

I cannot live without air conditioning! The role of identity, values and situational factors on cooling consumption patterns in India

Citation for published version:

Osunmuyiwa, OO, Payne, SR, Vigneswara Ilavarasan, P, Peacock, AD & Jenkins, DP 2020, 'I cannot live without air conditioning! The role of identity, values and situational factors on cooling consumption patterns in India', *Energy Research and Social Science*, vol. 69, 101634. <https://doi.org/10.1016/j.erss.2020.101634>

Digital Object Identifier (DOI):

[10.1016/j.erss.2020.101634](https://doi.org/10.1016/j.erss.2020.101634)

Link:

[Link to publication record in Heriot-Watt Research Portal](#)

Document Version:

Publisher's PDF, also known as Version of record

Published In:

Energy Research and Social Science

Publisher Rights Statement:

© 2020 The Author(s).

General rights

Copyright for the publications made accessible via Heriot-Watt Research Portal is retained by the author(s) and / or other copyright owners and it is a condition of accessing these publications that users recognise and abide by the legal requirements associated with these rights.

Take down policy

Heriot-Watt University has made every reasonable effort to ensure that the content in Heriot-Watt Research Portal complies with UK legislation. If you believe that the public display of this file breaches copyright please contact open.access@hw.ac.uk providing details, and we will remove access to the work immediately and investigate your claim.



I cannot live without air conditioning! The role of identity, values and situational factors on cooling consumption patterns in India

Olufolahan O. Osunmuyiwa^a, Sarah R. Payne^b, P. Vigneswara Ilavarasan^c, Andrew D. Peacock^a, David P. Jenkins^a

^a Institute for Sustainable Building Design, School of Energy, Geoscience, Infrastructure and Society (EGIS), Heriot Watt University, Edinburgh, United Kingdom

^b The urban Institute, School of Energy, Geoscience, Infrastructure and Society (EGIS), Heriot Watt University, Edinburgh, United Kingdom

^c Dept. of Management Studies, Indian Institute of Technology Delhi, New Delhi, India

ARTICLE INFO

Keywords:

Environmental self-identity
Values
Situational factors
Air conditioning
India

ABSTRACT

As the world continues to deal with climate-induced heat events, sustainable energy behaviours, or lifestyles combined with non-behavioural interventions have been identified as crucial pathways to curb the demand for air conditioners. Typically, ecological communities serve as a reference point for sustainable lifestyles as they have strong environmental self-identity and values and are more likely to further engage in pro-environmental and energy-saving actions. Yet, it is unknown if individuals within these communities will act as expected, especially when confronted with extreme climatic challenges like heatwaves. It is also unclear which factors will define individual responses to these challenges. Utilising environmental self-identity and Value-Belief-Norm theories, this paper examines factors underlying cooling consumption behaviours of households living in a Universal Community with strong environmental world views in India. Twenty in-depth qualitative interviews with residents, thematically analysed, found that while people expressed strong environmental self-identity, preferences for air conditioner use was often mediated by hedonic factors such as comfort and sleep. Moral norms played a positive role in how people operated their air conditioners. Yet, when faced with the choice of using energy-efficient air conditioners, biospheric concern was of limited importance while situational factors like cost and functionality were more pivotal. The above results raise interesting questions around the difficulties that might emerge in changing preferences around air conditioning behaviours in non-environmental communities, especially, if environmentally conscious communities which are expected to be “the locus of change for energy efficiency actions” are significantly influenced by hedonic values.

1. Introduction

“I am conscious of the environment, but this body cannot go another summer without an AC”. ~ Anonymous (UC, 2019)

As temperature levels increase and climate-induced extreme heat events become more frequent and intense, global energy demand from air conditioners (ACs) is expected to triple by 2050. Projections show that ACs are likely to grow from the current 1.6 billion units to 5.6 billion by 2050 [1]. This growth will particularly emerge from rapidly developing economies experiencing higher temperatures and warmer years [1]. To address the effects of AC on power consumption, especially from the residential sector, energy demand scholars argue that reorienting household behaviours towards pro-environmental cooling actions could unlock enormous energy and environmental gains [2]. However, such gains are underpinned by the individuals' own

assessments of environmental actions and are either motivated by the individuals environmental self-identity (i.e. the perception of own actions as environmentally friendly) or by their intrinsic values (i.e. goals that define what people consider as pivotal in their lives) [3,4].

Research utilising social science models designed to explain pro-environmental behaviours, like the value-belief-norm (VBN) theory, highlight the role of environmental self-identity and values [5–7]. Although promising, most only focus on general environmental or energy intentions and behaviours in the Global North [8], with only a few studies in the Global South [8–10]. Similarly, studies on cooling have focused on its impacts on peak energy demand with empirical insights solely from countries like Australia, Denmark, Japan, the United Kingdom and the United States. Examples include research on health know-what and infants health on AC use in Australia [2], the influx of ACs in hospitals in the United Kingdom to maintain operating

E-mail addresses: o.osunmuyiwa@hw.ac.uk (O.O. Osunmuyiwa), S.R.Payne@hw.ac.uk (S.R. Payne), evignesh@gmail.com (P. Vigneswara Ilavarasan), A.D.Peacock@hw.ac.uk (A.D. Peacock), D.P.Jenkins@hw.ac.uk (D.P. Jenkins).

<https://doi.org/10.1016/j.erss.2020.101634>

Received 27 February 2020; Received in revised form 27 May 2020; Accepted 27 May 2020

2214-6296/ © 2020 The Author(s). Published by Elsevier Ltd. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

conditions required by heat-sensitive technologies [11], the association of ACs with social politeness in Japan [12], and the collective resignation by participants in Singapore that ‘removing ACs from the lives of most Singaporeans was impractical and almost impossible’ [13].

Cooling behaviours in the Global South, projected to account for future global cooling demand, are less researched [1]. Only a few studies have delved into this subject, demonstrating how cooling preferences interlink with everyday practices to shape energy consumption patterns. Notable examples include Khalid and Sunikka-Blank’s [14] work which provided a historical overview of cooling practices in Pakistan, how local manufacturing of ACs began, became standardised and transitioned from a luxury good among the middle class to a necessity that signals modernity and accomplishment. In the Philippines, Sahakian’s [15] study showed that participants in middle-income communities associated the use of ACs with cleaner air and safety—as they could keep windows closed and block out outdoor pollution. Wilhite’s [16] study also revealed how changes in India’s building industry and the switch to modern designs that do not perform well in hot climates set the stage for the surge in air-conditioning use in India.

While lessons from these three cases provide insights on the historical materiality and practices associated with AC uptake in the Global South, still, there is a need to focus more explicitly on the motivations and behaviours underpinning peoples’ ownership and use of ACs—in light of the rise in climate-induced heat events. In major markets in the Global South, people are typically buying ACs that are inefficient [1]. From a policy standpoint, a clear understanding of adoption behaviour enables the development of better policies to boost the diffusion of energy efficient ACs and lower the barriers to adoption. Since ecological communities typically serve as a reference point for sustainable lifestyles, there is a need for theoretical and empirical insights on how such communities in the Global South, with strong environmental self-identity are dealing with extreme heat events and changing weather patterns. Thus, utilising environmental self-identity and value-belief-norm theory, this study aimed to explore how individuals, who identify as environmentalist and reside in communities considered as environmentally conscious, react when confronted with higher temperature levels or heatwaves. Additionally, which situational factors define individual responses to these emergent cooling challenges?

By answering the above questions, our study contributes key insights into two new inter-related research and policy debates. First, it offers insights on the impacts of heatwaves on the accelerated demand for ACs in the Global South [17] by providing an “environmentally coloured” behavioural perspective on the motivations that underpin households’ purchase of ACs in India. Second, theoretically, we provide insights on the tensions between collectivist norms and individual identity and goals, explore the susceptibility of biospheric values which are presumed stable to hedonic or situational drivers, and analyse the role of ‘others’ (children or health know-what) agentic capacity in shaping household behavioural choices. To provide a theoretical foundation for this study, the next section explores existing research which captures the interactions between environmental self-identity, values and situational factors.

