Challenging conventions towards energy sufficiency: ruptures in laundry and heating routines in Europe

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Abstract

This contribution proposes to address a central question in social science approaches to household energy studies: "how do conventions around energy services evolve, how do they alter over time, and how can they be changed once they are cemented?" (Sovacool 2014: 19). Drawing from a social practice theoretical framework, we posit that energy usage at the household level is tied up with forms of routinized and habitual activities in and across consumption domains, embedded in socio-cultural, and technical and material arrangements. We begin by proposing a definition of energy sufficiency which accounts not only for absolute reductions in resource usage, but also changes in everyday and habitual practices – which implies challenging collective conventions around energy usage in the home, as well as setting upper limits to consumption. Drawing from the ongoing ENERGISE research project (H2020), with its focus on laundry and heating, we then provide an overview of the literature on collective conventions related to these two consumption domains, noting the lack of a systematic review and easily accessible data. We follow with a review of over 1,000 initiatives aimed at reducing energy usage in the home or promoting renewables, relating these initiatives based on a typology that reflects our conceptual framework around the notion of 'sufficiency'. We discuss how and why energy consumption continues to be framed in terms of individual action and technological change, often blind-sighted to social norms and collective conventions – necessary towards achieving the normative goal of sufficiency. In a fourth section, we outline the ENERGISE Living Lab approach, designed towards setting upper limits to consumption and engaging households in a participative process towards creating ruptures in everyday routines – with an explicit focus on collective conventions. On this basis, we conclude with a discussion around the need for further developments around conspicuous and symbolic consumption, towards amplifying social change. We consider the opportunities that this represents, and how such an approach to uncovering, contesting and amplifying challenges to collective conventions can be relevant to practitioners and policy-makers alike.

Introduction

Households, as consumers and citizens, have a role to play in tackling the need to limit energy usage and related carbon emissions, yet approaches which rely solely on individual behavior change or technological change have proven to be far from sufficient thus far. Much of this has to do with the complexity of understanding household energy demand, which is tied up with almost every aspect of everyday life – from preparing a meal, to taking a warm shower – demonstrating how "energy demand is embedded in shared practices and activities that make up the ongoing flow of society" (Hui, Day and Walker in Hui, Day et al. 2017: 2). Energy is often rendered invisible and taken for granted in these routinized and habitual activities, leading to a call for research that grapples with 'inconspicuous' forms of consumption (Shove and Warde 2002). Yet, in setting aside more cultural forms of consumption from the analytical lens, have we thrown away the baby with the bathwater? – as Evan's (2018) recent review of the field of

research in the sociology of consumption suggests. What other approaches can help shed light on opportunities for reduced household energy usage, particularly when it comes to normalizing changes towards reduced energy usage? What might be the role of more conspicuous consumption, or an approach that is based on communicating social position to others through symbolic and cultural means?

This paper contributes to understanding how a social practice approach to energy usage in the home, augmented by a more conspicuous reading of consumption, can be meaningful towards policy and practice, towards the normative goal of achieving energy sufficiency – understood both as overall reductions in energy consumption, as well as changes in everyday practices. The focus is on understanding collective conventions which have a cultural hold on how energy practice plays out, alongside material arrangements, skills and competencies, and household dynamics. Drawing from developments underway in the ENERGISE project, we focus on two consumption domains: energy for heating homes, and energy for washing clothes in the home. Both are associated with specific collective conventions and material arrangements, some of which are inter-related, as we will further discuss below. However, we argue that other approaches in sociology – including consumption as a form of power dynamics, consumption as symbolic and cultural, and conspicuous consumption – can help amplify efforts to challenge collective conventions towards more sustainable consumption.

We begin by introducing our conceptual framework, focused around defining "energy sufficiency". We describe how sufficiency approaches relate to opportunities for challenging collective conventions and destabilising normative practices, as well as an absolute reduction in resources in relation to upper limits. We follow with a description of collective conventions around laundry and heating in Europe, with a focus on the eight countries involved in the ENERGISE challenges. In a third section, we describe the dominant approaches to reducing energy usage in the home, based on a review of over 1,000 initiatives across Europe – demonstrating how few initiatives grapple in earnest with the question of sufficiency. To resolve this issue, and in a fourth section, we discuss the ENERGISE approach towards uncovering collective conventions, challenging normative practices, and amplifying the resulting changes in representations and performances. We conclude implications of our approach for policy-makers and practitioners.

Conceptual framework

In this section, we propose a definition of "sufficiency" which relates both to resource consumption as well as challenging habitual practices, which requires accounting for both maximum limits to consumption and the collective conventions which hold together practices as performances.

Table 1. The Resource-Consumption-Hierarchy (Source: Rau et al., 2018, adapted from SCORAI 2014).

1	Consuming less: 'Back to basics'
2	Consuming less: Sharing
3	Consuming less: Repairing
4	Consuming differently: Buying 'green' products

A FOCUS ON SOCIAL PRACTICES AND SUFFICIENCY RELATED TO EVERYDAY ENERGY USAGE IN THE HOME

A social practice approach to energy studies has become well-established in the literature, starting with Shove's (2003) seminal work on *Comfort, Cleanliness and Convenience* and continuing with an abundance of academic papers (Røpke 2009, Gram-Hanssen 2011, Shove and Walker 2014, Wallenborn and Wilhite 2014, Sahakian and Bertho 2018, among others). While there are various interpretations for what makes up a social practice (building on theoretical developments from Bourdieu and Giddens, to Schatzki and Reckwitz), there is a general consensus around focusing on the doings and sayings of everyday life as the main unit of analysis, whether made up of "materials, competencies and meanings" in Shove et al.'s interpretation (2005), or "understandings, engagement and procedures" in Warde's (2005) interpretation. Much of the work that engages with this approach is descriptive, with fewer examples of how to understand social change through practices. Sahakian and Wilhite (2014) suggest that changing more than one element of a practice can lead to its destabilization. Challenging collective conventions, for example, alongside material arrangements, could lead to changes in practices. From a policy-perspective, Spurling et al.'s work (2013) towards distinguishing problem framings provides a hierarchy as to what framings have the potential to be more transformative, when it comes to social change: common framings in policy interventions (such as innovating technology, shifting consumer choices and changing behavior), are distinguished from a practice-perspective, which is seen as more transformative. Arguably, the problem framing relates both to the form of social change imagined, but also to the desired aim: towards either improving energy usage per unit of production (more efficient cars), or overall reductions in energy usage (shift from cars to bicycles, for example).

