinal variables as enablers or obstacles to implementing a local energy initiative.

Although engaging in a local energy community can be seen as a pro-environmental behaviour, it is also much related to pursuing a shared objective, allowing one to connect with other community members [16]. Given the fact that the success of the initiative is highly dependent on its citizens/community, prior research has indicated the increasing importance of a more inclusive participation of citizens in the energy system [3]. Therefore, previous investigations have acknowledged the need to understand better the impact of subjective norms on citizen participation in local energy communities [17]. Ultimately, prior investigations show a standard line of thought – the success of the local energy community requires the engagement of most community members, where social acceptability is decisive [18].

Table 1
Prior research on local energy communities.

Authors	Explanatory variables	Target variables
Bauwens, [12]	Renewable energy production, return on investments, price and transparency of prices, lack of charges, social influence, social identification, pro-environmental positioning, trust	Intention to join a renewable energy community
Koirala et al., [3]	Community trust and resistance, education, energy awareness, Environmental concern, renewables acceptance, energy independence	Willingness to participate in community energy systems
Berka et al., [13]	Institutional arrangements, policy processes, and regulations	Participation in local community energy
Conradie et al., [14]	Attitude, subjective norms, perceived behavioral control, environmental behaviour, financial benefit, technological innovativeness, home proprietorship, community identity	Intention to join a renewable energy community
Leonhardt et al., [1]	Government incentives, grid access, environmental protection, and community planning and capacity	Community energy adoption
Leknoi et al., [15]	Experience, significance, government response, negative emotion, and positive emotion to climate change; community trust and solidarity	Energy community initiative engagement

2.2. Social identity theory

Social identity theory considers that an person's behaviour can be shaped by the group in which they are inserted. When the individual identifies himself with the group, then his behaviour can be influenced by them. The concept of social identity suggests that individual behaviour can be defined by the social roles it has or identifies with [19]. This theory intends to explain individual behaviour and the conceptualization of the self through its relationships with a social group, where social identities and inherent norms may drive individuals' behaviours. Individuals may seek to identify and be inserted in a group for several reasons, like social status or avoiding uncertainty about their decisions [20], especially when these may require more significant effort or investment, as it happens when participating in a local energy community. LECs are also composed of social networks in which citizens interact and may share knowledge and engage, characterized as a dynamic interaction between personal factors and the social network [21]. Therefore, if an individual self-concept is firmly attached to a particular group he is inserted in, his behaviours tend to align with that social group's perceived norms [19]. This means that individuals' behaviour can be seen as an expression of their commitment to the group and shared values [22]. Given this, four main dimensions of social identity are identified:

- Community identification – it is defined as the individual sense of belonging towards a group or community [21];
- Community shared vision – it refers to the collective and common goals and aspirations of a group [21];
- Community commitment – it is defined as the individuals' willingness to contribute its efforts to the success of the community [23];
- Community trust – trust has been conceptualized in several ways, however in a community setting it refers to the individual expectation that the group members will act according with the norms and principles established, with no intention to harm the community goals [21].

The decision to adopt the social identity theory comes from both its theoretical focus on group-based processes and its practical compatibility with the quantitative methodology. This theory has been widely used to examine how individuals' self-concept, when derived from group membership, shapes attitudes, norms, and behavioural intentions. This focus aligns with our aim to investigate how identification with a community or collective influences willingness to engage in local energy communities. Furthermore, it offers constructs that are well-defined and measurable, which is essential for the approach employed. Nevertheless, other theoretical frameworks exist offering complementary or more practice-oriented perspectives of identity. For example, Wenger's communities of practice conceptualize identity not as a static trait, but as an emergent property of participation in shared practices over time. Identity, in this view, is formed through mutual engagement, and a joint and shared set of interests and resources. Applied to the context of LECs, this perspective could emphasize how ongoing participation in community energy practices helps shape members' sense of self and belonging. Similarly, Bourdieu's concept of habitus provides a lens for understanding how preferences and perceptions are shaped by historical and structural contexts. Habitus is conceptualized as "a *subjective but not individual system of internalised structures, schemes of perception, conception, and action common to all members of the same group or class*" [24]. In the case of community participation, habitus could help explain how class, education, and prior experiences condition an individual's openness to collective energy initiatives, beyond what can be captured by consciously held group identifications. Therefore, while the current approach focuses on a specific psychological mechanism that links identity and collective behaviour, we fully acknowledge that social identity theory provides only one perspective among many.

