

Making “sustainable consumption” matter: the indoor microclimate as contested cultural artifact

SAHAKIAN, Marlyne, HENRIKE, Rau, GRÉGOIRE, Wallenborn

Abstract

This article demonstrates how a cultural reading of consumption that focuses on the meaning and materiality of domestic indoor microclimates can contribute to conceptual developments in the field of practice theory that refocus attention on cultural patterns, including prevailing norms and prescriptions regarding indoor temperature and thermal comfort. Drawing on evidence collected during a research-led change initiative that encouraged people to reduce energy use in the home by lowering indoor temperature to 18°C, we deploy the heuristic device of “indoor microclimate as artifact” to show how the manifestation of this new artifact initiated significant changes in everyday practices that revolve around heating. We observe that these changes may also spill over into the public sphere – from home to workplace. By making the microclimate a tangible and visible thing, we describe how people appropriate and appreciate this new object of consumption, what it says about different bodies in diverse and bounded spaces, and what the artifact as a commodity reveals about broader systems of heating and energy provision, and [...]

Reference

SAHAKIAN, Marlyne, HENRIKE, Rau, GRÉGOIRE, Wallenborn. Making “sustainable consumption” matter: the indoor microclimate as contested cultural artifact. *Cultural Sociology*, 2020

DOI : 10.1177/1749975520932439

Available at:

<http://archive-ouverte.unige.ch/unige:138373>

Disclaimer: layout of this document may differ from the published version.



UNIVERSITÉ
DE GENÈVE



Making “Sustainable Consumption” Matter: The Indoor Microclimate as Contested Cultural Artifact

Cultural Sociology
1–21

© The Author(s) 2020

Article reuse guidelines:

sagepub.com/journals-permissions

DOI: 10.1177/1749975520932439

journals.sagepub.com/home/cus



Marlyne Sahakian 
University of Geneva, Switzerland

Henrike Rau
LMU Munich, Germany

Grégoire Wallenborn
University of Geneva, Switzerland
Université Libre de Bruxelles, Belgium

Abstract

This article demonstrates how a cultural reading of consumption that focuses on the meaning and materiality of domestic indoor microclimates can contribute to conceptual developments in the field of practice theory that refocus attention on cultural patterns, including prevailing norms and prescriptions regarding indoor temperature and thermal comfort. Drawing on evidence collected during a research-led change initiative that encouraged people to reduce energy use in the home by lowering indoor temperature to 18°C, we deploy the heuristic device of “indoor microclimate as artifact” to show how the manifestation of this new artifact initiated significant changes in everyday practices that revolve around heating. We observe that these changes may also spill over into the public sphere – from home to workplace. By making the microclimate a tangible and visible thing, we describe how people appropriate and appreciate this new object of consumption, what it says about different bodies in diverse and bounded spaces, and what the artifact as a commodity reveals about broader systems of heating and energy provision, and associated actors. Due to the increasing spread of central heating and the growing importance of complex technological devices to monitor and control indoor temperature, heating is no longer a practice in and of itself for many urban dwellers in Europe. However, when people appropriate the indoor microclimate, new heating-related practices emerge that can lead to energy sufficiency. We thus argue that by deliberately “materializing” domestic indoor microclimate as part of a change initiative, more sustainable forms of energy use can be made to matter.

Corresponding author:

Marlyne Sahakian, Institute for Sociological Research, University of Geneva, 40 boulevard pont d'Arve, Geneva, 1204, Switzerland.

Email: marlyne.sahakian@unige.ch

Keywords

Energy, households, material culture, microclimate, practice theory, Switzerland

Introduction

Households can play a significant role in efforts to reduce or improve domestic energy use (Fahy et al., 2019). Yet in a review of over 1000 initiatives intended to change household energy use, a vast majority focused on the uptake of more efficient technologies, or changes to individual behaviors (Jensen et al., 2018) – approaches which have not proven to be particularly effective thus far. The ENERGISE European project took another starting point: What if households could be engaged in energy sufficiency, understood as absolute reductions in energy use, aided by a recognition of the complex interactions between social practices which make up everyday life (Sahakian et al., 2019)? A key category of (un)sustainable consumption in the home is energy used for heating. Based on the assumption that heated homes allow for a series of practices to be performed, such as sharing a meal or sleeping comfortably, our practice-based approach provides fresh insights into how mundane activities play out in heated homes. At the same time, the example of home heating demonstrates how sustainability research needs to “mind the mundane” (Rau, 2018) to have relevance and societal impact. Inspired by Shove and Warde (2002), we recognize how everyday activities can involve inconspicuous forms of consumption, even if they draw on resources that are central to environmental concerns. Domestic energy use exemplifies this invisibility in all its nuances, raising interesting empirical and practical questions about the (in)effectiveness of efforts to reduce it (Shove and Walker, 2014). Even the notion of heating understood as an “energy service” – rather than a product – serves to render domestic heat all the more invisible and, as we will argue later, de-politicizes and homogenizes indoor thermal settings.

What happens when invisible forms of resource use and their links to particular practices are made visible during a research-led change initiative that seeks to lower indoor temperature? Based on a practice-theoretical approach to understanding consumption as “a moment in almost every practice” (Warde, 2005: 137), or as part of recognizable patterns of doings and sayings, ENERGISE developed and implemented a set of living labs that involved more than 300 households in eight European countries. As part of these living labs, householders were encouraged to try out a reduction in indoor temperatures to 18°C, over a four-week period during the 2018 fall/winter season.¹ To aid our analysis of this heating challenge, we propose the concept of an indoor microclimate, defined as a combination of temperature, humidity levels, airflow and thermal comfort, as a *cultural artifact* that can be subjected to practice-oriented social-scientific scrutiny. By doing so, we engage in a reappraisal of the role of material culture and commodities in the (re) production of everyday practices. Practice-theoretical approaches to the study of social life more generally, and consumption in particular, have been hailed for their ability to bring the material back into social theory (Hillebrandt, 2014; see also Evans, this issue), yet materiality often refers to tangible objects or infrastructures; here, we propose to make the indoor microclimate a visible object of consumption. The Introduction to this

special issue offers further consideration of a practice-theoretical approach to cultural formations across multiple practices.

Building on Warde's definition of consumption (2005), this new artifact of a lower-temperature microclimate needed to be *appropriated* and *appreciated* by household members. As a heuristic device, artifacts serve to capture the complexities and nuances of social life, including cultural norms and conventions that both shape and reflect everyday practices and their dependence upon various (in)visible resources, such as energy. A thorough empirical investigation of the linkages between the indoor microclimate and householders' engagement in everyday practices can help to make visible the complexities and dynamics of domestic social relations and their connections with notions of comfort. It is also possible to show how through heating their homes individual practitioners connect with wider society, including its rich landscape of cultural conventions around comfort and hospitality. This mirrors observations by Butler et al. (2016) that "understanding relationality and connection with 'others' is integral to understanding how energy consumption comes to be configured in particular ways" (2016: 897). This includes the (re)production of social relations in the home and the appropriation of differentiated spaces both within the domestic sphere and between home and out-of-home settings, including workplaces, as well as moral stances regarding the "right" indoor temperature related to others (Butler, 2010; Butler et al., 2016).

