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Original research article

Diversifying power in action: A socio-psychological approach to inclusive energy transition experiments

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A B S T R A C T

Today only an exclusive group of citizens is represented in most energy transition projects. Adoption patterns are substantially shaped by gender, ethnic identity, education level, income and wealth. This stands in contradiction to the principle of fostering inclusive engagement as a key goal of energy transition policy. Despite notable exceptions, research is lacking on developing strategies for supporting demographically inclusive energy transitions. This action research study contributes to this gap by developing a theory-based and empirically tested approach for supporting inclusive engagement in energy transitions. For this purpose, we follow-up on a promising line of research in psychology and societal transformation, to inform a transition experiment aiming at fostering inclusivity based on the social-psychological concept of identity. In particular, we build on the common ingroup identity model (CIIM). The CIIM describes an approach to uniting people with different identities under a common umbrella identity, with the goal of uniting previously separated and in some cases divided groups. As such, we propose that the CIIM holds potential for connecting actors with different backgrounds in jointly shaping energy transitions. To investigate this here we describe the design, implementation and evaluation of an energy transition experiment structured around the CIIM. The findings of a mixed methods-evaluation study suggest that there is indeed potential in this approach, for fostering inclusivity. We comment on the implications for energy policy and on some of the challenges of action research in energy transitions contexts.

1. Introduction

The topic of just transitions in general and inclusive transitions in particular is gaining momentum in the transitions research agenda [1–3]. Yet, practical projects on energy transitions often still neglect societal problems such as energy poverty and unequal pay structures between women and men, including in the energy sector [4]. This article addresses the question of how the implementation of an inclusive energy transition could be achieved.

A key challenge in the implementation of more just energy transitions is the imbalance regarding the involvement of different citizen groups. Studies show that mostly male citizens with higher education levels and income are involved in energy projects [5]. Women [6]; citizens without an academic degree (hereafter referred to as citizens with lower or modest academic education level) [7], low income

communities and citizens with migrant backgrounds [4], to name just a few examples, remain underrepresented. The article contributes to remedying this research gap, with a focus on making energy transitions more inclusive with regard to gender and educational background. This has relevant implications for policy design towards more inclusive energy transitions.

We contribute to the research gap through an action research approach [8]; namely we conduct a theory-driven energy transition experiment in a real-world lab in Germany, with the intention of fostering inclusiveness in energy transitions. The transition experiment is part of the real-world lab "District Future" [9]. The real-world lab has used transdisciplinary and transformative methodologies for almost 10 years now in order to initiate change processes together with local actors [10]. For this purpose, it uses, among others, transition experiments. Thus, although the context is an experimental project, it is intended to

change practices in everyday lives together with local stakeholders in a transdisciplinary setting (see also [11] re the definition of real-world labs as action research). We describe the approach as action research in that it is reflexive, recognizes social structures and seeks to change these together with local stakeholders [8].

In the energy transition experiment, we examine how micro-renewables could be adopted more widely among citizens, especially among the underrepresented groups of women and citizens without a high level of academic education. The niche technology "plug-in balcony solar system" was chosen for the transition experiment, as this offers specific potential to foster inclusiveness in the energy transition. Balcony solar modules are small solar systems designed for private households. They could, in contrast to other solar technologies (see e.g. [5]), also be used by tenants, as they need less space, (depending on the position), no approval from the landlord, and can be moved easily when tenants move flats.

Balcony solar modules offer private individuals a way of participating in the energy transition in a way that does not require a high level of technical knowledge or engagement with bureaucracy, and that is comparatively inexpensive. Yet the extent to which the potential of the technology can be realised; how everyday practices interface with these systems; and what role community aspects and diversity will play are unknown: hence the transition experiment *Your Balcony Network. Energy creates community*. The overall transition experiment addresses these questions in a transdisciplinary and transformative setting [12], with an emphasis on fostering inclusivity, and with the (co-)design of the transition experiment based on insights from social psychology.

To date, interventions for increasing citizen engagement in energy transitions have focused mostly on monetary incentives, information, feedback, social comparison, as well as, motivational approaches such as goal setting [13,14]. The designs for these are often based on individualistic psychological models such as the Theory of Planned Behaviour [15]. Studies of behaviour and transitions and psychology in transitions in particular have critiqued this reduction to individual change processes, e.g., in the well-known ABC-critique [16,17]. Even within the (social) psychology community, researchers have recommended that more attention be given to group membership as being critically important to individual functioning [18].

In contrast to the individualistic approach, the experiment discussed here involves citizens organised in a group, as they would be in energy communities. This enables investigation of the role of social identity in group contexts, particularly with respect to inclusion versus exclusion and any effect on diversity. The goal is to support more inclusive settings open for all, rather than focusing on individual changes of e.g. attitudes and knowledge levels. We use for this purpose the social psychological approach of social identity theory [19] and the common ingroup identity model (CIIM) [20], with a research design that is initially deductive, and then inductive in its inferential process.

An example of a social identity is the feeling of belonging to a political group, e.g. identity as a member of an environmental group, such as a food sharing group or being part of an energy community [21]. A key reason for investigating the potential value of a social identity-based approach in this context is that social identity is known to play a significant role in behaviour. Previous studies have observed the benefits of group identity, such as fostering motivation through group membership [22]. Yet, this perspective tends to underestimate the *negative* effects of social identity for inclusive energy transitions. For example, research shows that energy communities are often made-up of older men with higher education levels and a relatively high income [7]. This creates a particular identity for such groups and is likely to attract people with similar characteristics, while at the same time making it less attractive for people with different characteristics, e.g. different gender or education level [23,24].

Some of these detrimental effects have structural reasons, e.g. the threshold for a financial investment in an energy community. Yet social identity theory notes that reasons for the exclusive effects are also found

in psychological processes and that these, too, need to be taken into account when a higher level of inclusiveness in energy transitions is a goal. In this study, we focus on these socio-psychological exclusion effects, as these have often been overlooked; indeed this can be seen as part of the wider research gap on the psychology of transitions, particularly at the intersection of structural and psychological perspectives [25].

Our action research design encompasses four steps to address this and three accompanying research questions:

Step 1 - Goal setting: Our key goal was to develop strategies to foster inclusiveness in energy transitions in general and energy transition experiments in particular, in an action research design. We therefore decided to use the micro-renewable technology of balcony solar modules for our transition experiment, developing a strategy based in social psychology for the experiment, with a focus on fostering inclusivity in terms of gender and educational background.

RQ 1. : *How can a more diverse range of citizens, especially more women and people without a university degree, be encouraged to adopt micro-renewables (e.g. balcony PV modules), specifically by lowering barriers relating to social identity?*

Step 2 - Theory-based design for inclusiveness: To answer the research questions, we present a theoretical model from social psychology that proposes the building of a common identity to overcome barriers between groups, namely the common ingroup identity model (CIIM) [20]. We thus chose the CIIM as a theory, guiding the design of the transition experiment.

RQ 2. : *How can a common identity be built in practice in a transition experiment?*

Step 3- From theory to practice: The second research question reflects the fact that, while the CIIM shows strong theoretical potential for fostering inclusivity in transitions [26], few studies have operationalised it in practice. Based on the theoretical background of the CIIM, we therefore conducted 10 expert interviews to analyse how this theoretical approach might be applied to the design of a transition experiment aimed at building a common identity. The learning from the interviews are presented, to inform further studies and as part of our account of the design.