Additionally, while this study focuses primarily on attitudinal and

identity-based predictors of participation, it is important to recognize that social behaviour is deeply embedded in broader structural and relational contexts. Recent interdisciplinary research, particularly in the fields of community energy and sustainability transitions, has emphasized that participation in local energy initiatives is not merely a function of personal attitudes or environmental concern, but is also shaped by citizens' positions within social networks ([17]; [25]). Those embedded in strong community ties or connected to initiative leaders are more likely to access information, feel social encouragement, and perceive a sense of collective efficacy. Mapping out the local social landscape and identifying diverse community needs and resources early in the process can support the development of more effective and inclusive community energy initiatives. Incorporating social network factors, such as centrality, density, or tie strength, could enrich current models by revealing how trust, motivation, and engagement flow through communities. A combined approach using social identity theory and social network analysis could better explain not only who gets involved in local energy communities, but also how collective action emerges and is sustained over time.

2.3. Pro-environmental behaviour

Besides LECs' community/social characteristics, these are firmly seen as a strategy promoting sustainability and decarbonization of the energy system. Given this, the citizens' pro-environmental behaviours (PEB) can strongly influence their intention to participate in these sustainable initiatives. Although specific pro-environmental behaviours (PEBs), such as recycling or reducing household energy consumption, may appear distinct from participation in local energy communities, they are often supported by similar motivational processes. Engaging in everyday sustainable practices can both reflect and strengthen an individual's environmental identity, which in turn increases openness to more collective forms of climate action [26]. From this perspective, participation in a local energy community should not be viewed as a stand-alone behaviour, but rather as a natural extension of an ongoing commitment to environmental responsibility and other forms of pro-environmental behaviors [27].

PEB is conceptualized in the following dimensions: (1) social environmentalism – defined as the social engagement related to sustainable plans, such as sharing knowledge, informing others on the relevance of conservation actions, among others – it presents a solid social component [28]; (2) conservation lifestyle – refers to conservation behaviours, such as recycling, turn off lights when possible, saving water, among others – it is considered the most common behaviour [28]; (3) environmental citizenship – it is defined as the civic engagement on sustainable actions, such as supporting policies, voting, signing petitions, among others – it presents a solid civic element [28].

2.4. Integrated model

Given two main characteristics of local energy communities, i.e., the strong dependency on the community members, as well as its sustainable trait, the proposed integrated research model brings a new and joint perspective of the social identity theory and pro-environmental behaviour to understand better the antecedents of citizen intention to participate in local energy communities (LEC). By analysing the phenomenon through these two perspectives - social and pro-environmental – we believe we can deliver an investigation that covers the main aspects of these communities and deepen the research on how community factors influence citizens' decisions. The research model is presented in Fig. 1. The following sub-sections will develop the research hypotheses.

2.5. Hypothesis development

Social identity theory considers that an individual's behaviour can be influenced by the group in which they are inserted, mainly if the behaviour strongly depends on the group's attitude and performance [19]. Given this, four main dimensions of social identity are identified: (1) community identification – community identification tends to nurture feelings of loyalty and behaviours that promote group benefits, similar to LECs community benefits; (2) community shared vision – if an individual shares identical goals to a group then it is more likely to engage in group actions and cooperation, such as LECs; (3) community commitment - this is especially important on an energy community where only a community effort can create a truly successful LEC; (4) community trust – given the strong dependence of LECs to its members, it is especially relevant to ensure that no citizen would purposefully harm the communities' goals. Considering the social characteristics of the LECs and following the social identity theory, we hypothesize the following:

H1. Community identification positively impacts citizens' intention to participate in LECs;

H2. Community-shared vision positively impacts citizens' intention to participate in LECs;