Moreover, recognizing the domestic indoor microclimate as an artifact makes it possible to study the links between this artifact and broader systems of heating provision. This sheds light on the constellation of actors that are engaged in shaping indoor microclimates, including those that have hitherto received limited attention in the social-scientific literature on heating, such as property owners and building managers. We thus argue that a cultural reading of consumption through the "materializing" of the indoor microclimate, allows us to further understand changes in more or less resource-intensive domestic practices, or how routinized and habitual practices in the home are made more meaningful to those engaged in them.

Conceptual Background: The Consumption of the Microclimate as Artifact

A recent trend in social-scientific energy research has been the explicit focus on everyday practices as a central way of understanding variations in domestic energy use (e.g. Fahy et al., 2019; Gram-Hanssen, 2011; Rau et al., 2020; Sahakian, 2019; Shove et al., 2014). Here, energy use is inextricably linked to people's engagement in more or less routinized practices, including heating homes, cooking, or moving between home and workplace. As Walker (2014: 49) observes, "[e]nergy demand . . . is a product of the vast array of interwoven social practices out of which the ordering of society is made." These practices consist of different elements, fusing meanings, skills and competences, and materials in one interpretation (Shove et al., 2012); and, in another, people, things, and socially-grounded settings (Sahakian and Wilhite, 2014: 39). Conceptually, the relationship between culture and practices is far from clear. There have been lively debates, including among sociologists working on the topic of consumption, about how (much)

culture matters when considering everyday practices (e.g. Balsiger et al., 2019; Evans, 2018; Rau and Grealis, 2019; Reckwitz, 2002; Swidler, 2001).

Accepting that practice theories form a rather heterogeneous field (cf. Warde, 2005), it is nevertheless possible to detect certain trends concerning the treatment of culture. On the one hand, there are arguments advanced by practice theorists such as Andreas Reckwitz and Anne Swidler that practice theories are cultural theories, in that practices always both shape and reflect the cultural fabric of a group or society. According to Reckwitz (2002: 195), “theories of culture can be defined as vocabularies that understand or explain human action and social order by establishing their basis in symbolic codes and schemes that regulate meaning”. To him, theorizing practices creates such a vocabulary. Similarly, Swidler’s (2001) critical appraisal of different conceptions of culture as “practice” demonstrates the merits of viewing place – or setting-specific bundles of practices – as publicly observable and empirically traceable socio-material manifestations of culture. Yet others such as Theodore Schatzki tend to clearly distinguish practice theories from culturalist approaches, to avoid an association with more structuralist interpretations of “culture.” Here, the practice turn is presented as an alternative to the cultural turn (e.g. Schatzki, 1996).

The cultural dimensions of practices, including those that involve some form of direct energy use, are ripe for reappraisal. Recent critical accounts of the growing dominance of practice theory in (un)sustainable consumption research have identified a noticeable neglect of aspects of culture from much work in this area. Building on cultural approaches to commodification and “the social life of things” (cf. Appadurai, 1986), Evans (2018: 110) argues for a reappraisal of the “particular and partial reading of material culture” that is offered by practice-theoretical approaches to the sociology of consumption. He suggests that to “follow things” as they move through the domestic sphere can yield fresh insights into the dynamics of household consumption and the cultural biographies of consumer objects. Using evidence of food waste practices and laundry habits, he is then able to demonstrate the benefits of his geographical and cultural approach. But what about heating, a consumption domain that makes up the largest share of domestic energy use, but does not lend itself to overt forms of symbolic or conspicuous consumption, and cannot easily be followed as a material “thing”?

In the ENERGISE project, households were invited to reduce indoor temperatures to 18°C as part of a four-week challenge. This new space heating experience needed to be appropriated by households, as a form of consumption – building on Warde’s definition of consumption as: “a process whereby agents engage in appropriation and appreciation, whether for utilitarian, expressive or contemplative purposes, of goods, services, performances, information or ambience, whether purchased or not, over which the agent has some degree of discretion” (2005: 137). What people were appropriating through the heating challenge was an “indoor microclimate as artifact” – a notion that builds on the work of Roesler and Kobi (2018). In their work, a term from natural sciences (meteorology) is fused with a well-established concept from anthropological studies of material culture, and applied to various built, indoor and outdoor spaces.² Roesler and Kobi (2018) argue that microclimatic conditions might initially appear to be “natural.” A closer look through the conceptual lens of “microclimates as artifacts” reveals their inherently anthropogenic character, such as in the case of urban heat islands. Similarly,

the microclimate of an indoor environment does not occur “naturally” but represents the results of many tangible and intangible human activities, including culturally accepted heating practices and political efforts to standardize indoor temperatures. Conceptualizing indoor microclimates as human artifacts draws explicit attention to their man/woman-made materiality, as social constructs.

Efforts by different interests (e.g. energy providers, engineers, architects, energy advisors) to homogenize indoor temperature, usually at an alleged standard of 22°C, have been studied in the social sciences (Shove, 2003; Wilhite, 2017). Yet cross-national variations remain: Brelih (2013: 16), in comparing several European national regulations, points out: “The requirements on indoor temperature . . . were all found very inconsistent. Indoor air temperatures in the summer range from 25°C to 28°C and 15°C to 20°C in winter.” These variations reflect different cultures and translate into differences in space heating, as was already demonstrated in earlier work by Wilhite et al. (1996) in comparing Norway and Japan. In France, a guide to “being a good housewife” published in the early 20th century recommended indoor temperatures of 14°C in living rooms, and 11°C in bedrooms (in Dreyfus, 1990: 25). While technical changes in heating systems can explain why certain European homes today have temperature readings almost 10°C above these recommendations, this is only part of the picture: representations around what it means to sleep and live comfortably have also changed. Sleeping with a bonnet or sharing a bed with siblings are no longer common practice, for staying warm, as was common in early 20th-century Europe; while wearing a t-shirt year-round indoors has become ubiquitous to some people, regardless of seasonality.

The notion of artifact in Roesler and Kobi (2018), and in this article, builds on the work of Daniel Miller (1998), who saw goods not so much as useful towards forms of display in identity formation, but rather as objects that both reveal and lubricate the fabric of social life. For Miller, some things matter more than others, and more to some people than to others, yet artifacts do not necessarily have to be tangible and visible to be meaningful. There has been much discussion in the social sciences on how making energy visible could lead to different forms of engagement and potential reductions in its usage: in Hargreaves et al. (2013), the usefulness of metering is critiqued, as households grow weary of the novelty. In Gabrys (2014), divergent efforts to “materialize” energy and their relevance to the promotion of experimental environmental practices are discussed, with an emphasis on cultural relevance and collective experiences. More recent work by Royston et al. (2018) on “invisible energy policies” applies this visibility/invisibility distinction to the realm of policy, to show the effects of non-energy policies on energy demand, to promote a better understanding of how energy demand might be governable. Yet less work exists on how an invisible form of energy use in the home can be rendered visible as a material good, as intended with this contribution. In his edited book, Miller (1998) provides one example in the work of Tacchi, whereby the textured soundscape emitted by a radio creates a certain domestic setting, which is materially distinct from oppressive silence in the home. In Roesler and Kobi (2018), Sahakian notes how artificially cool air as an artifact signals class distinction (Sahakian, 2018); in Metro Manila, the colder the shopping mall, the more elite the clientele and luxurious the commodities.

