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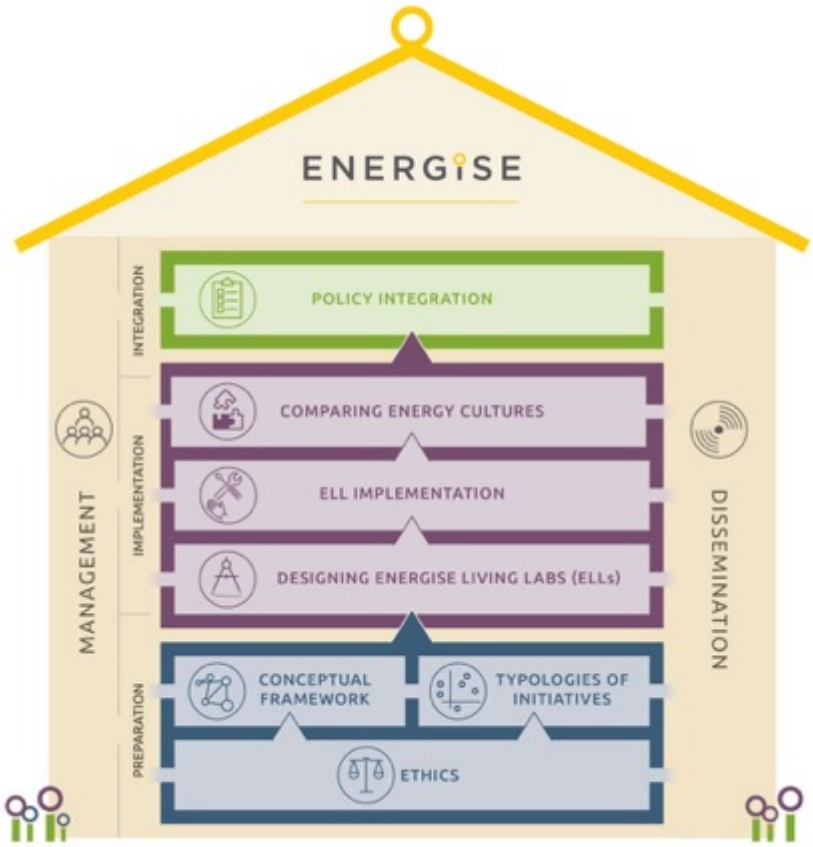
ENERGISE PROJECT

ENERGISE is an innovative pan-European research initiative to achieve a greater scientific understanding of the social and cultural influences on energy consumption. Funded under the EU Horizon 2020 programme for three years (2016-2019), ENERGISE develops, tests and assesses options for a bottom-up transformation of energy use in households and communities across Europe. ENERGISE's primary objectives are to:

- **Develop an innovative framework** to evaluate energy initiatives, taking into account existing social practices and cultures that affect energy consumption.
- **Assess and compare the impact** of European energy consumption reduction initiatives.
- **Advance the use of Living Lab approaches** for researching and transforming daily practices associated to energy use.
- **Produce new research-led insights** into the role of household routines and changes to those routines towards more sustainable energy.
- **Encourage positive interaction** between actors from society, the policy arena and industry.
- **Effectively transfer** project outputs towards the implementation of the European Energy Union.



EXECUTIVE SUMMARY

The aim of this report is to uncover **how and in what way the ENERGISE Living Labs (ELLs) contributed to a change in practices related to heating and laundry**, across over three-hundred households in eight European countries. By embedding this research in a practice-theoretical framing, we recognise that much of everyday life is made up of more or less routinized activities, which use energy and can be difficult to change. We see practice configurations as involving meaning, skills and competences, and material and technological elements[1] – which must be understood together and in a dynamic relation to other practices. For ENERGISE, social practices are a heuristic tool that describe observable socio-material arrangements that exist across time and space, and that are enacted more and less consistently by groups of people. We analyse in this report the results of a mixed-method study that involved both qualitative and quantitative data on everyday practices and related energy use, gathered before, during and after two main challenges that ELL participants engaged with in their homes: reducing laundry cycles, and lowering indoor temperature.

In Elizabeth Shove's (2003) seminal work on the role of collective conventions on energy use in the home, representations of *"comfort, cleanliness and convenience"* are seen as having an important and normative role on how everyday practices play out. For this project, we took everyday life and social norms seriously, in that we designed ELLs to offer participants a time and a space for changing practice configurations in the home, and challenging routinised and habitual ways of performing daily activities. The ELLs focused on laundry and heating through two challenges lasting four weeks each, during which households were invited to reduce indoor temperature to 18°C and halve the number of laundry cycles. Through the ELLs, and for most of the 306 households across Europe who participated in the study, we have found that: **reducing indoor temperatures by 1°C in the winter months is possible and not *un-comfortable*. Reducing by one laundry cycle per week is possible and not *in-convenient*, nor *un-clean*[2] and regardless of household size.** The following table displays the self-reported average quantitative change as a result of the ELLs:

Table 1: Average changes in reported temperatures and wash cycles during ELLs
(Data source: weekly surveys; averages taken before challenges, and during challenges)

Change in temperatures		Change in weekly wash cycles		
Living room	**Bedroom**	**Family of 2**	**Family of 4**	**All**
From 21.12°C to 20.16°C	From 19.97°C to 18.58°C	From 4.3 to 3,2	From 4.1 to 3.0	From 4.2 to 3.1
1 degree (0.96°C less)	1 and a half degrees (1.39°C less)	1.1 cycle less (26% reduction)	1.1 cycle less (26% reduction)	1.1 cycle less (26% reduction)

The ELL results presented in this report demonstrate that **reductions in energy use are possible, when people are given the time and space to question their usual practices**, as they experiment with departing from the norm, and try out ways of doing things differently. This is in stark contrast to approaches centred on individual or technological change, which dominate

[1] A Glossary of Terms, elaborated for ENERGISE by Rau 2017, contains several definitions of concepts used throughout the project, and will be hereafter referred to as the work package 1 (WP1) Glossary.
[2] This key finding is based on two premises: 1) all sectors of society have a role to play in energy transitions, not solely households; and 2) absolute reductions in temperature settings are possible if households start from an average indoor temperature baseline, thus not including households experiencing energy poverty and those who are already at relatively low temperature. By average temperatures, we mean temperatures that were commonly observed in the households prior the challenges.

initiatives aimed at more sustainable forms of household energy use across Europe, and which fail to address the complex interactions and social norms that make up everyday life (Jensen et al. 2018). In general, the participants in the ELLs enjoyed the challenges, which is also a significant finding. If done in a respectful and engaging way, efforts to reduce energy use in the home are not only possible, but also **an enjoyable process that does not hinder a sense of overall wellbeing**. Of course, not everyone enjoyed reductions in indoor temperatures – we had expected to take people outside of their comfort zone – but the challenge format was appreciated by most of the participants.

By designing and implementing Living Lab[3] initiatives across eight countries and over 300 households, ENERGISE makes a commitment to "culturally sensitive approaches in everyday practices and associated patterns energy use, drawing attention to prevailing energy cultures, that is, sociocultural factors that shape collective energy demand and create variations in how energy is generated, distributed, viewed, and used both within and between countries" (Rau and Grealis 2017, D1.2). The design and implementation of the Living Labs accounted for cultural variability as much as possible, and for this report we recognise that changes in practices are culturally embedded. We study change in relation to differences between countries, households, and ELL1 and ELL2, and have found that both laundry and heating result in everyday practices that are recognisable across the eight countries. The cultural variations, rather, are in how practices are performed by people, which can be both similar and variable between and within countries, and across and even within households.

A main approach to examining how and in what way changes took place (as illustrated in Figure 1) is in the analysis of 1) existing practice configurations, 2) the introduction of challenges as a form of experimentation that households engaged in, and 3) the different **enablers and deterrents of change** in relation to appropriating the challenges. These are not to be taken as single separated elements, but rather as several interacting and integrated ingredients in practices that have an influence on how existing configurations play out. Finally, we examine processes of 4) stabilisation after the challenges, either in relation to new configurations of practices, or a return to pre-existing configurations, often with reduced energy use. In addition, we consider other variables in explaining change, such as **sociodemographics, and housing- and heating-system types**. We also describe differences in how the challenges played out: in comparing changes between countries, in comparing households within countries (and specifically the differences between an individual and collective approach to ELL design, termed ELL1 and ELL2 respectively), and in comparing households across the countries. Based on our analysis, we also provide some insights on the **sufficiency potential of ELLs,** the **possible spillover effects,** and finally the implications for policy measures and for further amplification of the approach and results, through communication and dissemination.

In this report, consumption is understood as the use of resources arising from the routine reproduction of practices (WP1 Glossary). Two consumption domains were selected for the study: laundry and heating. These relate both directly and indirectly to everyday practices: for laundry, a series of actions such as sorting, washing and drying clothes are part of the overall practice; for heating, this consumption domain relates to practices as diverse as sleeping, entertaining guests or working from home. While space heating is responsible for the largest share of overall household energy use, laundry has a relatively smaller share of direct household energy use but is significant as a daily task. As discussed in D5.1, laundry is a 'sticky' practice as it is tied up with habitual and routinised sets of activities, which are held together by collective conventions around hygiene and cleanliness, all of which may be less malleable to change.

[3] As defined in the WP1 Glossary, a living lab is an initiative or 'real-world experiment' that is spatially defined (e.g. city, agglomeration, university campus) and that brings together diverse social actors (e.g. academics, municipalities, communities, NGOs, committed individuals). Intended to foster innovation through the application of both lay and scientific expert knowledge to real-world problems (e.g. excessive energy use).

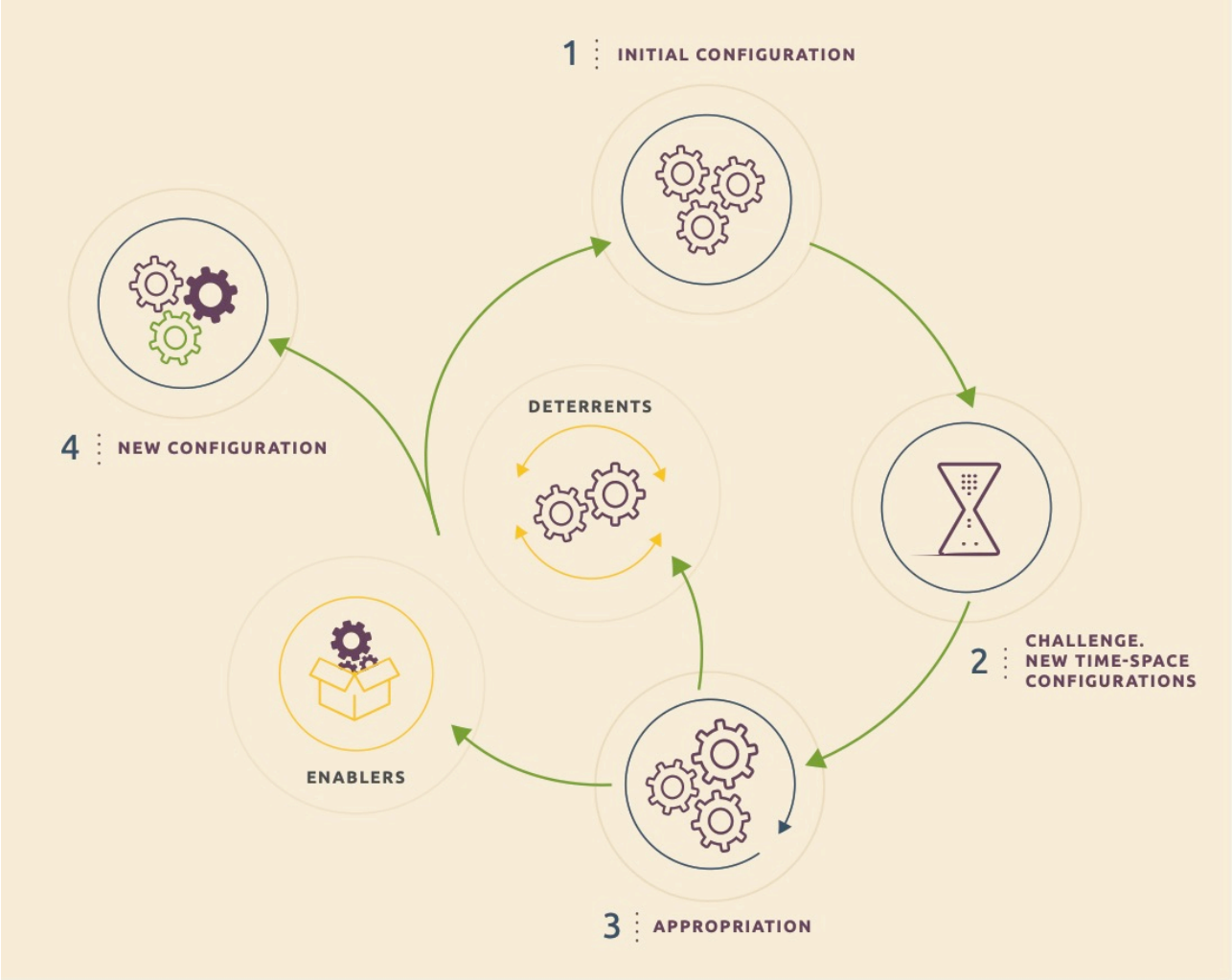


Figure 1: Stages of Living Lab appropriation by households

In order to explain how and in what way changes occurred as a result of the ELLs, we provide below a summary of our results:

- **Giving people permission to go outside of their comfort zones** is a promising approach towards changing everyday practices. Through this form of experimentation, people were able to try out new approaches to everyday life, in a set space and limited time period, towards a goal suggested by the research team. Challenge kits were provided in relation to heating and laundry, including a welcome pamphlet, which provided tips and insights, as well as gifts related to keeping warm and clean (such as warm socks for the former, and stain-removal for the latter). We also found that there are promising spillover effects from the home to other spaces such as the workplace or other homes. The approach we took is a part of the success factor: we presented the challenges as a **social learning process, and not a competition**. The objective was to learn together, with an explicit focus away from 'energy saving' as the sole aim, through a deliberative and reflexive process. We designed a form of engagement with households that sought to guide and support, rather than direct and govern.

- **Changing practices, rather than people,** moves away from changing people's attitudes or behaviour and takes everyday life seriously, accounting for the variety of activities that make up laundry and heating in homes. The ELLs placed an explicit focus on material arrangements, people's skills and competencies, as well as meanings or representations of

social norms – in relation to laundry, which is a clearly discernable practice; and in relation to heating homes, which can be a practice in and of itself (making a fire, for example), but most often is no longer a clear practice, since heating is delegated to technology. Nonetheless, heating makes possible a series of practices in the home, such as sleeping, socialising, or even working. In a practice-based approach, it is important to recognise that practice configurations and forms of engagement with practice-based challenges differ: we found that the laundry challenge invited people to actively change a whole series of actions (more proactive to changes); for heating, people were adapting to a new indoor microclimate[4] (more reactive to changes).

- **Engaging sensory feeling and emotions in experiential learning:** through both the heating and the laundry challenges, sensory feelings in spaces were given centre stage in that they played an active role in how people appropriated the two challenges. In relation to heating, when people reduced indoor temperatures (or attempted to reach a target of 18°C), they could read temperature settings and relate them to sensory feelings. Over time, their bodies learned to adapt to the change. As expected, people came to recognise that there is not one standard temperature that is valid for all people, in all spaces. Less heat in bedrooms was much more accepted than less heat in living areas, for example. In relation to laundry, some people generally took on a more sensorial approach to smells and stains and developed a new relationship to feelings of cleanliness. We thus argue that people's senses were fully engaged in learning how to reduce energy use.

- **Making energy visible through devices such as energy meters and thermometers,** and engaging people in recording energy use, is a powerful tool for change, as it transforms representations and equips people with new skills to act on their energy consumption. It contributes to giving people agency over material arrangements, thus inducing change in one central dimension of a practice. However, such tools are only relevant and effective in so far as they are tied to a goal and as a way to reflect on their own routines, in this case the heating and laundry challenges, and must be understood in relation to the notion of 'sensory experience' described above. We have also noticed that in some cases measuring energy consumption can be counterproductive if people realise that they consume less than expected, and are thus incited to perhaps consume more.

- **Social relations and everyday interactions** are an important element to account for, as they determine the standards and expectations people will strive to meet over a day or a week, while being home, at work, or at school, for example. This relates closely to how people represent what is comfortable or not, clean or not, in different settings and for varying activities. Social relations involve negotiating dynamics and standards within the home between couples, and with children; but also, with guests, and in some instances, with pets.

Among the over 300 households across eight countries who participated in our study, laundry and heating practices are relatively homogenous, with no significant cultural variations in these practices as recognisable entities: people generally use washing machines and detergents, and although heating systems may vary, most heating is derived through systems of provisioning into homes – with fireplaces a complementary feature. However, our research indicates that there are variations in how people carry out these practices. The different sequences associated with doing (less) laundry or the ways of adapting to (lower) temperatures is highly variable, indicating that there are differences in how practices are performed. This strongly suggests that any initiative that seeks to achieve more sustainable forms of energy use in the home must account for how

[4] The notion of 'indoor microclimate' refers to a series of conditions, including indoor temperatures, humidity levels, air flow, as well as diverse feelings of comfort or discomfort in relation to these. See Sahakian et al. (2019b, submitted).

practices play out – in relation to competencies, meanings and materials that are variable within and between countries, and indeed among different members of a same household. As further elaborated in this report, we suggest that a culture of sufficiency might be necessary to achieve absolute reductions in domestic energy use, coupled with changes to everyday life situations, while accounting for wellbeing.

The ENERGISE Living Labs demonstrate that it is possible to reduce energy use in absolute terms coupled with changes in routinised and habitual practices, as further described in this report. The ELLs introduced targets for lowering their energy use, related to laundry and heating practices, which people were able to engage with through a deliberative and reflexive process, even if many did not achieve these 'challenging' targets.

PART 1: OVERVIEW AND RESEARCH QUESTIONS

The following section outines in detail the objectives of this report (Deliverable 5.2), in addition to summarising the approach adopted in the ENERGISE Living Labs (as documented in more detail in other project deliverables and mentioned below)[5].

1.1 OVERVIEW OF THE ELL APPROACH

The ENERGISE Living Labs (ELLs) were envisaged around reducing energy use in two consumption domains: **(1) space heating** and **(2) laundry washing**. While space heating is responsible for the largest share of overall household energy use, laundry has a relatively smaller share of direct household energy use but is significant as a daily task. Both indoor heating and washing relate to social norms around comfort, convenience and cleanliness, which we wanted to challenge and contest through our approach. The exploration of practices related to both indoor comfort and cleaning was also chosen because of the ways in which these sets of practices relate to daily life, involving material arrangements, skills and competencies, as well as representations of social norms. Contrary to data on electricity costs or energy sources across European countries, D5.1 (Sahakian and Naef 2019) demonstrated that there are few studies on collective conventions, social norms, and standards, when it comes to both comfort and cleanliness, which are comparable across Europe. This report seeks to fill that gap in placing attention on the social norms tied up with heating homes and washing laundry.

The ENERGISE Living Labs were designed with two approaches in mind: **in ELL1, households were approached individually; in ELL2, households were approached collectively,** as part of a community of place, with more interactions between participants. The ELLs were developed through a co-design process, involving the consortium research members, implementation teams with expertise in community and energy issues in each location, exchanges with the ENERGISE Expert Panel, as well as interactions with household participants (see D3.1, D3.2 and D3.3). The guidelines for implementation and monitoring (D4.1), and evaluation and assessment (D3.5) were designed on the basis of a practice-based conceptual framework and in close collaboration with Work Package 5, in relation to analysis that would be delivered herein (D5.2).

The main engagement method was that of **a challenge, set within a specific space (the home) and time (four-week periods for each challenge,** with an overlap of one week between challenges, as well as a baseline and follow up period).

Households were proposed two challenges:

- In the domain of laundry, the aim was to **reduce washing cycles by half,** relative to the baseline figure.
- In heating, the challenge was to **reduce the indoor daytime temperature to 18°C.**

In both challenges, it was possible for participants to define their own targets, based on what they felt they could achieve; participants were nonetheless encouraged to go outside of their comfort zones.

Households were gifted two **challenge kits** that corresponded to each consumption domain, laundry and heating, to be opened at the start of each challenge and providing sustainably-sourced materials, tips, and insights, to stimulate discussions within households and support the challenges. For example, and for laundry, natural stain removers were included, along with an apron, to question regular washing routines and help keep clothes ‘clean’ for longer. For heating, warm drinks and socks were provided, to help warm people rather than spaces. To facilitate

[5] All public deliverables are indicated as D.no. in the text and relate directly to the seven workpackages of the ENERGISE project; they are available at: http://energise-project.eu/deliverables

comparative analyses both within and across countries, all ELLs followed a similar approach. However, the challenge kits were tailored to each of the eight participating countries and were, as far as possible, locally sourced in relation to sustainability criteria.

1.2 RESEARCH QUESTIONS

As stated in the Grant Agreement, the main goal of this report is to provide an analysis of ENERGISE Living Labs within the eight countries engaged in implementation. In this analysis, we account for:

- Individual, organisational, institutional and societal influences on energy-related practices
- Links between routines and changes within specific socio-cultural contexts

We uncover these differences and similarities between ENERGISE Living Labs:

- In different countries: accounting for national socio-cultural context
- Within the same country: accounting for intra-national variations in ELL results
- Across countries: accounting for cross-national similarities and differences in ELL results

In order to focus our efforts for this deliverable, we discussed and agreed on the main research question that would drive the analysis (ENERGISE Copenhagen consortium meeting, June 2018). Based on these discussions, the main research question that is the focus of this report is:

In what way do ENERGISE Living Labs contribute to a change in practices related to heating and laundry?

The explicit focus is on understanding change, and specifically how and in what way change occurs through Living Lab initiatives designed around a challenge as the main approach. The research question led to an analysis within and between ELLs in eight countries – Denmark, Finland, Germany, Hungary, Ireland, Switzerland, the Netherlands and the United Kingdom –, implemented in the fourth quarter of 2018.

This main research question leads to a series of sub-questions:

- In relation to heating and laundry, how can changes in practices be described?
- What are the differences in how changes occur, within and between countries, and between ELL1 (individual approach) and ELL2 (collective approach)?
- What are policy implications of ELL results, as well as opportunities for upscaling and further dissemination?

PART 2: ANALYTICAL FRAMEWORK

Based on the conceptual framework developed by WP1 (Rau and Grealis 2017, D1.2), the analytical framework aims to apply concepts, to research methods and analysis – as guidelines for the design, implementation and analysis of the ELLs. A summary of the concepts and methods is provided here, as well as the approach to comparative data analysis.

2.1 DEFINING THE CONCEPTS

2.1.1 PRACTICES AS THE SITE OF THE SOCIAL

A social practice approach to energy studies is well established in the literature, starting with Shove's (2003) seminal work and continuing with a steadily increasing number 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. A practice is a recognised entity that can be performed by practitioners, such as preparing a meal or doing laundry. For ENERGISE, attention was placed on everyday practices in the home.

Much of the work that engages with practice-based approaches is descriptive, with fewer examples of how to **understand social change through practices**. Focusing on mobility practices such as car use, Greene and Rau (2018) demonstrate the potential of a biographic, practice-centred approach for examining the dynamics of practices across the life course. 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. Jensen (2017) describes how the performativity of practices with a shared goal, for instance that of 'doing light within the home' is embedded in as well as emerging from the constitution, institutionalization and modifications of wider practice-arrangements related to the provisioning and consumption of lighting. 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 behaviour), are distinguished from a practice-perspective, which is seen as more transformative. For ENERGISE, it is the practices of everyday life that are the site of social life; rather than changing people's behaviour or transforming technologies, our approach to Living Lab implementation was to focus on changing practices in relation to two domains: heating and laundry. We propose the following elements as essential to understanding existing practices and opportunities for changes in practices.

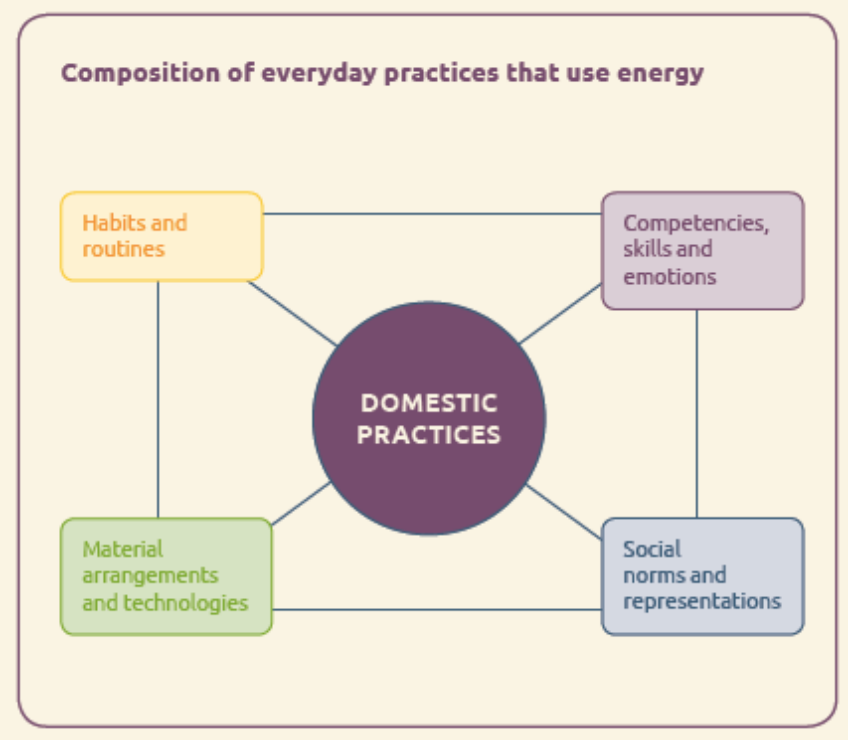


Figure 2: Inter-related dimensions of social practices

As stated in the ENERGISE conceptual framework (D1.2), while practices have directly observable aspects that lend themselves to conventional social-scientific inquiry, **their tacit or hidden elements can be equally (if not more) important.** In this research frame, the iceberg metaphor

serves to illustrate how practices consist of a visible part, like the tip of the iceberg that floats above water, and a much bigger and largely invisible part that remains below surface. One of the main challenges is to analyse the hidden parts of practices and the elements that frequently resist direct observation and assessment, like taken-for-granted cultural norms and conventions. This research project therefore addresses challenges concerning the empirical research design, as we discuss below in section 2.2.

2.1.2 SUFFICIENCY IN RELATION TO ENERGY USE AND PRACTICES

This report attempts to describe and explain change, but it is also necessary to clarify the aim of changes in relation to household energy use: towards either improving energy use per unit of production (more efficient cars, for example), or overall reductions in energy use (shift from cars to bicycles and less travel, for example). As discussed in D5.1 *Overview of collective conventions, governing frameworks and material systems in relation to energy-using practices* (Sahakian and Naef 2019), the energy efficiency narrative features prominently in the various energy policies and strategies of the eight countries under study. Building on earlier work by the ENERGISE consortium (Jensen et al. 2018; Laakso et al. 2018), we see sufficiency as a normative and desirable goal for the aim of the ENERGISE Living Labs.

As defined by Jensen et al (2017) for D2.4, sufficiency is about reducing energy use and limiting what is produced and consumed, without having a disproportionately negative impact on 'wellbeing'. A further definition of sufficiency was put forward in Sahakian et al. (2019a): a focus on sufficiency implies something more than absolute reductions in energy use – which can be achieved by reducing heat settings and wash cycles, as proposed in the ENERGISE challenges. There is a need to grapple with the difficulty of breaking the unsustainable habits that use energy services, posing the question: how much heating, cooling, washing and lighting is enough, and how can everyday life activities be changed to meet this aim? We address the need to rethink how much "comfort, cleanliness and convenience" (Shove 2003) people truly require to live a good life towards "sustainable wellbeing" (Gough 2017), or a form of wellbeing that is socially just and environmentally sound. We consider the ENERGISE project as a process whereby people were engaged in sufficiency measures, not through a top-down approach, but through participatory deliberations that encouraged reflexivity.

This approach to energy sufficiency is differentiated from energy efficiency, a technical term which relates to a unit of production (for example, a lightbulb), and aims for maximising the value created in relation to the resource used (an energy-efficient lightbulb). As described in Jensen et al. (2017: 23-32), efficiency improvements can also reduce the cost of using certain products, leading to savings that can result in direct rebound effects (savings are directed towards the purchase and usage of more energy efficient lightbulbs) or indirect rebound effects (energy savings from lightbulbs are spent on other forms of energy use). For ENERGISE, we use the notion of 'rebound effects' to account for positive or negative effects related to changes in practices, including efficiency gains in terms of time, financial, or other resources.

2.2 RESEARCH DESIGN

The research design was carried out with the use of a mixed-methods approach, described below, and draws directly from the analytical framework presented above and derived from Deliverable 1.2 (Rau and Grealis 2017), which provides a conceptual framework for apprehending social practices as recognisable patterns of doings and sayings.

Table 2: Elements studied in relation to changes in social practices

Material arrangements and technologies	Competencies, beliefs and skills	Social norms and representations
Infrastructures, systems, buildings, technologies, things/objects, material arrangements	Knowledge, beliefs, competencies, skills, feelings, emotions	Representations of what ought to be (you do x in y situation); what would merit moral sanctions; standards. Can include, but is not limited to, social expectations.
Habits and routines	**Sociodemographics**	**Changes in energy use**
Regular or irregular organisation of activities related to heating and laundry (and related practices), and how these change over time	Age, gender, household composition, education level, etc.	Reduced indoor temperatures Reduced number of cycles (with larger loads and lower temperatures) Positive and negative rebound effects in relation to practices, including efficiency gains in terms of time, financial and other resources

2.2.1 THE RESEARCH TOOLS, THEIR CONTRIBUTIONS AND LIMITATIONS

All of the research tools designed by work package 3 (WP3), in close collaboration with WP5 and WP4[6], were developed with specific aims, which relate back to the analytical framework and to particular phases in ELL implementation (see D3.6, Online tools and user community for scaling up ENERGISE Living Labs, Laakso et al. 2019). The recruitment phase asked questions for qualifying for ELL implementation, such as size of households and access to heating and laundry systems, while the baseline and exit questionnaires were designed to capture a “before and after” picture of laundry and heating routines. A follow-up questionnaire was also launched three months after the end of the living labs in order to observe the (lack of) persistence of new practices. An emphasis was placed on the deliberation phase, which was designed as a “rupture in routines”, encouraging deep reflexivity around habitual practices. In the format of in-depth interviews for ELL1 and focus group discussions for ELL2, the guide covered many of the elements of practices described in Table 2, with an emphasis on understanding initial configurations of practices, as well as the representation of social norms. Exit interviews and focus group discussions were organised after the end of ELLs in order to understand whether practices have changed and how. The different

[6] These three work-packages refer to the implementation phase of ENERGISE Living Labs and their analysis, involving: designing ENERGISE Living Labs (WP3), ELL implementation (WP4), and comparing energy cultures (WP5).

phases of research are represented in Figure 3 below[7]. Mixed methods were privileged as a way to gain different types of information: for examples, in-depth interviews and focus groups aimed to capture meanings and representations, in more of a discussion format. By conducting interviews at participants' places, additional information could be gleaned in relation to material arrangements and household dynamics, for example. Surveys are useful for gaining a quantitative overview, which can also reveal discrepancies between what people do and what they say they do.

When it came to implementing the various tools in the eight countries, there were some differences in how people completed the forms (including laundry and heating diaries, and weekly surveys). Overall, 306 households filled in the baseline questionnaire, most households actively participated in interviews or focus group discussions, and 259 completed the closing survey. Similar questions were asked in the three surveys and general trends are observed. However, some results are difficult to explain, for instance people declared less skills in some countries, after the challenge. This might be due to a slightly different wording of the questions, or a change in the understanding of the question. Deliberation and exit interviews are not always coherent. For instance, people could state before the challenge that they do various things but the exit interview shows that they were not doing these things as often or intensively as they stated first. All in all, quantitative surveys seem less reliable than interviews when it comes to describing elements of practices and emotions. The exit interviews and focus groups were therefore an important phase towards understanding what households actually did or did not do.