RQ 3. : *To what extent does the design based on the CIIM result in the expected building of a common identity, and, if so, what were key mechanisms?*

Step 4 - Evaluation and further inductive analysis: The design was evaluated to test whether a shared identity emerged and hence whether the theoretical strategy might be confirmed as having potential in terms of increasing inclusiveness. The experiment was evaluated in a longitudinal design, with research questions corresponding to the phases of the study: (1) *Recruitment phase*: How diverse are the citizens participating in the information events for the experiment?; (2) *Application phase for the transition experiment*: How diverse are the citizens applying for participation in the experiment?; (3) *Experimental phase*: To what extent and through which mechanisms has a degree of common identity emerged, if at all?

In answering these questions, the study comes with limitations that reflect its action research design. Regarding generalisability, the study involves a small, self-selected sample: it is an action research case that we think points to generally-applicable issues, but each action research case will nonetheless have its empirical particularities (e.g. a different socio-spatial context, see [27]). At the theoretical level, the focus is on a social psychological viewpoint, which fits for the purpose of the study to examine the identity formation in a small group which is in line with the usual setting from which the psychological insights on this topic emerge (see e.g. [21]). In further studies extending the topic of study to the role of identity and identity formation in broader societal settings, e.g. including societal developments such as polarisation in societies, it

should be enriched by sociological and/or political science perspectives (see [28,29]). Overall, we note that the study of psychological-related barriers to energy transitions needs consideration of the broader systemic context in which (energy) transitions take place [17].

Despite these limitations, we do think that the study sheds light on the underestimated consequences of identity in citizen energy projects and how such negative effects may be counteracted by an identity-sensitive design, i.e. one that takes the insights on positive and negative effects of social identity for inclusivity of energy transitions into account. The implications are relevant for designing energy transition experiments that are more just, and also for developing strategies and policies to foster more inclusive energy communities. It may also inspire further interdisciplinary studies on the role of identity in energy transitions at the intersection of psychology, sociology and political science.

2. Conceptual framework

In this section, we introduce the theoretical concept of identity (Section 2.1) and its application to energy transitions (Section 2.2). The common ingroup identity model as a way forward for the research agenda on identity in energy transitions is also presented (Section 2.3).

2.1. The concept of identity

Social identities are based on shared attributes with others [30,31]. They include both membership in a group with direct interaction with other group members (e.g. being a member of a food sharing group) and identification based solely on category memberships (e.g. gender, age, nationality) [32,33]. Crucial for social identities is that they are integrated into the individual's self-concept, i.e., that knowledge about group membership is present and is perceived as meaningful and important [32,33]. Thus, in addition to the cognitive component of classifying oneself as a member of a category (self-categorization), identity also includes an evaluative component (the extent to which a person evaluates a group positively or negatively) and an affective component (the extent to which a person feels emotionally connected to a group) [32].

Social identity is known to have a strong effect on behaviour. According to Tajfel and Turner's [19] social identity theory, people strive for a positive social identity to enhance their self-esteem, and this evaluation is determined by social comparisons between their ingroup (with whom they share a group membership) and relevant outgroups. Hence, the drive to achieve a positive social identity leads social groups to differentiate themselves from one another. This includes discriminating against members of the outgroup and/or favoring members of the ingroup to stabilize the group identity [19]. This distinctive membership implies that the inclusiveness of groups may conflict with the need to maintain a distinction from other people as a key mechanism of group identity. Social identity may, thus, become a barrier to diversity and inclusiveness [34].

2.2. Identity in energy transition

While it is agreed that identity is a key factor in transitions [35], identity studies have so far received only little scholarly attention [36]. The notable exceptions assert a crucial role for identity in different transitions fields, e.g. mobility transitions [37], agricultural transitions [38], organisational change and transitions [36], urban and regional development [39,40] and energy transitions [39].

To conceptualise individual behaviour in the transitions literature, however, it is the more individualistic psychological approaches such as the Theory of Planned Behaviour [15,42] that have been used [17,43]. Within an explicit transitions framing, only a few studies address the role of social identity or related identity concepts such as e.g. cultural identity [44]; partisan and ideological identities [45]; and place identity [17]. Notable exceptions include study of the role of social identity in

household energy use [13], and the growth of community energy [46]. These studies confirm the double-edged effect of social identity on engagement in energy transitions in general and inclusiveness of engagement in particular. From this it can be inferred that identifying with a group that shares the intention and motivation to foster renewable energies has the potential to support energy transitions [21]. Hence, for example, Jans [21] shows in a correlational field study of 29 energy communities that initiative identification with a group can foster pro-environmental behaviour.

Yet, at the same time, as also stated, there is a risk that the building of group identity may lead to exclusivity of energy groups and inter-group conflicts [29,45,47]. With regard to negative effects of group identity, Seyfang & Haxeltine [24] note that *"strong internal identity formation and community building might equally be an inhibiting factor to wider groups of participants who do not wish to adopt the identities offered by participation. Consequently, an additional critical factor for niche diffusion of grassroots innovations is to carefully negotiate this element of group identity and community building (...)"*. It follows that the social identity of a group might even hinder inclusive engagement in energy transitions. The following section presents the CIIM as a social psychological approach to addressing potential exclusion effects arising from social identity, and elaborates on its application to fostering the inclusiveness of energy transitions.

2.3. Common ingroup identity model

The common ingroup identity model (CIIM) [20] is a strategy for reducing the intergroup bias. It recognizes that most individuals belong to a variety of groups (i.e. have multiple social identities) simultaneously and that these groups are often organised hierarchically in terms of inclusiveness [20]. The CIIM states that when people are induced to recategorize ingroup and outgroup members within a common category boundary, ingroup-favoring biases occur for the new, superordinate identity group. " More precisely, "(.) the common ingroup identity model proposes that inducing people to recategorize ingroup and outgroup members within a common category boundary (a one-group representation based, for example, on common school, city, or national identity) redirects those motivational and cognitive processes that produce ingroup-favoring biases to increase positive feelings, beliefs, and behaviors toward others who were previously regarded primarily in terms of their outgroup membership", as Gaertner and Dovido describe it (ibid, p. 2). This increases cross-group friendship development, helpfulness, trust, confidence in suggestions for innovation and forgiveness [20]. Since the dominance of category inclusiveness in the immediate situation depends on factors such as goals, motives, expectations, and emphases [20], it is possible to create a common identity by influencing these. The CIIM thus argues for creating an inclusive space for all, as a means of encouraging positive affect and motivation, rather than aiming at changing current attitudes and identities.

An illustrative example is the formation of the superordinate identity of being European which is inclusive of the national identities of being e. g. German or French (see [48] re a socio-psychological perspective on European identity; see also [49] re micro-macro relations in European identity formation). Following from this, the CIIM has been applied in various fields such as peace studies [50] and social movements (e.g. [50,51]). With regard to sustainability research, Becker et al. [26] use the case of the cycling referendum in Berlin, Germany, to argue that addressing higher values such as safety and justice can create a common identity, which in turn can enable the mobilization and unification of a previously heterogeneous group of people for mobility transitions, e.g. reconciling conflicts between cyclists and car drivers. The study shows that the superordinate identity of a safe and just mobility system was helpful to engage members of so far often conflicting groups to jointly support the cycling referendum for a safer and more just mobility infrastructure in Berlin.

2.4. Applying the CIIM to energy transitions in action

The key contribution of the CIIM lies in its transformative capacity: It not only describes identities as challenges or chances, but rather points towards a way of actively shaping them as a key mechanism for fostering energy transitions. The overarching strategy derives clearly from the theoretical framework: Building a common identity, e.g. through joint project goals, which could unite members of social groups that have thus far been relatively separate and maybe even conflicted.