There have been recent efforts to draw attention to materiality in relation to thermal energy and systems of provision. Shove, Walker and Brown (2014) focus on how thermal

energy depends on the social ordering of materiality; specific configurations of indoor temperature settings, such as the 22°C standard as an “orchestrating concept,” are a result of social and historical processes that involve orchestrating materials, ideals and standards. Further, Shove and Trentman’s (2019) edited collection attempts to conceptualize infrastructures in practices; one chapter by Carlsson-Hyslop (2019) considers how heating systems are historically and socially constructed over time. In this approach, practices are part of networks with materials that include infrastructures; energy systems and heating infrastructures enable practices that draw on heating services, and that in turn allow for experiences of (dis)comfort. The notion of microclimate as artifact differs from these approaches to materiality in relation to systems of provision and indoor spaces; we argue that it is the invisible indoor microclimate itself that should be considered as an artifact of consumption, rather than a service. The materiality of heating (or cooling) as an invisible object of consumption is not addressed in this literature, to our knowledge.

Presumably, people living in homes at one constant temperature setting, let us say 22°C for example, would have a certain way of engaging in different practices in the home. When asked to reduce indoor temperatures to 18°C, as the target temperature suggested for the challenge, the temperature reduction in turn reveals something about feeling bodies in domestic spaces, and how people adapt; it also says something about how indoor temperature levels can or cannot be directed by human interference in heat systems towards a set goal, leading to a deeper understanding of the institutional setting in which microclimates become artifacts. This introduces two additional angles for our analysis: on the one hand, we explore how bodies and spaces appropriate the microclimate as artifact in everyday practices; and on the other, we demonstrate how making the indoor microclimate visible also serves to reveal its role as a commodity and related market mechanisms. In Switzerland, where people do not always have a direct handle on temperature settings in their homes, the challenge created opportunities for learning about energy and heating systems, or to have a hand in actually creating the desired artifact of an indoor temperature setting of 18°C. Both of these perspectives are about how people learn to consume indoor microclimates in new and different ways, and what that form of social learning might bring to the normative goal of reduced household energy use.

In relation to human and non-human interactions, Wallenborn (2013: 152) proposes that the enactment of a practice can be considered as the performance of an “extended body,” which is delineated by a “skin” (such as clothing or building envelopes) which interacts with different flows of air, lighting, energy, among other invisible elements. These layers or “skins” create a homogeneous milieu or microclimate in which bodies can perform various practices. This perspective discloses the relation between a performed practice and its adequate microclimate, which is perceived as both the milieu and the possibility of the practice. As far as a skin creates a distinction between “indoor” and “outdoor” climates, the performance of practices as extended bodies varies according to the kind of skin which is considered or challenged. The microclimate is regulated through various layers of skins and through holes of different sizes that allow different fluxes to come in and out. The performance of practices can be more or less spatially extended, depending on how skins are added up, and how these construct various (non) heated spaces. Microclimates are then embodied as expectations, through the kind of clothes people wear in different spaces.³ For instance, when someone comes home, that person might take off some clothes, or put on

other types of clothing. In this perspective, challenging households by introducing the new 18°C indoor microclimate means creating and negotiating new “skins” for bodies. Thus, to the notion of extended bodies we add the interactions between bodies and indoor microclimates and analyze how this relates to boundaries between bodies, with other bodies, and within bounded spaces in the home, and beyond the home. This also relates to work by Wallenborn and Wilhite (2014) on embodied knowledge, and how the body experiences and is shaped by temperature settings. As we will see in our analysis, not all bodies in the same space appropriate the indoor microclimate in the same manner; different parts of bodies may also appropriate this artifact differently. This leads us to analyze social relations in regarding bodies in spaces.

Concerning commodification, we argue that the experience of being a consumer, in appropriating microclimates as artifacts, relates to understanding how the (in)ability to change temperature settings in the home makes visible constellations of actors in the energy sector and related power dynamics. Moving beyond a sole focus on energy provisioning as a commodity, recognizing the microclimate as commodity reveals a different set of actors, beyond the utility company, from architects to building management agencies. As Warde (2017: 62) argues, “Commodity production and impersonal markets place exchange and exchange-value at the center of economic arrangements”. Energy is converted to heat, with an exchange value based on the economic market around heat provisioning, in our case. Typically, it is the utility company that represents this interface between consumer and heat as a commodity. Yet as Warde explains, “[e]xplicit examination of the interconnections between changes in practice and demand for commodities reveals a tangled web of forces. Demand will often be generated indirectly, as when new tools or techniques require complementary products for their effective adoption; fast cars beg for motorways, hot rods for drag strips” (Warde, 2017: 92). In the same line of thinking, microclimates at lower temperatures may reveal the web of forces behind energy distribution in the home, beyond utility companies, as we will discuss.

Methodology

The ENERGISE project is inspired by a practice-theoretical framework whereby domestic energy use is inextricably linked to the performance of everyday practices, or a way of apprehending social life as being organized around recognizable patterns of doings and sayings (Rau and Grealis, 2019). This perspective informed our design of a challenge around heating in the home, with data presented here on the Swiss case. Households were recruited either individually (ELL1), or in a community of place (ELL2). First, we sought to understand existing everyday practices around heating services, through in-depth interviews with ELL1 participants (n=20) and focus groups with ELL2 participants (n=16), with discussion guides organized around: understanding everyday routines and habits when it comes to keeping warm; skills and competencies people already had, prior to the challenges, to keep warm; material arrangements in the home, including heating systems, but also the use of objects and spaces used for keeping warm; and finally, how people represent collective conventions around thermal comfort.⁴

Set in a specific time and space – a four-week period, in the home – the heating challenge was introduced as a deliberate interruption in everyday life that could potentially

lead to a reconfiguration of everyday practices. After the in-depth discussions, the research teams suggested a reduced indoor temperature of 18°C^5 as a target, while recognizing that this reduction could place certain households outside of their comfort zone. We saw this temperature setting as a prescription, as a guideline for conduct that need not have a moral sanction; an emphasis was placed on *not* moralizing the households, but rather recognizing how energy usage is tied up with everyday life, with routinized and habitual practices that can be difficult to change. We took an explicitly non-prescriptive stance in introducing the challenges and providing household members with accompanying tools. For example, the four-week challenge was kicked off with a challenge kit: households received tips and suggestions in the form of “did you know . . .” statements, along with new “things” for people to experiment with, such as warm socks, hot cocoa, and a board game. These objects were not intended to directly affect people’s everyday routines but initiate debate among household members and visitors around the theme of “keeping warm.”

In the recruitment phase, households had to have some ability to reduce indoor temperatures, although this ability varied greatly in relation to heating systems. As compared to the other seven countries under study, it was more difficult for Swiss households to have a handle on heating systems. Many had hydraulic valves and floor heating, which were more complicated to adapt; others lived in apartments that were heated through a central system in the building, with building managers responsible for turning on the heat and setting temperatures. This reflects the difficulty of apprehending heating as a practice: there are few skills and competencies required of people living in homes with central heating, in stark contrast to former heating practices in European homes of the past century that involved chopping wood, provisioning coal, and more generally, keeping the fire going. Even thermostat regulation was lacking in most Swiss households, which was found to reveal a socio-technical interface that was found relevant for uncovering cultural understandings of heat control in other contexts (Kempton, 1986).