Increasingly, and in relation to energy studies and sustainable consumption research more generally, there is growing discourse around the need to focus on sufficiency as the desired goal, rather than efficiency, and generally understood as overall reductions in energy usage. This relates to the "Resource Consumption Hierarchy" (RCH) (Table 1), inspired by the waste hierarchy and discussions around an energy hierarchy at a SCORAI workshop in Lausanne (SCORAI 2014). Drawing on the RCH, energy resource management actions are prioritized, towards reduced environmental impacts: efficiency is included at the base of the hierarchy, as less of a priority; sufficiency, however, is at the top of the hierarchy or a first step.

Sufficiency can involve attaining a lower limit to be achieved (sufficient reliable energy for heating homes, as a minima), but could also include an upper limit (sufficient housing space for a family of four or five, as a maxima). The latter definition is more challenging as it brings into question "how much of what is enough?" in relation to setting both lower and upper limits (Spengler 2016). While some would argue that efficiency and sufficiency measures can be combined, Shove (2017) claims that a shift to sufficiency is "not simply a matter of recognizing that efficiency is not the same as sufficiency, or that efficiency measures might rebound or backfire. The more important insight is that efficiency measures obscure the politics of the present", which could be overcome by "designing energy-efficiency policies and strategies that are reflexive, historically aware and alert to the forms of service that they enable (…)" (p. 8). This

idea is echoed in other works that consider how resource efficiency improvements are contributing to the expansion of the economy as a whole (Pirgmaier 2017). Debates around sufficiency lead into more fundamental, societal questions, such as what services should be enabled, in what contexts, and towards what needs; and what aspects of change are being ignored in an efficiency perspective, such as the dominance of the limitless and unbounded market economy.

A focus on sufficiency, for this paper, implies something more than absolute reductions in energy usage: minimum and maximum limits to consumption must be considered, echoing the concept of "consumption corridors" (Di Giulio and Fuchs 2014). Within corridors, individual and protected needs are being met by a society that privileges distributional justice, within planetary and biophysical limits, as well as participatory and democratic forms of engagement. Consumption corridors is part of a growing trend in sustainability studies, drawing on human development literature and towards the aim of "sustainable wellbeing" (Gough 2017). Raworth's Doughnut economics (2017) offers a similar framing, yet consumption corridors more explicitly places a focus on both upper and lower limits to consumption. Within consumption corridors, individuals are able to live a good life without compromising the ability of others to do the same, today and in the future. How such corridors are designed, in relation to resources, remains to be discussed; participatory forms of engagement are needed, that account for diversity in how different people go about satisfying their needs. This relates to the distinction between needs and satisfiers. While satisfiers can vary across time and cultures, human needs are fundamental, in that they are "finite, few, and classifiable" (Max-Neef et al. 1989) as well as constant across time and space. Di Giulio and Defila (2018) go further in suggesting that there are a set "protected" needs, where a society can plan to ensure that such needs are met. For Max-Neef et al. (1989), different types of satisfiers can be identified in relation to needs: "violators or destroyers" are those which impair need satisfaction, while "synergic satisfiers" simultaneously satisfy different needs. Sahakian and Lorek (2018) suggest that three inter-related stages can lead to consumption corridors: i) Placing the consumption of (limited) resources in relation to protected needs and satisfiers, towards maximal synergies; ii) Engaging in a democratic process that accounts for a plurality of worldviews, diverse contexts and cultures, as well as historical processes towards achieving the first stage; and iii) Recognizing the need for social change, including structural issues and the need to shift unsustainable consumption habits.

In addition to sufficiency in relation to reductions and limits, there is a need to grapple with the difficulty of breaking the bad habits of a consumer society that has emerged in the golden age of readily available fossil fuels. Practices that rely on energy services are rarely questioned; how much heating, cooling, washing and lighting is enough, is a question rarely asked – literature on the upper limits of consumption is lacking. One reason for this research and policy gap is the normative notion of individual consumption as being tied to notions of consumer sovereignty and individual freedom societies (Wilk 2002); meddling with what people do in the privacy of their own homes is a no-go zone, for many. There is an urgent need to rethink how much "comfort, cleanliness and convenience" people truly require to live a good life towards "sustainable wellbeing", as we

consider in the ENERGISE project, and to do so not through a top down prescriptive but through participatory deliberations. We will now turn to uncovering whether and how collective conventions, tied up with energy-intensive practices, can be understood but also challenged and contested.

GRAPPLING WITH THE NORMATIVE DIMENSION OF SOCIAL PRACTICES AS PERFORMANCE

While the policy and technological dimensions of energy usage have received much attention in the literature, the collective conventions that hold together everyday practices that use energy services – such as laundry or food preparation – are relatively under studied. This relates to a key question raised in relation to social science approaches to energy: "how do conventions around energy services evolve, how do they alter over time, and how can they be changed once they are cemented?" (Sovacool 2014). We use 'social norms' interchangeably with 'collective conventions', related to how the different elements of a practice that make up heating and laundry are held together by shared understandings of what ought or should be in relation to how those practices play out. We understand social norms following the Durkheimian tradition, where a norm – or a moral rule – is made visible by deviance, and exists through the sanction brought about by transgressive behaviour. Further, we suggest that 'prescriptions' (Plessz, Dubuisson-Quellier et al. 2016; Godin and Sahakian 2018) can be a useful handle for uncovering the various injunctions which guide actions, such as prescriptions found on clothing labels around temperature settings, prescriptions that inform indoor comfort in building regulations, or the less explicit prescriptions put forward in everyday adages that are culture-specific (for example, "Cleanliness is next to godliness", attributed to a sermon by an 18th century English cleric). In Elias' work (Elias 1969/2016), the "process of civilization" which he studied since the Middle Ages and in Europe involved the normalising of social codes of conduct, which included the development of an affective economy, primarily formed through anxiety, shame and blame. Prescriptions played a key role in this process, along with the shaming and blaming of people who were not seen as adhering to the establishment of collective conventions around hygiene and cleanliness, for example. Through this process, both the individual and society are conjointly pushed toward bodily (self) control.

