Energy Citizenship and Energy Communities for a Clean-Energy Transition

D4.2 Report on experimental lab studies on energy citizenship

Energy community set-ups, energy visions and collective agency as predictors of energy citizenship and pro-environmental spillover

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Abstract	In this deliverable, we present nine studies with a total of *N* = 5,175 participants that investigated the psychological questions of what role the set-up of energy communities plays in encouraging energy citizenship and support for energy communities (RQ1), whether and how collective agency motivates energy citizenship (RQ2), and the conditions under which positive or negative pro-environmental spillover effects occur (RQ3). Overall, we found indications that people's willingness to support energy communities indeed depends on the set-up of energy communities. Moreover, letting people envision future set-ups of a just and sustainable energy system can motivate them to collectively engage in the energy transition. While two manipulations managed to increase energy citizenship through information on increasing (vs. stagnating) numbers of Europeans engaging in the energy transition and sharing (vs. not sharing) the goal of the energy transition, most collective agency manipulations did not positively affect energy citizenship or spillover behaviours. Thus, this deliverable presents first evidence on how to foster energy citizenship but also reveals the limitations of collective interventions in the energy transition.

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List of Abbreviations

APA	American Psychological Association
AM	Autonomous (i.e. self-determined) motivation
CE	Collective efficacy
CG	Control group
CM	Controlled motivation
DEG	Degradation time index
DN	Descriptive norms
EC	Energy citizenship
EU	European Union
IN	Injunctive norms
PEB	Pro-environmental behaviour
RAI	Relative autonomy index
RED	Renewable Energy Directive 2018/2001/EU
RSI	Relative speed index
RQ	Research question
SD	Standard deviation
VFI	Variance inflation factor
WP	Work package
ZSI	Centre for Social Innovation

1 Summary & policy recommendations

This deliverable presents nine studies with a total of *N* = 5,175 participants investigating the determinants and consequences of energy citizenship, as a psychological concept. Study 1 tested our assumptions cross-sectionally and thus prepared the following Studies 2 – 9. These contained experimental manipulations, which can test whether causal influences occur. Studies used a diverse set of manipulation material such as small text snippets describing energy communities, generating visions about a future energy community set-up within the EU, newsletter articles describing trends of EU citizens, EU flyers promoting energy communities, and reflection tasks about own experiences in energy communities and thoughts with regard to climate and environmental efforts within the EU.

Studies 2 and 3 examined what role the set-up of energy communities plays in encouraging energy citizenship and support for energy communities. In Study 2, we found that the set-up of an energy community indeed seems to have a causal influence on people's willingness to support it. Precisely, we found that people were more willing to support energy communities when they were described to be owned and led by community members or community members and the government (rather than only by the government or an enterprise), focused on environmental sustainability and social justice (rather than financial benefits), locally based (rather than nation- or Europe-wide), and part of a larger network of other energy communities. Moreover, willingness increased if energy communities were portrayed as being funded by the state, having a legally binding contract, and being situated in a country with a clear legal framework. Energy communities also seemed to be more attractive when members of this energy community interacted a lot (vs. remained anonymous), were demographically diverse (vs. homogenous), and didn't (vs. did) have to invest a lot of time and money. These set-ups can serve as guides for policy makers to decide which types of energy communities to promote within the EU, so that they easily motivate new members. Furthermore, members of energy communities can draw from these characteristics when deciding how to organise and present themselves. Yet, in order to examine whether the findings can be generalised, they would need to be replicated in representative and international samples.

Study 3 showed that envisioning a future set-up of a just and sustainable energy system within the EU can motivate people to collectively engage in the energy transition. This was especially true for those people who were already acquainted with visionary thinking. These findings suggest that it may be useful if policy makers sketch large visions of the energy transition, and let people who are interested in it, think about and contribute with their own visionary ideas. Citizen councils and co-creation processes may be suitable means for such visioning interventions. For energy communities, this finding suggests that they could take the time to let potentially new members develop their own visions and, if possible, integrate these in their own set-up. However, further research is warranted on the particular boundary conditions of successful visioning interventions.

Studies 4 – 9 investigated whether and how people's sense of collective agency motivates energy citizenship (i.e. perceived rights, responsibilities and willingness to contribute in the energy transition). Moreover, they addressed the conditions under which positive or negative pro-environmental spillover effects on private behaviour occur. Out of these experiments, Study 4 successfully induced energy citizenship in study participants. Participants reported

more energy citizenship when they had read texts about an increasing (vs. stagnating) number of Europeans engaging in behaviour that promotes carbon trading, energy efficiency and energy communities, and sharing (vs. not sharing) the goal of the energy transition. Identifying and making visible positive behaviour trends towards sustainable energy production and usage in the population therefore might be a viable means for policy makers or energy communities to promote people's perceived rights to, responsibility for and willingness to support a just and sustainable energy transition. However, in none of our other experiments, we managed to positively influence energy citizenship, people's intention to collectively engage in the energy transition, or private pro-environmental (spillover) behaviours. This was most likely due to frequently weak and unsuccessful manipulation of collective agency indicators in our experimental studies. Therefore, we cannot give a clear recommendation on whether policy makers or energy communities would benefit from collective agency interventions. **Rather, our experiments highlight that future research on this topic seems urgently needed in order to find out how to motivate people within the EU and beyond to participate in a just and sustainable energy transition.**

2 Introduction

With climate change being regarded as the greatest threat to the survival of humanity (United Nations, 2021), a transition to renewable energy is essential to provide a liveable planet for current and future generations. Looking at 2020, the EU has reached its target of producing 21% of the EU's total energy consumption from renewable sources. However, the renewable energy target of 32% by 2030 (RED II, 2018) is far more challenging, and is assumed to depend on successfully implementing new mechanisms of the energy transition.

One such mechanism can be the involvement of citizens – previously regarded as passive consumers of top-down energy (Bögel et al., 2021) – as active citizens who can promote the energy transition and form communities for this purpose. Including citizens is now an essential part of EU growth strategies and visions (see Europe 2020 and EU-roadmap 2050, as cited in Hadjichambis et al., 2020). This is why, in WP2 of the EC^2 project, we developed an interdisciplinary understanding of energy citizenship (see Hamann et al., 2022, 2023), outlining legal, economic, psychological, interdisciplinary and transdisciplinary perspectives on this concept.

Relevant to this deliverable, we defined **energy citizenship** from a psychological perspective as "people's belief that they as individuals and as collectives have rights and responsibilities for a just and sustainable energy transition, and their motivation to act upon those rights and responsibilities" (Hamann et al., 2022, 2023, p. 47). Another part of WP2 was the development of a psychological scale to measure energy citizenship at the individual level (see Held et al., 2022). This scale encompassed various aspects relevant to energy citizenship such as people's perceived rights as individuals and collectives, their felt responsibility, and their willingness to contribute to an energy transition that is both socially just and ecologically sustainable. **Energy communities** are a particularly interesting case in which energy citizenship can unfold. Energy communities are often locally based initiatives that promote environmental sustainability, social justice and provide economic sustainability for their members and their region (Hamann et al., 2022; Hamann, Bertel, et al., 2023). While bottom-

up formation is one of their key features, they are often initiated in cooperation with external institutions such as the local government. Engagement in energy communities can be one among many areas of collective action (i.e. individuals taking coordinated action as group members to pursue a group aim, Agostini & van Zomeren, 2021; Landmann & Rohmann, 2020; Wright et al., 1990) that is relevant to the energy transition.

Within the energy transition, a psychological perspective on both energy citizenship and collective action in energy communities is central. For once, citizens' environmental impact is highlighted by the finding that private households are responsible for 26% of the final EU energy consumption (Eurostat, 2021). Moreover, citizens' perceptions legitimise political decisions. In fact, a recent Eurobarometer survey of 26,425 EU citizens found that most EU citizens accept the energy transition (European Commission, 2023). 85% are in favour of massive EU investment in renewable energy sources like wind and solar power. This finding is reflected by the actual engagement of EU citizens in the energy transition. A recent article estimated that more than 2 million people are currently involved in more than 40,000 renewable energy initiatives and projects in the EU (Schwanitz et al., 2023). According to their estimations, these initiatives and projects are responsible for 7.2–9.9 GW installed capacities of renewable energy and for 6.2 to 11.3 billion Euros of investment in renewable energy, thus providing evidence for the contribution of citizen-led initiatives to the energy transition.

WP4 raises the question how energy citizenship and energy community engagement can be fostered to support this trend and overcome psychological barriers that may hinder people from playing an active part in the energy transition. We look at the psychological circumstances that are necessary for people to believe in and act on their responsibility in the energy transition. While Deliverable 4.1 addresses the question under which conditions people participate in energy communities, this Deliverable 4.2 focuses on what motivates energy citizenship (i.e., people's perception of having rights and responsibilities in the energy transition, as well as their willingness to participate in it).

More precisely, we aimed to examine whether and which (real-world and visionary) **set-ups of energy communities** could influence citizens' support for these energy communities, and what role energy citizenship would play in this process. This first strand was partly informed by the legal and economic analyses of WP3 (Bertel et al., 2022), and further considers how perceived cooperation within an energy community could influence people's motivation. In a second strand, we put a special emphasis on group processes. It is still rare for researchers to apply a collective lens to examine environmental psychological processes (Fritsche et al., 2018), but it is essential for the study of energy citizenship and energy communities (Hamann et al., 2022; Hamann, Bertel, et al., 2023). To do so, we examined how the visibility of **collective agency** – people's perceptions of a group's actions, aims and efficacy (Fritsche & Masson, 2021) – influences energy citizenship. A third strand concentrated on the question whether fostering energy citizenship would have positive or negative effects for other pro-environmental behaviour (i.e. **spillover**), which we investigated in experimental studies.

Each of these strands was represented by a minimum of two studies. The following psychological research questions (RQs) will be central to this deliverable:

RQ1: What role does the set-up of energy communities play in encouraging energy citizenship and support for energy communities?

RQ2: How does collective agency motivate energy citizenship?

RQ3: Under what conditions do positive or negative pro-environmental spillover effects occur?

In the following section, we will present the theoretical background for the psychological concepts central to answering these research questions.

3 Theoretical background and literature review

3.1 Energy community set-ups and visions

Our first strand of research asked what role the set-up of energy communities plays in encouraging energy citizenship and support for energy communities. We define energy community set-ups as specific characteristics of energy communities that can take various forms, for example the age or locality of an energy community. Overall, we assume that people's perceptions of existing energy community set-ups and their imagination of how energy communities might be set up in the future can influence people's perceptions and motivation to engage in the energy transition.

While we encountered many scholarly publications pointing out the various ways in which energy communities can be set up (see Hamann et al., 2022), we are not aware of any study that has tested how these diverging set-ups influence people's perceptions (but see Warbroek et al., 2019). In the absence of direct research that we could build upon, we decided to adopt three strategies: Firstly, during our biweekly meetings in WP4, we engaged in **disciplinary and interdisciplinary discourse** to work out several set-ups that might be of interest in the study of energy communities. This brainstorming led to more than 30 energy community set-ups that we considered. The set-ups indicated, for example, how inclusive an energy community is, who owns the energy community, or who receives (financial) benefits from the energy community.

Secondly, we consulted Deliverable 3.3 (Bertel et al., 2022) and searched for energy community set-ups that were **central from a legal/economic point of view** as well as a psychological one. Interesting further set-ups emerged such as the locality of the energy community, for example, whether it was located in various areas in Europe and therefore largely related to the concept of virtual prosumers. In addition, this deliverable noted that being part of a larger network may facilitate the operation of energy communities, which we deemed a suitable set-up for our research. Another recommendation from Deliverable 3.3 was for the state to provide more funding for energy communities. We were curious whether this energy community set-up would also affect people's motivation.

As a third and **discipline-specific part**, we engaged in a literature search for studies in environmental psychology, related psychological fields, and general psychology (e.g., Lickel et al., 2000), and investigated whether there was any evidence as to why a particular design

feature would produce more motivation than another feature. In particular, we focused on two psychological processes that are central to people's motivation: Whether a particular set-up was related to perceived **collective efficacy**, which is the belief that a group can perform specific action to achieve its aims (Bandura, 1997; Hamann, Wullenkord, et al., 2023; Mummendey et al., 1999); and whether a set-up was associated with **collective aims** (as important indicators of collective agency; Fritsche & Masson, 2021).

Previous research suggests that a range of **group set-ups** can alter people's perceptions of collective efficacy and aims of the group and therefore their motivation to support, or participate in, the group (e.g., Stollberg et al., 2015). This lets us infer which set-ups may be most motivating for people to support energy communities. Energy communities may be more motivating when they are **initiated and owned by community members alone or in collaboration with the government** than when they are initiated and owned only by external agents such as the government or a company (Jans, 2021). This may be because these groups allow for more political representation, more interaction, and become especially important to their members (see Corcoran et al., 2011; Lickel et al., 2000). Previous research also lets us assume that groups could be more encouraging when they **focus on collective self-determined aims**, such as environmental protection and social justice than when they focus on aims that are external such as financial benefits or energy security (see effects of injunctive norms, Bongiorno et al., 2016; Lickel et al., 2000; Ünal et al., 2018; van Zomeren et al., 2004; Wang & Lin, 2017). Moreover, findings are mixed about whether diverse cultural characteristics, for example, diverse goals in a group are related to more or less collective efficacy (see Mennis et al., 2013; Sargent & Sue-Chan, 2001). Research also suggests that groups such as energy communities that are not anonymous and where **members are more strongly connected**, for example through a shared identity, are associated with higher motivation (see Einwohner, 2002; Lickel et al., 2000; Postmes et al., 2005; Thomas & Louis, 2013; van Zomeren et al., 2008). Similarly, if **members have to invest time** in a group, this may signal social identification, commitment and make the group less permeable (Lickel et al., 2000), all of which could be motivating for people.

The **context of the energy community** may also be a relevant set-up. Recent psychological research indicates that groups may be more motivating if they are based on a **legally binding contract** than if they don't have such a contract, because contracts may signal social norms (i.e. what is the appropriate and actually practised behaviour, see Eisner et al., 2021). Also a contract may foster people's own commitment and perceptions of other group members' commitment (see Lickel et al., 2000). Past research also indicates that groups that are **funded by the state** and are situated in a country with a **clear legal framework** should be more motivating because they receive more external support (see Babcicky & Seebauer, 2020), because the legal basis signals encouraging social norms (see Eisner et al., 2021), and because they are likely to have more actual (financial) resources (see empowerment theory and resource mobilisation theory, Cattaneo et al., 2014; McCarthy & Zald, 1977; van Zomeren et al., 2008; Zimmerman, 1995).

Yet, there are also many relevant energy community set-ups for which it was unclear whether they would be motivating for people, for example, because a set-up feature was assumed to be associated with stronger efficacy but weaker collective aims. Set-ups that may or may not

be associated with stronger motivation to support energy communities are: the **age** of a group (see Lickel et al., 2000), their **size** (see Doherty & Webler, 2016; Jans et al., 2011; Stollberg et al., 2015; van Zomeren et al., 2004), or whether they were **based in Europe, a country, or locally** (see Lickel et al., 2000; Louis et al., 2016; Mennis et al., 2013; Sargent & Sue-Chan, 2001), were part of a larger **network** (see effects of descriptive norms, Babcicky & Seebauer, 2020; Doherty & Webler, 2016; Lickel et al., 2000; Louis et al., 2016; van Zomeren et al., 2004; Wang & Lin, 2017), and had **demographically diverse members** (see Lickel et al., 2000; Mennis et al., 2013). We also wondered whether energy communities that don't require people to **invest a lot of money** might be more motivating for people than those that require more investment. While it may contribute to people's motivation that these types of groups offer more educational and income diversity (see Mennis et al., 2013), they are also more permeable, have less similar members which may decrease perceptions of group entity and agency (see Lickel et al., 2000), and may also have fewer actual resources (e.g., van Zomeren et al., 2008).

This overview shows an abundance of group and therefore energy community set-ups that could potentially influence motivation to support an energy community. However, we did not expect them to be perceived in the same way by every person. While there may be some more general underlying characteristics that make specific set-ups more motivating, there may also be set-ups that are perceived differently by people with diverging motivations. This is why we assumed that **energy citizenship** as a more general individual characteristic representing a pro-environmental inclination would moderate the perception of different energy community set-ups.

While there are many existing set-ups of specific energy communities that we can investigate, they do not necessarily reflect the kind of set-up of the whole energy system that people think of when they imagine what their preferable sustainable energy transition would look like. Yet it is exactly these visionary ideas that may be most motivating for them. Drawing on the concepts of utopian thinking (Fernando et al., 2018) and cognitive alternatives (Wright et al., 2020), we define **perceived positive energy visions** as people's perception that they have a vision of alternative futures in which the energy transition is completed. Historical accounts have shown that visionary writings and ideas can promote collective action, and in turn, social change (e.g., for a more egalitarian or feminist society, Fernando et al., 2018).

Indeed, correlational studies by Wright et al. (2020, 2022) corroborate this idea, showing that environmental cognitive alternatives are strongly related to collective action (intention) for environmental causes and pro-environmental behaviour (PEB). In line with this, Hamann et al. (2021) found that having an ecological vision predicted efficacy beliefs, which in turn were related to collective action intentions in the context of sustainable student initiatives. Recently, **experimental studies have also examined the concept of perceived positive visions**. Fernando et al. (2018) had participants describe either their ideal society or the current society. Compared to the current society, thinking about positive visions led to stronger intentions to change the status quo. In another experiment, Fernando et al. (2020) gave people descriptions of either a positive ecological or a technological future society. They found that the ecological societal vision increased people's motivation to take collective environmental action, whereas the technological vision had no motivational effect. Moreover, there are already a number of other experiments and field interventions showing that interventions

involving a visioning task are associated with increased efficacy beliefs and collective action intentions (Badaan et al., 2022; Hamann et al., 2021; Peisker & Schinko, 2023).

Moreover, past research further indicates that **certain set-ups of visions** can foster motivation. For example, the more benevolent and competent a vision appears, the more it motivates action (Bain et al., 2013). Interestingly, the same study found that ecological visions were perceived as more benevolent and competent when compared to society nowadays. Thus, people may indeed generate motivating set-ups in environmental visions. In the absence of research on the predictors of energy citizenship, we have reason to believe that the predictors of collective action intentions could similarly apply to energy citizenship. Thus, thinking about positive energy futures should also increase people's energy citizenship, and this increase should be stronger when energy visions are set up in a specific way. Adding to this, positive visionary futures could be valuable in itself for informing researchers and policy makers.

3.2 Collective agency (social norms, collective aims, collective efficacy)

Our second research strand investigated the role of collective agency in motivating energy citizenship. Collective agency is an innovative concept that includes highly relevant predictors of people's collective action, which is why we deemed it an interesting and valuable concept for our research on energy citizenship. Energy citizenship has an inherently collective aspect, both in its focus on the collective goal of energy transition and in its explicit inclusion of a collective agent. In their review article, Fritsche and Masson (2021) propose that **collective agency** comprises the trinity of collective self-determined aims (i.e. a group is perceived to have collective aims that are self-determined by their members), collective aim-directed action (i.e. a group is perceived to act jointly and in a coordinated fashion), and collective efficacy beliefs (i.e. a group is perceived to be effective in achieving their aims). As the concept of collective agency is a specification of a certain part of the social identity model of pro-environmental behaviour (SIMPEA, Fritsche et al., 2018), it is constructed for studying collective action in the environmental domain. In a similar vein, Hamann, Wullenkord, et al. (2023) suggest that collective efficacy beliefs and collective self-determined aims represent perceived collective agency if combined. In the following, we will give an overview of how the indicators of collective agency have been treated by previous research. As all of them have been shown to predict collective action in the past, we think that collective agency is a most suitable concept to study energy citizenship in the context of a collective energy transition.

Collective self-determined aims can be understood as cognitive representations of desired collective outcomes (Fishbach & Ferguson, 2007; Hamann, Wullenkord, et al., 2023). Self-determined motivation plays a major role in self-determination theory (SDT, Deci & Ryan, 2000). SDT differentiates regulatory processes from goal content. It posits that it is crucial to distinguish self-determined motivation (e.g., intrinsic motivation, "it is fun", identified motivation, "It gives me meaning in life") from controlled motivation (e.g., introjected motivation, "I would feel guilty if I didn't do it", external motivation, "it offers external rewards"). Research findings indicate that self-determined motivation is more important for behaviour than controlled motivation (Lavergne et al., 2010; Osbaldiston & Sheldon, 2003; Pelletier et al., 1998). Despite a large research body on SDT in general, self-determined aims with regard to the climate crisis are understudied (Masson & Otto, 2021; Wullenkord, 2020). Moreover, they

typically address self-determination only as a personal identity process. As Thomas et al. (2017) note, there is still a lack of combining a social identity perspective that focusses on groups with self-determination theory. To our knowledge, they were the first to study collective self-determination and found it to predict intergroup helping. Based on SDT and the findings by Thomas et al. (2017), we would therefore assume that self-determined motivation could strengthen collective action in the energy transition. What is more, in our view, it may be relevant to dissect specific facets of collective self-determined motivation. It contains a **collective aim** (Is a group perceived to have joint aims?), a **collective self-determined motivation** (Is the group perceived to have aims that are self-determined rather than controlled?), and possibly also **collective visions** (Is the group perceived to have a joint vision?).

A concept that might come close to collective, but not necessarily self-determined, aims are **injunctive norms** (Fritsche & Masson, 2021). According to the focus theory of normative conduct, injunctive norms represent what other people approve or disapprove of – what they think is the correct and good behaviour (Cialdini et al., 1990). They exert their influence on people's actions because individuals want to be liked and accepted by others and avoid punishment. Thus, they conform to people's expectations. Other researchers also argue that injunctive norms can inform people about how the group prototype should look like, so that individuals highly identified with a group would want to conform to this prototype (Abrams et al., 1990; Masson & Fritsche, 2014). Injunctive norms can strongly influence private PEB (Bator et al., 2014; Cialdini et al., 1990; Hamann et al., 2015) and collective action (van Zomeren et al., 2004). However, experimental studies on how collective self-determined aims influence collective action and energy citizenship are still missing.

When Fritsche and Masson (2021) speak of **collective aim-directed action**, they mean collective action that is *perceived* by individuals. In order to reduce confusion with collective action as people's action as group members for group aims, we therefore focused on descriptive norms that largely represent what was meant by the authors. Descriptive norms represent the typical actions of a group's majority (Cialdini et al., 1990). They show which behaviour is most popular and influence an individual's actions because they inform about the most effective action. Equal to injunctive norms, descriptive norms also tell us something about the group prototype, thereby influencing highly identified group members (Abrams et al., 1990). Descriptive norms have already been tested as successful predictors of PEB (Bergquist et al., 2019; Cialdini, 2003; Cialdini et al., 1990; Hamann et al., 2015). If many people around a person act pro-environmentally, this person might feel that it is also easy and worthwhile for them to act pro-environmentally, too. Some studies already found descriptive norms to be relevant for collective (environmental) action (e.g., Masson & Fritsche, 2014; van Zomeren et al., 2004; Wallis & Loy, 2021). However, researchers highlight that injunctive and descriptive norms are important predictors of collective action that are oftentimes neglected (Bamberg et al., 2018; Barth et al., 2016; Fritsche et al., 2018).

As in the environmental domain, there is not always a majority that is already acting in an environmentally conscious manner, or joins collective action for pro-environmental issues, researchers made use of **descriptive trending norms** that signal an increase in behaviour (e.g., "energy community engagement increases by 5% every year"). Previous research shows that

trending norms can influence an individual's actions, yet only to a small degree (Mortensen et al., 2019; Sparkman & Walton, 2017).

Collective efficacy beliefs are defined as an individual's belief that their group can perform specific actions and thereby achieve their aims (Bandura, 1997). In a recent review, we clarified the relevance of distinguishing action-focused efficacy beliefs ("we can perform an action") from aim-focused efficacy beliefs ("we can achieve an aim") (Hamann, Wullenkord, et al., 2023). In collective action contexts, especially aim-focused efficacy beliefs have been investigated. The association of aim-related efficacy beliefs with environmental collective action has been established in an abundance of studies (Fritsche et al., 2018; Fritsche & Masson, 2021; Hamann & Reese, 2020; Jugert et al., 2016; for an overview see Hamann, 2022). Yet, the research landscape of how to foster efficacy beliefs is still scarce, and oftentimes yielded unsuccessful experimental manipulations (see Hornsey et al., 2021). For example, Jugert et al. (2016) let people read texts that framed collective actions as either effective or ineffective. Individuals in the collective efficacy condition reported stronger environmental collective action intentions, mediated via elevated perceptions of collective and personal efficacy. While this indirect effect was significant across four studies, a total effect of the collective efficacy manipulation was only found in one of these studies. Another study by Landmann and Rohmann (2020) successfully increased collective efficacy with a video intervention, however, this did not lead to collective action intentions. These are only two of many scattered experimental studies that produce mixed findings on the question whether collective efficacy increases collective action.

Overall, we find that all indicators of collective agency relate to collective action but that experimental studies on this relationship are either missing or mixed. Thus, the study of collective agency as a predictor of energy citizenship is both a theoretically as well as practically relevant research endeavour.

3.3 Pro-environmental spillover

Our third strand of research examined under which conditions positive and negative pro-environmental spillover effects would occur. As we investigate spillover in experimental designs, we define it as **experimental manipulations leading to changes in behaviours that were not initially targeted** (Nash et al., 2017; Truelove et al., 2014).[1] Thereby, positive spillover is a positive experimental influence on a non-targeted behaviour, whereas negative spillover is a negative experimental influence on a non-targeted behaviour. This perspective made it possible to examine how both collective energy citizenship and experiments targeting collective agency processes could also positively influence private behaviour in energy *and* non-energy pro-environmental domains (positive spillover) or backfire and decrease these private behaviours (negative spillover).

Previous research has often found a positive spillover effect between different private PEBs (Baca-Motes et al., 2013; Lanzini & Thøgersen, 2014; Lauren et al., 2016; Thøgersen, 1999;

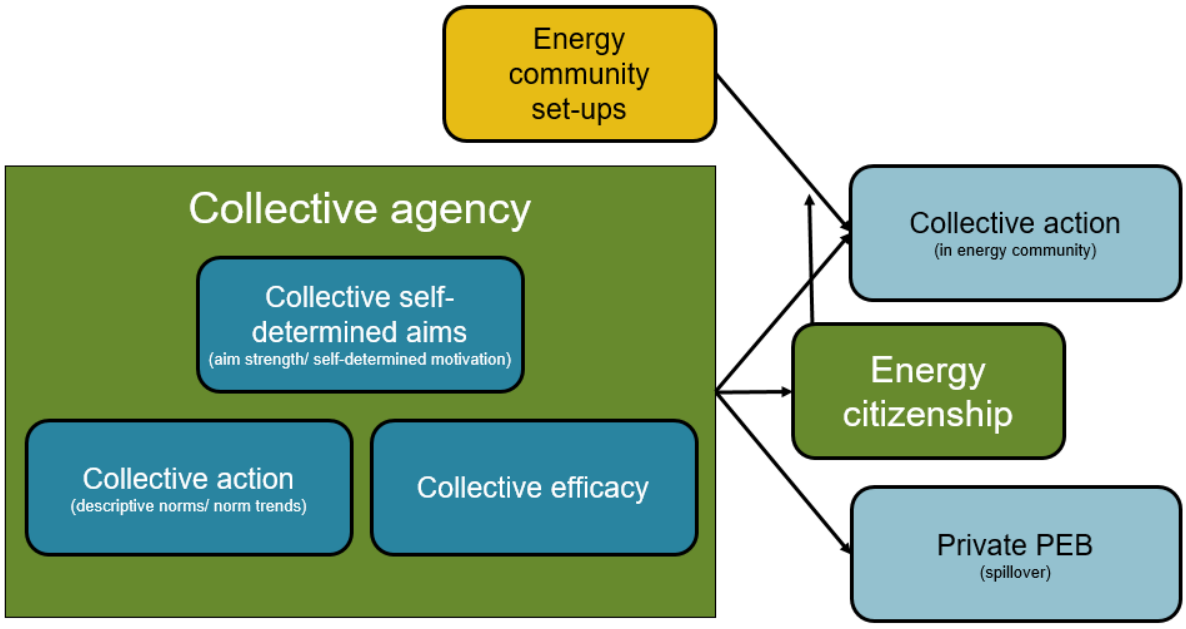
[1] Another spillover approach highlights that spillover effects may occur in everyday life due to real-world interventions (Nilsson et al., 2017). Spillover in this approach is defined as the process of one behaviour increasing the likelihood of a second behaviour (i.e. positive spillover) or decreasing its likelihood (i.e. negative spillover, Steinhorst et al., 2015; Thøgersen & Crompton, 2009).

Thøgersen & Ölander, 2003; Van der Werff et al., 2014; Xu et al., 2018) and negative spillover effects between private behaviour and policy support (Noblet & McCoy, 2018; Truelove et al., 2016; Werfel, 2017). Two recent meta-analyses on the interventional approach found that interventions, on average, produced a small-sized positive spillover effect on pro-environmental intentions (Geiger et al., 2021; Maki et al., 2019). Yet, there was no spillover on actual PEB or support for policies.

A smaller line of research that is appropriate within our collective agency framework is the **spillover from environmental collective action to private PEB**. Past research indicates that these two concepts typically correlate positively (e.g., Alisat & Riemer, 2015; Lee et al., 2014; Sweetman & Whitmarsh, 2016). Also within the energy transition, energy community involvement as collective action seems to be related to more private PEB (Sloot et al., 2018). Research investigating spillover from private to collective activist behaviour, as the opposite direction, produced mixed results (Carrico et al., 2018; de Moor & Verhaegen, 2020; Lanzini & Thøgersen, 2014). Yet we did not find any quantitative study on the topic of collective-to-private spillover. Nevertheless, accounts of activist research indicate that collective action may indeed spill over to an individual's private life (Cocking & Drury, 2004; Drury & Reicher, 2005; Stuart et al., 2013; Vestergren et al., 2018). Adding to this, unpublished work by our authors indicates that collective-to-private spillover is indeed possible under certain circumstances, but both rare and small (Hamann et al., unpublished).

In sum, these findings highlight that there is a lack of spillover research studying the effects of collective interventions on people's private decisions. Figure 1 gives an overview of how the three research strands that have been described can be embedded in a working model. In the following, we will describe nine experiments that targeted the paths of this model as well as our three research questions.

Figure 1. Working model of collective agency, energy community set-ups, energy citizenship, collective action and pro-environmental spillover.



4 Experimental studies

In our experimental studies for deliverable 4.2, we took the strategic and economic decision to test multiple research questions in one study, rather than conducting two studies for each research question. Overall, we conducted nine studies. An initial cross-sectional pre-study explored correlational relationships between concepts relevant to RQ1–3 (Study 1). This was followed by two studies that looked at set-ups of energy communities and the energy transition from two different angles. They investigated RQ1 by comparing different existing energy community set-ups (Study 2), and tested RQ1-3 with manipulations of energy visions and positive energy trends (Study 3). The final set of studies focused on RQ2 and RQ3 by examining how experimental manipulations of different indicators of collective agency would affect energy citizenship and pro-environmental spillover (Studies 4–9). Thereby, we varied the target group from energy community members, members of energy transition initiatives, and EU citizens. For the sake of clarity and brevity, we report only the main results that are of particular interest to EC^2.

4.1 Study 1: correlational pre-study

We implemented a correlational pre-study in order to (1) test the reliability of the scales we planned to use in the experiments, and (2) get an idea of how energy citizenship relates to relevant concepts. Precisely, we expected to find positive correlations between individual/ collective energy citizenship and agency indicators (collective aims, collective self-determined motivation, injunctive norms, injunctive norm trends, descriptive norms, descriptive norm trends, collective efficacy), and collective visions. Moreover, we assumed a positive relationship between individual/ collective energy citizenship and collective action intentions and spillover behaviour (energy-related PEB intentions and non-energy PEB intentions).

4.1.1 Sample characteristics

Data was collected over a four-month period from 24th of April to 6th of September 2022. To measure collective motivation, it is typically necessary to target a specific group with which people identify. For this study, we chose the group of “students of the University of Leipzig”. Accordingly, we distributed the survey through online channels such as mailing lists and websites at the University of Leipzig. Moreover, student assistants advertised the study in the local cafeteria. Participants could receive course credit for their participation and had the chance to win one of ten 30€ vouchers for an online market. For on-campus recruitment, participants also received a chocolate bar for their participation. We conducted a power analysis with the Shiny App to detect a mediation effect from descriptive norms to collective action intentions via collective efficacy, resulting in a desired sample size of N = 260 participants.

1272 people clicked on our survey, of which about half (*N* = 604) started it. A total of 364 people completed the survey. However, due to online recruitment, some of them were students from other universities. After excluding them, the total sample size was *N* = 281 participants from Leipzig University. We had 206 (73.3%) female participants, 64 (22.8%) male participants, 8 (2.8%) participants who described themselves as divers and a further 3 (1.1%) participants who checked the “other” category. This reflects the typical gender bias in

psychology courses. On average, participants were 24 years old (year of birth: *M* = 1998.56, *SD* = 6.13, range: 1921 to 2003) and worked an average of 8 hours per week (*M* = 8.20, *SD* = 7.58, range: 0 to 45). As of the income, 41 (14.6%) had less than 500€ at their monthly disposal, 105 (37.4%) earned 500€ to 750€, 89 (31.7%) earned 750€ to 1000€, 30 (10.7) earned 1000€ to 1250€, 9 (3.2%) earned 1250€ to 1500€, 3 (1.1%) earned 1500€ to 1750€, and another 3 (1.1%) earned more than 2000€.

4.1.2 Procedures and measures

We programmed our questionnaire using sosci survey (Leiner, 2020). On average, it took *M* = 20.33 minutes (*SD* = 7.24) to complete the questionnaire. Our data collection followed APA guidelines for the ethical conduct of research. We obtained informed consent and informed participants about the content of the study after their participation. The survey contained a number of measures. In Appendix 8.1, we present the items of all relevant scales as exemplary items for all experimental studies. Reliabilities are reported in Table 1. Unless otherwise stated, constructs were answered on a 7-point Likert scale ranging from 1 (completely disagree/not at all true/never applies) to 7 (completely agree/completely true/always applies).