Prior to the start of the challenge, baseline measures were recorded for each participating household; a thermologger was provided for a main room (the quintessential black box, used to gather indoor temperature with no visual interface); as well as digital thermometers in the main or living area, the adult bedroom and in one child’s bedroom (where applicable). While the kitchen is a central space for some families, fluctuations in temperature due to the use of cooking appliances would have made it more difficult to treat the resulting data. Participants were invited to note indoor temperatures and their appreciation of indoor comfort in a diary, in addition to weekly surveys. At the end of the challenge, we returned for in-depth discussions with the individually approached households (ELL1), and focus group discussions with the community of place households (ELL2), to understand how and in what way changes had occurred in relation to everyday practices. The data-set used for this article relates to the exit interviews and focus groups which took place directly after the challenge in Switzerland.

For the Swiss case and regarding the sample, 41% of the respondents live in a four-person household, mostly families. Slightly more women (20) than men (17) subscribed to the challenge. Half of the participants were aged between 41 and 50 years old, 19% between 31 and 40 years old, and 16% between 51 and 60 years old. Most were adults active in the labor market: 27% of the participants worked full-time, 46% part-time, and

three participants (8%) were entrepreneurs or self-employed, closely reflecting the employment situation in Switzerland. In households where both genders were represented, 54% of women worked part time, and 50% of men worked full time. The characteristics of the participants' dwellings are representative of the situation in the Canton of Geneva, where the vast majority of people are tenants in buildings. For this reason, many participants had little influence and often limited understanding of their building's energy supply and heating system. Half of ELL1 participants live in buildings built between 1970 and 2010, with variable quality in terms of insulation, and energy efficiency more generally. The cooperative in which ELL2 took place was built after 2010 following the building guidelines of the Swiss building efficiency label, Minergie.

Empirical Findings

In Switzerland, the heating challenge took place between 5 November and 3 December 2018. The average indoor temperature in living areas was 22.4°C prior to the challenge, and 21.8°C in bedrooms – in a rather warm October period. Outdoor temperatures were around 15°C in October, as a high point, and came down to around 10°C at the highest point in November and December; in the latter two months, temperatures reached 5°C to 0°C at the lowest points. Interiors were warmer than usual, most likely due to the high energy efficiency of building envelopes that retained heat from the Fall well into the Winter challenge period, in certain buildings. On average, the Swiss households were able to reduce temperatures by two degrees during the challenge period. Only few households were able to achieve the 18°C target, as indoor temperatures could not be brought any lower by some. Based on a follow-up survey three months after the challenge, the indoor temperature levels achieved were even lower than during the challenge, on average 19.9°C for the living room and 18.9°C for the bedroom.

Social Relations and Interrelated Activities in the Home

In this section, we detail how different bodies on varying occasions perform a range of activities, in different spaces in the home, in relation to the microclimate as artifact, and what this reveals about how people adjust to lower temperatures, as bodies in spaces.

Different Bodies, Different Feelings of Comfort. How people experience the microclimate has to do with bodies, spaces and activities in the home. For some, heating bodies instead of spaces was relatively easy; many people explained that they wore additional layers, such as sweaters or cardigans, or covered their feet with slippers or socks. Some participants consumed more hot drinks or used hot-water bottles. Items from the challenge kit, such as the tea and a game, prompted increased reflection and awareness – although some participants found them useless or even silly. Participants employed new skills as indicated in the leaflets included in the challenge kits. Some attempted to air out their rooms in order to heat them more efficiently, while others turned down the heating earlier in the evening, before going to bed, or used curtains or blinds. In this way, they were attempting to control not only heat but also air-flow and humidity levels. However, for most people and in households that were able to achieve the target, 18°C was too cold for most

activities, except for sleeping. Several mentioned that watching television in the cold was not cozy whilst others explained that extra blankets were used in living room areas for such purposes. One person explained that he could cover his body with a blanket, but that his fingers were cold when working from home and less mobile. We did not notice any difference in how people physically experience heat or cold based on gender: in some cases, men felt colder than women during the challenge, and this was mostly related to habits developed over time, such as sleeping in the nude. One woman explained that it was not the cold so much as the humidity that made her experience discomfort; this led to airing out rooms in certain ways, to reduce humidity. The notion of a microclimate as involving more than temperature settings but also humidity levels is made explicit here.

One participant in the individual household challenge (ELL1) explained how different people have different expectations around indoor temperatures and associated comfort in this way, by introducing into the interview a conversation she had with a friend:

[The friend says] “Oh, you know, we’ve got problems with the heating again, in the living room it’s 22, it’s cold” and so I looked at her in surprise and I said to her, “You know at mine it’s 19” [laughs], so that’s where you see that some people are cold at 22 degrees so we’re not all made from the same mould when it comes to the temperature we’re comfortable at . . . I’m also not one to be particularly sensitive to cold (*frileuse*, in French), so I think that also helps.

Negotiating Comfort with Children in the Home. In the focus groups, it was the adolescent children who were most resistant to the challenge; younger children went along with the adults, but older children were more vocal about their resistance, particularly in the focus groups where children had joined in the family discussions. In one case, it was too cold a target, not for the children, but for the pets. “My rats are cuddled up and are no longer moving as much,” as one woman complained. Social interactions between adults and children were also interesting to explore, as parents have certain representations of what is too cold for children, when playing and when sleeping. Sleeping at lower temperatures is generally seen as fine, for health and for better sleep, in adult and children’s bedrooms. This confirms findings in another study on household energy usage in Switzerland, where health was seen as an important register for understanding reduced energy usage (Sahakian and Bertho, 2018). But for some parents, a lower temperature setting was also a source of stress and concern: Is my child warm enough? The challenge allowed for inter-generational discussions around what is standard indoor attire in winter periods. A father and mother of two children explained this interaction with their 10-year-old son and 12-year-old daughter in this way:

Father: So A (child’s name) sometimes . . . once or twice he complained: “I am cold.” And I told him: “But put on the socks. You put on your slippers. We have bought you some great slippers that you found cool. And put on a fleece, right, don’t just stay there in a little shirt, in a t-shirt.”

Mother: It’s true that I now wear a jumper at home, which wasn’t the case before . . . And indeed it was . . . when we had 17 and a half (degrees) in R’s room (the daughter) as well. They were complaining they were cold when going to sleep. So, we put a huge . . . we took, basically, the big duvet for the guests to put it on A’s bed (the son).

In some instances, children's play areas were moved to other spaces in the home that were experienced as being warmer. The warmer microclimate thus had some influence, as an artifact, over what activities could take place in what spaces.

Social Expectations and the Arrival of Guests. How people represent and experience the arrival of guests was another point that came through: in many instances, the challenge target of 18°C was seen as being too cold for guests, who were provided with blankets and slippers upon arrival in certain homes. One participant prepared a raclette party for her guests (traditional melted cheese dish), which according to her, served to considerably warm up the space. She also showed a video of a fireplace, and everybody agreed that looking at the fire was enough to make them feel warmer. As expected, people also recognized the great variability in what was experienced as acceptable. One woman explained that her sister found it too cold when she was visiting; but she also claimed that it was way too warm for her, when visiting her sister's place. In the focus groups, the complaints of the guests were taken quite lightly in the discussions, as if the guests had to find ways to adapt, as this discussion between two different participants exemplifies:

- A: For me, it was more my visitors who complained about the temperature, they said things like "Oh, it's cold at your house!"
B: Same for me, so I just said, here's a woollen blanket, now stop whining!