Over time, the normalisation of everyday practices can be further sustained through institutional standards and regulations, which are a more explicit form of prescription. For this paper, we understand normalisation as mostly occurring through the repeated, and uncontested, performance of practices, following Rouse and Warde. For Rouse (2007), a normalised practice is "(…) maintained by interactions among its constitutive performances that express their mutual accountability" (p. 48), with "something at issue and at stake" (p. 50) in the outcome of practices or a goal-orientation of the practice. Similarly, and for Warde (2014), social norms can be observed to play out in the regularities of a practice, but are also a consequence of its performance. This suggests that challenging a normative practice requires some type of intervention in the performance of a practice. This leads us directly to the design of ENERGISE Living Labs (ELL), which engaged with a social practice-based theoretical framework

and aimed towards sufficiency – understood as setting relative upper limits to consumption, achieving absolute reductions and challenging habits and routines around laundry and heating. The ELLs have been implemented in Denmark, Finland, Germany, Hungary, Ireland, Switzerland, the Netherlands and the United Kingdom, and intended as ruptures in every day routines – as we will further discuss below. There is also a more discursive aspect to practices, what is at issue and at stake can be verbalised and expressed as discourse. Bourdieu's (1997) work on practices merits some reflection: a normalized practice is considered to be *orthodox*, in his terminology, while contesting the *doxa* – or share rules and understandings – can either lead to their stabilisation (*orthodoxy*) or de-stabilisation (*heterodoxy*). The challenge is to destabilise practices by contesting the issue at stake, or reframing the outcome as sufficiency, towards sustainable wellbeing, without reinforcing energy-intensive practices in the process. What merits further discussion and debate is how such changes can then be amplified, a central question we will return to later in this paper, where more conspicuous forms of consumption may be useful.

Collective conventions around laundry and heating in Europe

While data exists on energy usage and distribution across European countries – ranging from types of energy sources and services, systems of distribution and governance, types of appliances or even the cost of electricity – there is little to no comparable data available on the collective conventions around laundry and heating, a research gap which ENERGISE seeks to address. In this section, we provide a review of existing conventions and standards around each consumption domain.

LAUNDRY STANDARDS, SCRIPTS AND SOCIAL PRACTICES
Few studies have considered different laundry practices comparatively across countries. In a European study, Laitala et al. (2013) explain how: "The main differences found were washing temperatures and frequencies. For example, in Spain the majority of respondents washed cotton t-shirts in cold water, in Greece and Netherlands at 40 °C and in Norway at 60 °C." (p. 234). The link between high temperatures and hygiene seem to be more important in northern countries. In another paper, hand washing practices within the European continent are examined (Laitala et al. 2017): Southern and Eastern Europe countries used a combination of machine and hand washing more than other regions, as the rate of machine ownership is lower. Anderson, while presenting laundry practice in the UK, evokes "seasonal contingencies" that can affect countries, influencing practices such as drying clothes outdoors instead of using a tumble dryer (2016, p. 127). The trend to lowering temperatures in laundering is spreading across Europe, as illustrated by Laitala et al. (2013) for Norway, and Kruschwitz et al. (2014) for Germany and the UK. A recent PhD thesis provides comprehensive information on domestic washing in Sweden, in relation to time and resource use (Jack 2018). Yates and Evans (2016) draw on data from a quantitative survey of laundry practices conducted in Britain in 2013 to underline the diversity of washing practices in re-

lation to temperature, showing that a majority of households wash at 40 degrees. Such information is not available in many countries, a research gap which the ENERGISE project will seek to address.

When to wash clothes can depend on a hygienic evaluation, a sensation of discomfort in clothes considered as soiled, along with other factors. Studies demonstrate that some people maintain an organized schedule in relation to laundry, having fixed day for laundering might determine what clothes are being washed when (Sahakian and Bertho 2018a; Jack 2013 and 2018). Others will wash their clothes when their laundry basket is full, or on the contrary when they find themselves with an empty wardrobe (Costanza et al. 2014; Jack 2013). Other practices might be observed, such as the "whenever I have the time" practice noted by Anderson (2016: 133), also mentioned by Constanza et al. (2016). Anderson also cites the "just-in-time laundry (or ironing) for work/school (Sundays) and for going out (Fridays)" (2016, p. 133). Some people a more sensory relationship to what is clean and dirty, and might smell their clothes or look closely for stains before washing (Sahakian and Bertho 2018a). The type of clothing might also imply different washing standards: "In Norway, some products were reported to be used longer between washes now than before, such as towels and jeans. In jeans, we have seen a new trend to wash them more seldom, especially dark 'raw' denim materials, in order to keep the fit and colours unchanged" (Laitala et al. 2012: 235). Underwear is usually worn only one day, while woollen sweater can be worn seven to eight days before being considered 'dirty' (Laitala et al. 2012). The desire to care for the delicate or favoured clothes can reduce the frequency of washing, as washing can be seen as detrimental to cloth quality (Sahakian and Bertho 2018a).

Laundry practices can be seen as being "scripted" by washing machine interfaces and the different programs they propose. Default settings that people might use independently of the type of clothes they wash can lead to misuse of the machine (Kruschwitz et al. 2014; Laitala et al. 2012). Available programs can also be misunderstood, thus causing more energy demanding practices, such as the use of short cycle, wrongly seen as ecological (Laitala et al. 2012). Lack of comprehension is not the only problem. In the case of Norway, Laitala et al. (2012) also argue that the more frequent use of short programs "may be a reaction to the increased washing duration of the basic cotton program, which is a result of energy labelling requirements" (p. 235). Similar results were also documented in a Swiss study on household energy usage: few households understood the function of the eco-program, as a longer wash duration was not intuitively understood as being more energy efficient (Sahakian and Bertho 2018s). The focus on convenience in relation to laundry has also been documented in Sweden (Jack 2018).

While appliance manufacturers have an incentive to gain a high grade for the EU Energy label, which follows requirements from the EN 60456 standard; there is no explicit incentive to set an upper limit to washing machine usage, nor limit machine sizes. The energy label is now accompanied by the EU Eco Label, which addresses wider parameters revised to include new criteria such as "the availability of a 20 °C programme" on washing machines (Josephy et al. 2011: 4). Josephy et al. explain how, "due to the trend towards larger washing machines (6 to

10 kg) as well as the related problem of filling washing machines only partially, it is important that the washing machine has a sensor capable of estimating the weight of the laundry load and able to automatically adjust programme duration, energy and water consumption" (2011: 6). Bigger appliances also means that such appliances can be labelled as "efficient", even if they consume much more energy than smaller volumes.