For the practical application to energy transitions, two key questions can be derived (see [52]): (i) Which social identities are of relevance for inclusive engagement?; (ii) How might a common identity be built through the duration of the process: from raising awareness for a joint project, to actively cooperating and supporting each other? For the first question (identification of identities), we connect to empirical studies on motivations for climate activism in general and energy transitions in particular. We conclude from these that different motives relate to different identities, which may range from identity as an economic person (following monetary incentives), to a social identity as being part of a sustainability movement (identity as caring for the environment; in addition there may also be an altruistic motivation; see also Zilles & Marg [47]. We assume that connecting to different identities, e.g. by addressing financial benefits as well as ecological benefits, provides more opportunities to reach under-represented groups, e.g. people outside the 'green bubble'. A common identity-project should, we assume, aim to unite different motivations and identities, and through this foster an inclusive engagement.

For the second question (building a common identity), we can draw on findings from social psychology. For example, Thomas et al. [53] show that small group interaction (participation in a group discussion about strategies to achieve the group goal) can support the establishment of a social identity, which in turn increases the commitment or intention to act. The social identity created through social interaction in this experiment is based on the concept of opinion-based groups, that is, a social identity based not on a particular social category, but on a shared opinion [54]. Thomas et al. [55] argue that this approach is a useful way to build a common identity because the shared opinion that something needs to be done can include a diverse group of people in terms of their category membership. This overarching idea of building a common identity through a shared goal guides our transition experiment.

As a caveat, it should be noted that the above insights from social psychology are based mostly on laboratory experimental studies. A notable exception is the work from Jans [21] on identity formation in
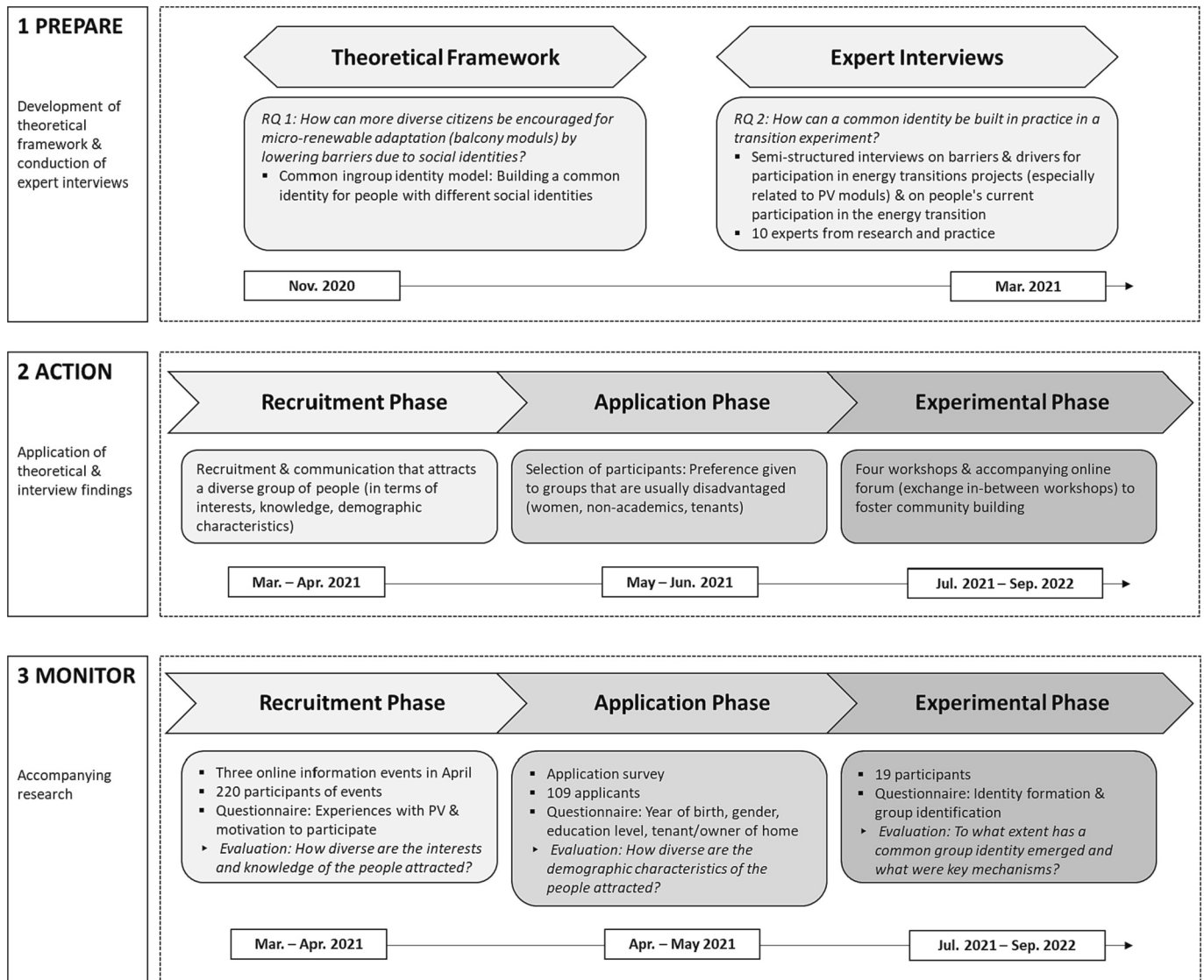

Fig. 1. Overview of the study design.

energy communities. For the application to energy transitions further insights are needed regarding identity identification and formation. In the following, understanding how to apply the CIIM to energy transitions is therefore further developed through initial expert interviews, which generated practical suggestions for identity identification and formation. This is followed by testing of these insights in the transition experiment.

3. Study design overview

This section offers an overview of the case study design (for a visual overview, see Fig. 1). The case study is divided in three different phases:

PREPARE	Choice of the CIIM as the theoretical framework (RQ 1) & expert interviews to examine how the theoretical model could be translated into the design of the transition experiment in action (RQ 2).
ACTION	Conducting the transition experiment, comprising three phases: (i) the recruitment phase, (ii) the application phase and (iii) the experimental phase.
MONITOR	The research accompanying the transition experiment is conducted according to the three phases of the experiment (RQ 3): (1) *Recruitment phase*: How diverse are the citizens participating in the information events for the experiment? (2) *Application phase*: How diverse are the citizens applying for participation in the experiment? (3) *Experimental phase*: To what extent and through which mechanisms has a common identity emerged, if at all?

In the following, the three phases are separately presented, from the *Preparation phase* including the methodology and results of the expert interviews (Section 4); to the *Action phase* of conducting the transition experiment, including the description of the design of the transition experiment based on theory and expert interviews (Section 5); to the *Monitoring phase*, including the methods and results for monitoring the recruitment phase, the application phase and the experimental phase (Section 6).

4. Expert interviews

After developing the theoretical framework, interviews were conducted with experts (N = 10) in the field of energy transitions. The interviews focused on implementation and participation in the energy transition (projects), experiences with and practical examples of energy transition projects (especially related to solar energy), and advice for this energy transition experiment with regard to identity identification and formation. The interviews were analysed in terms of barriers and drivers to participation in energy transition projects so that the insights gained thereby could inform a design to attract and engage a diverse group of people in a way that both creates and benefits from a common identity.

4.1. Method

4.1.1. Data collection - expert interviews

Ten semi-structured interviews were conducted with experts in Spring 2021. Each interview was carried out by two members of the research team via online meeting software (with the exception of one interview conducted via phone due to technical problems). The interviews encompassed both experts from research and practice. Experts came from several countries and while the majority of interviewees were based in Germany, it is notable that they often worked in international energy projects and thus had experience of a broad range of geographical and institutional contexts. In addition, the interviews also include local stakeholders in order to involve their knowledge in the design of the transition experiment. The full list of interview characteristics is shown in Table 1. To cover the full breadth of knowledge from the diverse set of experts, we used a semi-structured interview guideline which allowed for some variation in the specific topics covered in the interviews (for interview guideline, see Appendix A).