In another instance and for a household member participating individually, the challenge gave her more confidence in how she was receiving guests as in the past she had felt that her indoor microclimate was too warm. The challenge and prescription around reducing temperatures seemed to have given her permission to reduce her indoor temperature:

It happened to us, we had a family party and when we were having these family parties, I would always have to shut the heating down because it was too hot. So, I don't have to anymore . . . I already shut the valves. It's 20 degrees now. Between 20 and 21.

Complementary Products and Activities for Keeping Warm at Home. One of the normative dimensions of heating which we discussed in the deliberation phase, prior to the challenges, was that there is a tendency in European homes to heat spaces rather than people. We had discussions around whether all spaces needed to be kept heated at the same temperature, but also the different ways people can keep their bodies warm in lower temperatures. In relation to the thermal envelope of the building, people explained that they would start lowering their blinds earlier in the afternoon, to retain heat in bedrooms for the cooler evenings. One woman recognized the need to invest in blinds or curtains to keep the rooms warmer. In many cases, people added more layers of clothing to keep their bodies warm: adding sweaters, cardigans, slippers or socks, for example.

But then there were cases where people simply got used to the lower temperatures: in the focus group, the participants around one break-out table agreed that they started the challenge by wearing socks and other layers, but then got used to the lower temperatures and stopped using them. Creating occasions of movement and heating up the body through housework, in one case, were examples of how to stay warm. One man explained that the heating challenge made him more aware of the way he can heat

himself with his own inner energy. He explained that he starts his days with a meditation and yoga session (with a focus on the breath), and that he was able to notice during the challenge how he warms himself up during this practice, even if immobile, by awakening his inner energy. He says that he didn't realize how powerful that was before the challenge. A 7-year-old girl in the focus groups explained how she did a little dance before going to bed, to warm up her body. There were also some other interesting strategies for keeping warm, such as taking hot baths, or leaving open the oven to capture residual heat, both of which could result in negative rebound effects in terms of energy and other resources, such as water. Other rebound effects were also being observed in the embodied energy and materiality of newly bought objects, for example thicker curtains and warmer sleep wear.

Navigating Spaces, from Private to Public

In this section, we show how the artifact of indoor microclimate makes visible the ways in which people navigate spaces in the home, and how they move between public and private spheres. Different spaces in the home are also experienced differently, in relation to where the boundaries between the 18°C microclimate and other microclimates are experienced.

Different Private Spaces, Different Feelings of Comfort. While in the foregoing examples it is the activities that lead to different forms of comfort, here it is the activities assigned to certain spaces which inform temperature settings as comfortable. The spaces and activities associated with such spaces (for example, sleeping in bedrooms) have an influence over people and their representations of thermal comfort. For many, an 18°C or 19°C thermometer reading was sufficient for the sleeping areas, and was seen as healthier than sleeping in warmer temperatures, but considered to be too low in shared living spaces. Bathrooms were another example of spaces that people expected to be warmer than other spaces; coming out of the shower into a cold space is considered uncomfortable. But there are different feelings of comfort associated with specific areas within these rooms and spaces. As one woman explained, in talking about her partner: "He did not spend more time in one room to stay warmer, but he would use different sections of a same room, such as the sofa and the blanket, in the living room." Or as another participant expressed:

It isn't the room in itself so much as the place in the room, maybe, you see. For breakfast, I have a breakfast bar, so I put on my big . . . my jumper to have breakfast in the morning so I don't get cold. But it's more when I get back in, in the evening, when after eating and everything we sit down on the couch, you get an even stronger feeling of "Ah! On the couch with the blanket" [laughs]. You're happier because you can warm up on the couch.

People also learned to notice which rooms are warmer than others. In one case, a woman told us how the bay window area is experienced as colder than other areas; she uses a shawl instead of turning up the heat when she's in that space. Another woman explained how her family systematically had dinner in the living room (and not the kitchen), which

she recognized now as being on average one to two degrees warmer than the kitchen. Finally, another woman confessed how she heats the bathroom more than other rooms as she appreciates warmth after bathing. Her ability to turn on the heat when they are using that space, then turning down the heat after, is a new habit that she has incorporated as a direct result of the challenge.

In some cases, people closed off rooms that were cooler, to preserve heat in other areas. Through the creation of an 18°C setting, household members used doors to create boundaries between warmer and colder spaces. One man explained how he closed off his office, as it captures more heat during the day as compared to other rooms in the house, and is therefore more able to work from that office space in the evenings without being as cold as he would be in the kitchen or living room.

Dressing Down, from Work to Home. Coming home from a professional context, which for some people involves dressing down, also has implications on how people experience thermal comfort. This action often implies removing clothes and dressing in a more informal attire, thus the ubiquitous t-shirt that is worn indoors by some people year-round, despite seasonal variations. Participants in the challenge explained that they prefer to dress lightly at home, but managed to add more layers and still feel comfortable in the home:

But in a living room like that where you have to be all wrapped up in an apartment, I mean, in a chalet in the mountains, that's fine . . . it's part of its charm [laughs] but every day at home in your living room, well it's not as ideal . . . I mean, I personally, when I get home, I like to be able to get changed into a light tracksuit or something light like that, and to be comfortable like that, not to have to change back into everything you wear when you go out, put on your cardigan, and so on, but there you go.

Other people explained how they had the habit of being barefoot and wearing t-shirts at home, but had to learn to wear warmer clothing during the challenge. “Yeah, the big socks,” one woman complained:

I hate wearing socks. I spend my life in bare feet, everywhere. If I can be outside in bare feet, then I'm outside in bare feet. So that [emphasis on that] was difficult for me, because the floor was really a bit cold . . . I tried to put out two or three extra rugs. But I . . . I hate going around in socks, and now I've really got used to, well, to . . . to putting on socks or slippers so I'm not as cold. So that's something it's . . . it's the challenge that . . . really made me turn the corner let's say [small laugh].

Feelings of Comfort Extending Beyond the Home to Other Spaces. As representations of what is comfortable changed and adapted to a new indoor microclimate during the challenge, there were repercussions on how people experienced microclimates in other spaces, beyond the home. During the challenge, some participants expressed feelings of not being comfortable when arriving in other spaces, such as shops or workplaces, which were now experienced as being overheated. In one instance, a woman stated that she installed a thermometer in her workplace, to understand the differences in temperatures. As one participant explained:

And then well, personally, I think the heating had a real impact on me . . . it's even positive in terms of comfort actually. Because the kids sleep better, you sleep better when it's not too hot. And then . . . and then when I go somewhere I think, "God, it's boiling here" [laughs]. And in winter, for colds and illnesses it has an impact I think, I don't know if I would say we're less susceptible . . . you're not as cold when you go outside either because of that.

And from the focus group, a man explains how his feelings of what is a standard indoor microclimate has changed:

There you go, and now I don't feel good anymore, I feel more sensitive to overheated places, it makes me uncomfortable, and actually my daughter feels like that too, but yeah we must certainly get used to being in very warm places, and that makes us sensitive to the cold.