The links between users, washing machines, and energy consumption are synthetized here by Mylan: "Not only must washing machines contain 30 °C programs and detergents work effectively at low temperatures but consumers' criteria for sorting clothes and selecting programs must also adapt. Crucially the meaning of low temperature laundry must also change to become a normal part of the laundry repertoire" (2015: 17). In her study, she shows how product marketing, when accompanied with official recommendations assessing the quality of low temperature wash, could induce more trust in this practice (Mylan, 2015). Clothes labels could include recommendation on wash frequency, which might influence reduced energy usage (Laitala et al. 2012). Yet the question of habits and routines is often forgotten when solutions to improve energy usage related to laundry are being proposed (Wilhite 2016). These habits have evolved over time: in Europe and in the middle ages, clean clothes "constituted an increasingly significant indicator of social decency" (Shove 2003: 123), with a distinction between outer and under clothing. During the 17th century, undergarments were made visible: sleeves and collars appeared and became more and more fashionable, and the whiteness of such clothes was then judged. The motives to wash clothes were doubled: clean clothes meant feeling clean, but also looking presentable (Shove 2003).

With Pasteur's discovery on microbes in the 1800s, clean clothes took on a whole other meaning. Clothes were considered a bridge between the body and the world. Boiling clothes and ironing them were among the strategies used for getting rid of undesired microbes, and "their destruction represented a social as well as a personal duty" to prevent the diffusion of diseases (Shove 2003: 125). Where bad odors were first seen as coming from the exterior world, more attention was raised around personal odor in the 19th century: bad smells were seen as emanating from people, who needed to thus manage their body odor in order to prove their hygiene standards and be socially acceptable (Shove 2003). Having clean clothes thus meant to be respectable person, as well as preventing oneself from sickness. For Elias (1969/2016), the quest for cleanliness is part of the civilization process in Europe, with societal blaming and shaming used to incorporate and normalize such practices in everyday life.

This can be captured in various adages in the countries under study. In Denmark, the expression: *"Du skal ikke lufte dit beskidte undertøj i det offentlige rum"* means that you should not put out your dirty laundry for everyone to see, or that you should not reveal your private life to others; in this way, dirty laundry is not respectable. In Finland, there is the expression *"Puhtaus on puoli ruokaa"* which literally translates to "Cleanliness is half a meal" and serves to exemplify how being clean can lead to added benefits. "*Etre proper sur soi*" in French-speaking Switzerland literally translates to "being clean upon yourself" but more directly translates to "being presentable in society".

INDOOR COMFORT STANDARDS AND THE MICROCLIMATE AS ARTIFACT

In this section, we discuss how people in different contexts understand what is a comfortable indoor microclimate and what adaptation strategies can be considered, in relation to people and their usage of indoor spaces. We consider indoor climates or "microclimates" to be an artefact (Roesler and Kobi 2018): rather than a neutral and objective given, microclimates are socially constructed over time and in different contexts, affected both materially and spatially by building configurations and usage, but also through both explicit standards and implicit understandings of what makes for a 'comfortable' indoor climate. As Shove (2003) summarizes: "There is more to comfort than temperature, but exactly where expectations lie along this range is, largely, a matter of culture and convention" (p. 33). The first institutional interrogations around indoor comfort can be traced back to the turn of the XIX century, initiated by professionals involved in the development of thermal environment technologies. Academic reflexions on thermal comfort began in the 1920s, towards "the scientific study of comfort conditions" (Shove 2003: 27). In the pre-War and post-War periods, engineers, architects and private interests converged around the need for a better control over indoor thermal environments (Dreyfus 1990), with air-conditioning in the United States positioned as a mean to control humidity, with a promise for 'ideal', man-controlled indoor weather (Cooper 1998: 182). In 1947, the International Organization for Standardization was founded, with the aim of producing standards that can be applied to a variety of products and services worldwide. In relation to heating and cooling, the effort to generate unified standards and related national requirements lead to complex calculation methods (Dreyfus 1990; Shove 2003). Based on both physiological satisfaction and seasonal change, universal recommendations for the achievement of thermal comfort was established.

Yet precisely what 'standard' is assigned to achieve a 'comfortable' indoor climate in the winter period and in Europe has evolved over time, challenging the notion that such recommendations could be universal. Dreyfus refers to an early 20th century "guide for the good housewife" issued in France, which prescribed: "14 ° in the dining or living room, 15 ° when receiving guests, 11 ° in the bedrooms"; the temperature recommendations were already outdated by 1958, when official guidelines in France suggested 18 ° as an ideal indoor temperature (Dreyfus 1990: 25; translated from French). The arrival of mechanical heating systems allowed for higher room temperatures in the winter, which co-evolved with expectations around indoor comfort towards new standards for minimum accepted levels of comfort and social norms around a 'cosy' home (Dreyfus 1990; Chappells and Shove 2005; Shove 2003, Wilhite 2017). Moreover, in addition to varying across time, the recommended temperatures also differ greatly by country. Brelih (2013), 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." (p. 16). Similar results are found in the Buildings Performance Institute Europe (BIPE) analysis (Kunkel et al., 2015).

This might be explained by the fact that the range of temperatures tolerated or appreciated by individuals is wider than what the term 'standard' might imply. The homogenisation of

indoor temperatures towards one particular temperature setting can lead to a lowering of personal tolerance to variable temperatures; habits created by mechanical temperature management can be difficult to change over time (Sahakian 2014; Wilhite 2017). Olesen and Parsons (2002) compare the thermal satisfaction of people living in mechanically cooled building with people living in free running buildings, demonstrating that: "In such buildings [with no mechanical cooling], the occupants seem capable of adapting to a broader range of conditions and can accept higher indoor temperature than predicted by the PMV" (2002: 543). In relation to a standard indoor temperature for artificial cooling in hot climates, Wilhite (2017) explains: "There are a number of empirical studies of comfort perception in buildings that demonstrate that this 22 °C norm is arbitrary and far lower than people in either naturally cooled or air-conditioned buildings are comfortable with. Comfort systems have been designed to provide 22 °C in all microclimates and seasons, whereas people have been reported to be comfortable at a wide range of degrees, between 6 °C and 31 °C" (p. 33). What it means "to feel comfortable" can thus vary between different people in the same context or across contexts. Climate diversity can indeed be promoted, built on the assumption that some people do enjoy variability in relation to microclimates – for example, coming in from the cold (Sahakian in Roesler and Kobi 2018; Dreyfus 1990).

