



Including Social Housing Residents in the Energy Transition: A Mixed-Method Case Study on Residents' Beliefs, Attitudes, and Motivation Toward Sustainable Energy Use in a Zero-Energy Building Renovation in the Netherlands

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Specialty section:

This article was submitted to
Urban Energy End-Use,
a section of the journal
Frontiers in Sustainable Cities

Received: 21 January 2021

Accepted: 13 April 2021

Published: 14 May 2021

Citation:

Bal M, Stok FM, Van Hemel C and De
Wit JBF (2021) Including Social
Housing Residents in the Energy
Transition: A Mixed-Method Case
Study on Residents' Beliefs, Attitudes,
and Motivation Toward Sustainable
Energy Use in a Zero-Energy Building
Renovation in the Netherlands.
Front. Sustain. Cities 3:656781.
doi: 10.3389/frsc.2021.656781

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Reducing household energy use in social housing buildings can substantially contribute to mitigating global climate change. While municipalities and social housing corporations are willing to invest in sustainable renovations and innovations, social housing residents' inclusion in the sustainable energy transition lags behind. This pilot study explored social housing residents' attitudes toward sustainability and sustainable renovation of their apartment building, as well as (factors underlying) their motivation toward two specific sustainable behaviors. Semi-structured interviews, containing both open- and close-ended questions, were conducted with 20 residents of one social housing building that was due for renovations. Results showed that respondents were concerned about climate change, including environmental justice beliefs, typically already engaged in various sustainable behaviors, and were motivated to add sustainable behaviors to their repertoire after the renovation. Yet, perceived social norms were not always supportive of behaving sustainably and respondents sometimes failed to recognize the sustainable value of these behaviors. Furthermore, while respondents were more positive than negative about the sustainable renovation, they nevertheless listed many concerns and problems regarding the renovation process, including procedural justice concerns. This small-scale study provided important insights into barriers and facilitators of the sustainable energy transition among social housing residents, who are at risk of lagging behind in the sustainable urban energy transition. Findings underline the importance of including residents in the sustainable renovation process through engagement, communication, and co-creation.

Keywords: social housing, sustainable energy transition, sustainable behavior change, sustainable renovation, value belief norm theory, theory of planned behavior, procedural justice

INTRODUCTION

Climate change poses a major challenge to societies worldwide, and contemporary generations are the first to experience the negative consequences first-hand. Several influential reports allude to the urgency of the problem (IPCC, 2018; IPBES, 2019), indicating that if we do not act now, the negative consequences of climate change will be irreversible. However, to achieve the necessary transitions to counter climate change, a fundamental shift in how we use the earth's resources is necessary. One important transition that needs to be made is in our energy use; we drastically need to decrease the use of fossil fuels and reduce our overall energy consumption to bring down the emission of greenhouse gasses that cause global warming (IPCC, 2018). While a large role is set aside for industries and the agricultural sector in this process, the residential sector also substantially contributes to the total energy consumption in Europe, mainly for space and water heating, lighting, and electrical appliances; estimates range that households use between 16 and 50% of total energy consumption (Nejat et al., 2015; Filippidou et al., 2016; Eurostat, 2019). A lot can thus be gained from reducing household energy use. Since existing buildings will dominate the housing stock for the next 50 years based on their life cycle, energy renovations in existing dwellings offer unique opportunities for reducing the energy consumption and greenhouse gas emissions (Filippidou et al., 2016).

One important area in which sustainable improvements to reduce energy consumption are essential and feasible is in the non-profit housing sector, also referred to as social housing. As social housing buildings are often not well-insulated, these buildings promise large potential gains in terms of reducing energy consumption (Kammen and Sunter, 2016). Moreover, social housing residents are also at risk of lagging behind in the energy transition (Santangelo and Tondelli, 2017). In the Netherlands, social housing accounts for one-third of the total housing stock (Braga and Palvarini, 2013; Filippidou et al., 2016), which is the largest percentage in Europe. Thus, in the Netherlands, sustainably renovating existing the housing stock cannot occur without taken into account social housing. At the same time there are numerous sustainable technological innovations available that would be suitable for renovating social housing buildings, enabling the reduction of energy consumption in these buildings (Wassenberg, 2004; Glad, 2012; Nejat et al., 2015). However, technological innovations alone will not result in a successful energy transition if these innovations are not accepted by stakeholders in the social housing market. Important stakeholders are municipalities, social housing corporations, and social housing residents. There is momentum in the social housing market for sustainable energy investments: sustainability and energy saving are central goals for municipalities and social housing corporations (Aedes, 2013; Filippidou et al., 2016), and their willingness to invest in sustainable renovations and innovations is generally high.