1.1. Understanding the role of environmental self-identity and values in shaping pro-environmental and energy behaviours

In environmental psychology, environmental self-identity features prominently as a predictor of pro-environmental behaviour (PEB) [18,19]. Environmental self-identity is described as a worldview in which a large set of attitudinal and behavioural beliefs around the environment become personally relevant to an individual’s sense of self (for self-esteem or self-enhancement). People aim to assert this identity by establishing consistent attitudes and actions around pro-environmental behaviours [20]. Past behaviours may moderate the relationship between environmental self-identity and pro-environmental behaviour

[21,22]. The premise here is that individuals who have performed environmentally friendly actions in the past are more likely to not only label themselves as “environmentalists” but create self-expectations to act consistently in line with that label [23]. This can result in positive spillovers, where pro-environmental behaviours in one area of life result in pro-environmental behaviours in another area. For example, individuals who purchased electric vehicles for environmental reasons which strengthened their environmental self-identity were also more willing to engage in other energy-saving behaviours such as removing appliances from standby or switching off lights in unoccupied rooms [24].

However, some research has shown that the performance of past pro-environmental behaviour can also create negative spillovers, where pro-environmental behaviours in another activity decline [25]. These negative spillovers are generally believed to emerge as a result of changes in the motivation of the individual, moral licensing effects as well as the perceived ease of achieving the desired action. For example, if the individual feels less morally obliged to act in ways consistent with prior pro-environmental behaviours due to a “contribution ethic or moral license” (convinced that past laurels uphold the contribution ethic) such reasoning may serve as a justification to abstain from environmentally friendly actions [25,26].

Both positive and negative spillover effects may affect a different behaviour, the same behaviour in the future, or the same behaviour in an alternate context [25]. Thus, it is argued that focusing on the processes driving spillover effects, individual’s regulation of moral self-image [27] and understanding the fundamental aspects of a person’s values can provide insights on the importance conferred on the performance of pro-environmental behaviour [28,29] and the strength of the individual’s environmental self-identity. To understand the role of values in shaping environmental identity and preferences, we engage with the value-belief-norm (VBN) theory of environmentalism [30].

The VBN incorporates value theory [31], norm-activation theory [32] and the new environmental paradigm perspective [33]. Schwartz [27, p.21] defines values as “a desirable transsituational goal varying in importance, which serves as a guiding principle in the life of a person or other social entity”. Values moderate behaviour specific predictors like personal norms capable of triggering moral obligations and impelling individuals to act in accordance with their cognitively internalised beliefs. From this, three types of value-orientations that underscore environment-directed behaviour were proposed: altruistic, egoistic, and biospheric values [30]. Individuals strongly attuned towards altruistic values weigh their actions based on its consequences for others. Those with egoistic values place more weight on the consequences for their resources.

While those with strong biospheric values weigh their actions based on its consequences for the environment. Later modifications of the theory include the hedonic value orientation whereby individuals focus on personal pleasure or self-gratification [34]. This is because while pro-environmental choices can provide certain gains like money or time savings, it can also threaten other personal benefits like comfort and pleasure. Thus, when faced with pro-environmental behaviour options, individuals with a hedonic value orientation focus on the potential hedonic costs, such as discomfort, displeasure or effort, thereby constraining their desire to perform pro-environmental behaviours [35].

1.2. Relationship and divergence between environmental self-identity and values: highlighting the role of situational factors

Many studies have explored the relationship between environmental self-identity and values [36–38]. These studies show that while environmental self-identity and biospheric values are closely aligned as they both increase the likelihood of pro-environmental behaviours, such as energy saving behaviours, yet, they may not always be consistent [38–40]. For instance, an endorsement of biospheric values does not mean the individual considers being environmentally friendly as

part of his/her identity [40,41]. Inconsistencies between the individual's self-identity, which is variable, and their values, which are more stable, may arise due to situational factors [41].

Situational factors are cognitively anchored within the locus of rationality and practicability. These are factors which either provide an economic advantage or informational incentives for desirable behaviour [27]. With situational factors, individuals usually condition behaviours to depend on a particular reference point, and they are sensitive to the risks and benefits associated with this point [42]. For example, past thermal history or synthesised information about the risks and benefits of certain cooling technologies might serve as a householders' reference point for what is considered an acceptable mode of cooling [43]. This does not mean that people do not regularly deviate from what is judged as 'logically practical' for what is perceived as 'right', however, more often than not, the logical can create cognitive dissonance or what has been described in the behavioural literature as the value-intention-knowledge-action gap (For a review see [44]). This perhaps explains why energy-saving measures which are cost-effective in the long-term and are usually in alignment with people's environmental identity or values, are sometimes ignored.

In summary, while biospheric values and environmental self-identity can predict a wide range of pro-environmental intentions and behaviours, situational factors can enable people to defer to behavioural rationalisations which allows them to ignore held values and focus on extrinsic rewards like personal gains. Based on the above conceptualisations and using a community in the Global South who identify as environmentally sustainable, this study evaluates to what extent environmental-self-identity and values can explain sustainable cooling behaviour; explore how and when environmental-self-identity diverge from values; identify the role of situational factors in this divergence and understand how this will affect current and future energy behaviour. In the following section, the case country, community and methodology are presented.

2. Methodology

We began our analysis by exploring individual motivation for the purchase of cooling technologies like AC and how this aligns with or contradicts self-defined identity or values. Empirical insights on how these contradictions or alignments occur were drawn using qualitative-in-depth interviews from a case study of a community founded on universal goals and aspirations in South India. Throughout this paper, this community is referred to as UC.

2.1. Participating community context

Average summer temperatures in India range from 32 °C to over 45 °C. AC sales in India are increasing annually by 20 per cent, with half of these purchases made by the residential sector. With India's projected population and income growth, and the likely rise in the demand for comfort, energy demand based on AC use alone will see a 15-fold rise from 90 terawatt-hours (TWh) in 2016 to 1,350 TWh by 2050 [1]. This would affect how the demand and supply of existing electricity infrastructures are configured.

Within India, the study examines a Universal Community (UC) with a strong environmental world view. UC is a community in South India created over 50 years ago with a purpose to realise human unity and promote the transformation of consciousness. According to its foundational charter, it is a community that 'no nation can claim, it belongs to no one, but humanity'. It is a site of 'material and spiritual researches for actual human unity with practical research on sustainable living, cultural, social, environmental and spiritual needs of mankind'. From its inception, the community has been involved in sustainability research across diverse fields including energy, agriculture and architecture. In the last ten years, UC's population has increased with the total number of residents growing from 2237 in 2010 to 2667 in 2017

[45]. Residents of UC have to apply to live there and promise to abide by the community rules.

Average summer temperatures at UC is 31.8°C. The evolution of cooling infrastructure, rules and practices in UC have been shaped by the community's sustainability philosophy. Buildings in UC are traditionally built to ensure natural airflow and light. Building style and architecture in UC range from those made with earth and Ferro-cement technologies to experimental constructions made with steel and glass. Residents are required to consult the governing body before technological or physical modifications are made in apartments. For over three decades, ACs were not allowed in UC, and most residents relied on the use of fans. However, in the last decade, there has been an increase in the use of ACs. In 2018, rules prohibiting the use of ACs were relaxed in some UC communities (like those interviewed) while others still enforce the no AC rule. At the time of the study, an estimated 250 AC units have been installed.

UC represents an interesting case as it has people from diverse nationalities with strongly shared views around energy conservation, yet in India, — a country experiencing more intense levels of heatwaves [17]. UC's energy conservation values are demonstrated in the numerous renewable energy projects undertaken in the last 50 years. UC has over 500 houses that use some form of solar energy; it has six 800 kW wind turbines and about 230 kW on-grid solar capacity to support its electricity infrastructure. Also, within UC, there are green zones with houses that do not rely on grid electricity but self-generate via renewable energy sources. In 2011, the community started a free electricity support program to reduce the financial burden of electricity payment for those working in its commercial units. Under this program, commercial unit members were excluded from paying for electricity consumed. By 2013, the free electricity support program was extended to all residents of UC. Residents are metered and given a bill showing their monthly consumption. The billing system is also used to notify residents of excess consumption. Per-capita annual electricity consumption has shifted from 1610 kWh in 2010 to 2226 kWh in 2017 [45]. Putting this in real terms, the average per capita electricity consumption in UC exceeds the Tamil Nadu average and is almost two times bigger when compared with the whole of India [45].