The implications for reducing temperatures in the home and allowing people to appropriate this new microclimate means that they then reconsider standards elsewhere, in public spaces, such as workplaces or shops. Experiencing less warmth in one context can lead to expectations around less warmth in others (and conversely), as the body learns new ways of feeling comfortable. By making the indoor microclimate visible, as a socially constructed artifact at an 18°C setting, this one artifact can then be compared and contrasted to other microclimates in different settings.

Microclimate as Commodity, Revealing Power Dynamics

In this section, we uncover how the microclimate reveals broader institutional settings, beyond energy as a commodity. We argue that the microclimate as artifact can also be apprehended as a commodity, which reveals what Warde (2017) has called "a tangled web of forces," including actors inside and beyond the home.

The Role of Thermometers in Making the Indoor Microclimate Visible. One of the main findings was the value of thermometers in relation to the challenge, in communicating indoor temperatures and making these ranges visible. But, rather than suggesting that thermometers are useful in and of themselves, they become meaningful when placed in relation to a new prescription and aim: achieving an 18°C target for indoor temperature settings. People used this technological interface to determine if and in what way they were achieving the challenge, as a form of motivation, and to then make sense of how they experienced thermal (dis)comfort. By having a thermometer, households were able to see if changes they were attempting actually had an influence on indoor temperatures, if at all.

And yet, the thermometer also revealed the difficulties of controlling the indoor microclimate. As introduced earlier, many households in Switzerland have very little handle on how they might adapt indoor temperatures. In some cases, people have radiators with dials that allow basic changes by 1, 2 or 3 points, but how this relates to temperature degree settings is not immediately experienced nor visually communicated. In other homes, floor heating systems are complex – people explained how changes to the

hydraulic valves would only be noticeable some two or three days after, and how each valve was connected to specific rooms was not always obvious. In other cases, households could turn down the heat but were dependent on boiler settings for their building (controlled by landlords, building management agencies, and thermal energy consultancies hired to adapt the boilers on an annual basis); or were receiving heat from neighboring apartments, which made it difficult to achieve lower settings in their homes. Those who could not achieve the 18°C target expressed frustration at their inability to have a handle on their own temperature settings.

The control over heating systems led some people to reconsider certain automatisms, such as the turning on of building heat systems at certain times of the year:

Well, it's one thing to talk about "saving, saving" but when you do it, it's different, you think about it every day. There you go. And that gives us extra motivation. It's something that's more present [in our thoughts]. Every day, I was looking at the temperature, whereas normally, well, I checked to see if my radiator was set to 3 and that's it. And I thought, they (the building managers) could actually switch on our heating a month later, instead of turning it on in October.

Or, as another person explains, the challenge allowed people to overcome their fears and simply turn off the heat, because they are able to, and know what to expect in terms of appropriating lower temperature settings:

And I tell myself, maybe that's it, that I needed to learn this. That's my philosophy. That's it: you have to learn to turn off the heating really everywhere. Without being scared of being cold. And this is what I have done.

When Skills Meet Material Configurations: Gaining Control of Heating Systems. For some people, the heating challenge was an opportunity to discover their heating systems for the first time: either because they had only just moved in to their place of residence one year before, or because they did not realize they could control floor heating. Regaining control of heating systems was one of the learned experiences of the challenge. As one woman explained, she not only gained control, but also learned how to make fires in the fireplace as a result of the challenge, as a way of gaining more direct control on heat:

Yes. I regained control. Also. Because since I have no control over . . . I don't know how to turn on the heating. I don't know how to set it. So, I have no control whatsoever over this (...)

And I think that is the point where I have started to become stressed, because I didn't have any control over the heat and the kids. With the fire making I regained a bit of control.

She goes on to explain how she began to learn how the heat of the fire diffuses in the home, by when it might reach the upper floors for example, and for how many days the heat is retained in the home.

The challenge revealed deep frustrations with heating systems: it was often very difficult for people to actually have agency over their microclimate, which can lead to

forms of resistance or contestation. In the case of the ELL2 focus group, in a building that uses district heating, one person explained: “We don’t have a clue how to work our boiler, the thing’s like a nuclear power station” revealing the level of complexity they assigned to their building heating system. Treating the microclimate as cultural artifact not only reveals the different collective conventions around heating, or that there is no “normal” setting that works for all people and that lowering temperatures can still be experienced as comfortable. It also tells us something about how the microclimate is made possible by actors that make up a “tangled web of forces,” to use Warde’s language, or a commodity that reveals the agency over indoor temperature settings, which are sometimes beyond the control of people living in a given space. In Grant McCracken’s (1988) work, it is the different objects that make sense when they hang together in a constellation; in our study, the lack of agency of our participants over indoor microclimates towards the 18°C goal led to revealing a constellation of actors who have more direct agency on setting temperatures in homes than household members – such as architects, builders, developers or building managers. Indoor comfort is delegated to different actors through central-heating systems, which is in contrast to the act of making a fire for oneself – which involves feeling- and competent-bodies.

Discussion and Conclusion

Heating is no longer a recognizable integrated practice for many people across Europe, in that people do not actively engage in a series of actions to heat their homes on a regular basis – such as building a fire or cleaning out a coal stove. Introducing the idea of the indoor microclimate as an artifact offers a useful heuristic device for analyzing culturally meaningful domestic practices such as receiving guests, or eating a meal, that require some form of space heating in winter months. At the same time, it questions the merits of apprehending heating as a service that makes practices possible, because doing so underestimates the social construction of microclimates. Through a research-action initiative, we make indoor microclimates matter by introducing a new artifact: an indoor microclimate reaching towards an 18°C setting in a particular space-time configuration (the home, over a four-week period). In doing so, we materialize what is usually intangible and invisible, and reveal the different ways in which people come to appropriate and give meaning to this artifact in daily lives.

This analysis reveals how diverse bodies interact with other bodies in relation to activities in the home, appropriating new products for keeping warm, and differentiating spaces in and outside of the home. There is ample evidence in the literature, as well as in the interview material presented in this article, that this relates very closely to inter-individual and intra-body variations concerning both expectations of comfort and physical experiences of room temperature (which may or may not match the actual measured temperature). There is no single artifact appropriate for every “body”: appropriation and appreciation of the artifact is a process singular to a certain body, and leads to a negotiation between bodies with different feelings, in various spaces. Reading the microclimate as artifact creates opportunities for people to reconsider what activities are carried out in what spaces. Our research suggests that there is no “normal temperature” to suit the “standard body” or “typical activities” in the home - save, perhaps, for sleeping.

While this article reveals what people do at home, domestic practices can also have spillover effects into more public realms of activity such as workplaces, commercial spaces, and public institutions. One artifact (the 18°C home) is then compared to other microclimates-as-artifacts in other spaces, suggesting that adapting to new forms of thermal comfort in one setting can influence how people experience and represent comfort in other, more public settings. There is considerable potential for tensions and conflict here, for instance when a person who tries to adopt less resource-intensive practices at home is confronted with excessive resource use in the workplace. There could also be negative spillover effects, or people heating workplace spaces to compensate for lower heating at home. Domestic and public microclimates may turn out to be incommensurate, at least for some groups of practitioners, reflecting potentially divergent sets of practices. How people resolve these clashes between different microclimates remains poorly understood, requiring more culturally sensitive research on heating, building on existing studies on air-conditioning and everyday practices between home, public space, and workplace (Cooper, 1998; Hitchings and Jun Lee, 2008; Sahakian, 2014; Shove et al., 2012).