Yet, whether social housing residents accept and adopt sustainable changes to their residences and the accompanying technological innovations remains to be seen. It has been shown that people in lower socio-economic status groups generally

tend to be late adopters of new behaviors (Franceschinis et al., 2017). It is sometimes assumed that social housing residents' willingness to accept sustainable renovations and adapt their energy-related behaviors may be low (Glad, 2012; Santangelo and Tondelli, 2017). Nevertheless, other possible underlying reasons include a lack of opportunities or an inadequate capabilities set (Kollmuss and Agyeman, 2002; Michie et al., 2011; Walker et al., 2014). In the current study, we will focus specifically on these possible underlying reasons and investigate social housing residents' beliefs, attitudes, and motivation toward sustainable energy use, also focusing specifically on perceptions of justice and injustice in this process.

Value Belief Norm theory (VBN; Stern, 2000; Steg et al., 2005) has been widely applied to study sustainable behavior intentions. The theory postulates that values, the general goals that people strive for in life, and more sustainable-behavior-specific beliefs are key determinants of people's sustainability attitudes and behaviors, including the acceptance of sustainable technologies and the adoption of sustainable energy-related behaviors. With regard to environmental behaviors, four types of core values have been discerned (Schwartz, 1992; Stern et al., 1998; Dietz et al., 2005; de Groot and Steg, 2008; Steg et al., 2014; Hornsey et al., 2016): two types of self-transcending values that motivate sustainable behavior intentions, namely biospheric values (i.e., valuing the environment) and altruistic values (i.e., valuing the welfare of other human beings and fairness considerations), and two types of self-enhancing values that hamper sustainable behavior intentions, namely egoistic values (i.e., valuing personal resources and achievement), and hedonic values (i.e., valuing pleasure and comfort). Moreover, awareness of consequences and the ascription of responsibility pose important sustainable-behavior-specific beliefs that shape the acceptance of sustainable technologies and the adoption of sustainable energy-related behaviors. However, as social housing residents' environmental values and beliefs have not yet been studied extensively, it is not yet known to which extent these values play a role in their sustainable behavior choices. In the current study, we aim to address this gap in the literature. We propose that these core values and beliefs also shape social housing residents' beliefs about sustainability in particular, as well as their willingness to engage in the sustainable energy transition, in important ways.

While VBN theory focuses on values, beliefs, and personal norms, underlying people's sustainable behavior intentions specifically, Theory of Planned Behavior (TPB; Ajzen, 1991; Fishbein and Ajzen, 2010) has been adopted widely to study various types of behavior. TPB postulates that people's attitudes (the way people feel toward a particular behavior), subjective norms (the extent to which people believe those around them engage in, and approve of, the particular behavior), and perceived behavioral control (people's perceived ability to adopt behavior changes) determine their intentions to engage in any given behavior. While VBN and TPB show similarities, two crucial factors that have been shown to determine whether people adopt specific behaviors: behavioral control and subjective norms should be included in the study of sustainable behavior change. As such, we use this TPB as a guiding framework to enhance

understanding of social housing residents' intention to engage in two specific sustainable behaviors.

Social housing residents' attitudes toward proposed sustainable renovations and their intentions to adopt the required sustainable behavior changes after a renovation may furthermore be shaped in important ways by how they experienced the renovation process, especially since these renovations are oftentimes initiated by the social housing corporation and, as such, will not be the result of individual choice. A wealth of literature on procedural justice (e.g., Lind and Tyler, 1988; Tyler, 1989; Van den Bos et al., 1997) showed that how people have been treated during a process may count heavily toward their acceptance of an outcome (regardless of the outcome itself). Moreover, within the field of energy justice, procedural justice elements of providing information (transparency and accountability) and engaging end-users in the process (due consideration) have been deemed vital for a successful energy transition (e.g., Sovacool and Dworkin, 2015; Sovacool et al., 2016). As such, it is important to take into account social housing residents' experiences during the renovation process as well.

The social housing building focused on in this pilot study was due for renovation and therefore provided an ideal research context. At the time of study in 2019, the housing corporation had presented two possible plans for the renovation to the residents: a "traditional" minimal renovation aimed only at making necessary improvements to the building, and an "innovative" sustainable renovation aimed at making the building energy neutral (see **Figure 1**). The housing corporation, as well as the municipality involved, strongly favored the sustainable renovation, mirroring the generally high momentum for sustainable transitions described above. The housing corporation aimed to create support for the sustainable renovation among the building's residents in multiple ways, for example by organizing information and participation sessions for the residents and by involving the residents' committee in the decision-making process. With this study, the housing corporation wanted to gain additional insight into resident's motivations for sustainable energy use and the sustainable renovations of their social housing building.