2.2. Interview schedule and analysis

Between July 2018 and September 2019, thirty households in UC had their energy consumption monitored at 30 minutes temporal precision. The monitoring was done as part of a larger interdisciplinary Community-scale Energy Demand Reduction in India (CEDRI) project that aims to develop clear demand reduction/management strategies to foster resilient electricity networks in India. CEDRI provided the equipment for monitoring while the project partner in UC oversaw the installation. 20 participants from two different groups were interviewed. Group one had ten participants' each representing an independent household among the monitored houses. Similarly, group two had ten participants' each representing an independent household from non-monitored micro-communities within the UC. Selection was largely influenced by participants willingness to be in the study. Of those interviewed (a) ten participants had ACs with three being from the monitored communities; (b) five participants had energy efficient fans only and (c) five participants had non-efficient fans only. Interviewee sample was diverse and included individuals from different socio-economic backgrounds, nationality, race and gender. Participants ranged from 22 years to 80 years old. Twelve respondents were from India, while two were Russian, two Germans, one French, one Spanish, one Italian, one American. Participants differed in the household they lived in (single or multi-generational); the design of the house (conventional, semi-passive, passive)¹; the cooling systems used (ACs and

¹ Passive houses are climate responsive buildings designed to achieve

Table 1
Socio-demographic characteristics of research participants.

Sl. no	Interview Pseudonym	Nationality	Gender	Age	Household type	Building type	Air conditioning	Energy efficient fans
1	Jagu	India	M	27	Single	Semi-Passive	N	N
2	Ita	India	F	29	Multi-generational	Conventional	Y	N
3	Prasad	India	M	40	Multi-generational	Conventional	Y	Y
4	Manav	India	M	26	Single	Passive	N	Y
5	Anatoly	Russia	M	35	Household with Children	Passive	Y	N
6	Bermuda	India	F	25	Two-person household	Conventional	N	Y
7	Bani	India	F	35	Household with Children	Conventional	Y	N
8	Angela	Germany	F	72	Two-person household	Semi-Passive	N	N
9	James	France	M	76	Two-person household	Semi-Passive	N	N
10	Khan	India	M	80	Single	Semi-Passive	Y	N
11	Bill	America	M	37	Single	Semi-Passive	N	N
12	Manish	India	M	49	Household with Children	Conventional	Y	N
13	Luna	Spain	F	49	Household with Children	Conventional	Y	N
14	Veer	India	M	40	Two-person household	Semi-Passive	N	Y
15	Jeet	India	M	55	Single	Semi-Passive	Y	N
16	Tanya	Russia	F	39	Two-person household	Semi-Passive	N	Y
17	Kumar	India	M	39	Two-person household	Semi-Passive	Y	N
18	Marie	Germany	F	38	Household with Children	Passive	N	N
19	Akshay	India	M	65	Two-person household	Semi-Passive	N	N
20	Matteo	Italian	M	68	Single	Semi-Passive	Y	N

Source: Table compiled by author 1.

fans; or just fans); and the use of additional power back-up systems. Only two participants owned the apartment in which they lived in, and these were from the non-monitored communities. Participants are stewards of their apartment as almost all apartments belong to the UC (Table 1).

The interviews were conducted by the first author who has a background in energy-social science research with a good understanding of current debates within the environmental psychology literature. Interviewees discussed their current and future interactions with the electricity system and provided perspectives on their energy behaviour. Interview questions covered topics such as grid experiences and general electricity consumption patterns; comfort and the formation of cooling choices based on grid challenges and building structure; electricity use perception and values; changes in electricity consumption behaviour since moving into the community; current energy-efficiency actions taken, future proposed actions and barriers to shift in energy behaviour. To ensure values around cooling choices and general energy behaviours were discussed, questions were directly related to specific factors in the VBN (e.g. “What motivated you to buy this cooling appliance? To understand participants’ own view of their identity and its influence on their energy behaviour, participants were asked questions like (e.g. “what motivated you to move to this community”?

Interviews lasted for an average of sixty minutes, followed by informal discussions with participants. Consented audio recordings of the interviews were made and transcribed. Responses were coded in Nvivo QSR International software. Thematic coding was conducted by author 1 and then discussed with authors 4 and 5. Specifically, responses were first thematically coded by (i) participants views around AC ownership and cooling; (ii) the adaptive measures adopted by participants to achieve comfort; and (iii) how situational factors and membership of the UC moderates their adaptive behaviour. Subsequently, deductive coding matched responses to VBN and environmental identity

(footnote continued)

minimum energy use and good indoor ventilation quality. Passive buildings in UC have advanced insulations, renewable solar systems, rainwater harvesting systems, and domestic wastewater treatment plants. Semi-passive buildings in UC are designed to achieve minimum energy use. However, ventilation can sometimes be poor in some buildings while renewable energy systems are generally not integrated. Whereas conventional houses are not designed to achieve high energy performance.

variables. These themes are used as a framework to present the findings.

3. Results

3.1. Environmental self-identity and cooling patterns

Based on existing research, interviewee discussions around environmental self-identity were coded by broader worldviews and past behaviours. Most participants labelled themselves as environmentalists. This identity construction was formed because they were born into the UC or had left “a previous life” to embrace a sustainable lifestyle. Participants born or those who grew up in the UC mostly attributed their cooling choices to their socialisation and childhood experiences.

- *Bermuda: “From school, the first thing they taught us was to stop the fan, and to stop the light. Whenever we use something, we have to switch it off. That is the main thing which goes into our mind. They constantly tell us to do this. That is how it is saved in my mind. I think the school changed us a lot. I don't know how else to explain it, because I don't know, outside UC if they are telling the children or not. In UC, they tell all these kinds of things to children.”*

Participants who shared similar environmental identities with Bermuda, but moved to UC as adults, regarded the purchase of AC as a necessity. This idea of necessity is likely motivated by the individuals' past thermal history or preferences around what is considered an acceptable mode of cooling. The regulation of ACs to certain temperature levels (26 degrees) was seen as an energy curtailment activity. However, this did not stop participants from running their ACs for longer hours than necessary.

- *Kumar: “I purchased an AC. I put AC in a room, just one room for sleeping, where you keep a temperature of 28 or something like that. I don't go low on the temperature.”*

Only two participants explicitly attached their non-purchase of AC to identity around the environment.

- *Veer: “I'm more of an environmentalist and concerned about the environment, so I didn't go for it”.*

Although participants showed an awareness of the environmental consequences of in-efficient AC use through numerous socialisation processes which had occurred within the community, however, it was observed that participants who in their younger years would have objected to the purchase of high energy consuming ACs for comfort, were no longer visibly antagonistic of the idea. As people got older, their identity constructs changed.

Participant's reflection on previous pro-environmental action as a motivator or barrier to cooling choices and behaviour contained both positive and negative spillover behaviours. Positive spillovers from past pro-environmental behaviours included participants who self-reported using energy-efficient light bulbs, showing distinct preferences for the use of low energy consuming fans.

- Prasad: *"In my house now, I already changed from the round enamel bulb to PIA and CFL. Now my house is filled with LEDs because with ten watts you can get 40 watts of luminescence. I have also changed into low-power-consumptions fans only."*

Identity research suggests that positive cueing, such as stimulating individuals' self-perception by framing past behaviour as 'diagnostic' of pro-environmental behaviour, can elicit positive spillovers [25]. When asked to discuss energy efficiency curtailment or intervention behaviours conducted in the past, participants were cued to reflect on their past activities around energy saving measures. Observably, most participants were quick to refer to technological and behavioural changes made, which not only made them feel better but led to subsequent changes around their cooling preferences. For example, Jagu explained that.