One of the objectives of official standards regarding thermal environments is to maximize the energy performance of buildings (Nicol and Wilson 2011). As such, standards are expected to be "valid, reliable and useable" yet fail to account for physiological factors (Olesen and Parson 2002). Floor temperature and vertical air temperature differences can have a greater impact on a person comfort satisfaction than the mean temperature of the room, but are not assessed in standards (ibid). Nicol and Wilson (2011) argue that the calculation used in the European Standard EN 15251 (Indoor Environmental Criteria) is based on theoretical studies, which leave out many factors contributing to thermal comfort, such as light and sun exposure – a critique raised by Shove (2003), in relation to ISO and ASHRAE standards (The American Society of Heating, Refrigerating and Air-Conditioning Engineers). Nonetheless, recent developments in standardisation seem to be making room for additional parameters, for example in correlating outdoor/indoor climate conditions, or in recommended temperatures expressed as ranges (Boerstra et al., 2015; Nicol and Wilson 2011; Olesen and Parson, 2002). Adaptive factors are also considered in EN 15251, including "considerations not only of the environmental variables (temperature, humidity and air movement), but also of the clothing insulation and the activity of the occupants" (Nicol and Wilson 2011: 186).

There is a call for additional research to further develop standards, particularly in linking physiological and social comfort factors. Nicol and Humphreys (2002) propose a new adaptive standard, in which individuals are active in their comfort management; rather than fixed temperatures, ranges "in the region of ±2 °C (are proposed). Giving occupants the control necessary to make themselves comfortable can increase this range (Nicol and Humphreys 2002: 571). They also suggest that introducing variable temperatures in controlled buildings, following seasonal changes, could induce energy savings. Boerstra et al. (2015) demonstrate how the 2004 ISSO 74, ATG or adaptive temperature guidelines, was established in the Netherlands, integrating an occupant's behavior to help reduce the so called "performance gap" between energy efficiency by design and energy usage in practice. Ultimately, the overall ambition of such standards is being called into question: Nicol and Wilson (2011) explain, the European Standard EN 15251 (Indoor Environmental Criteria) "is written to augment the Energy Performance of Buildings Directive of the European Union. [However,] It is not obliged to encourage low-energy solutions and seeks merely to provide the information necessary to make energy calculations" (p. 191).

For the countries involved in ENERGISE Living Lab implementation, the literature suggests that differences exist between countries when it comes to heating standards, which may be related to outdoor climatic conditions but also habits that have developed over time. In Finland, as in other Nordic countries, indoor temperatures are rather high (approximately 21 ºC). Finns are accustomed to stable indoor environments and well-functioning automatized systems; they are also keen on adopting technological novelties (such as heat pumps and LEDs). Moreover, there are about 2 million saunas in Finland, with individual saunas fast becoming a standard feature in apartments, though this trend might be declining in cities due to space constraints and the resurgence of public saunas in cities such as Helsinki. Dutch people feel comfortable at comparatively lower indoor temperatures (below 20 °C) and actively regulate indoor temperature alongside other measures for indoor comfort, such as airing and ventilating. The latter is enabled by a central thermostat and a regulating valve on every radiator in Dutch homes. In the United Kingdom, what is considered as a 'reasonable level of warmth' has varied significantly over time. In the last 40 years, the average room temperature in the United Kingdom has risen considerably (from 12 °C to 18 °C in the winter months), largely due to the wide dispersion of central heating and improving insulation standards (BEIS 2017). Most British households do not keep their heating on 24 hours a day though; 70 % homes with central heating heat their homes twice per day, with peaks around 7am and 7pm. On average, British homes are heated for around eight hours per day in winter.

Regarding indoor comfort, various adages also abound in the countries under study: in the United Kingdom, to give someone a "warm welcome" uses the notion of warmth as synonym for a positive social welcome. In Denmark, warmth is also given positive attributes: *"At lune sig"* means to warm oneself and is used when someone is happy about the thought of something; *"Varm om hjertet"* is to be warm around the heart or to feel happy about something. Conversely, if you say *"Lukke for det varme vand"*, you are suggesting that hot water be shut off, which means that you no longer wish to do something. Cutting off the warmth is seen as a negative. The expression "Home is where the hearth is", used in Ireland, shows the central role of the fireplace and associated warmth in Irish homes.

Analysis of initiatives aimed at reducing energy usage in the home

For the ENERGISE project, Sustainable Energy Consumption Initiatives (SECIs) are activities which aim at reducing energy usage by actively involving households in either of two ways: 1) reducing the actual energy consumption, 2) re-

Table 2. Problem Framing Typology and frequency of occurrence (Source: Jensen et al., 2017).

Sustainable consumption category	Number of initiatives	% of total initiatives
Changes in social and material organisation	147	13.7
Changes in everyday life activities	124	11.7
Changes in individual behaviour	514	48.2
Changes in technologies and products	282	26.4
Totals	*1,067*	*100*

ducing the emissions intensity of energy consumption, by substituting fossil fuels with renewable energy sources. In an analysis of over 1,067 SECIs across Europe, typologies were developed and subsequently used for organizing the initiatives, understood in the Weberian sense as ideal types which act as a heuristic device for characterising the social world, while avoiding strict delimitations (Weber 1905/2002). An "ideal type" therefore brings together certain characteristics of social life represented by the SECIs, but few SECIs actually take on all of the characteristics defined in a single category. Both typologies, detailed below, were informed by a number of different sources of data, utilising both inductive and deductive research approaches. For this paper, we suggest a cross-analysis of the two typologies, towards understanding what percentage of SECIs across Europe focus on sufficiency, or are aiming "towards" sufficiency, defined as both absolute reductions in energy usage (to a maximum level, where feasible), alongside the intention to transform social practices. We combine a Problem Framing Typology (PFT), inspired by Spurling et al.'s (2013) discussion of policy approaches to consumer behaviour, and which considers how the initiatives were framed in relating consumption to social change, with the Resource Consumption Typology (RCT), inspired by the four layers of the Resource Consumption Hierarchy (RCH) developed by members of SCORAI Europe and included in a position paper submitted to the European Commission in February 2015. The hierarchy ranges from buying green products, repairing, sharing and "back to basics" (SCORAI 2014; Rau et al., 2018), and relates to the intended goal of the initiative from a resource perspective.