In some cases, discrepancies were observed between stated and measured temperatures. Despite discussions with participants on where to locate thermologgers, these might have been moved over the course of the challenges, closer to a window, for example, thus leading to a different temperature reading than the thermometer. In this report, we describe as much as possible the different data sets used in our analysis.

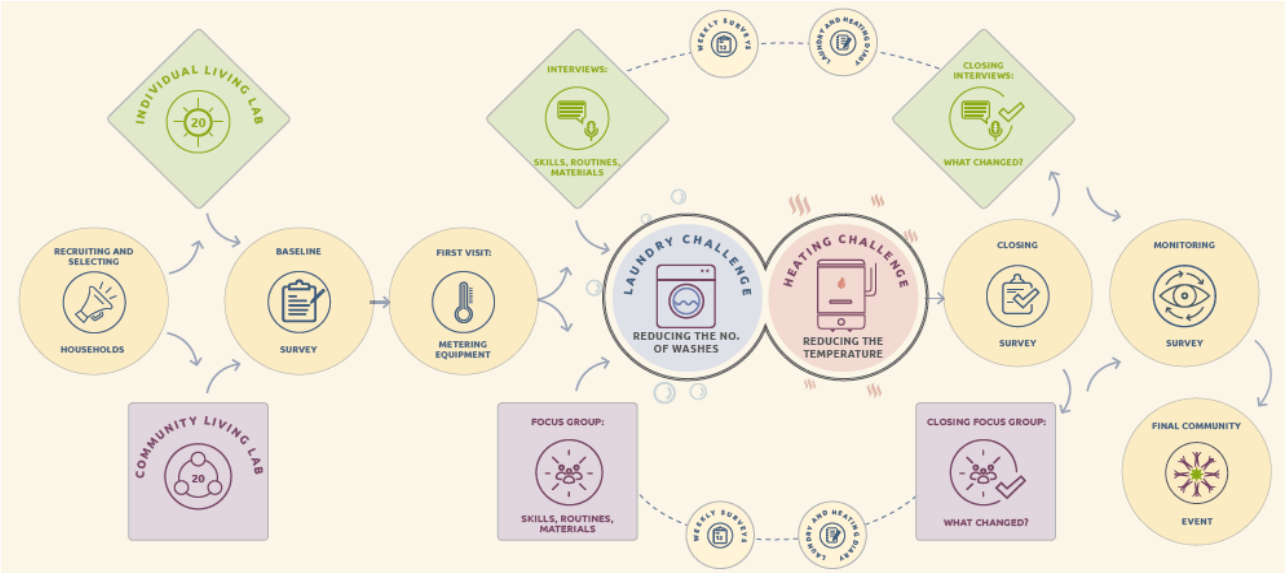


Figure 3: Rollout of ELL1 and ELL2, and research tools

2.2.2 OVERVIEW OF SAMPLING STRATEGY

A purposeful sampling approach (Palinkas et al. 2015; Patton 2002) was deployed to collect rich data that reflects wider trends concerning the two practices under study – but without aiming for representativeness in the statistical sense of the term. This strategy also allowed for a multi-staged

[7] The interview guide and other materials are available online, at http://www.energise-project.eu/livinglab_materials.

approach, which was useful for our recruitment phase. Through ENERGISE, we aimed to involve "hard-to-reach groups", or "households who are lacking the means, tools and/or reasons to save energy and who have not been actively involved in participatory processes such as living labs" (D3.4, footnote 8, p. 14). In order to account for such groups:

- We have used sociodemographic information (education level, employment, etc.) as a proxy for "means, tools".
- We have included a question in the recruitment survey about whether or not households have been involved in energy initiatives in the past, and of what type.
- We also consulted with implementation partners in each country, who have experience on who might be the hard to reach groups.

Based on discussions with partners from WP3 (design of ELLs) and WP4 (implementation of ELLs), we agreed on a selection of questions that are requirements for participating in the ELLs. These included:

- The possibility to change the temperature in homes
- Access to a private laundry machine, in the home or building
- Confirmation that participants would not be moving to another home over the next three months
- Agreement on engaging in a three-month initiative between September and December 2018, including a follow-up point in March 2019.

Note that at the recruitment stage, participants were not aware as to the nature of the initiative (i.e., the heating and laundry challenges, and what they entailed).

2.2.3 METHODS FOR UNCOVERING SOCIAL NORMS

One of the challenges with the ENERGISE project was to uncover social norms in relation to everyday practices, which involve heating homes and doing laundry. Norms around indoor comfort have been constructed over time, as documented in D5.1 (Sahakian and Naef 2019), as have norms around hygiene and cleanliness. Implicit norms are often taken for granted, and can be sensitive points of discussion. In our research design, we identified two normative dimensions of each consumption domain that we wished to address in the interviews and focus groups, at the deliberation phase. For laundry and wash cycles, we wanted to **challenge norms and representations around overly clean clothes**, such as the sparkling white shirts often displayed in advertisements. We also wanted to **challenge assumptions around laundry being a form of time-saving**, as well as reveal the gendered dimension of cleaning. For heating, we wanted to challenge two assumptions: that of **microclimate homogeneity throughout seasons**, or expectations around indoor comfort that involve wearing a t-shirt year-round; as well as the notion of heating as limitless, or the idea that **we heat extensive spaces, rather than heat the people** in those spaces.

While these rather complex notions are not easy to discuss, **in-depth interviews and focus groups** allowed for uncovering some of the representations of social norms before the challenges, as well as how they might have changed as a result of the challenges. In the focus groups and interviews, we turned to **photo-elicitation methods**, from visual sociology. By inserting images into research tools, respondents were invited to react to the images and share their representations and feelings, as addressing a sensitive subject through images and pictures can be more useful than asking a series of questions. This phenomenon is explained by an image's ability to act as a tertiary mediator and to facilitate the verbalisation of an experience. Elicitation interviews have the advantage of connecting core definitions of the self to society, or values, such as culture (Harper 2002). For ENERGISE, we discussed with the consortium members the social norms that we wanted to address in the deliberation phase, we also suggested a series of images. We then submitted these to the consortium, and asked the research teams to either use these sets

or identify images that were more relevant in their national or cultural context. The images were then used in deliberations in both the individual approach (ELL1) and the collective approach (ELL2), with data collected in the feedback forms and interview transcripts.

2.2.4 APPROACH TO THE CODING STRATEGY

In all, deliberation and exit forms of 157 households involved in individual interviews have been coded in NVivo software (N Deliberation=157; N Exit=164); the interview transcripts (N=16) were coded separately. The focus group data (N Deliberation=108; N Exit=102) was also analysed but not coded in NVivo, as they do not provide enough individual details for a comparative analysis with the individual household data. The quantitative data has been treated across the 306 households, as we further detail below. The first readings of data allowed us to formulate a series of hypotheses, which informed our coding strategy. Some of the hypotheses also emerged from the preliminary analysis of select qualitative data discussed at a consortium meeting in Budapest (January 2019), and have been confirmed to a great extent through our analysis of the data:

- The households appreciated setting a goal and being given the tools for managing the challenge, in a limited space and time. This form of experimentation created learning opportunities that led to new routines, towards reduced energy use – as a process.
- A series of elements are significant **deterrents for change**: 1) social expectations (arrival of guests, care for children and elderly); 2) structured routines around heating and laundry before the challenge; 3) material arrangements beyond the control of the household; 4) already low baseline, when it comes to laundry frequency or heating standards.
- A series of elements are significant **enablers for change**: 1) making energy visible; 2) having positive emotions about the challenge and readiness to experiment; 3) acquiring new skills and competencies (both quantitative and qualitative); 4) energy and ecological awareness; and 5) recognising that saving energy can lead to less, not more, housework
- Changes in practices are stabilised through the integration of new materials, skills and meanings. These changes have happened through experiences associated with various feelings and emotions. In speaking about the challenge to others, people seem to reinforce the practice change.
- The type of household (sociodemographic variables, household composition) and the building/system type are, to some extent, explanative variables for observed practices and their transformation.
- Practices are gendered, but variously across countries. We consider that uncovering gender dynamics in practices is not only important for equity purpose but also for looking how a change in a gendered practice reconfigures other (gendered) practices.
- Bodies appear to be important in the challenges taken up by households: the challenges are indeed linked to body representation (clothes) and sensorial experiences (heat, smell).

We have then coded individual (deliberation and exit) interviews to capture the following elements:

- Initial heating and laundry configurations, including material arrangements and social norms
- Reactions to the heating and laundry challenges, including emotions
- Changes in heating and laundry practices, including material arrangements, skills and competencies, representations and social norms.
- Stabilisation of the new practices, including learnings and willingness to continue the same practices
- Observations about gender

In addition to the qualitative findings, we developed a quantitative framework, which includes the following data from surveys:

- Household type: age; couple/single; young children at home (13 years old or under); older children at home (over 13 years old); elderly parents at home; gender; education level; employment status
- Building/system type: number of rooms; type of house; decade of construction; decade of renovation
- Heating system: sources of energy; elements of the system; individual/collective heating system; ability to adjust temperature by individual room and/or for entire home; manage temperature; measured and desirable temperatures, in living-rooms and in bedrooms
- Laundry system: individual/shared; care; temperatures; number of weekly cycles; dryer use; ironing

2.3 COMPARATIVE APPROACH

This section details the approach used towards comparative research that involved a mix of qualitative and quantitative data. Given the sample size of over 300 households, the possibility of doing comparative quantitative work is not problematic. However, a sample size of over 300 across eight countries poses a challenge for qualitative comparative work. Thus, we contribute to the advancement of such approaches by providing an overview of the literature on comparative qualitative methods, and designing research analysis on the basis of this review.

2.3.1 UNDERTAKING A CROSS-NATIONAL COMPARISON

While quantitative data analysis across different countries and larger samples is common, **it is less common to engage with cross-national comparative analysis of qualitative data**. For the ENERGISE project, we therefore engaged in a literature review to uncover best practices in comparative, qualitative- and mixed-methods, in order to inspire research analysis, and to contribute to the literature through our approach.

Bogdan and Biklen (1998) define qualitative data analysis as “working with data, organising it, breaking it into manageable units, searching for patterns, discovering what is important and what is to be learned, and deciding what you will tell others” (p. 145). The selection and coding of data represented a significant challenge in the ENERGISE project, which is based on the treatment of a significant amount of qualitative data captured in 8 different countries in Europe. Indeed, a well-organised and manageable set of qualitative data is of paramount importance to analyse the intra- and cross-national differences and similarities in energy uses among households in these different countries. Furthermore, when researchers apply qualitative methodologies such as focus group discussions and semi-structured interviews, not only the vocal answers of participants and interviewees must be considered, but also other elements like body language, expression of enthusiasm or discomfort, hesitations or strong statements, as well as the settings in which such discussions took place.

Therefore, the empirical design of ENERGISE comparative work called for innovative tools allowing different researchers to capture a substantial amount of qualitative data in a cross-national context, to allow for a comparison that goes beyond national boundaries. To build such a methodological frame, the following questions need to be posed: How to collect data in the context of a cross-national analysis involving 8 countries and researchers with different backgrounds? How to manage issues related to translation and contextualisation? How to capture non-verbal elements, such as body language, emotive expression, or other non-verbal expressions? How to go beyond national analysis, bring data into a comparative framework, and achieve cross-context analysis? Broadly speaking, the main challenge here is to **propose an approach that would allow different researchers, in different cultural and linguistic contexts, to capture primary data and enable other researchers to use primary data in a comprehensive and manageable**

way. The issue of what to transcribe, translate and code needs to be considered, in a context where time, as well as human and financial resources, is limited.

Twenty years ago, Hantrais (1999: 105) suggested that there was no single recipe, or one best way for carrying out cross-national comparisons: "Just as inputs and products of cross-national projects are many and varied, so are the methods." Harkness (1999) concurred with this statement, adding that calibrated methodology for cross-cultural survey research was not yet available. While there seems to be a consensus on the adoption of a common interview template to gather data on similar fields for a cross-national research team (de Verdalle et al. 2012), no one-fits-all method or tool to synthesise primary data is proposed once the empirical work (e.g. interviews or focus discussion) has been conducted. De Verdalle et al. (2012) insist on the importance for the research team to have some time to appropriate this interview template, as well as its operationalisation. For them, like in all social sciences methods, 'bricolage' still prevails, or the construction of a body of work from a diverse range of sources and forms of analysis.

De Verdalle et al. (2012) suggest establishing some compromises between methods guided by the field or by the analytical framework of the research. The first approach implies a thorough description of the national field, where the comparison will take place only at a later stage during the concluding phase. The second approach, in opposition to the first, is based following the analytical framework and the hypothesis in the analysis: "Concretely, it is based on categorisation that does not refer itself to a specific national case" (de Verdalle et al., 2012: 6). In the context of the SI-DRIVE European project on social innovation (2018: 41), the research team highlighted some weaknesses and strengths that such a type of approach implied: "The structure of the mapping questionnaire and the case study template strictly followed the theoretical framework […] This deductive approach forced the partners conducting the survey and the case studies by following the theoretical structure. While this was often remarked as a kind of artificial data classification, not following the inductive or practical perspective of the single initiatives, it helped to maintain comparability by sticking to a common framework."

ENERGISE followed the middle ground approach, in relation to qualitative research. This approach was developed by designing an interview and focus group discussion template[8], based on the conceptual framework and shared by all researchers, and asking researchers to enter information into forms which pre-coded results based on "the elements of practices" (see Table 2), which was informed by the conceptual framework. In addition, more open-ended questions allowed researchers to develop other, more inductive approaches. Space was given for researchers to note emotive-bodily expressions or power dynamics taking place during interviews and focus groups.

A list of the how different research tools and data sources relate to the ELL implementation process is provided in Annex 1, along with a description of how analysis took place leading to key project outputs.

2.3.2 QUALITATIVE DATA: TRANSLATION AND SELECTION

In a cross-national study like ENERGISE, **issues related to translation and selection of qualitative data represent some of the main issues to be considered.** As mentioned by Mangen (1999: 111), languages do not limit themselves to words: "each language is not only a medium for intercourse but a particular style of discourse. Thus, the linguistic dimension interacts with cultural, as well as associated intellectual and professional specificities to form the problematic of comparative analysis." Following this idea, Osborn (2004) insists on the importance of differentiating what she conceptualised as 'conceptual' and 'linguistic' equivalence. The first implies for the researcher to explore whether the concepts under study have any equivalent meaning in the cultures under study. Osborn (2004: 269) highlights the fact that particular terms

[8] For form templates and all other research material, see http://www.energise-project.eu/livinglab_materials.

may not have exact counterparts in all cultures: “A major challenge for comparative research then is to provide conceptual definitions that have equivalent, though not necessarily identical meaning in various cultures.” In a study on primary teachers in France and England, she demonstrates that notions such as ‘teaching style’ or ‘accountability’ were ambiguous or had no equivalent meaning in French. It is therefore of paramount importance to identify such concepts or expressions in order to find ‘conceptual equivalence’ in other languages, or to provide a detailed and comprehensive explanation of their significance. Secondly, difficulties exist in obtaining linguistic equivalence through translation. Indeed, for Jankowitcz (1994, cited in Osborn: 2004), there are key differences between what he calls ‘langue’, language as translated, and ‘parole’, the language as experienced in a given culture.

Equivalence of concepts and language is a central issue in cross-national comparisons and Hantrais (1999) shares Osborn’s view on the fact that **some concepts do not travel well across national boundaries**. While Osborn advocates for a coherent selection of concepts to illuminate ‘constants’ (factors seen as universal) and ‘contexts’ (factors more culturally specific), Hantrais follows scholars who reject any form of analysis that directly compared ‘equivalent’ terms. For her, no comparison is completely neutral: “By the level of generalization chosen, the variables chosen, the method of agreement or difference used, the accent is placed on diversity or unity. The way in which the question is asked implies part of the response” (Hantrais, 1999: 103).

The ENERGISE research team therefore argues, joining Carmel’s (1999) position, for the need to find **a balance between adopting concepts which ‘travel’ and avoiding ‘conceptual straining’** whereby concepts become so general as to be impossible to apply. As Carmel (1999: 144) reminds us: “qualitative research has the potential to explore the varying meanings of concepts in different national contexts as part of its comparison […] to explore the meaning of its (different) components in different locations has theoretical and empirical value in itself.” We therefore suggested that any specific terms or concepts that emerge from qualitative research are not only translated into English, but also contextualised – so as to uncover their meaning in specific contexts. This contextualisation was included directly in the interview summary forms.

2.3.3 CAPTURING CROSS-NATIONAL DATA

Both qualitative and quantitative data was gathered throughout the course of the project, as detailed in **Figure 3** (Rollout of ELL1 and ELL2, and research tools). The quantitative data was captured through an online monitoring platform, both by research teams across the eight participating countries entering data, and the ENERGISE participants directly responding to surveys. While ensuring data protection by design and by default, the platform enabled easy collaboration of all research teams across the eight participating countries. By enabling the administration of the same surveys in all countries at similar times and by collecting all responses in one database, the platform was able to support subsequent cross-country, comparative analysis (WP5). After collecting all the data, it was downloaded and treated by each country, based on guidelines provided by the University of Helsinki[9] and the University of Maastricht; quantitative data was then shared with the University of Helsinki, where it was merged together into one document, for analysis across the 306 participants. This dataset was analysed both by the University of Helsinki, and the University of Geneva – towards comparative analysis of quantitative results. All partners have also analysed their own country data.

Regarding the qualitative data, the main issues are how to collect and manage large volumes of context-specific qualitative data, for comparative and cross-national analysis. If semi-structured or

[9] We gratefully acknowledge the important contribution of Tuija Kajoskoski at the University of Helsinki for the tremendous work that went into cleaning the quantitative data sets from all countries, and combining them into a useable format. A supplementary report explaining how the quantitative data was calculated will be made available on the ENERGISE website.

free-format interview schedules are a common media employed in cross-national survey research, they remain high-risk ventures that require detailed planning (Mangen 1999). One approach is to address the issue of data which does not 'travel well' across languages and contexts. As Quilgars et al. (2009: 26) state in the context of cross-national qualitative projects undertaken by multilingual teams: "Researchers are left only with options to make the analysis process as structured and transparent as possible to ensure that the purity of the data is preserved to the greatest extent possible." The production of a shared repertoire of concepts and problematic terms could help uniformising the definitions of these "notions that do not travel well". 'Context' and 'constant' concepts could be divided, and contextual elements could also be presented through a 'vignette': a short summary of a practice specific to a national context. Another approach is to design research analysis that addresses the challenge of large volumes of qualitative data, and overcomes the need to translate and transcribe all interviews, for example. Researchers have suggested that some 'data reduction' can be planned for, which implies 'keeping the project manageable by limiting the amount of data, field notes and interview transcripts collected, to avoid being overwhelmed through making sampling decisions at the data collection stage (Troman and Jeffrey, 2007: 512).

For ENERGISE, we aimed for data reduction, inspired by the tools and strategies suggested above. We developed a template for the ELL1 interviews and ELL2 focus groups[10], designed to capture summaries of discussions, and select direct citations. Each question of the interview template refers to a practice element (see Table 2), and was associated with two to three sentence responses, summarised by the interviewers. All the data were translated into English and limited to a certain number of words to enable 'data reduction'. The research teams were thus responsible for selecting what they would include in the feedback forms, given the space limit, which means that there was a pre-selection process for which data would be made available for analysis. Additional space was provided to collect data related to non-verbal communication as well as direct citations of the interviewee when appropriate. All the data captured through the online template was then coded and categorised, using NVivo qualitative analysis software.

To face some of the translation issues mentioned above, we suggest documenting as much as possible the challenges with data collection, such as biases, flaws, contextual aspects, etc. Data related to 'not traveling concepts' captured during the interviews and focus group discussion should be directly put into perspective with information collected from content analysis, through an iterative process between focus groups, interviews and content analysis. 'Context' and 'constant' concepts should be made explicit in how the data is analysed, which we will now turn to. We also required the sharing of completed forms with the WP5 team for feedback, which was provided to all teams and was a crucial step in data reduction and coherence between countries in terms of process.

In practice, the forms were relatively easy to complete – although time intensive – and allowed the teams to engage in pre-coding, which facilitated analysis. The more open-ended questions and space left for emotive expressions were seldom used, however, pointing to the time intensity of using such forms. There were differences in how the different teams used the forms, though; some were rather minimalist with their direct citations, for example, while others were more generous in providing longer supportive quotes. To reduce costs (in terms of time for treating data and, in most cases, for translation into English), forms provided summary responses only; for the exit interviews, summary responses were accompanied by select direct citations. Finally, two interviews per country were fully transcribed and provided in English: these transcripts were sampled in that the households exemplified sufficiency, as defined earlier in this report. The transcripts provided an opportunity for thick narratives, which provided a richer data set to draw from. The forms and transcripts were shared among the research team and discussed at a

[10] For form templates and all other research materials, see http://www.energise-project.eu/livinglab_materials.

consortium meeting in Budapest (February 2019), with an emphasis on highlighting similarities and differences between countries.

2.3.4 ANALYSING CROSS-NATIONAL DATA

While the comparison of quantitative methods is more established in research and practice, studies based on comparative qualitative methods tend to propose different approaches to the analysis of data, within and between countries. Country reports produced by each partner represent an effective means for the rapid generation of comparable data (Millar 1990, cited in Mangen 1999), yet data also needs to be analysed cross-nationally. As highlighted by Chamberlayne and King (1996, cited in Carmel: 1999): “access to a combination of insider and outsider understandings of the subject and countries may produce the most useful insights into data.” As a reflection of this approach, a project, which compared qualitative interview data (n=135) across four European countries, included a ‘system of exchange and reciprocity’ (Van de Velde 2008: 229-230), whereby research teams exchanged transcribed interviews between countries and analysed each other’s data. This led to the creation of ideal-types, which went beyond national representations, and were then subjected to statistical analysis based on the results of a longitudinal study.

For ENERGISE, **we put forward the following strategy for qualitative data analysis**: **analysis within countries, analysis across countries, and allowance for ‘insider outsider’ perspectives.** This was carried out in the following way: 1) a template was designed for input by all consortium members, then provided as a guide for the analysis of quantitative and qualitative data per country; 2) a workshop was hosted in Budapest (February 2019), where team members were asked to read and discuss each other’s forms and transcripts; finally, 3) the WP5 research team was responsible for analysing data from the forms and transcripts, across research sites and within countries, using NVivo software. In addition, the University of Helsinki contributed cleaned quantitative data as well as data analysis, with further data analysis also conducted by the WP5 team.

Each partner team provided a synthesis of their results, based on a common framework. The **country report template** was discussed and agreed-upon among consortium members, and an exercise in qualitative data analysis was conducted among key members in Budapest (January 2019) to pre-empt the analysis that would be required for the completion of the country reports. All of the **country reports are available** at http://energise-project.eu/livinglab_country_reports, as part of our open data strategy. Each country report provides a greater level of detail than what has been included in this deliverable, and can be consulted in open access.

PART 3: ANALYSIS OF RESULTS

This part of the report presents the results of ELL data analysis, starting with a short overview of the household sociodemographics and building types, in which the Living Labs took place. We then follow with a brief discussion around how and in what way laundry differed from heating, as a consumption domain. In relation to the analysis, we summarise our main findings by uncovering the main deterrents and enablers for change in relation to the laundry and heating targets. This is followed by a discussion around comparative results between countries, within countries, and across households in all eight countries.

3.1 SUMMARY OF SOCIODEMOGRAPHICS AND BUILDING TYPES

Samples in each country were built to reflect the diversity of households in participating countries, based on the following sociodemographical criteria: age, gender, family composition, work, education, and to include "hard-to-reach" groups as defined earlier (see section 2.2.2). However, the recruitment process yielded to an over-representation of respondents with a higher education degree and, to a lesser extent, an over-representation of households with two or more people (see Annex 2). ELL 2 households were recruited in various ways: some were already existing communities (i.e. people knowing each other); others were people living in the same neighbourhood or the same town. Participants were recruited through a wide range of strategies (e.g. partnership with local associations and organisations, local paper articles, street recruitment drives, word of mouth, events, etc.), and most of them (around 90%) had no prior experience of energy initiatives.

Since ELL participants were contacted to take part in an "energy initiative", most of them expected that researchers would explain to them how to use energy efficiently, how to improve insulation, to understand washing programmes, among other actions. It seems that national research teams have reacted differently to this demand, some providing more information than others. However, once informed of the objectives of the living lab, the vast majority of participants proved keen to tackle the challenges.

In ANNEX 2, we provide a table with selected cross-sectional data for all ELL participants including: 1) an overview of sociodemographics, and 2) building types (age of building, and tenant/owner).

In ANNEX 3, we provide a visual overview of the different building types in each country, so as to contextualise the settings in which the ELLs took place. The specific settings in which the ELLs take place were people's homes, yet how these buildings look like vary greatly between the households and across the eight countries. Annex 3 is intended as a way for readers of this report to get a feeling for the very different contexts in which the ELLs took place, or a visual aid to illustrate the diversity of housing across the sample.

3.2 COMPARING CONSUMPTION DOMAINS

The selection of the consumption domains – laundry and heating – is based on the ENERGISE Living Lab design (see Laakso et al. 2018). At a consortium meeting (Helsinki, November 2017), all partners and members of the steering committee engaged in a discussion about criteria for selecting what consumption domains would be studied as part of ENERGISE Living Labs. While heating homes was seen as the most significant domain in terms of energy use, there was agreement on selecting domains that would represent different types of challenges. Laundry was selected because it tends to be a 'sticky' practice, in that it may be harder to change – tied up, as it often is, with routinized household activities, as well as shared meanings and collective conventions around cleanliness and hygiene. Heating and laundry were thus chosen as the two

consumption domains because they are relevant in terms of energy and resource uses, but also because they appear to vary in their degree of malleability from a practice perspective. This suggests that the choice of consumption domain matters greatly in relation to efforts to promote more sustainable forms of energy use: a mobility challenge, for example, would have required a very different way of engaging with changes in everyday practices.

Reducing wash cycles and temperature settings turned out to be true 'challenges' for people, but in different ways – as expected in our selection of these consumption domains. The ways in which the challenges were appropriated[11] and made their own, by households, varied by consumption domain. Based on our analysis, we summarise here some impressions as to why this might be the case. During the laundry challenge, most participants were very proactive in sequential actions, such as wearing clothes more often, airing them, removing stains, reducing the number of appliances they use, etc. They would test different settings on the washing machine and compare their energy consumption, try out the tools provided in the challenge kit, turn to tricks they might have picked up in the media, such as putting jeans and ties in the freezer, or turn to better known techniques such as airing out clothes, removing stains or brushing them. By doing so, they consciously and voluntarily developed new habits without being constrained by anything other than the desire to complete the challenge.

Things were quite different for the heating challenge, as it did not involve changing a specific routine as much as adapting to a new indoor microclimate. All households had to actively keep the temperatures lower than during the baseline period, which was problematic in Switzerland, Finland, Germany, and Denmark due to warm weather or the lack of control on heating systems. Once the action to reduce heat was taken (either by not turning on heaters, or switching down heaters), they found themselves in a reactionary position, in relation to adapting to a new microclimate (rather than adopting a new laundry routine that involves a series of sequential actions). They sought to protect themselves against adverse sensations and reacted to a new microclimate once it was established. In other words, while people demonstrated more agency in relation to changing laundry practices, it was the new microclimate in their home that was dominant in the establishment of new heating practices. The fireplace, available only in some homes, became the main way people used to engage in more active management of their heat.

3.3 SUMMARY OF DETERRENTS AND ENABLERS FOR CHANGE

The ENERGISE Living Labs have been analysed according to stages, as illustrated in Figure 1 (p9, repeated below):

1. **Initial configuration:** existing habits and routines, and satisfaction with the current system of practices.
2. **Challenge:** what is the chosen challenge (common or individual), emotions, discussions with others about the challenge, reactions to the challenge.
3. **Appropriation of the challenge:** including appreciation or irritation with the challenge. Here, we analyse which elements of practices changed, and what practice configurations changed in relation to:
    - **Deterrents and enablers for change:** note that deterrents and enablers are elements of practices and should not been considered as external "barriers and levers"; deterrents and enablers are always complex, inter-related and specific to certain settings.

[11] We are referring here to a broad definition of consumption proposed by Alan Warde (2005) 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" (p. 137).

4. **New configuration:** continuing practices, the potential reconfiguration of practices, satisfaction from participating in the challenges, learnings from the challenges, sufficiency measures and spillover/rebound effects.

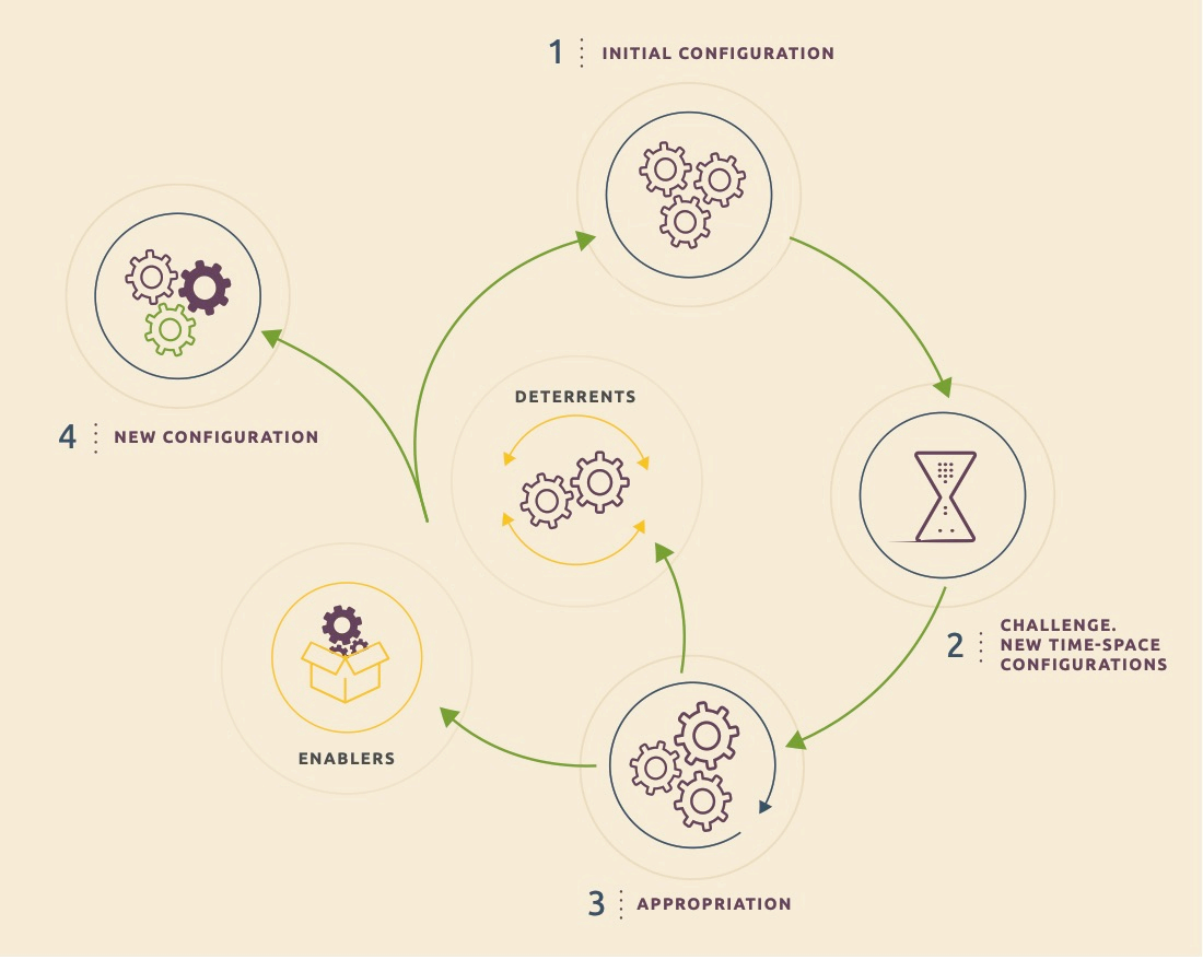


Figure 1: Stages of Living Lab appropriation by households

In broad terms, there seems to be a **general satisfaction** among all households who participated in the ELL challenges. Some households found the Living Lab experiences quite challenging while for others, changing their practices was relatively easy. Giving people permission to go outside of their comfort zones through these forms of experimentation created opportunities for people to try out new approaches to everyday life, in a set space and limited time period, towards a goal. The approach we took is a part of the success factor: we presented the challenges as a **social learning process, and not a competition**. The objective was to learn together, with an explicit focus away from 'energy saving' as the sole aim, through a deliberative and reflexive process. In relation to laundry and heating, we have compiled a summary of the different **deterrents and enablers for each.** In some households the ability to regulate indoor temperature (and to complete the challenge or achieve a lower temperature target) was conditioned by the type of heating system, thus giving people less ability to engage in energy reductions in relation to heating. This was a significant deterrent. Conflicts and tensions between family members are also deterrents towards engaging in both challenges. Thus, social relations and everyday interactions are an important element to account for, as they determine the standards and expectations people will strive to meet, as well as the social dynamics they negotiate in and beyond the home – with family members, guests, and peer groups, for example.