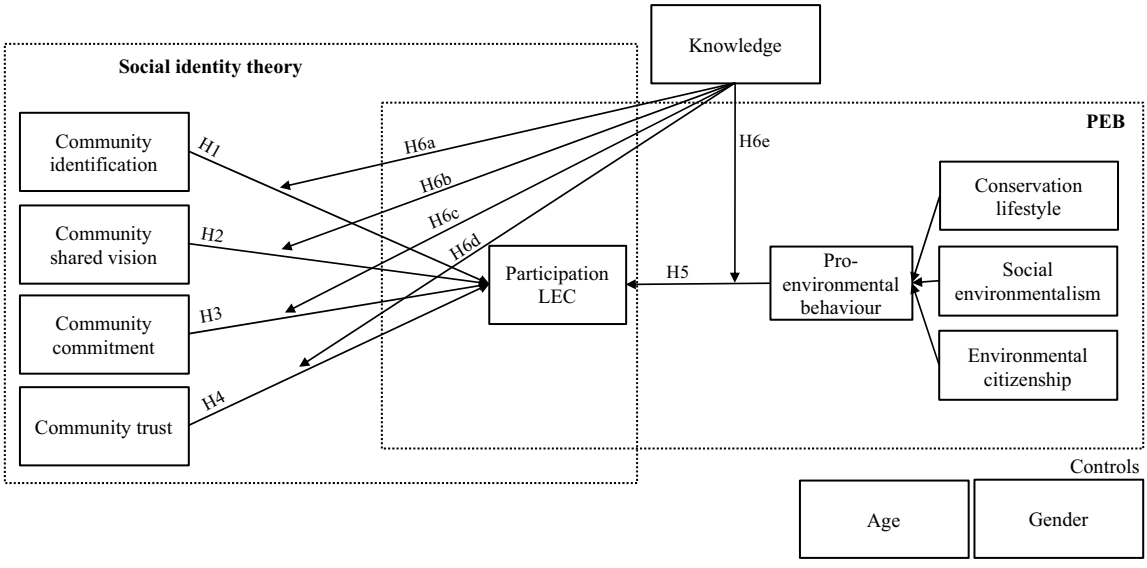

Fig. 1. Research model.

H3. Community commitment positively impacts citizens' intention to participate in LECs;

H4. Community trust positively impacts citizens' intention to participate in LECs.

Local energy communities are firmly seen as a strategy promoting sustainability and decarbonization of the energy system, presenting a robust pro-environmental characteristic. Given this, the citizens' PEB can strongly influence their intention to participate in these sustainable initiatives. PEB has been used to explain a lot of ecological behaviours/initiatives (e.g., [14]) since individuals who already behave in a pro-environment way will be more willing to pursue/participate in other initiatives that present environmental benefits. Hence, we hypothesize that:

H5. PEB positively impacts citizens' intention to participate in LECs.

Given the fact that the participation in a local energy community requires a certain level of interest and comprehension, we believe that the relationships of social and pro-environmental factors to citizens intention to participate in LECs can differ according to the citizens level of knowledge. Overall, knowledge can be defined as a personal accomplishment acquired by theoretical or practical experiences and/or education, being one of the five phases of the diffusion of innovation theory [29]. Prior research has proved that knowledge is an essential factor when engaging in pro-environmental behaviours, especially the ones considered complex or that require some effort [30]. Presenting information and facts to citizens can support their environmental protection norms that affect their behavior. Therefore, knowledge of the energy sector, environment and available technologies can dictate how the consumer engages with LECs. More knowledgeable citizens may have different perspectives on the local community's potential and benefits; hence, their motivations may differ according to their knowledge level [31]. Given this, we hypothesize the following:

H6a. Knowledge moderates the relationship between community identification and citizens' intention to participate in LECs;

H6b. Knowledge moderates the relationship between community-shared vision and citizens' intention to participate in LECs;

H6c. Knowledge moderates the relationship between community commitment and citizens' intention to participate in LECs;

H6d. Knowledge moderates the relationship between community trust and citizens's intention to participate in LECs;

H6e. Knowledge moderates the relationship between PEB and citizens intention to participate in LECs;

3. Methods

3.1. Measurement

The constructs used in this study were adapted from established measurement instruments in the literature to fit the context of local energy communities. Adaptation involved a multi-step process: (1) rewording items to reflect the LEC setting while preserving the theoretical essence of the original scales; (2) translating the items into Greek by a native speaker with subject-matter expertise; (3) conducting a back-translation into English to verify semantic consistency [32]; and (4) testing the adapted version in a pilot study with 50 participants. This process ensured both conceptual validity and linguistic appropriateness of the items. While the underlying constructs remain theoretically aligned with the original measures (e.g., [21,28]), the language and examples were contextually grounded in the lived experiences and terminology relevant to LEC participation in Greece.

3.2. Data

Data was collected through an online questionnaire during one month (September 2022). The samples of respondents consisted of a random selection of residents from the country under study, with the condition of being responsible or co-responsible for the decision of technologies' adoption in their houses [33]. This was especially relevant because participation in an LEC requires adopting some technologies, such as renewable energy systems, smart meters, etc. After data cleansing, 400 responses were considered valid. Finally, the sample was examined for common-method bias using two approaches: (1) Harman's one-factor test [34] – this test indicated that no indicator by itself explained more than 50 % of the variance in data; (2) adding a theoretically irrelevant marker variable to the questionnaire – this variable presented 0.048 (4.8 %) as a maximum shared variance with the other variables, being considered a low value [35]. Hence, no significant common-method bias was indicated.