The 1,067 SECIs collected in ENERGISE D2.1 (Jensen et al, 2017) were analysed in relation to the typologies described above. Strikingly, though not surprisingly, the number of SECIs that could be understood as aiming towards sufficiency, categorised in the PFT as 'changes in everyday life activities' and 'changes in social and material organisation', are few (25 %); whereas the majority of SECIs can be understood as 'efficiency' approaches (primarily a mix of reduction and substitution), categorised as 'changes in technologies and products' as well as 'changes in individual's behaviour' (Table 2). SECIs that are strictly focusing on energy production are not included in the resulting selection of SECIs and thus not represented in the numerical results presented in the table. The SECIs that have been categorised within category 1 and 2 include aspects of sufficiency (as defined above), but it is important to note that this was evaluated based on the problem framing of the initiative; the concrete results of their implementation were not studied empirically.

Designing initiatives in the home: ENERGISE Living Lab approach

For ENERGISE, co-design and deliberative methods are put forward as a way to challenge social norms and collective conventions around energy-intensive activities, with a focus on heating homes and laundry practices and towards sufficiency as a desired outcome (Laakso et al. 2018). While the participatory engagement of households is an important aspect of living labs, the focus of this section is how initiatives aimed at reducing energy consumption in the home can be designed for sufficiency, as defined in this paper: aiming at absolute reductions and accounting for rebound effects; setting upper limits to consumption, in a consumption corridors perspective (which implies deliberation); and challenging everyday habits and routines – through an explicit focus on the collective conventions that hold together many of our habitual practices in the home.

Approximately 40 households were engaged in the Living Labs in each of the eight countries involved, approximately 300 households; of the 40, 20 households were approached individually (through in-depth interviews) and 20 households were approached as a community of place (through focus group discussions). While the type of household (socio-demographic information including household composition), and type of building (energy systems for heating and laundry system) were taken into account in the research design, a focus was placed on understanding how and in what way elements of social practices can be changed through challenges that set an upper limit to consumption: no more than 18 degrees over a four week period, half the number of usual laundry cycles over a four week period, with a one week overlap between the two. A deliberation phase at the onset of the challenges and with household members was designed to achieve two goals: understanding how everyday practices play out, and introducing the challenges and agreeing together with the households on what challenges they would commit to. The more descriptive part of these interviews involved discussions around material arrangements, skills and competencies, habits and routines, but also a reflexive exercise around representations of social norms. We envisioned this first in-depth interview and focus group with households to be a rupture, in that we explicitly focused on collective conventions – through photo elicitation – to contest established social norms around being comfortable indoors and cleaning clothes. For example, we discussed standards around bright white clothes in advertising, and the time and gendered constraints of laundry; we also discussed norms around comfort, which imply heating spaces rather than people, or expectations around light clothing that is increasingly worn year-round indoors (the ubiquitous t-shirt for example).

The focus groups followed a similar flow, allowing for discussions in smaller groups.

In addition, we concluded these 'deliberation phase' interviews, as well as the focus groups, with the introduction of Challenge Kits, which households were invited to open on the first day of the start of each challenge. These kits were designed to introduce insights around keeping clean and staying warm, which were intentionally *not* formulated with any kind of prescriptive tone (e.g. did you know that …). While we are not suggesting that introducing new material elements into the home would immediately lead to a change in practices, the 'things' included in the kits were intended as discursive devices to start conversations around cleanliness and comfort, while also proving useful towards reduced energy consumption. For example, an apron and organic stain remover was provided in the laundry kit; warm socks and hot cocoa was provided in the heating kit (each object was sourced locally for the more socially and environmentally sustainable option; households who did not want such objects could return them). In addition, surveys were conducted on a weekly basis via an online platform, prior to the challenges as well as during. Households were invited to install energy meters for their laundry machines, complete weekly journals recording indoor temperature changes and laundry cycles, place thermologgers for heating in key spaces, and were also given electronic thermometers for main rooms – all of which also acted as specific material arrangements and new skills (e.g. journal keeping), which added to increased reflexivity around every day routines and habits associated with heating and laundry.

At the end of the challenges, households were again visited for individual interviews or focus groups, in order to debrief on the challenges and understand specifically what had changed in the process, in relation to habits and routines, but also skills and competencies, material arrangements and representations of social norms. The aim of this final stage was to gauge in what way the challenges help to contest established conventions around heating and laundry: can you feel clean with an upper limit to laundry, and can you feel comfortable indoors with an upper indoor temperature limit? In this way, the ENERGISE project contributes to understanding how limits can lead to new experiences and representations, in practice, and within "consumption corridors". The analysis of the qualitative and quantitative data, along with follow-up interviews planned for Spring 2019, will yield insights into exactly what kind of "ruptures" took place, which remains to be determined at this stage in the project. The Living Labs were concluded in December 2018 in all eight countries and analysis is underway.

ENERGISE plans for communication around Living Lab results, through stakeholder and press outreach for example. While communications are often seen as due diligence in such a project, as assigned to a specific work-package, we argue that the communication around the challenges has a central aim and should be integrated into Living Lab design. Through certain forms of communication and amplification of results, sustainable forms of consumption can be made more "conspicuous" and become symbolic, in that they represent the possibility of contesting conventions and achieving sufficiency as well as wellbeing. Similar to Jack's (2018) work on cleanliness practices in Sweden, we found that discussions in small groups can lead to the normalisation of representations, if not directly on practices. We also found that discussions around laundry and heating can affect other consumption domains, such as showering or meal preparation, what can be seen as a positive rebound effect. This would suggest that the organisation of community conversations around collective conventions, similar to carbon conversations, could be one way of contesting normalised practices that are energy intensive. Further, Jack's study of the role of media in blaming and shaming consumers into washing more would also suggest that media has a role to play in normalising more sustainable forms of consumption – the issue is that consuming less is not aligned with capitalist growth perspectives. Rather than consider paid media and brands as key partners, the press as well as creative agencies – filmmakers, photographers, etc. – can play a key role in amplifying the results of challenges, as starting a discussion around upper limits to consumption. One significant risk, in Bourdieu's perspective, is that challenging conventions can also lead to their further stabilisation or reinforce orthodoxy.