- Jagu: *"When I stayed in a different sub-community before, I had an energy efficient fan with a remote, which used to lie down on my bed or on the pillow and I controlled the speeds later in the night because it gets much cooler in the night. So, if I have that thing, I can control. Otherwise now, I end up using a big quilt or a blanket and I lay on myself, being lazy. Very few people get up in the middle of the night and reduce the fan speed. So, it's just convenient, and it consumes half the amount of energy."*

Jagu's example reifies Lacasse's [21], stance that pro-environmental cueing or labels can strengthen people's environmental self-identity and influence the extent to which environmental considerations are taken into account in purchase decisions. People want to avoid the unpleasant feeling of behaving inconsistently across different pro-environmental behaviours or between times and contexts. Thus, tapping into people's fears of consistency can be a vital source of strengthening an individual's normative preferences around environmental goals.

In terms of negative spillovers, participants who had previous experience in the energy efficiency business or had some knowledge of energy efficiency actions preferred the use of energy efficient ACs. The environmental cost of using AC was discounted due to participants' 'know-how' around the efficient use of AC. For example, Anatoly argues that his AC is only used on 'very hot' days, or when it was 'needed'.

- Anatoly: *"ACs? Yes, I'm involved in an energy-efficiency business. I know how to use AC efficiently. I have an AC in the living room. If I want to use it at night, I know it is very good practice to put it on in the living room, open the door and get a bit cold in my bedroom. I'm planning to get a second one, a smaller one so that I can run at night in the room where I'm sleeping."*

Similar discussions with other participants like Anatoly suggest that know-how around AC produced direct rebound effects as it did not only encourage the use of ACs, it also increased participants willingness to purchase more ACs. Some participants saw the use of AC as non-threatening to the environment, and there was scepticism that their

behavioural changes would have zero impact on broader environmental problems in the world [41]. For example

- Bill: *"I think about it, of course, I do think about it but, frankly, when I see the state of things, especially in India regarding the use of AC and when you go to China everybody has AC. So, there is a point where, for me, it's not that I'm not concerned about the environmental impact, but I feel a bit silly when I force myself to not use something which, in any case, is just a drop in the ocean. Yes, I think it's not my use of AC which actually would be completely limited and restricted to the minimum that I need, that will make a difference!"*

Participants who shared similar concerns like Bill exhibited what Lacroix, Gifford, and Chen [41] terms as "the change unnecessary dragon of inaction". While they seemed to be keenly concerned about environmental problems, they engage in judgemental discounting (a situation whereby environmental conditions is presumed to be worse elsewhere) or attribute their inaction to perceived inequity (asking why they should exhibit environmentally conscious behaviour while there are other free-riding nations or sectors who are worse). Such justifications are made to excuse culpability in the non-performance of environmentally friendly behaviour or provide a palliative function to ease the embarrassment caused by the conflict with the individuals' environmental identity or image [42].

3.2. Individual values and cooling behaviours

While individuals in principle, may endorse all four types of values, some values are given more priority than others. Of the four value orientations, hedonic values were the most dominant among participants. The hedonic values seem to influence the purchase of ACs among participants who had installed ACs and fuelled the desire to purchase among participants who had not yet done so. Biospheric values played a more direct role in the type of ACs or fans purchased by participants, yet it was of lower significance to participants when it came to operating the appliance.

3.2.1. Hedonic values of comfort: sleep and wellbeing

In line with existing research [e.g. 43], hedonic values were congruent to the purchase of ACs as they elicited emotions of comfort and pleasure. Participants who had purchased and installed ACs often referred to their own, or their families need for comfort as the primary reason for purchase. Comfort for single-household participants was mostly associated with the ability to work from home.

- Matteo: *"The point here is, conscious use. I am not philosophising, I am simply sharing an experience. Conscious use of the energy, even if it is not the best, like AC, can give you positive human energy. For example, I noticed this summer I was very pleased that I could work. I have stopped working from the office. I work from home. I'm really focused, in really good physical condition and not struggling, but I minimise the environmental impact of the AC"*.

Participants with children were quick to attribute the purchase and sometimes longer hours of AC use to their children's needs. For participants with younger children, the children's lack of consideration for electricity use was often discussed as a barrier towards becoming energy efficient. However, controlling the children's use of AC was not seen as an option. For these participants, it is Children vs the Environment, and the Children always win.

- Ita: *"We're managing because my son and daughter, they want the AC to be running! If AC was not running in my room, they would go to my mother-in-law's room. He'll fight with me if the AC's low and will go to another room and put the AC on high. They will bring their friends. They will keep playing in that room."*

Whereas for participants with teenage children, the purchase of AC was linked to educational needs and the ability to sleep at night.

- *Luna: “Three years ago, my daughter was having her first O level exams and, of course, they have exams in May which is the hottest month in India. So, she needed it to study because she was just dripping. A lot of kids, they come here because we have AC, but we felt it was more conducive to have it at home and since the weather is getting hotter, so we felt, okay, let’s just have it and keep it. We have a small one that goes for the bedroom and a small one for the office.”*

However, when asked if they were willing to reduce their AC use, several participants showed a huge lack of interest in the subject. Even participants who had initially discussed their strong normative beliefs about the environment perceived the request to reduce AC use in summer as behaviourally costly. This assumed high behavioural cost made them focus on hedonic benefits of AC rather than its impacts on the environment.

- *Anatoly: “I got one because it was very hot! Yes, I’m in India for 15 years. In the beginning, it was okay, one can suffer through the summer and it’s okay, but year after year you start questioning, why? If you can get an AC and make yourself more comfortable. Finally, I got it. Yes, I was using it just for, I think, two months this year. This is my first experience with AC here.”*

Interestingly, for participants who had not yet purchased ACs and were unwilling to do so, membership in UC was mentioned as the underlying reason for this decision. According to these participants, the use of ACs was highly contradictory to the community’s ecological goals. This sense of connection to the community’s goals and a feeling of responsibility to community ideals were stronger in some than others.

- *Bermuda: “For example, from my experience, a few people in the community are suggesting having ACs because they feel like a fan is not enough for them. They feel because they’re from outside India, and are foreigners, they feel like India is becoming very hot. So, for them, a fan is not enough, and they are suggesting for us to have ACs. In UC, we are not allowed to have ACs!”*

Bermuda’s statement resonates with previous findings [44] that when individuals are nested within a group and think of themselves as integral members of such groups, the group goals become internalised, motivating members to behave in alignment with such goals. Yet, it was observed that these internalisations were relatively weak and insufficient once rules around AC ownership were lifted. For example, some participants expressed frustrations and described the UCs previous rule around AC ownership as being unrealistic and unreflective of the current climatic changes happening in the world.

- *James: “I said, if I take AC, I will move out...because I have to respect the rule which was put. But in fact, I’m not the first one to challenge the rule. It doesn’t matter. We have to adapt. I don’t like rules, but common sense. Rigid rules anyway, make no sense. Life is not like this, you know.”*

Like James most participants who had not, but were considering the purchase of AC said they had been mostly dissuaded by the community rule in the past. Thus, the community rule had a more enduring effect on participants as this “forcefully” encouraged pro-environmental cooling behaviours. This is in line with previous research [45] which argues that when hedonic values are stronger than normative ones, individuals are more likely to consider aspects that affect the way they feel, and if it does not bring comfort, they still may not act in an environmentally friendly way even if they hold environmental norms.

3.2.2. The influence of biospheric values on cooling behaviours

Biospheric values have proven to be an important and consistent predictor for understanding and explaining the formation of individuals’ general beliefs and personal norms about nature and the environment [38]. The more deeply rooted these personal norms, the deeper the individuals’ awareness of the consequences of their behaviour towards the environment [32]. Participants who demonstrated their awareness of environmental issues expressed their sensitivity to the environmental consequences of their own cooling behaviours. Morality around contributing to emissions was cited by some participants as a reason for the non-purchase of ACs, the use of efficient fans or sometimes the sparing use of ACs during summers.

- *Manav: There were fans, and that’s pretty much it, and that was hell! I would have gone as far as to have got a cooler, a cold-water cooler. You couldn’t use the AC there because of the way it was, but I would have done that, it also would not be efficient at all.*

Participants’ ascription of responsibility to perform sustainable cooling behaviours (e.g. non-purchase of ACs or the use of efficient appliances) were mostly related to their knowledge of alternative means of maintaining comfort. Some of the alternatives discussed were showering, opening of windows or the use of mechanised or hand fans. The presence of trees in UC was also discussed as a better, environmentally friendly measure that can satisfy households cooling needs. Some participants also reported moving around the house to find a cooler place to relax or sleep. The use of alternatives was often framed by participants as a required environmental trade-off.