Considering some sample characteristics, the respondents in the sample present the same age and gender distribution as the population. A chi-square for probabilities difference test indicated no statistically significant differences between the sample and population ages and gender categories. Most respondents have a bachelor's or master's degree, with an average household net income between 2000 and 3000 euros. Most respondents also live in an urban area, mainly in flats. The average number of children in the household is two. Additionally, most respondents were homeowners.

4. Results

The research model was assessed resorting to the partial least squares technique. This method was chosen since it is suitable for testing models that were never tested before and especially because is not restrictive in terms of data distribution [36]. Hence, this method is considered suitable. Both measurement and structural models will be evaluated. Smart PLS 4.0 was the chosen software [37].

4.1. Measurement model

To evaluate the measurement model, several criteria were assessed. Table 2 presents the mean and standard deviation of the constructs, together with composite reliability (CR). Regarding this last measure, all variables present a value higher than 0.7, guaranteeing the reliability of scales. The average extracted variance (AVE) was also assessed and presented as the square of the diagonal values. A value greater than 0.5 is shown for all constructs, confirming convergent validity [38]. Next, discriminant validity was evaluated using three criteria: Fornell–Larcker, Heterotrait–Monotrait Ratio (HTMT), and a comparison between loadings and cross-loadings. Starting with the Fornell–Larcker, Table 2 shows that the diagonal values are more significant than the correlations between constructs, supporting the discriminant validity [39]. Next, the HTMT values were analysed (Appendix B), being all lower than 0.9, except for the value between community identification and community commitment constructs. Given this, the confidence interval for 95 % confidence was assessed. The interval varies between 0.874 and 0.927, confirming no surpassing the value 1. Therefore, we can confirm the discriminant validity between all constructs. Finally, a comparison between loadings and cross-loadings was made (Appendix C). All the first are higher than the cross-loadings [40], supporting the discriminant validity.

Regarding the reflective-formative construct (PEB), we have evaluated the weights' multicollinearity and statistical significance [41]. Regarding the first mentioned, we have analysed the variance inflation factor (VIF), presenting values lower than 5, suggesting no collinearity issues [42]. Additionally, the weights were analysed, being all statistically significant (Table 3).

Table 2
Mean, standard deviation, CR, and Fornell-Larcker table. The diagonal elements are the square root of AVE.

	Mean	STD	CR	CI	SV	CC	TR	CL	SE	EN	K	LEC
Community identification (CI)	4.614	1.499	0.958	0.922								
Community shared vision (SV)	4.128	1.593	0.970	0.809	0.957							
Community commitment (CC)	4.304	1.589	0.963	0.850	0.826	0.931						
Community trust (TR)	3.946	1.561	0.973	0.720	0.820	0.786	0.937					
Conservation lifestyle (CL)	5.564	1.032	0.833	0.358	0.350	0.370	0.317	0.793				
Social environmentalism (SE)	3.396	1.690	0.938	0.465	0.530	0.587	0.537	0.424	0.913			
Environmental citizenship (EN)	2.536	1.646	0.918	0.360	0.436	0.499	0.476	0.304	0.795	0.859		
Knowledge (K)	5.187	1.233	0.893	0.397	0.409	0.425	0.348	0.502	0.425	0.298	0.858	
Intention to participate in LEC (LEC)	4.186	1.749	0.983	0.595	0.576	0.669	0.606	0.372	0.542	0.442	0.458	0.975

Table 3
Weights, loadings, and VIF of formative construct indicators.

		VIF	Weights
PEB	Social environmentalism	3.020	0.456***
	Environmental citizenship	2.729	0.505***
	Conservation lifestyle	1.224	0.194***

(* p-value < 0.10; ** p-value < 0.05; *** p-value < 0.01)

4.2. Structural model

Before evaluating the structural model, VIF values were checked to assess any possible multicollinearity between constructs. Since all values were smaller than 5, we can conclude that there are no multicollinearity issues [43]. To determine the significance of the path coefficients, bootstrapping was carried out with 5000 iterations of resampling [38]. Fig. 2 presents the path coefficients. The model explains 54.1% of the variability of citizens' intention to participate in local energy communities. From the social identity theory, only community commitment and trust present statistically significant impacts, supporting H3 and H4. Pro-environmental behaviour also presents a statistically significant impact, supporting H5. From the moderation hypotheses, three are found to be significant, supporting H6a, H6b, and H6e. Therefore, six out of ten hypotheses are supported.