Dependent variables of prospective experimental studies. Nine items each measured individual and collective energy citizenship (e.g., "Affordable sustainable energy is an important right for me", "We students feel responsible for contributing to a sustainable energy transition", Held et al., 2022). As an alternative dependent variable relevant to Deliverable 4.1, we also measured collective action intentions with 15 items (e.g., "Next year I plan to (continue to) participate in municipal events with a focus on the energy transition (e.g. lectures, discussions)"). Two scales were constructed to grasp the concept of pro-environmental spillover. Eleven items measured energy-related PEB intentions (e.g., "Next year I plan to (continue to) use only energy-efficient household appliances"), and nine items assessed non-energy PEB intentions (e.g., "Next year I plan to (continue to) store leftover food after meals"). All action (intention) items were based on Hamann and Reese (2020).

Independent variables of prospective experimental studies. We measured the collective self-determined aim indicator of collective agency with a number of scales. Three items measured the collective aim of students (e.g., "I believe that we students can drive an energy transition that is just and sustainable.", self-generated), ten items assessed collective self-determined motivation of the group of students (e.g., "We students pursue the goal of a just and sustainable energy transition because it is fun for us", based on Sheldon et al., 2017; Wullenkord et al., 2021), three items assessed injunctive norms on a flexible scale from 0% to 100% (e.g., "What percentage of students thinks a just and sustainable energy transition is good?"), and three items measured injunctive trending norms (e.g., "A growing number of students approve of a just and sustainable energy transition"). To calculate collective self-determined motivation, we used a method suggested by Sheldon et al. (2017) called the relative autonomy index (RAI) and created a scale by adding six self-determined motivation items and subtracting four controlled motivation items. Two scales represented the collective action indicator of collective agency. Three items measured descriptive norms on a scale from 0% to 100% (e.g., "What percentage of students participates in protests/ demonstrations for a just and sustainable energy transition?"), and three items measured descriptive trending

norms (e.g., “An increasing number of students vote for a party that supports a just and ecological energy system”). Social descriptive and injunctive norms were adapted from (Rees & Bamberg, 2014). We assessed collective efficacy with three items (e.g., “I believe that we students can drive an energy transition that is just and sustainable”, adapted from Hamann & Reese, 2020), and collective visions with nine items (e.g., “We students have the vision of a world in which the energy system is completely renewable.”, adapted from Wright et al., 2020).

Demographics and further variables. Our correlational pre-study included gender, age, working hours, income and the university that participants were enrolled in as demographic variables. Moreover, we measured social identification with three items (e.g., “I feel I belong to the student group”, adapted from Cameron, 2004). Next to these, other variables were included that are not relevant to this deliverable (individual aim, individual vision, individual self-determined motivation, individual self-efficacy, participative efficacy, general collective agency, efficacy affect, social desirability, volunteer hours).

4.1.3 Data preparation and analyses

We performed data analysis with R Statistics version 4.2.0, and data management with SPSS 29. We arrived at our total sample size of 281 by applying a number of exclusion criteria in order to secure the validity of our data. We only included 396 participants that finished the questionnaire. Two participants were excluded as they answered less than 90% of the questions. Another 23 participants dropped out as they answered our concentration test item incorrectly. We excluded a final seven participants because they answered the questionnaire exceptionally fast (DEG_TIME > 70, degradation time index, Leiner, 2020), and arrived at a sample size of 364 participants from diverse universities. After excluding participants from other universities, the total sample size was *N* = 281 participants from Leipzig University. Our main analyses in this study were bivariate correlations. Moreover, we explored two multiple regression analyses, and ensured that the variance inflation factor was below 5 (VIF, James et al., 2013, pp. 101–102).

4.1.4 Results

Table 1 presents means, standard deviations, Cronbach’s *α* and bivariate correlations of main concepts. All scale reliabilities are suitable. Descriptive norms, descriptive norm trends and energy-related PEB should be captured with more items to increase Cronbach’s *α* in future experiments. For some scales, it may even be economical to reduce them in the future (e.g., injunctive norm trends, collective action).

As expected, both individual and collective energy citizenship correlated positively with the other main concepts. Individual energy citizenship showed large correlations with collective action intention, and energy-related PEB intention (*r* >= .50). It correlated to a medium degree with collective aims, collective efficacy, collective visions, and non-energy PEB intention (*r* >= .30). Small correlations occurred with self-determined aims and all concepts pertaining social norms (*r* >= .10). Collective energy citizenship showed a slightly different picture. It related most strongly to collective agency indicators such as collective aims, collective efficacy and collective visions (*r* >= .50). Medium correlations emerged for collective self-determined aims, injunctive and descriptive norm trends, collective action intention, and non-energy PEB intention (*r* >= .30). We found small correlations between collective energy citizenship and

injunctive norms, descriptive norms, and energy-related PEB intention (r >= .10). We also added a Gaussian Graph in Figure 2, which further highlights partial correlations between the concepts (i.e. controlling for relationships with other concepts). Such graphs can help to explore which may be the best predictors for a particular outcome, taking into account all other predictors.

Table 1. Means, standard deviations and bivariate correlations of main concepts. Cronbach's *α* is displayed in the diagonal.

Variables	***M (SD)***	**1.**	**2.**	**3.**	**4.**	**5.**	**6.**	**7.**	**8.**	**9.**	**10.**	**11.**	**12.**	**13.**
1. Individual energy citizenship	4.88 (0.85)	.81												
2. Collective energy citizenship	4.89 (0.85)	.53	.84											
3. Collective aims	5.16 (1.12)	.32	.59	.86										
4. Collective self-determined aims	5.75 (5.35)	.20	.44	.40	-									
5. Injunctive norm	82.27 (12.26)	.23	.26	.44	.19	.82								
6. Injunctive norm trend	5.80 (0.84)	.21	.38	.43	.24	.47	.90							
7. Descriptive norm	42.52 (14.10)	.14	.29	.22	.19	.19	.14	.61						
8. Descriptive norm trend	4.78 (0.91)	.19	.33	.31	.16	.22	.50	.32	.67					
9. Collective efficacy	4.93 (1.08)	.45	.54	.57	.39	.30	.28	.22	.30	.79				
10. Collective vision	4.50 (0.97)	.38	.57	.63	.36	.27	.28	.27	.24	.50	.80			
11. Collective action intention	3.37 (1.13)	.61	.33	.24	.12	.11	.10	.16	.20	.36	.37	.91		
12. Energy-related PEB intention	5.04 (0.73)	.52	.28	.27	.16	.11	.09	.06	.07	.33	.26	.59	.67	
13. Non-energy PEB intention	5.06 (0.92)	.49	.39	.29	.18	.17	.05	.14	.13	.35	.28	.48	.65	.76

Note. We marked correlations according to their size with $r >= .50$ in dark green, $r = .30$ to $.50$ in medium green, $r = .10$ to $.30$ in light green, and $r < .10$ in grey.

Figure 2. Visualisation of partial bivariate scale relationships ($r > 0.05$) with Gaussian Graphs as proposed by Bhushan et al. (2019).

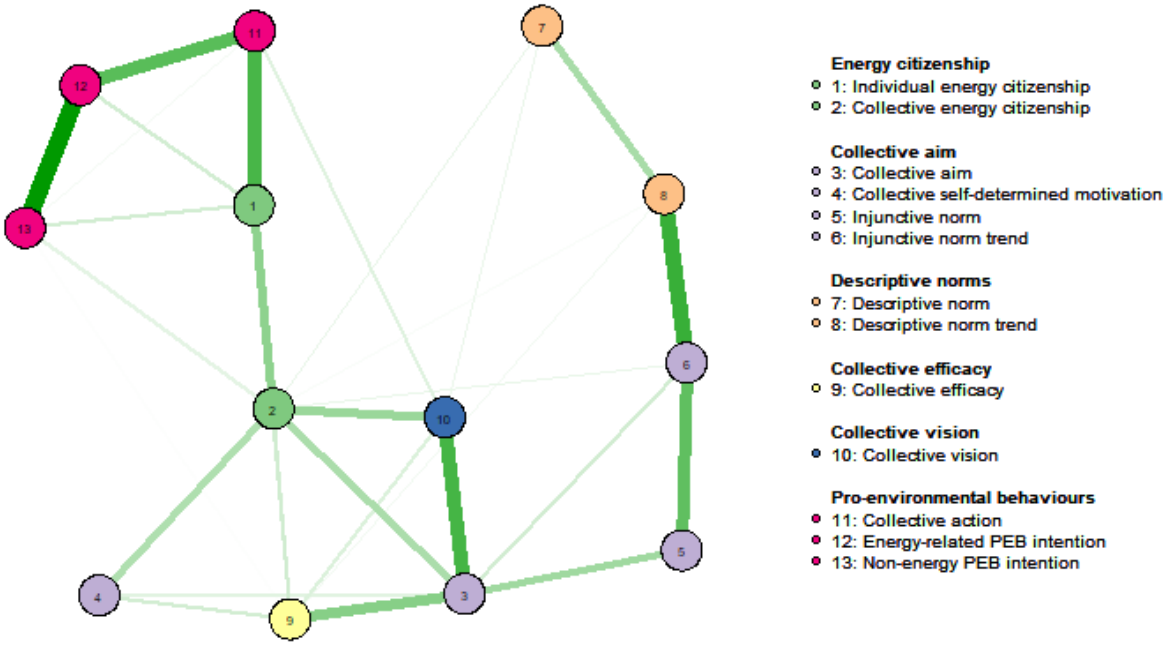


Table 2. Multiple linear regression models predicting individual and collective energy citizenship.

	Individual energy citizenship			Collective energy citizenship		
	B	*t*	*p*	B	*t*	*p*
Collective aim	-0.04	-0.72	.470	**0.16**	**3.23**	**.001**
Collective self-determined aim	-0.00	-0.30	.768	**0.02**	**3.12**	**.002**
Injunctive norm	0.01	1.17	.243	-0.00	-1.24	.217
Injunctive norm trend	0.04	0.56	.576	**0.12**	**2.16**	**.032**
Descriptive norm	-0.00	-0.09	.930	0.01	1.85	.066
Descriptive norm trend	0.02	0.27	.788	0.05	1.04	.300
Collective efficacy	**0.27**	**5.04**	**<.001**	**0.15**	**3.37**	**<.001**
Collective vision	**0.19**	**3.07**	**<.001**	**0.21**	**4.13**	**<.001**
	$R^2 = .243^{***}$			$R^2 = .501^{***}$		
	$F(8, 270) = 10.82$			$F(8, 270) = 33.88$		

Further, we explored which collective agency indicators would predict energy citizenship. Only two agency indicators, collective efficacy (B = .27, $p < .001$) and collective visions (B = .19, $p < .001$) predicted individual energy citizenship, $F(8, 270) = 10.82$, $p < .001$, $R^2 = .243$. All other agency indicators were non-significant ($ps > .05$). We were able to explain much more variance in collective energy citizenship, $F(8, 270) = 33.88$, $p < .001$, $R^2 = .501$. Collective aims (B = .16, $p = .001$), collective self-determined aims (B = .02, $p = .002$), injunctive trending norms (B = .12, $p = .032$), collective efficacy (B = 3.37, $p < .001$), and collective vision (B = 4.13, $p < .001$) all predicted collective energy citizenship, while other agency indicators did not ($ps > .05$).

4.1.5 Discussion Study 1

Our correlational Study 1 showed that our constructed scales do indeed have good scale properties. Only the scales for descriptive norms, descriptive norm trends and energy-related PEB could be improved in further studies. As expected, individual and collective energy citizenship were positively related to collective agency indicators, collective action intentions, and pro-environmental spillover behaviours (energy-related and non-energy-related). Notably, individual energy citizenship was so strongly associated with spillover behaviours that it may be questionable whether they are partly measuring similar concepts.

In exploratory regression analyses, we discovered that collective visions predicted both individual and collective energy citizenship, making them a suitable concept for experimentally manipulating different energy community set-ups. Intriguingly, of all the agency indicators, only collective efficacy and collective visions predicted individual energy citizenship. It therefore seems that the concept of collective agency is not necessary to explain individual energy citizenship. Nevertheless, collective agency seems to be a suitable framework for the study of collective energy citizenship, as several collective agency indicators predicted it (collective efficacy, collective aim, self-determined motivation, injunctive norm trend). Therefore, we decided to focus on explaining collective energy citizenship in the following experiments on visions, agency, and spillover effects.

4.2 Study 2: energy community set-ups

Study 2 aimed to test different existing energy community set-ups, thus focusing on RQ1, and the moderating power of individual energy citizenship, which feeds into RQ2. In addition, we further explored how cooperative the different set-ups were perceived to be.

4.2.1 Hypotheses

Hypotheses were pre-registered on the Open Science Framework (https://osf.io/3gzn4). We have adapted the formulation of the hypotheses to make them comprehensible for this deliverable[2]. We proposed the following hypotheses for this deliverable:

H1: Based on previous research (e.g., Lickel et al., 2000), we hypothesise that the following energy community set-ups are perceived as more agentic with regard to at least one agency indicator (collective efficacy, collective aim) and thus elicit more willingness to join than their set-up counterpart when …

1) the EC was initiated and is now owned and led by community members themselves or by community members and the local government (vs. only government vs. enterprise)
2) the EC has a strong focus on environmental and climate protection and has a strong focus on social justice (vs. has a main focus on financial benefits vs. has a focus on energy security vs. diverse goals)
3) EC members are strongly connected, interact a lot and some of them are friends (vs. barely know each other)

[2] Note that the numbers of hypotheses in Studies 2–9 do not necessarily match the numbers that were given in the pre-registration, as not all hypotheses were central to this deliverable.

4) the EC is based on a legally binding contract (vs. is an informal group of people without a legally binding contract)
5) EC members have to invest time (vs. not)
6) the EC is older (vs. younger)
7) the EC is funded by the state (vs. not)
8) the EC is situated in a country with a clear legal energy community framework (vs. not)

For the following energy community set-ups, agency indicators (i.e. collective efficacy and collective aims) did not align, making it difficult to generate assumptions about the effect of these set-ups on willingness to join. Therefore, for this deliverable, we look at them exploratively:

9) the EC is large (vs. small)
10) the EC is based in various areas in Europe or nationally based (vs. locally based)
11) the EC is part of a larger energy community network (vs. not)
12) EC members are a diverse demographics group of people (vs. homogeneous)
13) EC members don't have to invest money (vs. have to invest money)

We further explore whether an energy community would be perceived as cooperative, and investigated energy citizenship as a moderator of set-up effects.

4.2.2 Sample characteristics

Data was collected on three days from 28th to 30th of March, 2023. For data collection, we used the online panel provider clickworker. Participants received 2.40€ for their participation which corresponds to the German minimum wage for the duration of the survey.

As there is no prior empirical work on the differences of energy community set-ups, we based our sample size and power estimation on more general assumptions. We conducted a power analysis with G*Power. We calculated the effect size for a two-tailed independent t-test with the aim of detecting a small effect size (d = .20), a standard error probability (α = .05), and a large power of .80. This resulted in a sample size of 394 per group. Mainly comparing two conditions with each other, we thus aimed for a total sample size of at least N = 788 participants.

Overall, 994 people clicked on our survey and 922 of them started the survey. After applying our exclusion criteria, we reached a final sample size of N = 819 participants. Our sample consisted of 312 (38.1%) participants who identified as female, 501 (61.2%) participants who identified as male, and 6 (0.7%) who identified as diverse. Participants' mean age was 40 years (year of birth, M = 1983.59, SD = 12.19, range: 1947 to 2005). Participants had diverse types of formal education. Three participants (0.4%) were still students, two (0.2%) left school without a degree, 21 (2.6%) of the participants had a secondary modern school qualification, 145 (17.7%) had a high-school diploma, 12 (1.5%) had a ten-class polytechnic secondary school certificate, 59 (7.2%) had a university of applied sciences entrance qualification, and 194 (23.7%) had a higher education entrance qualification. Almost half of the participants, 381 (46.5%), had a university degree. Two (0.2%) participants checked "other degree". Regarding participant's occupation, we found that 6 (0.7%) were students, 12 (1.5%) were in training, and 76 (9.3%) were currently university students. The large majority was employed with 469

(57.3%) of the participants. Another 40 (4.9%) were public servants, 138 (16.9%) were freelancers, 30 (3.7%) were unemployed, and 44 (5.4%) checked the "other" category. With regard to participant's income, 15 (1.8%) participants had no income, 18 (2.2%) earned less than 250€, 24 (2.9%) earned 250€ to less than 500€, 71 (8.7%) earned 500€ to less than 1000€, 72 (8.8%) earned 1000€ to less than 1500€, 112 (13.7%) earned 1500€ to less than 2000€, 130 (15.9%) earned 2000€ to less than 2500€, 122 (14.9%) earned 2500€ to less than 3000€, 67 (8.2%) earned 3000€ to less than 3500€, 41 (5.0%) earned 3500€ to less than 4000€, and 48 (5.9%) earned more than 4000€. Another 99 (12.1%) participants did not want to answer this question. We further looked at the political orientation of our sample and found it to be somewhat leaning a little bit to the left with M = 5.01 (SD = 1.79) on a 1 to 10 scale.

4.2.3 Procedures and measures

We used sosci survey as our study platform (Leiner, 2020). The questionnaire took the participants an average of M = 10.57 minutes (SD = 4.70). This study was approved by the ethics committee of our partner organisation ZSI. Data collection followed APA guidelines for the ethical conduct of research and included informed consent as well as a clarification of the study target.

The study started with measuring psychological concepts prior to manipulation, of which a measure of individual energy citizenship was relevant to this deliverable. After showing participants a definition of energy communities, they were confronted with different energy community set-ups. Table 3 shows our experimental manipulation. Overall, we included 13 set-ups that had two up to five different characteristics. Each participant saw 13 set-ups with only one of the characteristics. This way, we ensured to manipulate set-ups between subjects. With regard to each characteristic, participants answered a number of questions. After the experimental manipulation, participants stated demographic information.

The survey assessed the following concepts on a 7-point Likert scale ranging from 1 (completely disagree) to 7 (completely agree). For each set-up characteristic, we measured willingness to support with one item (i.e. "I can see myself supporting such an energy community") and perceived cooperation within the energy community with one item (i.e. "This energy community acts jointly, in a coordinated and concerted manner"). As a moderator, individual energy citizenship was assessed with nine items (α = .88) as in Study 1. Demographic information was measured by asking participants about their age, gender, postal code, income, education, country code, and occupation. We further assessed political orientation using a scale from 1 (left) to 10 (right). The study also included the following measures that were not inspected in this deliverable: Collective efficacy (environmental/ social), collective aim, participative efficacy, representativeness, and diversity value.

Table 3. Manipulation material used to describe different set-ups of energy communities.

Set-up manifestation 1 (higher support expected)	**Set-up manifestation 2** (lower support expected)
1) Agent that owns and leads the energy community **This energy community was initiated and is now owned and led by community members themselves** "This energy community was started and founded by citizens of the city. Since then it has been owned by citizens. Furthermore, the energy community is organised and managed by the citizens themselves." **vs. community members and the local government** "This energy community was started and founded in cooperation of the city council and the city administration with citizens of the city. Since then, it has been owned by citizens and the city. Furthermore, the energy community is organised and managed by citizens in cooperation with the city administration."	**vs. the government** "This energy community was started and established by the city council and the city administration. Since then, it has been owned by the city. Furthermore, the energy community is organised and managed by the local government and municipality." **vs. an enterprise** "This energy community was started and founded by an already existing company in the city. Since then, it has been owned by the company. Furthermore, the energy community is organised and managed by the company."
2) Focus of the energy community **This energy community has a strong focus on environmental and climate protection** "This energy community attaches great importance to environmental protection. Its founding contract states that it pursues the goal of ecological responsibility. For this energy community, environmental protection is the most important thing and therefore comes first." **vs. has a strong focus on social justice** "This energy community attaches great importance to social justice. Its founding contract states that it pursues the goal of social responsibility. For this energy community, social justice is the most important thing and therefore comes first."	**vs. has a main focus on financial benefits** "This energy community attaches great importance to financial profits. Its founding contract states that it pursues the goal of financial profits for its members. For this energy community, financial profit is the most important thing and therefore comes first." **vs. has a focus on energy security** "This energy community attaches great importance to energy security. Its founding contract states that it pursues the goal of crisis-proof energy for its members. For this energy community, independence from the energy market is the most important thing and therefore comes first."

	vs. focuses on diverse goals "This energy community attaches great importance to various goals. Its founding treaty states that it pursues the goals of environmental protection, social responsibility, financial profits and energy security. Different goals are important for this energy community."
3) Interaction of members of the energy community **Members of this energy community are strongly connected, interact a lot and some of them are friends** "In this energy community, the members spend a lot of time together. Many of them are friends. Many members spend their free time together."	**vs. they barely know each other, anonymity** "In this energy community, the members tend to remain anonymous. Many of them hardly know each other or not at all. Members hardly meet each other in their free time."
4) Legally binding contract of the energy community **This energy community is based on a legally binding contract** "This energy community is an official and formal association of members. It is based on a legally valid contract to which all members agree. The formal contract is the basis for the work of the energy community."	**vs. is an informal group of people without a legally binding contract** "This energy community is an unofficial and informal association of members. There is no legally binding contract. Only informal agreements exist as a basis for the work of the energy community."
5) Time members have to invest in the energy community **Members of this energy community have to invest time** "With this energy community, members have to be willing to invest a lot of time. To be a member, you have to attend meetings and activities regularly. You also have to take on tasks that arise."	**vs. don't have to invest time** "With this energy community, members have to invest very little time. Members are free to decide whether they want to participate regularly in meetings and activities. Tasks that arise can, but do not have to, be taken on."

6) Age of the energy community **Energy community is older** "This energy community has been around for a long time. It was founded 15 years ago. Its founding date is 01.02.2007. "	 **vs. is younger** "This energy community has only existed for a short time. It was founded one year ago. Its founding date is 01.02.2022."
7) State funding of the energy community **Energy community is funded by state** "This energy community is supported by the state. It is supported by public funds and pays lower tax rates. In addition, this energy community receives cheaper loans and pays lower fees for the use of the electricity grid."	 **vs. not** "This energy community is not supported by the state. It is not supported by public funds and does not receive tax benefits. Furthermore, this energy community is subject to regular credit conditions and regular fees for the use of the electricity grid."
8) Legal framework in country of the energy community **Clear legal framework** "This energy community was founded in a country where there is a clear legal framework for energy communities. In this country, people know exactly what an energy community is, which regulations apply and which subsidies they can apply for. There is also guidance on how to set up and build an energy community."	 **vs. no clear legal framework** "This energy community was founded in a country where there is no clear legal framework for energy communities. In this country it is unclear what an energy community is, what regulations apply and what funding it can apply for. There is no guidance on how to establish and build an energy community."
9) Size of the energy community **Energy community is large** "This energy community is very big. It has a total of 502 members."	 **vs. is small** "This energy community is very small. It has a total of 22 members."

10) Location that the energy community is based in **Energy community is based in various areas in Europe** "This energy community is spread all over Europe. It has production sites in different places in Europe. This energy community has 153 members." **vs. nationally-based** "This energy community is spread all over Germany. It has production sites in different places in Germany. This energy community has 153 members."	**vs. is locally based** "This energy community is organised locally. It is concentrated in one municipality. This energy community has 153 members."
11) Network of the energy community **Energy community is part of a larger energy community network** "This energy community is part of a large network of energy communities that stretches across Europe. It works closely with other energy groups and exchanges information on a regular basis."	**vs. is not part of a larger energy community network** "This energy community is independent and not part of a large network of energy communities. It is detached from other energy communities and hardly exchanges with other energy communities."
12) Demographical diversity of members of the energy community **Members are a diverse demographics group of people** "This energy community has members from very different backgrounds. People of different age groups are represented. Members also differ significantly in their education and income."	**vs. are a homogenous demographics group of people** "This energy community has members with very similar backgrounds. There are mainly people of one age group. The members are also very similar in their education and income."
13) Money members have to invest in the energy community **Members don't have to invest money** "With this energy community, members have to invest very little money to become part of the energy community. Even if you don't have much money, it is possible to join the energy community."	**vs. members have to invest money** "Members have to invest a lot of money to become part of the energy community. If you don't have a lot of money, it's not possible to join the energy community."

4.2.4 Data preparation and analyses

We performed data management and analysis with SPSS 29. Before analysing our data, we applied a number of exclusion criteria. Twenty-seven participants were removed from the dataset as they failed our concentration check item. We then considered 848 participants who finished the questionnaire. Second, three participants answered the questionnaire twice and therefore, we deleted their second data point. Third, we excluded ten participants as they answered unreliably in the open answering field (e.g., wrote nonsense or in English even though the questionnaire was programmed in German), thus raising the question whether these were bot responses. Fourth, we observed participants that answered the questionnaire exceptionally fast for curious answering patterns (DEG_TIME > 75; TIME_RSI > 2). We excluded 16 participants who only checked the same number throughout the whole survey as this response was highly unlikely, thus arriving at our final sample size of N = 819 participants. For analysing our data, we applied ANOVAS with contrast tests, and multiple regression analyses. We report Welch's F test whenever Levene's test of heterogeneity of variances was significant.

4.2.5 Results

Table 4 to Table 16 provide an overview of means and standard deviations of all conditions as well as group comparisons using ANOVA. The following results are based on contrast tests and (Welch's) F tests. In line with our hypotheses, we found that greater willingness to support an energy community was reported when it was owned and led by community members or community members and the local government (as compared to only the local government, and an enterprise), $t(815) = 9.86$, $p < .001$. These energy communities were also perceived as more cooperative, $t(815) = 10.75$, $p < .001$. As expected, we found that an environmental sustainability and social justice focus of an energy community (compared to a financial, energy security, and diverse value focus) led to higher willingness to support this energy community, $t(814) = 6.45$, $p < .001$, and more perceived cooperation, $t(814) = 5.23$, $p < .001$. Corroborating our hypotheses, willingness to support an energy community was increased when members interacted more (vs. only few, $p < .001$), when it contained a legally binding contract (vs. no contract, $p < .001$), was state-funded (vs. not, $p < .001$), and when it was situated in a country with a clear legal framework (vs. unclear, $p < .001$). However, we only found similar effects on cooperation for interaction, binding contracts and a clear framework ($p < .001$; state-funded, $p > .05$). Contrary to our expectations, participants were more willing to support an energy community if members didn't have to invest a lot of time in it (vs. do, $p = .001$), even though energy communities with more time investment were perceived as more cooperative ($p < .001$). Moreover, while older energy communities were perceived as more cooperative ($p = .002$), we found no difference in willingness to join them ($p = .959$).

In the next series of set-ups, we found that the size of an energy community did not affect willingness to support ($p = .179$), even though smaller energy communities were perceived as more cooperative ($p < .001$). We also found a number of significant differences. Our results indicated differences in the location of an energy community, in that participants reported more willingness to support it when it was local compared to European or nation-wide initiatives, $t(816) = -2.07$, $p = .039$. These energy communities were also perceived as more cooperative, $t(816) = -1.88$, p = .004. Set-ups also created more willingness to support ($p <$

.001) and perceived cooperation (p < .001) when the energy community was part of a larger network (compared to not being part of one). Furthermore, energy communities produced more support when they had demographically diverse members (vs. homogenous), and if members did not have (vs. had) to invest a lot of money in them (p < .001). It is noteworthy that for these set-ups, no difference in perceived cooperation occurred (p > .05). See Table 4 to Table 16 for further indicators.

As a second exploratory step, we analysed energy citizenship as a moderator of these effects with multiple regression analyses. We found that it did not moderate the following set-ups: agent of owning and setting up an energy community, focus of energy community, time members have to invest in the energy community, size of the energy community, and funding. However, for other set-ups, energy citizenship strengthened the effect of set-ups in that people with high energy citizenship reported stronger differences between conditions than people with low energy citizenship. We found significant interactions between condition and energy citizenship on willingness to support for the following set-ups: interaction of members, $t(815) = -2.45$, $p = .015$, legal contract, $t(815) = 3.43$, $p < .001$, larger network, $t(815) = 2.91$, $p = .004$, demographic diversity of members, $t(815) = 1.99$, $p = .047$, legal framework of country, $t(815) = 2.24$, $p = .026$, and money people have to invest in the energy community, $t(815) = 4.41$, $p < .001$. These findings show that people with strong energy citizenship put more emphasis on diverse, interactive, and financially easy-to-join groups, legal contracts and frameworks. Simple slope analyses reveal that with regard to all these set-ups, we find significant increases in the same direction for energy citizenship -1SD (p < .01), energy citizenship 0SD (p < .01), and energy citizenship +SD (p < .01). So the trend is similar on the whole spectrum of energy citizenship but more pronounced in those with high energy citizenship. Figure 5 shows an exemplary moderation. One especially interesting interaction pattern emerged for the duration of energy communities, $t(815) = -2.21$, $p = .027$. While people with high energy citizenship endorsed younger energy communities (energy citizenship +1SD: B = -0.17, $t = -1.23$, $p = .22$), those with lower energy citizenship endorsed older energy communities (energy citizenship -1SD: B = 0.26, $t = 1.90$, $p = .06$), see Figure 6.

Table 4. Agent that owns and leads the energy community.

	Community members	Community members and local government	Local government	Enterprise	Group comparison	
	M (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	Welch's *F*	*p*
Willingness to support	4.96 (1.42)	4.85 (1.48)	4.03 (3.39)	3.39 (1.66)	44.33	<.001
Perceived cooperation	5.38 (1.23)	5.25 (1.12)	4.54 (1.35)	4.24 (1.57)	32.85	<.001

Figure 3. Means of willingness to support in the four conditions.

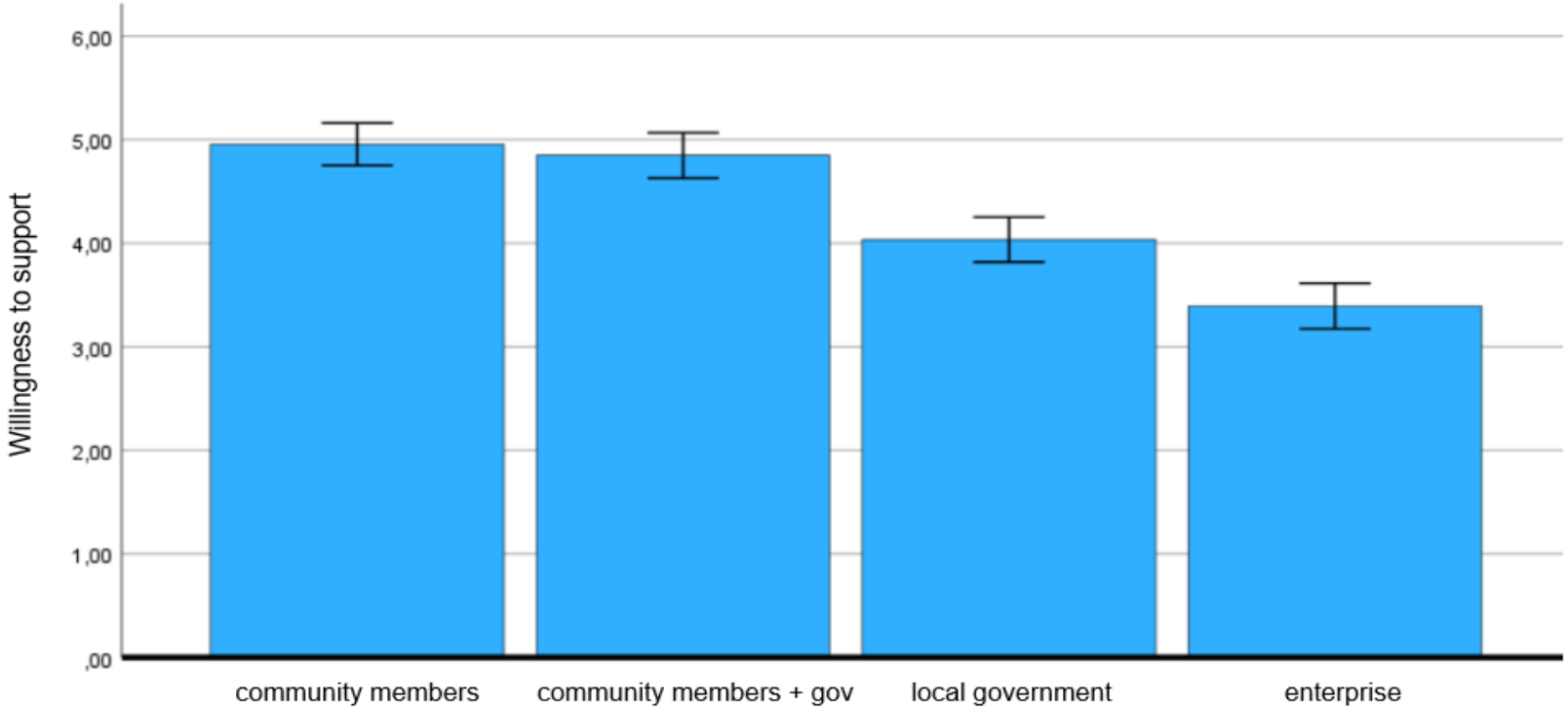


Table 5. Focus of the energy community.

	Environmental sustainability	Social justice	Financial benefits	Energy security	Diverse values	Group comparison	
	M (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	Welch's *F*	*p*
Willingness to support	4.52 (1.61)	4.92 (1.46)	3.23 (1.88)	4.30 (1.55)	4.41 (1.64)	21.23	<.001
Perceived cooperation	5.03 (1.25)	5.26 (1.10)	4.10 (1.45)	5.00 (1.19)	4.93 (1.33)	17.01	<.001

Figure 4. Means of willingness to support in the five conditions.