The role of different devices for **measuring temperatures or the energy use of laundry equipment** was found to be an important enabler, along with the completion of weekly survey and

diaries, but we bring an important nuance to the notion that these devices are enablers in and of themselves. People found them useful in so far as they were meaningful to a goal they had set themselves, i.e. the ELL challenges, and as a way to reflect on their own routines. In addition, and maybe more importantly, people did not solely learn at the interface of these measuring devices, they also learned from their experiences, or what we call 'sensory feelings' in spaces. People could read temperature settings, but also experience them, with bodies adapting to the change. As expected, people came to recognise that there is not one standard temperature that is valid for all people, in all spaces. In relation to laundry, some people generally took on a more sensorial approach to smells and stains, and developed a new relationship to feelings of cleanliness. We thus argue that people's senses were fully engaged in learning how to reduce energy use. In Sahakian et al. (2019b, submitted), we discuss the importance of bodies in relation to spaces and activities in the home and beyond, and how challenges towards sufficiency help people to develop capacities at the body level, such as sensorial experiences (towards heat and smell, for example).

To complete both challenges, ELL participants had to expend effort and make important sacrifices, while realising that over time, it is possible to change practices and reduce consumption without giving up too much of a sense of overall wellbeing. For this reason, some of them reacted quite strongly when others rejected straight away the possibility of engaging in a similar process because it would be too hard. This seems to demonstrate the value of learning by doing, as a Danish man (DK245) says:

> *M: I think it's been a little like…when I told others that we were doing this, people's reaction has been 'no way, I could never do that' and that's where I'm thinking: 'Can't or won't?' Of course, you can.*
> *Interviewer: Yes, of course you can – it's a question of will.*
> *M: Yes, and it makes me feel bloody provoked, because we all know we've got to think more about what we're doing.*

Analysing how new practices took hold across the countries, we noticed that there was also an evolution in the emotions: feelings of being 'more or less fine' and 'relaxed' tended to increase as the weeks went by, perhaps indicating that people were adapting to change. We found that generally, there was a period of anxiety for some people at the start of the challenge, which was then diffused, suggesting perhaps that people had to come to terms with a period of uncertainty and social change. More generally, we found that it is possible to design and implement initiatives aimed at reducing household energy usage by changing practices, rather than people. The ELLs placed an explicit focus on elements of practices, including material arrangements, people's skills and competencies, as well as meanings or representations of social norms. We now provide an overview of the two challenges, in relation to a summary of deterrents and enablers for change, accounting for these 'elements of practices'. This is detailed in much more length in section 3.4.

3.3.1 HEATING CHALLENGE

Initial configuration: we observed that certain households already engaged in a number of actions in the home towards reduced indoor temperatures, such as turning down the thermostat, airing out rooms, adjusting the heating settings separately in each room, and heating bodies rather than spaces. However, achieving the target (18°C in most cases) meant that people also needed to learn or appropriate new ways of keeping warm (note that there were around 5% of households already at 18°C or lower in their living rooms).

During the challenge:

- **Deterrents for change in relation to heating:** the following elements are very much inter-related.

Material arrangements and technologies	Competencies, beliefs and skills & Routines and habits	Social norms and representations
The heating system; whether people have a handle or not on their heating system and an ability to reduce temperatures **conveniently and effectively** (through complex hydraulic floor heating systems, for example, or through radiator dials and thermostats). The lack of availability of **other heating sources**, such as a fireplace or stove. Being in an apartment where your unit is **heated by others** (i.e. heat transfer between adjacent apartments). Starting from a **low baseline**.	**Health issues** constraining everyday life, such as arthritis, often in relation to **elderly people**. Being engaged in activities that render people **relatively immobile** in homes. **Resistance towards layers**, such as blankets, socks, and other ways of keeping bodies warm; preference for dressing down, when at home. Difficulties experienced when **negotiating indoor temperatures with other people**, when in the home. Difficulties in **controlling drafts and humidity levels**.	A social consideration for **guests and young children**, as well as (to a lesser extent) a consideration for the wellbeing of pets. Not wanting others to be uncomfortable. Caring for more vulnerable people/beings. **Social representation around being dressed down at home** and thus being more undressed than outdoors (enjoying the feeling of walking barefoot or sleeping in the nude, for example). General sense that **18**°C **is too low as a target** (shared by many households). **The "right to have a warm home",** or beliefs around entitlement

- **Enablers for change in relation to heating:** the following elements are very much inter-related.

Material arrangements and technologies	Competencies, beliefs and skills & Routines and habits	Social norms and representations
A **controlable heating system** (with thermostats and/or radiator valves that people can manouevre). **Thermometers,** so long as they are tied to a goal which is meaningful to people (such as the 18°C target). Starting from a **high baseline.** **Having a fireplace** or other source of heat in the home, which people can actively control. **Use of layers, for people or homes:** clothing or blankets to heat people; use of draft excluders, blinds, curtains and doors to create warmer, bounded spaces.	Being able to **monitor and regulate indoor temperatures** towards a set goal (thermometer and diary usage). Feelings of being **part of a common challenge**, shared by numerous households. Excitement towards experimentation. **Ability and desire to do things differently**, such as add more layers (clothing or blankets), do physical exercises in the home, drink hot beverages, take warm showers/baths, play games. **Ability to negotiate/compromise** with other family members. **Understanding** how heating system and its compotents work (boiler, radiators).	Associating lower temperatures with **sleeping better at night**; better and healthier sleep. Recognising that people **experience indoor comfort very differently**, and accepting this variability. Engaging in **discussion and deliberation** with research team member(s), and these deliberations continuing with others (friends and family).

Stabilisation: most households reported that they were able to **reduce indoor temperatures by at least 1°C**, with many households stating that this is possible without feeling un-comfortable at the lower temperature (and some reduced even more). While there were significant variations in the amount of changes experienced in relation to indoor temperature settings, a reduction of 1°C appears to be a reasonable goal for all – based on average temperatures recorded prior to the challenges. Most participants were also comfortable with lower temperatures in bedrooms, as compared to living areas.

Table 3: Average changes in reported temperatures, from start to end of challenges
(Data source: baseline and weekly surveys). *Note: Temperatures have been averaged, on one hand, for the 7 weeks before the challenge and, on the other hand, for the 4 weeks of the challenge.*

Change in reported temperatures	
Living room	**Bedroom**
From 21.12°C to 20.16°C	From 19.97°C to 18.58°C
1 degree (0.96°C)	1 and a half degrees (1.39°C less)

3.3.2 LAUNDRY CHALLENGE

Initial configuration: the initial configuration represents the average number of wash cycles recorded by a household and average temperature settings, and associated sorting, drying (hanging or by machine), and folding, ironing, as relevant. Thus, laundry represents a series of actions that people engage in, which are sequential and represent a certain rhythm in daily lives, either routinised or not. These actions had to change towards *reduced laundry cycles* (most of the time, by half) in relation to the challenge.

During challenge:

- **Deterrents for change in relation to laundry:** the following elements are very much inter-related.

Material arrangements and technologies	Competencies, beliefs and skills & Routines and habits	Social norms and representations
Limited space for drying laundry or storing slightly-worn clothing. Households with **young children** tended to have more wash cycles, generally. **Small-format washing machines,** which can lead to doing more laudry cycles. **Starting from a low baseline**, in terms of few laundry cycles per week. In single-person households,	**Caring for pets, children, elderly,** or people with allergies or sickness. Not wanting dirty clothes to pile up around the house, which leads to **feelings of being un-tidy or having a messy home.** **Practicing half-loads** **Not feeling like it matters if you reduce laundry**, as the energy consumption is insignificant compared to global problems. **Mis-use of laundry programmes** or mis-understanding of eco-efficiency	Belief around hygiene and a need to have freshly washed/clean **clothes that are in close contact with the body** (underwear, socks). Concern over social norms (e.g. at work) against **wearing the same clothes for two days in a row**. Not wanting to smell, or to **appear un-clean or smelly to others.** Expectation around washing **newly purchased clothes.**

not having sufficient underwear and other clothes to last two weeks, for example.	functions.	

- **Enablers for change in relation to laundry:** the following elements are very much inter-related.

Material arrangements and technologies	Competencies, beliefs and skills & Routines and habits	Social norms and representations
Monitoring the energy use of washing machines, so long as this relates to a given goal (reduced laundry cycles and associated energy use). Having **fewer household members** (except in single-person households). Having higher preferences for initial temperature settings; higher wash cycles per household members **(starting from a high baseline).**	Being able to **monitor laundry frequency and energy use** towards a set goal (energy meter, in some instances, and diary usage). Ability to have **fuller loads**, and ability to mix different clothing colours and types together. Ability (and space) for **airing out clothes at home.** Distinguishing **home clothes from out of home clothes; circulating worn/used clothes.** **Letting go of control:** letting dirty clothes pile up, or finding ways to keep them out of view (additional laundry baskets). Ability and willingness to **try other ways of keeping clothes clean** (e.g. brushing, stain washing). **Experimenting** with temperature régimes and cycles. Engaging in **new criteria for buying clothes** (in that they would be low maintenance for washing)	Coming to terms with **washing less and not feeling un-clean;** particularly in relation to bedding. Sense of **freeing up time** for other things (in some cases), or **freeing up the mental load** (feelings of what chores need or ought to be done, generally gendered as feminine chores), Engaging in **discussion and deliberation** with research team member(s), and these deliberations continuing with others (friends and family).

What we found across countries in relation to laundry was the ability for people to overcome emotions of anxiety and find ways to get used to living with unwashed laundry over longer periods of time, as demonstrated in this quote from Finland (FI25):

> *Personally, I had an emotional reaction and I had to go through, but these days I understand that I had to get through it and I understood that I have a phobia of dirty laundry, it was hard for me to deal with unwashed laundry, I mean the piles of it. What I did here was that I got more hampers, to collect the dirty laundry for different loads, so that at least they wouldn't be in piles, which I had the biggest problem with. It was little less stressful when they were in different places and through that, I didn't do as much laundry because I waited for them to fill up and I didn't wash half-empty loads trying to find other laundry to fill it up with.*

Stabilisation: almost all households were able to reduce by one laundry cycle per week, without feeling un-clean or experiencing in-convenience. While there were significant variations in the degree of changes experienced in relation to wash cycles, this one cycle change is a reasonable goal – assuming a mean household size and an average number of wash cycles to begin with.

A key finding across the households was that the four-week period was sufficient for stabilising a change in routines, at least in the short term (as documented in the monitoring survey results, captured 3 to 4 months after the challenge). By the end of the laundry challenge, many people expressed the sentiment that they continued to do things differently (as compared to the start of the challenge), and that they may have become normalised. This is nicely expressed in this UK example:

> *Because I think D. and I both did it and I don't think we really thought of it as a challenge anymore; I think it's just if we've just done it and then it's like I don't really think about it now. I think because all 3 of us, we've all been doing it, it means it's just like, like just doing it is part, not thinking of it as a challenge or something that will finish; it's just kind of I don't really think about it now (UK02).*

Table 4: Average changes in wash cycles, from start to end of challenges
(Data source: baseline and weekly surveys) *Note: Averages taken before challenges, and during challenges.*

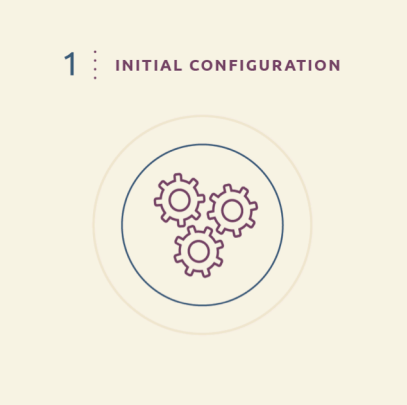
Change in weekly wash cycles		
Family of 2	**Family of 4**	**All**
From 4.3 to 3.2	From 4.1 to 3.0	From 4.2 to 3.1
1 cycle less (1.1, or 26% reduction)	1 cycle less (1.1, or 26% reduction)	1 cycle less (1.1 or 26% reduction)

3.4 COMPARATIVE RESULTS BETWEEN COUNTRIES

A template was designed to collect similar data analysis across the eight countries, with some differences – as expected – in how the the country reports were used, with some privileging more "thick descriptions" in a qualitative data analysis tradition, while other countries favouring more quantitative approaches. As a complement to country report analysis, WP5 also homogeneously coded and analysed both qualitative and quantitative data. An analysis of coded data and country reports is included in this section.

In order to analyse the country reports, all of the key evaluation points were synthesised in a Country Report master table. We were able to identify common denominators between countries and more general themes, as well as key differences or outliers when possible and relevant. In our analysis, we refer to country names to avoid any assumption over a type of national culture, as we see culture as varying across regions and settings of consumption. ELLs have taken place in specific settings in each country, and these settings cannot be assumed to be 'representative' of the countries.

3.4.1 HEATING PRACTICES



Initial configuration of heating, in relation to the different elements of practices and how they inter-relate, involves **existing** material arrangements, skills and competencies, and representations of social norms – prior to the start of the challenge.

In terms of material arrangements, **the heating systems and building types were important elements** in understanding initial configurations**.** Heating systems vary greatly across the eight European countries involved in Living Lab rollout. Building types that are highly energy efficient, even with windows facing the north, are relatively warm (for example, Denmark, Finland, Switzerland and Germany). In contrast, some buildings were older and less energy efficient (for example, the United Kingdom and Hungary). Although households were recruited based on their ability to turn down the heat, in order to qualify for the challenges, the **possibility of regulating indoor temperatures** varies greatly between countries (see fig. 4): in some cases, radiators are available in different rooms; in more energy efficient buildings, floor heating systems required adapting temperatures through the adjustment of hydraulic valves. Because some of the households participating in the ELLs were in small towns, rural areas, or stand-alone homes, the alternative sources of heating – such as fireplaces – also varied greatly between countries, and between households. As reported in D5.1, **energy systems** for heating vary by country, with district heating more common in Finland and Denmark, and mainly individual gas boilers in the Netherlands, the United Kingdom and Hungary. In our sample, there were a relatively large number of heat pumps as primary source for Switzerland (38%) and Ireland (17%).

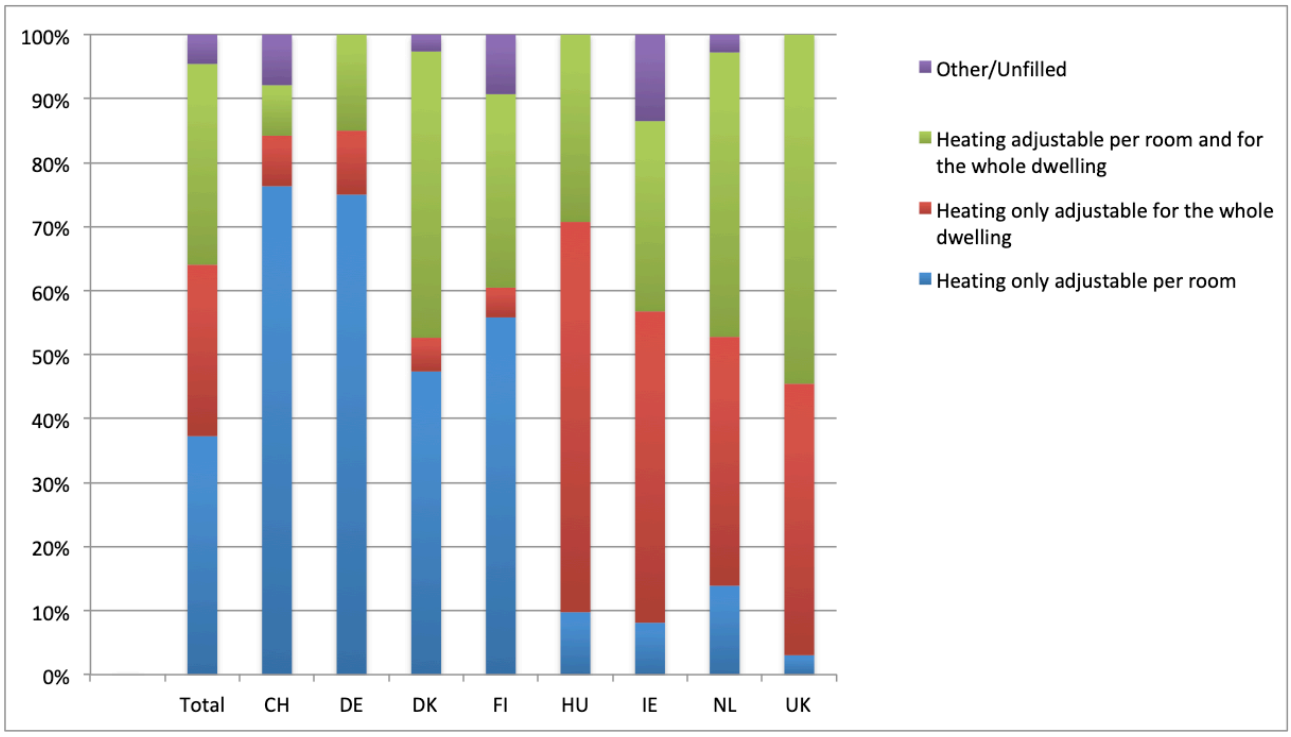


Figure 4: Heating regulation according to countries

Data source: baseline survey (N=306)

The initial skills and competencies of household members also varied greatly by country. In terms of **regulating indoor temperatures for different occasions** – at night, or when away – there are

significant differences by country. For giving the extreme examples, in Finland, the households hardly regulated temperatures (less than 10% did so); while in the Netherlands it was more common to adjust temperatures (80% did so). In certain countries, programming thermostats were used more regularly (for example, in Germany). **Gender dynamics were also found to be at play** (Figure 5). For example, in families where there are two adults of different gender, the heating was slightly more regulated by men in Germany, Finland and Denmark, whilst in the Netherlands and the United Kingdom it was women who regulated heating more.

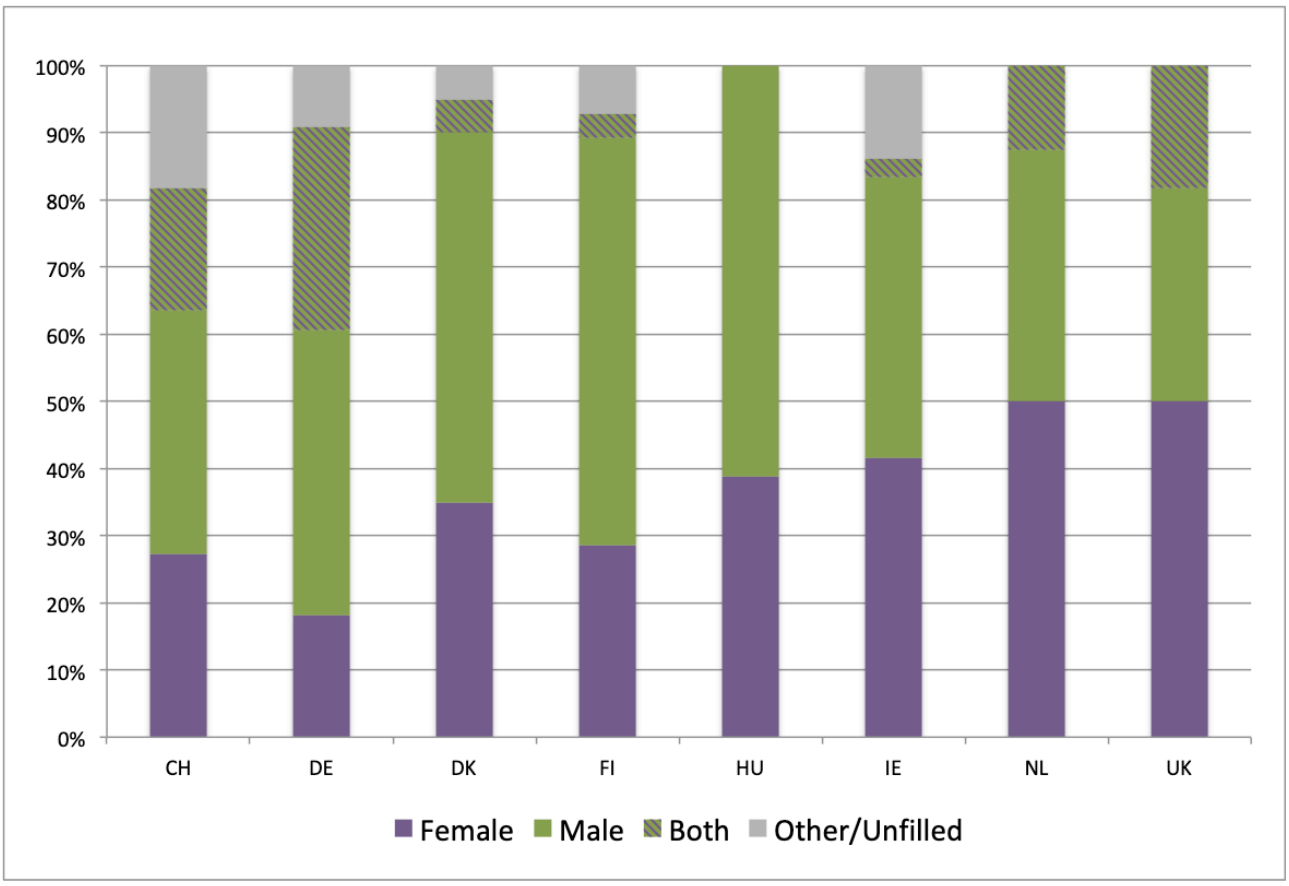


Figure 5: Heating regulation responsibility according to the gender in families with two adults of different gender

Data source: recruitment and baseline survey (All households, N=221)

In almost all countries, participants state that they were already wearing additional clothes for staying warm, except in the Irish case (only 26% of participants) and to a lesser extent Hungary (only 59% of participants). Socks and slippers were used in the same way by most households, except for Switzerland where only half of the participants stated that they wear socks and slippers (high levels of floor heating may be one explanation). Blankets were less used than socks and slippers for Finland and Switzerland. People cook dishes more frequently in the winter, but this does not seem to be seen explicitly as a means for keeping warm. In terms of **social representations of comfort**, in households where there are two adults, some couples have similar views on what is a comfortable indoor temperature (Finland, Hungary, for example), but in most cases these views differ.

Quantitative representation of initial reported temperatures

As demonstrated in Figure 6, the average reported temperatures of living rooms across the eight countries varied greatly, from 19.7°C in Ireland to 22.3°C in Switzerland. And reported temperatures in bedrooms varied from 17.5°C in Ireland to 21.7°C in Switzerland (Figure 7). In children's bedrooms, the range was from 16.7 °C in the Netherlands to 21.4 °C in Hungary. The

higher temperatures in some countries, such as Switzerland, can also be explained by the mild weather conditions at the start of the challenges, as well as the energy efficiency of building envelopes in retaining heat. For example in October, Switzerland experiences a high of 25°C, and in November, a high of 16°C.

Before the challenge, most of participants stated that they were satisfied with their current indoor temperatures. However, the deliberation interviews and focus groups revealed in many cases that participants had various complaints and problems with their heating and the temperatures in their homes (often due to window position, insulation or collective heating). This was often made clear after interviewers toured their homes.

Introducing the challenge: in all countries, except for Hungary[12], a vast majority of households took the common challenges: a target of 18 °C for indoor heating, and reducing by half the number of wash cycles per week. When people set different targets, these were usually intended as smaller reductions, or allowing for some leniency in terms of what rooms would have the lower temperature. In other examples and in some countries, people used fireplaces rather than central heating, which they used as complementary heating. If and how fireplaces were to be included in the challenge was not explicitly debated (Ireland, Denmark, United Kingdom and Hungary).

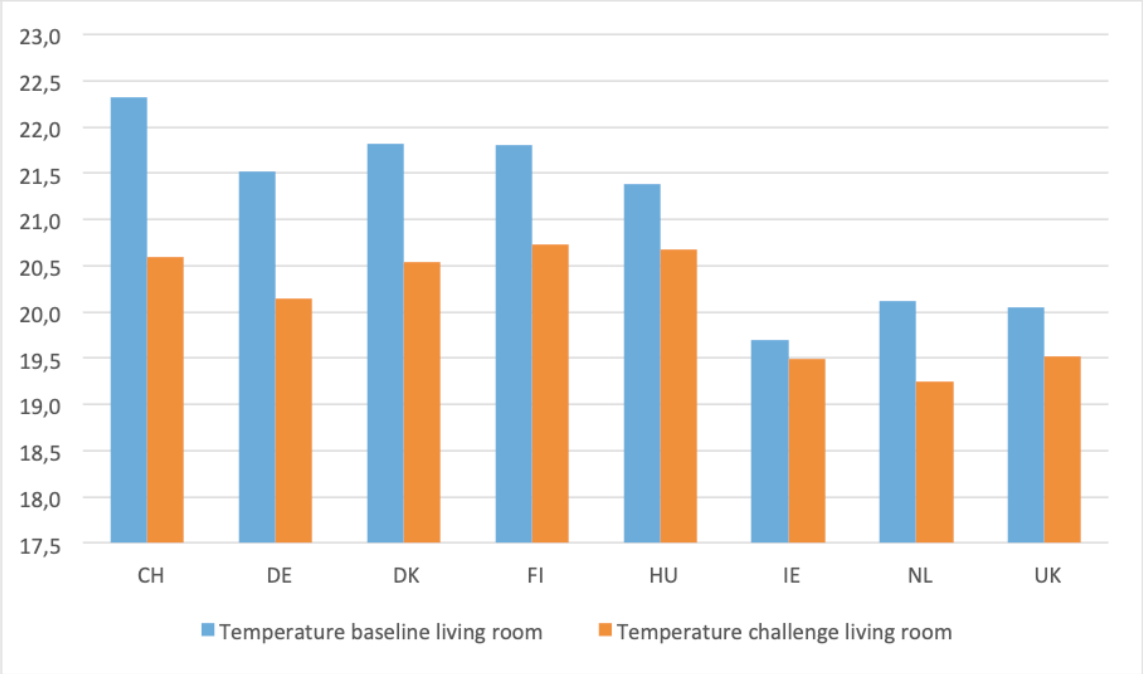


Figure 6: Reported living room temperature baseline and average values during challenge
Data source: Baseline and weekly surveys (N= 284 & 266; data analysis by T. Kajoskoski)

[12] To learn why, please refer to the country report for Hungary available at http://energise-project.eu/livinglab_country_reports

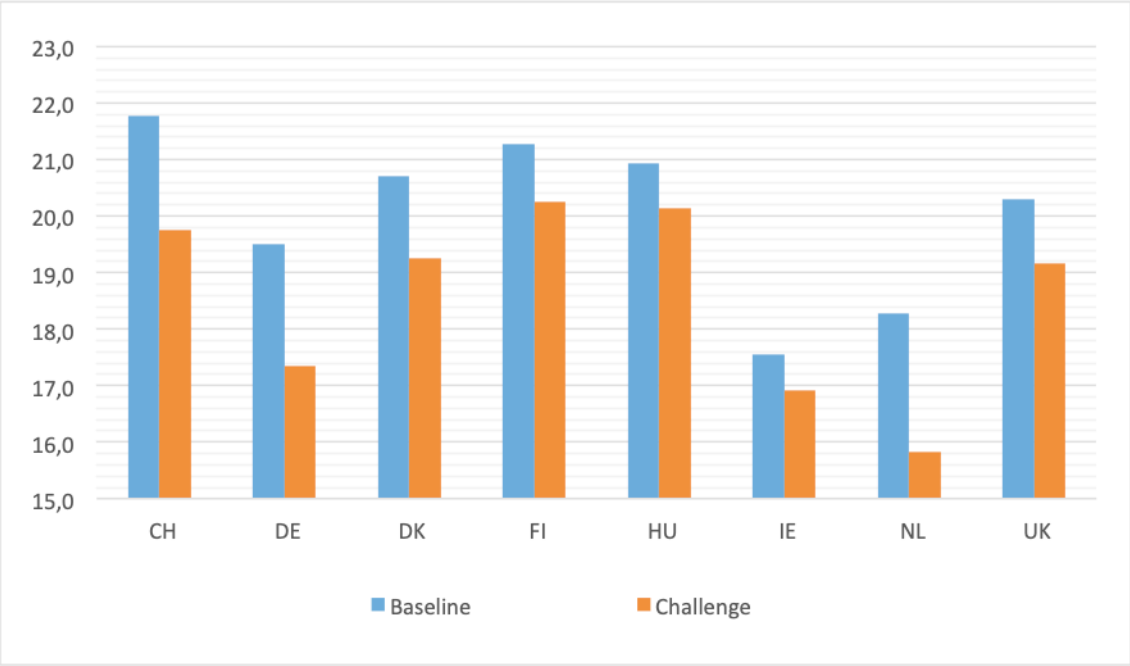


Figure 7: Reported bedroom temperatures baseline and average values during challenge
Data source: Baseline and weekly surveys (N=283 & 265; data analysis by T. Kajoskoski)

Appropriation: deterrents and enablers

Following the start of the heating challenge, various forms of appropriation were observed in similar ways in all countries. The most common strategy was to wear more and warmer layers: extra clothes (jumpers, sweaters, thermal underwear); (wool) socks (instead of going barefoot at home); blankets; pyjamas; thicker bed linens, etc. However, these tactics were not new for many households, as mentioned above. Some participants consumed more hot drinks or used hot water bottles. Items from the challenge kit, such as the tea and the 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.

Several participants reported having become more knowledgeable about their own heating system and how to regulate it, as a direct result of the challenges. Yet others became more frustrated as they experienced that they had difficulties managing their heating systems. Wherever available, the wood stove or the fireplace was often used as a way to access heat quickly. Several participants spoke about how they began to put smaller amounts of fuel at more frequent intervals to reduce fluctuations in temperature. A few participants explained how they practice physical exercise or move around more when they got cold. Taking a hot shower (or sauna in Finland) was rare to keep warm. Even in Finland, where the sauna is part of the culture and a common fixture in certain buildings and neighbourhoods, very few participants declared going more regularly to the sauna.

In terms of enablers, some participants bought new material elements for keeping warm, such as warmer pyjamas, rugs for the bathroom, or woollen socks. Also, some pets got extra help for keeping warm: a pet gecko got a heating mat and a dog received a woollen shirt. The use of different rooms slightly changed in a minority of families. People living in large houses started to turn off heating in rooms that were not being used. A few participants mentioned that they changed the activities they do in different rooms, so they could stay in the warmer ones. The challenge

prompted some participants to review their material heating arrangements: moving the thermostat in the living room, installing draught excluders or loft insulation. But these adaptations were rather rare and seemed to have been envisaged before the challenge.

A series of deterrents to practice change have been observed in all countries. One main deterrent to achieve the challenge is if people started from a low baseline to begin with, or were already at 18°C. Another important deterrent arises when different representations and criteria of thermal comfort happen between couples, or between parents and children. Participants with families were sometimes particularly protective of having higher temperatures in the evenings, when warmth was represented as an essential ingredient for sociability and cosiness. Generally, parents are more careful when it comes to children, preferring warmer temperatures in their bedrooms than in the adult rooms. Also, the presence of small children, who play on the floor, influences the desired temperature in the living room. There seems to be strong social expectations to having a house warm enough for children. Families with teenagers explained that it was sometimes complicated to make them participate in the challenge, because they want to manage their own comfort and were perhaps more resistant to this type of change.