Table 1
Overview of expert interviewee backgrounds.

Interview number	Area of expertise	Job position	Specific expertise for the interview	Gender
I1	Research	Senior researcher/ group lead at a German research institute	Socially responsible energy transition, social justice/energy poverty, gender, instruments/ methods for various target groups	Female
I2	Research	Professor working on energy transitions with a focus on just transitions	Socially responsible energy transition, justice, power distribution, equality	Female
I3	Research	Senior researcher in the field of environmental planning	Environmental & species protection, social and ecological aspects of the energy transition	Female
I4	Research/ practice	Project lead at an energy and climate agency in the South of Germany	Knowledge on the region, knowledge of instruments & processes, energy project experiences	Female
I5	Practice	Co-founder of an energy start-up aiming at strengthening citizen participation	Start-up, community, identity, justice/ power, ecological projects, tree planting/ footprint compensation	Female
I6	Practice	Project lead at an NGO fostering citizen engagement in energy transitions	NGO, mobilization of citizens (long-term motivation), solar energy, projects for citizen engagement in energy transitions	Male
I7	Practice	CEO of a large energy cooperative in Germany	Self-determination, governance, environmental awareness, identity	Male
I8	Practice	Pioneer of energy transition solutions in the region	Building community & identity, everyday/ bureaucratic hurdles, Interpersonal interaction	Male
I9	Practice	Member of an energy cooperative in Berlin	Energy saving, information stands, energy consulting and communication	Female
I10	Practice	Member of an energy cooperative in Berlin	Energy consulting, balcony modules, allotments	Male

4.1.2. Data analysis - expert interviews

We first conducted a preliminary analysis of the expert interviews: After each interview two members of the research team discussed the findings in relation to the theory and adapted the design of the transition experiment. All interviews were fully transcribed and underwent qualitative content analysis [56], with data processing performed by using MaxQDA software. The approach to the analysis combined deduction and induction: the interviews were, first, deductively analysed by considering the theoretical framework, and then inductively analysed by formulating new (sub-)categories from the material. To further develop the coding system, the first three interviews were double-coded by two other members of the research team and discussed afterwards to finalise the code system. The subsequent seven interviews were coded by one person in the research team. The code system consists of three main codes and results below are reported according to these three categories.

- **Status quo of diversity in energy transitions:** Under this code, statements are collected about the current representation of socio-demographic characteristics (e.g. gender, age, ethnic identity) of the people involved in the energy transition.
- **Barriers for participation & design learnings:** Under this code, statements are collected about the factors (*barriers*) that discourage or even prevent people from participating in energy transition projects, including barriers that structurally disadvantage certain groups (*structural barriers*), *financial barriers*, *time barriers* and insufficient knowledge and the deterrent effect of a complex topic (*insufficient knowledge/complexity of subject*).
- **Drivers for participation & design learnings:** Under this code, statements are collected about the factors (*drivers*) that increase participation in energy transition projects by facilitating access and/or increasing motivation. This includes statements about drivers that apply to everyone (*general drivers*) as well as drivers that encourage especially women and other underrepresented individuals to participate (*drivers for more female/diverse participation*). In addition, specific strategies for increasing motivation to participate (*how to increase motivation*) and specific strategies for communication that appeal to many and diverse people (*communication strategies*) are collected.

Quotations are used to illustrate findings. When quotations from interviews conducted in German are used, these have been translated to English.

4.2. Results - expert interviews

Reflecting the chronology of the study, here we summarise the results of the expert interviews, which then informed the design of the transitions experiment.

4.2.1. Status quo

First, regarding the status quo, the experts confirmed the lack of diversity in energy transitions, especially regarding the role of women, low-income households and citizens with lower formal education levels. It is notable that despite this agreed gap, the experts also reported that they knew of none or only few projects targeting these under-represented groups in Germany and beyond.

4.2.2. Barriers

Second, regarding barriers for inclusive engagement, the experts were of the view that finances are a key barrier for both women (gender pay gap) and households with a relatively low educational attainment. This overlaps with another barrier, namely that roof-top PV is only usable for house owners: tenants of apartments have little opportunity to participate. Another barrier is that both roof-top PV and balcony PV modules are, so far, only attractive for an exclusive group with enough time and knowledge. For citizens without knowledge of technical installation and registration, current information campaigns are considered to be often overwhelming and can - with quite the opposite of the intended effect - fuel questions and fear; they are, thus, daunting rather than encouraging:

> *"Yes, so my impression is, on the one hand, when we educate about the legal situation, that leads to more questions than answers and then it's like, oh God, oh God, do I have the confidence to somehow go this way, which is always a bit gray. […]." (I10).*

4.2.3. Drivers (identity identification and formation)

To overcome these barriers, we asked the experts about drivers of inclusive engagement. The interviewees highlighted that access could best be supported by providing support to communities in general, as they assume that being embedded in a community can give strength and endurance. In addition, being part of a community is a need of all people

- and one much neglected in lockdown phases due to Covid prior to the experiment - through which an additional benefit in participating in energy transitions could emerge. Overall, the experts proposed that if people feel as a community, engaging together energy transitions would be facilitated. We interpret this as confirming the potential of approaches such as those based on the CIIM.

Regarding our focus on how to build the common identity for different social groups, an aspect often highlighted in interviews was the need to move beyond a technology focus: a frequent recommendation was to give more attention to the social aspects of energy transitions:

> *"Well, decentralized in any case, so that all citizens can relate to it. So that they have a concept of what it actually is? And that this narrative of energy transition equals technology is somehow reinterpreted as energy transition is a social political change at the grassroots level." (I9).*

Overall, it was recommended that we connect to participants' different interests and motivations. This mirrors the approach of the CIIM, which advocates encompassing different interests under an umbrella identity, here that of an energy community. The interviews helped to concretize the different, relevant dimensions of motivation for this purpose. The following motivations were identified as having such potential: (i) financial savings through (balcony) PV modules; (ii) gaining self-efficiency or even autarky in energy production; (iii) and interest in sustainability, e.g. urban gardening or food-sharing. Regarding practical implementation, it was suggested that we advertise the transitions experiment through a range of channels, to increase the likelihood of bringing together people from different social backgrounds who may nonetheless share the above mentioned interests. For this purpose, it was suggested that we contact existing communities with relevant interests, e.g. sustainability initiatives, and then seek to connect people from these different communities in the experiment through a common goal.

The strategy of building on existing communities requires reaching out to a wide range of networks to make sure that a variety of such networks are reached. However a risk of doing so, and of introducing new types of participant, was perceived as that of alienating *"some retired engineers" (I5)* typically involved in energy projects. Hence, for further communication with interested people, and in line with the theoretical model, the experts recommended linking the different topics in a holistic manner when communicating with them. In practice this implies messaging strategies for workshops that involve, for example, conflating different types of appeal, such as both technological and innovation as well as societal change.

Regarding the latter workshops, the experts also advised offering a range of interaction formats, from the beginning on, especially those that would take into account and connect differing needs and interests. To this end, the experts also advised the use of storytelling or narrative methods. This would also offer the possibility to provide role models representing the different interests and backgrounds. To foster transparency and build trust, e.g. in the role models, it was suggested that we offer the option to meet the research team members. Just providing this option - even if not used - was considered helpful for trust-building. A combination of offline and online formats was seen as most feasible for implementing this approach. To sustain the community, the experts suggested that people would need to be made regularly aware of the benefits of participation in ways that connect to participants' differing needs and interests, be these financial savings or mitigating personal environmental impact.