- *Marie: “You sweat a bit more, or you take three showers more, and then it is fine.”*

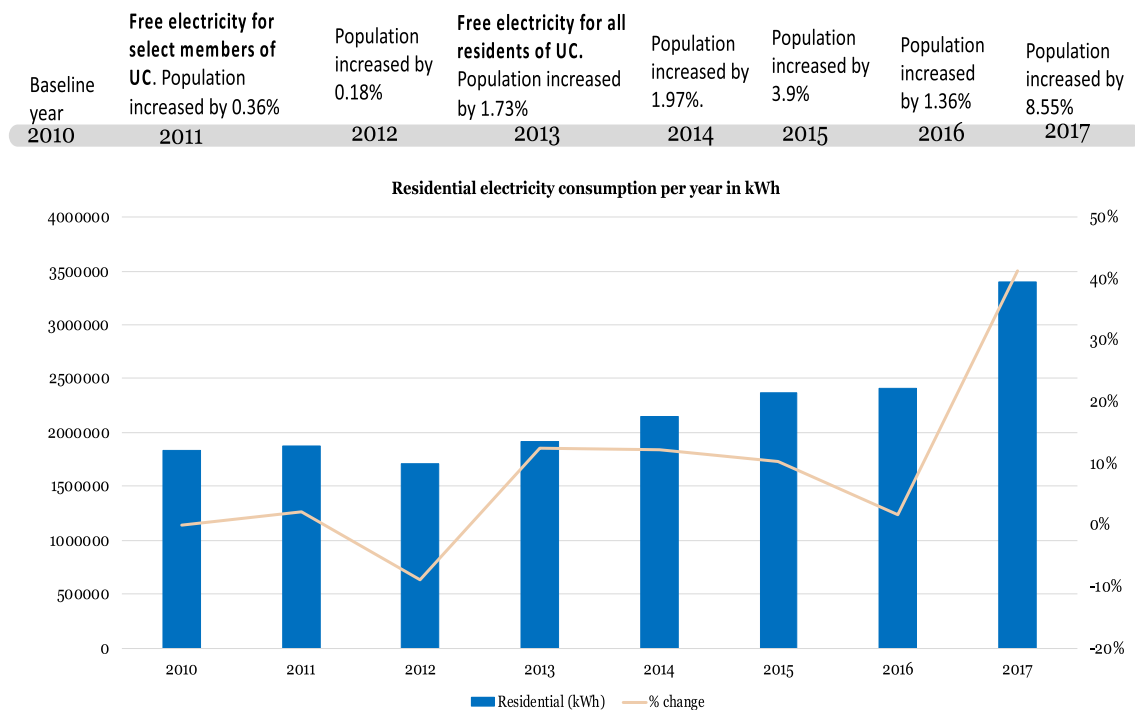
Similarly, participants’ use of efficient cooling technologies were positioned within the sphere of moral obligations. The purchase of efficient ACs was viewed as a “moral thing to do” especially when AC use is considered a necessity or tied to the individuals’ sense of ‘thermal survival’. In Matteo case, sticking to his principles had a higher financial risk, yet for him, the purchase of a four-star AC (an AC rated as the second most efficient under the Indian Star rating system) aligned with his environmental principles and the violation of these principles was perceived as intrinsically wrong (see [46]).

- *Matteo: “We have an AC which I put in this last summer to survive. But I took the best ecological I could find. Four-star. Cost me more, and it was not an easy decision, but I sacrificed that 15,000 Rupees on the altar of the environment because four-star is much more costly than the other. I don’t say it is perfect, and I try to use, not to justify myself, but to learn the exercise, I try to use it as consciously as possible.”*

The above example suggests that individuals can invoke moral norms around cooling choices even when it clashes with rationalisations around costs or material rewards. This resonates with findings from Steg et al. [35] which establishes that people are intrinsically motivated and willing to engage in pro-environmental behaviours even when it might be costly or deviate from rationality.

3.3. The role of situational factors in cooling choices

Building characteristics appear to be a crucial factor in the changing landscape of AC adoption among UC community members. Participants who lived in buildings with passive features were often quick to refer to its architectural style or the materials used as a means of ensuring and attaining an ‘ideal’ internal temperature within the home. These features did not only facilitate the personalisation of comfort but were explicitly stated as the reason for the non-purchase of ACs.



Source: UC consulting, 2018.

Fig. 1. Timeline on population and residential electricity change in UC.

- *Khan: "My house is built in a bioclimatic way. It has huge windows. You've got a lot of nice airflows. The walls are all made out of mud, so it's naturally insulated. When it's hot, it still stays pretty cool, so that's nice."*

While in poorly designed buildings, small windows and lack of cross-ventilation were discussed as drivers for purchasing or using ACs:

- *Jagu: "So the place where I stay now, the architecture is much better than the previous one. So, I'm able to cope with the heat with good ventilation and the high ceilings. The previous one, is a regular house with concrete and one window. Not very good ventilation. That's why I ended up using AC there."*

The above quotes show that this is a community well-educated about what is a "good" and "bad" building in terms of thermal comfort. This education is presumably due to (i) being in a climate where staying cool is a regular issue and (ii) being in a community where efficiency and sustainability are identified and discussed as issues. Participants referred to the way houses are built as a means of manipulating their comfort. This mirrors adaptive thermal comfort studies which posit that building occupants exposed to a variety of 'passive' infrastructures and technologies can enjoy a broader range of temperatures than those living in climate-controlled structures [43]. Since members of UC are not permitted to retrofit their homes, the adoption of ACs to achieve comfort appears inevitable once AC purchases were allowed (and socially acceptable) in the community.

Participants' age and health were also identified as a motivating factor for the purchase and use of ACs. Regardless of gender, middle-aged (45-50) and older participants reflected on their inability to deal with the rise in temperatures as compared to their memory of previous years. Older participants (60 and above) who identified with the environmental values of the UC expressed their helplessness around the use of ACs. For these participants, the increase in temperatures and frequent occurrences of heatwaves were potentially viewed as a dangerous phenomenon with severe health implications. For example,

Angela, who had lived in the UC for over forty years, attributed her attempt to purchase AC the previous year to her inability to cope with heat due to her age. She further explains that others within her age group have also begun to purchase ACs as they can no longer manage the heat

- *Angela: "But now, I have to add something. That is, I've never had a problem in the summer. It was hot, but okay. But now with getting older, I suffered a bit last summer. Due to sickness or whatever it is, some ACs emerged here and there. I know in this block one, two, three, four, or at least five ACs exist."*

For participants who had experienced health challenges or had family members with severe health conditions, the environmental impacts of AC use became inconsequential. Often, these participants attributed the purchase of ACs to advice from health practitioners.

- *Jeet: "Health conditions, I need to have the AC for health reasons. I moved here in 2010, so from 2010 to '18, there was no AC, and then 2018 I got an AC."*

Participants' environmental views were often relegated by Health authority advice. This is similar to findings of AC uptake in Australia, which have connected the health sector 'know-what' to the consumption of antibiotics and the regulation of temperatures for infants [2,47]. Outside of health advice, older people, in general, are unable to physically tolerate higher temperatures, especially when it might place them at risk of heatstroke or associated heat stress issues. This inability to cope further reinforced participants' willingness to use ACs.

Finally, the removal of electricity tariffs within the UC was identified as a push factor in the purchase of ACs among community members. To verify the role of the free electricity support program on AC use among residents, yearly residential electricity consumption data from 2010 to 2017 was contrasted with three variables; temperatures levels, population and community policy on electricity payment (see Fig. 1).

From Fig. 1, it can be observed that in 2013, the year the free-electricity program was introduced there was a 12.34% increase in electricity consumption. Like 2013, 2017 also shows a similar jump in electricity consumption. However, this could have been as a result of higher temperature levels (there was an unprecedented level of heatwaves across Tamil Nadu in 2017) or population growth. Buttressing the study's data observations, participants stated that with free electricity, neighbours who had previously abstained from the purchase and use of ACs due to high electricity cost, begun to purchase them.