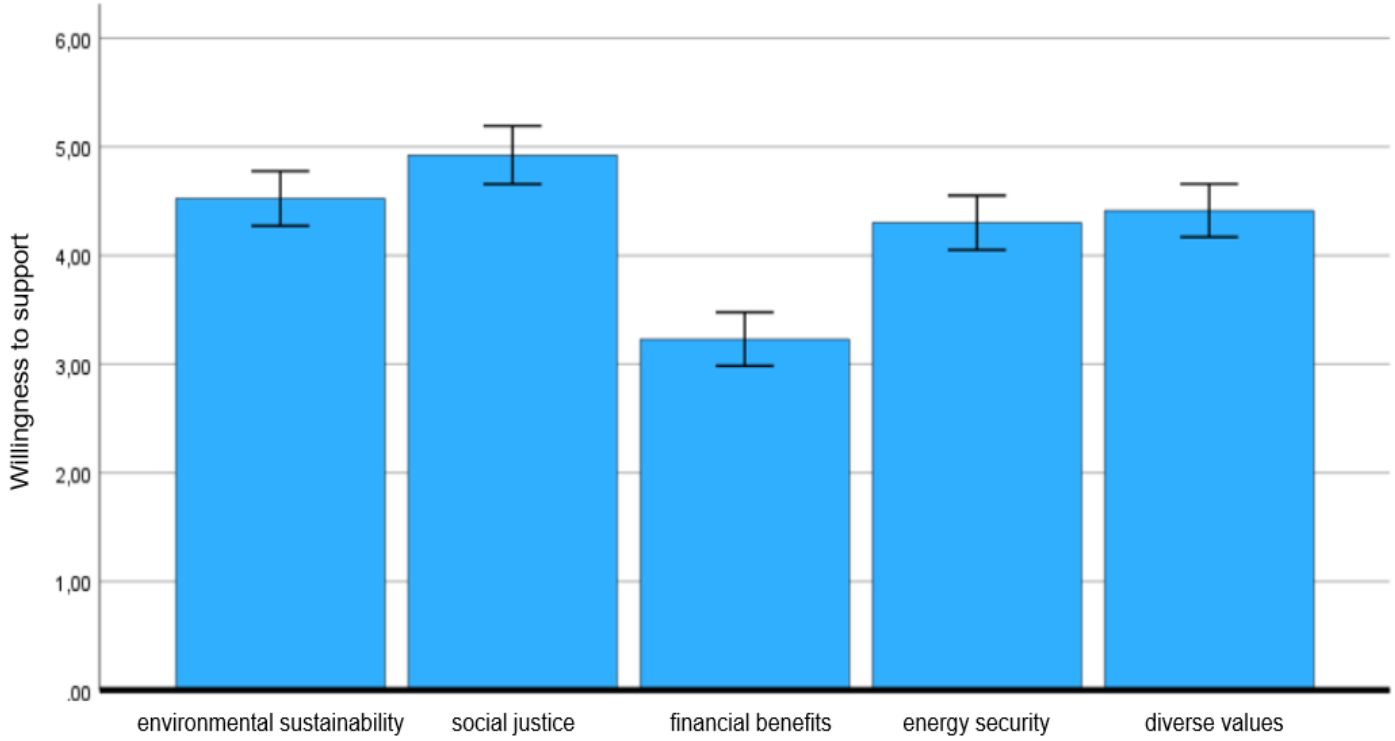


Table 6. Interaction of members of the energy community.

	Many interactions	**Few interactions**	**Group comparison**	
	M (*SD*)	*M* (*SD*)	Welch's *F*	*p*
Willingness to support	4.51 (1.62)	3.51 (1.71)	73.38	<.001
Perceived cooperation	5.33 (1.32)	3.35 (1.63)	366.94	<.001

Table 7. Legally binding contract of the energy community.

	Binding contract	**No binding contract**	**Group comparison**	
	M (*SD*)	*M* (*SD*)	Welch's *F*	*p*
Willingness to support	4.44 (1.67)	3.85 (1.72)	103.73	<.001
Perceived cooperation	5.17 (1.29)	3.55 (1.52)	273.00	<.001

Table 8. Time members have to invest in the energy community.

	High time investment	Low time investment	Group comparison	
	M (*SD*)	*M* (*SD*)	*F*	*p*
Willingness to support	3.74 (1.71)	4.12 (1.68)	10.24	.001
Perceived cooperation	5.21 (1.38)	3.92 (1.51)	163.40	<.001

Table 9. Age of the energy community.

	Older energy community	Younger energy community	Group comparison	
	M (*SD*)	*M* (*SD*)	*F*	*p*
Willingness to support	4.24 (1.54)	4.25 (1.50)	.003	.959
Perceived cooperation	4.77 (1.22)	4.50 (1.24)	9.61	.002

Table 10. State funding of the energy community.

	State funded	Not state funded	Group comparison	
	M (*SD*)	*M* (*SD*)	*F*	*p*
Willingness to support	4.32 (1.68)	3.91 (1.62)	12.57	<.001
Perceived cooperation	4.63 (1.33)	4.53 (1.29)	1.21	.272

Table 11. Legal framework in the country of the energy community.

	Clear legal framework	No clear legal framework	Group comparison	
	M (*SD*)	*M* (*SD*)	Welch's *F*	*p*
Willingness to support	4.53 (1.76)	3.84 (1.81)	135.08	<.001
Perceived cooperation	5.02 (1.27)	3.73 (1.56)	169.27	<.001

Table 12. Size of the energy community.

	Large energy community	Small energy community	Group comparison	
	M (*SD*)	*M* (*SD*)	Welch's *F*	*p*
Willingness to support	4.28 (1.41)	4.13 (1.77)	1.81	.179
Perceived cooperation	4.47 (1.23)	5.03 (1.49)	34.97	<.001

Table 13. Location that the energy community is based in.

	Europe	Nationally	Locally	Group comparison	
	M (*SD*)	*M* (*SD*)	*M* (*SD*)	*F*	*p*
Willingness to support	4.24 (1.57)	4.30 (1.55)	4.51 (1.58)	2.30	.101
Perceived cooperation	4.68 (1.36)	4.90 (1.36)	5.07 (1.25)	6.21	.002

Table 14. Network of the energy community.

	Part of larger network	Not part of larger network	Group comparison	
	M (*SD*)	*M* (*SD*)	Welch's *F*	*p*
Willingness to support	4.61 (1.54)	3.71 (1.73)	61.89	<.001
Perceived cooperation	5.25 (1.38)	4.05 (1.51)	139.26	<.001

Table 15. Demographic diversity of members of the energy community.

	Diverse	Not diverse	Group comparison	
	M (*SD*)	*M* (*SD*)	*F*	*p*
Willingness to support	4.75 (1.56)	3.89 (1.63)	58.26	<.001
Perceived cooperation	4.79 (1.31)	4.97 (1.31)	3.86	.050

Table 16. Money members have to invest in the energy community.

	High money investment	Low money investment	Group comparison	
	M (*SD*)	*M* (*SD*)	Welch's *F*	*p*
Willingness to support	2.74 (1.76)	4.88 (1.53)	346.37	<.001
Perceived cooperation	4.14 (1.42)	4.82 (1.28)	51.23	.272

Figure 5. Interaction of set-up "having to invest money vs. not" and energy citizenship in explaining willingness to support an energy community.

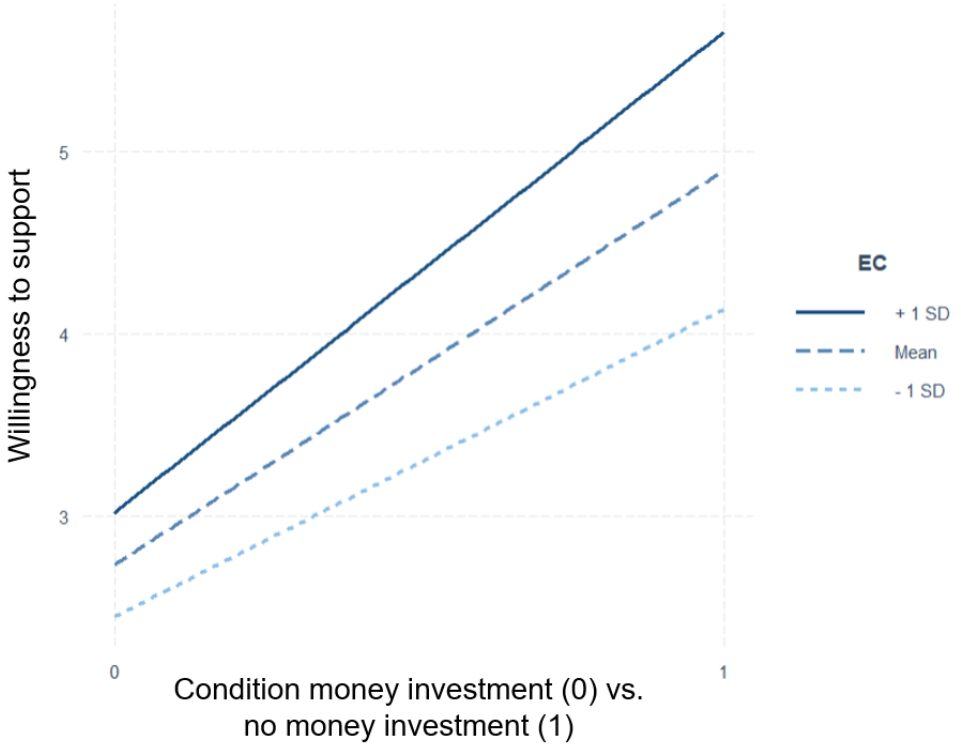
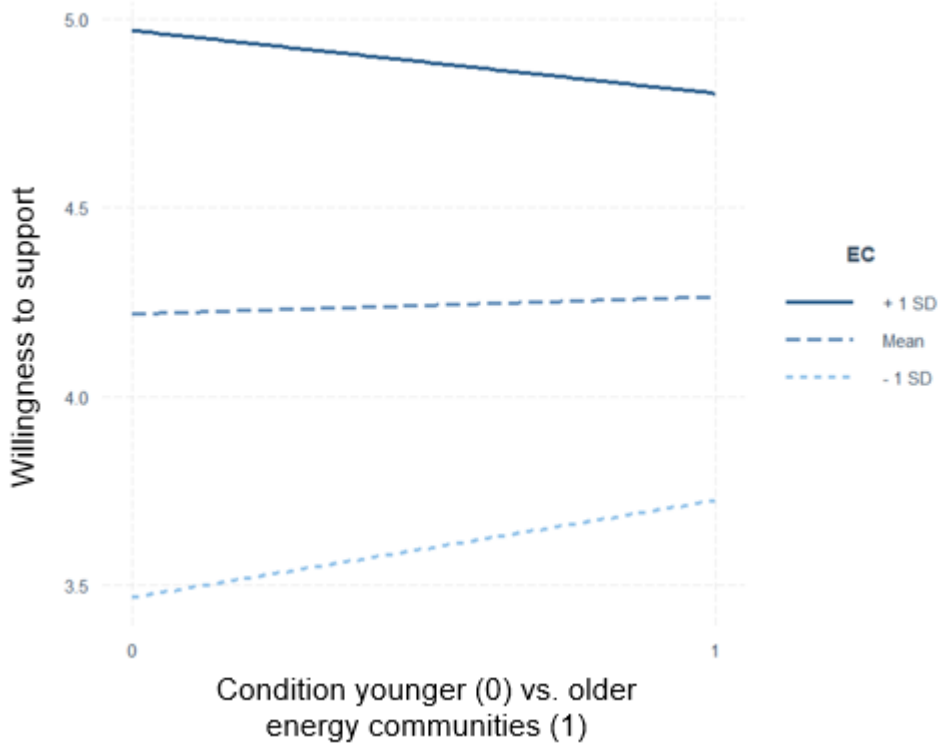


Figure 6. Interaction of set-up "age" and energy citizenship in explaining willingness to support an energy community.



4.2.6 Discussion Study 2

Study 2 showed that energy community set-ups indeed determine whether people are willing to support them. In line with our hypotheses, participants were more willing to support energy communities when these were owned and led by community members (and the local government), focused on environmental sustainability and social justice focus, had members who interacted a lot, were state-funded, based on a legally binding contract, and situated in a country with a clear legal framework.

Contrary to our expectations, more willingness to support was also shown when energy community members did not have to invest a lot of time in their energy community. Furthermore, we found that participants reported more willingness to support if an energy community was locally based, part of a larger network, demographically diverse, and if members did not have to invest a lot of money in the energy community. Other than expected, there was no difference between older and younger energy communities. Moreover, the energy community's size did not influence participant's willingness to support it.

Findings on cooperation partially match this picture. Energy communities were perceived as more cooperative when they were owned and led by community members (and local government), focused environmental sustainability and social justice, had members who interacted more, had a legally binding contract, were situated in a clear legal framework, were older, smaller, locally based, part of a larger network, and when members did not have to invest a lot of time in the energy community. We found no difference in perceived cooperation for the diversity of members, state funding, and members' money investment. As the pattern of willingness to support and perceived cooperation of an energy community sometimes diverged, our findings indicate that perceived cooperativeness may not be the most important indicator for whether people want to actually support it.

We explored energy citizenship as a moderator. Energy citizenship increased an already existing trend for interaction of members, a legal contract, a larger network, demographic diversity of members, legal framework of the country, and money people have to invest in the energy community. People with high energy citizenship therefore favoured energy communities that are diverse, interactive, and financially easy-to-join groups, based on legal contracts and situated in a clear legal framework even more than people low in energy citizenship.

It is noteworthy that the same trend direction appeared for both groups. However, energy citizenship had no influence on the perception of the agent of owning and setting up an energy community, the focus of the energy community, the time members have to invest in the energy community, the size of the energy community, and its funding. One set-up where energy citizenship led to different trends was the duration of an energy community. Participants with higher energy citizenship endorsed younger energy communities, while participants with lower energy citizenship rather endorsed older energy communities. Overall, these findings show that energy citizenship can moderate the perception of energy communities, however, it barely influences the direction of the effect. In a next study, we therefore went beyond the moderating effect of energy citizenship and wanted to examine how it may be influenced by different self-constructed set-ups of an energy future.

5.3 Study 3: setting up energy visions

Study 3 investigated whether people's visionary set-ups of energy futures could influence energy citizenship (RQ2) and pro-environmental spillover (RQ3). Thereby, experimental manipulations of collective visions can be seen both as an opportunity to set-up the future of the broad energy community EU and as a collective agency indicator. In addition, we explored whether a cooperative energy vision would be associated with more motivation. This was done in a between-subject 1-factorial design with three groups (visioning vs. trending norms vs. control group).

4.2.7 Hypotheses

Hypotheses were pre-registered on the Open Science Framework (https://osf.io/dukf4). We have adapted the formulation of the hypotheses to make them comprehensible for this deliverable. We proposed the following hypotheses for this deliverable:

H1: Main effect of visioning and trending norm conditions

a) The visioning condition (vs. control) increases collective energy citizenship and collective action intentions (i.e. public/activist intentions).
b) The trending norm condition (vs. control) increases collective energy citizenship and collective action intentions.

H2: Moderation by individual visions

a) The visioning condition (vs. control) increases collective energy citizenship and collective action intentions for participants with high individual visions (i.e. cognitive alternatives) but less so for those with low individual visions.

H3: Pro-environmental spillover

a) The visioning condition (vs. control) increases energy-related PEB intentions and non-energy PEB intentions.
b) The trending norm condition (vs. control) increases energy-related PEB intentions and non-energy PEB intentions.

Exploratively, we expected that people would perceive more energy citizenship when the collective vision that they imagined included cooperation.

4.2.8 Sample characteristics

From 6th to 21th of March, 2023, we collected data using the clickworker panel. Participants received an expense allowance of 3€ for their participation. This corresponds to the German minimum wage for the length of this survey.

Sample size considerations were guided by previous research. We based our power analysis on previous work by Lutz et al. (2022), and fit our first main hypothesis. Based on their findings (g = .18), we expect a small effect of the visioning task (vs. control group) on public/activist intentions. Previous research shows that the effects of trending norms vs. control group are in a similar range (d = .16, study 2, Sparkman & Walton, 2017; g = .14, Mortensen et al., 2019).

We conducted a power analysis with G*Power. We calculated the effect size for a one-tailored independent t-test with the aim of detecting a small effect size (d = .18), a standard error probability (α = .05), and an acceptable power of .80. This resulted in a sample size of n = 383 per group and a total of 1149 participants for this study.

2473 people clicked on our online survey, and of those, 2035 started the survey. Dropout diverged between conditions. While both the visioning (n = 212) and trending norm condition (n = 236) had large dropout rates, possibly due to their 3 minutes' manipulations, our no intervention control group only showed 7 people who dropped out. After applying exclusion criteria, our final sample consisted of N = 1349 participants.

Our sample consisted of 747 (55.4%) male, 588 (43.6%) female, and 13 (1.0%) diverse participants. On average, participants were 40 years old (year of birth: M = 1983.80, SD = 11.92, range: 1946 to 2005). Due to an uneven dropout between conditions, we report demographics for all conditions combined and separately in Table 17. These revealed no major differences between conditions. Only the descriptive difference in political orientation stood out. We conducted an ANOVA and found no overall difference between conditions, $F(2, 1341) = 2.45$, p = .086. When looking at contrasts between specific conditions, there was no difference between either the visioning nor the trending norm condition and the control group (ps > .05), even though a significant difference between visioning and trending norm condition appeared, $F(1, 1341) = 4.59$, p = .032, in that participants in the visioning condition reported to be more left-wing than participants in the trending norm condition. This finding should be considered when interpreting the results.

Table 17. Demographics of Study 2 overall and per experimental condition.

	overall	**vision condition**	**trend norm condition**	**control group**
	n(%) or *M*(*SD*)	*n*(%) or *M*(*SD*)	*n*(%) or *M*(*SD*)	*n*(%) or *M*(*SD*)
Group size	1349	403	354	592
Gender				
1 female	588 (43.6%)	168 (41.7%)	147 (41.5%)	273 (46.1%)
2 male	747 (55.4%)	230 (57.1%)	204 (57.6%)	313 (52.9%)
3 diverse	13 (1.0%)	5 (1.2%)	3 (0.8%)	5 (0.8%)
4 other	1 (0.1%)	-	-	1 (0.2%)
Year of birth	1983.80 (11.92)	1983.87 (11.76)	1984.12 (11.77)	1983.56 (12.12)
Formal education				
1 student	9 (0.7%)	3 (0.7%)	2 (0.6%)	4 (0.7%)
2 left school without degree	2 (0.1%)	1 (0.2%)	1 (0.3%)	-
3 secondary modern school qualification	20 (1.5%)	5 (1.2%)	7 (2.0%)	8 (1.4%)
4 high-school diploma	228 (16.9%)	77 (19.1%)	49 (13.8%)	102 (17.2%)

5 ten-class polytechnic secondary school	22 (1.6%)	3 (0.7%)	6 (1.7%)	13 (2.2%)
6 university of applied sciences entrance qualification	134 (9.9%)	37 (9.2%)	37 (10.5%)	60 (10.1%)
7 higher education entrance qualification	326 (24.2%)	85 (21.1%)	95 (26.8%)	146 (24.7%)
8 university degree	603 (44.7%)	189 (46.9%)	156 (44.1%)	258 (43.6%)
9 other	5 (0.4%)	3 (0.7%)	1 (0.3%)	1 (0.2%)
Employment				
1 student	19 (1.4%)	4 (1.0%)	5 (1.4%)	10 (1.7%)
2 in training	25 (1.9%)	8 (2.0%)	7 (2.0%)	10 (1.7%)
3 university student	120 (8.9%)	36 (8.9%)	32 (9.0%)	52 (8.8%)
4 employee	774 (57.4%)	241 (59.8%)	195 (55.1%)	338 (57.1%)
5 public servant	73 (5.4%)	17 (4.2%)	21 (5.9%)	35 (5.9%)
6 freelancer	223 (17.3%)	72 (17.9%)	64 (18.1%)	97 (16.4%)
7 unemployed	9 (2.9%)	7 (1.7%)	14 (4.0%)	18 (3.0%)
8 other	66 (4.9%)	18 (4.5%)	16 (4.5%)	32 (5.4%)
Income				
1 no own income	34 (2.5%)	6 (1.5%)	9 (2.5%)	19 (3.2%)
2 less than 250€	19 (1.4%)	3 (0.7%)	6 (1.7%)	10 (1.7%)
3 250€ to less than 500€	38 (2.8%)	10 (2.5%)	8 (2.3%)	20 (3.4%)
4 500€ to less than 1000€	126 (9.3%)	43 (10.7%)	32 (9.0%)	51 (8.6%)
5 1000€ to less than 1500€	139 (10.3%)	53 (13.2%)	37 (10.5%)	49 (8.3%)
6 1500€ to less than 2000€	174 (12.9%)	36 (8.9%)	52 (14.7%)	86 (14.5%)
7 2000€ to less than 2500€	214 (15.9%)	66 (16.4%)	50 (14.1%)	98 (16.6%)
8 2500€ to less than 3000€	189 (14.0%)	52 (12.9%)	54 (15.3%)	83 (14.0%)
9 3000€ to less than 3500€	120 (8.9%)	41 (10.2%)	30 (8.5%)	49 (8.3%)
10 3500€ to less than 4000€	68 (5.0%)	21 (5.2%)	19 (5.4%)	28 (4.7%)
11 4000€ or more	89 (6.6%)	25 (6.2%)	23 (6.5%)	41 (6.9%)
12 I don't want to answer	139 (10.3%)	47 (11.7%)	34 (9.6%)	58 (9.8%)
Political orientation	4.91 (1.73)	5.07 (1.76)	4.80 (1.73)	4.88 (1.70)

Note. We measured political orientation on a scale ranging from 1 (left) to 10 (right). Secondary modern school qualification is the German Hauptschulabschluss. High-school diploma represents the German Realschulabschluss.

4.2.9 Procedures and measures

We implemented our survey on sosci survey (Leiner, 2020). The average duration for completing the study was *M* = 13.41 minutes (SD = 6.39), with longer durations in the visioning condition (*M* = 16.38, *SD* = 6.58) and the trending norm condition (*M* = 16.52, *SD* = 6.34), and

a shorter duration in the no intervention control condition (*M* = 9.53, *SD* = 3.57). For this study, we acquired ethical approval by ZSI. As data collection followed APA guidelines for the ethical conduct of research, we included informed consent, and further informed participants about the manipulation, context, and aims of the study at the end of the survey. We compared three conditions in this experiment. One group of participants received a visioning task in which they were instructed to imagine their ideal Europe of the future with respect to the energy transition. A second group received a trending norm task, instructing participants to think about positive energy transition developments in Europe. A third control group did not receive any intervention. The following excepts show how we manipulated collective visions and trending norms in this study:

Visioning task

What are your visions for the energy transition in Europe?

Europe is in the middle of an energy crisis. The Ukraine war is jeopardising energy supplies and leading to rising energy prices in Europe. At the same time, the current focus on fossil fuels is driving climate change. A sustainable energy transition is often mentioned as a possible way out of these crises, counteracting ecological, economic and social problems.

This task is about using your imagination. Please imagine your ideal Europe of the future, in which a sustainable energy transition has been successfully and fairly implemented. Please describe your vision as precisely as possible in the text boxes provided.

There are no right or wrong answers. It is about your ideas of what an ideal Europe would look like. Please try to write at least 30 words per question. Please take at least 3 minutes to do this (after this time, the "Continue" button will appear if you have not left this page). You should answer the following questions:

What is your vision of a Europe in which a just and sustainable energy transition has been implemented according to your ideals?

How will energy be produced, stored, distributed and consumed in this future Europe?

How does this ideal implementation of a just and sustainable energy transition make itself felt in the lives of Europeans?

Trending norm task

What positive trends do you see in the energy transition in Europe?

Europe is in the middle of an energy crisis. The Ukraine war is jeopardising energy supplies and leading to rising energy prices in Europe. At the same time, the current focus on fossil fuels is driving climate change. A sustainable energy transition that counteracts ecological, economic and social problems is often mentioned as a possible way out of these crises.

This task is about discovering positive developments. Please think of positive developments that are successfully driving a just and sustainable energy transition in Europe. Please describe these positive trends as precisely as possible in the text boxes provided.

There are no right or wrong answers. It is about your ideas of what positive trends can be noticed in Europe. Please try to write at least 30 words per question. Please take at least three minutes to do this (after this time, the "Continue" button will appear if you have not left this page). You should answer the following questions:

What positive developments towards a just and sustainable energy transition are visible in Europe?

To what extent are these trends changing how energy is produced, stored, distributed and consumed in Europe?

How do these positive trends manifest themselves in the lives of Europeans?

Control group
- no manipulation -

The survey contained the following measures that are relevant to this study, measured similarly to study 1. Participants answered them on a 7-point Likert scale ranging from 1 (completely disagree) to 7 (completely agree), unless stated otherwise. As dependent variables, nine items measured collective energy citizenship (α = .89), another nine items measured collective action intention (α = .91), eight items assessed energy-related PEB intention (α = .79), and four items assessed non-energy PEB intention (α = .76). As independent variables and for our manipulation checks, five items measured individual visions (α = .87), six items measured descriptive norms (α = .75), and one item assessed trending norms.

Moreover, we included demographic information, precisely, gender, age, formal education, employment, income, country code and political orientation. The survey also included measures of collective aims, collective self-determined motivation, collective efficacy, social identification, and a number of characteristics of visions and positive trends that do not pertain to the hypotheses included in this deliverable.

4.2.10 Data preparation and analyses

We performed data analysis with R Statistics version 4.2.0, and data management with SPSS 29. Sixty-two participants failed our concentration check item. We then considered 1463 participants who finished our questionnaire. First, we excluded the second data point of 17 participants who answered the same questionnaire twice. Second, we excluded another 25 participants who answered unreliablely in the open answering field (e.g. nonsense or English, even though the survey was in German), as we could not make sure that these were human participants. This concerned eight participations in the visioning condition, five in the trending norm condition, and twelve participants in the control condition. A total of 45 was excluded because they answered our direct manipulation check incorrectly. This manipulation check was applied at the end of the questionnaire and asked participants about the condition that they had been in. As no participant had more than 20% missing values, we did not have to exclude anyone based on this exclusion criterion. Yet, we excluded five participants who always pressed the same number throughout the whole survey. During the observation of participants with RSI > 2, we noticed one participant with a curious answering pattern and

deleted them. Due to the poor previous data quality and many dropouts, we decided to exclude 21 participants with DEG_TIME > 150 (Leiner, 2020). After applying these manifold exclusion criteria that are necessary when conducting research with a panel provider, the final sample size was *N* = 1349 participants.

We analysed our hypotheses with ANOVAs including contrast tests. Multiple regression analyses were used for moderation analyses. For exploratory purposes, we also looked at bivariate correlations.

4.2.11 Results

Before testing our hypotheses, we checked whether our manipulation actually influenced the processes that it was meant to influence. Notably, these variables were not measured directly after the manipulation, so that they cannot be seen as a direct manipulation check. The visioning condition (vs. control group) indeed increased individual visions, $t(920) = 7.61$, $p < .001$, in contrast tests for unequal variances that were necessary due to a significant Levene's test. However, we did not find any difference between the trending norm condition and the control group with respect to descriptive norms, $t(1344) = -0.17$, $p = .865$, and trending norms, $t(1346) = -0.535$, $p = .592$, indicating that our descriptive trending norm reflection task did not increase people's perceived (trending) norms). Table 18 gives an overview of means, standard deviations, and group comparison between the three conditions with respect to main outcome variables.

Table 18. Means, standard deviations, and group comparison between experimental conditions.

	Visioning condition	Trending norm condition	Control group	Group comparison	
	M (*SD*)	*M* (*SD*)	*M* (*SD*)	*F*	*p*
Collective energy citizenship	4.96 (1.05)	4.92 (1.01)	4.92 (0.96)	0.23	.792
Collective action intentions	3.47 (1.41)	3.27 (1.29)	3.16 (1.26)	6.61	.001
Energy-related PEB intention	4.76 (1.18)	4.62 (1.13)	4.62 (1.10)	2.08	.125
Non-energy PEB intention	4.60 (1.33)	4.49 (1.34)	4.38 (1.39)	3.16	.043

Figure 7. Means for collective energy citizenship in the three conditions.

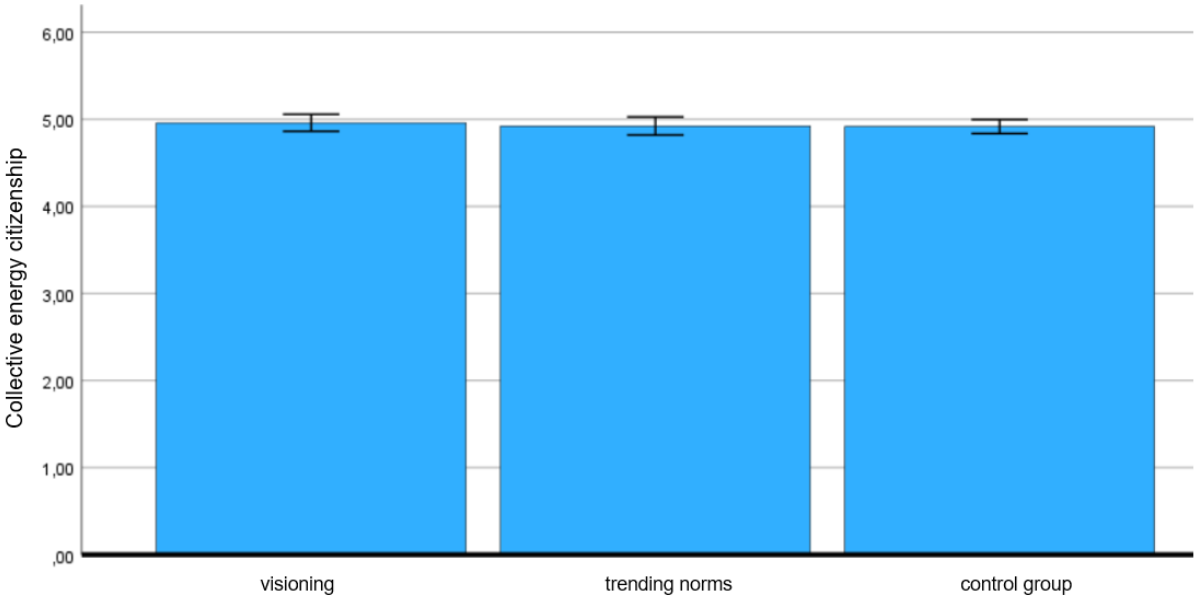
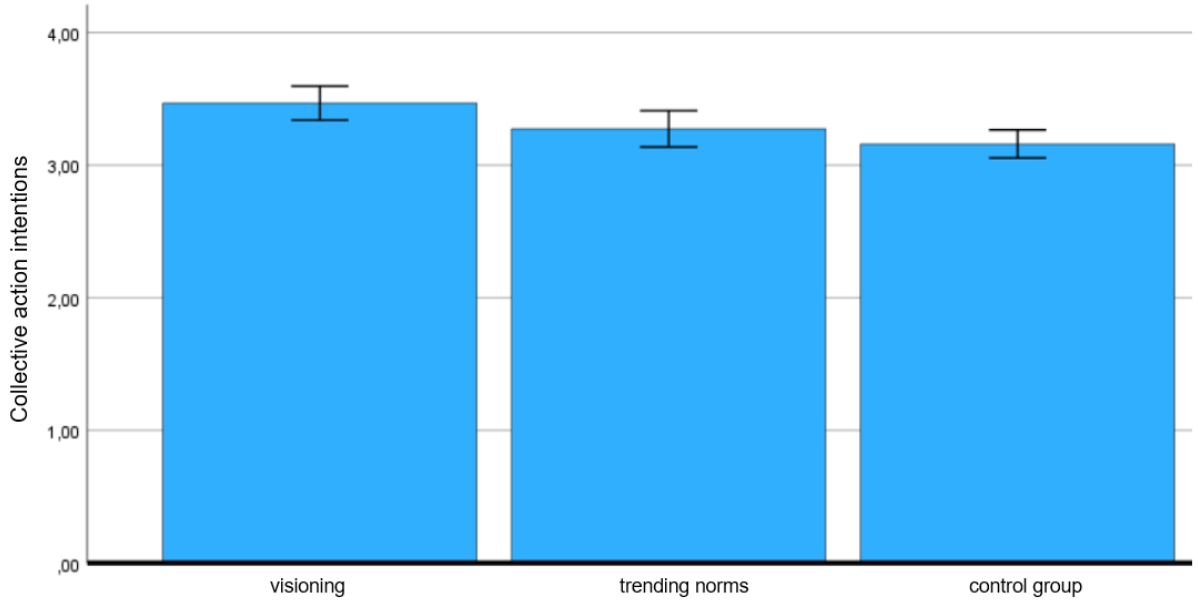


Figure 8. Means for collective action intentions in the three conditions.

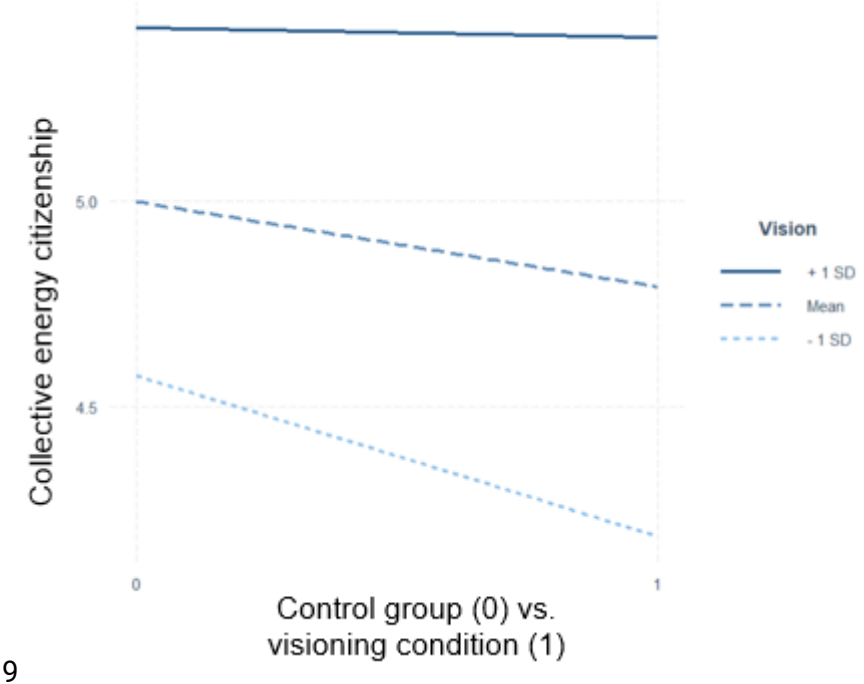


Contrary to H1, we did not find significant differences of collective energy citizenship between the visioning condition and the control group, $F(1, 1346) = 0.41$, $p = .522$, or the trending norm condition and the control group, $F(1, 1346) = 0.04$, $p = .850$. However, supporting H1, collective action intentions indeed increased significantly in the visioning condition compared to the control condition, $F(1, 1346) = 12.98$, $p < .001$. Yet, the effect of the trending norm condition compared to the control condition was not significant, $F(1, 1346) = 3.10$, $p = .078$.