5. Design of the transition experiment

The transition experiment is part of the real-world laboratory "District Future" in the south of Germany. It was conducted by a team of four researchers. Following the suggestions from our expert interviews, we chose a gender-balanced team. The educational background of the team was, as inevitable given our positions at a university, more homogeneous regarding the education level (two researchers with a degree and

two researchers with a PhD); it was nonetheless heterogeneous in terms of field of study, including researchers with no technical background.

The experiment consisted of providing 22 balcony solar panels (financed through a research project) for a one-year phase to 22 diverse citizens. Balcony solar modules are characterised by several features: they usually have a plug so that they can be readily connected to a residential electrical circuit; the power output is relatively small, so that the generated electricity is usually intended for limited self-sufficiency without a battery; the devices are installed on balconies or placed outside. In Germany, these mini solar PV plants must be registered with the local grid operator and in the market master data registry of the Federal Grid Agency as an attempt to collect relevant data for the electricity supply for a better planning of the energy transition [57,58].

Citizens were informed about the experiment (recruitment phase), had to apply for participation (application phase) and - when selected - became part of a one-year experiment aimed at building a common identity for members of the transition experiment. This included pertinent opportunities such as workshops.

The designs of all three phases (recruitment, application, experimental phase) were informed by the theoretical and empirical findings following the expert interviews, and were conceived with the aim of attracting diverse participants, especially more women and citizens without higher educational level, as well as creating a common identity for this diverse group of citizens. The assumption behind this design is that involving people with different motives and identities offers ways for involving groups so far underrepresented, with respect to, e.g., the gendered effects of sustainable behaviour, and related motives and identities [59] The assumptions on different motives identities as the ground for building a common identity build on both the associated literature and the expert interviews (for a similar approach on value-sensitive design see e.g. [60]). Another option for further research would be to identity motives and identities through initial workshops, as used e.g. in organisational theories on the connection sub-groups with different identities (see e.g. ASPIRE model [52]). While the initial design was theory-led and initiated by the research team, participants were involved in co-design throughout the project, e.g. by choosing relevant content for the workshops. In this way, different motives and identities further on were considered in the design. In the following section, we provide more detail on the design choices with a focus on the theoretical base as the focus of this article.

5.1. Recruitment phase: creating inclusive communication strategies

In the recruitment phase the research team, located at a German technical university and running a real-world laboratory in the city for almost 10 years, advertised the experiment through various communication channels and conducted three online information sessions. The sessions used an inclusive communication strategy designed to attract a diverse group of people.

The findings from the expert interviews were incorporated into the transition experiment for the purpose of putting the communication strategy into practice: First, a wide variety of communication channels were used, including easily accessible channels such as an article in a local newspaper. Second, starting with the first information events and thereafter, the design of communication and messaging was focused on facilitating interaction among potential and then actual participants, to allow and encourage different interests to be heard and to connect. For example, we portrayed different possible reasons for joining the project in the beginning, e.g. by communicating openly the diverse interest and knowledge levels on PV in our own research team. Third, we decided to build our proposed community upon contacts with existing networks. In practice, this meant reaching out to people, especially women, from other sustainability networks with which we worked in our real-world lab. Fourth, on the advice of the experts interviewed, we did not initially focus on technological information about PV, but rather on the environmental and social impacts of solar panels, to make participation

attractive to a wide range of people. In practice, this meant using a different way of communicating, both in images and in language, for example in the title of our project *"Your Balcony Network. Energy creates community"*, which focuses on the social benefits of photovoltaics. Fig. 2 shows an image that was used (in different variations) as a central part of our communication strategy, illustrating what we intended as a holistic approach to communication, in the sense of not simply focusing on technology per se.

Notes: The advertising poster illustrates the concept used, which aims to move away from a purely technical focus and emphasises social and environmental aspects, in both imagery and text. The promotional text says that the project enables people to try out solar energy for themselves in everyday life, together with others in a community and with scientific support. Trying out here means to evaluate its usability and impact on everyday life from installation to everyday use and evaluate which improvements (e.g. re registration) might be needed. The poster was originally in German and translated for this article.

5.2. Application phase: selecting diverse participants

Following the information events, people had the opportunity to apply to become participants in the experiment via an online application form. The link to the online form was shared with all of those who participated in the online events. The online form included a small survey with questions to record the different socio-demographic backgrounds of the applicants, especially regarding our key criteria of gender and educational background (see Section 6 for more information on methods and results). Preference was given in the selection process to

Fig. 2. Illustrative image of the community strategy of the inclusive energy transition experiment.

under-represented groups in energy transition experiments. Following our key criteria, women and individuals without academic degrees were preferentially selected to participate in the experiment. Additional criteria for selection related to further under-represented groups in energy transitions, e.g. tenants versus homeowners. A detailed description of the selected sample for the transition experiment can be found in Section 6.1.3.

5.3. Experimental phase: developing the common identity

The goal of the experimental phase was to support the group in working on the joint goal of installing and living with solar panels and, at best, to develop further shared goals to foster identity building. The experimental phase started with a workshop focusing on the topic of installing the PV module at home. Local pioneers were recruited for the workshop to help the group.

To foster the development of shared goals and community building, four more workshops followed during the year. The workshops included getting to know each other, small group work, and group discussions to support identity building. The workshops included many elements that foster connections and group building processes, such as discussions/conversations within smaller groups and pairs, interactive formats, exchange on individual experiences, visualisations and room for informal exchange. Table 2 provides an overview of topics discussed and related participatory methods in all four workshops. While only a one year experimental phase was planned, the fourth workshop included a brainstorming for the second project year - this emerged at the request of group members to continue the experiment.

The workshops were accompanied by an online forum that provided opportunities for exchange between workshops.

6. Monitoring the transition experiment

Throughout the entire process, data was collected and analysed to examine the extent to which the theory-based and practice-enriched CIIM-approach helps to (i) recruit diverse participants for an energy transition experiment and (ii) build a common identity that helps them

in joining forces for supporting just energy transitions. The data analysed included for the three phases were:

(1) **Recruitment phase:** Data from the online information sessions of the recruitment phase were used to assess the degree of diversity in the interests and knowledge of the recruited individuals.
(2) **Application phase:** Data from the application survey were used to assess the diversity of the applicants, particularly with regard to gender and educational background.
(3) **Experimental phase:** An initial assessment of participants' identity formation after the first year of the experimental phase was undertaken. For this part of the study, a mixed method longitudinal approach combining qualitative and quantitative data was used [56].

6.1. Method for the monitoring phase

6.1.1. Recruitment phase
As part of the information events, participants (N = 220) were, among other questions, asked about their motivation to join the information event ('What motivates you to be here today?'). Demographic data were analysed in the next phase.

6.1.2. Application phase
The application process required applicants (N = 109) to complete a questionnaire indicating, among other things, their year of birth, gender (male, female, diverse, not specified), education level, and whether they owned or rented their home.

6.1.3. Experimental phase: Group identity, identity formation & level of engagement
Following the application process, 22 individuals were selected to participate in the transition experiment (see Section 5.2 re selection criteria). Of these, 16 were women (72.7 %) and 10 were without an academic degree (45.5 %). Participants ranged in age from 29 to 64, with a mean of 47.0 years (SD = 11.4). With 13 tenants (59.1 %), more than half of the participants rented their home instead of owning it (for an overview, see Table 3, right column).

After the first year of the experiment, a survey was distributed to examine participants' perceptions of the group's social identity as well as the resulting level of engagement and cooperation (three of the 22 participants did not complete the questionnaire, thus N = 19). Scales for group identification were based on Jans [21], translated into German

Table 2
Overview of workshops in the transition experiment.