The current study investigated factors underlying (a) residents' attitudes toward climate change, sustainability and sustainable behavior in general, (b) their attitudes toward the process of the sustainable renovation of their building, and (c) their intentions to engage in specific sustainable energy-related behaviors. A mixed methods design was used to gain insight into residents' current stage of change (Prochaska and DiClemente, 2005) in the sustainable energy transition, their attitudes regarding climate change and the need for sustainable behavior in general, and their environmental values. Residents' opinions and emotions about the decision-making process regarding the renovation were also researched. In addition, their attitudes, subjective norms, and perceived behavioral control regarding two specific new behaviors, which would be required of them if the sustainable renovation were to occur, were probed. By increasing insight into the factors that either facilitate or hamper social housing residents' willingness to engage in the

sustainable energy transition, entry points for supportive policies and interventions can be identified.

METHODS

Participants

For this study, all residents were informed about the study with an information letter. Subsequently, all residents were approached by telephone by the researchers three times to invite them to participate. We asked the head of the household in each apartment to participate. Not all households were reached ($n = 26$) and not all of those we did reach wanted to participate ($n = 12$). We ended up with a sample of 20 participants, which is about one third of all households in the building. Appointments were scheduled with the respondents to conduct the interview in their apartment (or, when they did not want the interviewer to come to their home, they could opt for a location close to their apartment building especially set up for these interviews). All interviews took place in March and April 2019. Respondents were compensated for their participation with a gift voucher (€10).

Study Design and Materials

We conducted structured face-to-face interviews to gain insight into residents' attitudes toward sustainability and the sustainable renovation of their apartment building (see **Supplementary Material**). The interviews contained a mix of open-ended and multiple-choice questions. The questionnaire consisted of two parts. In the first part, we asked respondents about their attitudes toward sustainability in general and toward the potential sustainable renovation of the apartment building. In the second part, we asked for their environmental justice values, subjective norms, attitudes, and perceived behavioral control toward two specific sustainable behaviors; slow and constant heating of the apartment and active sun blocking using sun blinds.

At the start of the interview, the researcher shortly introduced herself and the study after which respondents provided informed consent. Subsequently, the questionnaire started. All interviews lasted for ~60 min.

Part 1 – Attitudes and Beliefs Regarding Sustainability and the Sustainable Renovation of the Apartment Building

The questionnaire started with two open-ended questions to prompt participants about the sustainable behaviors they already took part in and about the importance of sustainability for them personally. Subsequently, we asked them about their stage of change regarding sustainable behavior with a five-point algorithm (Prochaska and DiClemente, 2005). Next, based on VBN theory, we presented them with 11 statements regarding the awareness of consequences, the ascription of responsibility and their personal norms regarding global warming. The items were a selection of the ones used by Steg et al. (2005) and could be answered on a 6-point Likert scale ranging from 1 = Totally disagree to 6 = Totally agree. The questionnaire continued with an open-ended question about their attitudes toward the sustainable renovation of