5. Discussion

Given the increased efforts toward decarbonizing and decentralizing energy systems, local energy communities are receiving added attention from academics and practitioners. However, these communities strongly rely on the citizens' participation. Therefore, resorting to social identity and pro-environmental behaviour theories, this study examines the drivers for citizens' intention to participate in LECs. To the best of our knowledge, this is one of the first works that examine the LEC participation from this joint perspective.

Regarding the community factors, community identification and shared vision were found to be non-significant, while community commitment and trust were significant. These results suggest that citizens will present greater intention to participate in LEC when presenting higher levels of community commitment, i.e., they already contribute to the community and when trusting that all groups will behave according to the community goals instead of individual benefit. These findings align with prior research, especially regarding trust, given that the benefits of a local energy community are much more significant when individuals work together [3,44]. As expected, pro-environmental behaviour presents a positive statistically significant impact, suggesting that individuals who already perform other pro-environmental behaviours are more willing to participate in LEC. This result is aligned with prior investigations on other sustainable behaviours – for example, adopting smart thermostats [45].

Regarding the moderation results, knowledge positively moderates the relationship between community identification and participation in LEC. It negatively moderates the relationships of community shared vision and PEB to participation in LEC. Figs. 3a–3c represent the moderation effects.

For individuals with high levels of knowledge, the impact of community identification on citizens' intention to participate in LEC is higher. Community identification is only positively relevant when individuals have high knowledge levels. This result suggests that mainly knowledgeable individuals recognize the importance of a sense of community and togetherness for the LEC to be successful – which has been demonstrated in previous research on other types of communities, such as virtual ones [46].

Additionally, for higher knowledge levels, the impact of community-shared vision on the intention to participate in LEC is negative. While for lower levels of knowledge, community-shared vision is higher. This suggests that when the individual is not very knowledgeable on energy-related topics, they tend to follow the vision/goals of the group to avoid

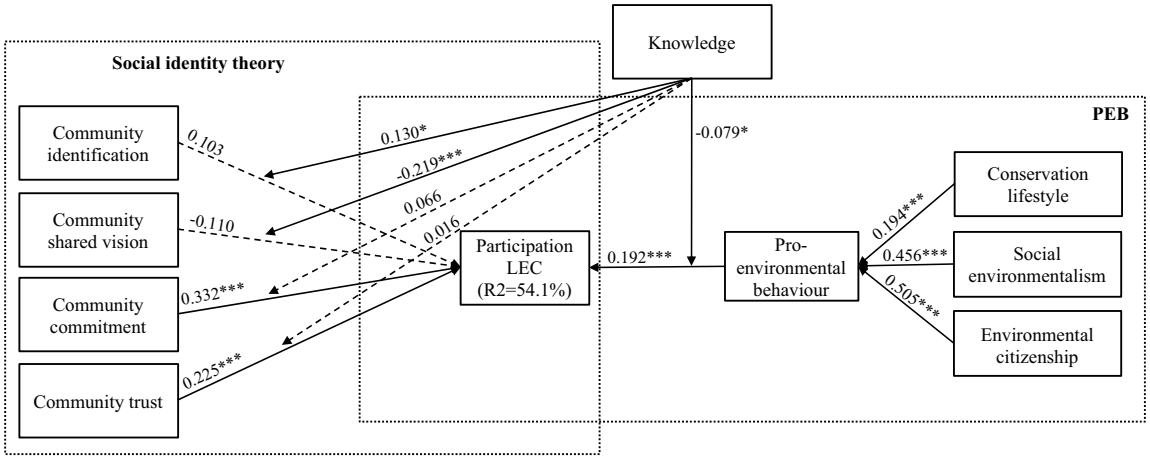

Fig. 2. Path coefficients (* p-value < 0.10; ** p-value < 0.05; *** p-value < 0.01).

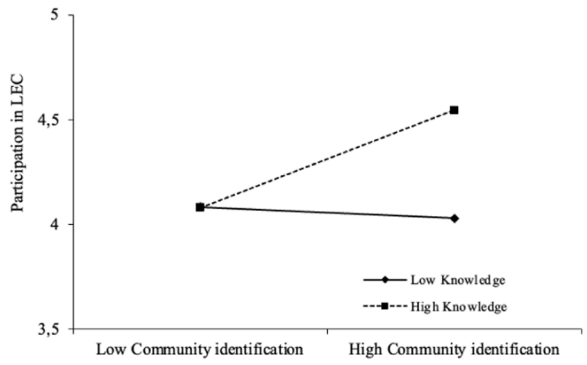

Fig. 3a. Moderation effect between CI and LEC.