Event	Topics	Participatory methods
Set-up workshop	Participants get to know each other and meet the team, instructions in handling the modules, formalities for handing over the modules to the participants	
First group workshop	Building of community spirit, installation and assembly challenges and solutions, understanding roles as actors in the energy transition	Gallery Walk, working in small groups, group discussion, living statistics
Second group workshop	Importance and meaning of photovoltaics for the participants, experience from and with their environment, multiplicators(y) effects	Working in small groups, group discussion, polling via approval scales
Third group workshop	Individual and personal energy behaviour: user-cases and reflection, best-cases: developing ideal frameworks conditions for balcony modules	Living statistics, discussions based on guiding questions, math ex., working in small groups, wish wall
Closing workshop	Tips before, during and after acquisition of balcony modules, identifying goals for the next project year; reflect and compare expectations vs. what has occurred, general project reflection	Group discussion, „time capsules", 123-method

Table 3
Overview on project applicants and selected participants.

Characteristics	N (%)	
	Applicants	Selected participants
Total	109	22
Gender		
Female	45 (41.3)	16 (72.7)
Male	63 (57.8)	6 (27.3)
Not specified	1 (0.9)	0
Age (years)		
25–29	5 (4.6)	1 (4.5)
30–39	23 (21.1)	6 (27.3)
40–49	17 (15.6)	4 (18.2)
50–59	25 (22.9)	7 (31.8)
60–69	24 (22.0)	4 (18.2)
70–79	10 (9.2)	0
80–85	5 (4.6)	0
Education level		
Higher education (academic degree)	72 (66.1)	12 (54.5)
Lower education (no academic degree)	37 (33.9)	10 (45.5)
Property		
Tenants	36 (33.0)	13 (59.1)
Owners	73 (67.0)	9 (40.9)

and slightly adapted to fit the project context (for the full questionnaire, see Appendix B). All items started with the question "To what extent do you agree with the following statement?". A Likert-scale (1 = completely disagree to 7 = completely agree) was employed for participants' answers. Since answering the questions was not mandatory, the number of participants for each item differs slightly.

Group identity. The four-item scale by Jans [21] (based on the scale on social identification by Postmes et al. [61]) was used for this study. It included the following items: (i) I feel connected with the project *Your Balcony Network* (original item by Jans [21] "I identify with the project." slightly adapted in translation to be easier understandable for our sample); (ii) "I feel committed to the project *Your Balcony network*"; (iii) "I am glad to be part of the project *Your Balcony network*"; and (iv) "Being in the project is an important part of how I see myself."

Initiative formation. To examine the achievement of common goal setting and hence identity among the participants, we asked them to rate the following statement: "I feel that everyone in the group pulls together to achieve common goals". In addition, we conducted a qualitative analysis to dig deeper into the mechanisms of identity formation. For this purpose, we used data from the workshops including documentation of the workshops and observation protocols from the research team. The qualitative content analysis [56] of this was inductive, given that the practice of identity formation had been little elaborated previously in the literature on the CIIM. Three main codes were used in the analysis: experience as a group, individual experience, and the set-up of the study.

Level of cooperation and engagement for energy transitions. To study the effect of group identity on the engagement for energy transitions, we asked participants to rate the extent of their agreement with the following statements: "Through the participation in the initiative *Your Balcony Network* my perceived role in the energy transition is changing". In addition, participants were asked which goals they perceived for the project and there was a possibility for participants to leave comments in an open field.

6.2. Results

6.2.1. Recruitment phase

More than 220 people participated in three online information events in spring 2021. Beyond the high number of participants, their diversity regarding their motivations for participation in this event is noteworthy. Word clouds based on the stated motivations for participation in the information events showed an encouragingly mixed picture, with a variety of motives indicated. While an interest in sustainability and climate protection was a major motivator at all three events, the other two main motivations identified through literature and expert interviews were also present: financial savings and gaining self-sufficiency. Additional motives mentioned included an interest in technology and, referred to several times, curiosity and an interest in learning more. We interpreted these findings as an initial indication that our design was proving helpful in appealing to citizens with different interests and backgrounds.

6.2.2. Application phase

Overall, nearly half of all participants of the information event (N = 109) applied for project participation. Table 3 provides an overview of the applicants and the selected participants:

With regard to increasing diversity in energy transitions, Table 3 indicates a positive effect of the project design; 41.3 % of the applicants were female. Compared to typical participation rates of females in energy projects in Germany and elsewhere, we think that this is a substantial improvement. For example, of individuals holding investment shares in renewable energies in Germany, only 31 % are female [62]. The education level of the participants is likewise mixed, with about one third of applicants not holding an academic degree.

The research question for the experimental phase (RQ 3) related to the extent to which a diverse group of citizens with different interests

and backgrounds (see final sample description in 5.1.3) might form a common identity through the process of the experiment, and it is to this question that we turn next.

6.2.3. Identity formation & group identity in the experiment phase

6.2.3.1. Group identity.
Based on the theoretical concept of the CIIM and the resulting project design, the goal of our study was to build a common group identity. Results for this were monitored in a mixed method design (*RQ 3: To what extent does the design based on the CIIM result in the expected building of a common identity, and, if so, what were key mechanisms?*). Results from the quantitative design indicate that the first part of the research question can be answered positively. In fact, the group identity was perceived by project members as very high (M = 6.0; SD = 0.7). It is particularly notable that the high level of group identity was perceived similarly by the group members, with an average of 6 and means ranging only from 4 to 7 on a 7-point scale. The only exception is the item representing a very strong identification with the project for one's own identity ("Being in the project is an important part of how I see myself"). Results ranged here from 2 to 7, with a mean still far beyond average (M = 5.1; SD = 1.5).

A quote from the open questions on project goals illustrates that particularly the diversity of participants is perceived positively rather than as a barrier:

> *"Above all, the project showed me how important it is to involve different groups of people and especially people with less background knowledge in the process."*

6.2.3.2. Identity formation.
The key strategy for building a common identity of the group was to achieve joint goal-setting. The item on perceived joint goals - "I feel that everyone in the group pulls together to achieve common goals" - showed indeed a high mean (M = 5.8; SD = 1.2; see also Fig. 3). As theorised, this is likely to be contributory to the high group identity reported above.

To dig deeper into the mechanisms of identity formation, in the following, we report results from the inductive analysis of identity formation throughout the four workshops. The analysis shows that the initial goal of trying out the use of a balcony solar module for one year, set-up through the experimental design, was an early shared goal of group members that helped to unite the group, despite their different motivations for participating. The analysis shows that the group setting of the experiment was perceived by members as providing at least three benefits: (i) practical benefits; (ii) cognitive benefits; and (iii) emotional benefits. Practical benefits encompass the mutual support with both technical (e.g. storm-safe installation) and bureaucratic barriers (e.g.
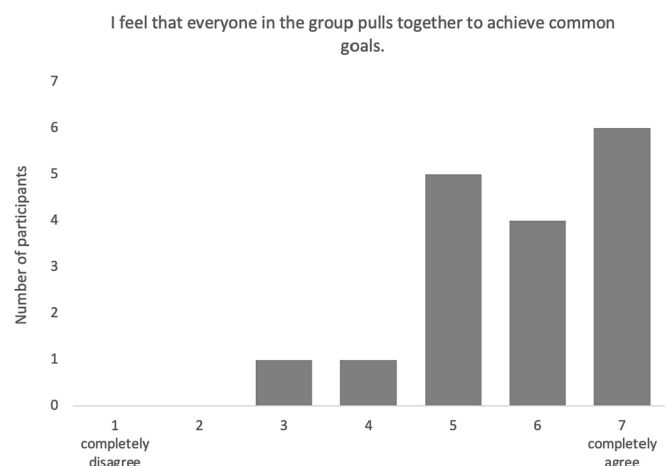
Fig. 3. Level of cooperation within the initiative.

initial rejection of landlords; and a complicated registration process at the public utility, which was often unclear for citizens with less bureaucratic experience). Cognitive benefits relate to the joint learning process. Participating in the project is a learning experience for all participants and, as it turned out during the workshops, an interest in learning in general and learning about renewables in particular is a shared characteristic of the diverse members. Having started out with different levels of knowledge on the topic and a shared interest in energy transition, they have deepened their knowledge through practical implementation of their own PV modules and continuous exchange with other participants. This process has for many of them positively influenced identification with the group. Emotional benefits encompass the sense of belonging through the group membership and, as members repeatedly remark, the joy of having a good time together during the workshops.