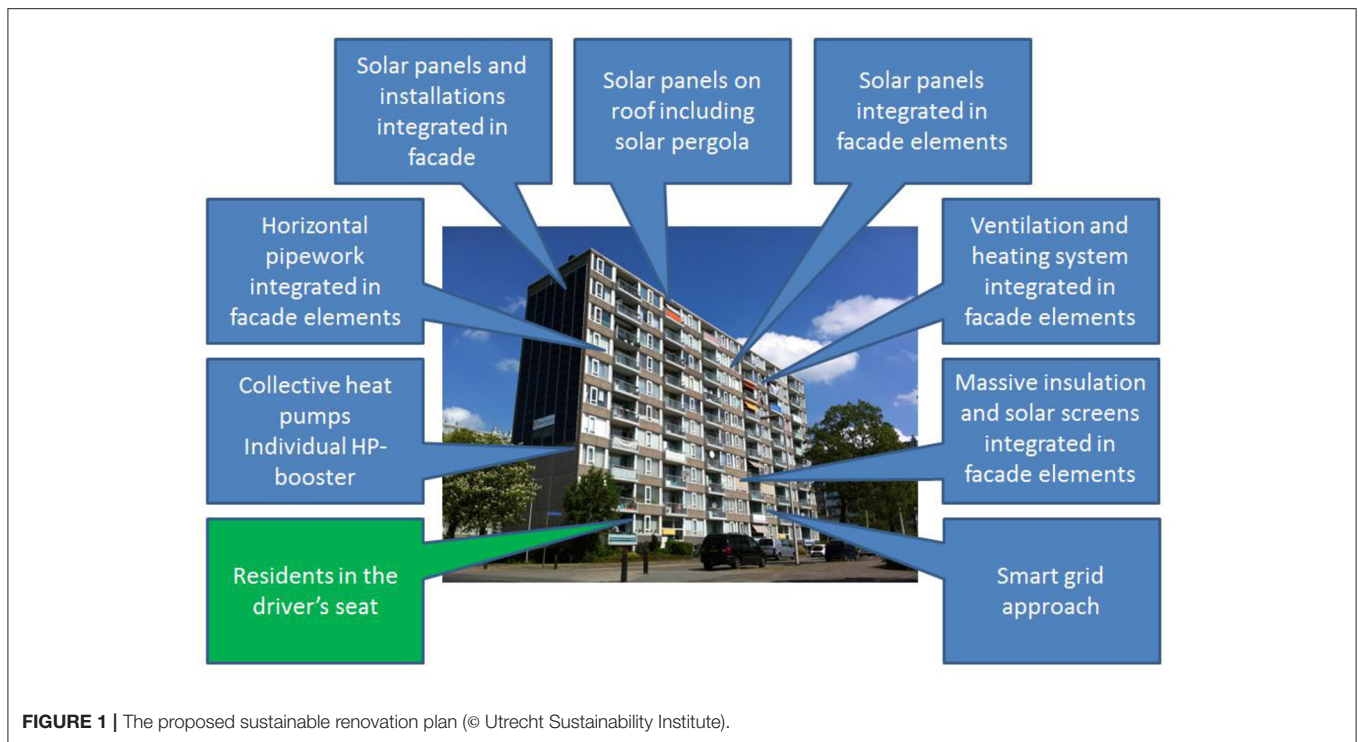


FIGURE 1 | The proposed sustainable renovation plan (© Utrecht Sustainability Institute).

the apartment building. After this general question, we asked them “if only thinking about the *positive/negative* sides of this renovation, how *positive/negative* they were” on a 6-point Likert scale ranging from 1 = not at all to 6 = very. Respondents could elaborate on their answer in a subsequent open-ended question.

Part II –Two Specific Sustainable Behaviors

After the general part of the questionnaire, we continued with a more specific part, based on a combination of TPB and VBN theory, in which we asked respondents for their values, attitudes, subjective norms, and perceived behavioral control regarding two specific sustainable behaviors. Together with the technical partners involved in the renovation and the social housing association, we decided on two behaviors that were essential for the renovation to be successful. Because of a new heating system, using a heat pump, residents had to set the temperature in each room separately once and then leave it as much as possible for optimal use of the system. This behavior was termed “heating constantly.” Because of special glazing that will keep warmth in, sun blinds would be installed on the south-east side of the building. Residents would then have to actively use these blinds to keep their apartments cool in summer (and more easily warm in winter). This behavior was termed “active sun blocking.” Both behaviors were questioned one by one.

After a short introduction of the behavior, we asked them in what way this required a behavior change for them and to specify their motives to either execute the behavior or not and to shortly motivate their answer as well. Respondents were

presented with a list of possible motives (*Joy, Convenience, Comfort, Costs, Recognition (by friends), Fairness, Doing the right thing, Contributing to a better world, The environment, Nature, Pollution, Other, namely...*) based on the self-enhancing and self-transcending values important for sustainable behavior outlined by Steg and colleagues (de Groot and Steg, 2008, Steg et al., 2014) and discussions with the social housing corporation. We continued the questionnaire with nine multiple choice items on 7 point Likert scales (1 = completely disagree; 7 = completely agree) to prompt attitudes (good-bad; pleasant-unpleasant; beneficial-disadvantageous; useful-useless), subjective norms (most people would approve if...; most people around me try to...), perceived behavioral control (I am confident that I can...; I can decide for myself whether I will...), and intentions toward the behavior (I intend to...), based on the theory of planned behavior (Ajzen, 1991; Fishbein and Ajzen, 2010).

After completing this part of the questionnaire for both behaviors, the respondents were thanked for their participation.

RESULTS

Attitudes and Beliefs Regarding Climate Change and Sustainability

Most respondents feel positive toward sustainability, regarding sustainable behavior an important theme in their lives. Motives for attaching importance to sustainability varied; some respondents were driven by self-transcending values, focusing on being fair toward future generations and the environment, and some were driven by self-enhancing values, such as saving money.

"Sustainability is very much needed. That's a fact. Yes. It's common knowledge. And I believe that we, as citizens, really need to think about it and contribute to it." (R9)

"If we do not behave sustainably, we will not have an earth to live on in no time." (R13)

"Because ehh... well, in earlier days people thought about us. We have to think about others, the future." (R18)

"You also have to watch your spending, yeah. Things are becoming more and more expensive." (R12)

A minority of respondents explicitly states that sustainability is not an important issue for them or questions the effectivity and sustainable behavior.