Participants also reflected on how their energy consumption was closely linked to caring for their family and friends, with some talking about needing higher temperatures in their homes when elderly relatives or grandchildren were visiting. Some participants have reported that having guests over has been a challenge – several felt that they had to tell their guests to bring extra clothes, which they did not feel very comfortable with. As a UK participant put it, in relation to feelings of embarrassment for making guests uncomfortable (whether real or imagined):

> *We had guests, yes, and we put the heating and it was the kids' party, which was early October. I was a bit, kind of, I thought, what if these children's parents come and they have to sit in a house that's really cold so I was embarrassed and I knew that I wouldn't be able to manage tending to the wood burner in the middle of a kids' party so we put the heating on but that's the only time (UK13).*

Several participants stated that they have experienced feeling too warm when visiting friends or family, or that visitors to their home during the challenge perceived it as rather cold. Changing the temperature at home made people reflect on temperatures elsewhere, when visiting other homes, as in this example from a Hungarian participant:

> *Last weekend we visited friends, they said to turn on the heating, we had a look on the thermometer, it was 19, we said it wasn't cold for us. ... we have lived here for 10 years, it was impossible to heat it up, so we got used to it, being at 19-20 degrees is our comfort zone. (HU32).*

In a few cases, participants reported about how visitors reacted positively to the challenge and that they felt more comfortable in the house at lower temperatures. Most of the participants working at home observed that 18°C is too low. For example, for this Danish participant:

> *There were days when I worked at home. Christ, I had to get up once in a while and jump about. You had to. My fingers were completely stiff, and I felt the cold on my throat, and my toes were frozen. That almost makes it damn appealing to go to work (laughs). I think I'm gonna stay a little longer at the office (laughs). (DK245).*

People with illness (e.g. arthritis) find also that they need higher temperatures. Some households reported that their material conditions made it difficult to reduce indoor temperature at 18°C. For example, living in dwelling with large windows oriented to the south, apartments that are heated by

secondary heating from neighbouring apartments, or floor heating systems that make it difficult to adjust temperatures. Other households had difficulties to meet the challenge partly because they resisted to the use of blankets or extra clothes.

Besides deterrents, **various enablers to practice change have been identified**. Many households used the thermometer to compare their feelings and perceptions to the indicated temperature. Participants mentioned that they learned to adjust the temperature in their homes by looking at the thermometer. Some became more conscious about the temperature and how warm or cool each room was. The use of diaries was also an appreciated form of monitoring towards learning, by some participants. Of course, the main enabler is the possibility to adjust heating in the whole house or in each room in the first place. Although we sampled for households who could adapt heating, the extent to which this can easily be done varied across the countries and households. Secondary sources of heating were sometimes used to create a warmer spot in the house where people could go to warm up. Playing with doors, as well as curtains and blinds (closing or opening) is also a tactic that has been observed. Several participants have reflected that they have experienced a higher quality of sleep after turning down the heating in the bedroom, and some parents have discovered that their children sleep better in colder rooms. Finally, some participants have noticed a reduction in their heating bill. For some households, the reductions in indoor temperature led to noticeable savings.

More generally, many households reported that due to the challenge, they paid more attention to the suitable temperature in different rooms; they kept some rooms at lower temperatures, especially bedrooms and rooms that are used less. **Participants realised that thermal comfort depends on various factors**: space usage, activities (mobile or non), age, gender, feeling tired or not, feeling sick, as well as building and home characteristics. People also noticed that different people feel comfortable at very different temperatures. Many participants found that they could be comfortable at lower temperature than they expected. However, most households found that a temperature of 18°C was too cold. As one household participant in Denmark put in, rather adamantly, "*It bloody matters…especially in here, in the living room. It isn't bloody nice to be in here. 18 degrees is not an okay indoor temperature*" (DK245). Many participants felt that they could do with about 1°C, maybe 2°C, lower than what they were used to before the challenge.

A general trend towards lower reported temperatures during the challenge is observed (Figure 6): there was an average decrease in temperatures of 1°C in the living room, ranging from 1.9°C (Switzerland) to 0.2°C (Ireland). These extremes are explained by the relatively high or low baseline temperatures, prior to the start of the challenge. For adult bedrooms, the change is even more marked (Figure 7): from 2.3°C (Netherlands) to 0.6°C (Ireland), with a mean of 1.4°C. Overall reductions in reported temperatures, by degree of difference, are illustrated in Figure 8, by country.

This decreasing trend is observed in the follow-up surveys, indicating that participants maintained their new practices. This continuing trend might be explained through a process of habituation: people (i.e. bodies) need time to acclimatise to a lower temperature. While some participants may have slipped back and returned to previous practice patterns, the shift in their perception of desirable temperatures for the living room and bedroom have been maintained – indicating a consistent awareness and evaluation of desirable temperatures and, more generally, indoor microclimate, after the end of the ELLs and in the months that followed.

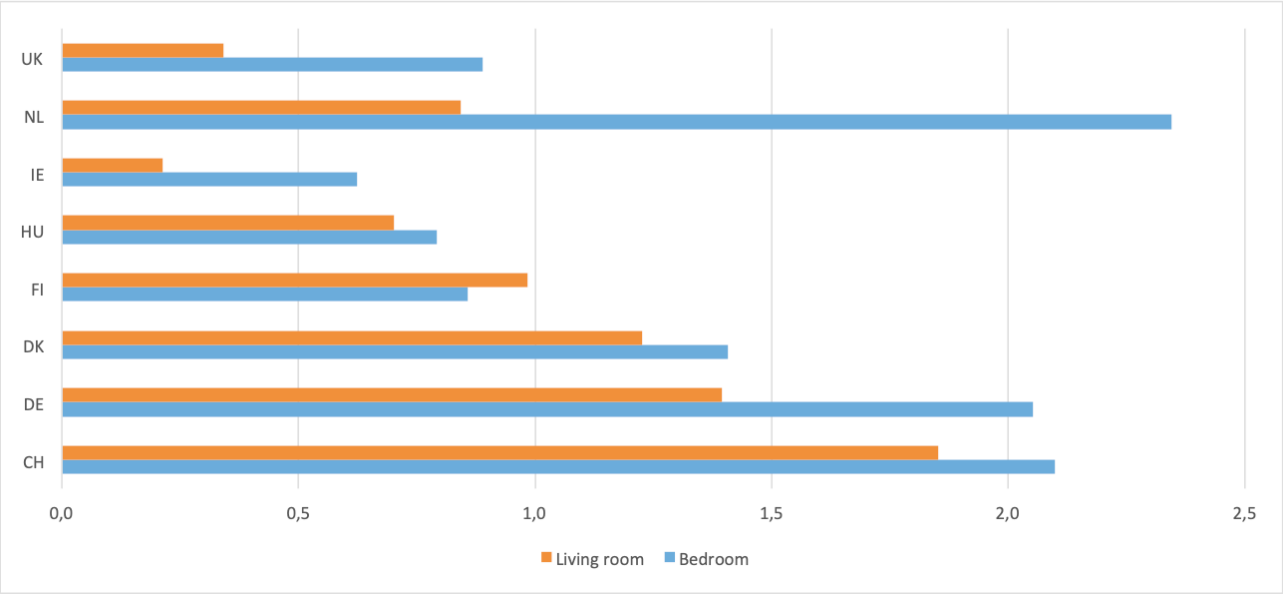


Figure 8: Reported temperature differences between baseline and average values during challenge
Data source: Baseline and weekly surveys (N=265 & 264; data analysis by T. Kajoskoski)

In general participants were happy with the heating challenge and some of the new practices during the heating challenge persisted after the end of the challenge (for example turning down the heating in certain rooms, wearing extra clothing to keep warm, and using blankets and socks). In some cases, households were particularly pleased with the socks they received in the challenge kits, as was the case with this UK participant:

> *Yes, so we've got those socks, which we've both been fighting over because they're brilliant, so we've actually invested in some really thick socks. The thermals socks have been really good and having them by my bed so when I wake up, I always have them on (UK02).*

Thus, we can extrapolate that reductions in indoor temperatures and associated energy use were made without any major changes to heating-related practices. Participants seemed to have "adapted" to lower temperatures whilst maintaining practices more or less the same. In the interviews and focus group discussion many participants commented that they were surprised by how well they could handle reduced temperatures. Many participants reported that, since engaging in the heating challenge, their perception of adequate indoor temperature has changed. For example, for this Danish participant:

> *But I've actually been thinking today, either something has happened to me – I mean, my body is regulating so that I feel warmer at lower degrees, so I've adapted to some kind of level. If that's what's happened, or if it is my hormones. That's also something to consider. I mean at my office, I've been sweating heavily, it's been almost unbearable. Sometimes I almost felt sick. But I think it's been nice to sleep in a cold room. You (to the older son) also felt it was cold, and you too (to the youngest son). (DK245).*

People often noticed how they sleep better in colder rooms, or how other spaces beyond the home are now experienced as too warm. Most of the households stated that they are going to continue having lower indoor temperatures than before. Those who accepted the common challenge seem generally more willing to continue with a reduction in indoor temperature than those who accepted personalised challenges.

3.4.2 LAUNDRY PRACTICES

Initial configuration of laundry, in relation to the different elements of practices and how they inter-relate, would involve existing material arrangements, skills and competencies, and representations of social norms.

All ELL participants have washing machines in their homes, even those who have access to a common laundry room and shared machines (as is the case in Switzerland, Finland, and the Netherlands). The rooms in which the machine is installed seem to vary with countries, from a dedicated laundry room to the kitchen or the bathroom. The possession of a private tumble dryer or cabinet differs greatly according to the country: from 15% in Hungary to 82% in Denmark. The share of stated A++ machines ranges from 24 to 40%, depending on the country. Although we have no indication about the size of the households' machines, it is known that they play an important role in influencing laundry practices: as many households try to wash mostly full loads, bigger machines tend to be used less often.

Within our sample, in families where two adults of different gender are present, women are more responsible for the laundry than men (Figure 9). However, interviews and focus group discussions tend to show that tasks might be a bit more shared, when for instance the men and/or the children participate in hanging out wet clothes, ironing, and/or folding dried clothes. In some cases, the gendered division of chores may have to do with the women being more regularly at home than the men. In a German household (GER287), a man who is recently retired joked about how being at home might lead to him being more involved in this chore. When asked who does the laundry:

> *Female respondent: laughter.*
> *Male respondent: Next question please! (everyone laughs). I'm retired now, I probably have to do it in the future (laughs). No excuses anymore.*
> *Female respondent: I assume that you are capable of learning (…).*

Some women participants also admitted that they do not think that their male partner does the laundry in the "right way", and therefore want to do it on their own terms – demonstrating how laundry standards differ, even within the same household. As a woman in Switzerland explained:

> *No, no, I do it all (the laundry). Because he doesn't know how to recognise materials, like cotton or wool, so he makes catastrophes. We divided the household chores and I wanted laundry (CH383).*

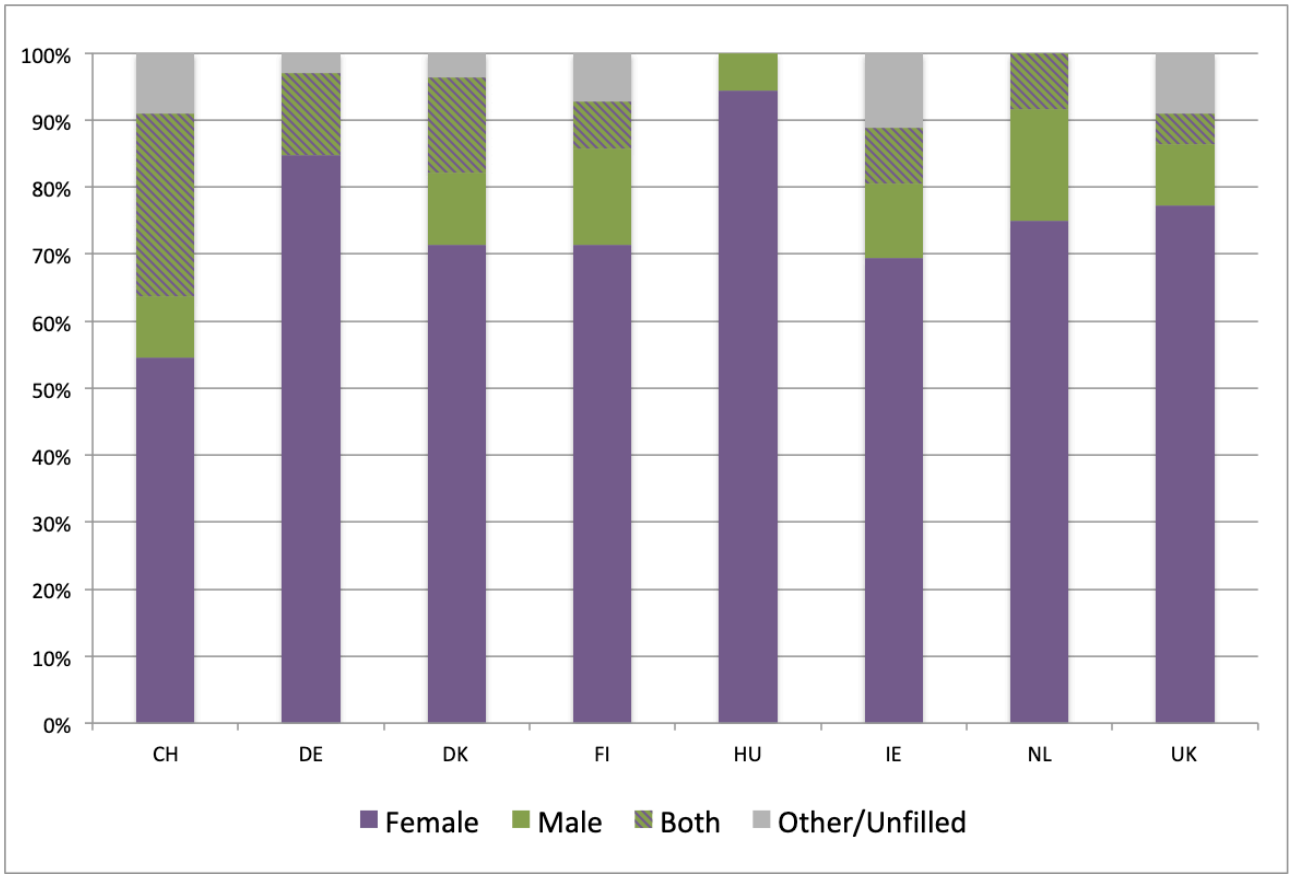


Figure 9: Laundry care according to the gender
Data source: Baseline survey (N=229)

Many participants mentioned both during the interviews (ELL1) and the focus group (ELL2) discussion that they do not feel that laundry is time consuming and they do not experience it as a chore. Unless they had more than two children in the home, they did not feel that laundry was taking up much of their time. However, they commented that folding and putting away of washed and dry clothes is more time-consuming and bothersome. In some countries (Denmark, Finland, UK, Ireland), it was even reported that female participants enjoy doing the laundry, that they prefer it over other household tasks, that it made them feel in control, or that it was a relaxing thing to do. In Ireland, participants spoke about how they linked the weather with laundry and that it meant they thought about the laundry quite often, in relation to when they might hang out clothes to dry in the outdoors. Some households expressed doubts about saving significant (if any) time by doing less laundry. Yet, in Switzerland, a national survey has demonstrated that 30 minutes to one hour is spent on each laundry cycle, in terms of sorting clothes, hanging, ironing and putting away (Sahakian and Bertho 2018); the fact that people underestimate the time this takes may reflect how the associated chores have become highly routinised.

Several routines and habits related to laundry have been observed across the ELLs. Their differences relate to sorting clothes, schedule, frequency of laundry and preferred temperature settings. Some households sort laundry in different piles according to types of textiles and colours, whereas others wash all coloured items together while separating only whites. While laundry is a highly routinised habit, only a fraction of participants stated that they do it on a fixed day. For those who do wash on fixed days, work schedules are the main constraint and participants do their laundry when they have time, mostly in the evening or during the weekend. For some households, the laundry is a more or less a regular or planned activity while the majority described it as a task that is performed when it needs to be done, either because the washing basket is full or they need more clothes. Only a few participants had off-peak electricity tariff that makes it more economical to do washing at night.

Almost all participants change their underwear and socks every day – this seems to be linked for some to the daily shower (i.e., you ought not to put dirty clothes on a clean body). Shirts, t-shirts and dresses can be worn for one to three days. Jumpers/sweaters and jeans are usually worn for longer. Participants tend to place worn clothes – but perceived as still clean – on a chair or a hook in the bedroom. Length of wear was initially by far the criteria most commonly used to determine when an item of clothing needed to be washed (ranging from 37% for Swiss participants to 71% for Irish participants). Most of the households agreed that it is important to have clean clothes when going to work (in an office for example), to parties, or more generally when around other people outside of the home, but it is also acceptable to wear what are seen as dirtier clothes at home. Many participants use the same clothes for several days, but not immediately on the following day because it is important that colleagues see that they change their clothes regularly. Many of the practices around laundry were influenced by perceptions of workplace and societal expectations with participants unwilling to wear or allow their children to wear the same clothes two days in a row. It seems that older participants wear the same clothes much longer than younger ones, without considering them dirty. In Germany, many participants expressed the view that the cleaner we become, the less resistance we have to infection and it is not necessary for clothes to be completely germ free. Other participants did however attach meaning to whites staying white, and the importance of appearance, particularly in certain situations.

Many households are accustomed to washing towels and bed linen separately, and on higher temperature settings. However, the frequency of this wash varies mainly between two to four weeks. Several participants mentioned changing out of their work-wear when arriving home, and having separate clothing for “dirty” activities (i.e., gardening, repairs) that do not need to be washed too regularly. Many households, particularly with young children, mention that they avoid white clothes. And many parents dressed children with dedicated clothes for messy activities. Several participants admitted that they do not buy or wear clothes that need ironing. This indicates that people think about washing processes even during the clothes purchase stage.

The average stated laundry temperature differs little across countries for dark clothes (37°C to 41°C) and varies a bit more for whites (37°C in Germany, 49°C in Finland) and bed linens (49°C in Ireland, 60°C in Denmark). Most of the participants declared that their machines have an ‘eco-programme’ (more than two thirds of participants in all countries, except in Finland with 38%). However, it seems that there was some confusion about this programme and few households seemed to use it (except in Hungary), notably because it is too long. The fact that it is supposed to be more efficient (in energy and water terms) but takes longer is counterintuitive to people who associate efficiency with rapidity. For many participants, the different programmes on their washing machines are quite mysterious, and they struggle to understand the various functions available. Therefore, many households used mainly only one or a few of the existing programmes available on their washing machines. In several countries, the energy meter attached to machines allowed some participants to explore the exact energy use of different programmes, which they found quite useful as an exercise towards changing their usual ways of using the machines. As one participant in Germany put it:

> *How can I describe that…We looked very carefully at the loggers and thermometers. And found out that our dryer is a real energy guzzler (…) we took initiative and stopped using it. We used it before for the towels [to make them soft], now we have the harder version (laughs). And we could reduce more than half of the laundry than before. The awareness increased thanks to the meters. (GER310)*

However, some participants (e.g. in Denmark) discovered that their dryers use less energy than they expected, and stated that they might consider using them more. The dryer is used regularly in about 30-50% of the households (with the exception of Hungarians, whose use is much lower). Some participants in the ELLs used the dryer for all clothing, and others used it only for large items that do not dry easily. The use of tumble dryers seems to be more common amongst larger

households. Some participants in the UK and Ireland discussed their concerns over drying clothes inside and incidence of dampness in buildings. Ironing is a more varied practice across countries: 66% of Dutch participants iron regularly, while only 14% of Swiss do so. It seems that ironing is more practiced by older people.

When the number of laundry cycles varies across countries (Figure 10), it is primarily due to a varied composition of households in the national samples (see Figure 15, section 3.6).

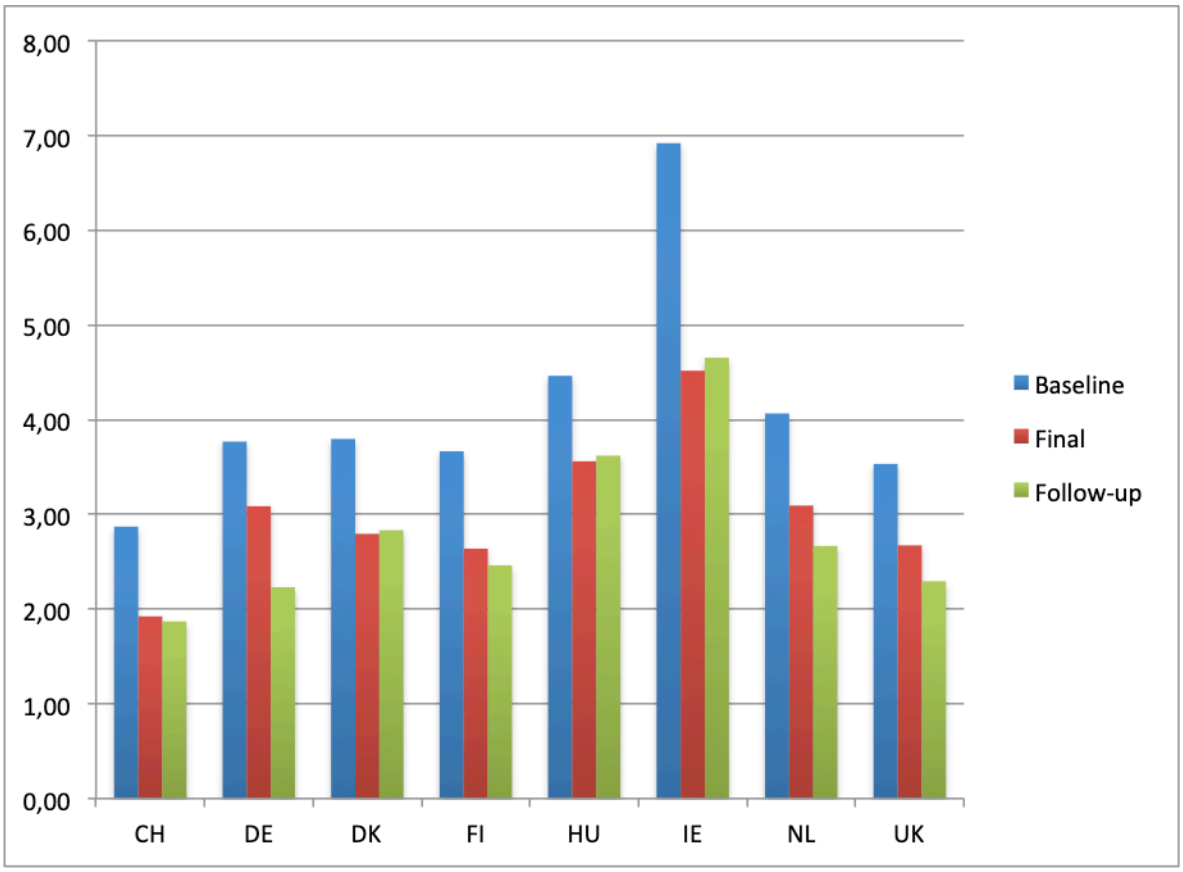


Figure 10: Stated weekly average laundry cycles by country, before, at the end of and 3 months after the challenge
Data source: Baseline, closing and follow-up surveys (N=286, 261 & 199)

Most families with small children spoke about the high volume of washing they have as a result of having infants or young children at home. In most cases, hand washing and removing stains were also more typical in these households compared to those without children. Some households having small children had reusable diapers to wash, and this raised the number of weekly wash cycles. For many participants the cleanliness and health of their children was a key concern, and they reported that they were unwilling to compromise in relation to their appearance and comfort. When it comes to deciding when a piece of clothing is dirty, teenagers seem to have much stricter standards than adults – wearing clothes less frequently, and washing more. With regard to dryer use, time was identified as a highly influential factor, as the use of a dryer avoided a significant time cost in terms of hanging up the laundry, particularly with children typically having many small items. Pets also had an influence on washing laundry, for instance to wash blankets used by a dog or soiled bed linen.

Occasional activities also increased the amount of laundry. For example, travelling (larger loads before and after), having family visit (changes to bed sheets), children returning with washing from university, among others. The time of year also influenced washing routines, with longer days and dry weather being cited as important factors. In Finland, sheets and clothes were changed more

often in summer in some households, and in households with children the “muddy season” was a season of more laundry. In Hungary, there is a routine for the seasonal change of clothing and cleaning, i.e. 'big autumn cleaning' when households change their clothing from summer to winter and also wash curtains, rugs, bedspreads, blankets, etc. This habit is also observed in some Finnish households.

Introducing the laundry challenge

More than three quarters of households took the suggested challenge, except in the Netherlands and in Hungary where only about 50% of the participants agreed to try to halve the weekly number of laundry cycles. Individual challenges included washing only full loads of laundry, washing at 30°C throughout the challenge, reducing spinning speed, selecting clothes more carefully, lesser reduction (e.g. from four to three washes), trying to wear items for longer, leaving some items outside the challenge (e.g. work clothes), or quitting the use of the dryer or a reduction in its usage. The result of the challenge is an average reduction of the number of cycles by 28%, ranging from 20% in Hungary to 37% in Denmark.

Exit interviews revealed that most participants struggled with the challenge, especially when the target was to halve the laundry – hardly anyone managed to do it as planned. Even in the case of a personal challenge, which were adapted to household’s circumstances, some struggled to achieve the set target. Those that had been washing every day or that washed by length of wear reduced their laundry the most. Some participants explained how the expectations, for example at the workplace, steered the way they used clothes, as it was not preferable to wear the same clothes two days in a row. It was also difficult to challenge the ways of doing laundry that had been learned in childhood homes, such as changing the sheets regularly and washing them at least at 60 degrees, for some. However, some participants realised that halving the number of wash cycles does not equal to halving energy and water consumption, and thus developed alternative ways of reducing laundry-related consumption such as washing at lower temperatures, reducing spin speed or using different programmes.

Appropriation: deterrents and enablers for the laundry challenge

Several tactics to reduce laundry cycles have been observed, each tactic being accompanied with deterrents and enablers. First, many of the participants started doing **fuller loads**. Most participants reported that the lower number of weekly washes was mainly a result of saving up laundry and filling up the washing machine more, and that was a relatively easy thing to do – although some participants had to wear pieces they don’t like so much or buy extra clothing like socks and underwear. As a German participant explained:

> *We did not just throw the things in the machine but really looked at the pieces and thought about it, is the machine really full. It´s not like we don´t own enough clothes, but we started to wear things for longer and did not wash them immediately after wearing them. We have not half the amount than before. That´s when we realised something really changed for us (GER310).*

In order to achieve the challenge some participants reported saving up clothing items until the washing machine could be fully loaded before running a cycle. The participants also started to estimate what clothes needed to be washed and how much space different clothes take in the washing machine. To achieve the challenge, some participants had to do less sorting out of clothes, mixing together bed linen with clothes, or bright and dark colours, for example. Some others decided to use clothes within the same colour range for a period of time, so that when they had to wash a full load, it would not be a mix of colours. Some participants also spoke at length about their dislike of full washing baskets and the urge to need to empty the washing basket as soon as possible. Many discussed how they found it difficult to wait for the baskets to be fuller so that they could put on a larger load. To solve this problem, several participants used a laundry basket that takes exactly as many clothes as a full load. Only few households made changes in the material facilities, such as bought new laundry baskets or other facilities for storing clothes. In particular one household bought four wash baskets so that they could organise their laundry by colour. Some participants re-organised their closets in order to find more space for slightly worn clothes, in addition to using the existing spaces such as racks, chairs and hangers. Some participants had trouble with finding space to dry their clothes, particularly during the heating challenge (there was a one week overlap between the two challenges) when there was less opportunity for drying.

Another tactic was to extend ways of **keeping used clothes in circulation** – so the 'in-between-use' pile of clothes got bigger and slightly more organised. Most of the participants tried to wear clothes (e.g. tops, t-shirts, jeans, skirts) for longer, several days in a row, or by letting pieces air for a day before wearing it again. Airing clothes was already done by some participants before the challenge but was taken up in other households during the challenge. Not having enough space for airing clothes was mentioned as a reason for not doing more airing. Some participants challenged the social norms (or at least their own experiences and representations of these) around wearing the same clothes for two days running. Those who tried to wear the clothes twice, two days running, stressed that they found this challenging – particularly the participants working at an office. Some of these participants ended up developing 'rotation systems' for the in-use clothes, so that they could extend the time the clothes were worn, without having to wear the same clothes with the same people several days in a row. Several participants mention the social aspect of expecting certain levels of cleanliness from each other, which is often also related to the clothes one is wearing. However, in general, participants did not compromise their feeling of being clean. For instance, most participants did not feel comfortable with wearing the inner clothes (e.g. socks and underwear, which are worn closer to the body) more than once. Buying natural fibre such as cotton and wool was sometimes evoked as a way to avoid the development of odours that would linger longer on synthetic clothing.

In general, it seemed like the participants became **more sensorial** (using senses like seeing and smelling) in order to assess when their clothes were dirty enough to be put into the laundry basket. While the main criterion to assess the cleanliness of a cloth was the length of wear before the challenge (for about half of the participants), this criterion was used only by around a quarter of the participants at the end of challenge. Conversely, smell was used as a criterion by only a quarter of the participants before the challenge, and became the main criterion (for at least half of the participants) at the end of the challenge. This increase in the use of smell rather than length of wear suggests the partial replacement of 'automatic' decision-making with a more empirical approach to judging when an item needs washing. Furthermore, the questionnaires show that in most of the countries there is a discernible increase in new tactics including airing clothes, preventing stains, and to a lesser extent, washing out stains by hand and brushing out stains. These trends are generally confirmed as persisting in the follow-up survey, three months after the end of the challenge.

Many participants also learned new ways of **removing stains**. Some households washed clothes a bit more by hand or, for example, rinsed the armpits or collars of the shirts if they were sweaty, instead of washing the entire item, and especially stains in outdoor clothes were brushed more

often. Some participants reported using aprons to protect their clothes (i.e. particularly when cooking) and brushes to clean clothes (e.g. to brush the mud off gardening clothes) more often. However, the use of an apron appears in some countries to be a very ingrained habit; conversely, some participants seem to have tried to use the apron in the challenge kit during the challenge, but did not manage to turn it into a routine. Several participants started doing hand washing occasionally. It is even reported that one household washed their underwear in the shower. Other strategies reported focused on having special clothes for different activities that can be used a number of times without having to be washed such as clothes for outdoor work/gardening/playing. The idea of changing clothes when arriving home after work into comfortable house wear that can be repeatedly worn without washing was already adopted by a few participants and was further discussed.

To succeed in the challenge, good **coordination between all family members** was essential. In the cases where parents (as the main participants) had managed to enrol their children in the challenge, it seems that the children were very much on board with the challenge, and they were in some cases the ones that enabled the parents to go even further. In other cases, where parents did not manage to enrol their children in the project, the children often became a deterrent for the challenge. The age of children seems to play an important role in the perception of cleanliness. Households with younger children in particular had difficulties making a significant reduction in their number of laundry cycles, due to the regular need for washing reusable diapers or washcloths, for example. On one hand, some households did not want to compromise the hygiene of their babies (e.g. in using the eco-programme as they believe it washes less efficiently), on the other hand some households stated that the children did not care about whether the clothes were clean or not.

The expectations regarding children being presentable at school (especially in countries where a school uniform is the norm) did not change for many households, although participants seem to be more relaxed about personal standards in other, more informal situations. In other circumstances, the parent actually had to “force” the kids to change clothes even occasionally. Some refer also as being the “laundry police” in relation to the teenagers. One interesting approach was giving children, who didn’t want to change their habits, their clothes back as ‘washed’ without washing them, or folded used clothes to be put back in closets. As one UK participant explained:

> *They didn’t take any notice because normally they would throw all their school uniform on Friday afternoon in the wash basket and so they would do that and I would sneak in and I would look at the cardigans. Yes, the shirts would get washed but their skirts and their cardigans, I would look at them and I’d think brush them down a bit. If they didn’t have food on or loads of pen then I would just put them back in their wardrobe and hang them up next to where their school stuff is and not say anything and they didn’t notice, so that’s fine, saved me a job (UK13).*

In Ireland, university students often bring their laundry to their parents’ houses when visiting on weekends. As a result, several participants mentioned that when they were expecting their adult children to return from university, they would try to have their wash baskets empty, ready for their clothes, but that taking part in the challenge prompted them to change this routine. In conclusion, the challenge allowed participants to reflect about how important it was to them that their children were clean, wearing clean clothes and generally well presented.