In line with H2, the visioning condition produced stronger effects on energy citizenship and collective action intentions for participants with higher (vs. lower) individual visions. We found a significant interaction between the visioning condition (vs. control group) and measured individual visions, B = 0.13, $t = 3.08$, $p = .002$. Analyses of simple slopes showed that there

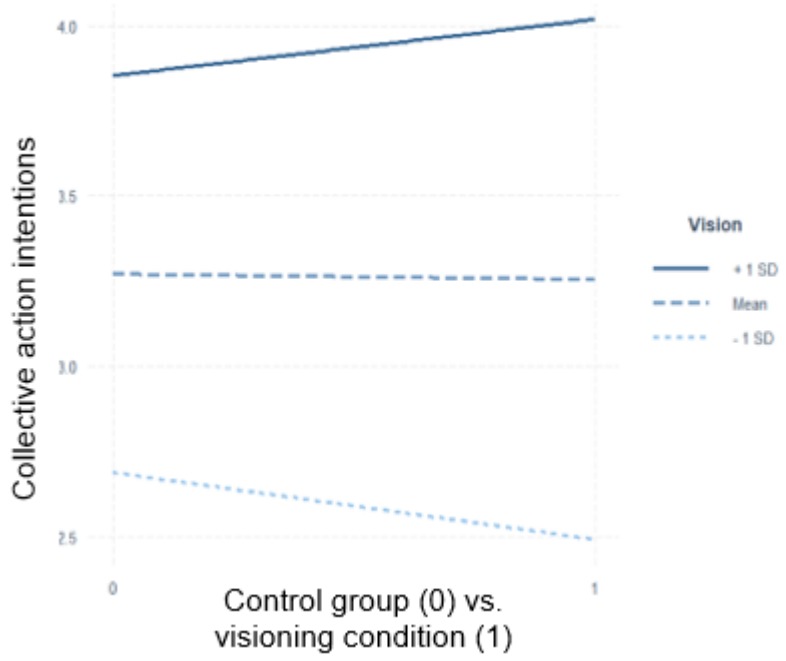
was no effect of the visioning condition on energy citizenship for people with high individual visions (+1SD: B = -0.02, *t* = -0.30, *p* = .76). Intriguingly, the visioning condition even decreased energy citizenship for those with medium (0SD, B = -0.21, *t* = -3.54, *p* < .01) or low individual visions (-1SD: B = -0.39, *t* = -4.43, *p* < .01). A significant interaction between visioning condition (vs. control group) and energy citizenship also occurred for collective action intentions, B = 0.13, *t* = 2.28, *p* = .023. In simple slopes analyses, more individual visions were related to a positive trend of the visioning condition on collective action intentions (B = 0.17, *t* = 1.58, *p* = .11), while less individual visions were related to a negative trend of the visioning condition on collective action intentions (-1SD: B = -0.20, *t* = -1.67, *p* = .09). However, both trends were not significant. Figure 9 and 10 depict these interactions.

Figure 9. Interaction of visioning condition (vs. control group) and measured individual visions in explaining collective energy citizenship.



9

Figure 10. Interaction of visioning condition (vs. control group) and measured individual visions in explaining collective action intentions.



In contrast to H3, we did not find significant differences in energy-related PEB between the visioning condition (vs. control group), $F(1, 1346) = 3.22$, $p = .073$, and between the trending norm condition (vs. control group), $F(1, 1346) = 0.09$, $p = .768$. Moreover, the trending norms condition (vs. control group) did not significantly increase non-energy PEB, $F(1, 1346) = 2.29$, $p = .131$. However, in support of H3, the visioning condition increased non-energy PEB compared to the control group, $F(1, 1346) = 6.31$, $p = .012$. These hint at small positive spillover effects of the collective visioning task.

In addition, we explored whether cooperation in vision and trending scenarios would relate positively with our outcome variables. We found that it indeed correlated positively and to a large degree with collective energy citizenship ($r = .525$, $p < .001$), and to a medium degree with collective action intentions ($r = .342$, $p < .001$), energy-related PEB intentions ($r = .405$, $p < .001$) and non-energy PEB intentions ($r = .370$, $p < .001$).

4.2.12 Discussion Study 3

Study 3 tested whether visionary set-ups of collective energy futures could influence collective energy citizenship, collective action intentions, and pro-environmental spillover. Contrary to H1, neither the visioning nor the trending norm condition increased collective energy citizenship. Interestingly, we find that participants with lower individual visions even decreased in their energy citizenship as a result of the visioning condition. These kinds of manipulations were therefore not suitable for manipulating the new concept of collective energy citizenship, but since the field of visioning research is very young, other successful manipulations may emerge.

However, in line with H1, the visioning condition increased collective action intentions compared to the control group. Nevertheless, as predicted in H2, this effect is mainly driven

by people who already have high individual visions. For those with low individual visions, the visioning task even backfired and decreased their collective action intentions. It becomes clear that more research on this process is needed. Yet, the trending norms condition only showed a marginally significant effect on collective action intentions. Nevertheless, this indicates that there may be a process at work that is not attributable to trending norms, as our manipulation seemed to have failed.

Contrary to H3, we did not find any spillover effects of the trending norm condition compared to the control group. While the visioning condition did not increase energy-related PEB intentions, we indeed find a small spillover effect on non-energy PEB intentions, showing that the vision manipulation at the collective level can spill over to private behaviour – even if it is situated in another behavioural domain.

Finally, our exploratory results show that cooperation in visioning and trending norm scenarios strongly correlated with energy citizenship, and revealed medium correlations with collective action intentions, energy-related PEB intentions, and non-energy PEB intentions. Thus, cooperation may be a crucial characteristic of manipulations to motivate for energy citizenship and intentions. Yet, the other causal direction is also likely, that participants with higher levels of energy citizenship and intentions thought of more cooperative visioning and trending norm scenarios. While Studies 1 and 2 focussed on energy community set-ups (RQ1), Studies 4 to 9 emphasised how agency processes may affect energy citizenship (RQ2) and pro-environmental spillover (RQ3).

4.3 Study 4: agency vignettes (social norms, collective aims, collective efficacy)

In Study 4, we tested the effect of various agency indicators (social norms, collective aims, collective efficacy) on energy citizenship (RQ2) and pro-environmental spillover (RQ3). This experiment can be seen as including many sub-experiments that share the same control group and can also be compared to each other. Precisely, it was a between-subject 1-factorial design with eight groups (collective efficacy high/low, descriptive norm trends high/low, collective aim high self-determined/ high controlled/ low, baseline).

4.3.1 Hypotheses

Hypotheses were pre-registered on the Open Science Framework (https://osf.io/x4aeq). We have adapted the formulation of the hypotheses to make them comprehensible for this deliverable. We proposed the following hypotheses for this deliverable:

H1: Collective agency influences collective energy citizenship and collective action intentions (i.e. public/activist intentions)
a) The high collective efficacy condition (vs. low/ baseline) increases collective energy citizenship and collective action intentions.
b) The high descriptive norm trend condition (vs. low/ baseline) increases collective energy citizenship and collective action intentions.
c) The collective aim conditions (self-determined/ controlled) increase collective energy citizenship and collective action intentions (vs. low/ baseline).

H2: Spillover on energy-related and non-energy PEB intentions

a) The high collective efficacy condition (vs. low/ baseline) increases energy-related and non-energy PEB intentions.
b) The high descriptive norm trend condition (vs. low/ baseline) increases energy-related and non-energy PEB intentions.
c) The collective aim conditions (self-determined/ controlled) increase energy-related and non-energy PEB intentions (vs. low/ baseline).

4.3.2 Sample characteristics

Data collection took place from the 2nd to 30th of August 2023 via clickworker. Participants received 2€ for their participation. This corresponds to the equivalent of the German minimum wage for the duration of the survey.

As this study included many sub-experiments, we conducted power analyses for all agency indicators. For the relationship between collective efficacy and collective action (intentions), previous correlational research revealed medium to large effect sizes (d = .72, Broszeit, 2020; d = .70 in Study 1 of this deliverable). Experimental work has found small to medium effect sizes (d = 0.35, Jugert et al., 2016, Study 4; d = 0.56, van Zomeren et al., 2010, Study 2). For descriptive norms and PEB (intentions), correlational research has found medium to large relationships, partially including collective action intentions (d = .93, Bamberg & Möser, 2007; d = 1.07, Klöckner, 2013; d = .30 in Study 1 of this deliverable). Experimental work on descriptive norms has found small effect sizes (d = 0.35, Poškus, 2016; d = 0.32, Bergquist et al., 2019, but field studies). Previous research on trending norms has found them to be more strongly related to action than mere descriptive norms. However, the reported effects of trending norms vs. control group are in a similar range (d = .16, Sparkman & Walton, 2017, Study 2; g = .14, Mortensen et al., 2019). With regard to collective aims and collective action intentions, we do not know of specific studies considering our research questions and rely on relations of injunctive norms as part of social norms in other studies, thus expecting a small effect size (e.g., Bamberg & Möser, 2007; Klöckner, 2013). However, our Study 1 of this deliverable showed correlations that would be transferred to a medium effect size of d = .56. Based on all these considerations, we conducted a power analysis with G*Power. As collective efficacy is our proposed core process, we calculated the sample size for a two-tailed independent t-test with the aim of detecting a small to medium effect size of d = .35 (Jugert et al., 2016; Poškus, 2016), a standard error probability (α = .05), and an acceptable power of .80. This resulted in a minimum sample size of n = 130 participants per group and a total minimum of 1040 participants.

In this study, 2666 clickworkers viewed the survey and 2406 of them started the survey. After applying all exclusion criteria (e.g., failure of attention checks), we reached a final sample size of N = 1323. The exclusion criteria led to a slight underrepresentation of the goal manipulation conditions with 173 (13,1%) participants in the collective efficacy high condition, 177 (13,4%) in the collective efficacy low condition, 192 (14,5%) in the descriptive norm high condition, 184 (13,9%) in the descriptive norm low condition, 106 (8,0%) in the collective self-determined goal motivation condition, 126 (9,5%) in the collective controlled goal motivation condition, 168 (12,7%) in the no goal condition, and another 197 (14,9%) participants in the control group.

Participant's demographics largely mirror those of Study 2 and 3. Our sample contained 586 (44.3%) participants who identified as female, 728 (55.0%) participants who identified as male, and 8 (0.6%) who identified as diverse. The average age of participants was 39 years (year of birth, *M* = 1984.23, *SD* = 12.23, range: 1944 to 2005). With regard to participant's education level, three participants (0.2%) were still students, two (0.2%) left school without a degree, 33 (2.5%) of the participants had a secondary modern school qualification, 235 (17.8%) had a high-school diploma, 19 (1.4%) had a ten-class polytechnic secondary school certificate, 102 (7.7%) had a university of applied sciences entrance qualification, and 316 (23.9%) had a higher education entrance qualification. Close to half of the participants, 606 (45.8%), had a university degree. Seven (0.5%) participants checked "other degree". As of participant's occupation, we found that 7 (0.5%) were students, 15 (1.1%) were in training, and 137 (10.4%) were currently university students. The large majority was employed with 774 (58.5%) of the participants. Another 53 (4.0%) were public servants, 217 (16.4%) were freelancers, 47 (3.6%) were unemployed, and 73 (5.5%) checked the "other" category. Participants also stated their income. 31 (2.3%) participants had no income, 19 (1.4%) earned less than 250€, 40 (3.0%) earned 250€ to less than 500€, 122 (9.2%) earned 500€ to less than 1000€, 147 (11.1%) earned 1000€ to less than 1500€, 150 (11.3%) earned 1500€ to less than 2000€, 224 (16.9%) earned 2000€ to less than 2500€, 159 (12.0%) earned 2500€ to less than 3000€, 109 (8.2%) earned 3000€ to less than 3500€, 69 (5.2%) earned 3500€ to less than 4000€, and 100 (7.6%) earned more than 4000€. Another 153 (11.6%) participants did not want to answer this question. Looking at our sample's political orientation, we found that participants were leaning a little bit to the left with *M* = 5.59 (*SD* = 1.89) on a 1 to 11 scale. In this study, we also conducted information on whether participants were part of an ethnic minority. 1280 (96.7%) or our participants described themselves as white, 11 (0.8%) were BIPoC (Black, Indigenous and People of Color), 23 (1.7%) said they were multi-ethnic, and 9 (0.7%) chose the "other" category.

4.3.3 Procedures and measures

Using the platform sosci survey (Leiner, 2020), participants took part in a questionnaire with an average duration of *M* = 12.56 (*SD* = 5.36) minutes. Data collection followed APA guidelines for the ethical conduct of research, including informed consent and clarification at the end of the study. It was approved by the ethics committee of ZSI.

Each participant received three designed texts about three energy transition topics that were framed so that they fit their condition. The three topics were: carbon trading, energy efficiency, energy communities. In the high collective efficacy condition, participants read how effective EU citizens are in the energy transition with the help of carbon trading, energy efficiency, and energy communities. In contrast, in the low collective efficacy condition, participants read how ineffective EU citizens are in the energy transition with the help of carbon trading, energy efficiency, and energy communities. In the high descriptive norm conditions, participants received texts about how EU citizens are more and more acting for carbon trading, energy efficiency, and energy communities. Contrasting this, in the low descriptive norm condition, they read about how EU citizens are not acting more and more for carbon trading, energy efficiency, energy communities but behaviour rates remain stable. In the condition of collective self-determined motivation, participants received texts stating that EU citizens think that carbon trading, energy efficiency, and energy communities are good because of

environmental and social reasons. In the condition of collective controlled motivation, participants received texts claiming that EU citizens think that carbon trading, energy efficiency, and energy communities are good because of financial and social pressure reasons. In contrast, in the no goal condition, participants read that EU citizens do not agree whether or not carbon trading, energy efficiency, and energy communities are good. Our control condition did not include any manipulation prior to all measurements, but participants received the high collective efficacy manipulation at the end of the survey, in order to balance dropout rates. For illustrative purposes, Appendix 8.2 shows one of the three designed texts for each condition.

The survey contained the following measures that are relevant to this study, and that were measured similarly as in Study 1. Unless stated otherwise, participants answered them on a 7-point Likert scale ranging from 1 (completely disagree) to 7 (completely agree). Scales of our dependent variables all showed a suitable reliability. Nine items measured collective energy citizenship (α = .89), eleven items measured collective action intention (α = .94), eight items assessed energy-related PEB intention (α = .78), and four items assessed non-energy PEB intention (α = .75). As manipulation checks for collective efficacy, three items measured collective efficacy (α = .95) and three items measured outcome expectancy of carbon offsetting, energy efficiency and energy communities (α = .73). As a manipulation check for descriptive norms, six items measured descriptive norm trends (α = .84) and another six descriptive norms (α = .80). For collective goals, three items assessed collective goals (α = .93) and we constructed a relative autonomy index with ten items assessing collective self-determined and controlled motivation.

The survey also included demographic information: gender, age, formal education, employment, income, country code, political orientation, and ethnicity. Next to the dependent and independent variables relevant to this deliverable, the survey also included measures of social identification with Europeans, participative efficacy, individual cognitive alternatives, hope, being moved, affective injustice, moralization, previous dealing with questions of energy supply, economic burden due to current energy prices, agent-action self- and collective efficacy, and difficulty of the manipulation task.

4.3.4 Data preparation and analyses

We performed data analysis with R Statistics version 4.2.0, and data management with SPSS 29. Our first exclusion criterion was the correct answering of our attention checks, with which we made sure that no clickworker participants randomly clicked through the survey. Participants were excluded directly when they did not answer the questions with regard to the manipulation material correctly. In advance, student assistants checked that all attention checks were very easy to answer. Dropout due to this exclusion criterion was (relatively) evenly distributed with 111 participants dropping out of the high collective efficacy or control group, 80 participants dropping out of the low collective efficacy group, 41 participants dropping out of the high descriptive norm group, 73 participants dropping out of the low descriptive norm group, 123 participants dropping out of collective self-determined goal motivation group, 160 participants dropping out of the collective controlled goal motivation group, and 89 participants dropping out of the no collective goal group. Another 76 participants dropped out as they answered an attention check item incorrectly.

As we only included participants who gave their informed consent after the clarification at the end of the study, we considered 1369 participants who finished the survey. We excluded the second data point of 14 participants who answered the questionnaire twice. Moreover, one participant was deleted as they produced 62% missings, which exceeded the pre-registered 20%. Another three participants were excluded as they guessed the study target. Finally, we observed 145 participants who produced an RSI > 2 and showed a rapid answering pattern. Including these and others, we deleted 28 participants who produced a curious answering pattern (e.g., answering the same score on all scales, or answering 100% in the descriptive norm ratings about rather rare energy-related behaviour). In the overall dataset, we only imputed two values by constructing the scale with the other measured items.

4.3.5 Results

Except for the collective efficacy scale, our manipulation checks were largely successful. With regard to our collective efficacy measure, we did not find a significant difference between the high and low collective efficacy conditions, $t(1315) = 1.35$, $p = .176$, or the control group and the high collective efficacy condition, $t(1315) = -0.17$, $p = .867$, and the low collective efficacy condition, $t(1315) = -1.57$, $p = .117$. However, we found that the no collective goal condition decreased collective efficacy when compared to the collective self-determined goal motivation condition, $t(1315) = 2.34$, $p = .019$, and the control condition, $t(1315) = -2.01$, $p = .045$. As a more direct manipulation check, we also measured participant's outcome expectancy for the three portrayed energy transition means. These results indicated the successful manipulation of outcome expectancy as the high collective efficacy condition produced significantly more outcome expectancy than the low collective efficacy condition, $t(1315) = 4.29$, $p < .001$. When compared to the control group, the high collective efficacy condition did not increase outcome expectancy, $t(1314) = 1.83$, $p = .068$, but the low efficacy condition decreased it significantly, $t(1314) = -2.59$, $p = .010$. However, again we found an influence of our goal manipulation, in that the no collective goal condition was significantly lower than collective self-determined motivation, $t(1315) = 2.46$, $p = .014$, and collective controlled motivation, $t(1315) = 2.89$, $p = .004$.

Looking at perceived descriptive norms trends, we report results for unequal variances as Levene's test for homogeneity of variances was significant. We find the expected increase of perceived descriptive norm trends in the high descriptive norm condition as compared to the low descriptive norm condition, $t(369) = 11.31$, $p < .001$. Thereby, the high descriptive norm condition increased perceived norm trends, $t(386) = 3.37$, $p < .001$, whereas the low descriptive norm condition decreased perceived norm trends, $t(377) = -7.82$, $p < .001$, compared to the control group. Yet, also our goal manipulation influenced the perception of descriptive norm trends. Compared to the no collective goal condition, there was an increase in descriptive trending norms in the collective self-determined motivation condition, $t(237) = 4.23$, $p < .001$, and the collective controlled motivation condition, $t(279) = 4.41$, $p < .001$. When considering descriptive norms, we find a similar pattern that the high descriptive norm condition increased perceived descriptive norms when compared to the low descriptive norm condition, $t(1315) = 6.33$, $p < .001$. This was based on an increase in descriptive norm in the high descriptive norm condition, $t(1315) = 2.23$, $p = .026$, and a decrease in the low descriptive norm condition, $t(1315) = -4.16$, $p < .001$, when compared to the control group. Again, we find that, compared to the no collective goal condition, there was an increase in descriptive trending norms in the

collective self-determined motivation condition, $t(1315) = 3.27$, $p = .001$, and the collective controlled motivation condition, $t(1315) = 3.63$, $p < .001$.

With regard to perceived collective goal motivation, we indeed found that both the conditions with collective self-determined motivation, $t(1315) = 4.70$, $p < .001$, and collective controlled motivation, $t(1315) = 4.56$, $p < .001$, increased our collective aim measure when compared to the condition with no collective goal. Yet, it seemed that this effect was mainly driven by a significant decrease of collective aims in the no goal condition as compared to the control group, $t(1315) = -3.49$, $p < .001$, whereas increases in the collective self-determined motivation condition, $t(1315) = 1.80$, $p = .073$, and the collective controlled motivation condition, $t(1315) = 1.50$, $p = .133$, were only marginally significant or insignificant. The data also showed that there was an increase in collective aims in the high (vs. low) descriptive norm condition, $t(1315) = 4.00$, $p < .001$.

We further conducted a manipulation check of self-determined vs. controlled motivation, using the relative autonomy index as an outcome. In line with our manipulation, the collective self-determined motivation condition increased collective self-determined motivation when compared to controlled motivation, $t(1315) = 2.64$, $p = .008$. Notably, collective self-determined motivation was also increased by the high (vs. low) collective efficacy condition, $t(1315) = 2.23$, $p = .026$. It is further noteworthy that all manipulation check scales were administered after presenting collective action intentions, so that the manipulation effects on them may have been weakened. In Table 19–21, we report means and standard deviations of all conditions for our main dependent variables.

Table 19. Means and standard deviations for collective efficacy conditions.

	High CE condition	Low CE condition	Control group
	M (*SD*)	*M* (*SD*)	*M* (*SD*)
Collective energy citizenship	4.80 (0.95)	4.68 (0.97)	4.87 (0.94)
Collective action intentions	3.21 (1.29)	3.18 (1.26)	3.11 (1.27)
Energy-related PEB intentions	4.52 (1.04)	4.59 (0.99)	4.67 (1.09)
Non-energy PEB intentions	4.32 (1.38)	4.37 (1.34)	4.42 (1.39)

Note. CE is collective efficacy.

Table 20. Means and standard deviations for descriptive norm conditions.

	High DN condition	Low DN condition	Control group
	M (*SD*)	*M* (*SD*)	*M* (*SD*)
Collective energy citizenship	4.85 (0.87)	4.48 (1.08)	4.87 (0.94)
Collective action intentions	3.09 (1.33)	2.89 (1.28)	3.11 (1.27)
Energy-related PEB intentions	4.60 (1.16)	4.45 (1.08)	4.67 (1.09)
Non-energy PEB intentions	4.33 (1.30)	4.23 (1.28)	4.42 (1.39)

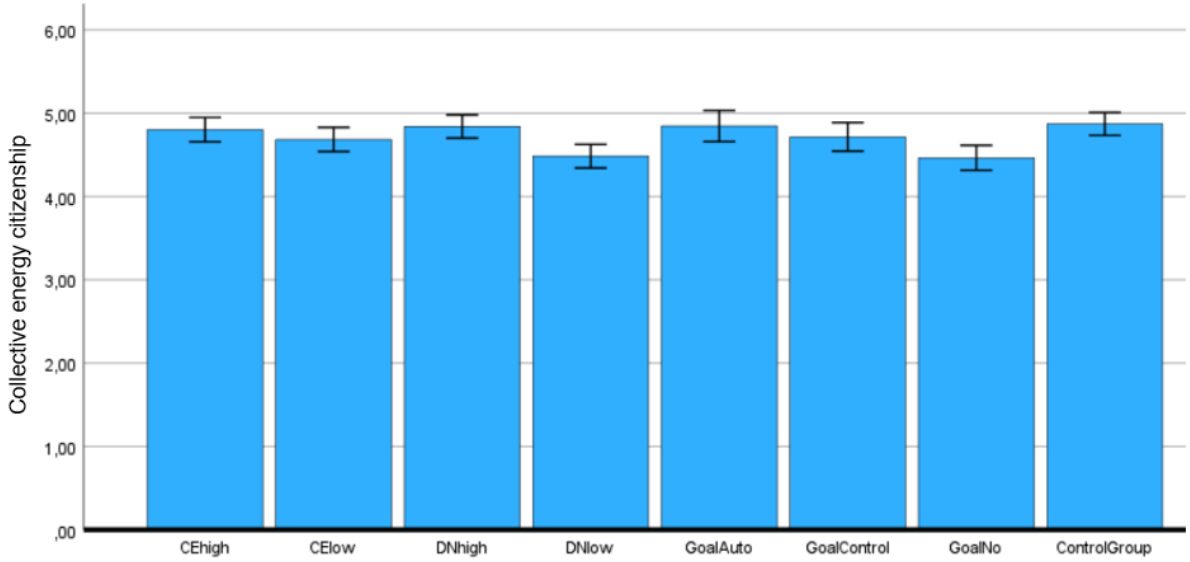
Note. DN is descriptive norm trend.

Table 21. Means and standard deviations for collective aim conditions.

	GoalAuto condition	GoalControl condition	No goal condition	Control group
	M (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)
Collective energy citizenship	4.85 (1.06)	4.72 (0.98)	4.87 (0.94)	4.87 (0.94)
Collective action intentions	3.06 (1.32)	3.05 (1.39)	2.88 (1.33)	3.11 (1.27)
Energy-related PEB intentions	4.51 (1.22)	4.53 (1.06)	4.37 (1.23)	4.67 (1.09)
Non-energy PEB intentions	4.17 (1.49)	4.20 (1.36)	4.08 (1.39)	4.42 (1.39)

Note. GoalAuto is a self-determined aim, GoalControl is controlled aim motivation.

Figure 11. Mean values of collective energy citizenship across conditions.



Note. CE = collective efficacy, DN = descriptive norm, GoalAuto = self-determined collective aim, GoalControl = controlled collective aim.

As can be seen in table 19–21, mean differences were largely apparent for energy citizenship but not for other dependent variables. In H1, we expected that our agency manipulations would influence energy citizenship and collective action intentions. In line with H1, we found that collective energy citizenship increased in the high (vs. low) descriptive norm condition, $t(1315) = 3.52$, $p < .001$, the collective self-determined motivation (vs. no goal) condition, $t(1315) = 3{,}13$, $p = .002$, and the collective controlled motivation (vs. no goal) condition, $t(1315) = 2.17$, $p = .031$. However, we did not find a difference between collective efficacy conditions, $t(1315) = 1.13$, $p = .258$. Moreover, there was no difference in collective energy citizenship between the baseline and the high collective efficacy condition, $t(1315) = -0.67$, $p = .503$, the high descriptive norm condition, $t(1315) = -0.31$, $p = .759$, the self-determined motivation condition, $t(1315) = -0.21$, $p = .832$, and the controlled motivation condition, $t(1315) = -1.39$, $p = .164$.

Contrasting H1, we found no differences in collective action intentions when looking at collective efficacy conditions, $t(1315) = 0.25$, $p = .804$, descriptive norm conditions, $t(1315) = 1.51$, $p = .131$, and collective goal conditions when comparing no goal with self-determined motivation, $t(1315) = 1.13$, $p = .257$, and controlled motivation, $t(1315) = 1.14$, $p = .256$.

Furthermore, there was no difference in collective action intentions when comparing the baseline with the high collective efficacy condition, $t(1315) = 0.80$, $p = .424$, high descriptive norm condition, $t(1315) = -0.13$, $p = .897$, self-determined motivation condition, $t(1315) = -0.30$, $p = .761$, and the controlled motivation condition, $t(1315) = -0.38$, $p = .705$.

In H2, we proposed that our agency manipulations would influence energy-related and non-energy related PEB intentions as a sign of spillover. Yet, we did not find any effect of our manipulation on both concepts. There was no difference in energy-related PEB intentions between the collective efficacy conditions, $t(1315) = -0.56$, $p = .573$, descriptive norm conditions, $t(1315) = 1.26$, $p = .208$, and collective goal conditions when comparing no goal with self-determined motivation, $t(1315) = 1.07$, $p = .287$, and controlled motivation, $t(1315) = 1.26$, $p = .209$. Moreover, the baseline did not differ significantly from the high collective efficacy condition, $t(1315) = -1.32$, $p = .189$, the high descriptive norm condition, $t(1315) = -0.68$, $p = .497$, the self-determined motivation condition, $t(1315) = -1.20$, $p = .231$, and the controlled motivation condition, $t(1315) = -1.12$, $p = .261$.

A similar pattern emerged for non-energy related PEB intentions. We found no difference in energy-related PEB intentions between the collective efficacy conditions, $t(1315) = -0.40$, $p = .691$, descriptive norm conditions, $t(1315) = 0.69$, $p = .488$, and collective goal conditions when comparing no goal with self-determined motivation, $t(1315) = 0.51$, $p = .608$, and controlled motivation, $t(1315) = 0.76$, $p = .450$. Again, the baseline did not significantly differ from the high collective efficacy condition, $t(1315) = -0.76$, $p = .448$, the high descriptive norm condition, $t(1315) = -0.71$, $p = .475$, the self-determined motivation condition, $t(1315) = -1.55$, $p = .121$, and the controlled motivation condition, $t(1315) = -1.42$, $p = .157$.

4.3.6 Discussion Study 4

Overall, results of Study 4 indicate that we successfully manipulated various agency indicators using our scale measures (collective efficacy, descriptive norms, collective aims). Our manipulation checks further reveal that agency indicators seem to also influence each other. A collective goal (vs. no goal) increased the efficacy indicator (i.e. collective efficacy, outcome expectancy) and the action indicator (i.e. descriptive norms, descriptive norm trends. High (vs. low) descriptive norms, in turn, increased the aim indicator (i.e. collective aims). Then again, high (vs. low) collective efficacy increased self-determined aim motivation. This suggests a complex influence pattern between agency indicators that is yet to be explored.

Looking at H1 and H2, we found that high (vs. low) descriptive norms and collective self-determined and controlled (vs. no) goals indeed increased collective energy citizenship. This is therefore the first study to show potential causal predictors of the newly introduced concept of energy citizenship. Next to this promising finding, we nevertheless showed that the agency indicators influenced neither collective action intentions, nor any of our spillover behaviours (i.e. energy-related and non-energy related PEB intentions). This finding is surprising as it contrasts previous work on collective efficacy (Jugert et al., 2016) and descriptive trending norms (Mortensen et al., 2019; Sparkman & Walton, 2017).

As main effects were largely absent in Study 4, Studies 5 to 9 examined similar questions but changed the manipulation material to, for example, flyers from the EU (Study 5), a newsletter article (Study 6), and questions guiding participants to write about their own experiences

(Study 7–8) and thoughts (Study 9). Moreover, we suspected that agency indicators may interact in explaining energy citizenship, collective action and pro-environmental spillover, and therefore included moderation hypotheses in the following experiments.

4.4 Study 5: social norms and collective aims (energy communities)

Study 5 constituted the Master's thesis of Clara Lotte Flöttmann (University Münster). It investigated how social norms and self-determined motivation influence energy citizenship, pro-environmental spillover, and collective action intentions (RQ2 & RQ3). Key variables that we manipulated for this study were social norms and self-determined motivation as they are considered as motivational determinants of environmental behaviour. Moreover, we examine an interaction pattern between types of social norm (descriptive vs. injunctive) and self-determined motivation. The assumptions behind this interaction were based on Milovanovic (2020), who showed that intrinsic motivation is increased by injunctive norms, while descriptive norms did not show any significant influence on intrinsic motivation. Therefore, we expected that self-determined motivation is an important moderator of social norms on engagement in energy communities. The design of this study was a 3 (injunctive norm vs. descriptive norm vs. control group) x 2 (autonomous vs. controlled motivation) between-subject design.

4.4.1 Hypotheses

Hypotheses were pre-registered on the Open Science Framework (https://osf.io/jdp29). We have adapted the formulation of the hypotheses to make them comprehensible for this deliverable. We proposed the following hypotheses for this deliverable:

H1: Social norm effects
a) Conditions highlighting injunctive norms lead to higher energy citizenship and intention to engage in energy communities compared to the control group.
b) Conditions highlighting descriptive norms lead to higher energy citizenship and intention to engage in energy communities compared to the control group.
c) We further expect that social identification moderates the above mentioned effect, so that social norm effects exert more influence on energy citizenship and intention to engage in energy communities if social identification is strong.

H2: Self-determined motivation effects
a) Conditions highlighting collective self-determined motivation lead to higher energy citizenship and intention to engage in energy communities compared to conditions highlighting collective controlled motivation.

H3: Interaction of social norms and self-determined motivation
Self-determined motivation moderates the influence of social norms on energy citizenship and the intention to engage in energy communities. We predict that there is a significant difference in energy citizenship and intention between the self-determined (vs. controlled) motivated injunctive norm condition, and that there is no such difference in the descriptive norm conditions.

H4: Spillover effects
We expect a spillover from energy-related to non-energy-related behaviour intentions, in that the above mentioned effects of social norms and self-determined motivation also apply for non-energy-related behaviour.

4.4.2 Sample characteristics

Data collection took place online in the period from Aug. 16, 2022 to Oct. 16, 2022 via the SoSci Survey website. We distributed the survey through online channels such as mailing lists, social media and personal contacts. As a reward participants had the chance to participate in a raffle to win one of three vouchers, each worth 10 euros.

Based on a power analysis, a minimum sample of 229 people should be surveyed, in order to achieve the effects. Since there will be 6 groups, each group will consist of 39 people, bringing the total sample size to a minimum of 234 participants. To have an equal number of subjects in the six groups and taking publication bias into account, a minimum sample of 45 participants per group was targeted. An a priori power analysis was carried out with the program G*Power. For the effect of social trending norms on PEB (H1), we expect an effect size of partial eta^2 = .041 (Mortensen et al., 2019; Sparkman & Walton, 2017). For the analysis a minimal sample of 229 persons is needed. For the effect of self-determined motivation on PEB (H2), we expect an effect size of partial eta2 = .083 (Milovanovic, 2020). For the analysis a minimal sample of 89 persons is needed. For the interaction effect (H), a mean effect size according to Cohen (f = 0.25) was assumed, resulting in a sample of 211 persons.