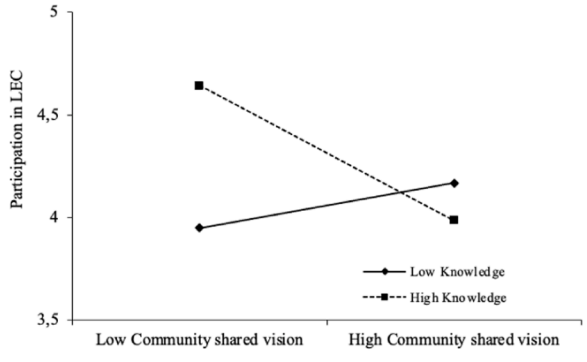

Fig. 3b. Moderation effect between SV and LEC.

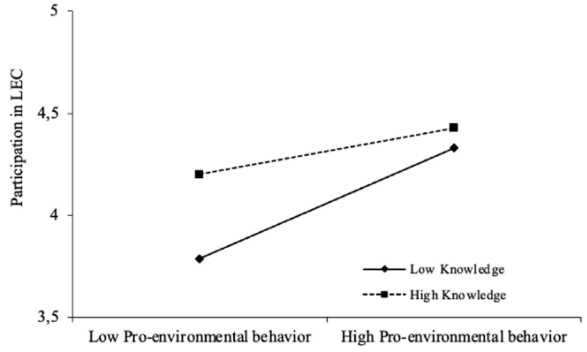

Fig. 3c. Moderation effect between PEB and LEC.

uncertainty and doubt in their decisions due to lack of knowledge [47].

Finally, for individuals presenting higher levels of knowledge, the impact of PEB on their intention to participate in LEC is more significant. This aligns with previous research since the individuals who perform more pro-environmental actions are usually more aware of the energy sector and climate change [48].

5.1. Theoretical implications

First, the current research contributes to the existing body of knowledge on local energy communities from the citizen behaviour perspective, for which we believe further studies should continually examine this behaviour given the great potential of these communities for the energy paradigm and its contribution to sustainable development goals. Second, to our knowledge, this is one of the first studies exploring citizen participation in local energy communities from the social identity and pro-environmental behaviour perspective. This research concluded that these two are vital to citizens' participation intention. Thirdly, this research has reinforced the influence of social relationships in sustainable behaviours, revealing that factors like a sense of belonging and social status should be further examined in sustainable behaviours or community ones. Finally, by proving the relevancy of the knowledge moderating impact, we could conclude the complexity of the phenomenon under study, realizing that direct relationships weren't sufficient and did not reveal the holistic picture of citizen behaviour. While we believe knowledge is an essential factor that can dictate several relationships, we also acknowledge that other possible dimensions can also have a similar moderating impact, for which we encourage to explore further studies.

5.2. Practical implications

Regarding practical implications, first, by identifying determinants of citizens' intention to participate in local energy communities, these results are especially relevant for policymakers to encourage participation in local energy initiatives. Therefore, two central elements cannot be disregarded: (1) the behaviour is influenced by the community where the citizen is inserted; (2) this behaviour has a solid pro-environmental trait. Results suggest that citizens who are already committed to the community and contribute their efforts are much more willing to participate in an LEC, as well as when citizens have a strong sense of trust in their neighbours. Given this, we believe that before implementing a local energy community, it is strongly advised to the municipalities to create other activities (e.g., civic, sustainable, etc.) that can boost citizens' commitment to each other and increase their trust in peers [49]. The creation of pro-environmental projects, such as conservation and preservation actions or the creation of local environmental groups, can be a successful measure since it also promotes pro-environmental behaviour and has proved to increase citizens' willingness to participate in LEC.