An important deterrent to the challenge was a **low baseline**. Participants who already had a low number of wash cycles per week before the ELL felt that reducing laundering even more was challenging.

A number of participants reported **allergies** that require washing specific items at higher temperature settings and therefore were unable to save more energy. Several participants also stated that they feel uncomfortable washing their clothes at lower temperatures or using shorter cycles.

Related practices to laundry were also challenged and participants tried various experiments. For instance, practices of **ironing** and using the **dryer** were done less frequently than before the challenge. Some participants discovered how much energy their dyers required, thanks to the energy meters that were installed. Few choose not to use the dryer at all during the challenge period. The dryer was also used differently, by for example using it only for a while to get the clothes less wet and then hanging the clothes to dry. Some participants found new ways to hang clothes and managed to iron less, or used the dryer less and hanged clothes more. Participants spoke about how they felt it was important to have fluffy, soft towels and how they felt that using the dryer was the only way to achieve this. During the challenge, several participants, rather than putting the towels in the dryer wet, started to hang them out to dry and then put them into the dryer to “fluff them up”. However, participants with young children tended to state that they would not stop using the dryer from a time saving perspective. Some Hungarian participants reduced the speed of their spin-driers, measured the change in consumption and concluded that it saves energy. However, some felt it is fine to perform this tactic in summer, but in winter it makes the drying period too long. The question also arose whether this has an impact on heating energy use.

In general, participants rarely discussed the **use of detergent** and it was not a concern for them. However, some participants (in Finland, Switzerland and Ireland) spoke about their concerns about using detergent and a desire to use natural products. Some participants started using new and homemade products, such as soap nuts, laundry vinegar, soda crystals, laundry balls or Marseille soap chips during the challenge. A few Swiss participants already used homemade detergent, whose recipe was shared among the ELL2 group via a WhatsApp group; the detergent was also made available to the building residents in the shared laundry space.

Many participants **experimented with their machine** more (e.g. with using different programmes, temperature and spin-dryer settings), and they discovered some extra saving options. Many participants reported that they experimented with different temperature settings and programmes on their washing machines. This included increased use of ‘cold’ and 30°C temperature settings, as well as the short-cycle and eco-setting. Most participants did not feel any difference between clothes washed at 30 or at 40 degrees, although there were also exceptions as some participants felt that less than 40 degrees is simply not enough for the clothes to get clean. In Denmark and Hungary, participants from ELL2, who had been able to install an energy meter, shared with the others how much energy they had saved by reducing laundry from 40 to 30 degrees. That seemed to have influenced the other participants. The test of using the eco-setting was rarely conclusive as this programme takes a much longer time and therefore is not so convenient. When possible, many participants used the meter to check the consumption of various programmes and settings. Some participants also mentioned taking out the manual of their machines to study it again. More broadly, it seems that participants were inclined to experiment new things. For instance, one woman bought ‘crystals/silicones’ to put in the wardrobe to fight damp and wash clothes less; in another household they put men’s ties in the freezer in a plastic bag to get rid of the smell.

The evidence from the laundry diaries would suggest that the reductions in energy use associated with the laundry challenge were overwhelmingly due to a **reduction in the number of wash cycles rather than a reduction in wash temperature**.[13] Many participants who observed the difference water temperature makes on energy consumption and who are aware that washing at

[13] It is difficult to assess which factor was more important to reduce energy use (number of cycles or temperature) because data from energy meters were not systematically collected, thus making it difficult to perform statistical analysis.

30°C or 40°C is enough for most clothes, even if they are quite dirty, still resisted the idea of washing at lower temperatures. However, all participants were not able to study their electricity consumption since it was not possible to install energy meters everywhere (notably in Switzerland and Denmark)

Most participants were happy that they took part in the challenge and many said that they felt like they spent less time doing laundry as a result (although this seems to vary much according to the country). As a UK household put it, in talking about laundry:

> *(…) because it takes you time to hang it out and then when you have to bring it back in because it's not dry and then you've got to hang it all round the house and all that takes ages and then folding it and putting it away because nobody except me does it, so I can try and get the children to put their stuff away 'Ohhh don't want to' and I just leave my husband's folded up at the end of the bed and he will deal with that. So, it's definitely, definitely really positive thing, it's saved me some time which is good (UK13).*

Some women expressed how great it was to be free of the stress and the mental load created by the never-ending laundry pile. As one participant from Finland expressed: "There's no going back. I've really felt the weight of the world has been lifted from my shoulders, so I think this has been a pretty good motivator" (FI129). Some spoke about how they had started to wash laundry mainly on the weekends, which made the evenings after workdays more relaxed. Others stated that although they may not be spending less time doing laundry that their attitude to laundry changed and that they felt it had become a more positive experience. Some respondents admitted that they will return to using the dryer as it is a significant time saver for them, while others committed to using the dryer less due to its high electricity consumption. Some others reported that they were not satisfied with the cleanliness of their clothing after washing at a lower temperature setting. In some cases, when households were not able to achieve the challenge, they expressed frustration. However, all in all, participants seem to be very positive about continuing with their practices in the future. Many declared that they will continue washing less laundry, as it was not as challenging as they had perceived. Changing perception and finding the right rhythm were important, for example not being afraid of the full laundry basket, but rather seeing it as a sign of being able to wash a full load and not having to wash laundry all the time. Most participants planned on keeping at least some of the new habits, such as airing clothes or wearing them longer. Most also wanted to keep on doing less laundry, because of the relief it offers. The follow-up survey confirms that many new habits acquired during the challenge had remained relatively stable, which also points to the possibility of changing ways of doing a routine activity over a four-week period of experimentation.

3.5 COMPARATIVE RESULTS BETWEEN HOUSEHOLDS AND ELLs IN THE SAME COUNTRY

As the differences within countries are as relevant as differences between households across countries, we focus here on the differences between two approaches within countries, or between ELL1 and ELL2. As described in the design of the Living Labs, two approaches were taken: in ELL1, households were approached individually; in ELL2, households were approached as a "community of place", or a set of people living in a common geographic area and who would be engaged collectively as a group[14]. According to a statistical analysis (performed by Tuija Kajoskoski, University of Helsinki), the only statistically significant difference between ELL1 and ELL2 across countries amounts to bedroom temperature reductions. The differences in living room temperature reduction and laundry cycle reduction were, however, not statistically significant.

[14] In the WP1 glossary, a community is described as group of individuals that share a place, worldview and/or particular interest; can involve face-to-face exchanges and/or virtual communication between group members.

Differences in ELL2 based on age, gender or the presence of young children in the home were similar to what could be experienced among ELL1 participants. One major difference between ELL1 and ELL2 is that participants in the latter group were able to discuss and share the experience of the challenge with each other. All these interactions were not necessarily documented by the ENERGISE research and implementation teams as the participants met on different occasions, not only at the organised focus groups prior to and after the challenges, but also through informal meetings in the buildings, for example, or at board meetings for their housing cooperative. Some ELL2 groups also exchanged over social media, through a Facebook or WhatsApp group. That being said, it is difficult to assess the degree of interactions between ELL2 participants, as these forms of exchanges were not designed for explicitly in terms of sustained interactions, and also played out quite differently in the different countries.

However, we might surmise that the ELL1 participants were not alone in their efforts, since our research team visited them three times during the project, providing opportunities for intensive discussions. They were also aware that other households across Europe were similarly engaged. We might assume that they also felt part of a community, in some ways, in participating in the ELLs. However, some ELL1 participants stated that they would have liked to meet the other participants, and the ELL2 participants expressed their appreciation for the collective meetings and opportunities to share experiences. This suggests that the ELL2 design can be privileged in terms of creating spaces for sharing and commitment, even though the effects of this collective approach is not visible in the actual outcomes of the challenges.

One of the most important contributions of the shared challenges through ELL2 seems to be the sense of a common experience, which participants were involved in together. People appreciated feeling that they were not alone in experiencing difficulties, especially with the heating challenge, which comforted and motivated them. The motivational effect may also have been derived from the fact that participants shared tips on how to improve their coping strategies, through social media and other interactions. This allowed them to try out new strategies, with a prior “approval stamp” of another participant. Heating and washing practices in the home are usually in the realm of the private sphere, and are not typically discussed between people. The ELL2 process thus allowed participants to share information on topics that are usually left out of everyday discussions. In addition, observing and hearing about other people’s practices made the participants reflect on their own practices. It either comforted them that they were doing things “right”, or made them realise that their practices weren’t as ecological as they thought, that they could do more/ better ecological gestures. In relation to the focus group discussions specifically, most discussions were consensus-oriented. The exchange did not seem to be heated nor contentious; all participants usually agreed with each other. Even if it is not stated as such, there is also a possibility that participants may have compared themselves to others, in a constructive way (as there was no competition built into ELL2 design, but rather exchange and collaboration), with participants conforming to the “good” practices of their neighbours. That being said, it may not be necessary for participants to interact in order to feel like they were part of a common project. Knowing that many other people were participating to the challenges across Europe may have been enough to create a sense of collective motivation. Moreover, some participants wanted to contribute to research, particularly because sustainability reseach is a ‘hot topic’.

Because ELL2 took place among households in the same building or geographic area, any constraints faced by the heating system and building infrastructure were generally shared by the residents. In relation to the heating challenge, the Danish, Finnish and Swiss ELL2 participants reported not being able to change their settings easily, or at all, which made the challenge of reducing to 18°C even more challenging and in some cases frustrating. In the focus groups and at the end of the challenge period, participants from all countries noticed how they perceived temperature and how this representation influenced their feelings of comfort (for instance humidity plays an important role in comfort in some countries, as important as temperature settings). Participants from Hungary, Denmark, Switzerland and Germany mentioned that they noticed how temperature perception can vary between two people of the same households. Netherlands

participants mentioned that they realised that they had different expectations regarding different rooms of their home (for instance, that bathrooms should be warmer, and bedrooms could be cooler). As we have seen, the most common practice to face the heating challenge was to put on more and/or warmer clothes. Participants from all countries mentioned this basic strategy. Some also used blankets when sitting down in the evening. For the laundry challenge and similar to ELL1 findings, all of the participants in ELL2 and across the countries reported that they were more careful about deciding when to wash clothes, reverting to a sensorial experience of smelling clothes or removing visual stains. Airing was a strategy to be able to wear clothes longer among ELL2 households in Finland, Ireland, Switzerland, Denmark and the UK. The various objects made available in the challenge kits were also seen as useful, including the apron for example. Participants in ELL2 in Switzerland, Ireland, Hungary, Denmark and the Netherlands also reported trying different washing temperatures. The most common shift was going from 40°C to 30°C. In all countries, most participants were able to feel comfortable in their clothes, even when worn longer; only a small minority of ELL2 disagreed.

3.6 COMPARATIVE RESULTS BETWEEN HOUSEHOLDS ACROSS EUROPE

This section analyses the similarities and differences between households in all studied countries according to sociodemographical and building type variables, and in relation to changes experienced through the ELLs.

3.6.1 HEATING PRACTICES ACROSS HOUSEHOLD TYPES

We have demonstrated that heating adjustments depends very much on infrastructure and other material arrangements upon which households do not always have a grip – leading to some frustration among participants who are not able to reduce indoor temperature as much as they would like. However, as seen in Figure 11 below (in comparing the baseline period to the challenge period), we observe that people living in apartments were able to reduce their indoor temperatures more than others, notably because they started at a higher temperature level to begin with.

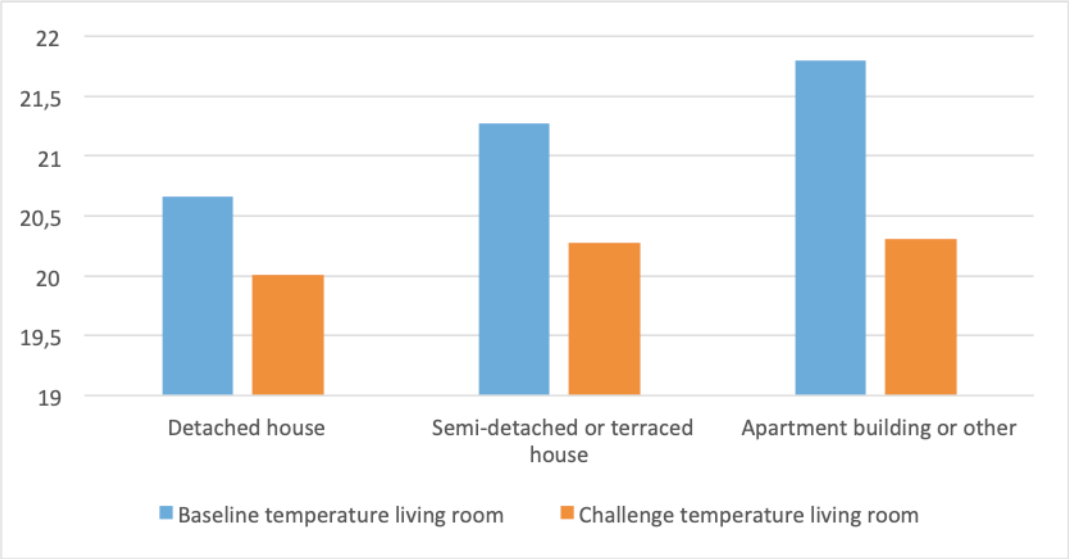


Figure 11: Reported living room temperatures by building type
Data source: baseline and challenge surveys (N= 277 & 258; data analysis by T. Kajoskoski)

Households have diverse abilities to regulate their indoor temperatures. 37% of the participants were able to regulate heating only through thermostatic valves or other devices specific to rooms,

27% could adjust heat demand only at the dwelling level (e.g. through a unique thermostat), and 31% had both possibilities, as shown in Figure 12.

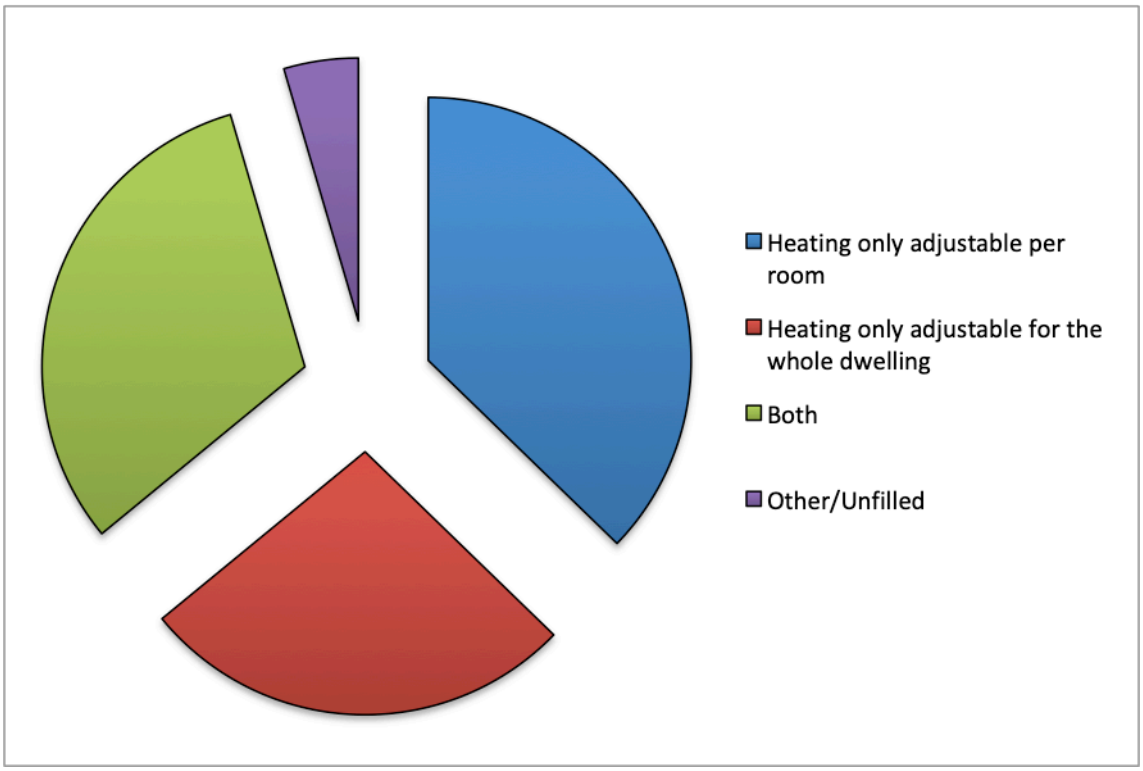


Figure 12: Heating regulation, total households
Data source: baseline survey (N= 306)

Households with heating only adjustable by room have reduced more their indoor temperature than other households with other types of heating regulation (Figure 13). This may be due to the fact that this allows for finer regulation and makes it easier to modulate temperature between rooms (to lower temperatures in bedrooms, for instance).

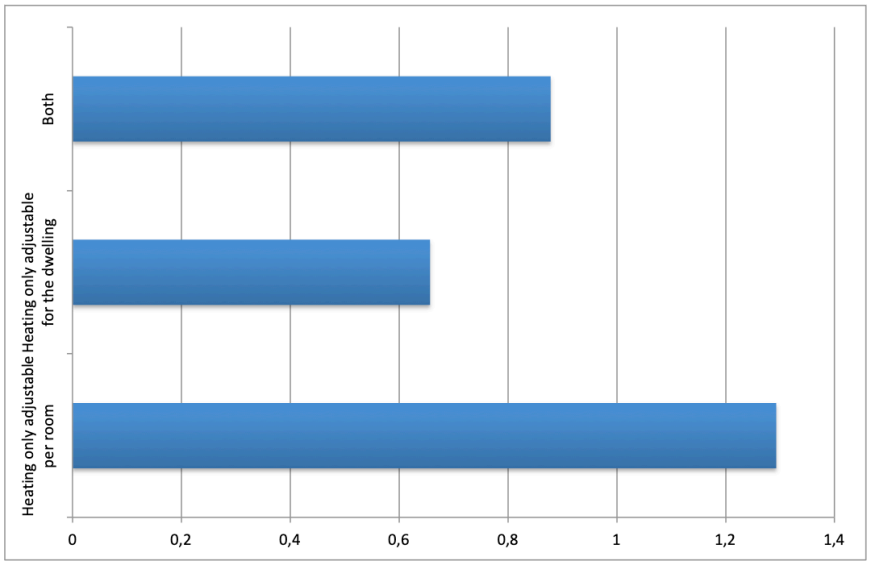


Figure 13: Average reported reduction in temperature in °C during the survey period per heating regulation possibilities (Data source: baseline and weekly surveys; N=265)

When looking at how temperature reduction is distributed according to household types (Figure 14), we observe that single persons were more able to reduce their indoor temperature, while households with elderly persons had more difficulties in reducing their indoor temperatures.

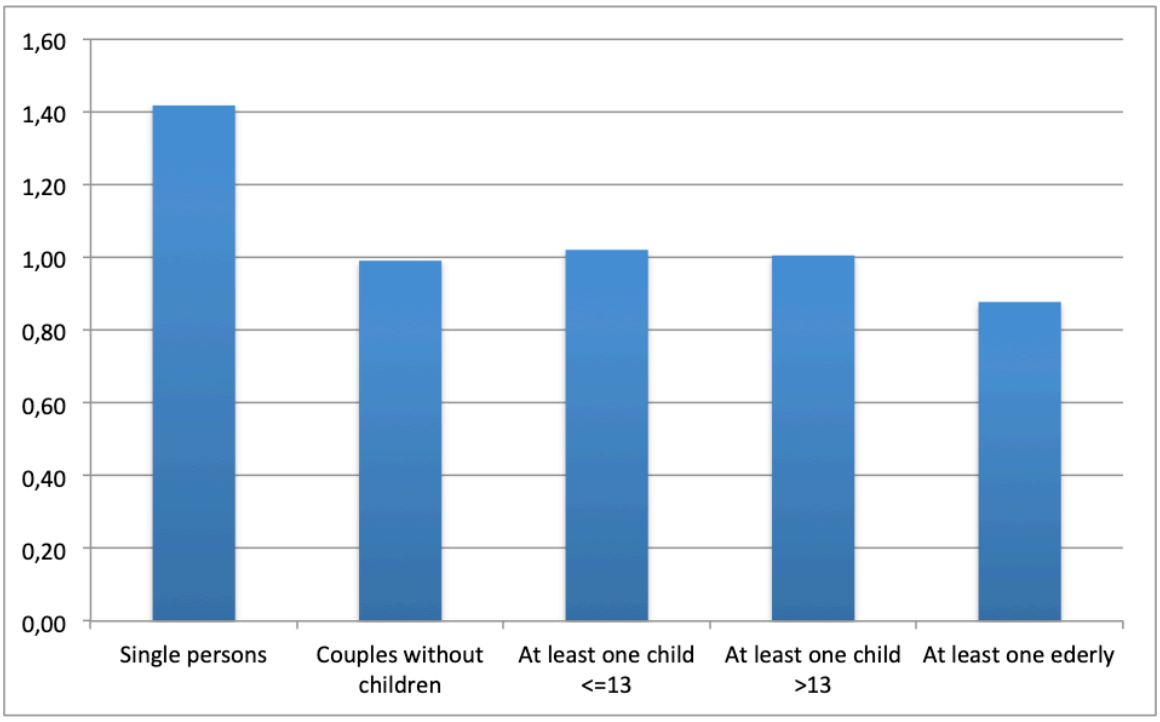


Figure 14: Reported reduction in temperatures (in C°) between the average before and during the challenge per household composition
Data source: weekly surveys (N=258)

We have also analysed heating changes according to education level, age of the building and date of the last major renovation, but have not found any evidence to suggest a significant relationship.

3.6.2 LAUNDRY PRACTICES ACROSS HOUSEHOLDS

We have seen in the discussions above that laundry is still a gendered practice, much more so than heating. We have also demonstrated that the decrease in laundry cycles very much varied across countries. In fact, this is mainly explained by the size of households, as shown in Figure 15. There seems to be a slight progression of the number of laundry cycles in function of the number of members in the households, which is rather logical: more people, more clothes to wash. It is not obvious however how the number of household members influences reduction in laundry cycles. One-person households reduced their laundry cycles by about 24%, 2-person households by about 26%, 3-person households by about 22%, 4-person households about 26%, and 5-person households or more about 30%.

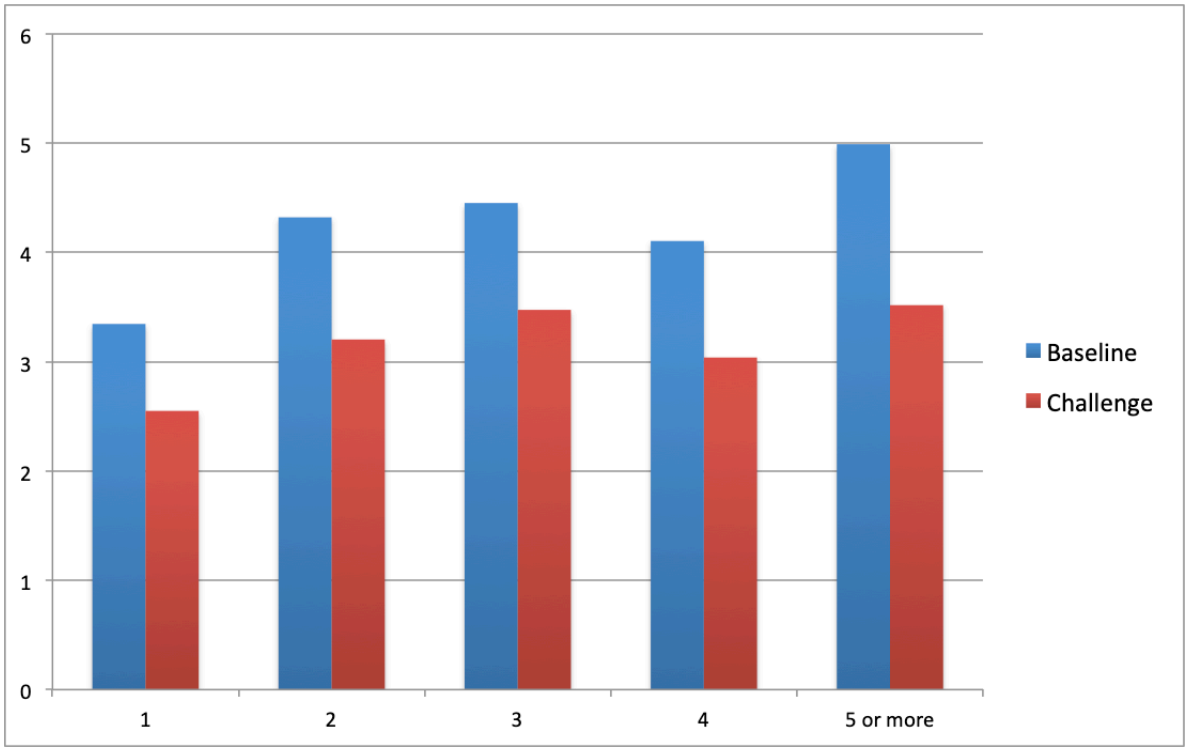


Figure 15: Average weekly laundry cycles per household size, before and during the challenge
Data source: weekly surveys (N=296)

We have not observed any significant relationship between the reduction of laundry cycles and the education level of participants, but a notable gender difference was observed. Given that the sample was biased towards women, and based on both quantitative and qualitative data analysis, it seems that women had either more room for manoeuvre or were more enthusiastic about the challenge than men. It is also noticeable that when both women and men are doing laundry in the household, the decrease of laundry cycles is not so significant (Figure 16). This might be also due to a question of coordination and organisation within households. We have indeed observed that in some cases, when laundry is a shared task, these households seem to be less 'organised', namely they do not coordinate all practices with each other and lead more 'independent' lives. These observations are primarily based on an analysis of the qualitative data, however it should be remembered that the sample is predominatly female.

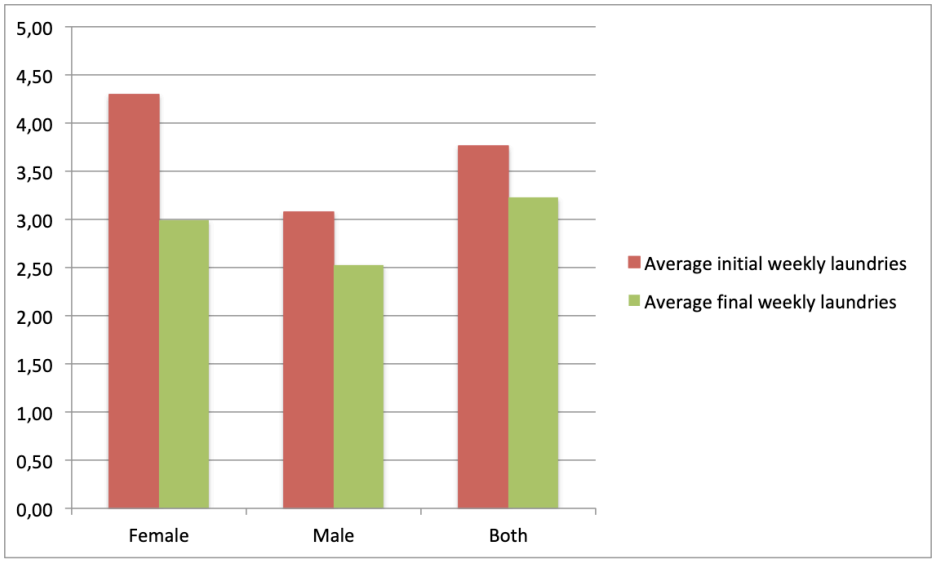


Figure 16: Average weekly laundry cycles per gender in charge
Data source: weekly surveys (N Female=225, N Male = 34, N Both = 25)

3.7 TOWARDS A CULTURE OF ENERGY SUFFICIENCY

Deliverable 1.2 (Rau and Grealis 2017) provides a conceptual framework for apprehending social practices as recognisable patterns of doings and sayings, suggesting that manifestations of individual practices and combinations of different practices can be culturally specific. In this section, we suggest that there are different ways in which people came to engage with the ENERGISE Living Labs, which reflect cultures of energy use that can be defined into two types: a culture of efficiency and a culture of sufficiency. As discussed above, we define sufficiency in this report as including absolute reductions in consumption, as well as the need to grapple with the difficulty of making changes to everyday life (see Sahakian et al. 2019a), thus sufficiency is achieved when people experience absolute reductions in consumption levels, as well as a willingness to challenge conventions. This approach to energy sufficiency makes the ENERGISE project quite unique: as documented in Jensen et al (2017) and based on a review of over 1,000 sustainable energy consumption initiatives across Europe (SECIs), a vast majority are focused on efficiency measures.

3.7.1 SUFFICIENCY POTENTIAL FROM THE ENERGISE LIVING LABS

One way of documenting the reductions was through diaries and metering, whether on washing machines or thermometers in rooms. As we have stated above, these new elements were introduced into the households as parts of challenges (in many households, thermometers were not a common fixture prior to the ELL challenges). People enjoyed making them a part of their routine; in other words, it was the routinised filling out of the diaries and surveys, as well as the consultations of the thermometer and energy meters which gave them a sense of direction in their mission – towards absolute and relative reductions in heating and laundry respectively. This suggests that sufficiency can be achieved when people are given tools that are meaningful to them (as a means for achieving a goal) or as part of a social learning process, where they are learning by doing (in completing the diaries, for example). Looking at the quantitative data, we observe reductions in laundry cycles and indoor temperatures as illustrated in Figures 17, 18 and 19.

The in-depth analysis of sixteen qualitative interviews (two transcripts for each country) chosen as especially telling in relation to sufficiency uncovered the potential of challenges for supporting the transition towards more sustainable energy consumption practices. What we have analysed below are the different starting points, from which people engaged in sufficiency measures in the households. There are three ways the ENERGISE Living Labs encouraged a culture of sufficiency during and after the challenges: 1) for some households, the challenges and the changes they induced **built on pre-existing practices** towards sufficiency, which mostly meant the intensification of established strategies; 2) for others, the challenges lead to the translation of **pre-existing desires to experiment with sufficiency into actual practices**, and reinforced "reducing" as a general principle for consumption; 3) finally, for many participants who were not thinking about sufficiency or acting on it necessarily, **the challenges acted as a trigger, representing a first step** in the transformation of consumption practices and setting off a chain reaction that impacted other consumption domains.

1. **Building on actual and pre-existing sufficiency practices**

For people who perceived that they already had engaged in sufficiency practices in relation to laundry and heating, participating in the living labs was especially challenging, since it meant pushing even further new habits they have developed over the years. At the beginning, a feeling that not much more can be done to lower consumption seems to be dominant, quickly followed by the surprise that it actually is possible to reduce even more, especially in relation to laundry. These households will go further in breaking from the norm and might even compromise on cleanliness.