Overall, 1157 people clicked on the survey, while 578 started the survey. After exclusion, the final sample size reached *N* = 301. These were distributed quite evenly across the six experimental conditions, with 55 (18,3%) participants in the descriptive norms and self-determined motivation condition, 54 (17,9%) participants in the injunctive norms and self-determined motivation condition, 45 (15%) participants in the self-determined motivation control group, 47 (15,6%) participants in the descriptive norms and controlled motivation condition, 47 (15,6%) participants in the injunctive norms and controlled motivation condition, and another 53 (17,6%) participants in the controlled motivation control group.

Among the subjects were 100 (33.2%) male participants and 192 (63.8%) female participants. Four (1.3%) subjects identified as divers, and five (1.7%) subjects indicated “other”. Participants’ age ranged from 18 to 78 years (*M* = 39.26, *SD* = 14.88). Twenty-six (8.6%) of the participants indicated that they were currently studying psychology, and 43 (14.3%) subjects indicated that they had completed their studies in psychology, and the remaining 232 (77.1%) did not study psychology.

4.4.3 Procedures and measures

Sosci survey (Leiner, 2020) was used as a study platform. The questionnaire took an average of *M* = 16.45 minutes (*SD* = 6.28). Data collection followed APA guidelines for the ethical conduct of research. It included informed consent as well as a clarification of the study target afterwards. The study compared six conditions in a 3 (injunctive norm, descriptive norm, baseline) x 2 (self-determined motivation, controlled motivation) between-subjects design. The manipulation of norms and collective aim motivation was done via slightly adapted text

modules in a staged information brochure of the European Union that were presented at the start of the survey. Thereby, the descriptive norm condition highlighted that more and more people are engaging in energy communities. The injunctive norm condition emphasised that an increasing amount of people think that energy communities are good and important. The control group did not receive any social norm information. However, all groups received a second message manipulation perceived motivation. The self-determined motivation condition highlighted that people engage in energy communities because of self-determined reasons (e.g., fun, meaning). The controlled motivation condition emphasised that people engage in energy communities because of controlled reasons (e.g., financial benefits, energy security, social pressure). The Appendix gives examples of the German manipulation material. After reading the manipulation material, participants answered psychological measures of interest and gave demographic information.

Unless stated otherwise, constructs were answered on a 7-point Likert scale ranging from 1 (completely disagree/not at all true/never applies) to 7 (completely agree/completely true/always applies), and adapted from Study 1. Collective items used Europeans as reference group. As a dependent variable, we measured energy citizenship with 18 items in total (α = .89), nine of them focusing on the group level and nine focusing on the individual level. Collective action intentions to engage in energy communities were captured with 18 items related to behavioural intention in the next year (α = .95). In order to investigate spillover effects, we assessed the constructs of energy-related pro-environmental intentions with seven items (α = .77) and non-energy related pro-environmental intentions with six items (α = .66).

Several independent variables were asked: Three items each measured descriptive norm trends (α = .90) and injunctive norm trends (α = .80). Moreover, we constructed a collective relative autonomous index adding nine self-determined motivation items (α = .90) and subtracting nine controlled motivation items (α = .75), that also constitute their own scales. Our moderator social identification with Europeans was measured with three items (α = .66). We further measured several variables that are not central to the study in this deliverable: Collective efficacy, individual self-determined motivation, bottom-upness, behavioural beliefs, individual vision, and chronic need frustration. At the end of the survey participants were asked about demographic information (age, gender, psychological study background), and whether they were concentrated while filling out the survey.

4.4.4 Data preparation and analyses

We performed data analysis with R Statistics version 4.2.0, and data management with SPSS 29. Excluding criteria were defined during the pre-registration process. We excluded 12 participants for not passing the attention test. No participant had to be excluded due to low concentration rates. Two participants were excluded as they exceeded the preregistered 20% of missing values. We examined 15 participants with very fast completion time (DEG_TIME > 75), and excluded one participant who showed a curious answering pattern (i.e. often checked opposing scale extremes for highly correlated items). No further participants had to be excluded for curious answering patterns. As pre-registered, we also excluded seven participants who guessed the study target. This high rate can be explained by the sample that included many psychology students.

Moreover, the initial 19 participants also completed a task for strengthening social identification at the start of the questionnaire. As we received a lot of negative feedback for this task, we decided to drop it for the remaining participants. We checked whether these participants significantly diverged from the rest of the sample and found no difference in main dependent and independent variables. The only trend emerged with regard to social identification in the opposing direction, so that participants who engaged in the strengthening task reported lower social identification with Europeans, $t(299)= 1.92$, $p = .055$, however, this trend was also not significant. Due to this arbitrary finding that opposes previous research, we decided to keep all participants in the sample as we detected no systematic differences.

Main analyses were conducted with non-transformed scales. For analysing our data, we applied ANOVAS with contrast tests, and multiple regression analyses. We report Welch's *F* test whenever Levene's test of heterogeneity of variances was significant.

4.4.5 Results

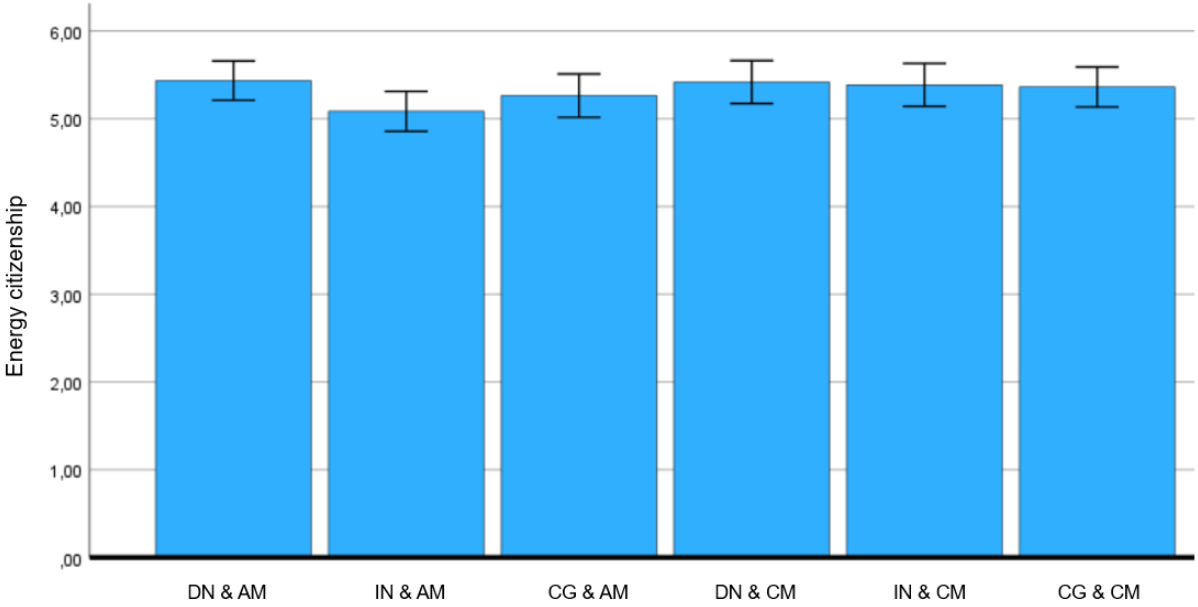
First, we tested whether the manipulation was successful. In line with our manipulation, the descriptive trend norm condition increased perceived descriptive trending norms compared to the control group and injunctive trend norm condition, $t(294) = 4.51$, $p < .001$. Supporting our manipulation, the injunctive trend norm condition increased perceived injunctive trending norms compared to the control group and descriptive trend norm condition, $t(293) = 4.07$, $p < .001$. Furthermore, the collective self-determined (vs. controlled) motivation increased the collective relative autonomy index, $t(290) = 3.96$, $p < .001$. Thus, our manipulation was successful, and in this study, agency indicators did not influence each other. In Table 22, we report our main dependent variables' means and standard deviations in all conditions.

Table 22. Means and standard deviations of all conditions.

	DN & AM	IN & AM	CG & AM	DN & CM	IN & CM	CG & CM
	M (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)
Energy citizenship	5.43	5.08	5.26	5.42	5.39	5.36
	(0.91)	(0.98)	(0.83)	(0.80)	(0.72)	(0.75)
Collective action intentions	4.13	3.67	4.19	4.08	4.01	4.05
	(1.36)	(1.34)	(1.23)	(1.30)	(1.21)	(1.23)
Energy-related PEB intentions	5.64	5.52	5.71	6.01	5.73	5.96
	(1.06)	(1.15)	(0.98)	(0.81)	(0.87)	(0.86)
Non-energy PEB intentions	5.48	5.68	5.52	5.67	5.43	5.66
	(0.97)	(0.96)	(0.75)	(0.98)	(0.90)	(0.79)

Note. DN = descriptive norm trend, IN = injunctive norm trend, AM = collective autonomous (i.e. self-determined) motivation, CM = collective controlled motivation, CG = control group.

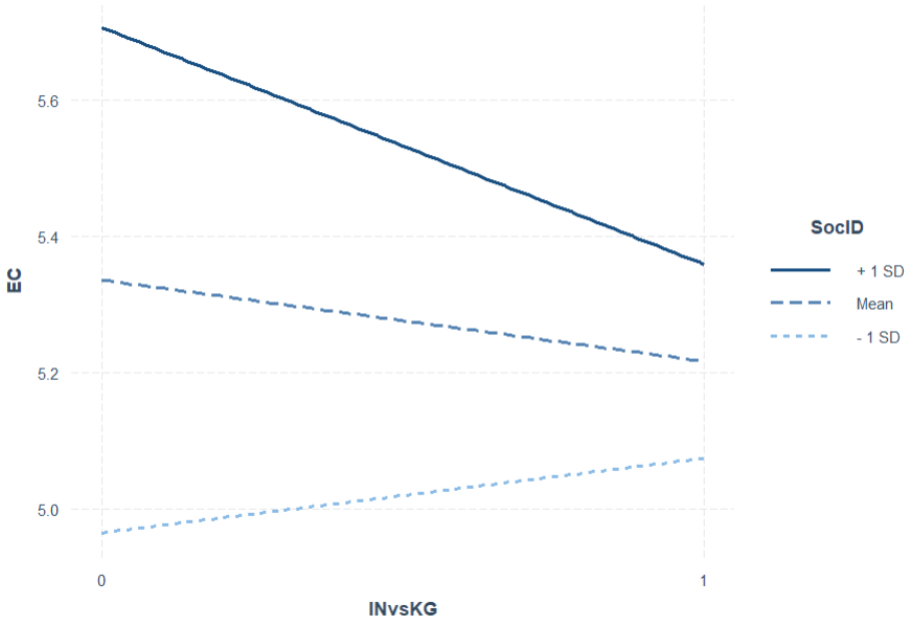
Figure 12. Mean values of collective energy citizenship across conditions.



Note. DN = descriptive norm trend, IN = injunctive norm trend, AM = collective autonomous (i.e. self-determined) motivation, CM = collective controlled motivation, CG = control group.

According to H1, we expected that social norms would influence energy citizenship and collective action intentions, and that these effects would be moderated by social identification. We did not find significant differences in energy citizenship when comparing the control group to the injunctive norm condition, $t(292) = -0.65$, $p = .519$, and the descriptive norm condition, $t(292) = 0.95$, $p = .343$. While social identification did not moderate the descriptive norm effect, B = 0.02, $t = 0.20$, $p = .843$, we found a non-significant moderation trend for social identification and the injunctive norm condition, B = -0.25, $t = -1.94$, $p = .054$. Precisely, we find that injunctive norms (vs. control group) decrease energy citizenship in high identifiers (+1SD: B = -0.35, $t = -2.17$, $p = .03$), and do not affect it in moderate identifiers (0SD: B = -0.12, $t = -1.08$, $p = .28$) or low identifiers (-1SD: B = 0.11, $t = 0.67$, $p = .50$), as depicted in Figure 13. This pattern is opposite to what we would have expected.

Figure 13. Interaction of social identification and injunctive norm condition (vs. control group) in explaining energy citizenship.



Note. 1 = injunctive norm condition, 0 = control group, EC = energy citizenship, SocID = social identification.

With respect to collective action intentions, the control group did not differ significantly from the injunctive norm condition, $t(295) = -1.55$, $p = .123$, or the descriptive norm condition, $t(295) = -0.10$, $p = .922$. Social identification did not moderate the injunctive norm effect, B = -0.28, $t = -1.37$, $p = .173$, and the descriptive norm effect, B = 0.06, $t = 0.32$, $p = .749$.

Contrary to H2, we found that the self-determined motivation condition and the controlled motivation condition did not differ significantly for energy citizenship, $t(292) = -1.31$, $p = .192$, and collective action intentions, $t(290) = -0.34$, $p = .736$. Opposing H3, two-way ANOVAs showed that our social norm factor (descriptive vs. injunctive) and goal motivation factor (self-determined vs. controlled) did not interact with regard to energy citizenship, $F(1, 200) = 1.68$, $p = .197$, and collective action intentions, $F(1, 203) = 1.16$, $p = .283$.

In contrast to our H4 spillover hypothesis, there was no difference in energy-related PEB intentions of the control condition when compared to the injunctive norm condition, $t(295) = -1.53$, $p = .127$, and the descriptive norm condition, $t(295) = -0.07$, $p = .942$. Also, we found no difference in non-energy related PEB intentions of the control condition when compared to the injunctive norm condition, $t(295) = -0.25$, $p = .802$, and the descriptive norm condition, $t(290) = -0.12$, $p = .907$. Other than expected, the self-determined (vs. controlled) motivation condition decreased energy-related PEB intentions, $t(290) = -2.48$, $p = .014$. Yet, there was no difference between these conditions for non-energy related PEB intentions, $t(290) = -0.29$, $p = .773$.

4.4.6 Discussion Study 5

While we successfully managed to manipulate descriptive norms, injunctive norms, and collective self-determined (vs. controlled) motivation, most of our hypotheses were not

confirmed. Contrary to H1 and H2, there was no effect of our social norm and self-determined motivation manipulations on either energy citizenship or collective action intentions. Moreover, the effects were not significantly moderated by social identification.

We also found no interaction of the social norm and goal motivation manipulation as expected in H3. Opposing H4, conditions also did not differ with respect to non-energy related PEB intentions. The only main effect present in this study was that self-determined (vs. controlled) motivation decreased energy-related PEB intentions, which was contrary to our expectation. Yet, this finding is difficult to interpret as spillover as a main effect on collective action intentions was absent. Overall, our descriptive results indicate that, other than with individual controlled motivation, collective controlled motivation may be more relevant for motivating behaviour. Going beyond Study 5, we wanted to gather more information on the agency indicator of self-determined motivation in Study 6.

4.5 Study 6: social norms and collective aims (energy transition)

Study 6 constituted the Bachelor's thesis of Marie-Christin Nelles (University Leipzig). It investigated the influence of collective goal motivation and the descriptive norm of a reference group on energy citizenship and spillover intentions (RQ2 & RQ3). Precisely, we tested a 2 (self-determined vs. controlled collective aim) x 2 (local vs. global reference group) between-subject design.

4.5.1 Hypotheses

Hypotheses were pre-registered on the Open Science Framework (https://osf.io/gcrmj). We have adapted the formulation of the hypotheses to make them comprehensible for this deliverable. We proposed the following hypotheses for this deliverable:

H1: Main effect self-determined collective aims
a) Participants of the condition with self-determined (vs. controlled) collective aim motivation have higher energy citizenship.
b) Participants of the condition with self-determined (vs. controlled) collective aim motivation have higher collective action intentions.

H2: Main effect local reference group
a) Participants of the condition with local (vs. general) reference group have higher energy citizenship.
b) Participants of the condition with local (vs. general) reference group have higher collective action intentions.

H3: We propose that the level of social identification with the reference group moderates the association of self-determined motivation with the abovementioned DVs.

H4: Spillover effects
We expect a spillover from energy-related collective action intention to energy-related private intention and non-energy-related behaviour intentions, in that the above mentioned effects of self-determined motivation and reference group also apply for energy-related PEB intentions and non-energy-related PEB intentions.

4.5.2 Sample characteristics

From 29th April to 12th of August 2022, we collected data for this study. We distributed the survey through flyers and various online channels such as mailing lists, social media platforms and personal contacts. As an incentive, participants had the chance to win one of three vouchers for an online store, each worth 15 Euro, and could receive course credit.

We based power analysis on Agerström et al. (2016) who investigated our second hypothesis in a related field (N = 135, r = .21). To ensure sufficient power (.80) and use the standard .05 alpha error probability, we pre-registered to collect at least 42 participants per cell. Due to expected dropout rates, we aimed to reach a minimum sample size of 168 participants (after excluding participants that failed our concentration checks). 1424 people clicked on the survey and 502 of them started the survey. Due to a programming error, participants who did not watch a video and did not leave an email address could not read the clarification. We therefore decided to exclude 28 participants who did not receive the clarification, posing a possible threat to our conclusions in this study. Overall, 160 participants finished the survey and received the study clarification.

After applying exclusion criteria, we reached a sample size of N = 148 participants. These were distributed evenly across our four conditions, with 35 (23,6%) in the general reference group and self-determined motivation condition, 38 (25,7%) in the general reference group and controlled motivation condition, 40 (27,0%) in the local reference group and self-determined motivation condition, and another 35 (23,6%) in the local reference group and controlled motivation condition. The sample had a mean age of 30 years (SD = 8,221, range: 18 – 67). Of this sample, 104 (70.3%) participants were female, 34 (23.0%) were male, and 9 (6.1%) identified as diverse.

4.5.3 Procedures and measures

As a survey platform, we used sosci survey (Leiner, 2020). The average questionnaire duration was 28.57 minutes (SD = 11.77). Data collection followed APA guidelines for the ethical conduct of research and included informed consent. Afterwards participants were informed about the study context. The study set up was a 2 (self-determined vs. controlled) x 2 (general vs. local) between subject design. A fictional online news article was used as a manipulation describing current developments regarding the energy transition supported by opinion polls. Participants in the self-determined general reference group condition read a text about Europeans supporting the energy transition out of joy and personal meaning. Participants in the controlled general reference group condition read a text about Europeans supporting the energy transition out of financial, social pressure, and energy security reasons. Participants in the self-determined local reference group condition read a text about Leipzig citizens supporting the energy transition out of joy and personal meaning. Participants in the condition with controlled local reference group read a text about Leipzig citizens supporting the energy transition out of financial, social pressure, and energy security reasons. The Appendix shows an exemplary German manipulation text.

Unless stated otherwise, constructs were answered on a 7-point Likert scale ranging from 1 (completely disagree/not at all true/never applies) to 7 (completely agree/completely true/always applies). The dependent variables were operationalized as follows and adapted

from Study 1: We measured individual energy citizenship with nine items (α = .85). Eight items assessed collective action intentions (α = .89). We measured energy-related PEB intentions with eleven items (α = .79) and non-energy related PEB intentions with six items (α = .75). We also assessed another measure of actual PEB (i.e. voluntary watching and rating of up to three You-Tube videos on the topic of the energy transition. However, due to our programming error, we refrained from an analysis of this variable.

As additional independent variables, we constructed a collective relative autonomy index of Europeans and a relative autonomy index of citizens of Leipzig with 17 items each. Three items each measured perceived descriptive norm trends of Europeans (α = .74) and Leipzig citizens (α = .65). Moreover, we assessed social identification with Europeans (α = .77) and Leipzig citizens (α = .80) with three items each.

At the end of the questionnaire, participants were asked about socio demographic parameters, attention checks, the plausibility of the text manipulations as well as an self-reported evaluation of the cognitive load after reading the text in the beginning. Other constructs that were included but are not relevant for this deliverable are the following: collective efficacy of Europeans and Leipzig citizens; individual visions; individual self-determined motivation; need for autonomy; the extent of perceived energy security on a personal, European and German level; the previous private and professional commitment to the energy transition, captured by asking the use of green electricity/gas, photovoltaic systems/balcony modules and membership in an energy cooperative.

4.5.4 Data preparation and analyses

We performed data analysis with R Statistics version 4.2.0, and data management with SPSS 29. Following the exclusion criteria, from the originally 160 participants who finished the survey and read the clarification, we excluded eight participants who failed the concentration check and one participant as they had more than the pre-registered 20% missing values. We observed seven participants with RSI > 2 for their answering patterns but none was irregular. Additionally, we checked the sample for curious answering patterns and excluded one participant who only checked “6” and wrote nonsense in the open answering field. Two participants were excluded as one guessed the study target and the other one did not write anything in the open answering fields. As stated above, we arrived at a final sample of N = 148 participants. We analysed hypotheses 1, 2 and 4 using ANOVAs, and H3 using regression analyses.

4.5.5 Results

Manipulation checks showed that our manipulation was partially successful. The self-determined (vs. controlled) motivation condition increased the collective relative autonomy index for Leipzig citizens, $t(144) = 2.40$, $p = .018$, but not for EU citizens, $t(144) = 1.23$, $p = .222$. Our reference group manipulation was successful. The general EU (vs. local Leipzig) reference group increased descriptive norm trends of EU citizens, $t(127) = 2.12$, $p = .036$ (corrected for unequal variances due to significant Levene’s test), but not that of Leipzig citizens, $t(142) = 0.60$, $p = .551$. Surprisingly, the self-determined motivation manipulation also influenced perceived descriptive norm trends, in that self-determined (vs. controlled) motivation decreased descriptive norm trends of EU citizens, $t(127) = -2.70$, $p = .008$ (corrected for

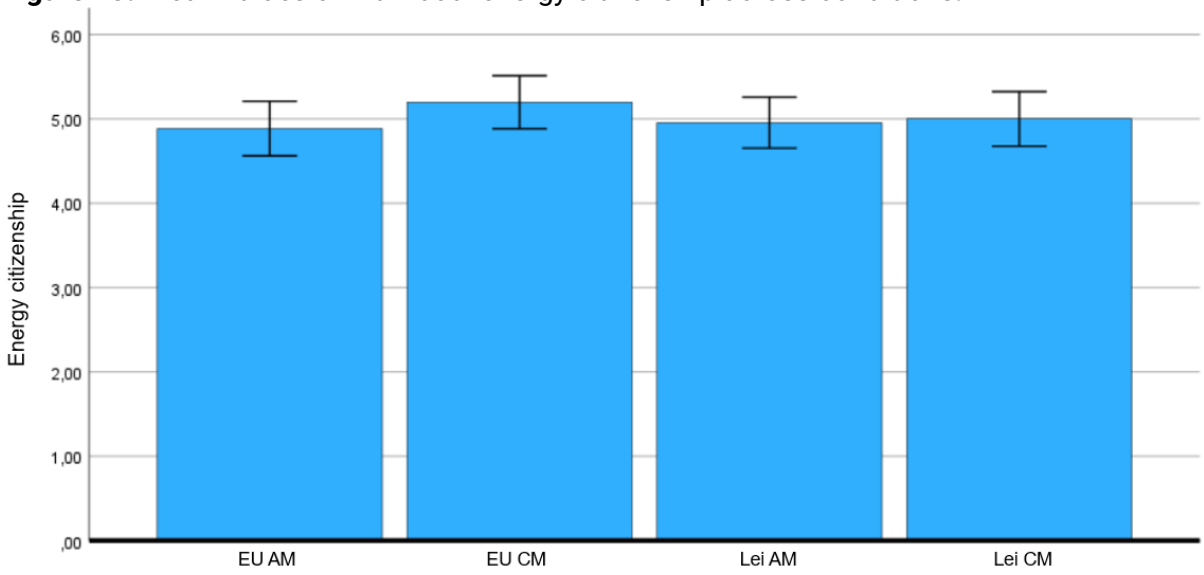
unequal variances), and Leipzig citizens, $t(142) = -2.53$, $p = .013$. In Table 23, we report means, standard deviations, and group comparisons of main dependent variables in all conditions.

Table 23. Means, standard deviations and group comparison of all conditions.

	EU AM	EU CM	Lei AM	Lei CM	Group comparison (ANOVA results)	
	M (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	*F*/ Welch's *F*	*p*
Individual energy citizenship	4.89 (0.95)	5.20 (0.81)	4.96 (1.13)	5.00 (0.93)	.70	.552
Collective action intentions	3.24 (1.49)	3.42 (1.23)	3.24 (1.24)	3.48 (1.19)	.34	.800
Energy-related PEB intentions	4.67 (1.07)	4.84 (0.74)	4.80 (0.92)	4.89 (0.85)	.37	.775
Non-energy PEB intentions	5.25 (1.23)	5.68 (0.83)	5.40 (1.03)	5.45 (1.04)	1.22	.308

Note. EU = European Union, AM = autonomous (i.e. self-determined) motivation, CM = controlled motivation, Lei = Leipzig. Due to a significant Levene's test, we calculated Welch's *F* for non-energy PEB intentions.

Figure 13. Mean values of individual energy citizenship across conditions.



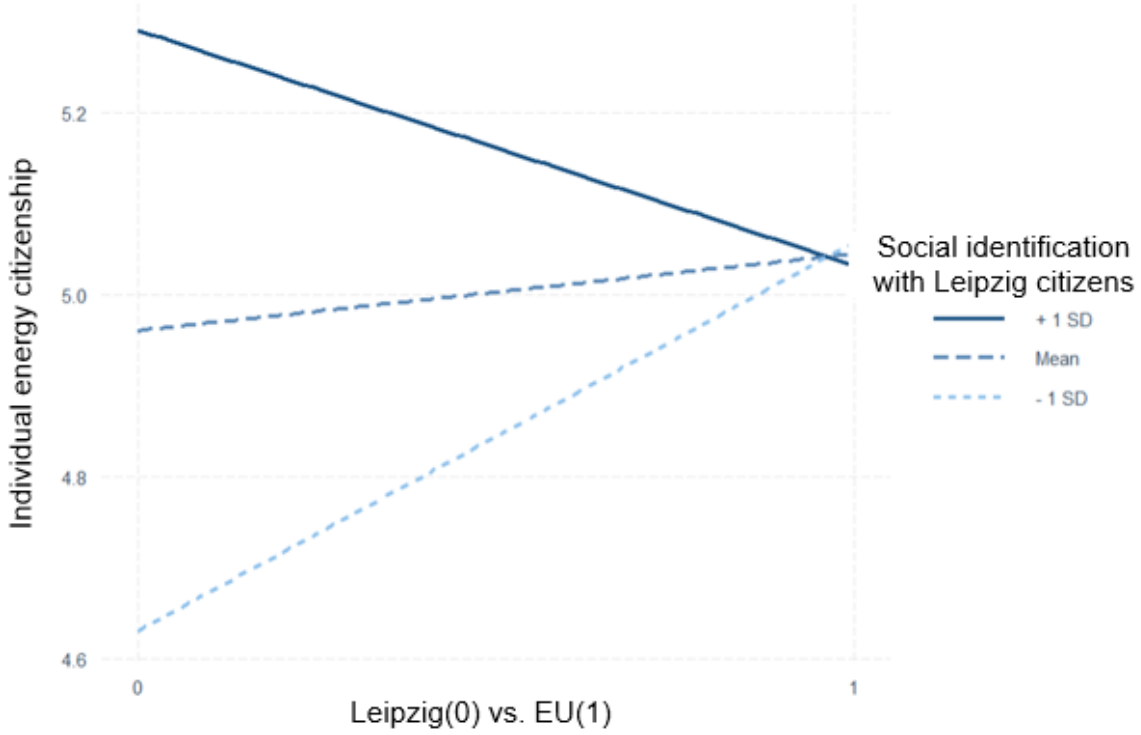
Note. EU = European Union, AM = autonomous (i.e. self-determined) motivation, CM = controlled motivation, Lei = Leipzig.

Contrary to H1, we did not find a significant difference in energy citizenship, $t(143) = -1.12$, $p = .266$, and collective action intentions, $t(144) = -0.99$, $p = .325$, when comparing the self-determined (vs. controlled) collective aim motivation conditions. Opposing H2, we also did not find a significant difference in energy citizenship, $t(143) = 0.40$, $p = .689$, and collective action intentions, $t(144) = -0.15$, $p = .878$, when comparing the local Leipzig (vs. general EU) collective aim motivation conditions.

In H3, we proposed that social identification would moderate our effects. Indeed, we found that social identification with EU citizens, B = -0.37, $t = -2.13$, $p = .035$, and Leipzig citizens, B

= -0.34, t = -2.19, p = .030, moderated the effect of the self-determined motivation conditions. For identification with Leipzig citizens, our data showed that for higher identifiers, EU (vs. Leipzig) reference group decreased energy citizenship (+1SD: B = -0.26, t = -1.17, p = .24), while it slightly increased for lower identifiers (-1SD: B = 0.43, t = 1.93, p = .06). Intriguingly, we found a similar pattern for identification with EU citizens, indicating that the EU (vs. Leipzig) reference group increased energy citizenship for participants with low social identification in general, and decreased it for participants with high identification (see Figure 14). Yet, it is necessary to consider that overall means of social identification were already very high for Europeans 4.79 (-1SD), 5.68 (0SD), 6.57 (+1SD), and Leipzig citizens 4.24 (-1SD), 5.25 (0SD), 6.26 (+1SD), on a 1 to 7 scale.

Figure 14. Interaction of social identification and EU (vs. Leipzig) reference group in explaining energy citizenship.



Looking at other moderation effects, we found no significant interaction of social identification (EU and Leipzig) with the self-determined motivation conditions for both energy citizenship and collective action intentions (ps < .05). Moreover, social identification (EU and Leipzig) did not interact with the EU (vs. Leipzig) reference group condition in predicting collective action intentions (ps < .05).

Contrary to H4, we found no spillover effects. There was no difference between self-determined and controlled motivation conditions with regards to energy-related PEB intentions, t(144) = -0.88, p = .382, and non-energy related PEB intentions, t(128) = -1.40, p = .163 (corrected for unequal variances due to significant Levene's test). Similarly, we found no difference between local Leipzig and general EU reference group with regards to energy-

related PEB intentions, $t(144) = -0.56$, $p = .576$, and non-energy related PEB intentions, $t(128) = 0.24$, $p = .808$ (corrected for unequal variances).

4.5.6 Discussion Study 6

Similar to Study 5, this study does not provide evidence for agency as a causal predictor of energy citizenship, collective action intentions, and pro-environmental spillover. While we successfully manipulated self-determined motivation and descriptive trending norms of the respective reference group, the self-determined motivation manipulation also influenced perceived descriptive norm trends. Precisely, controlled motivation increased perceived norm trends, which is a novel finding with regard to how agency indicators may influence each other.

Yet, contrary to H1, H2 and H4, self-determined (vs. controlled) motivation and Leipzig (vs. EU) reference group did not influence individual energy citizenship, collective action intentions, energy-related PEB intentions, and non-energy related PEB. With respect to H3, we found a significant interaction of reference group condition with social identification, in that EU (vs. Leipzig) reference group increased energy citizenship for participants with lower social identification with both Leipzig and EU citizens, and decreased it for participants with higher identification. However, it remains unclear how this moderation can be explained theoretically. It may be possible that introducing a rather novel, broader and more inclusive social identity may elicit more commitment in those who are not already extremely identified with social groups. As mentioned above, however, the results of this study should be interpreted with caution due to the programming error that caused a systematic dropout of $n = 28$ participants. Moving beyond the self-determination indicator of collective agency, Studies 7 – 9 focused on the collective efficacy indicator and its potential mediating role in the effect from descriptive norms on energy citizenship, collective action and pro-environmental spillover.

4.6 Study 7: social norms and collective efficacy (energy communities)

Study 7 examined how collective efficacy can alter the effect of descriptive norms in a setting of energy communities and their members. Specifically, we tested how the manipulation of either high, low or no collective efficacy would influence energy citizenship, collective action intentions within participant's energy communities and spillover effects (RQ2 & RQ3). Specifically, we tested a 1 x 3 (collective efficacy high/low/control) between-subjects design.

4.6.1 Hypotheses

Hypotheses were pre-registered on the Open Science Framework (https://osf.io/k89wj). We have adapted the formulation of the hypotheses to make them comprehensible for this deliverable. We proposed the following hypotheses for this deliverable:

H1: Collective efficacy influences intentions.
a) The high collective efficacy condition (vs. low) increases collective energy citizenship and collective action intentions (i.e. public/activist intentions).
b) The high collective efficacy condition (vs. control group) increases collective energy citizenship and collective action intentions.
c) The low collective efficacy condition (vs. control group) decreases collective energy citizenship and collective action intentions.

H2: Spillover on energy-related and non-energy PEB intention
a) The high collective efficacy condition (vs. low, vs. control group) increases energy-related PEB intention.
b) The high collective efficacy condition (vs. low, vs. control group) increases non-energy PEB intention.

4.6.2 Sample characteristics

Data collection took place from 2nd July to 27th August 2023. We distributed the survey through online channels such as mailing lists, websites, and personal contacts to reach energy community members. Moreover, we called energy communities directly in order to ask for their participation. Participants had the chance to win one of six 50€ vouchers for a sustainable online store.

Our power analyses were based on previous correlational and experimental work. Previous correlational research revealed medium to large relations between collective efficacy and collective action (intentions) (*d* = .72, Broszeit, 2020; *d* = .70 in Study 1 of this deliverable). Experimental work has found small to medium effect sizes (*d* = 0.35, Jugert et al., 2016, Study 4; *d* = 0.56, van Zomeren et al., 2010, Study 2). We conducted a power analysis with G*Power. Due to our rare sample population, we define a minimum sample size and an intended sample size. We calculated the effect size for a two-tailed independent t-test with the aim of detecting a small to medium effect size *d* = .35 to *d* = .56 (Jugert et al., 2016; van Zomeren et al., 2010), a standard error probability (α = .05), and an acceptable power of .80. Due to our rare sample (i.e. members of energy communities), we defined a minimum and intended sample size. Power analyses indicated a minimum sample size of *n* = 51 participants per group and a total of 153 participants for this study. However, our intended sample size is *n* = 129 participants per group and a total of 387 participants.