It is notable that throughout the experimental phase, the joint goal is not only encouraged but also developed further by members. For example, through practical implementation and the exchange with others, participants have acquired knowledge on the operating principles of PV modules and show a heightened curiosity for experimenting with their PV module to generate more energy. It is particularly remarkable that the shared goal is growing beyond the "default" goal of trying out balcony solar modules into developing further shared group goals, as the following quotation documented in an observation protocol may illustrate:

> *"It's great to be in a community that is interested in advancing the energy transition and that you might even be able to do other things together."*

When asked about their vision for further development, some members describe this in the form of a community-based/networking scenario. Ideas for this include a 'Regulars' Table' (Stammtische), establishment of local exchange networks and/or some kind of a self-help group. This emphasises the importance that participants of the project place on mutual support within a community for energy transition projects.

Beyond the role of a shared goal or rather shared goals in plural during the experimental phase, the analysis also shows that the identity-sensitive design developed based on the CIIM and through the expert interviews set an important frame for community development. This includes the support of the research team, the workshop formats, e.g. interactive formats with small groups or pairs, as well as establishing an open discussion culture in which mistakes and problems can be shared and knowledge gaps and making mistakes becomes a normal part of a learning journey.

6.2.3.3. The shared identity changed perceptions of energy transitions. The development of the group came across in terms of a heightened engagement and empowerment in the practice of energy transitions, as the development of the shared goals illustrates. About 40 % of participants reported that their self-perception of their role in the energy transition has changed completely (answers from 6 to 7 on a 7-point scale; M = 5.5, SD = 1.1; for the detailed distribution, see Fig. 4).

In the open question, they elaborated that they see themselves more in an active role, taking responsibility for the energy transition:

> *"Higher self-perception of being able and being responsible even as a tenant. Do not be deterred by supposed difficulties (registration, technology, agreement with the landlord, etc.)."*

This role change also led to the request of group members to continue the experiment for a second year in which they would act as change agents in helping further citizens to install solar panels. We also see this request as a positive indicator for shared group goals and identity with positive effects on fostering further inclusive engagement.
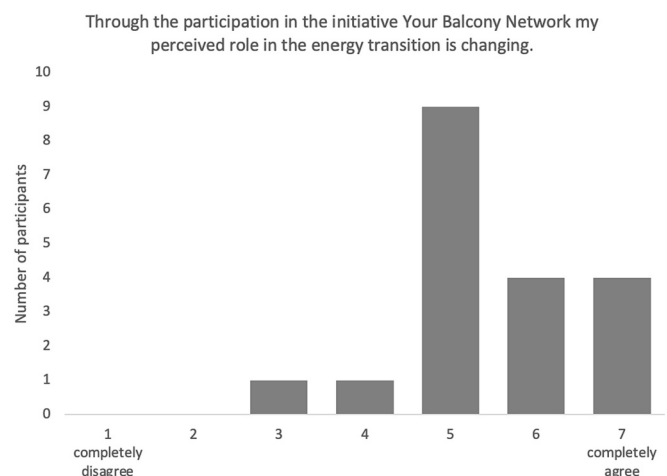

Through the participation in the initiative Your Balcony Network my perceived role in the energy transition is changing.

Fig. 4. Empowerment of participants.

7. Discussion

Our literature analysis as well as the results of our expert interviews confirm that, despite the heightened academic interest regarding just transitions in general [63] and the inclusiveness (or lack thereof) in energy transitions in particular [5], there are still very few projects in practice that specifically aim at fostering the inclusiveness of energy transitions. We therefore see the key contribution of our study as being the translation of a conceptual approach for inclusive energy transitions, namely the social psychological CIIM [20], into a transition experiment in practice, to support transformative learning on this important issue. In our transition experiment, we have explored in practice the theoretical assumption that creating a common group identity for a diverse group of citizens would attract diverse citizens and would empower them to jointly create a common goal, a common identity and, eventually, change their level of engagement and their perceptions of themselves in terms of a more active role in the energy transition [64]. It should be noted that this approach to inclusiveness of energy transitions contrasts with attempts to trigger change on the individual level, e.g. by and in terms of raising knowledge levels or changing attitudes. Rather than aiming at changing people, this study has aimed at creating an inclusive space in which citizens with different backgrounds and identities would have the structural conditions required to support them in taking an active role in energy transitions.

The monitoring of our transition experiment throughout the 1.5 years of the recruitment phase, the application phase and the experimental phase indicates the potential of the CIIM-based approach for supporting a more inclusive energy transition: The experiment did succeed in gaining and maintaining the interest of demographic groups that have to date been underrepresented in energy transitions projects. While men with a higher level of education typically predominate in energy projects [5], here 40 % of applications and over 70 % of the selected participants were female, and one third of the applicants and just under half of the selected sample did not have an academic degree. Moreover, the group members developed a high, self-reported common ingroup identity despite their diverse backgrounds in terms of gender and education, allowing them to act jointly and to gain a greater degree of energy self-sufficiency, despite their different backgrounds and interests.

Based on previous empirical work from social psychology [53,55], it is assumed that the feeling of having a shared goal was a key factor in creating a common identity. Our inductive analysis of identity formation suggests that this was also a driver of identity building. It was not just a shared goal but rather a multitude of dynamics helping to form a common identity. It is precisely these insights into the complexity of identity formation that show that further research is needed to better understand

mechanisms of identity formation, e.g. regarding the intensity of contact needed to build a common identity, and the impact of perceived top-down (as in this study) or bottom-up formation of energy groups (see also [21]).

Another factor that needs to be addressed in further studies involving transition experiments and studies on identity in energy groups in particular (see e.g. also [21]) is the strength and resilience of any common identity formed. While the perceived identity of group members in this project scored highly (6 on a 7-point scale), we do not know whether this group identity will be comparable in strength, durability and impact on behaviour with identities developed over a lifetime, such as ethnic identity [23], nor with other types of group identity. With a 1.5-year period we did have a time span longer than is usual for transitions experiments, which often last only a few weeks (e.g. pop-up cycle lanes). Nonetheless the question remains as to how the group and its identity will develop in the second year of the experiment and thereafter. Yet, the fact that the second experimental year, including more self-organization of the group and a lead in co-design changing from the research team to the participants, was a request from the group itself does indicate that the common identity engendered may be sufficient to support on-going action by participants as change agents for inclusive and sustainable energy transitions, and perhaps also for different types of sustainability-related action (a form of spill-over effect [65]. We also note that while our design aimed at building a common umbrella identity for different social identity groups, these groups were comprised of individuals in an experimental context, and further exploration is needed in contexts in which larger and other social groups are involved, e.g. in organisational settings.

In addition, the results also indicate that balcony PV modules themselves can play a role in fostering inclusion in energy transitions, especially by offering tenants a possibility to participate, which is not a given with roof PV [5]. The study also shows that further support is needed to make this feasible for citizens who may lack confidence or technical knowledge, e.g. in terms of support with installation and lowered administrative barriers for registration, especially for citizens with less experience with formality and bureaucracy.