As one participant from Finland puts it (FI29), *"If I start compromising in cleanliness and hygiene, you cross a certain line and it's dangerous".* This can manifest itself by trying new, 'risky' ways of doing laundry or by changing practices. For example, another participant decided to stop showering every day, following the challenge. "Pushing too far" for laundry sometimes leads to some discomfort while in a public space, or to people being more self-conscious, but going over one's limit in relation to heating very much awoke negative feelings. One woman in the UK who lives at particularly low temperatures says: *"there would be a point if it had gone below 12 degrees and I was really miserable, I would have put the heating on so I didn't feel it was that I wasn't allowed to: I was just seeing how far could I, how much could I tolerate" (UK13).* The households who built on actual practices during the challenges had a stronger tendency for advocacy: they brought themselves to their limit in the hope that this would also demonstrate to others what is possible, in terms of reducing consumption. As one participant in Ireland explained (IE03), *"I think you have to plant the seed and it takes a few years for people to come around to your way of thinking."*

2. **From desires to sufficiency practices**

For some households, people felt they were already doing quite a bit, but the ELL challenges actually pushed them to do more, by engaging them in laundry and heating measures towards sufficiency. There were strong positive emotions associated with testing out the challenges, as a UK participant explained*, "…we just kind of enjoyed it being a bit like a test but now it's just what we do so for us it was great in that regard (UK02)."* In Denmark, a participant explains how engaging in the ELLs was a game that created a healthy spirit of competition among household members who initially did not feel they could improve their practices, but then continued the laundry challenges even after the challenge stopped (DK247). They would push back the day for doing laundry as much as possible, *"that's got to be able to wait until Friday",* as expressed by the participant, who goes on to explain the positive spillover effects*: "And it's the same when I do my grocery shopping and I think about using some of the leftovers, I've become more conscious about what I do because of this laundry routine."* The family is now reflecting on changes they can bring to their diet: *"We like meat, but we do reflect over how we could eat less. We haven't taken up the vegan-meat solution yet, but I am definitely conscious about adding more vegetables to our food".* When asked whether the challenge created the opportunity for these new reflections and actions, the response was that it created an opportunity to put into practice the desires they already had: "*Yes, it's definitely bolstered the thoughts we were already having",* says one partner, to which the other responded, *"Yes, that's the right word, bolstered."*

3. **Triggering a change in attitude and practices**

Several households selected for exit interview transcripts also explained that they did not necessarily think about or practice sufficiency, and that the challenge acted as a trigger for changes in both attitudes and actions (this was the case for one household, from the two households selected for full transcripts in Hungary, Denmark and Ireland; and both of the households selected in the Netherlands). For these participants, the ELL raised awareness in regards to the need to reduce consumption, but mostly to the fact that it is possible to change habits in regards to laundry and heating, but also other domains of everyday life. One man from Denmark (245) discussed the impact of the challenges on his family's stance on environmental issues: *"And we've generally been discussing ways to reduce our consumption on other things as well. Because everyone's always so set in their ways of doing stuff, right? And it's been great to become more conscious about it because we were forced to. I think that's been really good."* Similarly, a Finnish (25) woman tells how the challenges empowered her to act on climate change by reducing her carbon footprint. She says she could prove to herself *"that one small person or household can do something about it."* In other words, the ELL empowered her to act where she had been feeling powerless. Saving water by using the "eco" option on the dishwasher, showering less, reducing the amount of plastic and food waste and sharing their experience to try and

convince their friends and colleagues to reduce their consumption were all approaches used by participants to lower their carbon footprint and promote a reduction in consumption.

Regardless of the starting point, for both indoor temperatures and laundry cycles, most households were able to experience reductions in laundry cycles and indoor temperatures, as demonstrated in the figures below. Yet these starting points tell us something about cultures of energy reduction, whereby searching for ways to be more energy efficient – in saving energy through A++ appliances, for example – is contrasted to a quest for sufficiency. This suggests that more could be done to promote a culture of energy sufficiency, when it comes to designing and implementing initiatives aimed at reducing household energy use.

The following graphs display the evolution of living room temperatures, bedroom temperatures and weekly laundry cycles as reported by households in each country. Although the weekly surveys began at different moments in each country (ranging from the 10th of September 2018 to the 24th of October 2018), the challenge scheme was designed in the same way in all countries: it started with 4 weeks of measures before the laundry challenge was launched (from week 5 to week 8), followed by the heating challenge (week 8 to week 11). When available, data from the final and follow-up (3 months after the challenge ended) surveys are included. The three graphs show general decreasing trends and a reduction of the dispersion of measures toward sufficiency. In some countries a slackening can be observed after 3 months, whereas in other countries the trend continues.

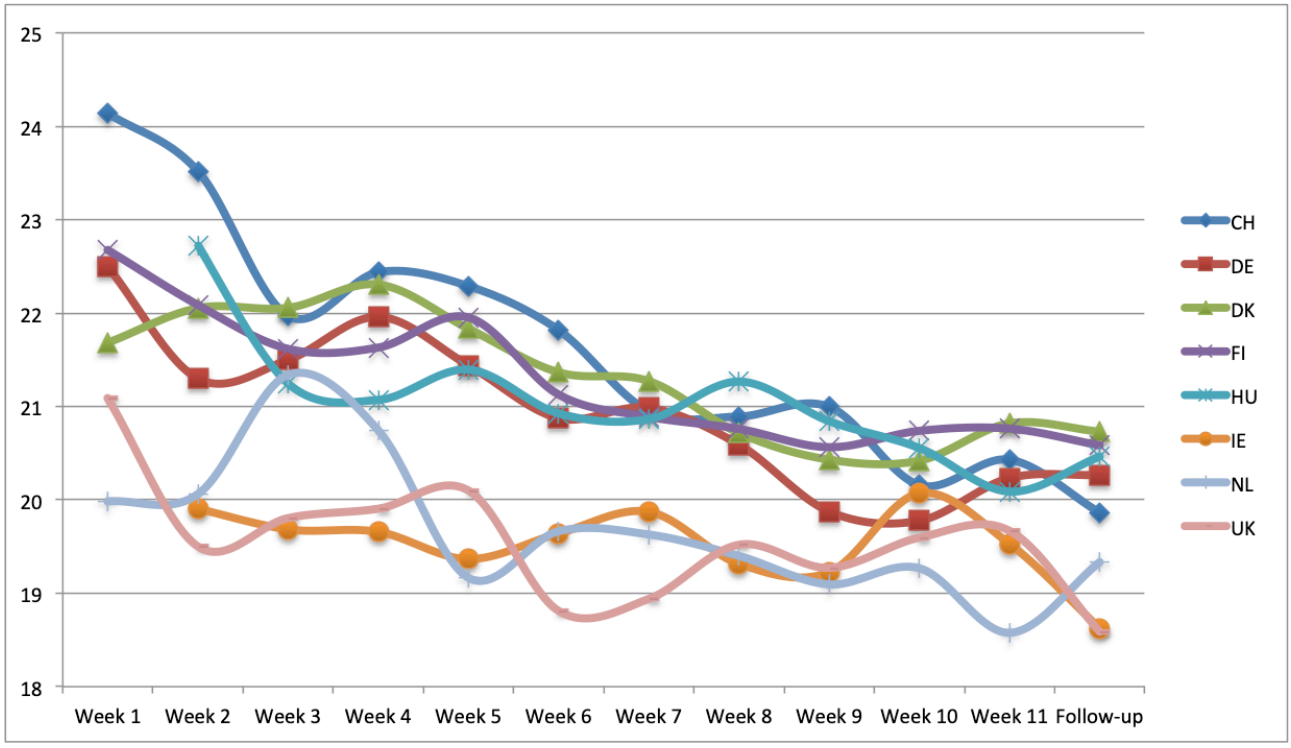


Figure 17: Living room temperatures before, during, immediately after and three months after the challenge

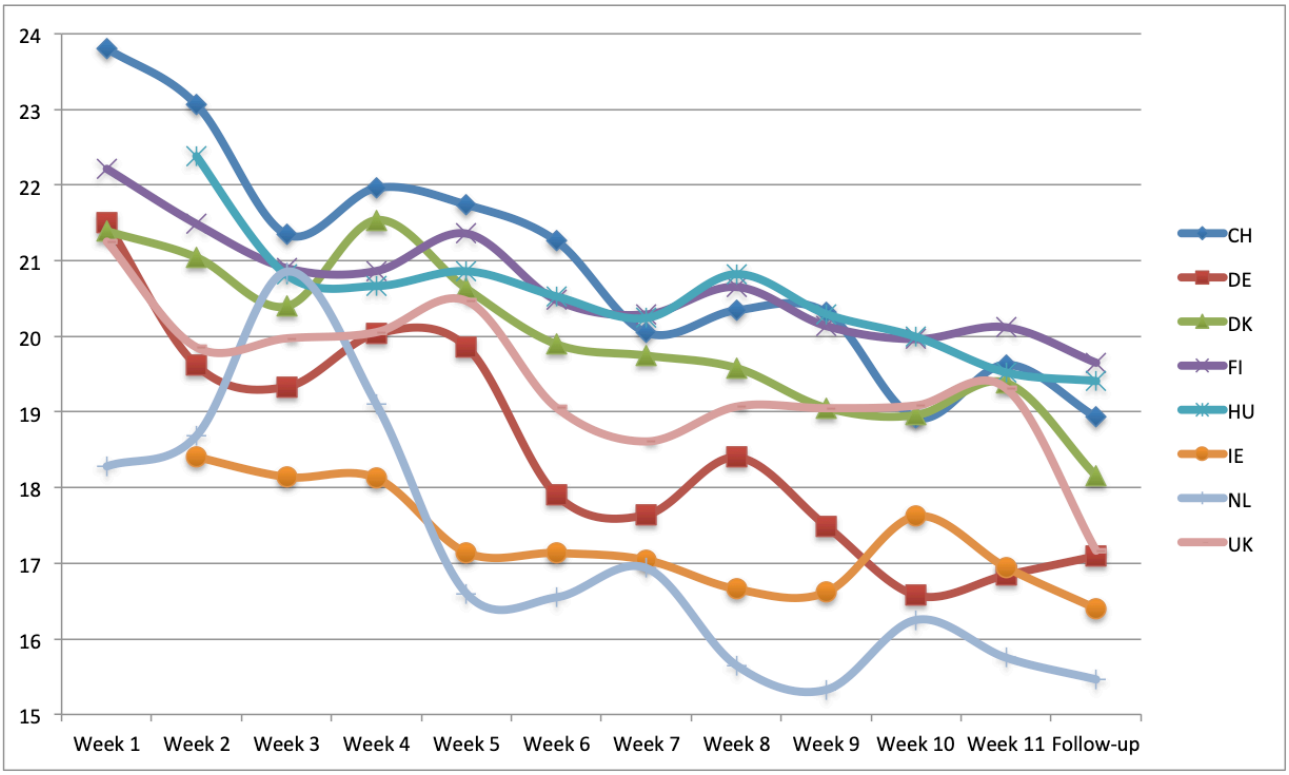


Figure 18: Bedroom temperatures before, during, immediately after and three months after the challenge

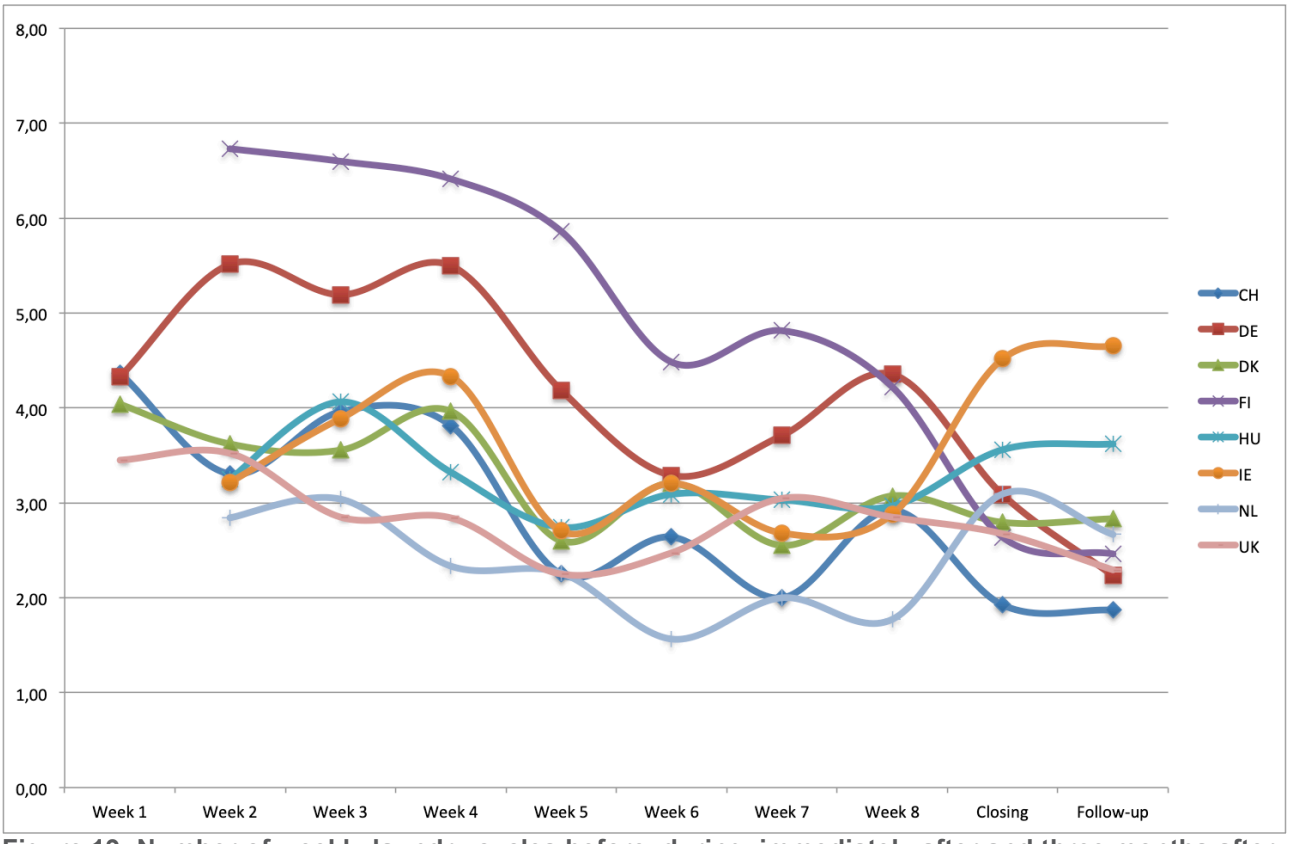


Figure 19: Number of weekly laundry cycles before, during, immediately after and three months after the challenge for the different countries

3.7.2 POSSIBLE SPILLOVER EFFECTS FROM THE ELLS

Sufficiency also implies that negative rebound effects are accounted for, and, if possible, translate into positive rebounds – or reductions across other consumption domains. We call these rebounds positive spillover effects (as they have not been quantified in terms of rebounds), and detail them below.

Possible spillover effects have not been quantified in this study, but we do have some indication as to how and in what way the challenges helped people reflect on other consumption domains. In some cases, reflections were made on mobility and food consumption. As this Finnish participant explains:

> *Right now, I can easily say I'm glad we did it because I had such an epiphany about the laundry, and at the same time started to think about all the other things that we could do. It feels like we've been in it for weeks, so we can't just stop it here, we might as well try other things too (FI25).*

Some of the spillover effects are related to **how people talked to others about the challenge**, for example in this Danish household:

> *It's more that I've told everyone about this project. I talk a lot, and this is a great subject to talk about. And I also think, if you could get others to join in, that would be a good thing, right? And then we've also talked about whether others perhaps think we are a little dirty, because we are trying to wear the same clothes for a longer time, but I haven't felt dirty at all, nor smelly. Not after it's been airing on a clothes' line. And I know I've had a cold (laughs), but I don't assume that people sitting next to me wouldn't have said anything to me. And I definitely haven't felt it in any way. (DK245)*

Most people stated at the end of the project that they shared their experience with friends and relatives. However, the rate of sharing, the type of people, and the media channels used differed greatly from one country to another.

Asked about the possibilities to convince other people to engage in similar challenges, an Irish participant (IE05) suggests "*an emotional insight maybe guilt, people in the world, children, you know stewardship. There's a lot to encourage people to follow the right path*." A Finnish woman (FI29) discussed how her actions awoke hope in her and other people, in that she seems to have inspired many people around her to engage in reducing their consumption:

> *I really liked that comment. And it came from a 2-meter bodybuilder guy with a golden lion chain[15] around here, who has the biggest protein intake in the world, and he says, 'how wonderful to have you as role model for others.' I was like okay, this one was like yay, there's still hope in the world when a person whose diet is based on meat has started thinking about these things and thinking about solar panels, and is like really, thinking about something else besides his muscles. [laughs] That's nice."*

Most participants recognise the need to scale-up their efforts, either in encouraging more people to reduce their consumption, or in taking collective measures to reach the same goal. In any case, the strong engagement of ELL participants towards reducing energy use is revealed through their own emotional response, but also through their suggestion to appeal to other's emotions to bring more people to adopt such practices. This leads to believe that **emotions could be a powerful tool** for turning individual sufficiency practices into collective action and policy.

[15] Finland's coat of arms depicts a lion, and wearing a chain like this is considered a sign of nationalism (hence, perhaps not so much environmentalism).

Positive spillover effects of the challenges were also discussed in the closing focus groups for ELL2 participants. The most common practices affected by the challenge were related to other appliances, such as the reduced use of the dishwasher or the tumble dryer. ELL2 participants were also more careful about turning off unused appliances and lights. Water usage was also mentioned often, with participants being more aware of how much water they consumed. Shopping habits were assessed by Hungarian, Finnish and Danish participants in ELL2. Some mentioned being more careful about which clothes to buy to reduce the need to do laundry (some even reflected on the amount of clothes that they owned), others extended their efforts to electric appliances, food or other products such as soaps and detergents (the fact of bringing a bag when shopping was also mentioned). The topic of mobility (especially the use of a personal car) was also discussed by some participants, as well as renewable energy. Throughout all the countries, ELL2 participants enjoyed engaging in the challenges. They felt proud to be part of the challenge, and to actually be able to try out new ways of doing. Some mentioned that they would like to participate in other challenges. They appreciated sharing the experiment with other participants as well as family members, colleagues or friends. They also appreciated learning new things from other people and from the ELL researchers and implementation partners. Most of all, they enjoyed having reflected on their practices, having a more profound point of view on them, and being able to evaluate them.

PART 4: IMPLICATIONS FOR PUBLIC POLICY AND PRACTICE

In relation to the implications of our ENERGISE Living Labs (ELLs) for public policy measures and media/communication opportunities, the following results are based on a) an analysis of the ELL data and b) a workshop organised at the ECEEE[16] Summer Study (June 2019), where preliminary results were discussed in an informal session with fifteen participants, including practitioners and researchers involved in energy studies. This summary is intended for different audiences, from policy-makers at the European Union, as well as national and local levels. We also reflect on what the implications of the ELLs might be for other stakeholders, beyond households, such as civil society, utility companies or research communities.

4.1 KEY MESSAGES FOR REDUCING AND IMPROVING HOUSEHOLD ENERGY USE

All sectors have a role to play in reduced and improved energy use across Europe. If households are to play a role in energy transitions, and assuming that such households are at an average baseline in relation to energy use (i.e., excluding households experiencing energy poverty), then the ENERGISE results demonstrate that significant reductions are possible.

Table 1: Average changes in reported temperatures and wash cycles during ELLs
(Data source: weekly surveys; averages taken before challenges, and during challenges)

Change in temperatures		Change in weekly wash cycles		
Living room	**Bedroom**	**Family of 2**	**Family of 4**	**All**
From 21.12°C to 20.16°C	From 19.97°C to 18.58°C	From 4.3 to 3.2	From 4.1 to 3.0	From 4.2 to 3.1
1 degree (0.96°C)	1 and a half degrees (1.39°C less)	1 cycle less (1.1, or 26% reduction)	1 cycle less (1.1, or 26% reduction)	1 cycle less (1.1 or 26% reduction)

At a minimum and as a **key policy message**, we can state that:

- **Reducing indoor temperatures by 1°C** in the winter months is possible and not *un-comfortable*. Directly after the challenges, households were able to reduce indoor temperatures by (on average) 1° C in living rooms, comparing the temperature before and after the challenge.

- **Reducing by 1 laundry cycle per week** is possible and not *in-convenient.* Directly after the challenges, households were able to reduce laundry cycles (on average) by one cycle, comparing wash cycles before and after, and for those who were not already below a certain threshold. Energy and water use can also be reduced through shorter cycles, or lower temperature settings, along with less use of dryers and less ironing.

[16] European Council for an Energy Efficient Economy.

Box 1: Example of how the key policy message translates to the Swiss context

All sectors have a role to play in reduced and improved energy use across Europe. If households are to play a role in energy transitions, and assuming that such households are at an average baseline in relation to energy use (i.e., excluding households experiencing energy poverty), the following savings are possible over a one-year period:

One less laundry washing per week per Swiss household for a year represents a saving of around 13 million m3 of water (more than 5,000 Olympic-size swimming pools), 10 million litres of laundry products and the equivalent annual electricity consumption of 90,000 households. One less laundry cycle per week is also estimated at saving one hour of domestic work per week.

1°C drop in room temperature, during the winter months when buildings are heating, results in an estimated saving of 6% of all energy dedicated to heating homes in Switzerland. This represents almost twice the energy needed for all laundry and drying requirements in Switzerland for one year[17].

1. **Changing practices, not people, nor technologies:**
   - According to our analysis of over 1,000 initiatives aimed at sustainable energy consumption in households across Europe, a vast majority focus on changing individual behaviours or individual technologies. These approaches have not proven sufficient to date.
   - Rather than focusing solely on efficiency gains, by changing people's behaviour or their use of more efficient technologies, prioritise an approach to household energy use that embeds energy use in everyday practices and complex interactions between practices.
   - Complex interactions between practices involve accounting for people's skills and competencies, representations of social norms, and material arrangements in relation to different recognisable patterns of activities in the home, such as doing laundry or preparing a meal. This is a more complex understanding of how changes take place, as opposed to behavioural change that focused on the individual.
   - Changing practices can be achieved when people are given a space and time for experimentation (as discussed directly below), as well as engaging people in strong positive emotions.
   - Rather than relying solely on better information or more efficient technologies as the main impetus for social change, engaging and empowering people in new ways of doing – laundry and heating, in this case – is impactful in terms of reducing energy consumption, but also in terms of potential positive spillover effects.

2. **Giving people the space and means for experimentation:**
   - There is high potential in forms of experimentation or pilot initiatives that engage people in changing their practices for limited periods of time, at individual and community levels.
   - An approach based on a social learning process, and not a competition, is a key factor for success. The objective of such forms of experimentation is to learn together (between households, associations, researchers, and other actors), with an explicit focus *away* from 'energy saving' as the sole aim, through a deliberative and reflexive process.
   - Creating spaces for reflexivity, involving different actors such as households, associations, and researchers, can be very effective for discussing and debating

[17] This data was calculated for the Swiss brochure presenting ENERGISE results, Godin et al. 2019.

what tend to be tacitly accepted norms and assumptions around consumption practices.

- Aim for forms of engagement that seek to guide and support, rather than prescribe and govern; assume that people need not be told what to do, but rather should work collaboratively to set targets, share experiences, and discuss issues that directly affect their wellbeing and that of their friends and family.
- Nonetheless, it is important to provide new knowledge or expertise when needed and required, for example on questions that might arise from the experiments – such as the carbon emissions of energy use in specific contexts and in relation to energy sources, or the effects of line drying on humidity levels and cold-wash on bacteria levels.
- Positive emotions can be a powerful vector for change, and for sharing experiences of change with others. Rather than rely on negative emotions such as blaming and shaming consumers, the positive emotions of being engaged in an experiment and sharing with others, of learning and trying out new ways of doing, are also important for change.

3. Heating bodies, rather than solely heating spaces:

- It is possible to engage in public discourse around the need to heat bodies, rather than solely spaces, during colder periods; for example, through media attention to the over-heating of buildings, or through outreach to building managers, engineers and architects. The normalisation of wearing a t-shirt indoors all year round can and should be contested in public debates, from classrooms to news programmes.
- As documented in our project deliverables, we found that there is an increasing trend to seek a controlled indoor standard for temperatures, such as the aim of achieving 22°C year-round. The quest for homogenous indoor microclimates, controlled at a 'standard' temperature year-round, is not a realistic goal – neither in terms of people's wellbeing, nor in terms of the energy required to achieve such a standard
- Heating bodies also recognises the great diversity of sensorial experiences in relation to heat, which have as much to do with age and mobility, as with the building envelope, type and orientation, and the outdoor climate.
- Heating bodies also recognises that people use space in different ways; there is a need to further reflect and design for different forms of space usage, such as working from home, for example, which requires specific heating.

4. Placing people and everyday practices at the centre of 'smart technology' approaches:

- We must ensure that people can continue to have an influence on their thermal comfort, rather than counting on smart buildings or invisible heating systems that allow only limited human interventions. Strategies that emphasise smart buildings and that assume that building users are un-smart or otherwise un-able to manage their own daily lives are to be avoided.
- Technological interfaces that make energy visible were useful in the ENERGISE project, but so long as they were the means to an end rather than an end in and of themselves; making energy use visible through 'smart' interfaces can be valuable, if and when they are useful to households who are engaged in achieving a target they have fixed for themselves, and related to activities that use energy. Material elements such as diaries also allow for reflection, without the need for technological interfaces.
- By placing people and everyday practices at the centre of 'smart technology' approaches, we assume 1) the capacity of people to be reflexive and creative, when it comes to reducing energy use in the home (and workplace, and schools, etc.) and 2) that energy use is tied up with complex interactions between

practices, which involve people's skills and competencies, representations of social norms, and material arrangements including smart technologies.

5. **Forgoing the low-hanging fruit, and aim for sufficiency in high-impact domains:**
   - A more holistic and balanced approach to energy use reduction is needed, shifting the focus from energy-using technologies, to practices in energy-intensive areas, such as heating, but also mobility and water consumption (depending on context).
   - There is an opportunity to engage in challenges that tackle these high environmental-impact consumption domains, rather than the low-hanging fruit – such as switching to more efficient appliances.
   - While we recognise that efficiency is necessary, we place an emphasis on sufficiency as a more urgent aim. There is a pressing need to focus on energy sufficiency, or consider absolute reductions in energy use.
   - We found that promoting a 'culture of sufficiency' through initiatives aimed at reducing energy use in the home, reduced energy use and changes in everyday habits and routines is possible.

4.2 LIMITS OF THE APPROACH

While we are enthusiastic about our approach and results, we recognise that the ENERGISE Living Labs represent certain limitations, in relation to how they might be transferred to different contexts and include a larger population.

1. **Recognise the resources necessary for engaging with everyday practices:**
   - The process of designing and implementing experiments such as ENERGISE Living Labs are 'resource-intensive' in that it requires much time and resources to convince and commit people to engage in such a project.
   - We could work to further understand how such initiatives can be amplified, for example through the involvement of the media, and how everyday people can also become change makers, towards taking on the initiative of deliberating with others and encouraging further participation in ways of reducing energy use.
   - Community based sustainable transition processes need to be driven and pushed forward by the citizens' strong engagement and commitment in order to anchor the sustainable practices over a longer term. There seems to be much of potential in designing interventions involving people to experiment with new ways of doing things over a longer period, which implied engaging energy intermediaries such as community associations working on energy issues.

2. **How to reach people beyond those already interested and engaged in energy issues:**
   - One caveat, however, is that such initiatives must find ways to go beyond people who are already interested and engaged in energy issues, as was planned with the ENERGISE project.
   - Working with people who are part of a community, such as a workplace, community centre, school parent association, or a gym, could be one way to transcend socio-economic boundaries, although this would need to be further investigated.

3. **How to move beyond individual approaches, to social forms of social change:**
   - Households can express frustration in performing sustainable practices while having to bear witness to others acting in unsustainable ways, which can be highly demotivating and even lead to negative effects (e.g., giving up, while others are consuming more, etc.).
   - How can initiatives that involve households, as citizens, allow for more collective actions that will lead to social change, such as organising collectively to generate renewable energies, engaging citizens to vote on pro-climate and pro-

renewable topics, or working across sectors through consumer groups to put pressure on the public and private sector to reduce energy use (e.g., ban on outdoor illuminated advertising)?

4.3 OPPORTUNITIES FOR AMPLIFICATION

The amplification of results from the ENERGISE project considers the role of diverse audiences in engaging with our key findings and approaches, as well as further disseminating and sharing them. Different stakeholders have a role to play in initiatives that aim towards changes in everyday practices, as outlined above.

1. **Media partners, both traditional (radio, television and print), and social media**, or the role of the media in relation to the following actions:
    - Demonstrate sufficiency lifestyles in relation to wellbeing, for everyday people (i.e., not an elite, and not sufficiency out of dire straits)
    - Show not only what is normal in terms of reducing, but also what is possible, in terms of reducing more. Therefore, consider a lower benchmark as dynamic rather than static (e.g., the TopRunner campaign in Japan is an upper benchmark for energy efficiency in appliances which must constantly be surpassed; our idea here it to have a similar initiative but for lowering energy use among households).
    - Engage in a media partnership to 'follow' households through a challenge; this partnership could include both online and offline forms of engagement, through social media for example.

The power of the media in communicating normative statements about indoor comfort and laundry/cleanliness is well recognised, as documented in this citation by a Finish participant in the ELL challenges:

> *(…) there was an article in the evening paper about "yuck, don't you wash your pillow cover every week" or something, whatever it is, how disgusting it is and I think like, okay, I've never thought that it's disgusting but articles like that are really harmful because they make people think that…But what does it matter if you don't wash your pillow cover every week or every two weeks or even once a month? If it doesn't smell and it's not dirty why should you wash it? But you see baffling things like this, and what kind of bacteria can be on the pillow that's super harmful? I've never heard of bacteria like that which destroys your brain, if you don't wash it. [laughs]* (F129)

2. **Social or peer groups**
    - We recognise the powerful role of social or peer groups in social learning.
    - Thus, opportunities for amplification through challenges or other forms of social learning could engage with peer groups. For example, they could be integrated into educational programmes underway, at different levels – from school programmes to community learning offers.
    - One benefit of working through education rather than households is that the learning programme could aim to engage with a specific age group, or peer group, and tailor challenges or specific initiatives to these peer groups.
    - Working with people who are part of a community, such as a workplace, community centre, school parent association, or a gym, could be one way to engage with peer groups.

3. **Small to medium enterprises, the building and design industry, and new business development ideas**
    - We would recommend that new business development ideas start by focusing on practices, rather than solely on energy savings.

- Consider the role of businesses invested in social innovation to further support energy sufficiency; sharing and repairing of appliances might be one way forward.
- Such businesses could also become sites for challenges, as they represent a community of place for employees.
- Consider the role of different actors in the systems of provision that relate to heating and laundry. For example, the role of building managers and owners, in the case of tenants; the role of architects, engineers and designers, in shaping material arrangements of homes in relation to heating systems and laundry. For example, this could involve encouraging shared spaces for laundry in buildings, rather than privatised laundry machines per household.
- In following a practice-based approach, we found that people should have a dedicated place for slightly used clothing that can be reused without washing, or the possibility to air-out clothes. However, this place is often lacking in homes. Specific (aired) closets or racks for such clothing might be diffused via interior designers. Shared laundry facilities, if not in buildings then on floors of buildings, could also be a design consideration in sustainable buildings.

4. Cities and municipalities, as well as the utility sector, and energy intermediaries.

- Cities and municipalities can play an important role in defining the conditions for everyday life, and can play an active role in promoting different forms of experimentation.
- Thus, the key messages presented above could be taken into account when cities and municipalities plan energy-saving initiatives that involve the household sector.
- In addition, the utility sector – including electricity and heating distributors – can play a role, along with energy intermediaries, or different community groups or associations that work on energy issues.
- Households could also be provided with training to further understand their heating system; this can be organised at key life stages, such as moves into a new home.

5. Non-energy-related policies

- There are a number of policies that are not directly related to energy use but have an important influence on how energy services are used in the home; these policies should also be accounted for, in a cross-sectoral approach.
- These can include but are not limited to indoor temperature standards, urban planning standards, labelling on clothing items (which indicate wash standards), among others.