"Yes, I believe it's all a bit nonsense." (R15)

"Yes, it's quite the issue nowadays. Really. Sustainability, environmental issues. I couldn't care less." (R19)

"I don't think it [behaving sustainably] will help. The Netherlands are taking it too far. But if I watch countries like the Czech Republic or Romania. If you see what they exhaust. Then [what we do in] the Netherlands will not help." (R20).

Exploratory quantitative analyses showed that most respondents are already behaving sustainably (i.e., maintenance phase). When asked about these behaviors, recycling and saving water were most often mentioned, followed by making less use of their car or driving an electric car, saving energy (e.g., turning the heating down). Of the people who indicated that they are not behaving sustainably yet, some are in the pre-contemplation phase, not having any intentions to start behaving sustainably, and the others are either in the contemplation or preparation phase. Based on this finding, we expect that a sustainable renovation can be successful, as the large majority is already focused on behaving sustainably or preparing to do so.

Moreover, respondents viewed global warming as a problem ($M = 4.65$; $SD = 1.13$). They also have a personal norm to save energy ($M = 4.40$; $SD = 1.26$), which is surprising, given their feelings of responsibility for causing global warming which are barely above the scale midpoint ($M = 3.55$; $SD = 1.27$).

Attitudes Toward the Sustainable Renovation of the Apartment Building

Respondents were more ambivalent regarding the sustainable renovation of the apartment building and the process thus far; they perceived both positive and negative aspects. When asked to indicate how positive and negative they felt about the renovation, they felt more positive ($M = 5.61$; $SD = 0.61$) than negative ($M = 3.89$; $SD = 1.49$). However, when prompted to elaborate on these answers, many more negative than positive aspects were mentioned (see **Table 1**). Regarding positive aspects, improved appearance of the building and more comfortable living were mentioned most. Regarding negative aspects, uncertainty regarding the renovation process, lack of communication, fear of high costs, and a degradation of facilities were mentioned a most. These negative aspects oftentimes referred to procedural justice concern and these contributed negatively to their attitudes toward the sustainable renovation of the apartment building.

TABLE 1 | Positive and negative aspects of the sustainable renovation of the apartment building.

Positive aspects	#Residents	Negative aspects	#Residents
Building appearance	10	Unclearity about process	12
Living comfort	8	Bad communication	9
Environmental benefits	4	Nothing happening yet	8
Cost reduction	3	Additional costs	8
Modern appliances	2	Deterioration in facilities	7
Positive early experiences	2	Building nuisance	7
No more district heating	2	Loss of faith	6
		Strangers in one's home	4
		Financial consequences for housing corporation	3
		Renovation is overdue	3
		Problems with residents' committee	2
		No contact person	2
		Resident's physical limitations	1
		Renovations differ between apartments	1
		Counteractions by government	1
Overall positive feeling [scale 1–6; M (SD)]:	5.61 (0.61)	Overall negative feeling [scale 1–6; M (SD)]:	3.89 (1.49)

Heating Constantly

Two respondents indicated already heating their apartment constantly, but for most respondents heating constantly required a behavior change. For some respondents this proved difficult.

"I hope not. I hope not. I hope that I am not required to change my behavior." (R13)