- *Manav: "Yes, but you see in UC now, you don't pay electricity bills. Basically, all residences and offices and all are getting free electricity. Nobody cares about their bills and their consumptions. Yes, because right after that we saw a spike of energy and people buying ACs and all kinds of good stuff. Not necessarily good, but even my parents went for stuff."*

Like Manav, other participants expressed similar alarm and disapproval at how fellow community members have begun to operate ACs for longer hours. Finally, when participants with ACs were asked to discuss reasons for the non-adoption of the most energy-efficient AC in the market or what is termed as a 5star ACs in India, high costs, associated with insufficient disposable income were the most frequently mentioned barriers. The mention of income is not surprising, as community members within UC live on a fixed allowance.

4. Discussion and Conclusions

Managing residential comfort expectations, increase in AC uptake and cooling demand in the face of extreme heat and rising affluence is one of the many challenges facing energy service providers and policymakers in emerging economies of the Global South. This is pivotal for India, where the share of space cooling in peak electricity demand is projected to rise drastically and jump from 10% in 2018 to 45% by 2050 [1]. Environmental psychology research proposes behavioural change via environmental identities and values as potential solutions to these challenges. This research contributes to the above conceptual debate by empirically exploring how environmental identities and values influence AC consumption patterns in a Universal Community with strong environmental goals in India. Based on our findings, three themes relevant for expanding theory emerged in our study (i) the collision or tensions between collectivist norms and individual identity and goals leading to individuals willingness to transgress group moral norms typically seen as socially consequential, (ii) susceptibility of biospheric values which are presumed stable to hedonic or situational drivers, (iii) the role of 'others' (children, health know-what) agentic capacity in shaping (parents/individuals) behavioural choices. We explore these themes further below.

Collision or tensions between collectivist values and individual identity and goals: Research on collective efficacy have often argued that collectivist orientation is more compatible with 'environmentalism' as people or communities which fall into this category do not only refer to duties and obligations but are more prone to emphasising the interdependence of the ecological system [48–50]. Yet, our results show that while collectivist environmental values and identities might be strong, these can become unstable and change once they collide with individual values or situational factors. The divergence between collective and individual values reflects how people's actual or perceived consumption needs can cognitively override existing normative constructs which underscore their identity. This was evident with participants who had actively made reassuring statements about their environmental identity and value for nature, yet, alluded to hedonic benefits and situational considerations as factors underlying their use of ACs. The tension between the individual's identity and the community's values further contradicts prior research in the environmental literature which posits that membership in social groups positively affects individual behaviour- especially as people want to adhere to moral norms

shared by the group and enjoy the social implications of doing so [50,51]. Yet, in our research, what was observed was the individual's willingness to transgress group moral norms even when these have social consequences. This is interesting for the VBN for two reasons; one, compliance with environmental norms is an important causal factor for pro-environmentalism in the VBN, and two, expressions of morality at the collective level is said to serve as a situational cue that can determine the moral behaviour of individuals [3,52]. Yet, in our study, we found that participants like James were willing to break with the group norm even if this meant socially excluding himself by moving out of the community. Thus, if individuals in strong ecological communities can discount the social ostracisation that accompany 'breaking' group environmental goals to satisfy hedonic needs, this suggests that those outside of such normative bounds might have no problems focusing on hedonic and egoistic gains.

Susceptibility of biospheric values which are presumed stable to more hedonic or situational drivers: Research on biospheric values are underpinned by the assumptions that (a) when held, they are constant in individual choices, and (b), they become more strengthened in a collectively moral environment [5,38]. Both assumptions, while not inherently wrong, are constrained by the ecological realities of many Global South countries currently facing heatwaves. As seen in our results, those who held biospheric views discussed practical considerations like cost and functionality when asked about the purchase of energy efficient ACs. Once key barriers to doing something non-biospheric (i.e. electricity cost) were removed, the stability of individual biospheric values begun to waver.

This is where the integration of Science Technology Studies (STS) concepts that are cognisant of the influences of broader socio-technical-ecological-geographical contexts might be useful for the VBN. Studies which come to mind are that of Trentmann [53] and Shove [54] that are based on understanding how technological and non-technological systems alter/shape householders' capacity to re-organise consumption patterns or routines to accommodate and respond to disruptions (i.e. heatwaves) or incentives (free electricity). Furthermore, studies suggest that individuals with biospheric values who engage in behaviours with thematic similarities (e.g., environmental activism) or those performed within similar contexts (e.g., green purchasing) tend to perform other behaviours in the same cluster [36,55]. One would expect that those who live in environmental communities would replicate these clustering from one domain (e.g. involvement in reforestation) to another (energy conservation). However, our study shows that such replication does not generally occur as participation in one environmental activity (choosing to live in an ecological community) has not translated to the use of energy efficient air conditioners. This ties with Sterns argument that private sphere behaviour like recycling can sometimes be in contrast with one-off purchase behaviours of goods like appliances (see Stern, [56]).

The role of 'others' (children-or health Know-What) agentic capacity in shaping behavioural choices: Existing insights on the role of 'others' agentic capacities to shape behavioural choices within the VBN has been limited to the evaluation of subjective norms or socio-demographic variables [26,57]. Sticking to this sliver of social behaviour alone, the VBN misses out on identifying the human and non-human actants who seemingly appear to have little consumer agentic power, (like children, visitors, health experts or building type), yet, contribute to cooling consumption directly or indirectly at the household level [58]. In the case of our research human and nonhuman actants (otherwise termed as situational factors) like building type, health, age, children, houseguest and variability in temperature played a crucial role in how participants justified their actions to purchase and use ACs. For middle-aged and older demographic participants, health advice on "the use of AC" was seen as a "golden rule" even when it was in contradiction with values congruent to their individual identities. Participants' decision to follow health advice was further strengthened by the increase in temperature levels. This is similar to findings from

Nicholls et al., [2] in Australia, which confirmed the role of health practitioners in shaping ideas around cooling behaviours. Likewise, choices to install air-conditioning (as in case of Ita and Luna) was not influenced by the 'individual value' of the traditional electricity user (the adults who make the purchasing decisions) but rather by the value of 'others' (their children). As pointed out by Strengers et al. [58] humans and nonhumans actants who do not fall easily within traditional consumer categories (because they do not pay electricity bills), can have a profound influence in shaping cooling consumption at the household level. This emphasises the need to consider broader situational factors, alongside individual values and identities, to get a comprehensive understanding of how individuals will potentially behave when required to choose between what appeals to their identity and what makes sense in terms of practical value.

4.1. Limitations

While our research presents one of the first attempts to evaluate cooling behaviours in an emerging economy (India) experiencing an increase in temperature levels, still, there are limitations that must be kept in mind in the interpretation of the results. First, it is centred on cooling behaviours in a universal community with strong ecological values that are not representative nor indicative of wider behavioural identities, values or preferences in India. Still, India represents an interesting case due to its' huge population and multiplicity of cultures. Future research evaluating the role of identities or the validity of the VBN across these different sub-cultures can provide important insights on the applicability of these theories. Second, our participants were selected in collaboration with a researcher from the UC. This might have influenced the participants' responses to certain questions around group values and goals. Another major drawback is the relatively small community in which the research is based. This raises concerns about the scalability and generalisability of behavioural findings.

Yet, we believe that the observed factors (the removal of operational cost barriers, increasing rise in temperature stress levels and the availability of medical information on the importance of cooling for certain demographic) underlying changes in rules around AC use in the case community are generic enough to trigger wider adoption of cooling technologies at a country-scale. While we acknowledge that these factors have been responded to in a specific way in the UC, they are likely to have similar impacts elsewhere.

4.2. Policy implications

Finally, from a policy standpoint, our results contribute to the discourse on the demand for ACs by providing a picture of the behavioural tangents individuals or households are likely to follow once the barriers to the adoption of ACs are removed. This is relevant for emerging economies in the global South for two reasons.