471 people clicked on and 438 started the survey. Dropout was lower in the condition without efficacy manipulation (34.2%) than in the conditions with high collective efficacy (43,2%) or low collective efficacy (49,3%). Of all participants, 253 finished the survey and said that after reading the study clarification, they agreed that their data would be used. After applying exclusion criteria, the final sample size was *N* = 241 participants that were quite evenly distributed across the three conditions: high collective efficacy (33,2%), low collective efficacy (28,6%), no collective efficacy manipulation (38,2%).

Our sample contained 58 (24.1%) participants who identified as female and 183 (75.9%) participants who identified as male. The average age of participants was 58 years (year of birth, *M* = 1965.22, *SD* = 12.70, range: 1934 to 2000). With regard to participant's education level, 8 (3.3%) of the participants had a secondary modern school qualification, 25 (10.4%) had a high-school diploma, 3 (1.2%) had a ten-class polytechnic secondary school certificate, 19 (7.9%) had a university of applied sciences entrance qualification, and 20 (8.3%) had a higher education entrance qualification. Over half of the participants, 156 (64.7%), had a university degree. Four (1.7%) participants checked "other degree". Regarding participant's occupation, we found that 2 (0.8%) were currently university students. Half of the sample, 105 (43.6%), was employed. Another 26 (10.8%) were public servants, 31 (12.9%) were freelancers, one (0.4%) was unemployed, and 75 (31.1%) checked the "other" category. Open comments

indicated that our sample contained a lot of participants that were already retired. Participants also indicated their income level. Two (0.8%) participants had no income, three (1.2%) earned less than 250€[3], seven (2.9%) earned 500€ to less than 1000€, ten (4.1%) earned 1000€ to less than 1500€, 22 (9.1%) earned 1500€ to less than 2000€, 38 (15.8%) earned 2000€ to less than 2500€, 33 (13.7%) earned 2500€ to less than 3000€, 29 (12.0%) earned 3000€ to less than 3500€, 20 (8.3%) earned 3500€ to less than 4000€, and 50 (20.7%) earned more than 4000€. Another 27 (11.2%) participants did not want to answer this question. As expected for energy community members, participants had a higher income than the German average (Statista, 2023). We also assessed the size of participant's energy communities. On average, participants' energy community had M = 475.18 members (SD = 1065.37, range: 2 to 12000).

4.6.3 Procedures and measures

We programmed a questionnaire using Qualtrics (Qualtrics, Provo, UT, 2023). On average, participants took *M* = 27.57 minutes (*SD* = 15.72) to finish the survey. Data collection followed APA guidelines for the ethical conduct of research, and included informed consent before the start of the study, and a clarification about the study context after the study had ended. This study was approved by the ethics committee of the University of Groningen.

Study 7 comprised a 3 (collective efficacy high vs. low vs. not manipulated) factorial design, while keeping the collective action indicator of agency constantly high. Participants in the high collective efficacy condition were instructed to write about an experience in their energy community in which community members worked well together and were successful. Participants in the low collective efficacy condition wrote about an experience in which community members worked well together and were unsuccessful. Participants in the no collective efficacy condition wrote about an experience in which community members worked well together, without giving further instructions on their perceived success. The following instructions show how we manipulated collective efficacy in this study:

First, we describe what energy communities are.

What are energy communities?

Energy communities are initiatives for the collective promotion of a sustainable energy transition. Energy communities produce, distribute, supply, consume or store energy or provide other energy services for their members (e.g. in the form of an energy cooperative or neighbourhood initiative).

Second, only energy community members are included in the study.

Then, the manipulation follows.

This task is about describing an experience in your energy community. Please recall a moment/experience/experience in which

[3] Due to a programming error, one category of 250–500€ was missing.

DN high, CE high:

... many members of your energy community acted for a common goal and worked well together and then you actually achieved YOUR GOAL. Please describe your memory as accurately as possible in the text box provided.

There are no right or wrong answers. It is about your own experience. Please try to write at least 100 words. Please take at least 3 minutes to do this.

This is a moment/experience/experience where we in the energy community acted for a common goal and worked well together and then we really achieved our goal:

DN high, CE low:

... many members of your energy community acted for a common goal and worked well together and then you did NOT ACHIEVE YOUR GOAL. Please describe your memory as accurately as possible in the text box provided.

There are no right or wrong answers. It is about your own experience. Please try to write at least 100 words. Please take at least 3 minutes to do this.

This is a moment/experience/experience where we acted and worked well together in the energy community for a common goal and then we did not achieve our goal:

DN high, CE no mentioning:

... many members of your energy community acted for a common goal and worked well together. Please describe your memory as accurately as possible in the text box provided.

There are no right or wrong answers. It is about your own experience. Please try to write at least 100 words. Please take at least 3 minutes to do this.

This is a moment/experience where we in the energy community acted for a common goal and worked well together:

Then, we will present various scales to measure collective agency, public/activist intentions and further variables.

After the manipulation, we assessed several psychological measures. Unless stated otherwise, constructs were answered on a 7-point Likert scale ranging from 1 (completely disagree/not at all true/never applies) to 7 (completely agree/completely true/always applies). The survey contained the following measures that are relevant to this study and were adapted from Study 1: nine items measured collective energy citizenship (α = .85), twelve items measured collective action intentions in the energy community (α = .92), seven items measured energy-related PEB intentions (α = .75), and another four items assessed non-energy related PEB intentions (α = .77). As an independent variable, two items assessed to which degree people stated they wrote about a moment of collective efficacy in the open manipulation fields (r = .70). Moreover, we assessed collective efficacy of the energy community with three items (α = .83).

We also measured demographic information (age, gender, education, job, income, and country code, job hours, care working hours). The study also included other variables that are not relevant or analysed for this deliverable: Descriptive norms of energy community, collective aim of energy community, self-determined motivation of energy community, engagement hour intention in energy community, general collective action intentions, social identification with energy community, hope, visions, outcome expectancy.

4.6.4 Data preparation and analyses

We performed data analysis with R Statistics version 4.2.0 and data management with SPSS 29. Of the initial 253 participants who finished the survey, we excluded eight participants who failed both concentration check items, two participants due to a missing value rate above the pre-registered 20%, and two participants who wrote nonsense in the open answering field. We checked the dataset for curious answering patterns but none were irregular. Furthermore, no participant guessed the study target, so that we arrived at our final sample size of N = 241 participants. It is relevant to note that 33.6% did not choose the correct manipulation at the end of the questionnaire when asked for their specific condition, indicating that a distinction between conditions was highly difficult.

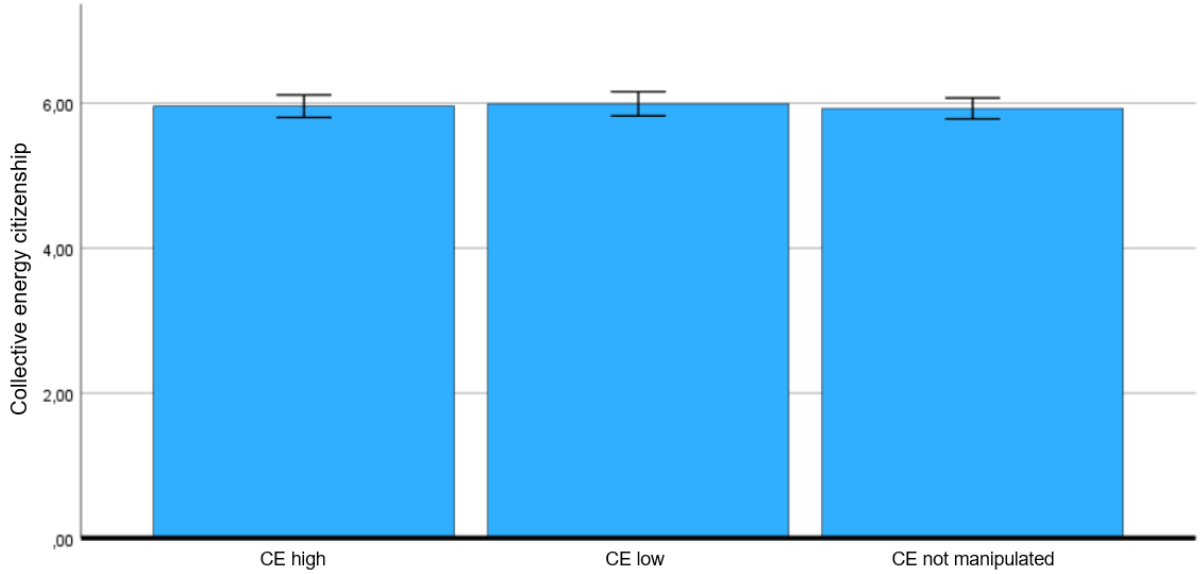
4.6.5 Results

Due to a significant Levene's test with respect to our manipulation check scale, we report contrast effects for unequal variances. In line with our manipulation, participants in the high collective efficacy condition, $t(126) = 5.02$, $p < .001$, and the no efficacy condition, $t(126) = -4.94$, $p < .001$, reported writing more about efficacious experiences than in the low efficacy condition. Yet, unexpectedly, there was no difference between the high and no collective efficacy condition, $t(167) = 0.17$, $p = .866$, suggesting that people who are instructed to think about an experience of working well together directly think of efficacious moments. Thus, only part of our manipulation was successful. Notably, when looking at our collective efficacy scale, we found no difference between conditions, $F(2, 238) = 1.19$, $p = .308$. Conditions did not differ significantly in how difficult they were perceived ($p > .05$). Table 24 shows means, standard deviations, and group comparisons of main dependent variables in all conditions.

Table 24. Means, standard deviations and group comparison of all conditions.

	CE high condition	CE low condition	CE not mentioned condition	Group comparisons (ANOVAs)	
	M (*SD*)	*M* (*SD*)	*M* (*SD*)	*F*	*p*
Collective energy citizenship	5.96 (0.79)	5.99 (0.72)	5.93 (0.60)	0.16	.849
Collective action intentions	5.11 (1.11)	5.20 (1.13)	4.97 (1.17)	0.83	.437
Energy-related PEB intentions	5.63 (0.81)	5.69 (0.98)	5.62 (0.83)	0.13	.878
Non-energy PEB intentions	5.23 (0.95)	5.32 (1.16)	5.38 (1.11)	0.47	.628

Figure 14. Mean values of collective energy citizenship across conditions.



Note. CE = Collective efficacy.

As indicated in Table 24, none of the conditions differed significantly. Contrary to H1, the high collective efficacy condition did not increases collective energy citizenship when compared to the low collective efficacy condition, $t(238) = -0.29$, $p = .773$, or the no collective efficacy condition, $t(238) = 0.29$, $p = .776$. Also, the low and no collective efficacy conditions did not differ with regard to collective energy citizenship, $t(238) = 0.57$, $p = .568$. As for collective action intentions, we found no increase in the high collective efficacy condition when compared to the low collective efficacy condition, $t(235) = -0.46$, $p = .643$, or the no collective efficacy condition, $t(235) = 0.82$, $p = .415$. Additionally, the low and no collective efficacy conditions did not differ with regard to collective action intentions, $t(235) = 1.26$, $p = .210$.

Opposing H2, the high collective efficacy condition did not increase energy-related PEB intentions when compared to the low collective efficacy condition, $t(238) = -0.40$, $p = .688$, or the no collective efficacy condition, $t(238) = 0.07$, $p = .943$. Furthermore, the high collective efficacy condition did also not increase non-energy related PEB intentions when compared to the low collective efficacy condition, $t(238) = -0.55$, $p = .582$, or the no collective efficacy condition, $t(238) = -0.96$, $p = .337$.

4.6.6 Discussion Study 7

Our manipulation partially worked and increased people's writing about efficacious moments in energy communities. Yet, a condition in which not collective efficacy but only collective action was prompted led participants to describe similarly efficacious moments. This indicates an inclination in energy community members to write of efficacious moments when thinking about working well together, and a potential influence between agency indicators from the collective action indicator to the collective efficacy indicator. It is further noteworthy that we did not find any difference between conditions with respect to measured collective efficacy of the energy community, suggesting that writing about collective efficacy does not necessarily increase participants' perceived collective efficacy.

Possibly due to the lacking effect on collective efficacy, our manipulation did not influence energy community members' energy citizenship, collective action intentions, or pro-environmental spillover intentions. Possible explanations would be that other factors are more important in driving people's motivation to engage in their energy communities, that member's engagement rates are quite stable, or that participants directly coped by restoring their efficacy beliefs in the low collective efficacy condition. While we did not find an effect on collective efficacy and our main dependent variables in Study 7, in the following studies, we changed the study context to energy initiatives (Study 8) and the EU as a broader energy community (Study 9) to see if these would produce different results.

4.7 Study 8: social norms and collective efficacy (energy initiatives)

In Study 8, we investigated how the collective action and collective efficacy indicators of collective agency influence collective energy citizenship and collective action intentions (RQ2). We expect a similar influence on pro-environmental spillover (RQ3). The fact that in Study 1, collective efficacy emerged as such a strong predictor of collective energy citizenship, while descriptive norms did not predict it when integrated in the same regression analysis, let us assume that collective efficacy may be an important mediator of the collective action indicator. This idea is supported by previous (partially cross-sectional) mediations showing that the effect of descriptive norms on collective action intentions is mediated via efficacy beliefs (Doherty & Webler, 2016; Gulliver et al., 2020; van Zomeren et al., 2004; Wang & Lin, 2017). We set out to test this mediation in a causal design with a specific type of energy community members: people actively involved in organisations that promote the energy transition. This was done in a 2 (goal-directed collective action high/low) x 2 (collective efficacy low/control) between-subjects design.

4.7.1 Hypotheses

Hypotheses were pre-registered on the Open Science Framework (https://osf.io/7xcgk). We have adapted the formulation of the hypotheses to make them comprehensible for this deliverable. We proposed the following hypotheses for this deliverable:

H1: Main effects of collective efficacy and collective action indicators on intentions.
a) When looking at the condition with the efficacy control group, the high collective action condition (vs. low) increases collective energy citizenship and collective action intentions (i.e. public/activist intentions).
b) Overall, the low collective efficacy condition (vs. control group) decreases collective energy citizenship and collective action intentions.

H2: Testing a mediation with moderation: Collective efficacy mediates the effect of the collective action indicator on intentions.
a) We expect an interaction of the collective action factor and the collective efficacy factor in predicting collective energy citizenship and collective action intentions. The pattern that we expect is that we find an effect of the collective action indicators in the collective efficacy control condition, while this effect is blocked in the low collective efficacy condition.

H3: Spillover on energy-related and non-energy-related PEB intentions
a) When looking at the condition with the efficacy control group, the high collective action condition (vs. low) increases energy-related and non-energy PEB intentions.
b) Overall, the low collective efficacy condition (vs. control group) decreases energy-related and non-energy PEB intentions.
c) We expect an interaction of the collective action factor and the collective efficacy factor in predicting energy-related and non-energy PEB intentions, with a similar pattern as described in H2.

4.7.2 Sample characteristics

We collected data for this study from 19th June to 27th September 2023 via online channels such as mailing lists, websites, and personal contacts, putting up flyers at the university – especially targeting environmental activists in the energy transition. As an incentive, all participants had the chance to win one of six 50€ vouchers for a sustainable online store.

We considered all main hypotheses in our power analysis. The collective action indicator has mostly been studied with the concept of descriptive norms. Correlational research has found medium to large relations between social norms and environmental (intentions), partially including collective action intentions (d = .93, Bamberg & Möser, 2007; d = 1.07, Klöckner, 2013; d = .30 in Study 1 of this deliverable). Experimental work on descriptive norms has found small effect sizes (d = 0.35, Poškus, 2016; d = 0.32, Bergquist et al., 2019, only field studies). Previous correlational research revealed medium to large relations between collective efficacy and collective action (intentions) (d = .72, Broszeit, 2020; d = .70 in Study 1 of this deliverable). Experimental work has found small to medium effect sizes (d = 0.35, Jugert et al., 2016, Study 4; d = 0.56, van Zomeren et al., 2010, Study 2). We conducted a power analysis with G*Power. Due to our rare sample population, we defined a minimum sample size and an intended sample size. We calculated the sample size for a two-tailed independent t-test with the aim of detecting a small to medium effect size d = .35 to d = .56 (Jugert et al., 2016; van Zomeren et al., 2010), a standard error probability (α = .05), and an acceptable power of .80. This resulted in a minimum sample size of n = 52 participants per group and a total of 204 participants for this study. Our intended sample size is n = 130 participants per group and a total of 520 participants.

We further used G*Power to calculate a sample size that would allow testing the interaction effect. As we have no prior data to base it on, we calculated the sample size for an F-test ANOVA interaction with four groups, df = 1, a medium effect size (f = .25), a standard error probability (α = .05), and an acceptable power of .80. This resulted in an average sample size of n = 128 per group. Thus, if the intended sample size will be reached, we are able to detect an interaction with a medium effect size.

Data collection was done simultaneously for Study 8 and Study 9, in that participants who were actively involved in an energy initiative participated in Study 8, while those who were not actively involved participated in Study 9. With respect to both studies, 2854 people clicked on the survey and 789 of them started it. Our inclusion criterion of active involvement in an energy transition initiative read as follows:

First of all, we are interested in whether you are currently involved in an environmental initiative that promotes the energy transition.
In our understanding, an environmental initiative that campaigns for the energy transition can be a small local group or a global NGO. The means of this environmental initiative can be very different from campaigns against lignite (e.g. BUND), political action (e.g. Green Party), to protests for the expansion of renewable energies (e.g. Fridays for Future). It is important that this initiative is committed to the energy transition, among other things.
Your involvement in the environmental initiative can also take a variety of forms, e.g. active participation, membership, selective support. The important thing is that you feel you belong to the environmental initiative.

Are you currently involved in an environmental initiative that promotes the energy transition?

Only looking at Study 8, 197 participants finished the survey and said that after reading the study clarification, they agreed that their data would be used (which was pre-registered). Two participants were excluded as they did not agree that their data would be used for this study.

Our final sample included *N* = 184 participants. Unfortunately, due to difficulties in recruiting exactly this type of sample, this was 20 participants less than pre-registered as minimum sample size. Therefore, non-significant findings could be due to the small sample size. Nevertheless, participants were quite evenly distributed across conditions with 52 (28.3%) in the collective action high collective efficacy control condition, 43 (23.4%) in the collective action high collective efficacy low condition, 45 (24.5%) in the collective action low collective efficacy control condition, and another 44 (23.9%) in the collective action low collective efficacy low condition. It is relevant to note that 12% of our sample did not check the correct manipulation when asked about it at the end of the questionnaire, indicating that it is difficult for participants to tell apart our agency indicator conditions.

Our sample included 113 (61.4%) participants who identified as female, 65 (35.3%) participants who identified as male, and five (2.7%) who identified as diverse. The average age of participants was 46 years (year of birth, *M* = 1977.24, *SD* = 16.04, range: 1946 to 2005). With regard to participant's education level, one participant (0.5%) was still a student, seven (3.8%) had a high-school diploma, six (3.3%) had a university of applied sciences entrance qualification, and 31 (16.8%) had a higher education entrance qualification. About three fourth of the participants, 137 (74.5%), had a university degree. One participant (0.5%) checked "other degree". With respect to participant's occupation, demographics indicate that one participant (0.5%) was still a student, one participant (0.5%) was in training, and 29 (15.8%) were currently university students. Many participants, 72 (39.1%), were employed. Another 13 (7.1%) were public servants, 25 (13.6%) were freelancers, six (3.3%) were unemployed, and 36 (19.6%) checked the "other" category. As of participants' income, three (1.6%) of them had no income, three (1.6%) earned less than 250€, 14 (7.6%) earned 250€ to less than 500€, 27 14.7%) earned 500€ to less than 1000€, 28 (15.2%) earned 1000€ to less than 1500€, 23 (12.5%) earned 1500€ to less than 2000€, 24 (13.0%) earned 2000€ to less than 2500€, 14 (7.6%) earned 2500€ to less than 3000€, 13 (7.1%) earned 3000€ to less than 3500€, 12 (6.5%) earned 3500€ to less than 4000€, and 12 (6.5%) earned more than 4000€. Another 11 (6.0%) participants did not want to answer this question. Looking at participant's ethnicity, 171 (92.9%) or our

participants described themselves as white, two (1.1%) were BIPoC (Black, Indigenous and People of Color), 4 (2.2%) said they were multi-ethnic, and one participant (0.5%) was of another ethnicity. Regarding our sample's political orientation, we found that participants were strongly leaning to the left with *M* = 2.89 (*SD* = 1.11) on a 1 to 10 scale. Further, we asked participants about the size of their environmental initiative. On average, the initiative had *M* = 38,913 members (*SD* = 156,696; range: 3 to 1,000,000). As expected of environmentally involved people in Germany, we therefore had a well-educated, well-situated, left-wing and predominantly white sample.

4.7.3 Procedures and measures

For data collection, we used the platform sosci survey (Leiner, 2020). On average, participants took *M* = 20.57 minutes (*SD* = 7.15) to fill out the survey. Our data collection followed APA guidelines for the ethical conduct of research, and included informed consent prior to starting the survey and after receiving a study clarification. It was approved by the ethics committee of ZSI.

The study included a 2 (collective action high vs. low) x 2 (collective efficacy control vs. low) design. In a task called "your experience", participants had to take three minutes to share their experience. Participants in the collective action high and collective efficacy control condition were instructed to write an experience where they worked well together in their energy initiative, participants in the collective action high and collective efficacy low condition wrote down an experience where they worked well together in their energy initiative but they achieved nothing, participants in the collective action low and collective efficacy control condition were instructed to write an experience where they did not work well together in their energy initiative, and participants in the collective action low and collective efficacy low condition wrote down an experience where they did not work well together in their energy initiative and achieved nothing. In the following, we give an overview of the instructions that participants received:

Collective action high & collective efficacy control
This task is about describing an experience in your environmental initiative. Please recall a moment/experience in which, in your opinion, many members of your environmental initiative WORKED WELL TOGETHER (e.g. because many people found each other for a project or you were all together in "implementation mode"). Please describe your memory as accurately as possible in the text boxes provided.
There are no right or wrong answers. It is about your own experience. Please try to write at least 25 words per question. Please allow at least 3 minutes for this.

This is a moment/experience where we worked well together in my environmental initiative:

In this way, we worked well together:

Collective action high & collective efficacy low
This task is about describing an experience in your environmental initiative. Please recall a moment/experience in which, according to you, many members of your environmental initiative WORKED WELL TOGETHER (e.g. because many people found each other for a project

or you were all together in "implementation mode") and then in the end you achieved no effect and had NO IMPACT. Please describe your memory as accurately as possible in the text boxes provided.
There are no right or wrong answers. It is about your own experience. Please try to write at least 25 words per question. Please allow at least 3 minutes for this.

This is a moment/experience where we worked well together in my environmental initiative and did not achieve anything:

In this way we worked well together:

We could not achieve this impact:

Collective action low & collective efficacy control
This task is about describing an experience in your environmental initiative. Please recall a moment/experience where you felt that members of your environmental initiative did NOT WORK WELL TOGETHER (e.g. only a few people could be found for a project or you all were not in "implementation mode" at all). Please describe your memory as accurately as possible in the text boxes provided.
There are no right or wrong answers. It is about your own experience. Please try to write at least 25 words per question. Please allow at least 3 minutes for this.

This is a moment/experience where we did not work well together in my environmental initiative:

We did not work well together in this way:

Collective action low & collective efficacy low
This task is about describing an experience in your environmental initiative. Please recall a moment/experience when, in your opinion, members of your environmental initiative did NOT WORK WELL TOGETHER (e.g. because only a few people could be found for a project or you were all not in "implementation mode" at all) and in the end you achieved no effect and had NO IMPACT. Please describe your memory as accurately as possible in the text boxes provided.
There are no right or wrong answers. It is about your own experience. Please try to write at least 25 words per question. Please allow at least 3 minutes for this.

This is a moment/experience/experience where we did not work well together in my environmental initiative and did not achieve anything:

In this way we did not work well together:

We could not achieve this impact:

Then followed various psychological measures that participants answered on a 7-point Likert scale ranging from 1 (completely disagree/not at all true/never applies) to 7 (completely

agree/completely true/always applies). We report measures that are relevant for this deliverable. Adapted from Study 1, as dependent variables, nine items measured collective energy citizenship of the energy initiative (α = .85), twelve items measured collective action intentions (α = .92), six items measured energy-related PEB intentions (α = .59), and four items assessed non-energy PEB intentions (α = .67). As we did not reach our pre-registered α-value for energy-related PEB intentions, results regarding this dependent variable should be interpreted with caution.

As independent variables, one item each assessed whether participants wrote about a moment of collective action and collective efficacy. Additionally, we measured descriptive norms of the energy initiative with six items (α = .90) and collective efficacy of the energy initiative with three items (α = .82). Our demographic variables were age, gender, formal education, employment, income, ethnicity and political orientation. We further assessed the size of the energy initiative. Other variables included in the survey that are not relevant for the hypotheses in this deliverable are: hours intended to volunteer for initiative, participative efficacy, collective self-determined motivation, general collective agency, activist burnout, social identification with energy initiative, individual visions, hope, being moved by what they wrote, affective injustice and agent-action self-efficacy.

4.7.4 Data preparation and analyses

We performed data analysis with R Statistics version 4.2.0, and data management with SPSS 29. Of the 195 participants that finished the survey and agreed that their data would be used, we excluded eight participants as they failed the concentration check, two participants who guessed the study target, one participant who stated that they were not actively involved in an energy initiative, and another two participants who did not write anything that had to do with the manipulation in the open answering fields. In this study, we did not have to exclude further participants as all had less missings than the pre-registered 20% and no irregular answering patterns emerged. In the overall dataset, we imputed four values, in order to construct relevant scales by means of scale regressions (Tabachnick & Fidell, 2007).

4.7.5 Results

Our manipulation checks revealed that participants successfully followed our instructions in their writing, however, conditions influenced each other and did not have an effect on our descriptive norm and collective efficacy scales. In detail, our high (vs. low) collective action condition led people to state that they wrote more about moments in which their energy initiative indeed acted well together, $t(145) = 13.75$, $p < .001$, while the collective efficacy conditions did not diverge, $t(145) = 0.89$, $p = .375$ (corrected for unequal variances due to significant Levene's test). In line with our manipulation, the low (vs. control) collective efficacy condition decreased people's writing about moments in which their energy initiative achieved their goals successfully, $t(179) = -4.99$, $p < .001$. However, participants also reported that they wrote more about moments of successful goal achievement in the high (vs. low) collective action condition, $t(179) = 5.18$, $p < .001$. This result was similar when only comparing the two efficacy control group conditions, $t(179) = 6.46$, $p < .001$. This finding could be an initial indication of our mediation assumption, in that the collective efficacy indicator does not influence the collective action indicator, while the collective action indicator increases people's thoughts of collective efficacy.

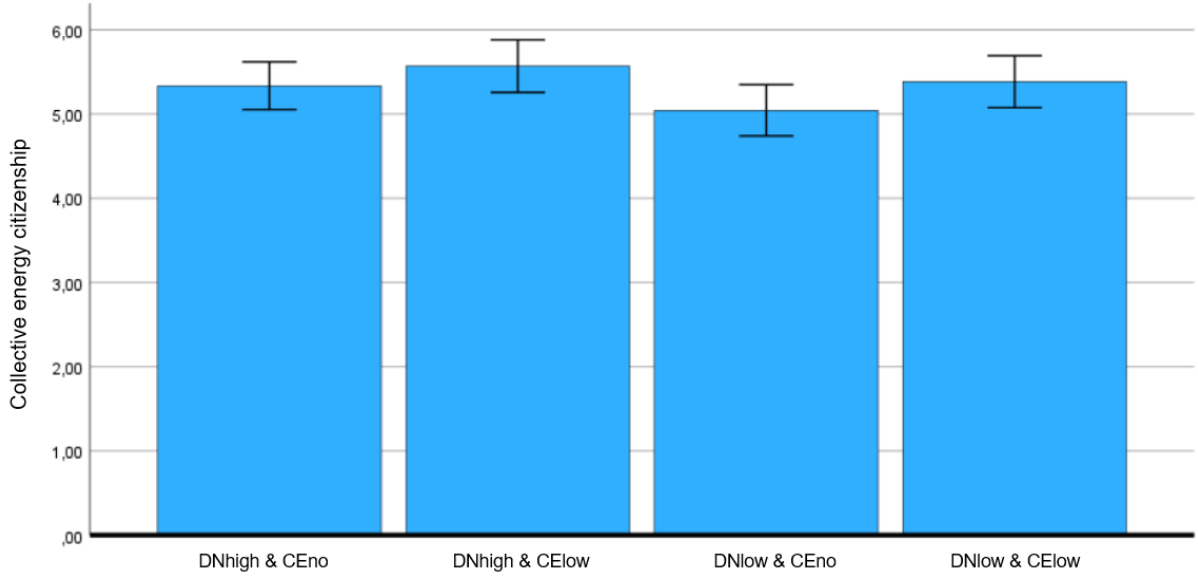
However, it is noteworthy that the high (vs. low) collective action condition did not influence our descriptive norm scale, $t(180) = -0.47$, $p = .637$, and our collective efficacy scale, $t(180) = 0.06$, $p = .954$. Similarly, the low (vs. control) collective efficacy condition did not influence our descriptive norm scale, $t(180) = -0.80$, $p = .427$, and our collective efficacy scale, $t(180) = -0.06$, $p = .950$. As in Study 7, while people stated they wrote about moments of collective action and efficacy, this activity did not influence the concepts that we aimed to manipulate. With respect to difficulty, we found that the high (vs. low) collective action condition task was perceived as less difficult, $t(180) = -2.60$, $p = .010$, while we found no difference between efficacy conditions, $t(180) = -0.01$, $p = .995$. Table 25 shows means, standard deviations, and group comparisons of main dependent variables in all conditions.

Table 25. Means, standard deviations and group comparison of all conditions.

	DN high, CE no condition	DN high, CE low condition	DN low, CE no condition	DN low, CE low condition	Group comparison (ANOVAs)	
	M (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	*F*	*p*
Collective energy citizenship	5.34 (1.07)	5.57 (1.05)	5.04 (1.14)	5.38 (0.85)	1.94	.125
Collective action intentions	5.48 (1.24)	5.48 (1.15)	5.50 (1.20)	5.73 (1.15)	0.47	.705
Energy-related PEB intentions	5.80 (0.78)	5.79 (0.93)	5.90 (0.72)	5.72 (0.84)	0.37	.777
Non-energy PEB intentions	5.82 (0.93)	5.51 (1.14)	5.59 (0.92)	5.57 (1.04)	0.91	.435

Note. DN = descriptive norm (i.e. collective action condition), CE = collective efficacy.

Figure 15. Mean values of collective energy citizenship across conditions.



Note. DN = descriptive norm (i.e. collective action condition), CE = collective efficacy.

Contrary to H1a, the high collective action condition (vs. low) did not increase collective energy citizenship, $t(180) = 1.38$, $p = .169$, and collective action intentions, $t(180) = -0.07$, $p = .943$, when looking only at collective efficacy control conditions. Opposing H1b, the low collective efficacy condition (vs. control group) did not decrease collective energy citizenship, $t(180) = 1.87$, $p = .063$, and collective action intentions, $t(180) = 0.66$, $p = .512$. In fact, we found a marginally significant effect that low (vs. no) collective efficacy may increase collective energy citizenship. In contrast to H2, our collective action condition and collective efficacy condition did not interact significantly when looking at collective energy citizenship, $F(1, 180) = 0.12$, $p = .729$, and collective action intentions, $F(1, 180) = 0.43$, $p = .512$, as dependent variables.

Differences in spillover behaviour are similarly absent. Opposing H3, when looking at the condition with the efficacy control group, the high collective action condition (vs. low) did not increase energy-related PEB intentions, $t(180) = -0.57$, $p = .567$, and non-energy related PEB intentions, $t(180) = 1.11$, $p = .268$. Furthermore, the low collective efficacy condition (vs. control group) did not decrease energy-related PEB intentions, $t(180) = -0.79$, $p = .430$, and non-energy related PEB intentions, $t(180) = -1.13$, $p = .259$. Interactions of the two agency indicators were also not visible for energy-related PEB intentions, $F(1, 180) = 0.50$, $p = .482$, and non-energy related PEB intentions, $F(1, 180) = 0.99$, $p = .321$.

4.7.6 Discussion Study 8

Study 8 successfully manipulated writing about high collective action in the collective action high (vs. low) condition, and writing about low collective efficacy in the collective efficacy low (vs. no) condition. However, we also found that the collective action manipulation influenced collective efficacy in that participants in the high (vs. low) collective action condition also reported to write more about efficacious moments. This is an initial finding on how people intuitively complement the agency indicators, even if they are not asked for it. Notably, the completion of efficacy when asked about collective action fits our mediation assumptions. However, as in Study 7, while people stated they wrote about moments of collective action and efficacy, this activity did not influence actual scale measures of descriptive norms and collective efficacy. Thus, we did not manage to influence the constructs that are supposed to drive our effects.

Possibly due to the lacking effect on descriptive norms and collective efficacy, we did not find any significant effects on collective energy citizenship, collective action intentions, energy-related PEB intentions and non-energy related PEB intentions. Precisely, there was no difference between the high (vs. low) descriptive norm conditions in the efficacy control groups, and no difference between low (vs. no) collective efficacy conditions for all these dependent variables. Moreover, an interaction of the two agency indicators did also not predict our dependent variables. The only marginally significant effect that occurred was that participants reported more collective energy citizenship in the low (vs. no) collective efficacy condition. Notably, Study 4 found that the collective action indicator and the collective aim indicator, but not the collective efficacy indicator, influenced collective energy citizenship. To shed light on these diverging findings, we adapted Study 8 to include a more inclusive target group (Europeans as an energy community) and thus a larger possible sample in Study 9.