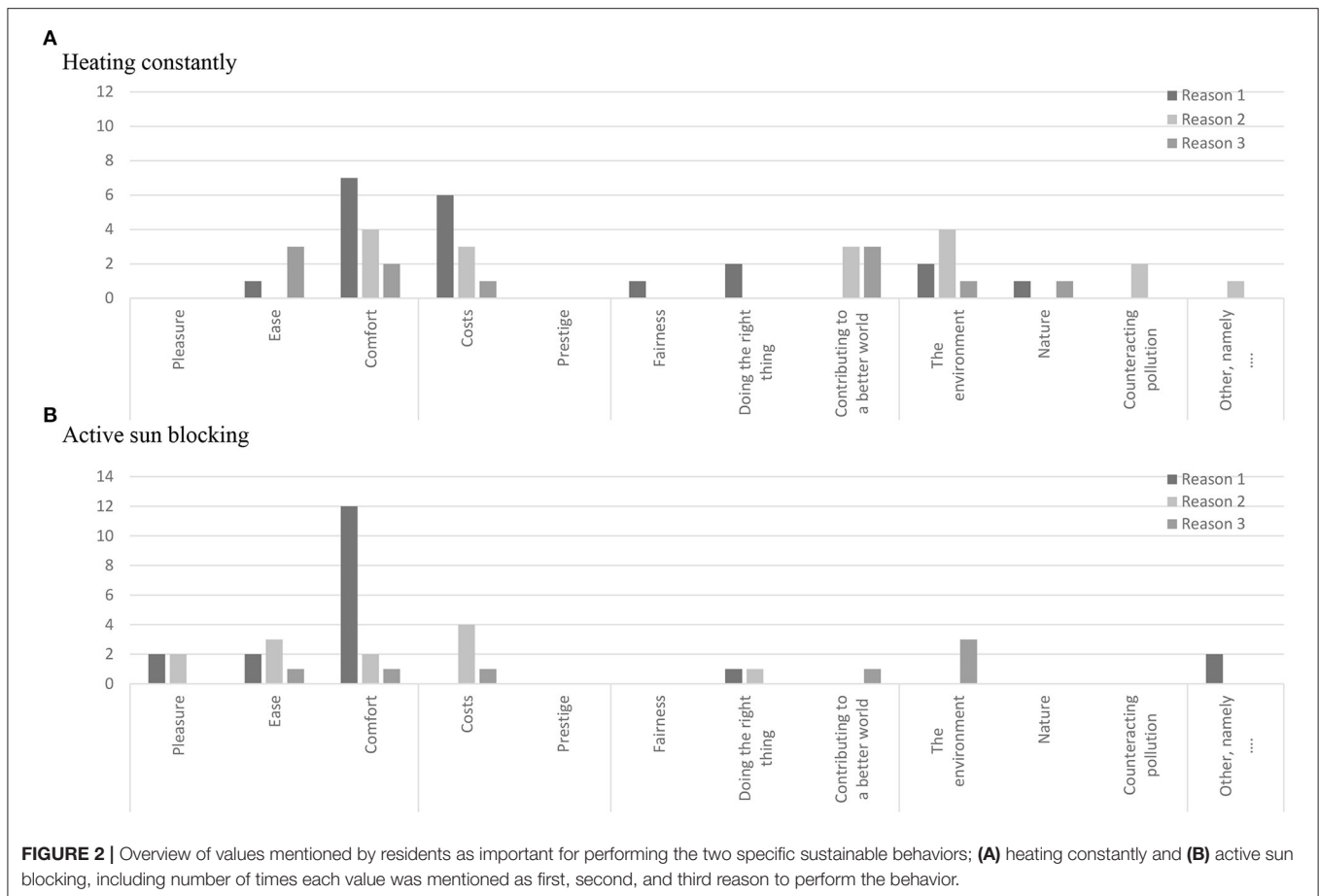
"And everything keeps being postponed over and over, so I don't know what to expect anymore." (R3)

Some respondents also indicated they had questions regarding the required behavior change, for instance about the possibilities for ventilating their home.

The majority of respondents, however, was motivated to adopt the required behavior change, even when that meant to counterintuitively (it felt "like wasting energy" (R1) to some) leave on the heating system when leaving the house.

"... I will leave the heating at 18 degrees, whether I am home or not." (R15)

With regard to motives, respondents most often mentioned an expected increase in living comfort and an expected reduction of costs (see **Figure 2A**). In addition, this behavior is also clearly recognized as self-transcending, as contributing to a better world,



protecting the environment and countering pollution are also mentioned regularly as motives for heating constantly.

Furthermore, exploratory quantitative analysis of attitudes, norms, efficacy and behavioral intentions clearly show that people have a positive attitude toward heating constantly ($M = 1.95$; $SD = 0.88$) and feel they can effectively execute the behavior ($M = 6.18$; $SD = 1.03$). However, the social norm regarding heating constantly is judged somewhat less favorably ($M = 4.63$; $SD = 1.82$). Nevertheless, this does not seem to impede on respondents' intentions to adhere to heating constantly after the renovation ($M = 6.35$; $SD = 0.88$).

Active Sun Blocking

In comparison to heating constantly, relatively more respondents indicated that they already actively blocked the sun from their apartment in the current situation.

"Well, actually, not that much [will change], as we are currently also doing that already." (R1)

"We already close the blinds before leaving our apartment. We usually already do that the night before, if we know the sun will be shining... the sunshine hits our windows very early in the morning." (R9)

Some residents also indicated they did want to engage in more active sun blocking after the renovation. For them, this primarily

means starting to think about closing the blinds at an earlier stage than they are currently doing.

"So you can arrange everything yourself. Imagine that I would go outside and I know the sun will be shining in through our kitchen window, then I would want to block the sun there, you know." (R12)

A few times, respondents mention that electronic control of the blinds would make it easier to adopt the behavior. Still, for a few respondents the required change proved difficult.

"Well, that will be a big change for me." (R20)

Finally, some residents mention that they actually like the sun in their home, so they find it difficult to actively block the sun from their apartment.