First, not only would air conditioning growth have a significant impact on peak electricity demand and total electricity consumption, but it would also mean that electricity distribution companies would need to make significant investments in the existing electricity infrastructure if demand is not managed adequately. Second, due to increasing globalisation and as shown in our results, more people across the globe will work from home (as seen with the 'black swan' event of Covid-19 pandemic). This means that with increasing temperatures, more AC units will be needed at home to meet people's needs.

Declaration of Competing Interest

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

Acknowledgement

The results presented in this manuscript is part of the CEDRI project funded by the Newton-Bhabha scheme, supported by the UK Engineering and Physical Sciences Research Council (EPSRC) reference: EP/R008655/1 and the Indian Department of Science and Technology (DST). The authors acknowledge the support extended by Mr Martin Scherfler and Mr Jaswanth Yaddala for their valuable insights and logistical support during the data collection process in the case community. Any opinions, findings and conclusions expressed in this study are those of the authors and do not necessarily reflect the views of the EPSRC, Heriot-Watt University and/or IIT Delhi.

References

- [1] IEA, The Future of Cooling, 2018. doi:10.1787/9789264301993-en.
- [2] L. Nicholls, Y. Strengers, Heatwaves, cooling and young children at home: Integrating energy and health objectives, *Energy Res. Soc. Sci.* 39 (2018) 1–9, <https://doi.org/10.1016/j.erss.2017.10.002>.
- [3] E. van der Werff, L. Steg, The psychology of participation and interest in smart energy systems: Comparing the value-belief-norm theory and the value-identity-personal norm model, *Energy Res. Soc. Sci.* 22 (2016) 107–114, <https://doi.org/10.1016/j.erss.2016.08.022>.
- [4] P.C. Stern, K.B. Janda, M.A. Brown, L. Steg, E.L. Vine, L. Lutzenhiser, Opportunities and insights for reducing fossil fuel consumption by households and organizations, *Nat. Energy*, 1 (2016), <https://doi.org/10.1038/nenergy.2016.43>.
- [5] F. Fornara, P. Pattitoni, M. Mura, E. Strazzera, Predicting intention to improve household energy efficiency: The role of value-belief-norm theory, normative and informational influence, and specific attitude, *J. Environ. Psychol.* 45 (2016) 1–10, <https://doi.org/10.1016/j.jenvp.2015.11.001>.
- [6] L. Steg, L. Dreijerink, W. Abrahamse, Factors influencing the acceptability of energy policies: A test of VBN theory, *Bull. Coun. Res. Music Educ.* 25 (2005) 415–425, <https://doi.org/10.1016/j.jenvp.2005.08.003>.
- [7] F.G. Kaiser, G. Hübner, F.X. Bogner, Contrasting the theory of planned behavior with the value-belief-norm model in explaining conservation behavior, *J. Appl. Soc. Psychol.* 35 (2005) 2150–2170, <https://doi.org/10.1111/j.1559-1816.2005.tb02213.x>.
- [8] J. Hiratsuka, G. Perlaviciute, L. Steg, Testing VBN theory in Japan: Relationships between values, beliefs, norms, and acceptability and expected effects of a car pricing policy, *Transp. Res. Part F Traffic Psychol. Behav.* 53 (2018) 74–83, <https://doi.org/10.1016/j.trf.2017.12.015>.
- [9] A. Jakovcevic, L. Steg, Sustainable transportation in Argentina: Values, beliefs, norms and car use reduction, *Transp. Res. Part F Traffic Psychol. Behav.* 20 (2013) 70–79, <https://doi.org/10.1016/j.trf.2013.05.005>.
- [10] E. Sahin, Predictors of Turkish elementary teacher candidates' energy conservation behaviors: an approach on value-belief-norm theory, *Int. J. Environ. Sci. Educ.* 8 (2013) 269–283, <https://doi.org/10.12973/ijese.2013.204a>.
- [11] E. Shove, G. Walker, S. Brown, Transnational transitions: the diffusion and integration of mechanical cooling, *Urban Stud.* 51 (2014) 1506–1519, <https://doi.org/10.1177/0042098013500084>.
- [12] I. Matsukawa, N. Ito, Household ownership of electric room air conditioners, *Energy Econ.* 20 (1998) 375–387, [https://doi.org/10.1016/S0140-9883\(97\)00011-X](https://doi.org/10.1016/S0140-9883(97)00011-X).
- [13] R. Hitchings, S.J. Lee, Air conditioning and the material culture of routine human encasement: The case of young people in contemporary Singapore, *J. Mater. Cult.* 13 (2008) 251–265, <https://doi.org/10.1177/1359183508095495>.
- [14] R. Khalid, M. Sunikka-Blank, Evolving houses, demanding practices: A case of rising electricity consumption of the middle class in Pakistan, *Build. Environ.* 143 (2018) 293–305, <https://doi.org/10.1016/j.buildenv.2018.07.010>.
- [15] M.D. Sahakian, Understanding household energy consumption patterns: When "West Is Best" in Metro Manila, *Energy Policy* 39 (2011) 596–602, <https://doi.org/10.1016/j.enpol.2010.10.032>.
- [16] H. Wilhite, New thinking on the agentive relationship between end-use technologies and energy-using practices, *Energy Effic.* 1 (2008) 121–130, <https://doi.org/10.1007/s12053-008-9006-x>.
- [17] L.T. Biardeau, L.W. Davis, P. Gertler, C. Wolfram, Heat exposure and global air conditioning, *Nat. Sustain.* 3 (2020) 25–28, <https://doi.org/10.1038/s41893-019-0441-9>.
- [18] J.I.M. De Groot, L. Steg, W. Poortinga, Values, Perceived Risks and Benefits, and Acceptability of Nuclear Energy, *Risk Anal.* 33 (2013), <https://doi.org/10.1111/j.1539-6924.2012.01845.x>.
- [19] R.E. Dunlap, A.M. McCright, Social movement identity: Validating a measure of identification with the environmental movement, *Soc. Sci. Q.* 89 (2008) 1045–1065, <https://doi.org/10.1111/j.1540-6237.2008.00573.x>.
- [20] M. Conner, C.J. Armitage, Extending the theory of planned behavior: A review and avenues for further research, *J. Appl. Soc. Psychol.* 28 (1998) 1429–1464, <https://doi.org/10.1111/j.1559-1816.1998.tb01685.x>.
- [21] B. Verplanken, D. Roy, Empowering interventions to promote sustainable lifestyles: Testing the habit discontinuity hypothesis in a field experiment, *J. Environ. Psychol.* 45 (2016) 127–134, <https://doi.org/10.1016/j.jenvp.2015.11.008>.
- [22] M. Dean, M.M. Raats, R. Shepherd, The Role of Self-Identity, Past Behavior, and