The notion of “indoor microclimate as commodity” makes a reference to how home heating is not only socially constructed, but also an object that reveals power dynamics – as people negotiate heat within the same household, but also in relation to other actors that go beyond the energy sector. Energy as a commodity is tied to utility providers; the indoor microclimate, however, reveals a host of other actors: building owners, in situations where participants are tenants; the companies managing buildings, as is common in western Switzerland; and architects and building designers, who chose one form of heating system over another, or one building envelope over another. As people try to take control of their thermal comfort, their (in)ability to manage this new commodity reveals the different actors related to the heating and building systems, which in turn creates a better understanding of power dynamics and potential lock-in effects, such as building boilers set at certain temperatures and turned on at certain times, which people might then be able to contest. The indoor microclimate can thus become political, in that it is no longer invisible as an “energy service.”

Attempts are also afoot in many countries to streamline home heating through so-called “smart” technology; smart buildings would have technological agency over indoor comfort, leading to situations where people who wish to lower their energy use may not be able to do so, overwriting the different needs of building residents. While we recognize the variety of smart metering systems and what they might bring in terms of rendering energy usage more visible (and the limits thereof, cf. Hargreaves et al., 2013), we argue that approaches solely based on taking over the regulating of thermal comfort settings could turn people away from experiencing and having control over their resource use, which might counteract efforts to lower energy use. Rather than smart buildings, our challenges show how “smart people” can learn to adapt to lower temperatures in reflexive and creative ways; by sharing a hot meal and turning on the visual of a fireplace, in one case, or by teaching children to wear warmer clothes in the winter, in another. The conceptualization of microclimate as artifact results in making people aware of how they can have an active involvement in appropriating this object of consumption, as a form of experiential learning.

By rendering the indoor microclimate explicitly conspicuous, its consumption becomes a way of communicating and negotiating with others, perhaps not in relation to status, so much as in relation to feelings of comfort and control. This proved to be a promising avenue for changing everyday practices in the home towards heating people instead of spaces, as well as creating a space for discussions around heat and heat provisioning. Reducing indoor temperatures was one way of achieving sufficiency, understood as reductions in energy use while recognizing the complexities of everyday life. The challenge raised interesting opportunities on how best to engage people in contesting indoor heating standards, especially in relation to social practices whose resource implications remain largely hidden from view – either because the resource itself is invisible (e.g. energy/electricity), or its use incurs no noticeable costs, economic or otherwise. An explicit focus on home heating in relation to microclimates as artifacts, appropriated by bodies in spaces, has the potential to break through this wall of invisibility. By deliberately “materializing” domestic indoor microclimate as part of a change initiative, more sustainable forms of energy use can be made to matter.


Acknowledgements

We would like to thank the reviewers for excellent and constructive feedback, as well as the editorial team for bringing together this special issue. We are grateful to all household members who agreed to participate in this study, and acknowledge the work of Dr Laure Dobigny and Dr Laurence Godin in supporting Swiss ENERGISE Living Lab implementation.

Funding

The research presented in this article received funding from the European Union’s H2020 Research and Innovation program under grant agreement number 727642. The sole responsibility for the content of this article lies with the authors.

ORCID iD

Marlyne Sahakian  <https://orcid.org/0000-0003-0196-7865>

Notes

1. A second challenge called for a relative reduction in laundry cycles, or down by half the usual amount, over a four-week period. The laundry challenge is not discussed in this article.
2. We are aware of earlier work by Lisa Heschong (1979) on the notion of “thermal delight” in architecture, which influenced Roesler and Kobi’s work on microclimates. Heschong’s main argument was that diverse thermal settings could be positive sensory experiences, in light of the increasing homogenization of energy-intensive indoor comfort standards under way at the time.
3. Expectations around cooling and how this leads to certain clothing items being appropriated over others, through a material cultural reading, has been studied in the case of Singapore (Hitchings and Jun-Lee, 2008), whereby artificial cooling has “. . . extended the range of fashionable choices available to the consuming tropical body and these stretched from cardigans and shawls for women to long-sleeved shirts and jackets for men (2008: 258–259), with similar findings in Metro Manila (Sahakian, 2014).

4. Photo-elicitation was used as a tool from visual sociology (see Sahakian and Bertho, 2018) to engage people in reaction to a series of images that were chosen to inspire reflexive debates and discussions around social norms in relation to indoor comfort. We discussed, for example, an image where a woman is represented wearing a t-shirt indoors on a winter day, to deliberate the homogenization of thermal comfort across seasons.
5. We understand microclimate as something more than temperature settings, but demonstrate in the findings how lower indoor temperatures led to changes in microclimate as artifact, making humidity levels, air flow, and thermal comfort more visible in the home.

References

- Appadurai A (1986) *The Social Life of Things: Commodities in Cultural Perspective*. Cambridge and New York: Cambridge University Press (Cambridge Studies in Social & Cultural Anthropology).
- Balsiger P, Lorenzini J and Sahakian M (2019) How do ordinary Swiss people represent and engage with environmental issues? Grappling with cultural repertoires. *Sociological Perspectives* 62(5): 794–814
- Brelieh N (2013) Thermal and acoustic comfort requirements in European standards and national regulations. *Federation of European Heating, Ventilation and Air Conditioning Associations (REHVA) Journal*. Available at: <https://www.rehva.eu/rehva-journal/chapter/thermal-and-acoustic-comfort-requirements-in-european-standard-and-national-regulations> (accessed 9 June 2020).
- Butler C (2010) Morality and climate change: Is leaving your TV on standby a risky behaviour? *Environmental Values* 19(2): 169–192.
- Butler C, Parkhill KA and Pidgeon NF (2016) Energy consumption and everyday life: Choice, values and agency through a practice theoretical lens. *Journal of Consumer Culture* 16(3): 887–907.
- Carlsson-Hyslop A (2019) The construction of central heating in Britain. In: Shove E and Trentmann F (eds) *Infrastructures in Practice: The Dynamics of Demand in Networked Societies*. Abingdon: Routledge, 90–101.
- Cooper G (1998) *Air-Conditioning America: Engineers and the Controlled Environment, 1900–1960*. Baltimore, MD and London: The Johns Hopkins University Press.
- Dreyfus J (1990) *La société du confort : quel enjeu, quelles illusions?* Paris: L'Harmattan.
- Evans DM (2018) Rethinking material cultures of sustainability: Commodity consumption, cultural biographies and following the thing. *Transactions of the Institute of British Geographers* 43(1): 110–121.
- Fahy F, Goggins G and Jensen C (2019) *Energy Demand Challenges in Europe*. Cham: Palgrave Macmillan.
- Gabrys J (2014). A cosmopolitics of energy: Diverging materialities and hesitating practices. *Environment and Planning A* 46(9): 2095–2109.
- Gram-Hanssen K (2011) Understanding change and continuity in residential energy consumption. *Journal of Consumer Culture* 11(1): 61–78.
- Hargreaves T, Nye M and Burgess J (2013) Keeping energy visible? Exploring how householders interact with feedback from smart energy monitors in the longer term. *Energy Policy* 52: 126–134.
- Heschong L (1979) *Thermal Delight in Architecture*. Boston, MA: MIT Press.
- Hillebrandt F (2014) *Soziologische Praxistheorien*. Wiesbaden: Springer VS.
- Hitchings R and Jun-Lee S (2008) Air conditioning and the material culture of routine human encasement: The case of young people in contemporary Singapore. *Journal of Material Culture*, 13(3): 251–265.