"I like having the sun inside, so I will not quickly close the blinds." (R13)

With regard to motives for actively blocking the sun from their apartment, an expected increase in living comfort is mentioned most often (**Figure 2B**). Self-transcending motives are mentioned rarely.

Finally, exploratory quantitative analysis of attitudes, norms, efficacy and behavioral intentions showed that people have a positive attitude toward heating constantly ($M = 2.12$; $SD = 1.04$) and feel they can effectively execute the behavior ($M = 6.18$; $SD = 1.10$). Again however, the social norm regarding heating constantly is judged somewhat less favorably ($M = 4.58$; $SD = 1.53$). Moreover, in the case of active sun blocking, this does seem to impede on respondents' intentions to adhere to heating constantly after the renovation somewhat ($M = 5.79$; $SD = 1.84$). Nevertheless, respondents still indicate they intend to actively block the sun.

DISCUSSION

The current study explored social housing residents' beliefs, attitudes, and motivation regarding the sustainable renovation of their apartment building. By focusing on social housing residents, who are at risk of lagging behind in the sustainable urban energy transition, this small-scale study provided important insight into the barriers and facilitators of the sustainable energy transition in this specific population that is not often reached in research. The results of this study showed that residents were concerned about climate change and most already engaged in sustainable behavior or considered doing so in the near future. They largely believed global warming was problematic and had a personal norm to save energy even though they seemed to feel little responsibility for causing climate change. Regarding the renovation process, they did mention several negative aspects, mostly related to procedural justice concerns, even though their overall rating of the process was more positive than negative. Finally, when prompting specific sustainable behaviors (i.e., heating constantly and active sun blocking), we found that residents were generally motivated and felt able to adopt these behaviors, but that perceived social norms unsupportive of these behaviors might impede on adoption sometimes. Overall, our study showed that social housing residents are motivated to participate in the sustainable energy transition, but attention needs to be given to creating the right circumstances to convert this motivation into sustainable action.

In contrast to earlier research about social housing residents' sustainability motivation (Kollmuss and Agyeman, 2002; Glad, 2012; Santangelo and Tondelli, 2017), our study showed that residents' motivation to engage in sustainable behavior was high. Interestingly, respondents were motivated both by self-transcending values as well as by self-interested values, while the latter usually hamper sustainable behavior intentions (e.g., de Groot and Steg, 2008; Crosbie and Baker, 2010; Steg et al., 2014). It might be the case that, in social housing buildings especially, sustainable renovations and municipality's and social housing corporation's investments in sustainable technologies can decrease energy consumption and, at the same time, increase living comfort and decrease costs for residents. Hence, in this case, self-transcending environmental-justice and biospheric values and self-enhancing egoistic and hedonistic values may both motivate sustainable behavior, creating a win-win situation. Taken together, these results suggest that participation in the sustainable energy transition may be more about creating

an accepting and enabling (social) environment than about increasing motivation (Michie et al., 2011; Walker et al., 2014).

Furthermore, our results suggest that respondents were on average more positive than negative about the sustainable renovation of their building, again indicating support for the sustainable renovation. However, our results also indicate that the process of such a renovation can hamper people's willingness to engage in the sustainable energy transition. While they indicated being more positive than negative about the sustainable renovation, respondents did in fact mention many more negative aspects than positive ones. While most positive aspects referred to the outcome (e.g., improved appearance of the building, increased living comfort) or sustainability aspects, most of the negative aspects were related to the renovation process (e.g., uncertainties about starting dates or contact persons, communication issues). Many actions were taken by the social housing organization to allow residents to participate in the renovation process, both by providing information as well as by trying to carefully take into account the needs and opinions of residents during the renovation process (e.g., through information letters and a resident's committee; Sovacool et al., 2016). Nevertheless, the uncertainties and changes that happened in the course of the project (and which were all communicated to include residents in the renovation process) caused discontent and concern amongst residents. In this sense, informing residents at an too early stage may also backfire by overwhelming residents with uncertain information that needs to be corrected at a later stage. These results underline that procedural justice does not imply overwhelming residents with information, but importantly, entails including residents in the sustainable renovation process in the right way (see also Hauge et al., 2013).