8. Limitations & further research

While the study offers relevant contributions to develop the research agenda on diversity in energy transitions, it also has several limitations that are worth reflecting on in terms of implications for generalizability and further research. First, the sample size is, as often in transition experiments, quite small (N = 220 in the recruitment phase, N = 109 in the application phase and 22 selected participants for the transition experiment); the study is also limited to the spatial context of a German city. This limits the generalizability of the empirical findings, or at least needs further testing in other socio-spatial contexts (see also [66]). Furthermore, the action research design implied the need to balance the scientific interests and related data collection and the transformative aspiration of the experiment; e.g. from a scientific perspective video recordings of the workshops would have been preferable, but for the transformative impact we decided against this to assure a protected space for participants. Given these limitations, we want to note that we see our results as explorative and triggering further research avenues for the important issue of diversity in energy transitions. This concerns in particular the follow-up of the approach of building a common identity rather than focusing on attitude change models directly.

Energy transitions lack diversity in many ways [5]. Our study focus on increasing the participation of women and citizens without higher education provides avenues for further research by which to investigate and foster further diversity issues in energy transitions, e.g. addressing the role of ethnic identity (see [23]) and especially in terms of approaching intersectionality, e.g. involving black women [67] in energy transitions.

We focus in our study on the topic of social identity as a barrier to inclusiveness but fully acknowledge that structural barriers such as finance etc. play a key role, too. Our main message here is that these might be intertwined with social identity-based discrimination (see also [29]) and therefore that an identity perspective may be useful in contexts such as current German attempts to foster inclusivity by offering subsidies for balcony PV modules, and to involve also citizens who are tenants rather than homeowners.

The concept of identity also has wider potential for in transitions agendas, as it is arguably a boundary object concept connecting disciplinary literature streams [68]. We focus here on the literature from social psychology with regard to examining identity formation in small groups but see much value for further studies to include more literature from both sociology and political science, as well as work at the intersection of the disciplines; e.g. from psychology and sociology on roles & identities [26] and political science on identity formation on the societal level (e.g. [67,23,29]. This kind of interdisciplinary research would address a research gap on role and identity change in (energy) transitions [41,64]. The results could inform further policy, e.g. regarding the change of roles, identities and social norm change when transferring from consumption to prosumption modes.

Overall, while the design here has been explorative and further research is needed, we suggest that the identity-sensitive design defined here, and its translation into practice, should help in defining the research agenda of inclusive energy transitions further, and more specific work in particular.

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.

Data availability

The authors do not have permission to share data.

Acknowledgments

Appendix A

Interview guidelines for expert interviews "Actors of the energy transition"

10 interviews with actors from research and practice (private persons, NGOs, SMEs with energy relevance), conducted in spring 2021.
Brief presentation of the research project
Vision of the energy transition
What would a perfect energy transition look like for you?

o If applicable, Germany-wide/worldwide?

Among other things, you work on… [*Different follow-up questions depending on the field/research subject, question for researchers only*]

o Energy and climate policy: What do you think a socially responsible energy transition should look like?

o Ecological aspects of the energy transition: What ecological challenges arise in the course of the energy transition? What challenges exist depending on the technology?

o Social aspects of the energy transition: How can we interlink the energy transition with topics like social stability (jobs), economic justice or social and economic justice to create a social inclusive transition?

Projects for the implementation of the energy transition, practical examples

Please give us an overview of your own projects/focuses *[especially for NGOs, ask for self-image]*: You supervise/organize/research different projects, can you give us a short overview about this?

o If applicable, follow-up questions on social and ecological aspects: What role do social and environmental aspects play in implementation/your work/research?

What good examples/projects do you know, from your work, but also beyond that on…? *[Ask for projects or best practice examples depending on the research or field of action of the interviewee]*

o who have implemented an eco-friendly energy transition?
o who have implemented a socially just energy transition?
o …

How can energy issues be combined with social issues such as community (building) and ecological issues such as nature conservation or species protection? Are there any investigations of this in your own projects?

Lessons learned for the Balkony Network

[Ask for tips on how to design our own project, depending on expertise or background on the following topics]:

Experience with evaluation methods: Do you have any tips regarding the methodological approach for the evaluation of "soft measures" (networking among participants, voluntary behavioral changes)?

Selection of diverse participants: How did you reach/select your participants? What advice can you give us on how to attract the most diverse participants for our project?

Exchange with citizens: Forms and channels of communication: What experience have you had so far in dialogue when dealing with citizens and energy providers? Which media have you used?

Motivators, motives: From your experience, what are the biggest motivators among private citizens?

Experience with cooperative models: You are organised as a cooperative/NGO/…, how has this model worked? How viable is this model to advance the energy transition? *[Question for NGO's or SME's].*

Do you have any tips on how other sustainability-related topics can be better combined with energy topics?

Self-image, role:

[selection of appropriate question depending on field or background]:

Role of the own research or activity of the organization in the field of energy transition: What is the role of your research institute in the field of energy transition and social transformation?

Previous experiences in conflicts with citizens? What can we learn from conflict situations around wind power for PV projects?

Assessment: Public perception of scientists in the energy transition: How do you assess the public perception of your role as a scientist in the energy transition? *[Question only for researchers]*

Role of civic initiatives (e.g. cooperatives, NGOs) for the energy transition: What role do you see initiatives and cooperatives andd other actors (e.g. researchers) playing in the energy transformation?

Role of private actors and homeowners in the energy transition: What do you think is the role of homeowners in implementing the energy transition? *[Question for practitioners].*

Role of scientists in the energy transition: How do you assess the role of scientists* in the Energiewende? *[Question for researchers]*

Appendix B. Survey

Dear participants,

You have been participating in the project *Your Balcony network. Energy creates community* for almost a year now. So far you have diligently filled in the energy journals every month, thank you very much at this point for your dedicated cooperation. Besides aspects concerning your modules, we are also interested in how you perceive the **development of the project and the development of the group**.

Please take **5–10** min to fill out the survey about the **cooperation in the Balkony network**.

Thank you for your participation!

Q1.

What is your **participant number**?

Q2.

To what extent would you agree with the following statements? 1 = completely disagree; 7 = completely agree

Below you will find various statements. Please mark the extent to which you would agree with the statement. To do this, simply move the slider under the number in question.

I feel connected with the project Your Balcony Network.

I feel committed to the project Your Balcony network.

I am glad to be part of the project Your Balcony network.

Being in the project is an important part of how I see myself.

Q3.

To what extent would you agree with the following statements? 1 = completely disagree; 7 = completely agree

The foundation of the project Your balcony network was designed by the participants of the project themselves.

Participants of the project Your balcony network determine the vision of the project themselves.

Participants have the opportunity to contribute their own ideas, topics and activities and to design the project in this way.

In the project Your balcony network there is room to discuss what the project stands for.

The foundation of the project Your balcony network was initiated by the KIT research team.

The KIT research team determine the vision of the project.

The KIT research team sets out which activities will take place in the project.

The KIT research team determines the identity of the project Your balcony network.

Q4.

To what extent would you agree with the following statements? 1 = completely disagree; 7 = completely agree

During the course of the project, a group feeling has developed.

I feel that everyone in the group pulls together to achieve common goals.

Through the participation in the initiative Your Balcony Network my perceived role in the energy transition is changing.

Q5.

If applicable: Please describe to what extent your role in the energy transition has changed:

Q6.

In your opinion, what are the most important goals pursued by the "Your balcony network" project?

Q7.

Comments:

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