Additionally, knowledge was found to have an impact on some of tested relationships. This indicates a higher complexity on the determinants of participation intention since different knowledge levels suggest different importance of the motivations. Overall, higher knowledge of the energy sector and environmental situation led to a more significant impact of community identification and PEB on their willingness to participate in a LEC. Therefore, while promoting community activities are advised, it is also essential to educate the citizen on these matters, as more excellent knowledge will not only create better users of a local energy community but will also create more informed and conscious citizens regarding any other pro-environmental action [50]. Moreover, for more knowledgeable citizens, the impact of a community-shared vision is negative. This finding suggests a complex interplay between individual knowledge and collective group dynamics. For less knowledgeable individuals, alignment with their community's shared vision may provide reassurance for decision-making, particularly in a domain like energy transitions that can appear technically complex. Conversely, individuals with higher knowledge may feel more confident forming independent assessments of a local energy community. In such cases, adherence to their community vision may be perceived as redundant or even constraining. Nonetheless, this result can also suggest that knowledgeable individuals may begin to align more with expert communities rather than their own community. This could reflect a shift in identity, whereby belonging to a broader sustainability-oriented or expert group takes precedence over local alignment. Given this, it is strongly advised for municipalities and educational organs to deeply clarify to citizens the reasons, risks, and advantages of participating in climate change mitigation actions, creating greater environmental awareness [51].

5.3. Limitations and future research

This study is not without limitations. First, this study was conducted in Greece, which, although it is a country of interest, might not

generalize to other countries. For example, we encourage future research exploring country and cultural norms that influence implementing local energy communities. Moreover, our sample skews toward educated, urban homeowners, and may not reflect rural or low-income populations with different barriers to LEC participation. Since LECs often emerge in rural areas with distinct community dynamics, and homeownership may increase willingness to participate, our findings should be examined in light of these specific settings and not directly generalized. Additionally, we encourage further studies to examine these communities through different lenses. Although we provide noteworthy results in evaluating the role of social identity and pro-environmental behaviour on citizens' intention to participate in local energy communities, we believe other factors can also be essential in explaining this behaviour.

6. Conclusion

Based on the social identity and pro-environmental behaviour theories, this study investigates the impact of social and environmental factors on the citizens' intention to participate in a local energy community. The findings confirm the vital relevance of combining more social science insights on energy projects and strategies [50], especially on LEC projects, where community commitment and trust present substantial positive impacts. Additionally, results support that performing other pro-environmental actions is a strong determinant of citizen behaviour regarding LEC, reinforcing the need to create more community-sustainable projects [52]. Finally, knowledge was found to be a solid moderator, suggesting the need to create more informational strategies that can increase citizens' awareness of environmental problems, and which measures they can adopt. More knowledgeable citizens will present more autonomy and value more their belonging to the community, recognizing that the success of a local energy community can only be achieved when the community is aligned towards that ambition.

CRediT authorship contribution statement

Catarina Neves: Writing – original draft, Visualization, Software, Methodology, Investigation, Formal analysis, Conceptualization. **Tiago Oliveira:** Writing – review & editing, Validation, Supervision, Methodology, Investigation, Conceptualization. **Stylianos Karatzas:** Writing – review & editing, Validation, Supervision, Investigation, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Survey items

Construct	Acronym	Item	Source
Community identification	CI1	I feel a sense of belonging towards my community	[21]
	CI2	I have a feeling of togetherness or closeness in my community	
	CI3	I have a strong positive feeling toward my community	
	CI4	I am proud to be a member of my community	
Community shared vision	SV1	Members of my community share the vision of helping others	
	SV2	Members of my community share the same goal	
	SV3	Members of my community share the same value	
Community commitment	CC1	I am proud to belong to my community	[23]
	CC2	I contribute my efforts to the success of my community	
	CC3	I actively contribute to my community	
	CC4	I am very committed to my community	
Community trust	TR1	Members of my community will not take advantage of others when opportunity arises	[21]
	TR2	Members of my community will always keep their promises	
	TR3	Members of my community would not knowingly do anything to damage anyone	
	TR4	Members of my community behave in a consistent manner	
	TR5	Members of my community are truthful	
Conservation lifestyle	CL1	Recycled paper, plastic and metal	[28]
	CL2	Conserved water or energy in my home	
	CL3	Bought environmentally friendly and/or energy efficient products	
Social environmentalism	SE1	Talked to others in my community about environmental issues	
	SE2	Worked with others to address an environmental problem or issue	
	SE3	Participated as an active member in a local environmental group	
Environmental citizenship	EN1	Voted to support a policy/regulation that affects the local environment	
	EN2	Signed a petition about an environmental issue	
	EN3	Donated money to support local environmental protection	
	EN4	Wrote a letter in response to an environmental issue	
Knowledge	K1	I am familiar with sustainable energy solutions	[30]
	K2	I am knowledgeable about energy topic and the environment	
	K3	I know how to select sustainable energy solutions	
Intention to participate in local energy community	EC1	I intend to become part of the local energy community in the next months	[53]
	EC2	I predict I would become part of the local energy community in the next months	
	EC3	I plan to become part of the local energy community in the next months	