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ENERGISE

EUROPEAN NETWORK FOR RESEARCH, GOOD PRACTICE AND INNOVATION FOR SUSTAINABLE ENERGY

ANNEX 1: ENERGISE LIVING LABS: PROCESS, DATA SOURCES, ANALYSIS AND OUTPUTS

<table>
<tr><td rowspan="3">ELL PROCESS</td><td>ELL1</td><td rowspan="2">Recruiting and selecting households</td><td rowspan="2">Baseline survey</td><td rowspan="2">First visit: installing metering equipment, starting the temperature and laundry diaries</td><td colspan="4">Collecting meter data, diaries, weekly surveys</td><td rowspan="2">Monitoring survey

and

Closing community event with ELL participants and stakeholders</td></tr>
<tr><td rowspan="2">ELLL2</td><td rowspan="2">Deliberation interview (second visit)</td><td rowspan="2"></td><td rowspan="2">Closing interview (third visit)</td></tr>
<tr><td>Laundry challenge</td><td>Heating challenge</td><td>Closing survey</td></tr>
<tr><td></td><td>Deliberation focus group</td><td colspan="2"></td><td>Closing focus group</td></tr>
<tr><td rowspan="3">DATA SOURCES</td><td rowspan="3"></td><td rowspan="3">1. Recruitment survey</td><td rowspan="3">2. Baseline survey</td><td rowspan="3">3. Diaries (Temperature and Laundry)

4. Thermo-logger data</td><td>5.A Interview feedback forms</td><td rowspan="3">7. Weekly surveys (continued: 3. Diaries, 4. Thermologger data)</td><td>8.A Interview feedback forms</td><td rowspan="3">9. Closing survey</td><td rowspan="3">10. Monitoring survey (approx. 3 months after end of challenges)</td></tr>
<tr><td>5.B. Focus group feedback form</td><td>8.B Focus group feedback form</td></tr>
<tr><td>6. Challenges undertaken</td><td>8.C. two interview transcripts</td></tr>
<tr><td>ANALYSIS</td><td colspan="9">Country-based data cleaning and organization, summaries and translation: provided by eight national teams (ALL DATA SOURCES)
Cross-national quantitative data cleaning and analysis: by the University of Helsinki (DATA SOURCES 1-4, 7, 9-10)
Cross-national quantitative data analysis, and qualitative data coding and analysis: by the University of Geneva (ALL DATA SOURCES)</td></tr>
<tr><td>OUTPUTS</td><td colspan="9">Eight ELL country reports (all partners)
Report on ELL quantitative data analysis (University of Helsinki)
Report on analysis of ELLs (University of Geneva, with all partners as reviewers)</td></tr>
</table>

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ENERGISE

EUROPEAN NETWORK FOR RESEARCH, GOOD PRACTICE AND INNOVATION FOR SUSTAINABLE ENERGY

ANNEX 2: SOCIODEMOGRAPHICAL DATA OF ALL ELL PARTICIPANTS

Household size (n= 296)	1 member	2 members	3 members	4 members or more
No.	39	89	40	128
%	13%	30%	13%	43%

Age of contact person (n=295)	34 or younger	35-44	45-54	55-64	66 or older
No.	32	73	95	56	39
%	11%	25%	33%	19%	13%

Employment status of contact person (n=252)	Full-time employed or entrepreneurs	Part-time	Student/ Unemployed	Retired
No.	161	52	9	30
%	64%	21%	4%	12%

Educational level of contact person (n=306)	Tertiary	Secondary Phase/Vocational	Primary	Other or unknown
No.	176	64	8	63
%	57%	21%	3%	20%

Type of dwelling (n=298)	Apartment	Terraced/semi-detached	Detached	Other
No.	74	93	125	6
%	25%	31%	42%	2%

Age of dwelling, built (n=257)	before 1960	1960s-1970s	1980s-1990s	After 2000
No.	59	64	53	91
%	22%	24%	20%	34%

Tenure (n=257)	Tenant	Owner
No.	52	205
	20%	80%

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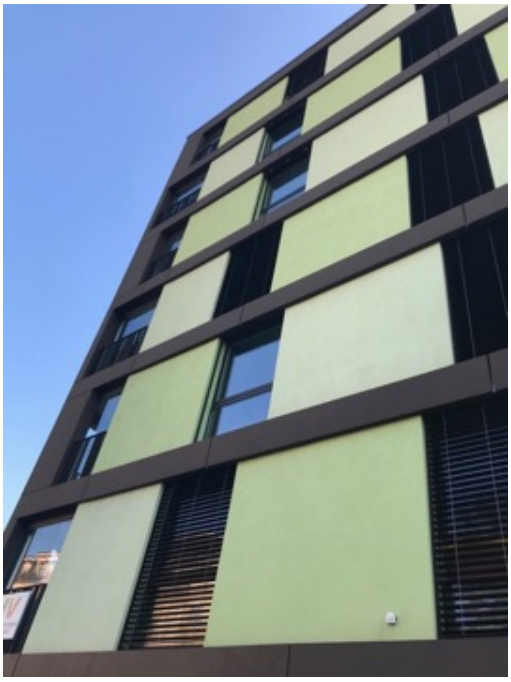
ANNEX 3: OVERVIEW OF DIFFERENT BUILDING TYPES ACROSS EIGHT EUROPEAN COUNTRIES

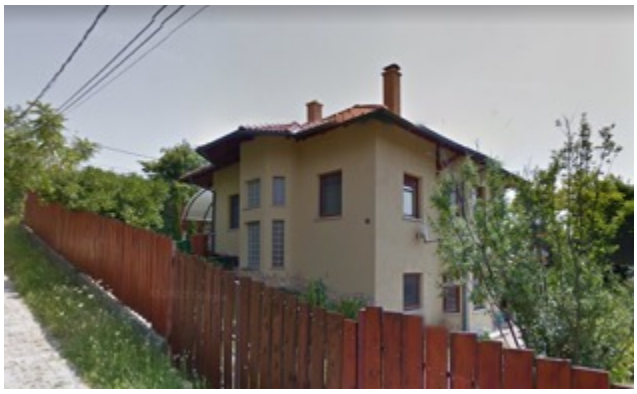
UK



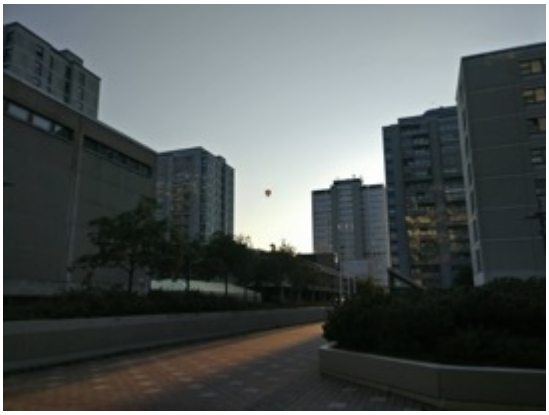
CH

NL


IE

HU




FI


DK

ANNEX 4: DATA FOR GRAPHS

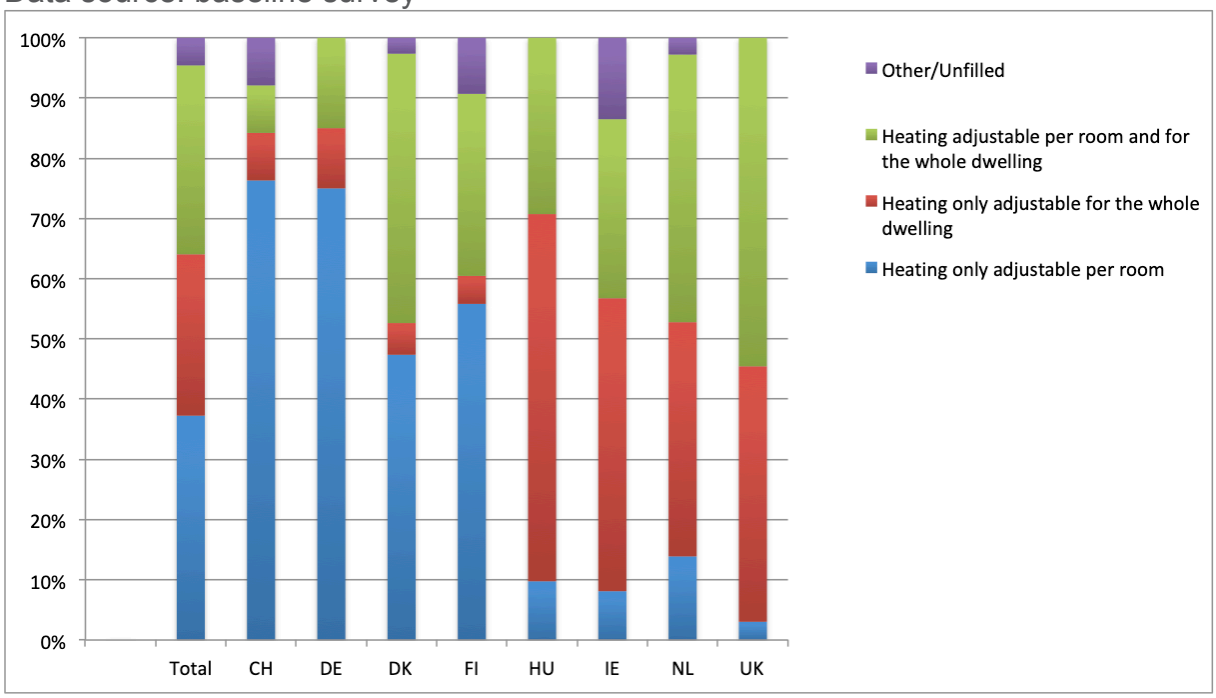
This annex gives details about which and how data have been used to build the various graphs in the document D5.2.
Many data have been collected in the ENERGISE project. The questionnaires are all available and described here: http://www.energise-project.eu/livinglab_materials. To make the graphs, we have used data coming from the following questionnaires:

- Recruitment
- Baseline
- Weekly surveys
- Diaries (used in some cases when data were lacking in weekly surveys)
- Closing
- Follow-up

In order to exploit the weekly surveys, data have been cleaned by each project partner then shared with the University of Helsinki for additional cleaning and streamlining. A few households did not provide enough information on their temperatures and laundry numbers. In this case the data have not been considered. For some graphs (realised by Tuija Kajoskoski, University of Helsinski), weekly surveys have been complemented with data from diaries. The data was then analysed by the University of Geneva and University of Helsinki teams, towards comparative analysis.
To evaluate the quantitative change consequential to the two challenges, laundry and heating, we have opted for treating the weekly surveys rather than the more general ones (e.g., the baseline and closing survey). Indeed, we find some discrepancies between the data in the baseline survey and in the first weeks of the weekly survey. The same is true for the last weeks of the weekly surveys and the closing survey. We hypothesize that general survey results are based on memory recall and may lead to more general statements, whereas weekly surveys are closer to ongoing practices and could be more accurate, as the households were invited to note down their figures and report back regularly. As a result, we choose to consider only weekly surveys to arrive at average changes in indoor temperatures and wash cycles, taking the average during the weeks before the challenge and the average during the challenge.
In order to analyse data on the basis of gender, we have indicated ‘male and female’ in cases where adults self-identified themselves as such. We constructed a category called ‘couple’ that is irrespective of gender and marital status, and based on two adults living together in a household. An adult is considered as being over the age of 25 for this study. We also create a category where the couple is male and female, to understand gendered dynamics around everyday practices, for example around laundry.
For each graph, the data source is indicated and a table is given with the figures and the number of answers for each represented sub-category.

FIG 4: HEATING REGULATION ACCORDING TO COUNTRIES

Data source: baseline survey



	Heating only adjustable per room		Heating only adjustable for the whole dwelling		Both		Other/Unfilled		Total
	N	%	N	%	N	%	N	%	N
CH	29	76,32 %	3	7,89%	3	7,89%	3	7,89%	38
DE	30	75,00 %	4	10,00 %	6	15,00 %	0	0,00%	40
DK	18	47,37 %	2	5,26%	17	44,74 %	1	2,63%	38
FI	24	55,81 %	2	4,65%	13	30,23 %	4	9,30%	43
HU	4	9,76%	25	60,98 %	12	29,27 %	0	0,00%	41
IE	3	8,11%	18	48,65 %	11	29,73 %	5	13,51 %	37
NL	5	13,89 %	14	38,89 %	16	44,44 %	1	2,78%	36
UK	1	3,03%	14	42,42 %	18	54,55 %	0	0,00%	33
Total	114	37,13 %	82	26,37 %	96	30,87 %	14	4,50%	306

N: number of households

FIG 5: HEATING REGULATION RESPONSIBILITY ACCORDING TO THE GENDER

Data source: recruitment and baseline survey

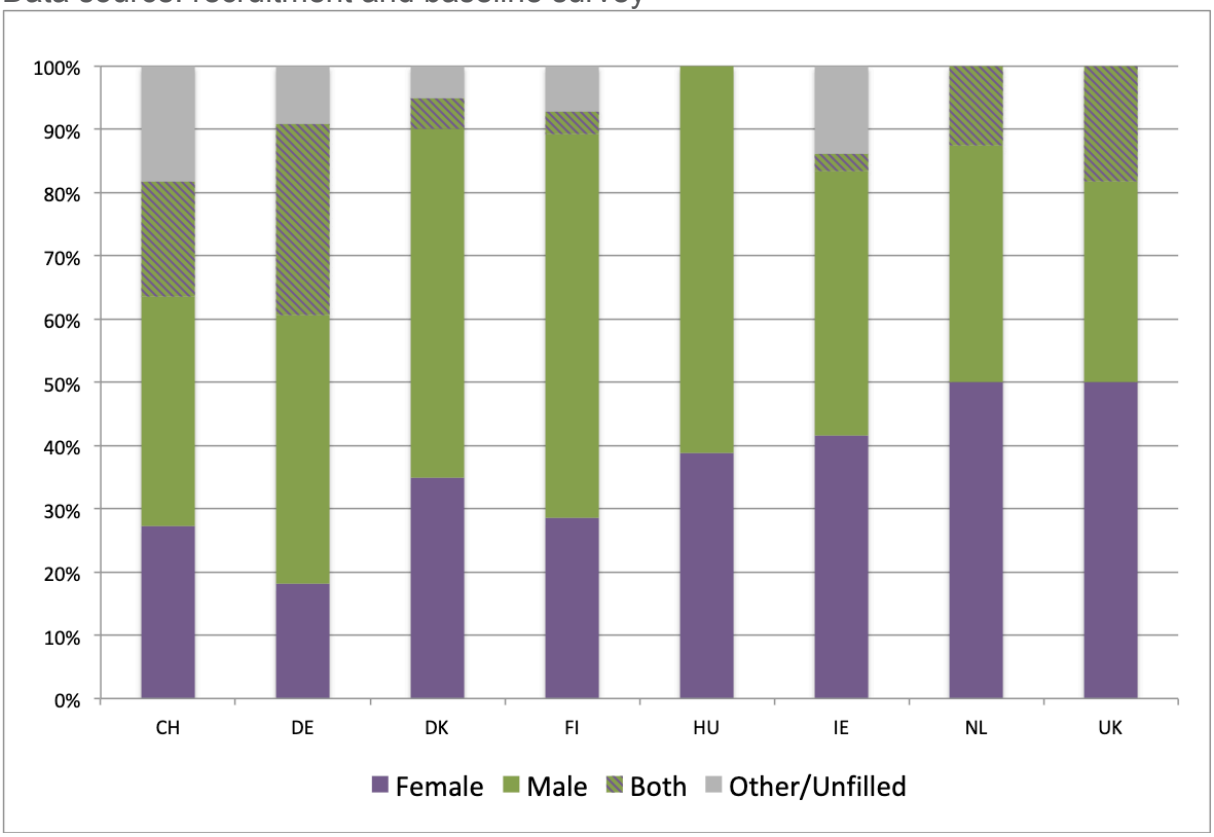
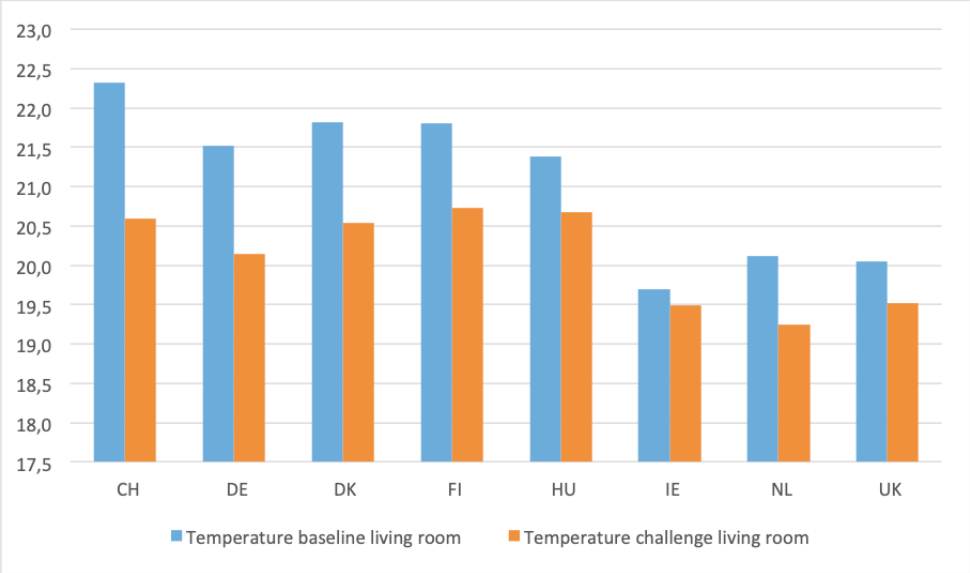


Table with the number of households:

	Female	Male	Both	Other/Unfilled	Total
CH	6	8	4	4	22
DE	6	14	10	3	33
DK	7	11	1	1	20
FI	8	17	1	2	28
HU	14	22	0	0	36
IE	15	15	1	5	36
NL	12	9	3	0	24
UK	11	7	4	0	22
Total	79	103	24	15	221

FIG 6: REPORTED LIVING ROOM TEMPERATURE BASELINE AND CHALLENGE

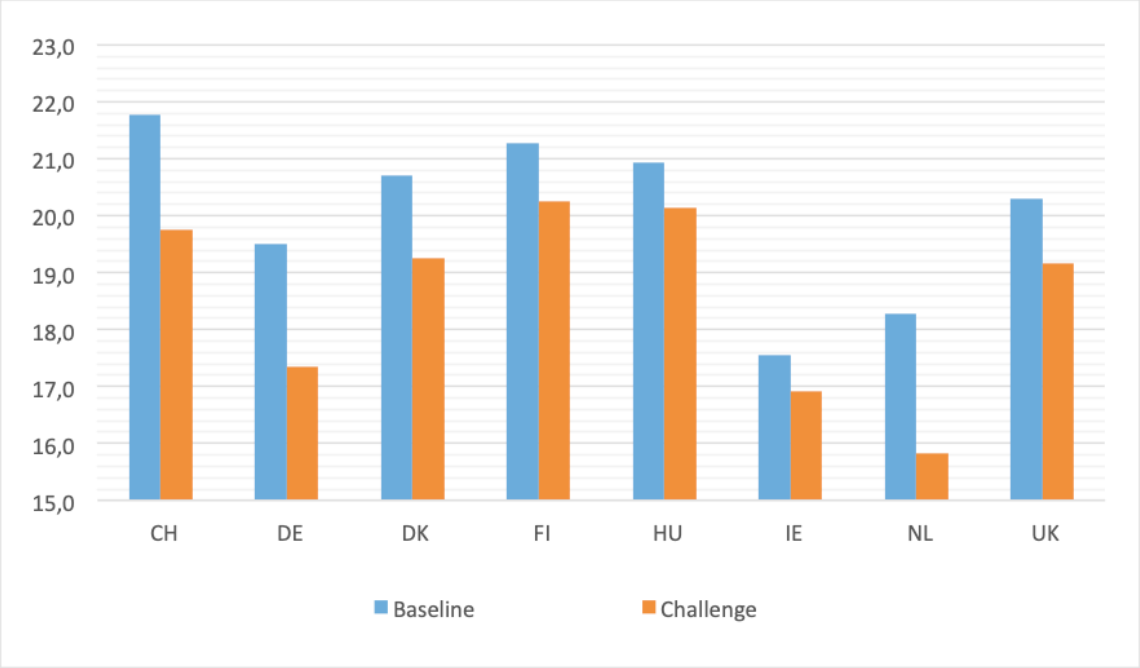
Data source: weekly surveys, completed with diaries.
The baseline is given by the average temperature before the challenge (weeks 1 to 7), and the challenge temperature is given by the average during the challenge (weeks 8 to 11).



	Baseline		Challenge	
	Average °C	Number of households	Average °C	Number of households
CH	22,33	34	20,60	31
DE	21,52	40	20,14	38
DK	21,82	38	20,55	34
FI	21,81	36	20,73	33
HU	21,38	41	20,68	41
IE	19,70	37	19,50	35
NL	20,11	33	19,25	31
UK	20,05	25	19,52	23
Total	21,14	284	20,16	266

FIG 7: REPORTED BEDROOM TEMPERATURES BASELINE AND CHALLENGE

Data source: weekly surveys, completed with diaries.

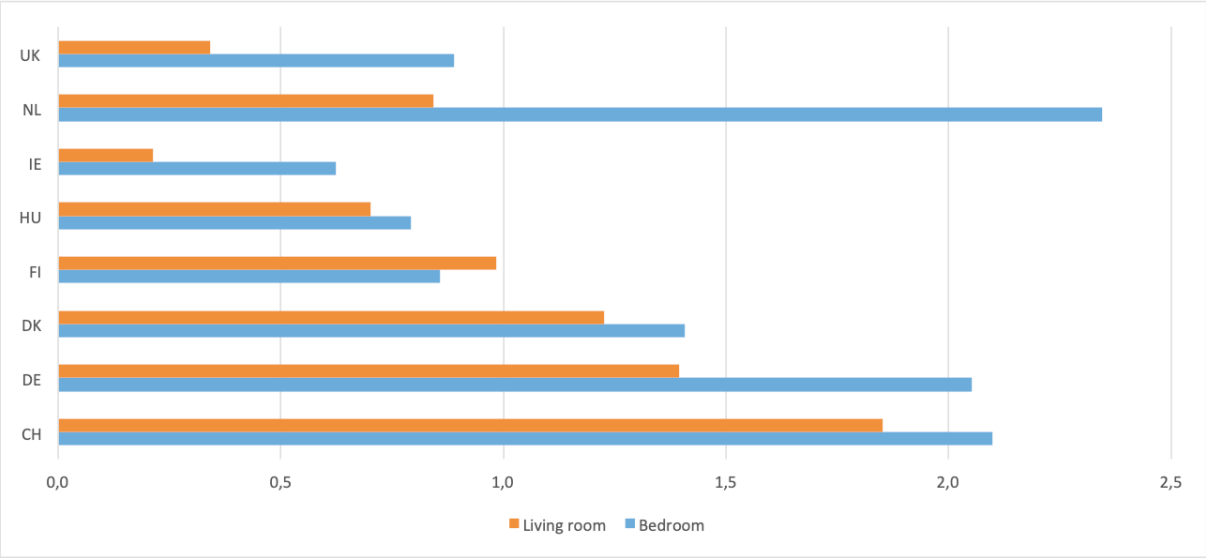


	Baseline		Challenge	
	°C	N	°C	N
CH	21,76	34	19,74	31
DE	19,50	40	17,35	38
DK	20,72	38	19,25	34
FI	21,28	35	20,24	32
HU	20,93	41	20,24	41
IE	17,55	37	16,92	35
NL	18,29	33	15,82	31
UK	20,29	25	19,17	23
total	20,04	283	18,58	265

N: number of households

FIG 8: REPORTED TEMPERATURE DIFFERENCES BETWEEN BASELINE AND CHALLENGE

Data source: weekly surveys, completed with diaries.
This graph is based on the data of the graphs 6 and 7. Since it is a difference of figures based on non identical sample numbers, it is not relevant to give global number samples.

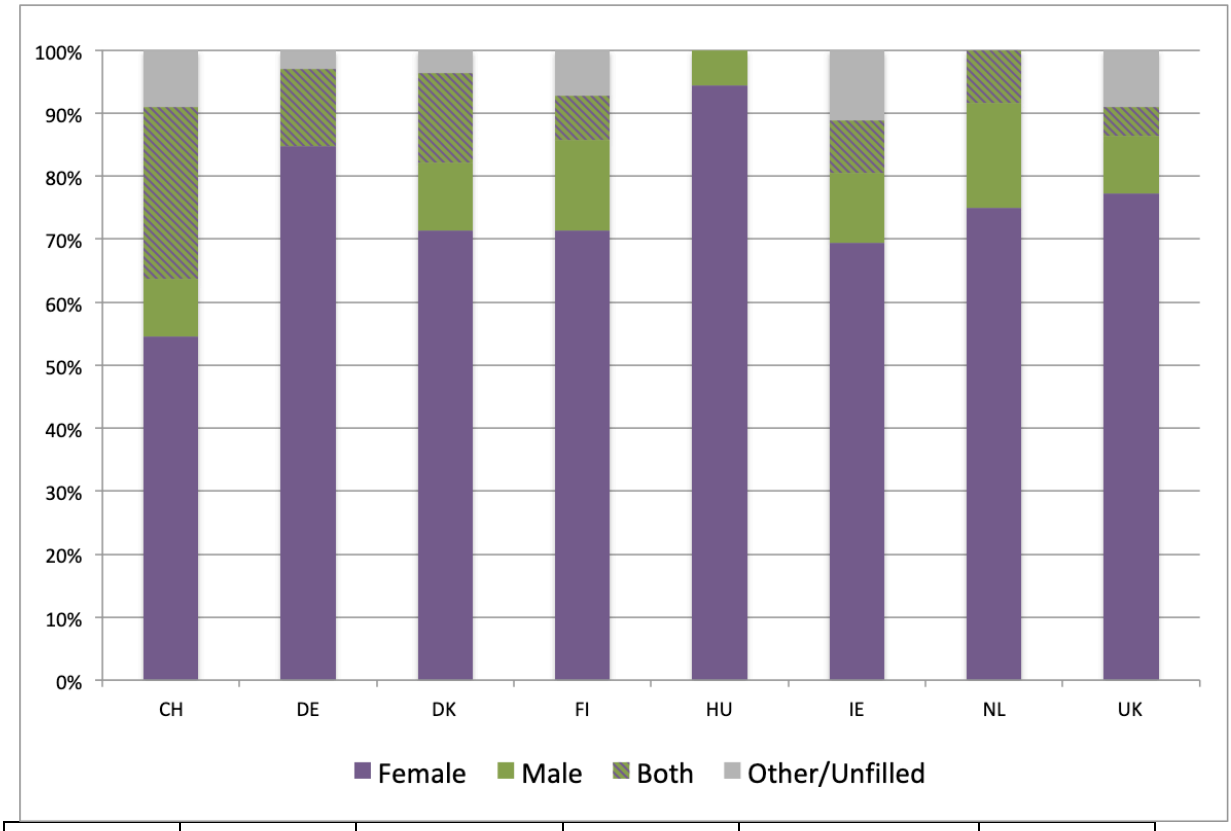


Country	**Bedroom**	**Living room**
CH	2,10	1,85
DE	2,05	1,39
DK	1,41	1,23
FI	0,86	0,98
HU	0,79	0,70
IE	0,62	0,21
NL	2,35	0,84
UK	0,89	0,34

Differences in °C

FIG 9: LAUNDRY CARE ACCORDING TO THE GENDER

Data source: Baseline survey

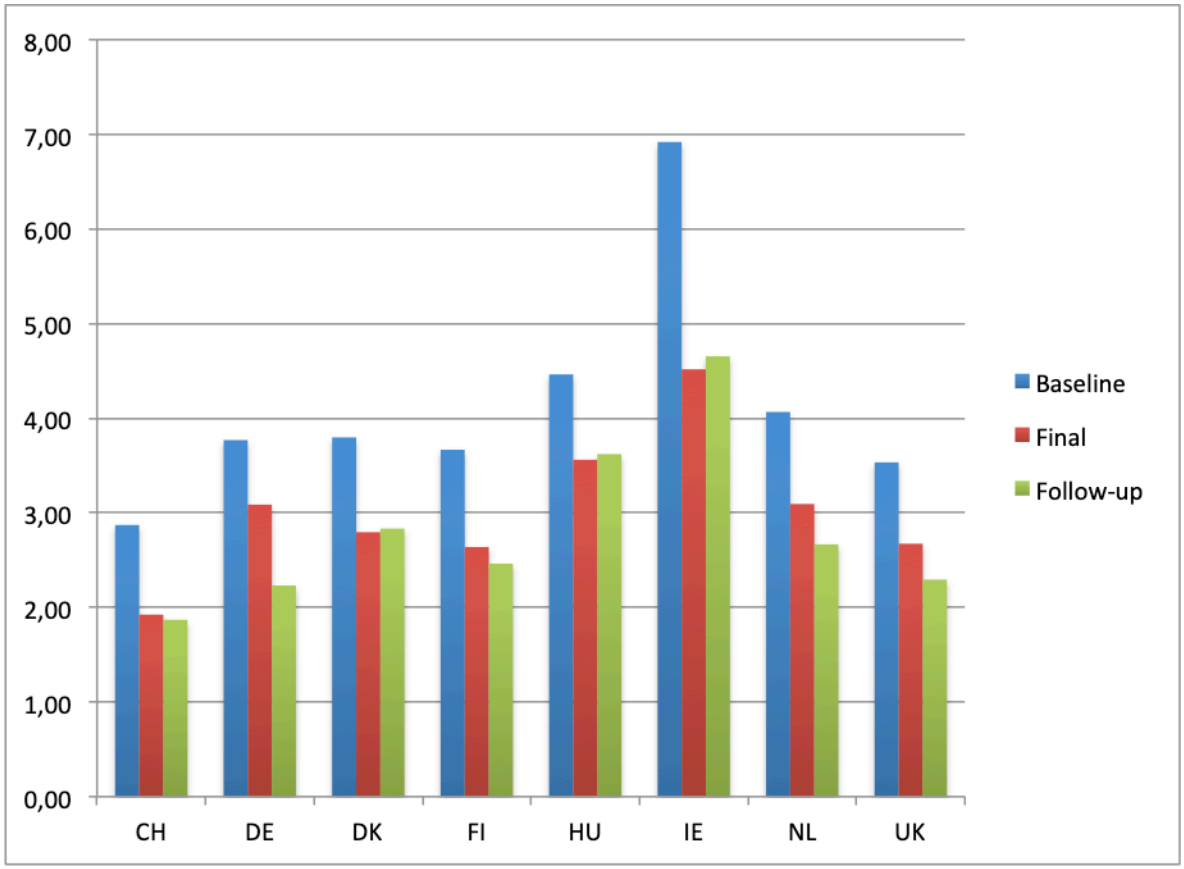


	Female	Male	Both	Other/Unfilled	Total
CH	12	2	6	2	22
DE	28	0	4	1	33
DK	20	3	4	1	28
FI	20	4	2	2	28
HU	34	2	0	0	36
IE	25	4	3	4	36
NL	18	4	2	0	24
UK	17	2	1	2	22
Total	174	21	22	12	229

Table: number of households with two adults (one male and one female)

FIG 10:WEEKLY AVERAGE LAUNDRY CYCLES BY COUNTRY, BEFORE AND DURING THE CHALLENGE

Data source: Baseline, closing and follow-up surveys

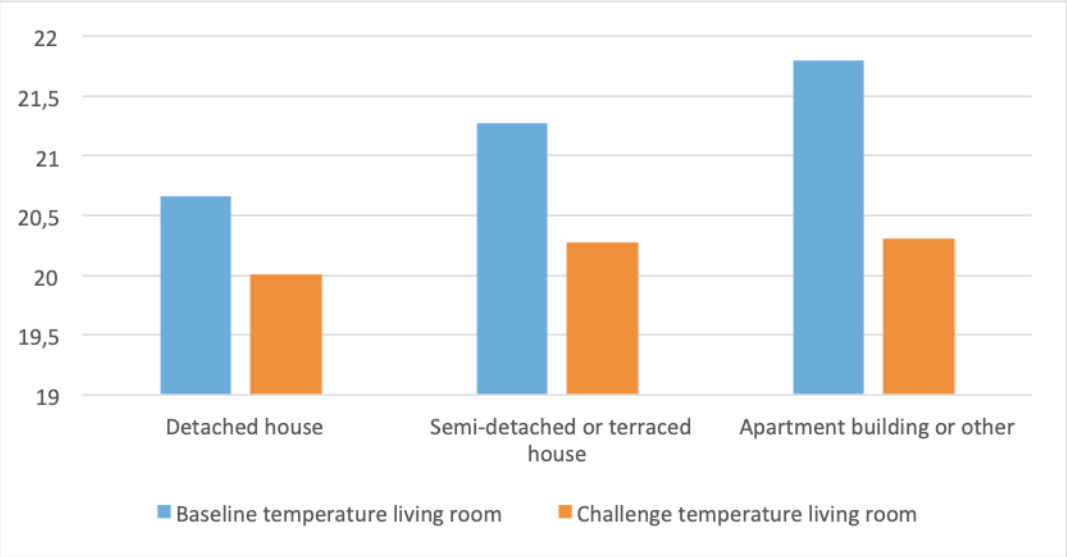


	Baseline		Final		Follow-up	
	°C	N	°C	N	°C	N
CH	2,87	35	1,92	29	1,87	23
DE	3,77	39	3,09	38	2,23	28
DK	3,80	37	2,80	33	2,83	24
FI	3,67	39	2,64	36	2,46	27
HU	4,46	41	3,56	41	3,62	29
IE	6,92	31	4,52	29	4,65	26
NL	4,07	34	3,09	32	2,67	24
UK	3,53	30	2,67	23	2,29	18
Total	4,10	286	3,06	261	2,87	199

N: number of households

FIG 11: REPORTED LIVING ROOM TEMPERATURES BY BUILDING TYPE

Data source: weekly surveys, completed with diaries.