- Jensen CL, Goggins G, Fahy F, et al. (2018) Towards a Practice-theoretical Classification of Sustainable Energy Consumption Initiatives: Insights from Social Scientific Energy Research in 30 European Countries. *Energy Research and Social Science* 45(November): 297–306.
- Kempton W (1986) Two theories of home heat control. *Cognitive Science*, 10, 75–90.
- McCracken G (1988) *Culture and Consumption: New Approaches to the Symbolic Character of Consumer Goods and Activities*. Bloomington: Indiana University Press.
- Miller D (1998) Introduction: Why some things matter. In: Miller D (ed.) *Material Cultures: Why Some Things Matter*. Chicago, IL: University of Chicago Press, 3–21.
- Rau H (2018) Minding the mundane: Everyday practices as central pillar of sustainability thinking and research. In: Boström M and Davidson D (eds) *Environment and Society: Concepts and Challenges*. London: Palgrave, 207–232.
- Rau H and Grealis E (2019) Everyday practices, cultural conventions and energy use: Researching new opportunities for reducing domestic energy use in Europe: Framework document for ENERGISE team. ENERGISE Deliverable 1.3. Available at: <http://energise-project.eu/deliverables> (13 June 2020).
- Rau H, Moran P, Manton R, et al. (2020) Changing energy cultures? Household energy use before and after a building energy efficiency retrofit. *Sustainable Cities and Society* 54(March) 101983. Available at: <https://www.sciencedirect.com/science/article/pii/S2210670719335243?via%3Dihub> (accessed 15 June 2020).
- Reckwitz A (2002) The status of the “material” in theories of culture: From “social structure” to “artefacts”. *Journal for the Theory of Social Behaviour* 32(2): 195–217.
- Roesler S and Kobi M (eds) (2018) *The Urban Microclimate as Artifact: Towards an Architectural Theory of Thermal Diversity*. Basel: Birkhäuser.
- Royston S, Selby J and Shove E (2018) Invisible energy policies: A new agenda for energy demand reduction. *Energy Policy* 123(C): 127–135.
- Sahakian M (2014) *Keeping Cool in Southeast Asia: Energy Use and Urban Air-Conditioning*. New York and Basingstoke: Palgrave Macmillan.
- Sahakian M (2018) Indoor urbanism: Air-conditioned microclimates in Metro Manila (the Philippines). In: Roesler S and Kobi M (eds) *The Urban Microclimate as Artifact: Towards an Architectural Theory of Thermal Diversity*. Basel: Birkhäuser: 64–81.
- Sahakian M (2019) ‘More, bigger, better’ household appliances: Contesting normativity in practices through emotions. *Journal of Consumer Culture*. Published first online. DOI: <https://doi.org/10.1177/1469540519889983>.
- Sahakian M and Bertho B (2018) Exploring emotions and norms around Swiss household energy usage: When methods inform understandings of the social. *Energy Research and Social Sciences*. 45: 81–90.
- Sahakian M and Wilhite H (2014) Making practice theory practicable: Towards more sustainable forms of consumption. *Journal of Consumer Culture* 14(1): 25–44.
- Sahakian M, Naef P, Jensen C, et al. (2019) Challenging conventions towards energy sufficiency: Ruptures in laundry and heating routines in Europe. *ECEEE Summer Study 3–8 June 2019*, Hyères, France.
- Schatzki T (1996) *Social Practices: A Wittgensteinian Approach to Human Activity and the Social*. Cambridge: Cambridge University Press.
- Shove E (2003) *Comfort, Cleanliness and Convenience: The Social Organization of Normality*. Oxford: Berg.
- Shove E and Trentmann F (eds) (2019) *Infrastructures in Practice: The Dynamics of Demand in Networked Societies*. Abingdon: Routledge.
- Shove E and Walker G (2014) What is energy for? Social practice and energy demand. *Theory, Culture & Society* 31(5): 41–58.

- Shove E and Warde A (2002) Inconspicuous consumption: The sociology of consumption, lifestyles and environment. In: Dunlap RE, Buttel FH, Dickens P, et al. (eds) *Sociological Theory and the Environment*. Lanham, MD: Rowman and Littlefield, 230–251.
- Shove E, Pantzar M and Watson M (2012). *The Dynamics of Social Practice: Everyday Life and how it Changes*. London: SAGE.
- Shove E, Walker G and Brown S (2014) Material culture, room temperature and the social organisation of thermal energy. *Journal of Material Culture* 19(2): 113–124.
- Swidler A (2001) What anchors cultural practices. In: Schatzki TR, Knorr Cetina K and von Savigny E (eds) *The Practice Turn in Contemporary Theory*. London and New York: Routledge, 83–101.
- Walker G (2014) The dynamics of energy demand: Change, rhythm and synchronicity. *Energy Research and Social Science* 1: 49–55.
- Wallenborn G (2013) Extended bodies and the geometry of practices. In: Shove E and Spurling N (eds) *Sustainable Practices: Social Theory and Climate Change*. London: Routledge, 146–164.
- Wallenborn G and Wilhite H (2014) Rethinking embodied knowledge and household consumption. *Energy Research & Social Science* 1: 56–64.
- Warde A (2005) Consumption and theories of practice. *Journal of Consumer Culture* 5(2): 131–153.
- Warde A (2017) *Consumption: A Sociological Analysis*. Basingstoke: Palgrave Macmillan.
- Wilhite H (2017) *The Political Economy of Low Carbon Transformation: Breaking the Habits of Capitalism*. Abingdon: Routledge (Routledge studies in low carbon development).
- Wilhite H, et al. (1996) A cross-cultural analysis of household energy use behaviour in Japan and Norway. *Energy Policy* 24(9): 795–803.

Author biographies

Marlyne Sahakian is Assistant Professor of Sociology at the University of Geneva, where she brings a sociological lens to consumption studies and sustainability. Her research interest is in understanding everyday practices in relation to environmental promotion, social equity and social change – with a focus on food, energy, and well-being. She is a co-founder of SCORAI Europe, a network for sustainable consumption research and action.

Henrike Rau is Professor of Social Geography and Sustainability Research at the Department of Geography, Ludwig-Maximilians-Universität (LMU), Munich, Germany. She has made internationally recognized contributions to the conceptual and methodological advancement of social scientific and interdisciplinary sustainability research on topics such as domestic energy use, food consumption and mobility practices.

Grégoire Wallenborn is Senior Researcher at the Institute for Environment Management and Land Planning (IGEAT), at the Université Libre de Bruxelles. The research on which this article was based was conducted while he was a Senior Researcher in the Sociology Department at the University of Geneva. He is interested in issues that cross energy, environment, technology and daily life, and has coordinated numerous interdisciplinary researches on household energy consumption through various aspects.