Discussion and conclusion

This paper has provided a definition of sufficiency in relation to energy usage in the home: while the aim is an absolute reduction in energy usage, accounting for rebound effects, we argue that sufficiency also implies setting upper and lower limits to consumption, as well as challenging the bad habits of unsustainable consumption practices. Towards this aim, a social practice framework is useful, whereby collective conventions are seen as holding together everyday practices, made up of routinized and habitual actions. Challenging collective conventions therefore becomes a key aim towards achieving sufficiency, which requires putting new practices into performance – which is what the ENERGISE Living Labs set out to achieve – but also relating any changes to notion of wellbeing.

Through the ENERGISE project, the laundry and heating practices of households living in eight European countries will be further understood, upper limits to consumption will be tested and debated, and the possibility of achieving sustainable wellbeing with sufficiency measures will be amplified. Exploring similarities and differences in practices across contexts – through the roll-out of ENERGISE Living Labs (ELLs) in eight European countries – will enable us to understand existing laundry and heating practices, in order to reveal 'cultural' aspects of practices that use energy in the home, specifically related to collective conventions. In ELL design, attention was placed on material arrangements and socio-demographic factors, as a backdrop, along with the gendered dimension of household chores, and environmental awareness, understood as prior engagement in environmental or energy-related issues. An emphasis was placed on the collective conventions and social norms in relation to energy usage, bridging a knowledge gap in understanding how collective conventions are similar or differ between and within countries, as well as how everyday practices can be de-stabilised – what we have termed ruptures in routines. The hypothesis is that contesting everyday practices and representations of comfort and cleanliness, as planned for in our laundry and heating challenges, could yield novel insights both on everyday practices (prior to the challenges) and social change (during and after the challenges).

What remains to be explored is how and in what way the experiences of the approximately 300 households across eight European countries can lead to *heterodoxy*, or the destabilisation of established ways of doing and saying around laundry and heating. Towards this aim, social practice theories can be complemented with other approaches from the sociology of consumption. Specifically, we need to consider how upper limits to consumption and sufficiency measures in the home can lead to more *conspicuous* forms of consumption, consumption that aims towards communicating social position, or consumption as symbolic and cultural. To achieve this aim, more emphasis needs to be placed on amplifying results towards the normalisation of "sustainable wellbeing". We have suggested above that communications around initiatives such as ENERGISE are not solely an output of the project, but should be integrated into project design – involving partnerships with the press but also other stakeholders involved in community engagement, documentary film and photography, or other forms of communication.

To conclude, initiatives which aim at reducing overall energy consumption in the home tend to focus predominantly on energy efficiency measures and individual/technological approaches. A more comprehensive approach is to account for everyday practices, as well as upper and lower limits to resource consumption, towards absolute reductions in energy usage – or sufficiency. Initiatives that engage households can achieve changes in everyday practices through challenges which explicitly change the performance of practices in a given time and space, leading to the possibility to contest the collective conventions which hold together habitual and routinized practices. However, the amplification of any results and the conspicuous communication around such changes needs to be integrated into the design of such activities – towards the normalisation of consumption practices which tend towards sustainable wellbeing.

References

Anderson B. (2016). Laundry, energy and time: Insights from 20 years of time-use diary data in the United Kingdom. *Energy Research & Social Science, 22*: 125–136.

BEIS. (2017). Energy Consumption in the UK, July 2017 [Online]. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/%20573269/ECUK_November_2016.pdf [Accessed 25 April 2018].

Bourdieu, P. (1997). *Méditations pascaliennes*. Paris, Seuil.

Boerstra A. C, van Hoof J. and van Weele A.M. (2015). A new hybrid thermal comfort guideline for the Netherlands: background and development. *Architectural Science Review*, 58 (1): 24–34.

Brelih N. (2013), Thermal and acoustic comfort requirements in European standards and national regulations, *Federation of European Heating, Ventilation and Air Conditioning Associations (REHVA) Journal*, pp. 4.

Chappells H. and Shove E. (2005). Debating the future of comfort: environmental sustainability, energy consumption and the indoor environment. *Building Research & Information* 33 (1): 32–40.

Costanza, E., Fischer, J. E, Colley, J. A, Rodde. T., Ramchurn Sarvapali D et Jennings, N. R. (2014). Doing the Laundry

with Agents: A Field Trial of a Future Smart Energy System in the Home, In: *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, CHI '14, New York, NY, USA: ACM: 813–822.

Di Giulio, A. and D. Fuchs (2014). Sustainable Consumption Corridors: Concept, Objections, and Responses. *GAIA* 23 (S1): 184–192.

Dreyfus, J. (1990). *La société du confort: quel enjeu, quelles illusions* ? Paris: L'Harmattan.

Elias, N. (1969/2016). *La civilisation des moeurs*. Paris, France, Pocket.

Evans, D. (2018). What is consumption, where has it been going, and does it still matter? *Sociological Review*, First online.

Godin, L. and M. Sahakian (2018). Cutting Through Conflicting Prescriptions: How Guidelines Inform 'Healthy and Sustainable' Diets in Switzerland." *Appetite* 130: 123–133.

Gough, I. (2017). *Heat, Greed and Human Need: Climate change, capitalism and sustainable wellbeing*. UK, USA, Edward Elgar Publishing Limited.

Gram-Hanssen, K. (2011). Understanding change and continuity in residential energy consumption. *Journal of Consumer Culture* 11 (1): 61–78.

Hui, A., et al., Eds. (2017). *Demanding energy: spaces, temporalities and change*. Palgrave Macmillan.

Jack, T. (2018). Negotiating Conventions: cleanliness, sustainability and everyday life. *Department of sociology, Faculty of social science*, Lund University. PhD dissertation.

Jensen et al (2017). Construction of Typologies of Sustainable Energy Consumption Initiatives. ENERGISE – European Network for Research, Good Practice and Innovation for Sustainable Energy, D2.4.

Josephy B., Bush E., Nipkow J. and Attali J. (2011), Washing Machines: Key Criteria for Best Available Technology BAT, Topten International Services.