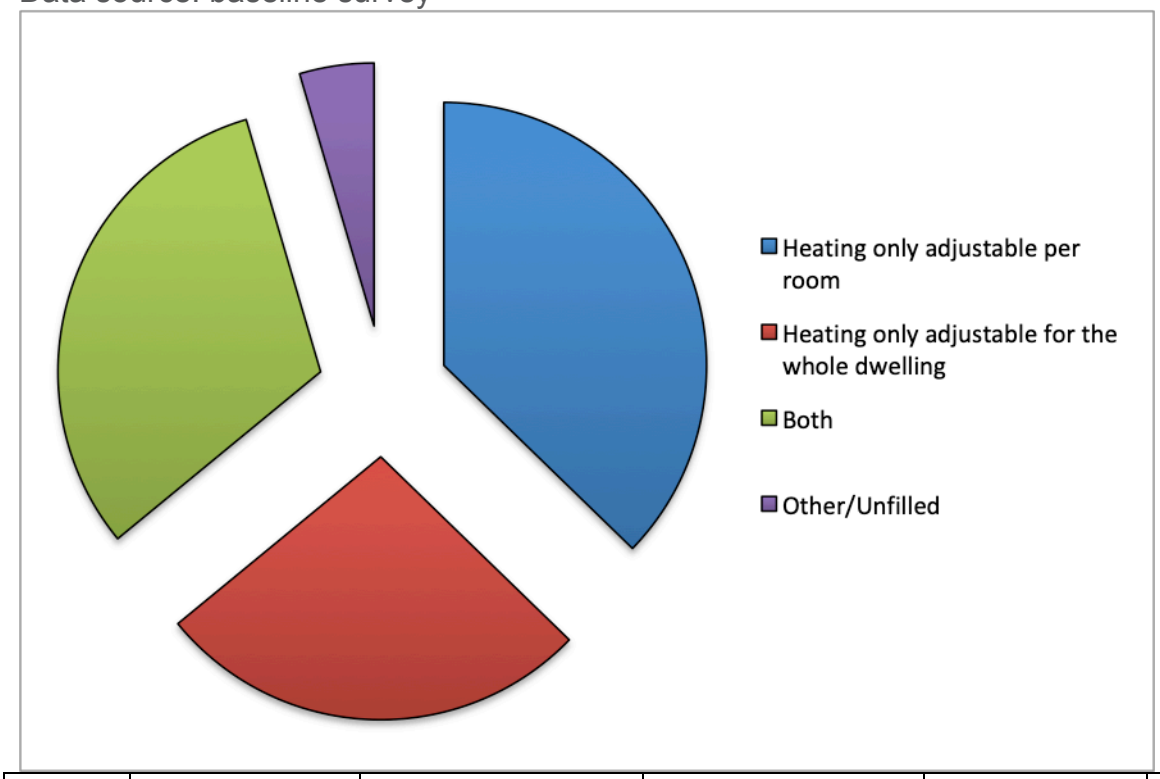


Building type		Baseline temperature living room (°C)	Challenge temperature living room (°C)	Temperature difference living room (°C)
Detached house	Mean	20,6660	20,0074	0,6502
	N	120	117	117
Semi-detached or terraced house	Mean	21,2769	20,2733	1,0122
	N	85	78	78
Apartment building or other	Mean	21,7932	20,3062	1,4197
	N	72	63	63
Total	Mean	21,1465	20,1608	0,9475
	N	277	258	258

N: number of households

FIG 12: HEATING REGULATION, TOTAL HOUSEHOLDS

Data source: baseline survey

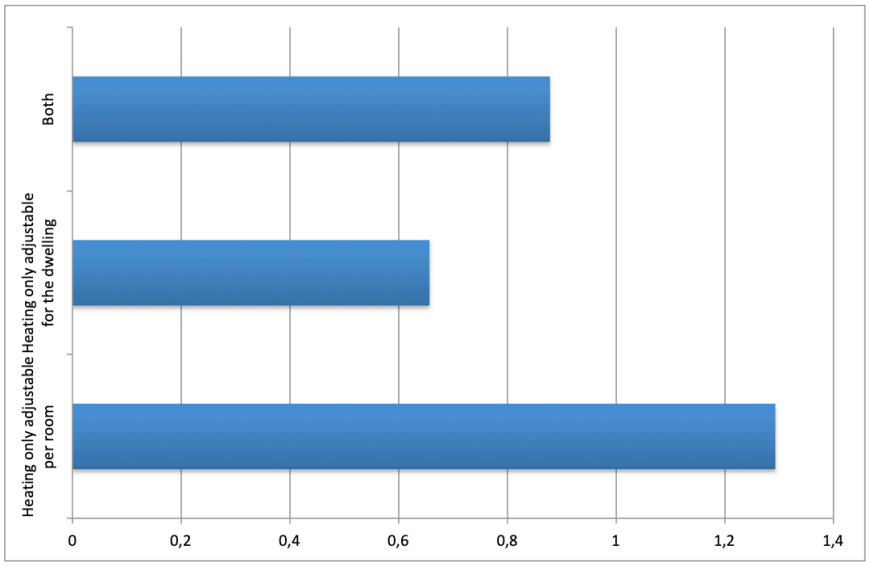


	Heating only adjustable per room		Heating only adjustable for the whole dwelling		Both		Other/Unfilled		Total
	N	%	N	%	N	%	N	%	N
Total	114	37,13%	82	26,37%	96	30,87%	14	4,50%	306
CH	29	76,32%	3	7,89%	3	7,89%	3	7,89%	38
DE	30	75,00%	4	10,00%	6	15,00%	0	0,00%	40
DK	18	47,37%	2	5,26%	17	44,74%	1	2,63%	38
FI	24	55,81%	2	4,65%	13	30,23%	4	9,30%	43
HU	4	9,76%	25	60,98%	12	29,27%	0	0,00%	41
IE	3	8,11%	18	48,65%	11	29,73%	5	13,51%	37
NL	5	13,89%	14	38,89%	16	44,44%	1	2,78%	36
UK	1	3,03%	14	42,42%	18	54,55%	0	0,00%	33

N: number of households

FIG 13: AVERAGE REPORTED REDUCTION IN TEMPERATURE IN °C DURING THE SURVEY PERIOD PER HEATING REGULATION POSSIBILITIES

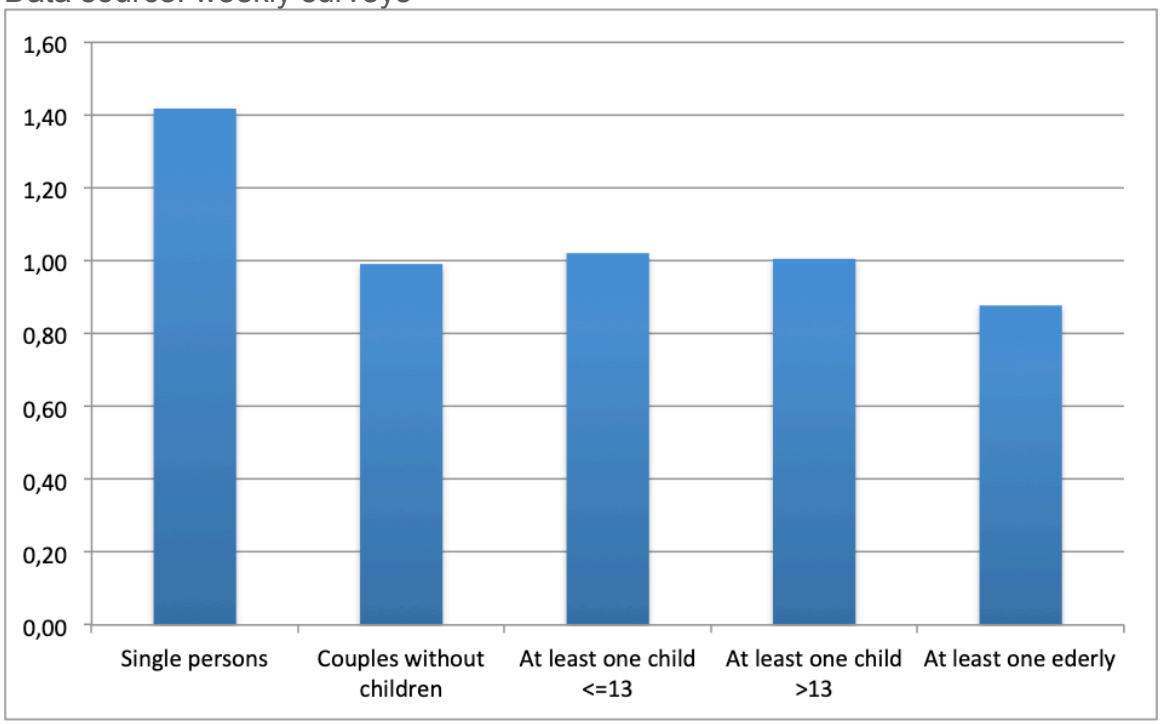
Data source: baseline and weekly surveys



	Heating only adjustable per room	Heating only adjustable for the dwelling	Both	Unfilled
Average reduction in temperature °C	1,29	0,66	0,88	-0,28
Number of households	114	82	96	14

FIG 14: REPORTED REDUCTION IN TEMPERATURES (IN C°) BETWEEN THE BEGINNING AND THE END OF THE CHALLENGE PER HOUSEHOLD COMPOSITION

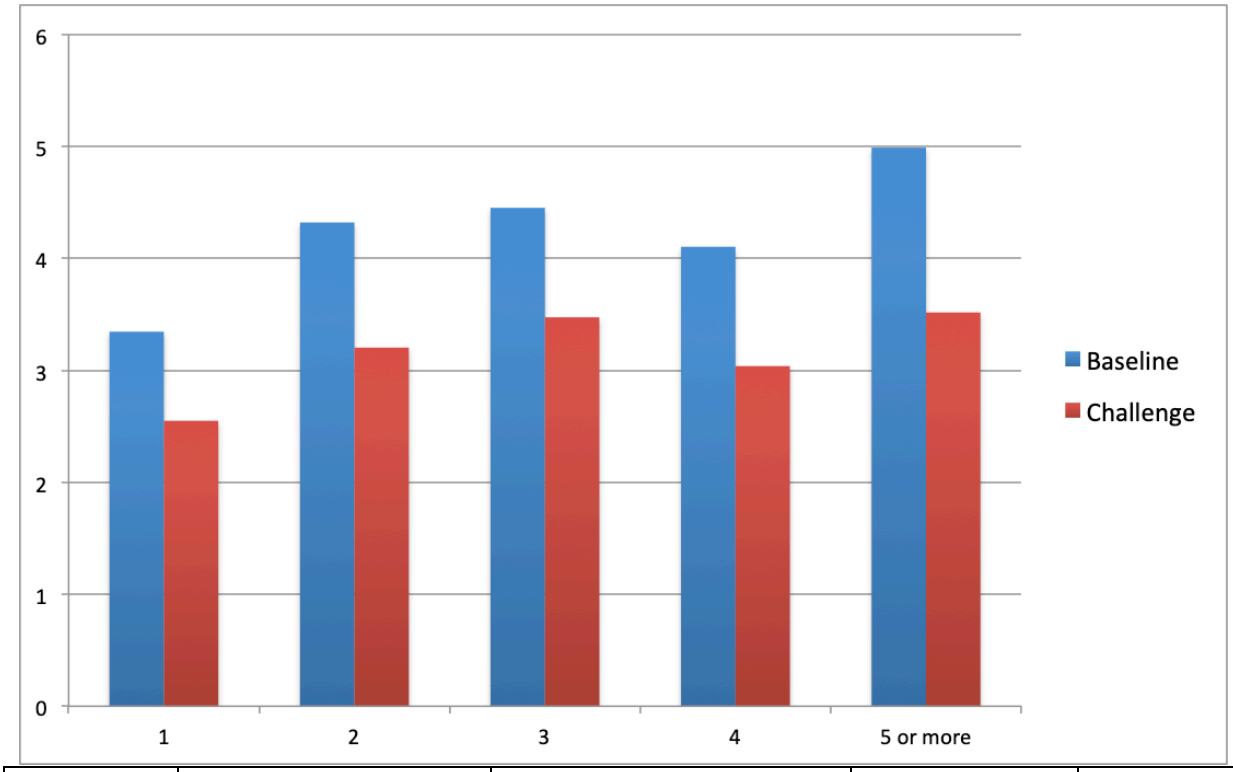
Data source: weekly surveys



Household type	Temperature reduction (°C)	Number of households
Single persons	1,42	39
Couples without children	0,99	74
At least one child <=13	1,02	115
At least one child >13	1,01	59
At least one ederly	0,88	38

FIG 15: AVERAGE WEEKLY LAUNDRIES PER HOUSEHOLD SIZE, BEFORE AND AFTER THE CHALLENGE

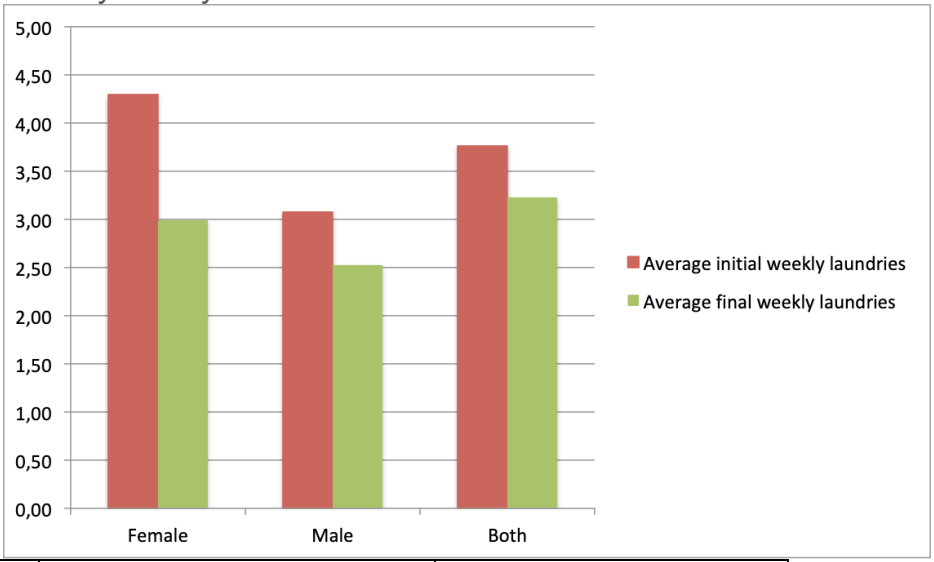
Data source: weekly surveys



	Baseline weekly number of laundry cycles	Challenge weekly number of laundry cycles	Number of households	% reduction
1	3,35	2,55	39	24%
2	4,32	3,20	89	26%
3	4,45	3,48	40	22%
4	4,11	3,04	80	26%
5 or more	4,99	3,52	48	30%
All	4,20	3,12	296	26%

FIG 16. AVERAGE WEEKLY LAUNDRY CYCLES PER GENDER IN CHARGE

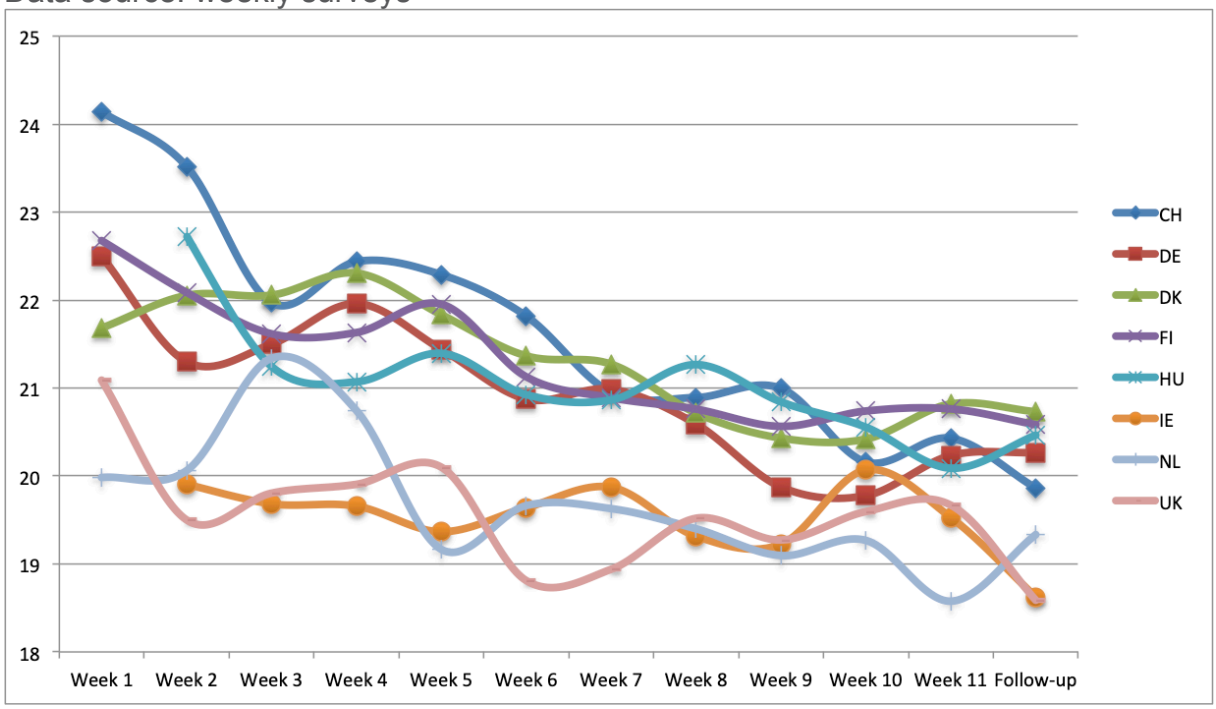
Data source: weekly surveys



	Average initial weekly laundries		Average final weekly laundries	
	# laundries	N	# laundries	N
Female	4,29	225	3,52	227
Male	3,07	34	3,30	35
Both	3,76	25	2,35	25

FIG 17: LIVING ROOM TEMPERATURES DURING, AFTER AND THREE MONTHS AFTER THE CHALLENGE

Data source: weekly surveys

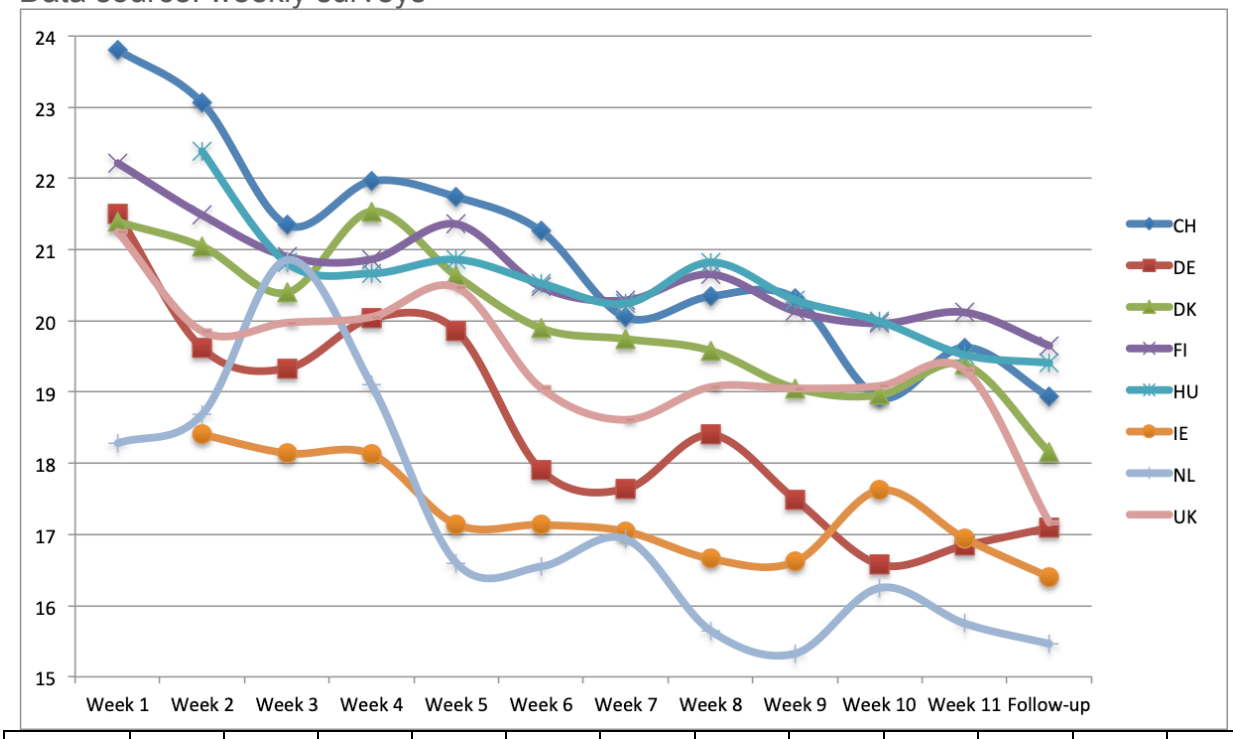


	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Follow-up
CH (°C)	24,14	23,52	21,97	22,44	22,29	21,82	20,95	20,89	21,00	20,16	20,43	19,86
CH (N)	*24*	*23*	*29*	*29*	*27*	*23*	*28*	*27*	*26*	*29*	*27*	*22*
DE (°C)	22,50	21,30	21,50	21,96	21,44	20,87	20,99	20,59	19,88	19,78	20,23	20,27
DE (N)	*37*	*36*	*35*	*35*	*35*	*35*	*36*	*34*	*36*	*35*	*33*	*30*
DK (°C)	21,68	22,05	22,06	22,31	21,83	21,37	21,27	20,72	20,43	20,42	20,82	20,73
DK (N)	*33*	*32*	*30*	*32*	*33*	*32*	*31*	*33*	*33*	*31*	*31*	*26*
FI (°C)	22,68	22,09	21,62	21,63	21,95	21,13	20,89	20,76	20,56	20,74	20,76	20,58
FI (N)	*29*	*29*	*30*	*32*	*30*	*29*	*29*	*30*	*31*	*28*	*27*	*33*
HU (°C)		22,72	21,25	21,07	21,39	20,93	20,87	21,27	20,84	20,56	20,09	20,46
HU (N)	*0*	*40*	*40*	*41*	*39*	*39*	*38*	*39*	*40*	*40*	*36*	*36*
IE (°C)		19,91	19,68	19,66	19,37	19,64	19,87	19,32	19,23	20,07	19,53	18,63
IE (N)	*0*	*23*	*30*	*28*	*30*	*32*	*32*	*31*	*32*	*30*	*31*	*24*
NL (°C)	19,99	20,06	21,34	20,74	19,17	19,66	19,63	19,40	19,10	19,27	18,58	19,33
NL (N)	*30*	*29*	*31*	*30*	*29*	*31*	*31*	*30*	*26*	*28*	*26*	*27*
UK (°C)	21,09	19,50	19,81	19,91	20,10	18,81	18,94	19,52	19,27	19,60	19,67	18,59
UK (N)	*21*	*22*	*19*	*18*	*20*	*19*	*20*	*20*	*22*	*22*	*19*	*17*
Total (°C)	22,00	21,50	21,22	21,31	21,01	20,59	20,50	20,37	20,09	20,10	20,05	19,93
Total (N)	*174*	*234*	*244*	*245*	*243*	*240*	*245*	*244*	*246*	*243*	*230*	*215*

N: number of measures (by week)

FIG 18: BEDROOM TEMPERATURES DURING, AFTER AND THREE MONTHS AFTER THE CHALLENGE

Data source: weekly surveys

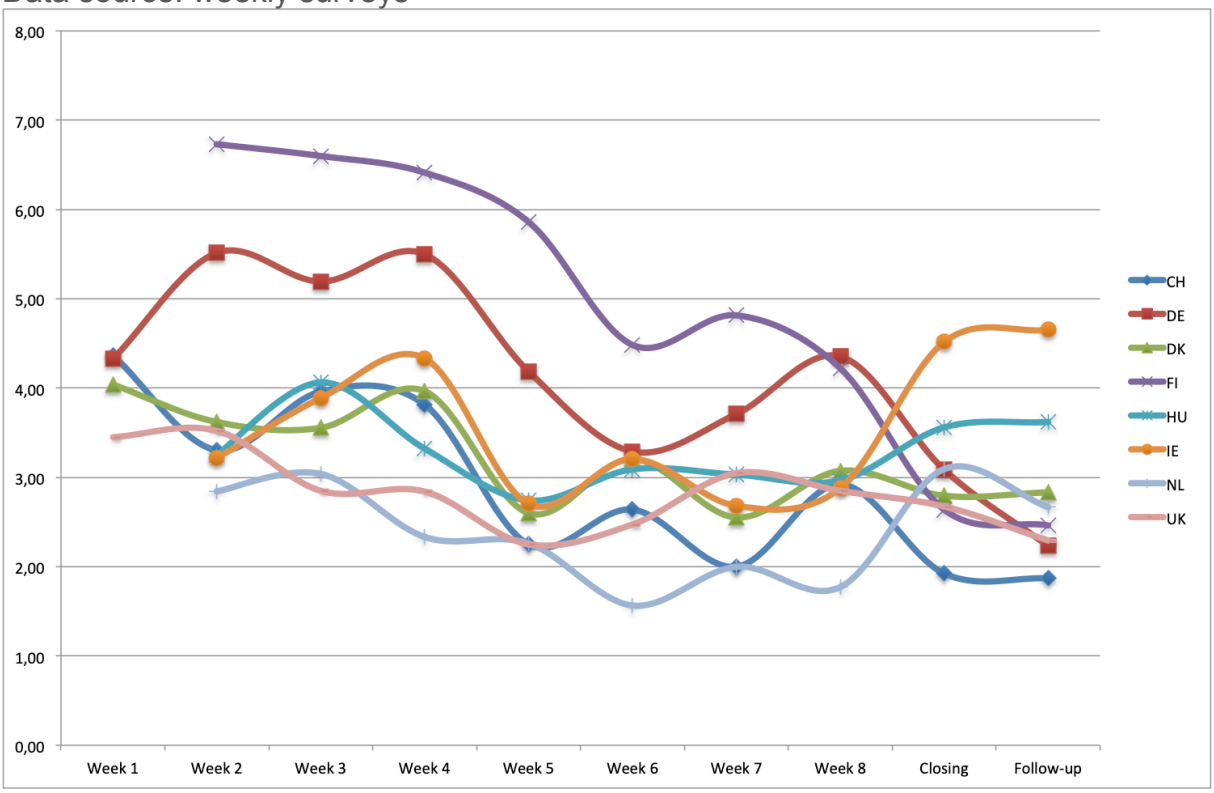


	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Follow-up
CH (°C)	23,81	23,06	21,35	21,96	21,74	21,26	20,05	20,34	20,32	18,92	19,63	18,93
CH (N)	*24*	*23*	*29*	*29*	*27*	*23*	*28*	*27*	*26*	*29*	*27*	*22*
DE (°C)	21,51	19,62	19,33	20,03	19,86	17,90	17,64	18,40	17,49	16,58	16,84	17,09
DE (N)	*37*	*36*	*35*	*35*	*35*	*35*	*36*	*34*	*36*	*35*	*33*	*32*
DK (°C)	21,39	21,04	20,40	21,54	20,63	19,90	19,75	19,58	19,05	18,96	19,38	18,15
DK (N)	*32*	*32*	*30*	*32*	*33*	*32*	*31*	*33*	*33*	*31*	*31*	*26*
FI (°C)	22,22	21,49	20,90	20,86	21,36	20,48	20,29	20,65	20,14	19,96	20,12	19,65
FI (N)	*28*	*28*	*30*	*31*	*29*	*28*	*28*	*30*	*30*	*27*	*26*	*33*
HU (°C)		22,39	20,81	20,67	20,86	20,53	20,24	20,82	20,29	19,99	19,52	19,41
HU (N)	*0*	*37*	*37*	*38*	*38*	*39*	*33*	*36*	*39*	*40*	*34*	*36*
IE (°C)		18,41	18,14	18,13	17,14	17,13	17,04	16,66	16,62	17,62	16,95	16,40
IE (N)	*0*	*22*	*30*	*28*	*30*	*32*	*32*	*31*	*32*	*30*	*31*	*25*
NL (°C)	18,28	18,69	20,85	19,10	16,60	16,55	16,94	15,65	15,33	16,25	15,75	15,46
NL (N)	*30*	*29*	*31*	*30*	*29*	*31*	*31*	*30*	*26*	*28*	*26*	*27*
UK (°C)	21,25	19,85	19,97	20,06	20,47	19,06	18,61	19,07	19,05	19,09	19,31	17,17
UK (N)	*21*	*22*	*19*	*18*	*20*	*19*	*20*	*20*	*22*	*22*	*19*	*18*
Total (°C)	21,33	20,63	20,23	20,34	19,83	19,04	18,77	18,91	18,57	18,43	18,39	17,90
Total (N)	*172*	*229*	*241*	*241*	*241*	*239*	*239*	*241*	*244*	*242*	*227*	*219*

N: number of measures (by week)

FIG 19: WEEKLY LAUNDRIES BEFORE, DURING, AFTER AND THREE MONTHS AFTER THE CHALLENGE FOR THE DIFFERENT COUNTRIES

Data source: weekly surveys



	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Closing	Follow-up
CH	4,36	3,30	3,96	3,81	2,25	2,64	2,00	2,92	1,92	1,87
N	*22*	*23*	*26*	*27*	*28*	*25*	*26*	*26*	*29*	*22*
DE	4,33	5,52	5,19	5,50	4,19	3,29	3,71	4,35	3,09	2,23
N	*6*	*33*	*31*	*30*	*32*	*31*	*31*	*31*	*38*	*28*
DK	4,04	3,62	3,56	3,97	2,60	3,21	2,55	3,07	2,80	2,83
N	*28*	*29*	*27*	*29*	*30*	*29*	*29*	*27*	*33*	*24*
FI		6,73	6,60	6,41	5,86	4,48	4,81	4,22	2,64	2,46
N	*0*	*26*	*30*	*29*	*29*	*31*	*27*	*27*	*36*	*27*
HU		3,25	4,06	3,32	2,74	3,09	3,03	2,97	3,56	3,62
N	*0*	*28*	*31*	*31*	*31*	*33*	*32*	*31*	*41*	*29*
IE		3,21	3,89	4,33	2,70	3,21	2,68	2,88	4,52	4,65
N	*0*	*19*	*27*	*27*	*27*	*29*	*22*	*25*	*29*	*26*
NL		2,84	3,04	2,33	2,26	1,57	2,00	1,77	3,09	2,67
N	*20*	*19*	*25*	*24*	*23*	*23*	*23*	*22*	*32*	*24*
UK	3,45	3,52	2,85	2,84	2,25	2,47	3,05	2,85	2,67	2,29
N	*22*	*23*	*20*	*19*	*20*	*19*	*21*	*20*	*23*	*18*

N: number of measures (by week)