4.8 Study 9: social norms and collective efficacy (EU level)

Similar to Study 8, Study 9 tested how the collective action and collective efficacy indicators of collective agency influence collective energy citizenship, collective action intentions (RQ2) and pro-environmental spillover (RQ3) separately and in interaction. This time, the collective agent was an energy community at a very broad level – EU citizens. As in Study 8, this was done in a 2 (goal-directed collective action high/low) x 2 (collective efficacy low/control) between-subjects design.

4.8.1 Hypotheses

Hypotheses were pre-registered on the Open Science Framework (https://osf.io/nty93). We have adapted the formulation of the hypotheses to make them comprehensible for this deliverable. We proposed the following hypotheses for this deliverable, equal to Study 8:

H1: Main effects of collective efficacy and collective action indicators on intentions.
a) When looking at the condition with the efficacy control group, the high collective action condition (vs. low) increases collective energy citizenship and collective action intentions (i.e. public/activist intentions).
b) Overall, the low collective efficacy condition (vs. control group) decreases collective energy citizenship and collective action intentions.

H2: Testing a mediation with moderation: Collective efficacy mediates the effect of the collective action indicator on intentions.
a) We expect an interaction of the collective action factor and the collective efficacy factor in predicting collective energy citizenship and collective action intentions. The pattern that we expect is that we find an effect of the collective action indicators in the collective efficacy control condition, while this effect is blocked in the low collective efficacy condition.

H3: Spillover on energy-related and non-energy-related PEB intentions
a) When looking at the condition with the efficacy control group, the high collective action condition (vs. low) increases energy-related and non-energy PEB intentions.
b) Overall, the low collective efficacy condition (vs. control group) decreases energy-related and non-energy PEB intentions.
c) We expect an interaction of the collective action factor and the collective efficacy factor in predicting energy-related and non-energy PEB intentions, with a similar pattern as described in H2.

4.8.2 Sample characteristics

We collected data for this study through two channels. First, participants starting Study 8 who did not pass our inclusion criteria of active involvement in an energy initiative were directed to Study 9. Here, data collection took place from 19th June to 27th September 2023 via online channels such as mailing lists, websites, and personal contacts, putting up flyers at the university, and had the incentive to win one of six 50€ vouchers for a sustainable online store. Second, in order to reach the intended sample size, we recruited further participants of clickworker from the 8th to 14th of August 2023. Clickworkers received 2.40€ for their participation which equals the German minimum wage for the average time spent on the survey.

Our power analysis was equivalent to Study 8. Correlational research has found medium to large relations between social norms (i.e. collective action indicator of agency) and environmental (intentions), partially including collective action intentions (d = .93, Bamberg & Möser, 2007; d = 1.07, Klöckner, 2013; d = .30 in Study 1 of this deliverable). Experimental work on descriptive norms has found small effect sizes (d = 0.35, Poškus, 2016; d = 0.32, Bergquist et al., 2019, only field studies). Previous correlational research revealed medium to large relations between collective efficacy and collective action (intentions) (d = .72, Broszeit, 2020; d = .70 in Study 1 of this deliverable). Experimental work has found small to medium effect sizes (d = 0.35, Jugert et al., 2016, Study 4; d = 0.56, van Zomeren et al., 2010, Study 2). We conducted a power analysis with G*Power. We calculated the sample size for a two-tailed independent t-test with the aim of detecting a small effect size d = .35 (Jugert et al., 2016), a standard error probability (α = .05), and an acceptable power of .80. This resulted in an intended sample size of n = 130 participants per group and a total of 520 participants.

Data collection was done simultaneously for Study 8 and Study 9, in that participants who were actively involved in an energy initiative participated in Study 8, while those who were not actively involved participated in Study 9. With respect to both studies, 2854 people clicked on the survey and 789 of them started it. Only looking at Study 9, 576 participants finished the survey and said that after reading the study clarification, they agreed that their data would be used (which was pre-registered) – 222 through our own recruitment and 354 through clickworker. Only one participant did not agree that their data would be used for this study, so that we excluded them from our sample.

Our final sample included N = 529 participants. We therefore reached our intended sample size. Distribution across conditions was not optimal due to a larger dropout rate in the collective action high collective efficacy low condition. 144 (27.2%) people participated in the collective action high collective efficacy control condition, 109 (20.6%) in the collective action high collective efficacy low condition, 144 (27.2%) in the collective action low collective efficacy control condition, and another 132 (25.0%) in the collective action low collective efficacy low condition. It is relevant to note that in this Study, 29% of our sample did not check the correct manipulation when asked about it at the end of the questionnaire, indicating that it is very difficult for participants to tell apart our agency indicator conditions.

Gender in this sample was evenly distributed with 261 (49.3%) participants who identified as female, 264 (49.9%) participants who identified as male, and one (0.2%) who identified as diverse. The average age of participants was 40 years (year of birth, M = 1983.33, SD = 16.04, range: 1945 to 2005). With respect to participant's education level, one participant (0.2%) left school without a degree, seven (1.3%) of the participants had a secondary modern school qualification, 74 (14.0%) had a high-school diploma, 9 (1.7%) had a ten-class polytechnic secondary school certificate, 28 (5.3%) had a university of applied sciences entrance qualification, and 121 (22.9%) had a higher education entrance qualification. About half of the participants, 289 (54.6%), had a university degree. Regarding participant's occupation, demographics indicate that three participants (0.6%) were still students, ten participants (1.9%) were in training, and 84 (15.4%) were currently university students. Half of the participants, 269 (50.9%), were employed. Another 18 (3.4%) were public servants, 90 (17.0%) were freelancers, 20 (3.8%) were unemployed, and 35 (6.6%) checked the "other" category.

Again, we measured participants' income level. 18 (3.4%) of them had no income, nine (1.7%) earned less than 250€, 13 (2.5%) earned 250€ to less than 500€, 67 (12.7%) earned 500€ to less than 1000€, 79 (14.9%) earned 1000€ to less than 1500€, 63 (11.9%) earned 1500€ to less than 2000€, 73 (13.8%) earned 2000€ to less than 2500€, 46 (8.7%) earned 2500€ to less than 3000€, 33 (6.2%) earned 3000€ to less than 3500€, 23 (4.3%) earned 3500€ to less than 4000€, and 42 (7.9%) earned more than 4000€. Another 63 (11.9%) participants did not want to answer this question. Looking at participant's ethnicity, 513 (97.0%) or our participants described themselves as white, four (0.8%) were BIPoC (Black, Indigenous and People of Color), 2 (0.4%) said they were multi-ethnic, and two participants (0.4%) were of another ethnicity. Regarding our sample's political orientation, we found that participants were slightly leaning to the left with *M* = 4.54 (*SD* = 1.83) on a 1 to 10 scale.

4.8.3 Procedures and measures

For data collection, we used the platform sosci survey (Leiner, 2020). On average, participants took *M* = 14.73 minutes (*SD* = 6.54) to fill out the survey. Our data collection followed APA guidelines for the ethical conduct of research, and included informed consent prior to starting the survey and after receiving a study clarification. It was approved by the ethics committee of ZSI.

Equal to Study 8, Study 9 included a 2 (collective action high vs. low) x 2 (collective efficacy control vs. low) design, only this time, the task was about Europeans and environmental/ climate protection. In a task called "your evaluation", participants had to take three minutes to write down their thoughts. Participants in the collective action high and collective efficacy control condition were instructed to write an issue where Europeans worked well together in environmental and climate protection, participants in the collective action high and collective efficacy low condition wrote down an issue where Europeans worked well together in environmental and climate protection but they achieved nothing, participants in the collective action low and collective efficacy control condition were instructed to write about an issue where Europeans did not work well together in environmental and climate protection, and participants in the collective action low and collective efficacy low condition wrote down an issue where Europeans did not work well together in environmental and climate protection and achieved nothing. In the following, we give an overview of the instructions that participants received:

Collective action high & collective efficacy control

This task is about thinking about the EU and describing your thoughts. Please think of an issue where you think many Europeans have worked together to protect the environment and the climate and have WORKED WELL TOGETHER (e.g. because many people actively supported a policy measure or many Europeans were together in "implementation mode"). Please describe your thoughts as accurately as possible in the text boxes provided.

There are no right or wrong answers. It is about your own ideas. Please try to write at least 25 words per question. Please allow at least 3 minutes for this.

This is an issue on which many Europeans have campaigned for environmental and climate protection:

In this way, many Europeans have worked and worked well together:

Collective action high & collective efficacy low

This task is about thinking about the EU and describing your thoughts. Please think of an issue where you think many Europeans have worked together for environmental and climate protection and have WORKED WELL TOGETHER (e.g. because many people actively supported a policy measure or many Europeans were together in "implementation mode") and then in the end achieved no effect and had NO IMPACT. Please describe your thoughts as precisely as possible in the text boxes provided.

There are no right or wrong answers. It is all about your own ideas. Please try to write at least 25 words per question. Please allow at least 3 minutes for this.

This is an issue where many Europeans have campaigned for environmental and climate protection and then achieved nothing:

This is how many Europeans have campaigned and worked well together:

Europeans could not achieve this effect:

Collective action low & collective efficacy control

This task is about thinking about the EU and describing your thoughts. Please think of an issue where, in your opinion, few Europeans have worked to protect the environment and climate and have NOT WORKED WELL TOGETHER (e.g. because few people supported a policy or Europeans were not in 'implementation mode'). Please describe your thoughts as accurately as possible in the text boxes provided.

There are no right or wrong answers. It is about your own ideas. Please try to write at least 25 words per question. Please allow at least 3 minutes for this.

This is an issue where few Europeans have taken up the cause of environmental and climate protection:

In this way, Europeans have not engaged and not worked well together:

Collective action low & collective efficacy low

This task is about thinking about the EU and describing your thoughts. Please think of an issue where, in your opinion, few Europeans have worked for environmental and climate protection and have NOT WORKED WELL TOGETHER (e.g. because only a few people supported a policy measure or Europeans were not in "implementation mode") and then in the end achieved no effect and had NO IMPACT. Please describe your thoughts as accurately as possible in the text boxes provided.

There are no right or wrong answers. It is all about your own ideas. Please try to write at least 25 words per question. Please allow at least 3 minutes for this.

This is an issue where few Europeans have campaigned for environmental and climate protection and then achieved nothing:

In this way, Europeans have not engaged and not worked well together:

Europeans could not achieve this impact:

Similar psychological measures as in Study 8 followed the manipulation. Participants answered on a 7-point Likert scale ranging from 1 (completely disagree/not at all true/never applies) to 7 (completely agree/completely true/always applies). Again, we report measures that are relevant for this deliverable. Adapted from Study 1, as dependent variables, nine items measured collective energy citizenship of Europeans (α = .88), twelve items measured collective action intentions (α = .92), six items measured energy-related PEB intentions (α = .76), and four items assessed non-energy PEB intentions (α = .78).

As independent variables, one item each assessed whether participants wrote about a moment of collective action and collective efficacy. Additionally, we measured descriptive norms of Europeans with six items (α = .85) and collective efficacy of Europeans with three items (α = .94). In exploratory analyses, we also analyse social identification with Europeans in a three-item measure (α = .84). Our demographic variables were age, gender, formal education, employment, income, ethnicity and political orientation. Other variables included in the survey that are not relevant for the hypotheses in this deliverable are: participative efficacy, collective self-determined motivation, general collective agency, individual visions, hope, being moved by what they wrote, affective injustice and agent-action self-efficacy.

4.8.4 Data preparation and analyses

We performed data analysis with R Statistics version 4.2.0, and data management with SPSS 29. Thirty-one clickworker participants who failed the concentration checks dropped out before finishing the survey. Of the 576 participants who finished the survey and gave their consent, we excluded one participant who failed the concentration check in the sample that we recruited ourselves and two participants who filled out the questionnaire twice (only kept one data point). No participant had to be excluded because missing values of all participants remained below the pre-registered 20%. Due to time RSI values > 2, we observed 29 participants and excluded six of them who showed an irregular answering pattern. We excluded another five participants who also showed a curious answering pattern (e.g., always checking “5”), seven participants whose start and end date of the questionnaire were not on the same day, two participants who guessed the study target, and 27 participants who wrote nonsense in the manipulation task or something that had nothing to do with the manipulation instruction.

4.8.5 Results

In line with our manipulation, participants in the high (vs. low) collective action condition with efficacy control group wrote more about collective action of Europeans, $t(525) = 12.27$, $p < .001$, and participants in the low (vs. no) collective efficacy condition wrote less about collective efficacy of Europeans, $t(145) = -6.18$, $p < .001$ (corrected for unequal variances due to significant Levene’s test). However, in this study, both manipulation factors also influenced the other concept in that participants in the high (vs. low) collective action condition with

efficacy control group wrote more about collective efficacy of Europeans, $t(485) = 10.50$, $p < .001$ (corrected for unequal variances), and participants in the low (vs. no) collective efficacy condition wrote less about collective action of Europeans, $t(525) = -2.37$, $p = .018$.

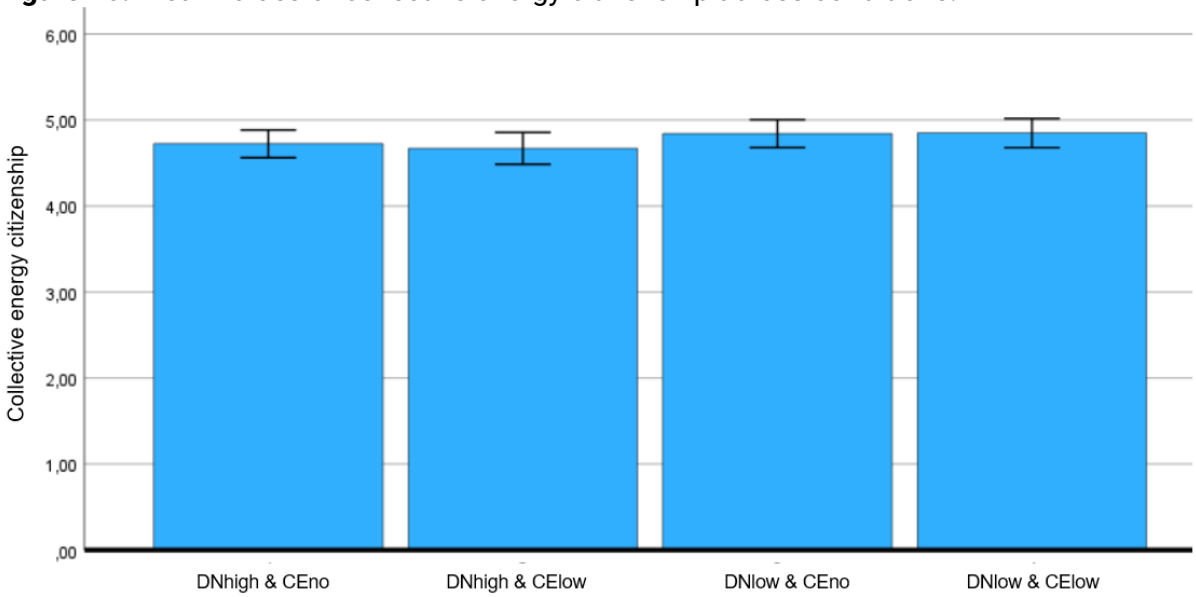
Looking at our measures of descriptive norms and collective efficacy, we again do not find any significant difference. Specifically, there was no difference between the low (vs. no) collective efficacy conditions with regard to perceived descriptive norms, $t(525) = 1.12$, $p = .264$, and collective efficacy, $t(414) = 0.48$, $p = .630$ (corrected for unequal variances). Also, we found no difference between the high (vs. low) collective action conditions with regard to perceived descriptive norms, $t(525) = -0.05$, $p = .961$, and collective efficacy, $t(284) = -0.25$, $p = .807$ (corrected for unequal variances), when only looking at the collective efficacy control conditions. However, when considering all conditions, we find that the high (vs. low) collective action condition decreases collective efficacy, $t(414) = -2.01$, $p = .045$ (corrected for unequal variances). This finding is surprising in that it is expected that agency indicators would influence each other positively. With regard to the difficulty of manipulation, we do not find any differences between conditions ($p > .05$). Table 26 shows means, standard deviations, and group comparisons of main dependent variables in all conditions.

Table 26. Means, standard deviations and group comparison of all conditions.

	DN high, CE no condition	DN high, CE low condition	DN low, CE no condition	DN low, CE low condition	Group comparison	
	M (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	*F*	*p*
Collective energy citizenship	4.72 (1.07)	4.67 (0.96)	4.84 (0.93)	4.85 (0.98)	1.01	.389
Collective action intentions	3.51 (1.43)	3.85 (1.51)	3.84 (1.45)	3.91 (1.36)	2.18	.089
Energy-related PEB intentions	4.73 (1.15)	4.95 (1.25)	4.88 (1.12)	5.04 (1.11)	1.87	.134
Non-energy PEB intentions	4.47 (1.46)	4.82 (1.37)	4.65 (1.37)	5.00 (1.25)	3.77	.011

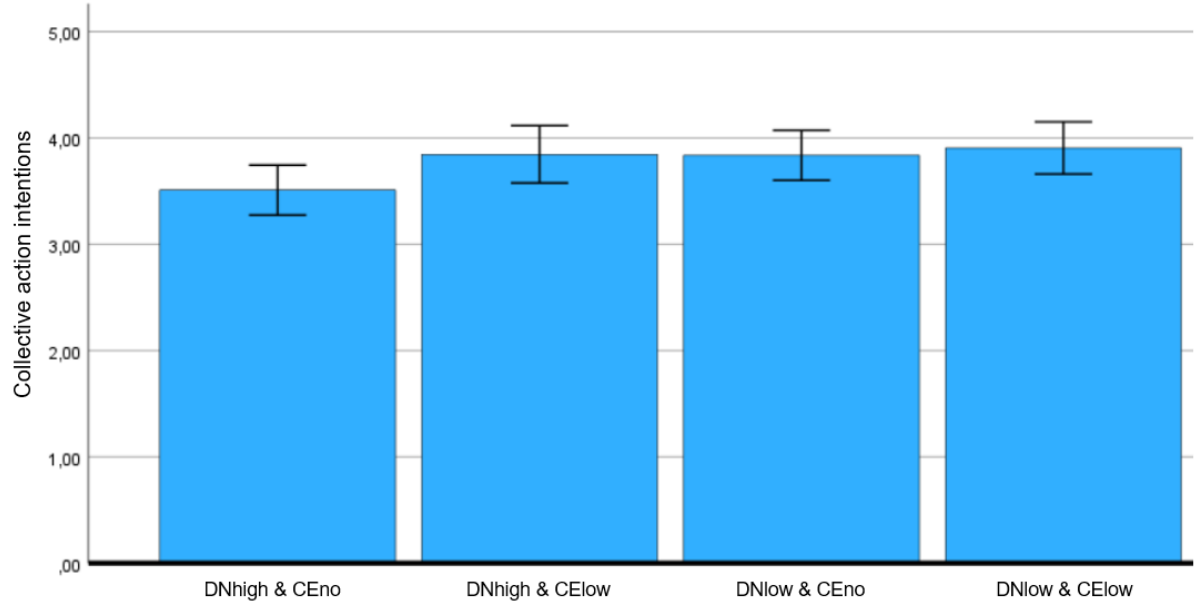
Note. DN = descriptive norm (i.e. collective action condition), CE = collective efficacy.

Figure 16. Mean values of collective energy citizenship across conditions.



Note. DN = descriptive norm (i.e. collective action condition), CE = collective efficacy.

Figure 17. Mean values of collective action intentions across conditions.

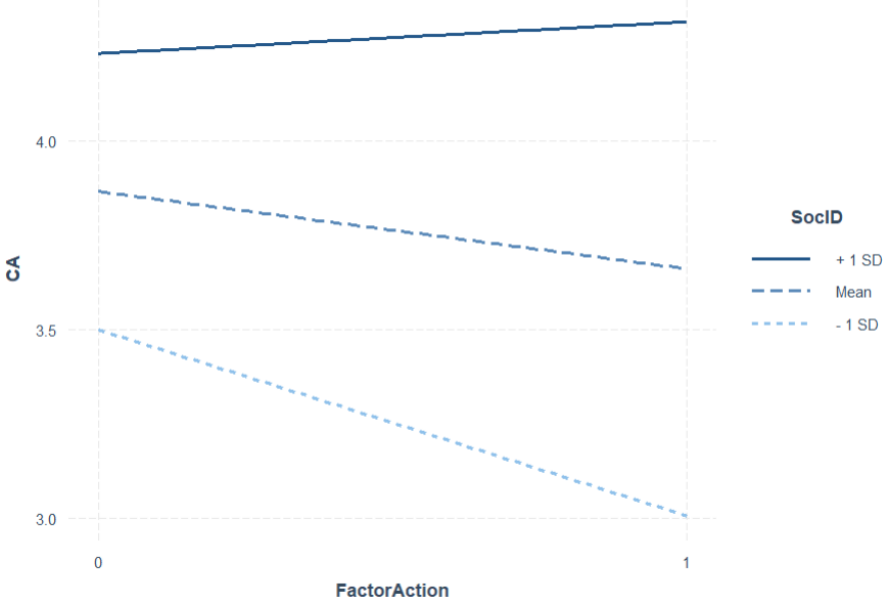


Note. DN = descriptive norm (i.e. collective action condition), CE = collective efficacy.

Contrary to our expectations in H1a, the high (vs. low) collective action condition did not increase collective energy citizenship, $t(525) = -1.02$, $p = .307$, and collective action intentions, $t(525) = -1.94$, $p = .054$, when looking at efficacy control conditions. Intriguingly, we find a marginally significant effect in the opposite direction for collective action intentions. To clarify this result, we included social identification with Europeans as an exploratory moderator. We found that social identification significantly moderated the effect of the collective action condition, B = 0.23, $t = 2.48$, $p = .013$. Precisely, we find that high (vs. low) collective action decreases collective action intentions in participants who show less identification with Europeans (-1SD: B = -0.49, $t = -3.00$, $p < .01$) and those who show medium identification with Europeans (0SD: B = -0.20, $t = -1.76$, $p = .08$), while there was no difference between conditions

for high identifiers (+1SD: B = 0.08, *t* = 0.51, *p* = .61), see Figure 18. Notably, the means of these groups were 3.70 (-1SD), 4.97 (0SD) and 6.23 (+1SD) on a 1 to 7 scale. Thus, the low identifiers are actually situated in the middle of the social identification scale.

Figure 18. Influence of high (vs. low) collective action condition on collective action intentions, moderated by social identification.



Note. CA = collective action, 0 = low collective action condition, 1 = high collective action condition, SocID = social identification with Europeans.

Opposing H1b, the low collective efficacy condition (vs. control group) did not decrease collective energy citizenship, *t*(525) = -0.28, *p* = .783, and collective action intentions, *t*(525) = 1.62, *p* = .107. Descriptively, the effect on collective action intentions went into the opposite direction than expected with low efficacy increasing intentions. Notably, although we do not find significant effects in Study 8 and 9, descriptive patterns for both collective energy citizenship and collective action intentions look very different between studies. Interactions between the collective action factor (high vs. low) and the collective efficacy factor (low vs. no) were non-significant for collective energy citizenship, *F*(1, 525) = 0.12, *p* = .732, and collective action intentions, *F*(1, 525) = 1.13, *p* = .287.

Contrary to H3a, the high (vs. low) collective action condition did not increase energy-related PEB intentions, *t*(525) = -1.16, *p* = .247, and non-energy related PEB intentions, *t*(525) = -1.07, *p* = .286. In fact, descriptive trends showed the opposite direction that low collective action increased these variables. Opposing H3b, the low collective efficacy condition (vs. control group) increased non-energy related PEB intentions, *t*(525) = 2.94, *p* = .003, and we also found a non-significant trend in the same direction with regard to energy-related PEB intentions, *t*(525) = 1.92, *p* = .055. Again, we did not find significant interactions of the collective action factor (high vs. low) and the collective efficacy factor (low vs. no) for energy-related PEB intentions, *F*(1, 525) = 0.11, *p* = .745, and non-energy PEB intentions, *F*(1, 525) = 0.001, *p* = .970.

4.8.6 Discussion Study 9

In Study 9, we did not successfully manage to manipulate our targeted concepts. While participants indeed followed our manipulation in writing about high (vs. low) collective action and low (vs. not mentioned) collective efficacy, the high collective action manipulation also increased writing about collective efficacy, and the low collective efficacy manipulation also decreased writing about collective action. Moreover, we also found that our collective efficacy measure decreased when people wrote about high collective action, which is surprising as we expected positive influences between the agency indicators. Results of this study should therefore be interpreted with caution.

In this study, H1–3 mostly oppose our predictions. Regarding collective energy citizenship, we do not find any main differences between high (vs. low) collective action conditions and the low (vs. no) collective efficacy conditions. There was no significant difference between the low (vs. no) collective efficacy conditions with respect to collective action intentions, but a trend indicating that people in the low collective efficacy condition increased in their intentions. In fact, we find a marginally significant difference between high (vs. low) collective action in that participants in the high collective action condition reported lower intention. To take a closer look at these unexpected findings, we performed an exploratory moderation via identification with Europeans. This analysis showed that the negative effect of the high (vs. low) collective action condition on collective action intentions was driven by those who identified less with Europeans.

Looking at spillover behaviours, we find a non-significant difference between the high (vs. low) collective action conditions that descriptively goes into an unexpected direction. Furthermore, we were surprised by the finding that the low (vs. no) collective efficacy condition increased energy-related PEB intentions and non-energy related PEB intentions. While in Study 8, the effect showed the expected pattern, in Study 9, thinking about low efficacy seems to be motivating private-sphere behaviour. Importantly, the patterns emerging from Study 8 and 9 are very different, which makes it difficult to draw conclusions.

5 General discussion

5.1 RQ1: What role does the set-up of energy communities play in encouraging energy citizenship and support for energy communities?

Studies 2 and 3 shed some light on what role energy community set-ups play in encouraging energy citizenship and collective action intentions with respect to energy communities. Thereby, they carry valuable implications for how energy communities should be portrayed and actually set up, in order to motivate new members.

In Study 2, we found that **people are more willing to support energy communities when they were described to be owned and led by community members or community members and the government (rather than only by the government or an enterprise), focused on environmental sustainability and social justice focus (rather than financial benefits), locally based (rather than nation- or Europe-wide), and part of a larger network of energy communities. Willingness to support also increased for energy communities that were**

portrayed to be funded by the state, have a legally binding contract, and situated in a country with a clear legal framework. Moreover, a number of member characteristics emerge that make energy communities more attractive. Participants were more willing to support energy communities **whose members interact a lot (vs. remain anonymous), are demographically diverse (vs. homogenous), and don't (vs. do) have to invest a lot of time and money**. We did not find that the age or size of an energy community influenced people's willingness to support it.

Energy citizenship increased already existing trends that still showed the same direction for people with either low or high energy citizenship. **Precisely people with high energy citizenship favoured energy communities that are diverse, interactive, and financially easy-to-join groups, based on legal contracts and situated in a clear legal framework even more than people low in energy citizenship.** It may be interesting for practitioners that participants with higher energy citizenship endorsed younger energy communities, while participants with lower energy citizenship were more willing to support older energy communities.

We further looked at how cooperative energy communities were perceived. People perceived energy communities to be especially cooperative that were said to be owned and led by community members or community members and the government (rather than only by the government or an enterprise), focus on environmental sustainability and social justice (rather than financial benefits), are locally based (rather than nation- or Europe-wide), are part of a larger network, have a legally binding contract, are situated in a country with a clear legal framework. With regard to member characteristics, people perceive energy communities to be more cooperative whose members are described to interact a lot and have to spend a lot of time for the energy community. Moreover, older and smaller energy communities appeared more cooperative to our participants. We found no difference with regard to state funding, member's demographic diversity or the time or money people have to invest in the energy community. **Thus, there seems to be a medium to large overlap between perceiving an energy community as cooperative and attractive**.

In Study 3, we tried to manipulate energy community set-ups by letting people generate them in a visioning and trending norm experiment. Overall, we found that neither a visioning task in which people set-up their own energy future nor thinking about positive trends that are already apparent did influence energy citizenship. **However, we did find that the visioning task increased people's collective action intentions within the energy transition.** In practical terms, this means that a very simple visioning task that only took three minutes and may be easily up-scaled can increase people's intentions to collectively take part in the energy transition. Notably, effect sizes were small, so that an upscaling intervention would be necessary to produce meaningful effects. Also, nothing can be said about the longevity of the effect. Intriguingly, the visioning task only produced these positive effects for people who indicated that they had higher visions, while it showed negative backfire effects for people with lower visions. This finding raises questions that will have to be targeted by future research and, for now, carry the implication that visioning interventions should focus on people who are truly open for these tasks.

Study 3 also investigated how the cooperation within people's described visions of energy futures and described trends influenced their motivation. Thereby, we found that **cooperation**

related to energy citizenship and collective action intentions, as well as to spillover behaviour in the private sphere. However, these findings cannot be interpreted causally. It may be that people who described more cooperative scenarios indeed increased in their energy citizenship and behavioural intentions. It may also be that people with stronger energy citizenship and intentions intuitively described more cooperative visions and trends.

Overall, our results indicate that energy community set-ups are indeed central to people's motivation to support them. Moreover, we show that thinking about future energy community set-ups may be motivating people to take part in the energy transition collectively.

5.2 RQ2: How does collective agency motivate energy citizenship?

In Experiments 4 – 9, we tested whether indicators of collective agency (collective action/ descriptive norms, collective aims, collective self-determination and collective efficacy) would influence energy citizenship and collective action intentions of individuals. Thereby, most of our studies focused on *collective* energy citizenship as this was assumed to be more easily manipulated by interventions highlighting a collective (e.g., energy communities, energy initiatives, Europeans). Moreover, collective agency indicators were a better predictor of collective energy citizenship than of individual citizenship, possibly because collective psychological processes have to be translated into individual psychological processes first (i.e. mediation). In this paragraph, we will focus on energy citizenship, collective action intentions and influences between agency indicators.

5.2.1 Energy citizenship

To our surprise, in Study 1 we found that descriptive norms representing the collective action indicator of collective agency did not predict individual and collective energy citizenship when other agency indicators were controlled for. **Across four experiments (Study 5, 6, 8, 9) we also did not find a causal effect of the collective action indicator on energy citizenship. Nevertheless, in Study 4, our descriptive norm trend intervention in which participants read three texts about carbon trading, energy efficiency, and energy communities successfully manipulated energy citizenship.** Participants reported more collective energy citizenship when they read about increasing numbers of people acting for and participating in behaviour that promotes the energy transition than when texts highlighted stagnating and decreasing numbers. Compared to other studies, Study 4 was quite strong in that it presented not only one but three texts, which may have produced the effects on energy citizenship. Furthermore, Study 4 successfully manipulated our descriptive norm scale while of the abovementioned, only Study 5/6 were successful and Study 8/9 were not. In turn, the sample of Study 5/6 consisted of many students that already perceive more energy citizenship in general as compared to clickworker participants in Study 4. Future studies aiming to increase energy citizenship could build on Study 4.

Moreover, in Study 6, a moderation pattern occurred, indicating that for participants with lower social identification in general (both with Europeans and Leipzig citizens) the more general European (vs. Leipzig) reference group condition increased individual energy citizenship. This finding suggests that emphasising the collective of Europeans, which is rather novel, broader

and inclusive, may work well for those who are not yet extremely identified with Europeans and other collectives.

Regarding collective aims as an agency indicator, Study 1 showed that collective aims and injunctive norm trends predicted collective energy citizenship. **In line with this, Study 4 indeed found an effect of collective goal (self-determined and controlled vs. no goal) on collective energy citizenship.** Participants who read that many Europeans think that carbon trading, energy efficiency and energy communities are good because of self-determined reasons (e.g., environmental protection, social justice) and controlled reasons (e.g., financial benefits, social pressure) reported more collective energy citizenship than those who read about Europeans being undecided whether these measures are good or not. However, Study 5 did not find that an injunctive norm of Europeans thinking that energy communities are good (vs. control group) increased energy citizenship. We suggest that especially portraying a group as undecided and split about an issue (i.e., as having no collective goal) may decrease energy citizenship. Future studies could use harsh political debates as manipulation material to test this suggestion.

As of the distinction between self-determined and controlled aims, we did not find a difference in energy citizenship across three experiments (Study 4–6), even though self-determined motivation predicted collective efficacy in cross-sectional analyses of Study 1. **Therefore, this deliverable does not provide any evidence that collective self-determination would influence energy citizenship.**

Similarly, while we found collective efficacy to be an important cross-sectional predictor of both individual and collective energy citizenship in Study 1, our collective efficacy manipulations did not have a causal influence on collective energy citizenship in four studies (Study 4, 7–9). Only one (non-significant) trend occurred in Study 7, showing that when energy community members thought about moments in which many members of their energy community acted well together, this led to less collective energy citizenship than when thinking about moments where many acted well together but were unsuccessful in reaching their aim (i.e. low efficacy). This is contrary to what we would predict. Notably, in none of these studies, the manipulations affected participants' collective efficacy scores, even though more direct manipulation checks were successful (e.g., asking participants whether their described experiences contained more or less efficacy). **Therefore, we interpret these findings in a way that we did not manage to manipulate collective efficacy and thus cannot make any claims about the causal influence of collective efficacy on collective energy citizenship.** This matches earlier research showing the difficulty of experimentally inducing a sense of collective efficacy (see Hamann & Reese, 2020; Hornsey et al. 2021, 2022)

Overall, our experiments present the first studies to manipulate energy citizenship (Study 4). Of all agency indicators, a strong manipulation of high (vs. stagnating) descriptive norm trends seems suitable to increase energy citizenship. In turn, describing how a collective is split and undecided over an issue (vs. sharing a collective goal) could potentially decrease people's energy citizenship. However, these are only first experimental indications that need to be replicated and, for now, provide a basis for manipulation material for future studies.