- Their Interaction in Predicting Intention to Purchase Fresh and Processed Organic Food, *J. Appl. Soc. Psychol.* 42 (2012) 669–688, <https://doi.org/10.1111/j.1559-1816.2011.00796.x>.
- [23] K. Lacasse, Don't be satisfied, identify! Strengthening positive spillover by connecting pro-environmental behaviors to an "environmentalist" label, *J. Environ. Psychol.* 48 (2016) 149–158, <https://doi.org/10.1016/j.jenvp.2016.09.006>.
- [24] A.M. Peters, E. van der Werff, L. Steg, Beyond purchasing: Electric vehicle adoption motivation and consistent sustainable energy behaviour in The Netherlands, *Energy Res. Soc. Sci.* 39 (2018) 234–247, <https://doi.org/10.1016/j.erss.2017.10.008>.
- [25] A. Nilsson, M. Bergquist, W.P. Schultz, Environmental Education Research Spillover effects in environmental behaviors, across time and context: a review and research agenda, (2017). doi:10.1080/13504622.2016.1250148.
- [26] J. Thøgersen, The Motivational roots of norms for environmentally responsible behavior, *Basic Appl. Soc. Psych.* 31 (2009) 348–362, <https://doi.org/10.1080/01973530903317144>.
- [27] L.A. Venhoeven, J.W. Bolderdijk, L. Steg, Why acting environmentally-friendly feels good: Exploring the role of self-image, *Front. Psychol.* 7 (2016), <https://doi.org/10.3389/fpsyg.2016.01846>.
- [28] B. Gatersleben, N. Murtagh, W. Abrahamse, Values, identity and pro-environmental behaviour, *Contemp. Soc. Sci. J. Acad. Soc. Sci.* (2014), <https://doi.org/10.1080/21582041.2012.682086>.
- [29] G. Perlaviciute, L. Steg, E.J. Hoekstra, Is gas perceived as sustainable? Insights from value-driven evaluations in the Netherlands, *Energy Res. Soc. Sci.* 20 (2016) 55–62, <https://doi.org/10.1016/j.erss.2016.06.002>.
- [30] P. Stern, T. Dietz, T. Abel, G. Guagnano, L. Kalof, A Value-Belief-Norm Theory of Support for Social Movements: The Case of Environmentalism, *Res. Hum. Ecol.* 1999.
- [31] S. Schwartz, Universals in the content and structure of values: Theoretical advances and empirical tests in 20 countries, in: M. Zanna (Ed.), *Adv. Exp. Soc. Psychol.*, Academic Press, 1992: pp. 1–65. doi:10.1016/S0065-2601(08)60281-6.
- [32] S. Schwartz, Normative influences on altruism., in: L. Berkowitz (Ed.), *Adv. Exp. Soc. Psychol.*, Vol.10, NY Academic, New York, 1977: pp. 221–279.
- [33] R.E. Dunlap, K.D. Van, L. Primen, A.G. Mertig, R.E. Jones, Measuring Endorsement of the New Ecological Paradigm: A Revised NEP Scale, 2000.
- [34] J.I.M. De Groot, L. Steg, S. Forward, C. Kaufmann, L. Martincigh, A. Pesak, R. Risser, B. Summo, K. Schmeidler, L. Urbani, Value orientations to explain beliefs related to environmental significant behavior how to measure egoistic, altruistic, and biospheric value orientations, *Environ. Behav.* 40 (2008) 330–354, <https://doi.org/10.1177/0013916506297831>.
- [35] L. Steg, G. Perlaviciute, E. Van der Werff, J. Lurvink, The significance of hedonic values for environmentally relevant attitudes, preferences, and actions, *Environ. Behav.* 46 (2014) 163–192, <https://doi.org/10.1177/0013916512454730>.
- [36] C. Barbarossa, P. De Pelsmacker, I. Moons, Personal values, green self-identity and electric car adoption, *Ecol. Econ.* 140 (2017) 190–200, <https://doi.org/10.1016/j.ecolecon.2017.05.015>.
- [37] E. Van der Werff, L. Steg, K. Keizer, The value of environmental self-identity: The relationship between biospheric values, environmental self-identity and environmental preferences, intentions and behaviour, *J. Environ. Psychol.* 34 (2013) 55–63, <https://doi.org/10.1016/j.jenvp.2012.12.006>.
- [38] E. Van Der Werff, L. Steg, K. Keizer, I Am What I Am, by Looking Past the Present: The Influence of Biospheric Values and Past Behavior on Environmental, *Environ. Behav.* 46 (2014) 626–657, <https://doi.org/10.1177/0013916512475209>.
- [39] A. Biel, U. Dahlstrand, G. Grankvist, Habitual and Value-guided Purchase Behavior, *AMBIO A J. Hum. Environ.* 34 (2005) 360–365, <https://doi.org/10.1579/0044-7447-34.4.360>.
- [40] G.O. Thomas, I. Walker, The development and validation of an implicit measure based on biospheric values, *Environ. Behav.* 48 (2016) 659–685, <https://doi.org/10.1177/0013916514553836>.
- [41] G. Perlaviciute, L. Steg, The influence of values on evaluations of energy alternatives, *Renew. Energy* 77 (2015) 259–267, <https://doi.org/10.1016/j.renene.2014.12.020>.
- [42] C.M. Collins, Psychological and situational influences on commuter-transport-mode choice, *Environ. Behav.* 37 (2005) 640–661, <https://doi.org/10.1177/0013916504265440>.
- [43] C. Tweed, D. Dixon, E. Hinton, K. Bickerstaff, Thermal comfort practices in the home and their impact on energy consumption, *Archit. Eng. Des. Manag.* (2013), <https://doi.org/10.1080/17452007.2013.837243>.
- [44] E.R. Frederiks, K. Stenner, E.V. Hobman, Household energy use: Applying behavioural economics to understand consumer decision-making and behaviour, *Renew. Sustain. Energy Rev.* 41 (2015) 1385–1394, <https://doi.org/10.1016/j.rser.2014.09.026>.
- [45] UC Consulting, Analysis of UC's Electricity, 2018.
- [46] J. Pelozo, K. White, J. Shang, Good and guilt-free: the role of self-accountability in influencing preferences for products with ethical attributes, *J. Mark.* 77 (2013) 104–119.
- [47] L. Nicholls, Y. Strengers, Air-conditioning and antibiotics: Demand management insights from problematic health and household cooling practices, *Energy Policy* 67 (2014) 673–681, <https://doi.org/10.1016/j.enpol.2013.11.076>.
- [48] P. Jugert, K.H. Greenaway, M. Barth, R. Büchner, S. Eisentraut, I. Fritsche, Collective efficacy increases pro-environmental intentions through increasing self-efficacy, *J. Environ. Psychol.* 48 (2016) 12–23, <https://doi.org/10.1016/j.jenvp.2016.08.003>.
- [49] M. Barth, P. Jugert, I. Fritsche, Still underdetected - Social norms and collective efficacy predict the acceptance of electric vehicles in Germany, *Transp. Res. Part F Traffic Psychol. Behav.* 37 (2016) 64–77, <https://doi.org/10.1016/j.trf.2015.11.011>.
- [50] K.S. Fielding, M.J. Hornsey, A social identity analysis of climate change and environmental attitudes and behaviors: Insights and opportunities, *Front. Psychol.* 7 (2016) 1–12, <https://doi.org/10.3389/fpsyg.2016.00121>.
- [51] S. Pagliaro, N. Ellemers, M. Barreto, Sharing moral values: anticipated ingroup respect as a determinant of adherence to morality-based (but not competence-based) group norms personal, *Soc. Psychol. Bull.* 37 (2011) 1117–1129, <https://doi.org/10.1177/0146167211406906>.
- [52] E. Van der Werff, L. Steg, K. Keizer, It is a moral issue: The relationship between environmental self-identity, obligation-based intrinsic motivation and pro-environmental behaviour, *Glob. Environ. Chang.* 23 (2013) 1258–1265, <https://doi.org/10.1016/j.gloenvcha.2013.07.018>.
- [53] F. Trentmann, Disruption is Normal: Blackouts, Breakdowns and the Elasticity of Everyday Life, in: E. Shove, F. Trentmann, R. Wilk (Eds.), *Time, Consum. Everyday Life*, Oxford, 2009, p. 67.
- [54] E. Shove, G. Walker, What is energy for? Social practice and energy demand, *Cult. Soc.* 31 (2014) 41–58, <https://doi.org/10.1177/0263276414536746>.
- [55] L. Whitmarsh, S. O'Neill, Green identity, green living? The role of pro-environmental self-identity in determining consistency across diverse pro-environmental behaviours, *J. Environ. Psychol.* 30 (2010) 305–314, <https://doi.org/10.1016/j.jenvp.2010.01.003>.
- [56] P.C. Stern, A reexamination on how behavioral interventions can promote household action to limit climate change, *Nat. Commun.* 11 (2020) 918, <https://doi.org/10.1038/s41467-020-14653-x>.
- [57] C. Boomsma, R.V. Jones, S. Pahl, A. Fuertes, Do psychological factors relate to energy saving behaviours in inefficient and damp homes? A study among English social housing residents, *Energy Res. Soc. Sci.* 47 (2019) 146–155, <https://doi.org/10.1016/j.erss.2018.09.007>.
- [58] Y. Strengers, L. Nicholls, C. Maller, Curious energy consumers: Humans and non-humans in assemblages of household practice, *J. Consum. Cult.* 16 (2016) 761–780, <https://doi.org/10.1177/1469540514536194>.