While the sustainable renovation of the social housing building will contribute positively to residents' physical opportunities to engage in sustainable energy behaviors and residents are motivated to behave sustainably, it is important to take into account perceived behavioral control and social norms as well. The sustainable renovation introduces many new technologies into the building and requires residents to change their behavior in numerous ways. Importantly, the technological innovations introduced during the renovation can attain maximum energy savings only when the residents indeed adopt the required behaviors resulting in the greatest reduction in energy consumption. With regard to two behaviors deemed crucial in the renovation under study, "heating constantly" and "active sun blocking," we found that residents were overall willing to change their behavior, but need clear instructions on what to do. Some residents felt more hesitancy toward their ability to adopt the new behaviors and will need clear guidance on what to do. Simple instructions should in this case be complemented with real-life demonstrations and monitoring to achieve optimal reductions in energy use (cf. Berry et al., 2014). Moreover, social norms regarding the behaviors were not always positive. Residents felt that people close to them might not always be supportive of the desired behavioral changes. This could be due to the counterintuitive nature of the desired behavior changes (e.g., leaving the heating on when leaving the house or actively (and effortfully) blocking the sun from your apartment). It is therefore essential to clarify and emphasize the sustainability

aspect of these behaviors, as failing to do so may negatively impact people's intentions to engage in these behaviors.

Previous evidence suggested that, compared to the general public, social housing residents' willingness to adopt energy-saving technologies and behaviors may be lower (e.g., Glad, 2012; Kammen and Sunter, 2016). This is problematic, because social housing makes up a substantial part of the share of residences, especially in the Netherlands, and reducing energy use in social housing buildings is thus a crucial component to a successful energy transition. In contrast to these previous findings, the current study suggests that social housing residents are in fact concerned about climate change and motivated to engage in sustainable behaviors. Their motivation for doing so may partially rest on potential self-interested motives, such as an increase in living comfort or a reduction of costs as compared to the general public (Ebrahimigharehbaghi et al., 2019), but in sustainable social housing renovations such as the one focused on in this study, this may actually prove an additional motivation as opposed to a competing one. In line with the COM-B model (Michie et al., 2011), our results thus imply that engaging social housing residents in the sustainable energy transition is less about increasing motivation and more about creating the right circumstances (i.e., opportunities and capabilities) to do so. Currently, the social housing sector and the political landscape are creating the necessary physical circumstances, through sustainable energy investments (Aedes, 2013; Filippidou et al., 2016); the sustainable renovation that was the focus of this study being a case in point. Yet, policy-makers should also focus on creating the social circumstances (e.g., social norms) that support the sustainable energy transition. However, more research on these underlying mechanisms in the energy transition as well as in different socio-economic groups and studies comparing these mechanisms across groups is necessary to more fully understand how to leave no one behind in the energy transition.

A limitation of our study could be that the underlying factors that we aimed to investigate at times overlapped. In our study it was often difficult disentangle motivations from values and beliefs about sustainability and efficacy from social norms. Furthermore, the limited number of respondents (both in terms of representation within the respective building and in terms of representation of the target group) requires that all findings should be interpreted with caution and replicated in future studies. Yet, it should be noted that the number of respondents is in line with what is common for qualitative studies in the field of energy consumption (Galvin, 2015).

Nevertheless, our mixed-method design did allow us to distill important lessons to take away from this sustainable renovation project. Our study showed that social housing residents are motivated to participate in the sustainable energy transition and are already engaging in various sustainable behaviors. However, it is important to create the right circumstances to convert this motivation into sustainable action. To that end, policy-makers should carefully take into account procedural justice considerations (i.e., inform but don't overwhelm residents). Furthermore, by providing clear instructions and emphasizing the sustainability aspects of the required behavior changes, we

can empower social housing residents to make the sustainable energy transition. These insights will be valuable for new sustainable renovation projects, especially when they concern larger groups of residents (e.g., a social housing building or blocks of houses in a certain area). Overall, our results stress the importance of focusing on the "human side" of the transition process, against the backdrop of the systems in place and structural factors in the broader context. We hope that with this study we have provided housing corporations and their technical partners a number of tools to better engage, communicate and co-create with the residents.

DATA AVAILABILITY STATEMENT

The datasets presented in this article are not readily available because due to the sensitive nature of the questions asked in this study, survey respondents were assured raw data would remain confidential and would not be shared. Requests to access the datasets should be directed to Michéle Bal, m.bal@uu.nl.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Ethics Committee of the Faculty of Social and Behavioral Sciences of Utrecht University [reference number FETC18-085]. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

MB, FMS, and JDW designed the research. MB and FMS wrote the article and edited it. JDW and CVH conducted review. MB, FMS, CVH, and JDW received project funding. CVH was responsible for project administration. All authors contributed to the article and approved the submitted version.

FUNDING

This work was supported by research grant by Topsector Energy (Grant Number 1507) and Utrecht Municipality. These funding sources had no involvement in the study design; in the collection, analysis and interpretation of data; in the writing of the report; and in the decision to submit the article for publication.

ACKNOWLEDGMENTS

The authors are grateful to Merel Donkers for her help with the data collection. The qualitative data reported on in this manuscript (excluding data on the specific behaviors) was also reported on in the master thesis by Donkers (2019).

SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/frsc.2021.656781/full#supplementary-material>

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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