5.2.2 Collective action intentions

Next to energy citizenship, we looked at people's intentions to collectively engage in the energy transition, for example, through participation in energy communities. **Across five experiments (Study 4–6, 8, 9), we did not find that the collective action indicator and descriptive norm manipulations influenced collective action intentions.** Study 9 even found a non-significant trend going in the opposite direction, in that thinking about issues where many Europeans acted well together for environmental and climate protection (vs. did not act well together) decreased collective action intentions for those who did not identify strongly with Europeans. This finding suggests that, if one wants to promote engagement for the European energy transition, imagination tasks about descriptive norms should be used with caution as they may backfire for people who do not identify strongly with this collective. **Similarly, neither collective aims (Study 4 & 5) nor collective self-determination (Study 4–6) influenced collective action intentions. Additionally, there was no influence of our collective efficacy manipulations on collective action intentions (Study 4, 7–9)**. However as mentioned above, this may be due to the fact that our collective efficacy manipulation did not influence our collective efficacy measure.

Notably, although we do not find significant effects in Study 8 and 9, descriptive patterns for both collective action intentions (and collective energy citizenship) look very different between studies. This may be due to the different kinds and levels of energy communities used. For example, participants in four studies (Study 4–6, 9) were lay people without a necessary connection to the energy transition, whereas two studies (Study 7 & 8) involved energy community members in a stricter sense. These differences make it difficult to generalise results and descriptive trends across all studies.

Taking all studies into consideration, our findings do not provide consistent evidence that agency indicators increase collective action intentions in the context of the energy transition. This finding is surprising as collective agency indicators were successful in experimentally increasing environmentally-related behaviour in past research (Fritsche & Masson, 2021). While this deliverable focused on collective motivation, it is possible that more individual-level motivation is needed in the context of the energy transition (e.g., manipulating people's environmental self-identity, Van der Werff et al., 2014). Taking another perspective, it may also be a promising finding that collective action intentions of energy community members and energy initiative members is not easily decreased by thinking about moments of low efficacy. It is possible that they already apply psychological coping strategies to restore, for example, their collective efficacy beliefs.

Finally, the experimental methods we used might have been simply too weak to affect participants' agency beliefs and downstream attitudes (such as energy citizenship) or intentions to a sufficient degree. First, environmental attitudes and intentions might be highly habitualised and chronic, particularly in times of strong societal politicisation and polarisation about these topics. Thus, providing additional information in a questionnaire might not be sufficient to change environmental attitudes and intentions that are highly relevant to individuals' political identity. Second, the experimental manipulations might have been too weak and problematic in itself. For instance, in Studies 4-6, we tried to affect participants' energy attitudes and intentions by providing them with different kinds of information texts.

While manipulations checks were in line with our manipulation in Study 4-5, we cannot be sure that they read these texts carefully enough and deeply internalised the information, or simply repeated the information they had just read when answering the corresponding items. Thus, to improve the intensity of the manipulations, we employed active writing tasks in Studies 7-9. People were asked to write about personal experiences of high or low collective agency. Although this might be an effective experimental manipulation of agency for those participants who possess plenty of accessible examples for such experiences matching either high or low agency, the manipulation might not work, or even backfire, for others that do not have such experiences or do not want to elaborate on them for motivational reasons.

As a consequence, the current (non-)findings on the effects of agency beliefs on energy citizenship are preliminary and should be treated with caution. At the same time, the current studies provide an important starting point for the systematic development of effective and strong future methods to induce agency perceptions in the lab and in field interventions. Only when such methods are available will it be possible to reliably assess the role of collective agency beliefs for people's energy citizenship and action.

5.2.3 Agency indicators

Finally, we examined how our agency manipulations influence other collective agency indicators. With respect to the collective action indicator, we found that a manipulation of descriptive norms via text vignettes also increased perceived collective aims (Study 4) and that a manipulation letting people describe moments in which a group acted well together also increased collective efficacy (Study 7–9). Hearing and writing about many people working well together can therefore also let people believe that there is a common goal behind it and that a collective can be effective in achieving this goal. It is also possible that the mentioning of working *well* is already associated with some degree of efficacy.

Regarding the collective aim indicator, results show that a manipulation of collective aims that are shared (vs. not shared) via text vignettes also increased participant's collective efficacy and perceived descriptive norm (trends) (Study 4). Thus, a collective that seems split about whether they pursue a goal may lead people to think that they won't act for these goals and achieve these goals. Interestingly, controlled (vs. self-determined) motivation also increased participants' perceived norm trend in Study 6. This could be an initial hint that hearing about many people being financially motivated prompts the assumption that a lot of people must be doing it. Other than individual controlled motivation, collective controlled motivation may therefore foster behaviour, mediated by descriptive norm trends.

We further found that our collective efficacy manipulation also increased collective self-determined motivation (Study 4). Thus, if a collective achieves their aim, people may attribute this rather to their self-determined than their controlled motivation in a sense of "they must have truly wanted it". The collective efficacy manipulation also influenced descriptive norms in Study 9 but not in Study 8, leaving the question open of how the collective efficacy indicator may affect the collective action indicator. Additionally, it is noteworthy that we did not find the interaction of agency indicators to influence energy citizenship or collective action intentions (Study 5, 6, 8, 9). Yet this may have been partially due to unsuccessful or weak manipulation of our collective efficacy and descriptive norm measures in Studies 8 and 9.

In sum, agency indicators seem to influence each other, however, the underlying pattern still has to be investigated in future research. Our studies give first insights of how this pattern may look like. Interestingly, there were not two agency indicators that were more strongly related to each other than to other indicators. Rather, agency indicators seem to function as a complex in which certain indicators prompt assumptions about several other indicators. For individuals, it therefore seems difficult to mentally tell agency indicators apart, which is signalled in the high rates of people checking to be in the "wrong" condition in Studies 7–9.

5.3 RQ3: Under what conditions do positive or negative pro-environmental spillover effects occur?

Under RQ3, we investigated whether our collective interventions had an effect on individual level variables that were not targeted: energy-related PEB intentions and non-energy related PEB intentions. It is noteworthy that we did not find any main effect on collective action intention, so that we cannot assume a spillover from collective action intentions to private PEB intentions.

In several studies, we did not find any effects of the collective action indicator/ descriptive norm interventions on energy-related and non-energy related PEB intentions (Study 4–6, 8, 9). Surprisingly, Study 9 even showed that letting people describe issues in which many Europeans acted collectively for environmental/ climate protection (vs. did not act well together) decreased energy-related and non-energy related PEB intentions, which contrasts previous research finding that descriptive norms are one of the most successful psychological interventions for increasing private PEB (Bergquist et al., 2019, 2023; Poškus, 2016).

Collective aim manipulations did not influence energy-related and non-energy related PEB intentions in two studies (Study 4 & 5). However, our visioning manipulation in Study 3 may be interpreted as a collective aim manipulation. This experimental manipulation indeed showed that visioning can increase non-energy related PEB intentions. As we also found a main effect on collective action intentions in this study, it may indicate a spillover from collective action to private-sphere action.

With respect to collective self-determined motivation, two studies found that it did not affect energy-related and non-energy related PEB intentions (Study 4, 6). In Study 5, collective self-determined motivation also did not influence non-energy related PEB intentions. However, we found a significant main effect on energy-related PEB intentions, only that it appeared in the opposite direction than expected. **Collective controlled (vs. self-determined) motivation increased energy-related PEB intentions.** Combined with the positive effect on descriptive trending norms, these findings show that collective controlled motivation as a quite new concept may be relevant in motivating behaviour in the energy transition. While previous research highlights that financial framings can decrease people's motivation to participate in energy communities (Sloot et al., 2019), a framing highlighting that others are motivated by financial benefits may carry the benefits of financial motivation while at the same time not prompting people's egoistic self-identity aspects. Future research should investigate this suggestion.

Looking at manipulations of the collective efficacy indicator, three studies found that our collective efficacy manipulations did not influence energy-related and non-energy related PEB intentions (Study 4, 7, 8). Unexpectedly, Study 9 showed that a low (vs. not mentioned) efficacy condition increased energy-related and non-energy related PEB intentions. People who thought about Europeans' failed achievements in climate and environmental protection were more motivated to increase their private efforts. However, as this study also did not affect our collective efficacy measure, we cannot make a causal claim, and the process behind this effect remains unclear.

Overall, due to flaws in our agency manipulations in Studies 6–9, the non-significant on spillover behaviours should be interpreted with caution. The spillover questions we raised should be subjected to future studies using much more powerful experimental manipulations of collective action (intentions).

6 Conclusion and limitations

From this deliverable, we can conclude that certain energy community set-ups can indeed influence whether people would support them (RQ1). Therein, envisioning future set-ups may be a suitable intervention for promoting people's engagement in the energy transition. Moreover, our results show that energy citizenship can indeed be manipulated by reading texts about increasing (vs. stagnating) numbers of Europeans engaging in the energy transition and portraying Europeans as sharing the goal of the energy transition for ecological, social and financial reasons (vs. not sharing this goal) (RQ2). However, on the grounds of the current studies, it seems difficult to properly assess the role of collective agency beliefs for promoting people's energy citizenship and engagement in the energy transition. This is also true for gauging the potential of spillover effects: Collective agency interventions barely influenced energy-related and non-energy related PEB intentions, and if they did, effects were opposite to what we would have expected (RQ3). It is likely that this is due to difficulties in inducing sufficiently high or low environmental agency beliefs in study participants, because of weak intensity or high difficulty of the various experimental procedures we used. Such difficulties in inducing environmental agency beliefs are known from other research (e.g., Hamann & Reese, 2020; Hornsey et al., 2021, 2022). The current studies provide a fertile starting point for re-thinking effective interventions towards collective environmental agency beliefs.

Our experiments have a number of limitations. First, in all of them, we used German samples (other than in Deliverable 4.1) which raises the question whether our (null) findings are due to the German context. Second, as stated above, our studies managed to successfully manipulate our direct manipulation checks, but several of them were unsuccessful in manipulating the collective agency scales that should also have been influenced. Thus, the lack of meaningful findings of some interventions may simply be due to the fact that interventions targeting an indicator did not manage to influence this indicator. Reflecting previous research (Hornsey et al., 2021, 2022), this was especially true for collective efficacy and shows that successful interventions for promoting collective efficacy are urgently needed to tackle the energy transition and climate crisis. Moreover, especially our failed manipulation of scales in Studies 7–9 suggests that letting people think about their own experiences and

thoughts may not produce the expected effects. We chose this task as it seemed like a very strong kind of manipulation that would also produce strong effects. However, it is possible that coping mechanisms of participants were activated in the course of writing, thus decreasing effects and sometimes even changing their direction altogether. In contrast to this, a visioning task such as in Study 3 that is directed towards the future and not past experience, seems more fruitful if the aim is to foster collective action intentions.

Third, recruitment of energy community members in Study 7 and 8 was very difficult, and we received some negative feedback on using this sample for experimental research. On the phone, one representative of energy communities advised researchers like us against conducting quantitative empirical studies with energy community members. He argued that quantitative studies in this context are very utopian because only very few members can ever be recruited from the overburdened voluntary sector, and that qualitative methods should be used where possible. We partially agree with this statement. With the trend of increasing numbers of energy communities, quantitative research may become more suitable. However, due to very large sample sizes needed for experimental studies, current quantitative research on energy community members should focus on cross-sectional analyses. Experimental studies, in turn, can be conducted with broader samples such as European citizens and, for example, target the question on how to get people motivated and involved in energy communities.

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9 Appendix

8.1 Study 1: Item overview

These items represent exemplary items for all the remaining studies. They were initially in German and translated into English with the help of deepl.com.

Individual energy citizenship

1. Affordable sustainable energy is an important right for me.
2. Being informed about the energy efficiency of different products is an important right for me.
3. I consider the possibility to actively participate in the energy market (e.g. produce/ sell/ exchange/ store energy) as an important right.
4. I feel responsible for supporting others to participate in the sustainable energy transition (e.g. by sharing my knowledge).
5. I feel responsible for contributing to a sustainable energy transition myself.
6. I feel responsible for actively participating in the energy market (e.g. producing/ selling/ exchanging/ storing energy).
7. I am willing to actively work to ensure that no one is disadvantaged in the sustainable energy transition.
8. Investing time, effort and money to be able to use more renewable energy fills me with pride.
9. I am open to helping shape energy policy and legislation.

Collective energy citizenship

1. For us students, affordable sustainable energy is an important right.
2. It is an important right for us students to be informed about the energy efficiency of different products.
3. It is an important right for us students to be able to actively participate in the energy market (e.g. produce/ sell/ exchange/ store energy).
4. We students feel responsible to support others to participate in the sustainable energy transition (e.g. by sharing our knowledge).
5. We students feel responsible for contributing to a sustainable energy transition.
6. We students feel responsible to actively participate in the energy market (e.g. produce/ sell/ exchange/ store energy).
7. We students are willing to actively work to ensure that no one is disadvantaged in the sustainable energy transition.
8. Investing time, effort and money to be able to use more renewable energy fills us students with pride.
9. We students are open to helping shape energy policy and legislation.

Collective aims

1. I believe that we students can drive an energy transition that is just and sustainable.
2. I believe that we students can support an energy transition that is just and sustainable.

3. I believe that our collective action as students can lead to a regenerative energy system.

Collective self-determined aim

We students pursue the goal of a just and sustainable energy transition...

1. because it is fun for us.
2. because it gives us pleasure.
3. because it is an important part of us as a group of students.
4. because it expresses what we as students really want to achieve.
5. because it makes sense.
6. because it is reasonable.
7. because we would otherwise feel bad.
8. because we would otherwise feel guilty.
9. because others would otherwise be annoyed.
10. because we don't want to be criticised.

Injunctive norms

What percentage of students ...

1. thinks a just and sustainable energy transition is good?
2. is in favour of a just and sustainable energy system?
3. finds a regenerative energy system good?

Injunctive norm trends

1. A growing number of students approve of a just and sustainable energy transition.
2. An increasing number of students are in favour of a just and sustainable energy system.
3. An increasing number of students approve of a regenerative energy system.

Descriptive norms

What percentage of students ...

1. participates in protests/ demonstrations for a just and sustainable energy transition?
2. takes part in educational events (e.g. lectures, workshops) related to the energy transition?
3. votes for a party that supports a just and ecological energy system?

Descriptive norm trend

1. An increasing number of students vote for a party that supports a just and ecological energy system.
2. An increasing number of students participate in protests/demonstrations for a just and sustainable energy transition.
3. An increasing number of students participate in educational events (e.g. lectures, workshops) related to the energy transition.

Collective efficacy

1. I believe that we students can drive an energy transition that is just and sustainable.
2. I believe that we students can support an energy transition that is just and sustainable.
3. I believe that our collective action as students can lead to a regenerative energy system.

Collective vision

1. We students have the vision of a world in which the energy system is completely renewable.
2. We students have a vision of a world where everyone has access to renewable energy.
3. It is easy for us students to imagine a world where all energy needs are met without harming nature.
4. It is easy for us students to imagine a world where fossil fuels are no longer used.
5. We students can imagine a world where politicians care more about building a just and renewable energy system than about economic growth.
6. When we students think about what a just and renewable energy system would be like, we can imagine it in detail.
7. We students often think about what a world with a renewable energy system would look like.

Collective action

Next year I plan to (continue to) ...

1. sign petitions for the energy transition
2. be a member of an organisation that campaigns for the Energiewende
3. contribute financially to an organisation that campaigns for the Energiewende
4. vote for a political party that supports a just and ecological energy system.
5. use online or traditional methods to raise awareness of the Energiewende among others (e.g. Youtube, Instagram, letters, articles)
6. participate in educational events related to the energy transition (e.g. lectures, workshops).
7. get involved in a group or political party that supports the Energiewende.
8. organise educational events related to the energy transition (e.g. lectures, workshops)
9. participate in municipal events with a focus on the energy transition (e.g. lectures, discussions)
10. participate in protests/demonstrations for a just and ecological energy system.
11. personally write to or call politicians or government officials on environmental issues.
12. organise protests/demonstrations for a just and ecological energy system
13. participate in energy cooperative events
14. organise meetings/events for an energy cooperative.
15. be a member of an energy cooperative

Energy-related PEB intention

Next year I plan to (continue to) ...

1. use only energy-efficient household appliances
2. always waiting until I have a full load to use the washing machine
3. taking a shower instead of a bath
4. use a freezer to store food (recoded)
5. use electricity from renewable sources
6. always make my trips to or in the city by car (recoded)
7. always use public transport or bicycle in nearby areas (less than 30 kilometres)
8. use the bicycle or public transport for journeys to work, university or school
9. travel by plane (recoded)
10. invest my money in renewable energies
11. invest my money in a bank that invests significantly in renewable energies

Non-energy PEB intention

Next year I plan to (continue to) ...

1. buy only food with an organic label
2. buy only seasonal and regional food
3. consume animal products or meat (recoded)
4. refuse plastic bags if they are offered to me
5. avoid canned drinks
6. store leftover food after meals
7. give away things I no longer need to friends, family or others
8. buy second-hand products whenever a purchase is necessary
9. buy new technical devices (e.g. mobile phone, PC, tablet) (recoded)

Social identification

1. I feel I belong to the student group.
2. I have a lot in common with other members of the student group.
3. In general, I am happy to be part of the group of student.

8.2 Study 4: Manipulation material

Figure 19. Manipulation material for high collective efficacy.

Figure 20. Manipulation material for low collective efficacy.

Figure 21. Manipulation material for high descriptive norm trend.

Figure 22. Manipulation material for low descriptive norm trend.

Figure 23. Manipulation material for self-determined collective aim motivation.

Figure 24. Manipulation material for controlled (not self-determined) collective aim motivation.

Figure 25. Manipulation material for no collective aim motivation.

8.3 Study 5: Manipulation material

Figure 26. Manipulation material for descriptive norms.

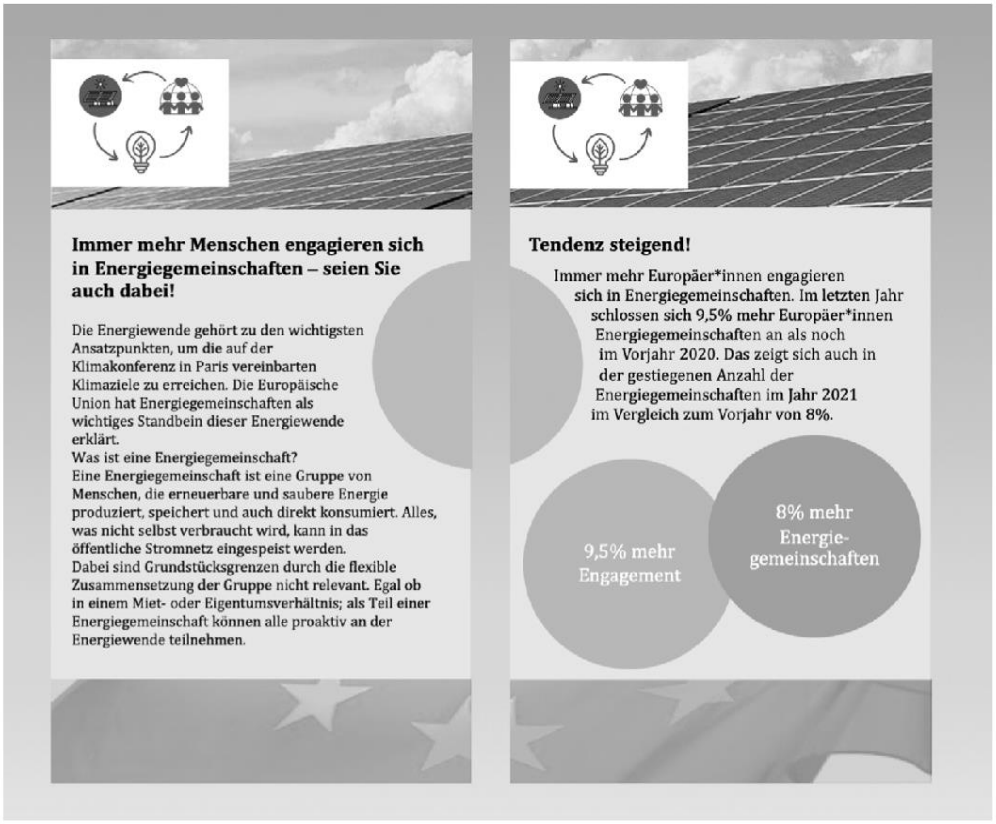


Figure 27. Manipulation material for injunctive norms.

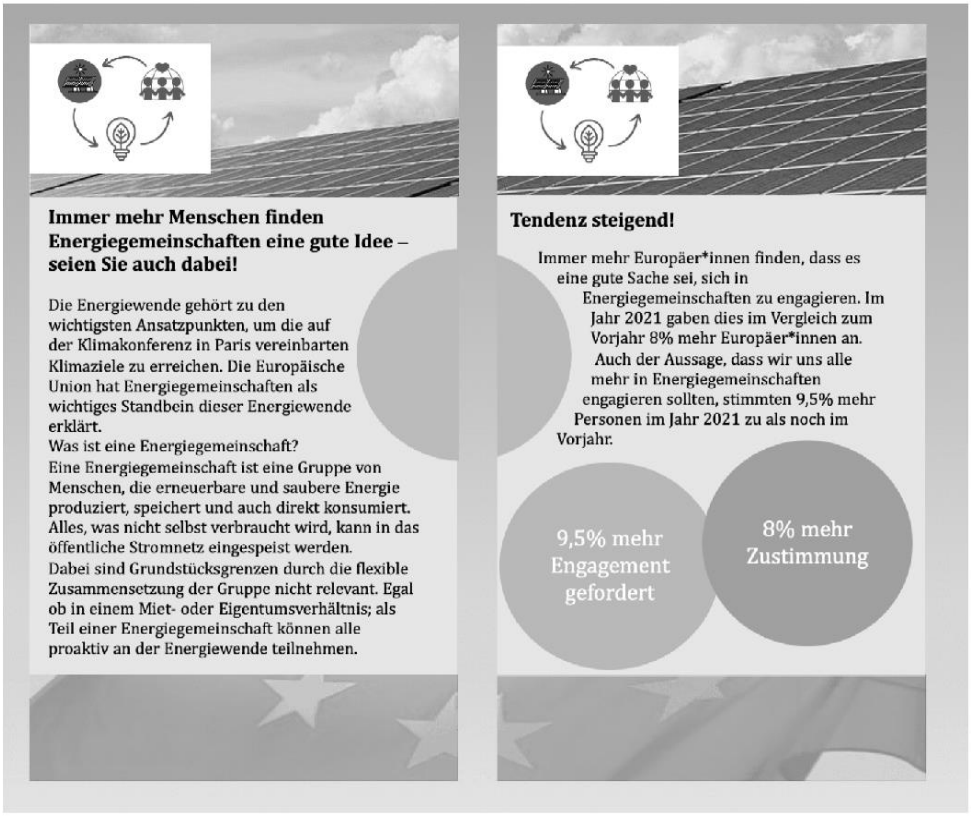


Figure 28. Manipulation material for control group.

Figure 29. Manipulation material for autonomous motivation.

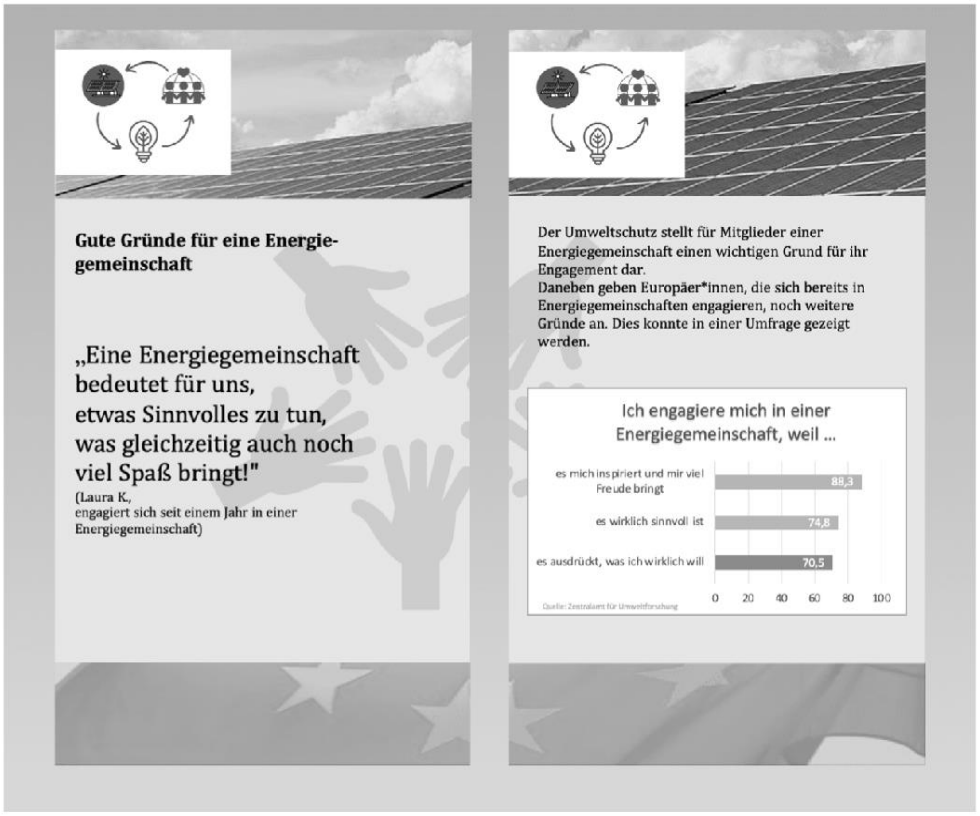
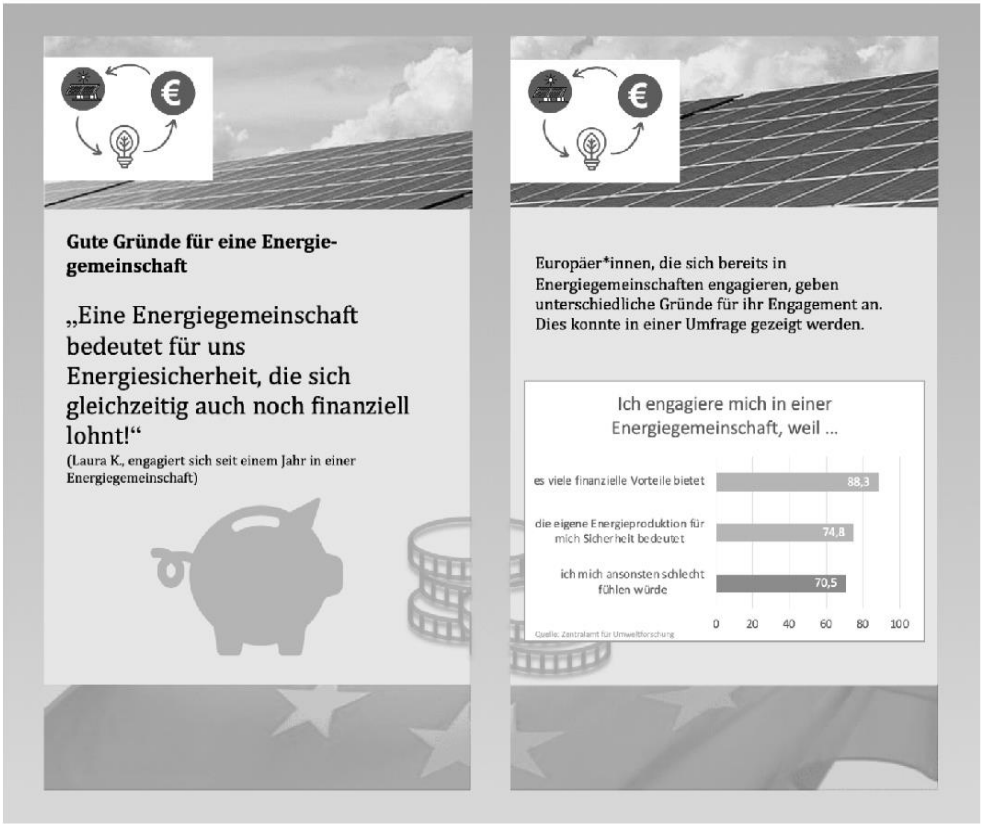


Figure 30. Manipulation material for controlled motivation.



8.4 Study 6: Manipulation material

Figure 31. Manipulation material for collective controlled motivation and local reference group.

WELT Ticker Suche Anmelden ABONNEMENT

HOME LIVE-TV MEDIATHEK WELTPLUS BUNDESLIGA NEXT POLITIK WIRTSCHAFT SPORT PANORAMA MEHR PRODUKTE

HOME » REGIONALES » Sachsen - News & Aktuelle Nachrichten aus Sachsen - WELT

Energiewende-Boom in Leipzig - Maßnahmen aus Politik und Wirtschaft zeigen Wirkung

Veröffentlicht am: 09.06.2022 | Lesedauer: 2 min

3

Der Plan der Stadt Leipzig scheint aufzugehen: Nach der Ausrufung des Klimanotstandes im Jahr 2019 ist die Leipziger Bevölkerung in zunehmendem Maß motiviert, nun auch die Energiewende schneller voranzutreiben.

Eine große Rolle spielt hierbei die Stromerzeugung mithilfe nachhaltiger Energiequellen. Diese Thematik ist nicht nur für Energieunternehmen oder große Betriebe relevant, sondern auch für Privatpersonen. Immer häufiger informieren sich Bürgerinnen und Bürger über ihre Optionen, nachhaltige Energie zu nutzen. So haben sich beispielsweise die Aufrufe der Webseiten von mehreren lokalen Ökostromanbietern innerhalb des letzten Jahres mehr als verdoppelt.

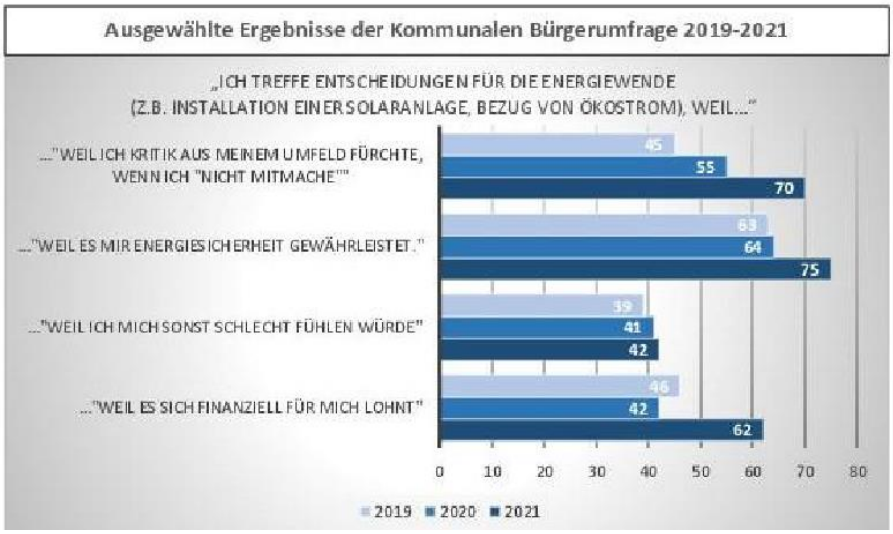
Auch in der kommunalen Bürgerumfrage von 2019 bestätigt sich dieser Ökostrom-Trend. Während sich im Jahr 2017 nur ca. 25% der Leipziger:innen für Ökostrom entschieden, erhöhte sich deren Anteil bis 2019 auf ca. 33%. Damit fließt im Durchschnitt bei jeder dritten in Leipzig lebenden Person Ökostrom durch die Steckdose.

Um der Klimakrise entgegenzuwirken, ist die Entscheidung für Ökostrom dabei nur eine von mehreren Möglichkeiten, die Bürgerinnen und Bürgern von Politik und Wirtschaft empfohlen werden. Photovoltaikanlagen auf dem eigenen Dach erfreuen sich ebenso zunehmender Beliebtheit wie das sogenannte Balkon-Modul. Dabei handelt es sich um eine am Balkon angebrachte, kleine und steckfertige Solarzelle, mit der sich bis zu 10% des eigenen Strombedarfs selbst produzieren lassen. Im Jahr 2021 installierten Leipziger:innen doppelt so viele Balkon-Module wie noch im Jahr 2020. Ein Grund, der immer häufiger angegeben wird: Die vom Stadtrat beschlossene finanzielle Förderung für Balkon-Module.

Auch Bürgerstrom-Initiativen, z.B. die lokale Energiegenossenschaft Leipzig (EGL) versorgen ihre Mitglieder mit erneuerbarer Energie aus Bürgerhand – ganz ohne Photovoltaikanlage auf dem eigenen Dach. Der Strom für die Mitglieder wird in der Stadt selbst oder im Umland erzeugt, meist mit Solar- oder Windkraftanlagen, deren Bau die Genossenschaft gemeinsam finanziert hat. Paul Nowak von der Vereinigung der lokalen Bürgerstrom-Initiativen berichtet: „Wir können uns zurzeit vor Anfragen lokaler Wohnungseigentümer:innen und Hausgenossenschaften kaum noch retten. Sie wollen uns ihr Dach zur Verfügung stellen, weil sie unabhängiger von großen Energiekonzernen sein wollen und finanzielle Vorteile darin sehen. Der nicht benötigte Strom wird in unser Netz eingespeist und an die Kundinnen und Kunden geliefert, die keine eigene Solaranlage haben. Wir beobachten seit ein paar Jahren, dass sich in Bezug auf die geäußerte Motivation, etwas für die Energiewende zu tun, einiges geändert hat."

Dies zeigt sich auch in der kommunalen Bürgerumfrage: Eine steigende Anzahl von Leipzigerinnen und Leipzigern orientiert sich offenbar an den Erwartungen von Nachbar:innen, Freund:innen oder der Gesellschaft und lässt sich weitgehend mit politischen und wirtschaftlichen Anreizen dazu motivieren, für die Energiewende aktiv zu werden.

Die folgende Abbildung verdeutlicht unter anderem diesen Trend anhand der unterschiedlichen Zustimmung zu Aussagen über die eigene Motivation in den Jahren 2019, 2020 und 2021.



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