Appendix B. Heterotrait–Monotrait Ratio (HTMT)

	CI	SV	CC	TR	CL	SE	EN	K	LEC
Community identification (CI)									
Community shared vision (SV)	0.852								
Community commitment (CC)	0.902	0.871							
Community trust (TR)	0.754	0.854	0.822						
Conservation lifestyle (CL)	0.397	0.852	0.395	0.754					
Social environmentalism (SE)	0.504	0.597	0.633	0.624	0.453				
Environmental citizenship (EN)	0.393	0.376	0.542	0.324	0.312	0.453			
Knowledge (K)	0.441	0.475	0.461	0.515	0.643	0.889	0.320		
Intention to participate in LEC (LEC)	0.620	0.437	0.694	0.371	0.390	0.473	0.476	0.492	

Appendix C. Loadings and cross-loadings

	CI	SV	CC	TR	CL	SE	EN	K	LEC
CI1	0.893	0.678	0.713	0.611	0.288	0.354	0.276	0.332	0.507
CI2	0.934	0.749	0.790	0.662	0.356	0.451	0.336	0.368	0.570
CI3	0.934	0.772	0.798	0.673	0.356	0.449	0.349	0.385	0.563
CI4	0.928	0.781	0.832	0.707	0.316	0.455	0.362	0.376	0.551
SV1	0.786	0.941	0.791	0.761	0.327	0.500	0.416	0.371	0.546
SV2	0.770	0.967	0.790	0.792	0.352	0.520	0.440	0.412	0.562
SV3	0.767	0.963	0.792	0.802	0.326	0.503	0.396	0.391	0.546
CC1	0.870	0.823	0.889	0.744	0.342	0.471	0.384	0.377	0.566
CC2	0.772	0.746	0.940	0.698	0.351	0.536	0.447	0.408	0.617
CC3	0.751	0.749	0.946	0.715	0.337	0.596	0.513	0.403	0.650
CC4	0.787	0.770	0.949	0.774	0.349	0.576	0.505	0.394	0.654
TR1	0.655	0.748	0.717	0.914	0.300	0.529	0.455	0.347	0.569
TR2	0.692	0.803	0.773	0.944	0.294	0.532	0.482	0.351	0.588
TR3	0.657	0.733	0.688	0.933	0.283	0.456	0.415	0.291	0.541
TR4	0.685	0.770	0.758	0.948	0.305	0.499	0.449	0.327	0.568
TR5	0.680	0.784	0.742	0.942	0.301	0.496	0.426	0.310	0.569
CL1	0.169	0.159	0.142	0.107	0.633	0.155	0.084	0.303	0.141
CL2	0.255	0.210	0.241	0.178	0.813	0.227	0.134	0.410	0.233
CL3	0.368	0.385	0.405	0.369	0.908	0.496	0.381	0.461	0.414
SE1	0.434	0.502	0.543	0.503	0.429	0.899	0.626	0.428	0.513
SE2	0.442	0.492	0.544	0.472	0.412	0.941	0.713	0.406	0.490
SE3	0.398	0.460	0.522	0.498	0.325	0.899	0.829	0.336	0.483
EN1	0.310	0.389	0.424	0.414	0.207	0.689	0.852	0.246	0.362
EN2	0.269	0.317	0.376	0.360	0.296	0.631	0.815	0.245	0.332
EN3	0.375	0.430	0.492	0.454	0.304	0.716	0.870	0.265	0.460
EN4	0.280	0.359	0.417	0.405	0.238	0.693	0.896	0.267	0.361
K1	0.392	0.443	0.444	0.388	0.454	0.447	0.341	0.910	0.469
K2	0.262	0.198	0.230	0.181	0.441	0.214	0.083	0.725	0.255
K3	0.348	0.359	0.376	0.285	0.420	0.384	0.279	0.926	0.412
EC1	0.579	0.543	0.636	0.574	0.368	0.503	0.396	0.452	0.969
EC2	0.583	0.563	0.661	0.595	0.367	0.533	0.442	0.443	0.982
EC3	0.577	0.578	0.658	0.602	0.354	0.547	0.455	0.444	0.974

Note: Community identification (CI); Community shared vision (SV); Community commitment (CC); Community trust (TR); Conservation lifestyle (CL); Social environmentalism (SE); Environmental citizenship (EN); Knowledge (K); Intention to participate in LEC (LEC)

Data availability

Data will be made available on request.

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