Karjalainen, S. (2009). Thermal comfort and use of thermostats in Finnish homes and offices, *Building and Environment,* 44 (6): 1237–1245.

Kruschwitz A., Karle A., Schmitz A. and Stamminger R. (2014), Consumer laundry practices in Germany, *International Journal of Consumer Studies,* 38 (3), pp. 265–277.

Kunkel, S. Kontonasiou, E. Arcipowska, A. Mariottini, F. and Bogdan, A. (2015). Indoor Air Quality, Thermal Comfort and Daylight, *Buildings Performance Institute Europe (BPIE),* [en ligne].

Laakso et al. (2018). Easy-to-use ENERGISE Living Labs intervention and engagement guidebook. ENERGISE – European Network for Research, Good Practice and Innovation for Sustainable Energy, Deliverable No. 3.4

Laitala K., Klepp, I. G. and Boks C. (2012). Changing laundry habits in Norway. *International Journal of Consumer Studies,* 36 (2): 228–237.

Laitala, K., Klepp, I. and Henry, B.K.. (2017). Global laundering practices – Alternatives to machine washing. *Household and Personal Care Today*. 12 (5): 10–16.

Mylan, J. (2015), Understanding the diffusion of Sustainable Product-Service Systems: Insights from the sociology of consumption and practice theory, *Journal of Cleaner Production*, Special Volume: Why have 'Sustainable

Product-Service Systems' not been widely implemented?, 97: 13–20.

Nicol, J.F. and Wilson, M. (2011). A critique of European Standard EN 15251: Strengths, weaknesses and lessons for future standard. *Building Research & Information*, 39: 18–193.

Olesen B. W.; Parsons K. C. (2002), Introduction to thermal comfort standards and to the proposed new version of EN ISO 7730 – ScienceDirect, *Energy and Buildings*, 34 (6): 537–548.

Pirgmaier, E. (2017). The Neoclassical Trojan Horse of Steady-State Economics. *Ecological Economics* 133: 52–61.

Plessz, M., et al. (2016). How consumption prescriptions affect food practices: Assessing the roles of household resources and life-course events. *Journal of Consumer Culture* 16 (1): 101–123.

Rau, H. Goggins, G and Fahy F (2018) 'From invisibility to impact: Recognising the scientific and societal relevance of interdisciplinary sustainability research' Research Policy, 47 (1): 266–276.

Raworth, K. (2017). *Doughnut Economics: Seven Ways to Think Like a 21st-Century Economist,* Random House Business.

Røpke, I. (2009). Theories of practice – New inspiration for ecological economic studies on consumption. *Ecological Economics* 68: 2490–2497.

Rouse, J. (2007). Social Practices and Normativity. *Philosophy of the Social Sciences* 37 (1): 46–56.

Sahakian, M. (2014). *Keeping Cool in Southeast Asia: Energy use and urban air-conditioning.* New York, London, UK, Palgrave Macmillan.

Sahakian, M. (2018). Air-Conditioned Microclimates in Metro Manila (The Philippines). *The Urban Microclimate as Artifact: Towards an Architectural Theory of Thermal Diversity.* S. Roesler and M. Kobi. Basel, Switzerland, Birkhauser: 200.

Sahakian, M. and B. Bertho (2018a). *L'électricité au quotidien : le rôle des normes sociales pour la transition énergétique suisse.* Genève, Suisse, Fonds nationale suisse (FNS), PNR71.

Sahakian, M. and B. Bertho (2018b). 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 S. Lorek (2018). Laying the Foundations for Consumption Corridors: the Case of Heating Bigger Homes. *Third International Conference of the Sustainable Consumption Research and Action Initiative, SCORAI Copenhagen.*

Sahakian, M. and H. Wilhite (2014). Making practice theory practicable: towards more sustainable forms of consumption. *Journal of Consumer Culture* 14 (1): 25–44.

SCORAI (2014). Conference report: 'Sustainable consumption' problem framing and research design: Can we be inter- and transdisciplinary and do we truly want to be? SCORAI Europe workshop. University of Lausanne, Switzerland.

Shove, E. (2003). *Comfort, Cleanliness and Convenience: The Social Organization of Normality.* Oxford, New York, Berg.

Shove, E. (2017). What is wrong with energy efficiency? *Building Research & Information.* 46 (7): 779–789.

Shove, E. and M. Pantzar (2005). Consumers, Producers and Practices: Understanding the invention and reinvention of Nordic walking. *Journal of Consumer Culture* 5 (1): 43–64.

Shove, E. and G. Walker (2014). What Is Energy For? Social Practice and Energy Demand. *Theory, Culture & Society* 31 (5): 41–58.

Shove, E. and A. Warde (2002). Inconspicuous consumption: the sociology of consumption, lifestyles and environment. *Sociological Theory and the Environment.* R. E. Dunlap, F. H. Buttel, P. Dickens and A. Gijswijt. Lanham, Md, Rowman & Littlefield.

Sovacool, B. K. (2014). What are we doing here? Analyzing fifteen years of energy scholarship and proposing a social science research agenda. *Energy Research & Social Science* 1: 1–29.

Spengler, L. (2016). Two types of 'enough': sufficiency as minimum and maximum. *Environmental Politics* 25 (5): 921–940.

Spurling, N., et al. (2013). Interventions in practice: re-framing policy approaches to consumer behaviour, Sustainable Practices Research Group Report: 56.

Wallenborn, G. and H. Wilhite (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. (2014). After taste: Culture, consumption and theories of practice. *Journal of Consumer Culture* 14 (3): 279–303.

Weber, M. (1905/2002). *The Protestant Ethic and the « Spirit » of Capitalism and Other Writings.* New York, London, Auckland, Ontario, Penguin Classics.

Wilhite, H. (2016). Energy Consumption as Cultural Practice, In: Strauss Sarah, Rupp Stephanie, and Love Thomas F (Eds.), *Cultures of energy: power, practices, technologies,* New York: Routledge: 60–73.

Wilhite H. (2017). *The political economy of low carbon transformation: breaking the habits of capitalism, Routledge studies in low carbon development.* Abingdon: Routledge.

Wilk, R. (2002). Culture and Energy Consumption. *Energy: Science, Policy and the Pursuit of Sustainability.* R. Bent, L. Orr and R. Baker. Washington, DC, Island Press: 109–130.

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